

TAMPA ELECTRIC

December 5, 2002

Mr. Scott Sheplak, P.E.
Administrator- Title V Section
Florida Department of Environmental Protection
111 South Magnolia Drive, Suite 4
Tallahassee, FL 32301

**Re: Tampa Electric Company
Polk Power Station Unit 1
Biomass Test Burn- Heat Recovery Steam Generator
Facility ID No. 1050233-009-AV**

Dear Mr. Sheplak:

Please find enclosed the Heat Recovery Steam Generator (HRSG) deposit report for Polk Power Station (PPS) Unit 1. Per the Test Burn Authorization and Specific Condition 10 of the Authorization from the Florida Department of Environmental Protection's (FDEP), Tampa Electric Company (TEC) has sampled the material that deposited in the heat recovery steam generator (HRSG) of PPS Unit 1. The enclosed analytical test report substantiates the initial suspicions that the material was comprised of sulfur oxides such as sulfates. The analytical test indicates the primary constituent of this deposit to be iron sulfate. A discussion of these results follows in this letter.

Results Summary

Although the majority of the sulfur is removed from the syngas prior to introduction to the combustion turbine (CT), the remaining sulfur is expected to be oxidized in the CT. Given the expected chemistry and temperatures in the HRSG, it is possible to have sulfates deposit on the heat transfer surface in the HRSG. Because the HRSG is comprised of carbon steel, there is a ready source of iron to react with the sulfates. Hence, the primary determination of iron sulfate for this material analysis is consistent with TEC's expectations.

It is believed that the deposits result from the firing of syngas, based on engineering judgement. However, because the back-up fuel (No. 2 fuel oil) which is also fired in the CT contains sulfur, these deposits could also result from the sulfur contained in the oil. Because TEC does not have a regular schedule for removing these deposits, it is beyond the scope of this investigation to attribute the deposits to a particular fuel fired in the CT.

In addition to the iron sulfate, low concentrations reported as trace amounts, but not quantified) of chromium and zinc are reported as being present in the sample. The HRSG contains Alloy Steel Tubes (T22) in both the super heater and re-heater. These tubes contain both chromium and molybdenum alloys. The HRSG also has 400 series stainless steel heat shields throughout the entire perimeter (floor & walls) which is the most likely source of the chromium. Many of the steel structural components are also protected with zinc rich coatings, the probable source of the zinc. Additionally, the sample was obtained by scraping with a stainless steel spoon, which may also be another source of contamination. Given this information regarding possible sources of chromium and zinc, it is not unexpected to have these compounds reported as trace amounts in the deposits.

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Mr. Scott Sheplak
December 5, 2002
Page 2 of 2

In conclusion, the analytical test results verify TEC's assertion that the HRSG deposits are sulfate based. These test results indicate this material is primarily comprised of iron sulfate, which would be an expected corrosion product between the steel tubes and the sulfate deposits.

FDEP Test Burn Authorization Condition 10

Upon completion of the test burn period and upon the first unit shutdown, representative HRSG deposits shall be obtained. The Department's Southwest District and the Bureau of Air Regulation shall be notified immediately upon such shutdown, as to the expected duration. TEC shall provide photographic evidence of the magnitude and location of such deposits upon conclusion of the unit shutdown. HRSG deposits shall be analyzed in a scanning electron microscope (SEM) using energy dispersive X-ray spectroscopy (EDS) to identify the elements present. The Southwest District and the Bureau of Air Regulation shall be provided with a copy of any and all sample analyses or results obtained for HRSG deposits upon receipt of any analyses or results, regardless of the purpose of such sample collection, analyses or results.

TEC Response

Enclosed in Attachment A is the HRSG deposit.

TEC thanks the Department for its cooperation in allowing TEC to perform the test burn. If you have any questions please call Dru Latchman or me at (813) 641-5034.

Sincerely,

*Dru Latchman
for*

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL140

Enclosure

c/enc: Mr. Jerry Kissel - FDEP SW
Mr. Al Linero, FDEP

Attachment A

Tampa Electric Company



Heat Recovery Steam Generator Deposit

Polk Power Station Unit 1

**SEVERN
TRENT
SERVICES**

Tampa Electric Company
Polk Power Station
9995 State Road 37 South
Mulberry, Florida 33860

Attention: Bret A. Nicholas
STL Job #: 202686
Billing Ref: P.O.# 59707

STL Billerica
149 Rangeway Road
North Billerica, MA 01862

Tel: 978 667 1400
Fax: 978 667 7871
www.stl-inc.com

Dear Bret:

Please find enclosed one (1) PLM photomicrograph, one (1) EDX spectrograph and two (2) SEM photomicrographs of the material submitted for SEM/EDX analysis.

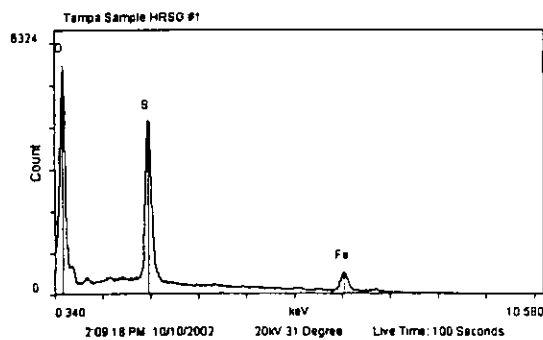
METHODS:

A representative portion of the material was prepared in R.I. index 1.65 oil on a glass slide for the initial Polarized Light Microscopy (PLM) analysis. Another portion of the sample was transferred to double-sided tape on SEM stubs. This mount was then coated with evaporated graphite for the Scanning Electron Microscope (SEM) examination. The particles detected were then examined under the SEM by Energy Dispersive X-ray Spectrometry (EDX) to determine their elemental composition. A SEM digital photomicrograph was also taken of these particles to document their morphologies.

FINDINGS:



Please refer to the PLM photomicrograph, the EDX spectrograph and SEM photomicrograph. As demonstrated in the PLM photo the material was homogeneous throughout the sample with a low percentage of opaque particles (~2% the sample volume). The SEM photomicrograph of this particle supports the PLM findings that the



sample is homogeneous. The particles appear ~10um to 40um, are irregularly shaped and clustered together. Higher magnification showed some of the particles to have a slightly fibrous shape as if crystallized. The included high magnification photomicrograph shows the crystalline structure of these small particles. The larger particles appear to generally be aggregates of these smaller crystals, or amorphs with crystalline characteristics

along their edges. The SEM/EDX showed a strong sulfur concentration, strong iron and low concentrations (trace amounts) of chromium and zinc. WEDX examination of the material showed an intense oxygen peak, suggesting the presence of the metallic elements likely being present in the form of oxides, as well as suggesting that the sulfur detected was due to the presence of sulfate anions. These elemental spectra were found consistently throughout the material, and only slight variations due to geometry and concentration were found.

Gross macroscopic examination of the material suggested that the Sem identification of the particles as aggregates of smaller crystalline particles was correct. The material behaved under gross bulk examination as a precipitate, a somewhat malleable collection of flocculant crystals. Adding a few milligrams of this material to water, and stirring slightly allowed the material to dissolve easily in de-ionized water. Once this was accomplished the solution was noted to have a yellow-red color, suggestive of iron oxide or iron chloride. This color deepened with time and exposure to the atmosphere, suggesting that the color was due to a mixture of iron (II) and iron (III) oxide that was shifting with time. Examination of this water solution under PLM showed few opaque particles, some mineral grains (silicacious and quartz-like), as well as a few biological particles.

