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BUREAU OF AIR REGULATION

TAMPA ELECTRIC

April 29, 2004

Mr. Joel Smolen
Florida Department of
Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

Via FedEx
Airbill No. 7912 2667 1351

Re: Tampa Electric Company
Biomass Test Burn
Polk Power Station Unit 1
Facility ID No. 1050233

Dear Mr. Smolen:

Per Paragraph 3 of the Polk Power Station Unit 1 Biomass Test Burn Authorization, which was issued by the Florida Department of Environmental Protection (Department) on November 25, 2003, Tampa Electric Company (TEC) is required to send the test results for the biomass test burn to the Department's Bureau of Air Regulation within 30 days upon completion of the biomass test burn. Enclosed are the test results for the biomass test burn which was completed on April 1, 2004.

If you have any questions please call Shelly Castro or me at (813) 228-4408.

Sincerely,

Laura Crouch
Manager - Air Programs
Environmental, Health & Safety

Enclosure

EA/gm/SSC190

c/enc: Mr. Scott Sheplak, FDEP
Mr. Mike Halpin, FDEP SW District

1.0 INTRODUCTION

On March 30 and April 1, 2004, Tampa Electric Company's, Environmental Services, Air Services Group, performed Carbon Monoxide (CO) source emission tests on IGCC Unit No. 1 at the Polk Power Generating Station. During the testing on March 30, 2004, a baseline was established while the combustion turbine was fired with syngas (derived from a blend of 60% petroleum coke/40% coal) from a coal gasification system; during the testing on April 1, 2004, the combustion turbine was fired with Syngas (derived from a blend of 60% petroleum coke/35% coal/5% biomass). Testing was conducted according to United States Environmental Protection Agency (USEPA) test methods stipulated in 40 CFR Part 60, Appendix A and Florida Department of Environmental Protection (FDEP) permit no. 1050233-012-AV. CO testing was conducted using USEPA reference method 10. Data from the Continuous Emissions Monitoring System (CEMS) was used to determine Nitrogen Oxides (NO_x) and SO_2 emission levels.

2.0 DISCUSSION OF RESULTS

Carbon Monoxide (CO) emission rates were derived from 3, 1-hour test runs. During the baseline test conducted on March 30, 2004, the calculated average emission rate was 17 lbs CO/hr. During the biomass test conducted on April 1, 2004, the calculated average emission rate was 17 lbs CO/hr.

Nitrogen Oxides (NO_x) concentrations and emission rates were derived from 3, 1-hour CEMS averages, corresponding to the CO test times. During the baseline test conducted on March 30, 2004, the calculated average concentration was 13 ppmvd NO_x @ 15% O2, with an average emission rate of 112 lbs NO_x/hr. During the biomass test conducted on April 1, 2004, the calculated average concentration was 13 ppmvd NO_x @ 15% O2, with an average emission rate of 113 lbs NO_x/hr.

The Sulfur Dioxide (SO_2) emission rate was derived from 3, 1-hour CEMS averages, corresponding to the CO test times. During the baseline test conducted on March 30, 2004, the calculated average was 325 lbs SO_2/hr. During the biomass test conducted on April 1, 2004, the calculated average was 325 lbs SO_2/hr.

During the test on, March 30, 2004, Unit No. 1 Combustion Turbine was operated at an average load of 185 megawatts and an average heat input of 1740 mmBtu/hr. During the test on, April 1, 2004, Unit No. 1 Combustion Turbine was operated at an average load of 185 megawatts and an average heat input of 1744 mmBtu/hr. Details of turbine operation are included in Appendix C.

3.0 SOURCE DESCRIPTION/TEST PROCEDURES

Polk Power Electrical Generating Station is located at County Road 630 approximately 13 miles southwest of Bartow, Polk County, Florida. Unit No. 1 is an IGCC generating unit, 192 MW capacity when fired with Syngas fuel. The source sampling location consists of a circular stack 19 feet in diameter with four sample ports located 90 degrees apart on the stack circumference. A diagram of the stack sampling location is included along with other pertinent information on the test site.

