

**SOURCE TEST REPORT
FOR
COMBINED CYCLE COMBUSTION TURBINE
INTEGRATED FACILITY UNITS 1 ("SPRINT")
COMPLIANCE EVALUATION
FOR
NATURAL GAS FIRING
OXIDES OF NITROGEN,
SULFUR DIOXIDE AND VISIBLE EMISSIONS
PASCO COGENERATION LIMITED
DADE CITY, FLORIDA**

FDEP PERMIT NUMBER 1010071-002-AC

JANUARY 4-5, 2007

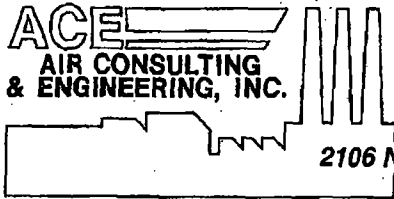
PREPARED FOR:

**CAITHNESS ENERGY, L.L.C.
9590 PROTOTYPE COURT
RENO, NEVADA 89521**

PREPARED BY:

**AIR CONSULTING AND ENGINEERING, INC.
2106 NW 67TH PLACE, SUITE 4
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424-07-01



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REPORT CERTIFICATION

To the best of my knowledge, all applicable field and analytical procedures comply with the Florida Department of Environmental Protection requirements and all test data and plant operating data are true and correct.

Dagmar Fick
Dagmar Fick, Staff Engineer

Date 1/23/07

Table 1. Emission Summary
Unit 1 Combustion Turbine - Gas Fired
Pasco Cogeneration, Ltd.
Dade City, Florida
January 4-5, 2007

Run Number	Time	Oxygen %	NOx Emissions				CO Emissions			CT Gas Flow scfm	CT Heat Input		CT + DB Heat Input MMBTUH HHV
			ppm	ppm 15% O2	lbs/hr	lbs/MMBTU	ppm	lbs/hr	lbs/MMBTU		MMBTUH HHV	MMBTUH LHV	
Full Load CT only at 49.8 MW - 1/4/07													
1	0704-0806	14.28	26.91	23.97	42.24	0.0883	23.52	22.47	0.0470	7697	478.4	432.8	NA
2	0835-0935	14.27	27.35	24.34	42.90	0.0896	22.12	21.12	0.0441	7701	478.7	433.0	NA
3	0951-1051	14.23	27.37	24.19	42.66	0.0891	21.72	20.61	0.0431	7703	478.8	433.2	NA
Average	—	14.26	27.21	24.17	42.60	0.0890	22.45	21.40	0.0447	7700	477.7	433.0	NA
Full Load CT at 49.7 MW with Duct Burner - 1/5/07													
1	0717-0817	13.47	28.89	22.94	44.60	0.0845	—	—	—	7685	478.6	433.0	527.8
2	0834-0934	13.43	28.83	22.77	44.25	0.0838	—	—	—	7685	478.6	433.0	527.7
3	0952-1052	13.38	29.17	22.90	44.42	0.0843	—	—	—	7684	478.6	433.0	526.6
Average	—	13.43	28.96	22.87	44.42	0.0842	—	—	—	7685	478.6	433.0	527.4

Natural Gas Fd-Factor = 8710 MMBTU/dscf. MW CO = 28 lbs/lb-mole. MW NOx = 46 lbs/lb-mole
Heat Input HHV = (gas flow)(1036 dry Btu/cf)(60 min/hr)/10E6 (1038 dry Btu/cf on 1/5/07)
lbs/hr = ppm(2.595 x 10^E-9)MW (20.9/20.9-%O2)(Fd)(Heat Input HHV)

SO2 Emissions (Subpart GG NSPS) = 7.75E-03 lbs/hr 0.202 gr/hcf

Allowable Emissions
NOx = 25 ppmvd @ 15%O2
CO = 28 ppmvd
DB NOx = 0.1 lbs/MMBTU

Duct Burner				
Run	Gas Flow dscfm	HHV MMBTUH	LHV MMBTUH	NOx Contr. lbs/MMBTU
1	790	49.2	44.5	0.048
2	788	49.1	44.4	0.028
3	771	48.0	43.5	0.037
Average	783	48.8	44.1	0.037