DISCUSSION:

Given that the material submitted has come from a piece of a steam heating and/or turbine assembly, it is likely that the cause of the material's collection on that equipment is heat assisted dissolution of some of the metallic elements of the assembly itself. Iron sulfate was determined to be the primary component of this material, with some traces of



STL Billerica

chromium and zinc. The iron is likely coming from the metal in the reconcentrator, which is dissolving under the heated conditions and exposure to oxygen rich, acidic water that is condensing on the material. Chromium and zinc are commonly alloyed with iron in an effort to increase its resistance to corrosion. The fact that they are present is due to their lesser susceptibility to sulfuric associated dissolution. The iron sulfate crystals are easily soluble in water of sufficient quantity. However, the presence of significant amounts of iron oxide, as well as the iron alloyed elements suggests that corrosion is likely the source of the iron precipitating out of the evaporating water. Though the material itself is easily dissolved, the presence of iron might be somewhat problematic. The other particles, including organic, mineral and opaque materials are all common elements of air and water in industrial settings, and were minor in proportion to the submitted sulfate crystals.

Should you have further questions, or need additional information, please do not hesitate to contact client or me services at any time.

Sincerely,



Jared Kelly
Consultant

file



TAMPA ELECTRIC

June 5, 2002

Mr. Scott M. Sheplak, P.E.
Florida Department of Environmental Protection
Division of Air Resource Management
111 South Magnolia Drive, Suite 4
Tallahassee, Florida 32301

**Re: Tampa Electric Company
Polk Power Station
Unit 1 Combustion Turbine
Permit No. 1050233-009-AV
Petcoke Additional Monitoring Report**

Dear Mr. Sheplak:

Enclosed, please find the additional monitoring emissions compliance report for tests performed on April 23, 2002.

As stated in the Summary of Results, below is a list of results:

- Nitrogen Oxides (NO_x) - calculated average was 172.7 pounds per hour and 30-day rolling average was 169.8 pounds per hour; 30-day rolling average permit limit is 220.25 pounds per hour
- Sulfur Dioxide (SO₂) - calculated average was 348.4 pounds per hour and 30-day rolling average was 331.9 pounds per hour; 30-day rolling average permit limit is 357 pounds per hour
- Sulfuric Acid Mist (H₂SO₄) - calculated average was 27.7 pounds per hour; 30-day rolling average permit limit is 55 pounds per hour

Per Conditions A.54 and A.55, Tampa Electric Company (Tampa Electric) shall annually maintain and submit to the Department Continuous Emissions Monitor (CEMs) data demonstrating the gasification of a blend of petcoke and coal up to 60% petcoke did not result in a significant emissions increase of NO_x and SO₂ when compared to the past actual coal levels. Per Condition A.56, Tampa Electric shall annually maintain and submit to the Department test results demonstrating the gasification of a blend of petcoke and coal up to 60% petcoke did not result in a significant emissions increase of sulfuric acid mist when compared to the past actual coal levels. The following sections demonstrate Tampa Electric's compliance with these conditions.

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Presented below in Table 1 is Polk Power Station's historical NO_x and SO₂ data from 1998 and 1999, before Unit 1 was permitted to gasify blends of petcoke and coal.

TABLE 1. Historical Emissions (Based on 1998 and 1999 AOR's)

AOR Year	NO _x [tons/yr]	SO ₂ [tons/yr]	Oil Fired Hours	Syngas Fired Hours
1998	589	1,321	665	5,171
1999	608	1,183	680	5,989
Average	599	1,252	673	5,580

Table 2 provides Polk Power Station's analyses based on 2002 CEMs data compared to the past actual coal levels, as requested by the Department, to demonstrate the gasification of a blend of petcoke and coal up to 60% petcoke did not result in a significant emissions increase of NO_x and SO₂.

TABLE 2. Analysis - 55% Petcoke, 45% Coal Blend (Based on 2002 data)

Parameter	2-year Average Historical Emissions	2002 Actual Emissions ⁽¹⁾ (55% Petcoke 45% Coal Blend)	Difference	Above Actual Coal Levels?
NO _x [tons/yr]	599	557	-42	No
SO ₂ [tons/yr]	1,252	929	-323	No

(1) Sample Calculation for 2002 NO_x Emissions:

$$0.100 \frac{\text{lb NO}_x}{\text{MMBtu}} * 1,610 \frac{\text{MMBtu}}{\text{hr}} * 5,580 \frac{\text{Hours}}{\text{yr}} + 2,000 \frac{\text{tons}}{\text{lb}} + \left(16 \frac{\text{tons NO}_x}{\text{hr}} * 673 \frac{\text{Oil fired hrs}}{\text{yr}} \right) = 557 \frac{\text{tons NO}_x}{\text{yr}}$$

Sample Calculation for 2002 SO₂ Emissions:

$$0.200 \frac{\text{lb SO}_2}{\text{MMBtu}} * 1,610 \frac{\text{MMBtu}}{\text{hr}} * 5,580 \frac{\text{Hours}}{\text{yr}} + 2,000 \frac{\text{tons}}{\text{lb}} + \left(0.0461 \frac{\text{tons SO}_2}{\text{hr}} * 673 \frac{\text{Oil fired hrs}}{\text{yr}} \right) = 929 \frac{\text{tons SO}_2}{\text{yr}}$$

Table 3 provides Polk Power Station's analyses based on the 2002 stack test data compared to the past actual coal levels, as requested by the Department, to demonstrate the gasification of a blend of petcoke and coal up to 60% petcoke did not result in a significant emissions increase of sulfuric acid mist.

TABLE 3. Analysis - 55% Petcoke, 45% Coal Blend (Based on 2002 Stack Test Data)

Parameter	2000 Baseline Historical Emissions	2002 Actual Emissions ⁽²⁾ (55% Petcoke 45% Coal Blend)	Difference	Above Actual Coal Levels?
H ₂ SO ₄ [tons/yr]	86.8	77.3	-10	No

(2) Sample Calculation for 2002 H₂SO₄ Emissions:

$$27.7 \frac{\text{lb H}_2\text{SO}_4}{\text{hr}} * 5,580 \frac{\text{Hours}}{\text{yr}} + 2,000 \frac{\text{tons}}{\text{lb}} = 77.3 \frac{\text{tons H}_2\text{SO}_4}{\text{yr}}$$

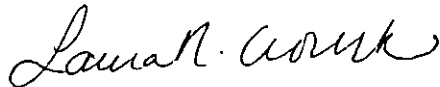
Mr. Scott Sheplak, P.E.

June 5, 2002

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As evidenced by the data above, NO_x, SO₂ and H₂SO₄ emissions resulting from the combustion of syngas produced from the gasification of petcoke and coal blends do not increase above the past actual coal levels. If you have any questions, please telephone Raiza Calderon or me at (813) 641-5261.