Carbon monoxide sampling was performed in accordance with USEPA Reference Method 10 (40 CFR Part 60, Appendix A) "Determination of Carbon Monoxide Emissions from Stationary Sources". Testing was performed using a Thermo Environmental Model 48 gas filter correlation CO analyzer.

Nitrogen oxides and sulfur dioxide data was provided by the CEMS Data Acquisition and Handling System (DAHS). Three 1-hour samples were selected from the time period bracketed by the carbon monoxide test period. All data was taken from the DBFHIST program. These reports are contained in Appendix B.

All mass emission rates were calculated based on the Heat Input value calculated from the mass fuel flow, corrected for saturator moisture, and the fuel analysis supplied by the plant's laboratory. The details are contained in Appendix C.

4.0 TEST RESULTS

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POLK POWER STATION
CARBON MONOXIDE DATA

BASELINE
UNIT # 1
COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS
March 30, 2004

Run	Run Times		RM - 10 CO	RM - 3A O_2	CO
Number	Start	Stop	ppmvd	%, volume dry	lbs/hr
1	0758	0858	7.31	11.68	17.35
2	0905	1005	6.99	11.69	16.61
3	1015	1115	7.01	11.68	16.64
				Average:	16.864

CO, lbs/hr calculated as:

CO, ppmvd x C_f x F_d x (20.9 / (20.9 - O_2 %, volume)) x Heat Input

where:

C_f = 7.2725E-08 lb/scf

F_d = 8276 dscf/mmBtu, from fuel analysis

Heat Input = 1739.5 mmBtu/hr, from heat input calculations

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POLK POWER STATION
CARBON MONOXIDE DATA

BIOMASS
UNIT # 1
COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS
April 1, 2004

Run	Run Times		RM - 10 CO	RM - 3A O_2	CO
Number	Start	Stop	ppmvd	%, volume dry	lbs/hr
1	0801	0901	7.21	11.68	17.17
2	0907	1007	7.01	11.72	16.77
3	1014	1114	7.1	11.70	16.95
				Average:	16.962

CO, lbs/hr calculated as:

CO, ppmvd x C_f x F_d x (20.9 / (20.9 - O_2 %, volume)) x Heat Input

where:

C_f = 7.2725E-08 lb/scf

F_d = 8286 dscf/mmBtu, from fuel analysis

Heat Input = 1743.7 mmBtu/hr, from heat input calculations

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POLK POWER STATION
NITROGEN OXIDES DATA FROM CEMS

BASELINE

UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

March 30, 2004

			CEMS Data			
Run	Run Times		NO_x	NO_x	CO_2	NO_x
Number	Start	Stop	ppm, wet	ppmvd @ 15% O2%,	volume wet	lbs/hr
1	0758	0858	19.143	13.358	8.275	112.28
2	0905	1005	19.217	13.481	8.263	112.88
3	1015	1115	18.996	13.357	8.285	111.29
			Averages:	13.3988	8.2740	112.147

NO_x, lbs/hr is calculated as:

NO_x, ppm wet x C_f x F_c x (100 / CO_2 %, volume wet)) x Heat Input

where:

C_f = 1.1946E-07 lb/scf

F_c = 2336 dscf/mmBtu, from fuel analysis

Heat Input = 1739.5 mmBtu/hr, from heat input calculations

CEMS Data source is Data Acquisition and Handling System DBFHIST program.

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POLK POWER STATION
NITROGEN OXIDES DATA FROM CEMS

BIOMASS
UNIT # 1
COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS
April 1, 2004

			CEMS Data			
Run	Run Times		NO_x	NO_x	CO_2	NO_x
Number	Start	Stop	ppm, wet	ppmvd @ 15% O2%	volume wet	lbs/hr
1	0801	0901	19.144	13.522	8.250	113.58
2	0907	1007	19.165	13.565	8.227	114.01
3	1014	1114	18.859	13.319	8.234	112.10
			Averages:	13.4685	8.2368	113.231

NO_x, lbs/hr is calculated as:

NO_x, ppm wet x C_f x F_c x (100 / CO_2 %, volume wet)) x Heat Input

where:

C_f = 1.1946E-07 lb/scf

F_c = 2350 dscf/mmBtu, from fuel analysis

Heat Input = 1743.7 mmBtu/hr, from heat input calculations

CEMS Data source is Data Acquisition and Handling System DBFHIST program.