Koerner, Jeff

From: Thomas Grace [tgrace@caithnessenergy.com]
Sent: Wednesday, September 06, 2006 4:21 PM
To: Koerner, Jeff
Subject: FW: Scanned from TOSHIBA 09/06/2006 13:01

Attachments: DOC090606.pdf



DOC090606.pdf
(474 KB)

Jeff,

Per our earlier conversation, here are attached the scanned pages from the recent source test. Normally Pasco is not required to do CO testing annually, only every five years prior to Title V permit renewal submittal, but we had it done as a separate test on Unit 2 this time due to the SPRINT addition (see table on last page of scan). The original of this source test was submitted last month to Southwest District.

I hope this addresses your needs for the extension approval for Unit 1. If you need any further info let me know.

Thanks once again for your help.

Tom Grace
775-850-2248

-----Original Message-----

From: Caithness Energy [mailto:gpotts@cenyc.com]
Sent: Wednesday, September 06, 2006 1:01 PM
To: Thomas Grace
Subject: Scanned from TOSHIBA 09/06/2006 13:01

Scanned from TOSHIBA.
Date: 09/06/2006 13:01
Pages: 10
Resolution: 200x200 DPI

AIR CONSULTING AND ENGINEERING, INC.
 2106 NW 67th Place, Suite 4, Gainesville, Florida 32653

PLANT OPERATING DATA
 COMBUSTION TURBINE UNIT 1
 PASCO COGEN LIMITED
 DADE CITY, FLORIDA
 JANUARY 4, 2007

BASE LOAD CT ONLY

TIME	INLET AIR TEMPERATURE	GT MW	NOx WATER FLOW GPM	TURBINE GAS FLOW SCFM	WATER:FUEL RATIO	DUCT BURNER FLOW KSCFH	DUCT BURNER FLOW SCFM
RUN 1							
703	52.1	49.4	41.7	7646	1.420	NA	NA
718	51.7	49.7	42.0	7707	1.410		
730	51.4	49.8	43.0	7714	1.430		
744	51.9	49.7	43.0	7707	1.430		
759	51.8	49.8	43.0	7710	1.430		
AVERAGES:	51.8	49.7	42.5	7697	1.424		
RUN 2							
835	52.2	49.8	43.0	7706	1.430	NA	NA
850	52.0	49.8	43.0	7691	1.440		
904	52.6	49.8	43.0	7706	1.430		
924	52.9	49.8	43.0	7700	1.430		
935	53.7	49.9	43.0	7704	1.430		
AVERAGES:	52.7	49.8	43.0	7701	1.432		
RUN 3							
951	53.0	49.8	43.0	7704	1.430	NA	NA
1008	53.3	49.8	42.0	7703	1.430		
1023	53.8	49.8	43.0	7703	1.430		
1041	53.9	49.8	43.0	7703	1.430		
1051	54.0	49.8	43.0	7704	1.430		
AVERAGES:	53.6	49.8	42.8	7703	1.430		

**SOURCE TEST REPORT
FOR
COMBINED CYCLE COMBUSTION TURBINES
WITH AUXILIARY DUCT BURNERS**

**INTEGRATED FACILITY UNITS 1 AND 2
COMPLIANCE EVALUATION
FOR
NATURAL GAS FIRING
OXIDES OF NITROGEN,
SULFUR DIOXIDE AND VISIBLE EMISSIONS**

FDEP PERMIT NUMBER 1010071-003-AV

**PASCO COGENERATION LIMITED
DADE CITY, FLORIDA**

JULY 13-14, 2006

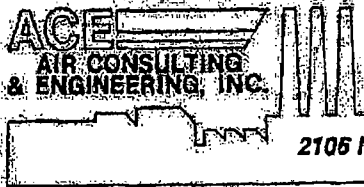
PREPARED FOR:

**CAITHNESS ENERGY, L.L.C.
9790 GATEWAY DRIVE, STE. 220
RENO, NEVADA 89521**

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REPORT CERTIFICATION

To the best of my knowledge, all applicable field and analytical procedures comply with the Florida Department of Environmental Protection requirements and all test data and plant operating data are true and correct.