Sincerely,



Laura Crouch
Manager - Air Programs
Environmental Affairs

EA/bmr/RC130

c/enc: Mr. Jerry Kissel, FDEP SW
Mr. Bill Proses, FDEP

**EMISSIONS TEST REPORT
SULFURIC ACID MIST, SULFUR DIOXIDE, and
NITROGEN OXIDES**

April 23, 2002

**POLK POWER STATION
FACILITY ID NUMBER: 1050233
EMISSION UNIT ID NO: -001
UNIT 1**

Prepared For:
Tampa Electric Company
Polk Power Station
P.O. Box 111
Tampa, Florida 33601-0111

Prepared By:
Tampa Electric Company
Environmental Affairs Department
Environmental Services, Air Services Group



Environmental Services
Air Services Group
5010 Causeway Boulevard
Tampa, Florida 33619- 6130

Responsible Official Certification

I have reviewed the testing results in this report, and hereby certify that this test report is authentic and accurate to the best of my knowledge.

Date May 29, 2002

Signature Mark Hornick
General Manager
POIK Power Station

REPORT CERTIFICATION

I have reviewed the test performance, the resulting calculations, and contents of this report, and verified that all project quality objectives have been met.

Date 5/24/2002 Signature 
Senior Environmental Technician
Quality Assurance/Quality Control Specialist
Air Services
Environmental Affairs
Tampa Electric Company

The sampling, analysis and calculations performed for this report were carried out under my direction, and I hereby certify that this test report is authentic and accurate to the best of my knowledge.

Date 24 May 02 Signature 
Environmental Technician
Report Author
Air Services
Environmental Affairs
Tampa Electric Company

I have reviewed the testing details and results in this report, and hereby certify that this test report is authentic and accurate to the best of my knowledge.

Date 5/28/02 Signature 
Coordinator
Air Services
Environmental Affairs
Tampa Electric Company

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APPENDICES

- A. SULFURIC ACID MIST CALCULATIONS
- B. SULFURIC ACID MIST LABORATORY ANALYTICAL DATA
- C. DATA ACQUISITION AND HANDLING SYSTEM REPORTS
- D. TURBINE DATA
- E. FUEL ANALYSIS
- F. FIELD DATA SHEETS
- G. SAMPLING EQUIPMENT CALIBRATIONS
- H. CHAIN OF CUSTODY
- I. TEST PARTICIPANTS

1.0 SUMMARY OF RESULTS

On April 23, 2002, the Environmental Services group of Tampa Electric Company performed source emission tests on Unit No. 1 at the Polk Power Station. Unit No. 1 is an integrated coal gasification combined cycle (IGCC) generating unit. The combustion turbine was fired with syngas from the coal gasification system. A blend of 55% petroleum coke and 45% bituminous coal was gasified for this test. 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. 1050233-009-AV. Sulfur Dioxide and Nitrogen Oxides data were measured and recorded using a Continuous Emission Monitoring System (CEMS) during the test.

The Sulfuric Acid Mist (H_2SO_4) concentrations and emission rates were derived from three 1-hour test runs. The calculated average H_2SO_4 concentration was 5.24E-07 lbs/dscf; the average H_2SO_4 emission rate was 27.7 lbs/hr. In accordance with condition A.5, the FDEP permitted emission rate is 55 lbs/hr based on a 30-day rolling average.

The Sulfur Dioxide (SO_2) concentrations and emission rates were derived from CEMS data corresponding to the test period. The calculated average SO_2 concentration was 0.200 lbs/MMBtu; the average SO_2 emission rate was 348.4 lbs/hr. The SO_2 emission rate based on a 30-day rolling average was determined to be 331.9 lbs/hr. In accordance with condition A.5, the FDEP permitted emission rate is 357 lbs/hr based on a 30-day rolling average.

The Nitrogen Oxides (NO_x) concentrations and emission rates were derived from CEMS data corresponding to the test period. The calculated average NO_x concentration was 20.4 ppmvd @ 15% O_2 ; the average NO_x emission rate was 172.7 lbs/hr. The NO_x emission rate based on a 30-day rolling average was determined to be 169.8 lbs/hr. In accordance with condition A.5, the FDEP permitted emission rate is 220.25 lbs/hr

based on a 30-day rolling average.

During the tests on April 23, 2002, Unit No. 1 Combustion Turbine was operated at an average load of 191 megawatts and an average heat input of 1610 MMBtu/hr. The average quantity of fuel burned was 364,588 lbs/hour of syngas. Details of turbine operation are included in Appendix D.

2.0 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 integrated coal gasification combined cycle (IGCC) generating unit, with a net capacity of 192 MW 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.

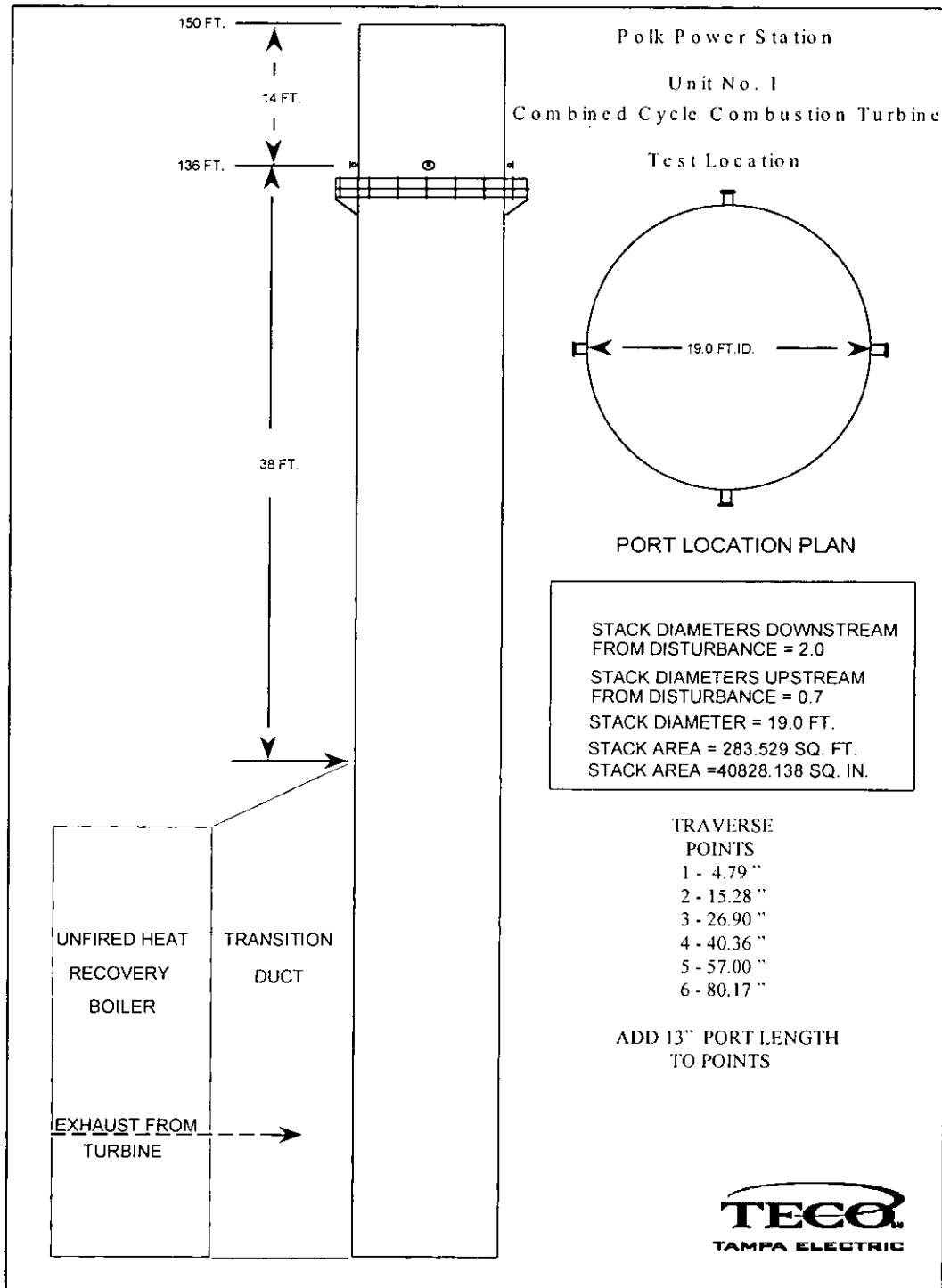
Sulfuric acid mist sampling and analysis was performed in accordance with USEPA Reference Method 8 (40 CFR Part 60, Appendix A) "Determination of Sulfuric Acid Mist and Sulfur Dioxide Emissions from Stationary Sources" and FDEP Permit No. 1050233-009-AV, Condition A.56.