TECO
TAMPA ELECTRIC

POLK POWER STATION
SULFUR DIOXIDE DATA FROM CEMS

BASELINE

UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

March 30, 2004

			CEMS Data		
Run	Run Times		SO_2	CO_2	SO_2
Number	Start	Stop	ppm, wet	%, volume wet	lbs/hr
1	0758	0858	37.349	8.275	305.05
2	0905	1005	40.724	8.263	333.11
3	1015	1115	41.449	8.285	338.14
				Averages:	325.43

SO_2, lbs/hr is calculated as:

SO_2, ppm x C_f x F_c x (100 / CO2 % volume wet) x Heat Input

where:

C_f = 1.6635E-07 lb/scf

F_c = 2336 dscf/mmBtu, from fuel analysis

Heat Input = 1739.5 mmBtu/hr, from heat input calculations

CEMS Data source is Data Acquisition and Handling System DBFHIST program.

TECO
TAMPA ELECTRIC

POLK POWER STATION
SULFUR DIOXIDE DATA FROM CEMS

BIOMASS
UNIT # 1
COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS
April 1, 2004

			CEMS Data		
Run	Run Times		SO_2	CO_2	SO_2
Number	Start	Stop	ppm, wet	%, volume wet	lbs/hr
1	0801	0901	39.280	8.250	324.52
2	0907	1007	39.733	8.227	329.15
3	1014	1114	38.659	8.234	320.00
				Averages:	324.56

SO_2, lbs/hr is calculated as:

SO_2, ppm x C_f x F_c x (100 / CO2 % volume wet) x Heat Input

where:

C_f = 1.6635E-07 lb/scf

F_c = 2350 dscf/mmBtu, from fuel analysis

Heat Input = 1743.7 mmBtu/hr, from heat input calculations

CEMS Data source is Data Acquisition and Handling System DBFHIST program.

TECO
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POLK POWER STATION
HEAT INPUT CALCULATIONS

BASELINE

UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

March 30, 2004

Average Fuel Flow for Test Period =	110.07952	lbs/sec
Average Satuator Moisture for Test Period =	2.0706211	% H_2O
Fuel Flow Corrected for Moisture =	107.80019	lbs/sec
Fuel Density =	0.0565057	
Volumetric Fuel Flow Rate, F =	6.868E+06	ft^3/hr
Higher Heating Value of syngas fuel, H_g =	253	Btu/ft^3
Average Heat Input =	H_g x F	
=	1.740E+09	Btu/hr
=	1739.5	mmBtu/hr