Dagmar Fick

Dagmar Fick, Staff Engineer

8/18/2006

Date

EXECUTIVE SUMMARY

The annual compliance test results for the Unit 1 (EU001) and the Unit 2 (EU002) Combustion Turbines meet all mass emission requirements listed in the Florida Department of Environmental Protection (FDEP) Permit Number 1010071-003-AV. All tests were conducted on natural gas firing only. The allowable lower heating value (LHV) heat input to each unit is 424 MMBTUH. Testing was conducted at 395.0 and 405 MMBTUH, respectively, due to restrictions imposed by G.E.

Pollutant	Source	Actual Emissions	Total Plant Allowable Emissions
UNIT 1			
NO _x	CT	38.4 lbs/hr, 24 ppm _d @ 15% O ₂	85.5 lbs/hr CT1 & CT2 combined 25 ppm _d @ 15% O ₂
	DB	0.74 lbs/hr, 0.016 lbs/MMBTU	18.0 lbs/hr DB1 & DB2 combined 0.1 lbs/MMBTU
	CT & DB	39.1 lbs/hr	103.5 lbs/hr Total
UNIT 2			
NO _x	CT	40.6 lbs/hr, 25 ppm _d @ 15% O ₂	85.5 lbs/hr CT1 & CT2 combined 25 ppm _d @ 15% O ₂
	DB	-2.01 lbs/hr, -0.038 lbs/MMBTU	18.0 lbs/hr DB1 & DB2 combined 0.1 lbs/MMBTU
	CT & DB	38.6 lbs/hr	103.5 lbs/hr Total

Mass emission limitations are total for both units combined.

Emission results at full load are provided in Tables 1 (Unit 1) and 2 (Unit 2), which include demonstration of compliance at ISO ambient corrected NO_x emission concentrations to ensure that CFR 40 Part 60 Subpart GG emission limits are also met. ISO corrected NO_x allowable is approximately 112.5 ppm.

No visible emissions were detected from full gas turbine or full gas turbine plus full duct burner operations from both units.

SO₂ emissions based on fuel analysis were 1.05×10^{-2} for Unit 1 at 42 MW and 1.01×10^{-2} lb/hr for Unit 2 at 47.4 MW.

1.0 INTRODUCTION

On July 13 and 14, 2006 Air Consulting and Engineering, Inc. (ACE) performed annual compliance testing for Oxides of Nitrogen (NO_x) and Opacity on the exhaust stacks of the Combustion Turbines, Units 1 and 2, at Pasco Cogeneration Limited in Dade City, Florida.

The Units were tested at full load to satisfy conditions of the current Florida Department of Environmental Protection (FDEP) Title V Permit 1010071-003-AV (see Appendix A).

United States Environmental Protection Agency (EPA) Method 20 (NO_x and O₂) and Method 9 (VE) were used to determine turbine emissions with and without duct burner operation. Sulfur Dioxide (SO₂) emissions were calculated from the fuel analysis.

Mr. Warren Park of Pasco Cogeneration, Ltd. coordinated testing and provided plant production data. Mr. Tom Grace of Caithness Energy, L.L.C. served as Project Director.

2.0 SUMMARY AND DISCUSSION OF RESULTS

The facility demonstrated compliance with permit conditions. Results of the emission tests are summarized in Tables 1 and 2. The Units were fired on natural gas.

The contribution of NO_x emissions of the gas fired duct burners was determined by performing a test series with and without duct burner firing. The difference in emission rates was attributed to the duct burners.