Sulfur Dioxide (SO₂) and Nitrogen Oxides (NO_x) concentrations and emission rates were derived from the CEMS data as directed in FDEP permit 1050233-009-AV, Conditions A.54 and A.55.

The SO₂ emission rates for the test period were derived from the CEMS report titled "Daily EPA CEM Summary". All data averages were calculated over the time frame corresponding to the sulfuric acid mist test (09:00 through 14:00). The SO₂ 30-day rolling average was taken from the CEMS report titled "Polk County Quarterly Emission Report". Both reports are included in Appendix C of this report.

The NO_x concentration was derived from the CEMS report titled "Daily NO_x O₂ Summary", representing hourly NO_x concentrations corrected to 15% O₂. The NO_x emission rate was derived from the CEMS report titled "Daily EPA CEM Summary". All data averages were calculated over the time frame corresponding to the sulfuric acid mist test (09:00 through 14:00). The NO_x 30-day rolling average was taken from the CEMS report titled "Polk County Quarterly Emission Report". All reports are included in Appendix C of this report.

3.0 SAMPLING LOCATION TRAVERSE DIAGRAM



4.0 TEST RESULTS



40 CFR 60, Appendix A - Test Methods
 Method 8 Test Calculations
 Test Summary

Plant: Polk Power Station
 Date: 04/23/2002
 Sampling Location: Unit #1
 Operating Conditions: 55% Petcoke / 45% Bituminous Blend

	Run #1	Run #2	Run #3	Average
Gas Flow Rate				
acfm	1360534.9	1366015.3	1366598.7	1364383.0
dscfm	870802.4	884569.4	880181.7	878517.8
Average Stack Temperature, °F	307.4	307.8	309.2	308.1
% Isokinetic	99.7	98.4	96.8	98.3
Moisture, %H ₂ O	6.2	5.2	5.5	5.6
Sampled Volume, dscf	39.295	39.369	38.560	39.075
Condensate Volume, ml	55.1	46.1	47.4	49.5
Meter Temperature, °F	81.0	87.3	98.2	88.8
$C_{H_2SO_4}$, lb/dscf	5.384E-07	6.031E-07	4.317E-07	5.244E-07
$E_{H_2SO_4}$, lbs/hr =	28.1	32.0	22.8	27.65



**POLK POWER STATION
SULFUR DIOXIDE and NITROGEN OXIDES from CEMS**

**COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
April 23, 2002**

Time of Day	Sulfur Dioxide (SO ₂)		Nitrogen Oxides (NO _x)			
	lbs/MMBtu	lbs/hr	ppmvd @ 15% O ₂	lbs/MMBtu	Heat Input	lbs/hr
9:00	0.190	331.8	19.7	0.097	1735	168.295
10:00	0.190	336.6	20.2	0.098	1733	169.834
11:00	0.200	342.9	20.4	0.101	1713	173.013
12:00	0.210	362.3	20.4	0.101	1711	172.811
13:00	0.210	367.7	20.5	0.101	1721	173.821
14:00	0.200	348.9	20.9	0.103	1734	178.602
Averages:	0.2000	348.37	20.35	0.1002	1725	172.7293

Notes to data:

Sulfur Dioxide data is derived from the "DAILY EPA CEM SUMMARY" report, from CEM data acquisition and handling system. Nitrogen Oxides ppmvd @15% O₂ data is derived from the "Daily NO_x O₂ Summary" report, from CEM data acquisition and handling system. Nitrogen Oxides in lbs/MMBtu and Heat input data are derived from the "DAILY EPA CEM SUMMARY" report, from CEM data acquisition and handling system.

Nitrogen Oxides lbs/hr calculated as:

$$\text{lbs NO}_x/\text{MMBtu} \times \text{Heat Input in MMBtu/hr}$$

**POLK POWER STATION
GAS DENSITY and HEAT INPUT CALCULATIONS**

**COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
April 23, 2002**

Sample #1	Molecular	Density	Density		
<u>Gaseous Component</u>	Mole %	Weight	lbs./ft ³	lbs./ft ³	
Hydrogen	27.441680	2.016	0.0053	0.0014544	HHV 266 Btu/ft ³
Oxygen	1.162450	32.000	0.0846	0.0009834	
Nitrogen	3.385130	28.016	0.0744	0.0025185	
Carbon Dioxide	13.494460	44.010	0.1170	0.0157885	
Carbon Monoxide	54.355060	28.010	0.0740	0.0402227	
Methane	0.125000	16.041	0.0424	5.300E-05	
Ethane	0.021800	30.067	0.0803	1.751E-05	
Propane	0.002250	44.092	0.1196	2.691E-06	
I-Butane	0.002120	58.118	0.1582	3.354E-06	
N-Butane	0.002310	58.118	0.1582	3.654E-06	
I-Pentane	0.000980	72.144	0.1904	1.866E-06	
N-Pentane	0.001410	72.144	0.1904	2.685E-06	
N-Hexanes	0.002880	86.169	0.2274	6.549E-06	
Constituent Density =			0.0610589 lbs./ft ³		

Sample #2	Molecular	Density	Fractional		
<u>Gaseous Component</u>	Mole %	Weight	lbs./ft ³	lbs./ft ³	
Hydrogen	27.402340	2.016	0.0053	0.0014523	HHV 268 Btu/ft ³
Oxygen	1.171400	32.000	0.0846	0.000991	
Nitrogen	3.471970	28.016	0.0744	0.0025831	
Carbon Dioxide	13.274710	44.010	0.1170	0.0155314	
Carbon Monoxide	54.372650	28.010	0.0740	0.0402358	
Methane	0.252000	16.041	0.0424	0.0001068	
Ethane	0.024200	30.067	0.0803	1.943E-05	
Propane	0.002240	44.092	0.1196	2.679E-06	
I-Butane	0.002110	58.118	0.1582	3.338E-06	
N-Butane	0.002290	58.118	0.1582	3.623E-06	
I-Pentane	0.004650	72.144	0.1904	8.854E-06	
N-Pentane	0.005600	72.144	0.1904	1.066E-05	
N-Hexanes	0.014110	86.169	0.2274	3.209E-05	
Constituent Density =			0.0609812 lbs./ft ³		