TECO
TAMPA ELECTRIC

POLK POWER STATION
HEAT INPUT CALCULATIONS

BIOMASS

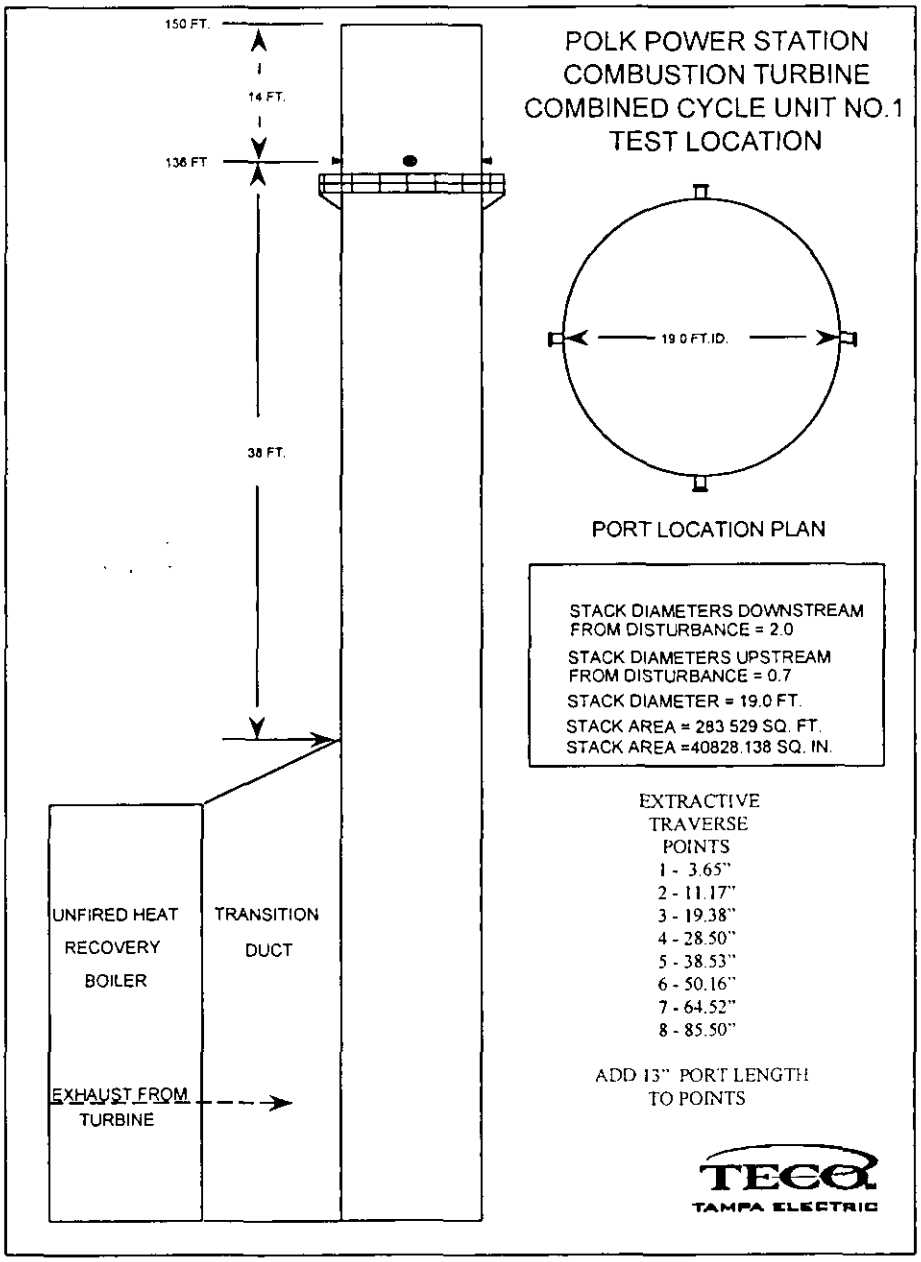
UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

April 1, 2004

Average Fuel Flow for Test Period =	111.39787	lbs/sec
Average Satuator Moisture for Test Period =	2.8701868	% H_2O
Fuel Flow Corrected for Moisture =	108.20054	lbs/sec
Fuel Density =	0.0565396	
Volumetric Fuel Flow Rate, F =	6.889E+06	ft^3/hr
Higher Heating Value of syngas fuel, H_g =	253	Btu/ft^3
Average Heat Input =	H_g x F	
=	1.744E+09	Btu/hr
=	1743.7	mmBtu/hr

5.0 SAMPLING LOCATION TRAVERSE DIAGRAM


150 FT.
14 FT.
136 FT
38 FT.
UNFIRED HEAT RECOVERY BOILER
TRANSITION DUCT
EXHAUST FROM TURBINE
POLK POWER STATION
COMBUSTION TURBINE
COMBINED CYCLE UNIT NO.1
TEST LOCATION
19.0 FT.ID.
PORT LOCATION PLAN
STACK DIAMETERS DOWNSTREAM FROM DISTURBANCE = 2.0
STACK DIAMETERS UPSTREAM FROM DISTURBANCE = 0.7
STACK DIAMETER = 19.0 FT.
STACK AREA = 283 529 SQ. FT.
STACK AREA =40828.138 SQ. IN.
EXTRACTIVE TRAVERSE POINTS
1 - 3.65"
2 - 11.17"
3 - 19.38"
4 - 28.50"
5 - 38.53"
6 - 50.16"
7 - 64.52"
8 - 85.50"
ADD 13" PORT LENGTH TO POINTS
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