Duct burner NO_x contributions averaged 0.016 pounds per Million BTUs (lbs/MMBTU) for Unit 1 and -0.038 lbs/MMBTU for Unit 2. The power output of the combustion turbines 1 and 2 was 42 and 47.4 megawatts (MW) with and without duct burners. Unit 2's Inlet Air Temperature and Water Flow Rates were 60.2° F and 38.0 GPM for CT operation only and 58.4° F and 38.1 GPM for CT plus Duct Burner Operations. The NO_x water to fuel ratio averaged 1.39 for both operating conditions (see Appendix F for Plant Data). The apparent negative emission rate was possibly caused by a slight increase in the water injection rate and a slight decrease in CT heat input as well as a higher inlet air temperature during the DB test. DB contribution for NO_x are difficult to accurately demonstrate due to the relative low (10%) DB contribution to the total heat input. Allowable emissions are 0.1 lbs/MMBTU NO_x.

Units 1 and 2 without duct burners averaged 23.9 and 24.6 parts per million (ppm) NO_x at 15% O₂, respectively, which is within the permitted standard of 25 ppm at 15% O₂.

To also demonstrate compliance with Federal New Source Performance Standards (NSPS) by 40CFR 60 Subpart GG, observed NO_x concentrations were first adjusted to 15% O₂ and then finally to ISO standard ambient conditions using the following equation:

$$\text{ISO NO}_x \text{ Emissions} = (\text{NO}_{\text{obs}} \text{ ppm}) \left(\frac{P_{\text{ref}}}{P_{\text{obs}}} \right)^{0.5} e^{1.9(1.43 - 0.00633)} (288^\circ\text{K}/T_{\text{amb}})^{1.53}$$

Where:

NO_{obs} = measured NO_x ppm at 15% O₂

P_{ref} = reference combustor inlet absolute pressure at 101.3 kilopascal ambient pressure (29.92 in. Hg)

P_{obs} = measured combustor inlet absolute pressure at test ambient pressure (actual barometric pressure in in. Hg)

H_{obs} = specific humidity at ambient air at test (g H₂O/g air)

T_{amb} = temperature of ambient air at test

e = 2.718 - transcendental constant

Allowable NO_x emissions for NSPS are approximately 112.5 ppm @ ISO ambient conditions. Both units were in compliance with this standard.

Table 1. Emission Summary
 Unit 1 Combustion Turbine - Gas Fired
 Pasco Cogeneration, Ltd.
 Dade City, Florida
 July 14, 2006

Run Number	Time	Oxygen %	NOx Emissions					COMBUSTION TURBINE			DUCT BURNERS		CT + DB	NOx
			ppm	ppm 15% O2	ppm @ISO	lbs/hr	lbs/MMBTU	Gas Flow scfm	CT Heat Input MMBTUH HHV LHV		Gas Flow scfm	Heat Input MMBTUH HHV	Heat Input MMBTUH HHV	Contr. lbs/MMBTU
<u>Full Load CT only at 41.9 MW</u>														
1	1113-1222	14.28	26.79	23.87	31.60	38.45	0.0879	7076	437.3	395.5	NA	NA	NA	NA
2	1238-1338	14.28	26.58	23.68	30.60	38.08	0.0872	7064	436.6	394.8	NA	NA	NA	NA
3	1355-1455	14.28	26.96	24.01	31.30	38.60	0.0885	7069	436.2	394.6	NA	NA	NA	NA
Average	—	14.28	26.78	23.85	31.17	38.38	0.0879	7066	438.4	395.0	NA	NA	NA	NA
<u>Full Load CT at 42.0 MW with Duct Burner</u>														
1	1513-1613	13.40	27.74	21.82	NA	38.75	0.0804	7060	436.3	394.6	740	45.7	482.1	0.007
2	1632-1732	13.41	27.99	22.05	NA	39.30	0.0812	7081	437.6	395.8	746	46.1	483.7	0.026
3	1746-1847	13.38	28.28	22.19	NA	39.30	0.0817	7037	434.9	393.4	750	46.4	481.3	0.015
Average	—	13.40	28.00	22.02	NA	39.12	0.0811	7059	436.3	394.6	745	46.1	482.3	0.016