**POLK POWER STATION
GAS DENSITY and HEAT INPUT CALCULATIONS**

**COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
April 23, 2002**

Sample #3		Molecular	Density	Fractional	
<u>Gaseous Component</u>	Mole %	Weight	lbs./ft ³	Density	HHV
				lbs./ft ³	
Hydrogen	29.958860	2.016	0.0053	0.0015878	269 Btu/ft ³
Oxygen	1.122520	32.000	0.0846	0.0009497	
Nitrogen	3.292690	28.016	0.0744	0.0024498	
Carbon Dioxide	13.067520	44.010	0.1170	0.015289	
Carbon Monoxide	53.332840	28.010	0.0740	0.0394663	
Methane	0.158000	16.041	0.0424	6.699E-05	
Ethane	0.021200	30.067	0.0803	1.702E-05	
Propane	0.005920	44.092	0.1196	7.080E-06	
I-Butane	0.003630	58.118	0.1582	5.743E-06	
N-Butane	0.005050	58.118	0.1582	7.989E-06	
I-Pentane	0.005320	72.144	0.1904	1.013E-05	
N-Pentane	0.005990	72.144	0.1904	1.140E-05	
N-Hexanes	0.020190	86.169	0.2274	4.591E-05	

Constituent Density = 0.0598095 lbs./ft³

Average Constituent Density = 0.0606165 lbs./ft³

Average Fuel Flow for Test Period = 101.27431 lbs./sec.

Volumetric Fuel Flow Rate, F = 6.015E+06 ft³/hr.

Average Higher Heating Value of syngas fuel, H_g = 267.66667 Btu/ft³

Average Heat Input = H_g x F

= 1.610E+09 Btu/hr.

= 1609.9 MMBtu/hr.

APPENDIX A

SULFURIC ACID MIST CALCULATIONS



40 CFR 60, Appendix A - Test Methods
Reference Method 8
Test Calculations

Customer: Polk Power Station
Facility: Unit #1
Sampling Location: Stack
Operating Conditions: 55% Petcoke/45% Bituminous Blend
Run Number: 1
Date: 04/23/02

Sample Time, θ :	60 minutes	Nozzle Diameter, D_n :	0.198 inches
Barometric Pressure, P_b :	29.76 "Hg	Nozzle Area, A_n :	0.00021381 ft ²
Stack Pressure, P_s :	29.67 "Hg	Average Orifice Meter, ΔH :	1.484 "H ₂ O
Effective Stack Area, A_s :	283.528737 ft ²	Sample Volume, V_m :	40.328 ft ³
Pitot Coefficient, C_p :	0.84 dimensionless	Average Meter Temp., T_m :	81.0 °F
Gas Analysis:	8.0 % CO ₂	Average Stack Temp., T_s :	307.4 °F
	12.0 % O ₂	Average $\sqrt{\Delta p}$:	1.180 "H ₂ O
	0.0 % CO	Condensate Volume, V_{lc} :	55.1 ml
	80.0 % N ₂	Meter Box Y:	1.000 dimensionless

Data Calculated from Source Measurements:

$V_{w(std)} = 4.714E-02 \times V_{lc}$	2.597 scf
$V_{m(std)} = 17.647 \times V_m \times Y \times (P_b + (\Delta H / 13.6)) / (T_m + 460)$	39.295 dscf
$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$	0.062 %
$FDA = 1.0 - B_{ws}$	0.938 %
$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	29.76 lb./lb. mole
$M_s = (M_d \times FDA) + (18.0 \times B_{ws})$	29.03 lb./lb. mole
$v_s = 85.49 \times C_p \times (\sqrt{\Delta p}) \times (\sqrt{(T_s + 460)}) / (M_s \times P_s)$	79.98 ft/second
$Q_s = v_s \times A_s \times 60$	1360534.9 acf/minute
$Q_{s(std)} = Q_s \times FDA \times (528 / (T_s + 460)) \times (P_s / 29.92)$	870802.4 dscf/minute
$I = (T_s + 460) \times ((2.67E-03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / (0 \times P_s \times A_n \times v_s)$	99.7 %

Data from Laboratory Analysis:

Normality of Barium Chloride titrant, N	0.0103 meq/ml
Volume Titrant Blank, V_{tb}	0.01 ml
Volume Titrant Sample, V_t	3.81 ml
Volume of Sample Aliquot, V_a	100 ml
Total Volume of Solution, V_{soln}	500 ml

Calculated Data from Laboratory Analysis:

$C_{H_2SO_4} = 1.081E-04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)}$	5.384E-07 lb/dscf
$E_{H_2SO_4} = C_{H_2SO_4} \times Q_{s(std)} \times 60$	28.13 lb/hr



40 CFR 60, Appendix A - Test Methods
Reference Method 8
Test Calculations

Customer: Polk Power Station
Facility: Unit #1
Sampling Location: Stack
Operating Conditions: 55% Petcoke/45% Bituminous Blend
Run Number: 2
Date: 04/23/02

Sample Time, θ :	60 minutes	Nozzle Diameter, D_n :	0.198 inches
Barometric Pressure, P_b :	29.81 "Hg	Nozzle Area, A_n :	0.00021381 ft ²
Stack Pressure, P_s :	29.73 "Hg	Average Orifice Meter, ΔH :	1.520 "H ₂ O
Effective Stack Area, A_s :	283.528737 ft ²	Sample Volume, V_m :	40.802 ft ³
Pitot Coefficient, C_p :	0.84 dimensionless	Average Meter Temp., T_m :	87.3 °F
Gas Analysis:	8.0 % CO ₂	Average Stack Temp., T_s :	307.8 °F
	12.0 % O ₂	Average $\sqrt{\Delta p}$:	1.188 "H ₂ O
	0.0 % CO	Condensate Volume, V_{lc} :	46.1 ml
	80.0 % N ₂	Meter Box Y:	1.000 dimensionless

Data Calculated from Source Measurements:

$V_{w(std)} = 4.714E-02 \times V_{lc}$	2.173 scf
$V_{m(std)} = 17.647 \times V_m \times Y \times (P_b + (\Delta H / 13.6)) / (T_m + 460)$	39.369 dscf
$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$	0.052 %
$FDA = 1.0 - B_{ws}$	0.948 %
$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	29.76 lb./lb. mole
$M_s = (M_d \times FDA) + (18.0 \times B_{ws})$	29.14 lb./lb. mole
$v_s = 85.49 \times C_p \times (\sqrt{\Delta p}) \times (\sqrt{(T_s + 460)} / (M_s \times P_s))$	80.30 ft/second
$Q_s = v_s \times A_s \times 60$	1366015.3 acf/minute
$Q_{s(std)} = Q_s \times FDA \times (528 / (T_s + 460)) \times (P_s / 29.92)$	884569.4 dscf/minute
$I = (T_s + 460) \times ((2.67E-03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / (\theta \times P_s \times A_n \times v_s)$	98.4 %