Natural Gas Fd Factor = 87.10 MMBTU/dscf
 lbs/hr = ppm(2.595 x 10⁻⁹)MW (20.9/20.9-%O2)(Fd)(Heat Input HHV)
 Heat Input HHV = (gas flow)(1030 dry Btu/cf)(60 min/hr)/10E6

MW/NOx = 46 lbs/lb-mw

SO2 Emissions (Subpart GG NSPS) = 1.05E-02 lbs/hr 0.299 gr/hcf

Allowable Emissions
 NOx = 25 ppmvd @ 15%O2
 DB NOx = 0.1 lbs/MMBTU

Table 2. Emission Summary
Unit 2 Combustion Turbine - Gas Fired
Pasco Cogeneration, Ltd.
Dade City, Florida
July 13, 2006

Run Number	Time	Oxygen %	NOx Emissions					COMBUSTION TURBINE			DUCT BURNERS		CT + DB Heat Input MMBTUH	NOx Contr. lbs/MMBTU
			ppm	ppm 15% O2	ppm @ISO	lbs/hr	lbs/MMBTU	Gas Flow scfm	CT Heat Input MMBTUH HHV	MMBTUH LHV	Gas Flow scfm	Heat Input MMBTUH HHV		
Full Load CT only at 47.4 MW														
1	1306-1413	14.39	26.95	24.44	32.90	40.31	0.0900	7237	447.7	405.0	NA	NA	NA	NA
2	1435-1535	14.40	27.20	24.68	30.30	40.71	0.0909	7237	447.7	405.0	NA	NA	NA	NA
3	1552-1652	14.41	27.28	24.80	30.30	40.90	0.0914	7232	447.4	404.7	NA	NA	NA	NA
Average	—	14.40	27.14	24.64	31.17	40.64	0.0908	7235	447.6	404.9	NA	NA	NA	NA
Full Load CT at 47.4 MW with Duct Burner														
1	1717-1817	13.38	26.82	21.05	NA	38.72	0.0776	7231	447.3	404.6	838	51.9	499.2	-0.031
2	1830-1930	13.40	26.62	20.94	NA	38.56	0.0771	7234	447.5	404.8	849	52.5	500.0	-0.041
3	1944-2044	13.43	26.51	20.93	NA	38.60	0.0771	7235	447.6	404.8	847	52.4	499.9	-0.044
Average	—	13.40	26.65	20.97	NA	38.63	0.0773	7233	447.5	404.8	845	52.3	499.7	-0.038

Natural Gas Fd Factor = 8710 MMBTU/dec

lbs/hr = ppm(2.595 x 10⁻⁹)MW (20.9/20.9-%O2)(Fd)(Heat Input HHV)

Heat Input HHV = (gas flow)(1031 dry Btu/cf)(60 min/hr)/10E6

MW NOx = 46 lbs/lb-mole

SO2 Emissions (Subpart GG NSPS) = 1.01E-02 lbs/hr 0.279 gr/hcf

Allowable Emissions

NOx = 25 ppmvd @ 15%O2

DB NOx = 0.1 lbs/MMBTU

Actual combined mass emissions for both turbines are 79.0 lbs/hr NO_x at a total heat input of 799.9 MMBTUH (LHV). Combined mass emissions with duct burners are 77.8 lbs/hr NO_x at a total heat input of 799.4 MMBTUH (LHV).

Mass emissions for in pounds per hour were calculated using the actual heat input and the pollutant concentration.

Sulfur Dioxide (SO₂) emissions were determined by fuel analysis performed by the SGS North America, Inc. SO₂ emissions based on 4.470 ppmv (7/13/06) and 4.788 ppmv (7/14/06) Sulfur content averaged 2.06×10^{-2} lbs/hr for both Units combined (see Appendix F for fuel analysis).