Data from Laboratory Analysis:

Normality of Barium Chloride titrant, N	0.0103 meq/ml
Volume Titrant Blank, V_{tb}	0.01 ml
Volume Titrant Sample, V_t	4.275 ml
Volume of Sample Aliquot, V_a	100 ml
Total Volume of Solution, V_{soln}	500 ml

Calculated Data from Laboratory Analysis:

$C_{H_2SO_4} = 1.081E-04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)}$	6.031E-07 lb/dscf
$E_{H_2SO_4} = C_{H_2SO_4} \times Q_{s(std)} \times 60$	32.0 lb/hr



40 CFR 60, Appendix A - Test Methods
Reference Method 8
Test Calculations

Customer: Polk Power Station
Facility: Unit #1
Sampling Location: Stack
Operating Conditions: 55% Petcoke/45% Bituminous Blend
Run Number: 3
Date: 04/23/02

Sample Time, t :	60 minutes	Nozzle Diameter, D_n :	0.198 inches
Barometric Pressure, P_b :	29.78 "Hg	Nozzle Area, A_n :	0.00021381 ft ²
Stack Pressure, P_s :	29.70 "Hg	Average Orifice Meter, ΔH :	1.544 "H ₂ O
Effective Stack Area, A_s :	283.528737 ft ²	Sample Volume, V_m :	40.802 ft ³
Pitot Coefficient, C_p :	0.84 dimensionless	Average Meter Temp., T_m :	98.2 °F
Gas Analysis:	8.0 % CO ₂	Average Stack Temp., T_s :	309.2 °F
	12.0 % O ₂	Average $\sqrt{\Delta p}$:	1.186 "H ₂ O
	0.0 % CO	Condensate Volume, V_{lc} :	47.4 ml
	80.0 % N ₂	Meter Box Y:	1.000 dimensionless

Data Calculated from Source Measurements:

$V_{w(std)} = 4.714E-02 \times V_{lc}$	2.234 scf
$V_{m(std)} = 17.647 \times V_m \times Y \times (P_b + (\Delta H / 13.6)) / (T_m + 460)$	38.560 dscf
$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$	0.055 %
$FDA = 1.0 - B_{ws}$	0.945 %
$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	29.76 lb./lb. mole
$M_s = (M_d \times FDA) + (18.0 \times B_{ws})$	29.12 lb./lb. mole
$v_s = 85.49 \times C_p \times (\sqrt{\Delta p}) \times (\sqrt{(T_s + 460)} / (M_s \times P_s))$	80.33 ft/second
$Q_s = v_s \times A_s \times 60$	1366598.7 acf/minute
$Q_{s(std)} = Q_s \times FDA \times (528 / (T_s + 460)) \times (P_s / 29.92)$	880181.7 dscf/minute
$I = (T_s + 460) \times ((2.67E-03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / (t \times P_s \times A_n \times v_s)$	96.8 %

Data from Laboratory Analysis:

Normality of Barium Chloride titrant, N	0.0103 meq/ml
Volume Titrant Blank, V_{tb}	0.01 ml
Volume Titrant Sample, V_t	3 ml
Volume of Sample Aliquot, V_a	100 ml
Total Volume of Solution, V_{soln}	500 ml

Calculated Data from Laboratory Analysis:

$C_{H_2SO_4} = 1.081E-04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)}$	= 4.317E-07 lb/dscf
$E_{H_2SO_4} = C_{H_2SO_4} \times Q_{s(std)} \times 60$	= 22.8 lb/hr



Environmental Affairs
Laboratory Services

5012 Causeway Blvd * Tampa Fl. 33619 * Ph (813) 630-7378 * Fax (813) 630-7360 * CompQAP #910140G * DOH #E54272

Report For: David Smith, Air Services
E/A Causeway

Report Date: 04/29/2002

Sample Information

Laboratory ID: AA65187

Sampled By: JUAN RAMIREZ

Location Code: PK-STK-S

Date Sampled: 04/23/2002

Location Description: Polk Stack test ,SO3 analysis

Time Sampled: 5:00:00 PM

Project Account Code:

Laboratory Results

Parameter	Result	Units	MDL	Lower Limit	Upper Limit	Violation Check
Normality of BaCl2 * 2H2O	0.0103		0.0001			
SO3, Avg. of Blank Titrations	0.01	milliliters	0.01			
SO3, Run #1, Avg. of Titrations	3.81	milliliters	0.01			
SO3, Run #2, Avg. of Titrations	4.275	milliliters	0.01			
SO3, Run #3, Avg. of Titrations	3.0	milliliters	0.01			
SO3, Volume of Contained Sample	500	milliliters	1			
SO3, Volume of Sample Aliquot	100	milliliters	0.1			

Comments

Polk Unit #1
ERA306 Known sample (T.V.=306ppm SO3)
E/A Causeway: 306.3ppm SO3 = 100.1% Recovery

Robert Dorey,
Manager, Environmental Services

APPENDIX C

DATA ACQUISITION AND HANDLING SYSTEM REPORTS

=====
 Polk Station
 HRSG
 Tampa
 =====

Today's Date: 04/26/2002
 Time: 05:05:19

Reporting Period
 Day: 04/23/2002

DAILY EPA CEM SUMMARY

Time	CO2 %	SO2 ppm	SO2 lb/mmBtu	SO2 lb/hr	NOX ppm	NOX lb/mmBtu	FLOW kscfh	Ht Inp mmBtu
0000	7.8	40.1	0.200	341.8	27.4	0.097	51342	1733
0100	7.8	41.1	0.200	348.0	27.4	0.097	51000	1722
0200	7.8	40.5	0.200	343.7	27.2	0.096	51120	1726
0300	7.8	39.4	0.190	332.9	27.4	0.097	50898	1718
0400	7.8	39.0	0.190	330.5	27.7	0.098	51048	1723
0500	7.8	38.8	0.190	328.7	27.4	0.097	51030	1723
0600	7.8	38.7	0.190	328.6	27.5	0.097	51156	1727
0700	7.8	38.5	0.190	328.7	27.4	0.097	51432	1736
0800	7.8	38.7	0.190	330.3	27.3	0.097	51420	1736
0900	7.8	38.9	0.190	331.8	27.5	0.097	51384	1735
1000	7.8	39.5	0.190	336.6	27.8	0.098	51336	1733
1100	7.7	40.2	0.200	342.9	28.1	0.101	51390	1713
1200	7.7	42.5	0.210	362.3	28.1	0.101	51348	1711
1300	7.7	42.9	0.210	367.7	28.3	0.101	51630	1721
1400	7.7	40.4	0.200	348.9	28.8	0.103	52020	1734
1500	7.7	39.3	0.200	337.3	29.0	0.104	51696	1723
1600	7.7	39.8	0.200	341.9	28.9	0.104	51756	1725
1700	7.7	39.7	0.200	340.5	28.9	0.104	51666	1722
1800	7.7	40.0	0.200	342.0	29.2	0.105	51510	1717
1900	7.8	40.2	0.200	345.4	29.1	0.103	51756	1747
2000	7.8	41.0	0.200	350.1	26.8	0.095	51438	1736
2100	7.8	40.6	0.200	345.0	26.7	0.094	51192	1728
2200	7.8	39.4	0.190	333.7	26.6	0.094	51024	1722
2300	7.8	39.5	0.190	334.2	26.1	0.092	50964	1720
AVRGE	7.8	39.9	0.197	340.6	27.8	0.099	51357	1727

Daily SO2 4.1 Tons
 Daily CO2 5456.7 Tons

Legend

- C - Out of Control
- F - Fans Off
- D - Out of Service
- I - Insufficient Data
- M - Maintenance Fault
- A - Calibration Error
- X - Calibration Expired

Tampa Electric
Polk Unit 1

Today's Date: 05/21/2002
Time: 05:46:26

Reporting Period
Day: 04/23/2002

Daily NOx O2 Summary

Dry Values are corrected to 7% moisture

Time	O2 %	O2 dry	NOx ppm	NOx dry	NOx @15% O2
0000	11.2	12.0	27.4	29.5	19.6
0100	11.2	12.0	27.4	29.5	19.6
0200	11.2	12.0	27.2	29.2	19.5
0300	11.2	12.0	27.4	29.5	19.6
0400	11.2	12.0	27.7	29.8	19.8
0500	11.2	12.0	27.4	29.5	19.6
0600	11.2	12.0	27.5	29.6	19.7
0700	11.2	12.0	27.4	29.5	19.6
0800	11.2	12.0	27.3	29.4	19.6
0900	11.2	12.0	27.5	29.6	19.7
1000	11.3	12.2	27.8	29.9	20.2
1100	11.3	12.2	28.1	30.2	20.4
1200	11.3	12.2	28.1	30.2	20.4
1300	11.3	12.2	28.3	30.4	20.5
1400	11.3	12.2	28.8	31.0	20.9
1500	11.3	12.2	29.0	31.2	21.0
1600	11.3	12.2	28.9	31.1	21.0
1700	11.3	12.2	28.9	31.1	21.0
1800	11.3	12.2	29.2	31.4	21.2
1900	11.3	12.2	29.1	31.3	21.1
2000	11.2	12.0	26.8	28.8	19.2
2100	11.2	12.0	26.7	28.7	19.1
2200	11.2	12.0	26.6	28.6	19.1
2300	11.2	12.0	26.1	28.1	18.7
AVRGE	11.2	12.1	27.8	29.9	20.0

Legend
C - Out of Control
F - Fans Off
D - Out of Service
I - Insufficient Data
M - Maintenance Fault
A - Calibration Error
X - Calibration Expired

POLK COUNTY QUARTERLY EMISSION REPORT
 HRSG

DATE	30-DAY		Daily	Daily	Hours
	So2	Oil (lbs)	Gas (lbs)	Oil (lbs)	Gas (lbs)
03/24/2002	40.6	257.3	52.7	0.0	14
03/25/2002	41.0	262.4	56.7	339.5	24
03/26/2002	40.9	266.2	44.7	286.5	22
03/27/2002	41.4	270.9	36.5	308.8	24
03/28/2002	41.4	278.7	0.0	392.1	24
03/29/2002	42.5	287.1	54.5	387.4	24
03/30/2002	43.2	293.1	50.0	346.4	24
03/31/2002	43.2	296.3	0.0	355.9	24
04/01/2002	43.2	300.2	0.0	360.2	24
04/02/2002	43.2	303.5	0.0	337.4	24
04/03/2002	43.2	304.3	0.0	318.2	24
04/04/2002	43.2	299.2	0.0	258.5	24
04/05/2002	43.2	298.9	0.0	295.4	24
04/06/2002	43.2	299.7	0.0	303.6	24
04/07/2002	43.2	298.9	0.0	233.0	24
04/08/2002	43.5	302.8	43.2	317.3	24
04/09/2002	43.5	306.2	0.0	356.2	24
04/10/2002	43.5	307.5	0.0	378.2	24
04/11/2002	43.5	308.1	0.0	356.7	24
04/12/2002	43.5	308.9	0.0	330.3	24
04/13/2002	43.5	312.8	0.0	357.1	24
04/14/2002	43.5	317.1	0.0	389.5	24
04/15/2002	44.0	322.6	42.7	412.6	24
04/16/2002	44.3	322.6	38.0	0.0	16
04/17/2002	44.4	322.6	45.9	0.0	17
04/18/2002	44.3	322.6	39.7	0.0	17
04/19/2002	44.1	322.6	38.9	0.0	19
04/20/2002	44.3	322.6	45.0	0.0	20
04/21/2002	44.5	326.0	51.7	340.1	24
04/22/2002	44.5	329.8	0.0	341.7	24
04/23/2002	44.5	331.9	0.0	340.5	24

POLK COUNTY QUARTERLY EMISSION REPORT
 HRSG

DATE	30-DAY		Daily	Daily	Hours
	Nox	Oil (lbs)	Gas (lbs)	Oil (lbs)	
03/24/2002	194.2	146.8	231.0	0.0	14
03/25/2002	194.7	148.8	224.3	178.9	24
03/26/2002	194.3	150.9	192.8	195.7	22
03/27/2002	195.7	151.9	164.3	167.9	24
03/28/2002	195.7	152.9	0.0	172.5	24
03/29/2002	198.5	153.2	221.0	154.1	24
03/30/2002	200.2	154.3	204.6	163.1	24
03/31/2002	200.2	155.8	0.0	156.8	24
04/01/2002	200.2	157.1	0.0	149.2	24
04/02/2002	200.2	158.9	0.0	163.7	24
04/03/2002	200.2	161.0	0.0	167.5	24
04/04/2002	200.2	163.8	0.0	188.1	24
04/05/2002	200.2	166.0	0.0	186.3	24
04/06/2002	200.2	167.3	0.0	179.4	24
04/07/2002	200.2	168.4	0.0	185.5	24
04/08/2002	200.9	170.6	191.1	214.3	24
04/09/2002	200.9	172.1	0.0	177.4	24
04/10/2002	200.9	172.2	0.0	168.5	24
04/11/2002	200.9	172.2	0.0	166.3	24
04/12/2002	200.9	172.4	0.0	158.1	24
04/13/2002	200.9	171.8	0.0	165.0	24
04/14/2002	200.9	171.0	0.0	155.0	24
04/15/2002	200.9	170.4	154.2	155.0	24
04/16/2002	199.5	170.4	160.4	0.0	16
04/17/2002	199.5	170.4	203.4	0.0	17
04/18/2002	197.0	170.4	164.3	0.0	17
04/19/2002	195.5	170.4	179.9	0.0	19
04/20/2002	196.1	170.4	204.9	0.0	20
04/21/2002	195.5	169.9	214.6	160.7	24
04/22/2002	195.5	169.7	0.0	166.7	24
04/23/2002	195.5	169.8	0.0	170.3	24