Visible emission tests were conducted on both units during turbine operation only and combined turbine and duct burner operation. Visible emissions on both turbine exhaust stacks at both conditions averaged 0.0 percent opacity for the highest six minute period of each test (see Appendix D for VE data). Permitted emissions are 10 percent opacity.

Gaseous emission data with data logger results and strip chart copies are provided in Appendices B and C, respectively.

3.0. PROCESS DESCRIPTION AND OPERATION

The Pasco Cogeneration Limited facility consists of two GE LM6000 PA combustion gas turbine generating sets with a nominal generating capacity of 42 MW each. Each turbine is exhausted through a Heat Recovery Steam Generator (HRSG) with supplemental duct burner firing. The steam produced by the HRSG is exhausted through a common steam turbine generator originally rated for 26.5 MW. The duct burners are permitted for up to 90 MMBTU heat input each. The gas turbines can be fired on either natural gas or oil. The duct burners are fired only with natural gas. The gas turbines have a chiller system, which maintains inlet combustion air at 51°F to 58°F and 100% relative humidity year round. Water is injected at the turbine combustor ring to reduce NO_x emissions.

Unit 2 is equipped with a "Sprint" system that injects atomized water in the combustor inlet. This increases power and further reduces NO_x.

During the compliance test the Units generated 42 MW (Unit 1) and 47.4 MW (Unit 2) at full load (see Appendix F for plant production data).

AIR CONSULTING AND ENGINEERING, INC.
2106 NW 67th Place, Suite 4, Gainesville, Florida 32653

BIAS CORRECTION AND EMISSION RESULTS
PASCO COGEN
CT-2 OUTLET
DADE CITY, FLORIDA
JULY 13, 2006

CT:BASE LOAD

F-FACTOR 8710

1306-1413		Cal Gas	Pre Run		Post Run		Average		Run	Corrected	NOx @ 15%	LB/MMBTU	LB/HR
CT ONLY		Value	Bias	Zero	Bias	Zero	Bias	Zero	Average	Value			
RUN 1	NOx	24.78	24.71	0.07	24.84	0.25	24.77	0.18	26.92	26.95	24.44	0.0900	40.31
	CO	27.75	27.72	-0.04	27.84	0.01	27.78	-0.02	27.50	27.47		0.0559	25.00
	O2	13.93	13.92	-0.01	13.94	0.01	13.93	0.00	14.39	14.39			
GAS FLOW (SCFM)		7237											
HEATING VALUE:		1031	BTU/SCF										

1435-1535		Cal Gas	Pre Run		Post Run		Average		Run	Corrected	NOx @ 15%	LB/MMBTU	LB/HR
CT ONLY		Value	Bias	Zero	Bias	Zero	Bias	Zero	Average	Value			
RUN 2	NOx	24.78	24.84	0.25	24.77	0.26	24.80	0.26	27.20	27.20	24.68	0.0909	40.71
	CO	27.75	27.84	0.01	27.82	0.01	27.83	0.01	27.30	27.02		0.0550	24.61
	O2	13.93	13.94	0.01	13.90	0.01	13.92	0.01	14.39	14.40			
GAS FLOW (SCFM)		7237											
HEATING VALUE:		1031	BTU/SCF										

1552-1652		Cal Gas	Pre Run		Post Run		Average		Run	Corrected	NOx @ 15%	LB/MMBTU	LB/HR
CT ONLY		Value	Bias	Zero	Bias	Zero	Bias	Zero	Average	Value			
RUN 3	NOx	24.78	24.77	0.26	24.47	0.03	24.62	0.15	27.08	27.28	24.80	0.0914	40.9
	CO	27.75	27.82	0.01	27.82	-0.03	27.82	-0.01	27.16	27.10		0.0552	24.7
	O2	13.93	13.90	0.01	13.90	0.02	13.90	0.02	14.38	14.41			
GAS FLOW (SCFM)		7232											
HEATING VALUE:		1031	BTU/SCF										