APPENDIX D

TURBINE DATA

1 MINUTE AVERAGES

TEST PERIOD

04/23/2002 9 08
04/23/2002 13.57

	GT SYNGAS MASS FLOW 1TSYF1910	GT GEN LOAD WATTS 1PWRJ1900	GT GENERATOR WATTS 1GMLJ1962	GT N2 FLOW 1NITF1920A	GT CPRSR MAX INL FLANGE TE 1TMST1922M	AMBIENT BAR PRESSURE 1TMSP1909
TEST PERIOD AVERAGES	101.27431383	190.119	190.508	121.2706	80.5994	29.8790
23-Apr-02 09:08:00	101.61152649	190.661	191.008	121.4554	74.7940	29.8755
23-Apr-02 09:09:00	101.41902924	190.897	191.289	121.8336	74.6919	29.8755
23-Apr-02 09:10:00	100.83230591	190.133	190.752	121.9731	75.2959	29.8755
23-Apr-02 09:11:00	100.66286469	189.369	190.288	120.6528	75.0188	29.8755
23-Apr-02 09:12:00	100.84170532	189.135	190.208	120.7546	75.1485	29.8870
23-Apr-02 09:13:00	101.00333405	188.919	190.128	121.0267	75.3012	29.8907
23-Apr-02 09:14:00	101.13880157	189.881	190.523	120.2741	75.0393	29.8907
23-Apr-02 09:15:00	101.01374054	189.267	190.513	121.7393	75.2799	29.8907
23-Apr-02 09:16:00	100.96530151	190.535	190.665	121.1670	75.2703	29.8907
23-Apr-02 09:17:00	101.70460510	190.861	191.197	122.0681	75.4951	29.8804
23-Apr-02 09:18:00	101.66615295	190.678	191.401	121.6475	75.3441	29.8755
23-Apr-02 09:19:00	101.35288239	189.989	190.885	121.6176	75.0572	29.8755
23-Apr-02 09:20:00	101.22667694	190.175	190.555	120.2626	75.1244	29.8755
23-Apr-02 09:21:00	100.94985199	189.731	190.555	120.4971	75.1916	29.8755
23-Apr-02 09:22:00	100.80728912	189.419	190.345	120.8680	75.2589	29.8755
23-Apr-02 09:23:00	100.72071838	189.374	189.994	120.6945	75.3261	29.8755
23-Apr-02 09:24:00	101.37730408	190.065	190.429	120.7220	75.3934	29.8755
23-Apr-02 09:25:00	101.59844208	190.088	190.737	120.8674	75.4606	29.8755
23-Apr-02 09:26:00	101.52402495	190.197	190.884	121.1906	75.5279	29.8755
23-Apr-02 09:27:00	101.85338593	190.398	191.182	121.1938	75.5951	29.8755
23-Apr-02 09:28:00	101.43067932	190.523	191.480	121.8356	75.6966	29.8755
23-Apr-02 09:29:00	101.22781372	190.649	191.356	121.7904	75.8194	29.8839
23-Apr-02 09:30:00	101.32205963	190.067	190.969	121.4417	75.9422	29.8826
23-Apr-02 09:31:00	101.13909912	189.633	190.582	121.2491	76.0650	29.8755
23-Apr-02 09:32:00	100.67837524	189.419	190.196	120.8780	76.1878	29.8755
23-Apr-02 09:33:00	100.59969330	189.301	189.809	120.0994	76.4063	29.8755
23-Apr-02 09:34:00	101.39362335	190.039	190.565	119.6342	76.2471	29.8755
23-Apr-02 09:35:00	101.41962433	190.375	191.452	121.3992	76.2471	29.8755
23-Apr-02 09:36:00	100.91896820	189.845	190.551	121.1999	76.2471	29.8755
23-Apr-02 09:37:00	100.71810150	189.041	190.040	120.0729	76.5272	29.8755
23-Apr-02 09:38:00	100.86917114	189.345	190.342	120.5092	76.4508	29.8755
23-Apr-02 09:39:00	101.37508392	190.102	191.189	120.5391	76.3744	29.8817
23-Apr-02 09:40:00	101.62602997	190.904	191.605	121.3664	76.2980	29.8846
23-Apr-02 09:41:00	101.58146667	190.754	191.545	121.5256	76.4525	29.8755
23-Apr-02 09:42:00	102.02906036	190.440	191.485	121.3609	76.5295	29.8813
23-Apr-02 09:43:00	101.57215881	189.741	191.425	121.2402	76.4268	29.8907
23-Apr-02 09:44:00	101.97230530	190.547	191.546	121.1719	76.3241	29.8851
23-Apr-02 09:45:00	101.59105682	191.041	191.788	121.6030	76.3233	29.8755
23-Apr-02 09:46:00	101.22776031	190.797	191.482	121.3951	76.6280	29.8755
23-Apr-02 09:47:00	101.15839386	190.718	190.812	121.1714	76.9326	29.8755
23-Apr-02 09:48:00	100.78128815	189.897	190.423	120.9319	77.1343	29.8755
23-Apr-02 09:49:00	101.07974243	189.741	191.075	120.6923	76.9239	29.8799
23-Apr-02 09:50:00	101.75890350	191.117	191.322	121.6017	77.1660	29.8907
23-Apr-02 09:51:00	101.21920776	190.550	190.960	121.8907	77.0120	29.8907
23-Apr-02 09:52:00	101.48161316	189.983	190.597	121.6740	76.8580	29.8871
23-Apr-02 09:53:00	100.68351746	189.565	189.937	121.1405	76.7040	29.8792
23-Apr-02 09:54:00	101.56443024	190.442	190.639	121.1140	76.8785	29.8907
23-Apr-02 09:55:00	102.07106018	190.573	191.658	121.6297	76.9818	29.8907
23-Apr-02 09:56:00	101.43223572	190.658	191.661	121.6703	77.0850	29.8907
23-Apr-02 09:57:00	101.20581818	189.474	191.298	121.0708	77.4996	29.8907
23-Apr-02 09:58:00	101.40019226	190.699	191.308	121.2385	77.6017	29.8907

23-Apr-02 09:59:00	100.81336975	189.589	190.609	121.1792	77.7038	29.8907
23-Apr-02 10:00:00	101.09152985	190.095	190.564	121.0056	77.8059	29.8907
23-Apr-02 10:01:00	101.83812714	191.072	191.344	120.7011	78.0956	29.8907
23-Apr-02 10:02:00	101.96554565	190.932	191.467	121.6165	77.7101	29.8907
23-Apr-02 10:03:00	101.73783112	191.013	191.183	121.8530	77.2481	29.8907
23-Apr-02 10:04:00	101.14131927	190.243	190.899	120.4144	77.4534	29.8907
23-Apr-02 10:05:00	101.19390869	189.302	190.615	121.0330	77.2421	29.8907
23-Apr-02 10:06:00	101.55789948	189.892	190.677	120.9594	77.2703	29.8907
23-Apr-02 10:07:00	101.90618896	190.752	190.952	122.0388	77.3730	29.8907
23-Apr-02 10:08:00	101.23731232	189.079	190.399	121.6967	77.4757	29.8907
23-Apr-02 10:09:00	102.02027893	190.135	190.928	120.7141	77.3825	29.8907
23-Apr-02 10:10:00	101.33663177	190.779	191.468	121.0194	77.2298	29.8907
23-Apr-02 10:11:00	101.72154999	190.657	191.338	121.0720	77.3336	29.8907
23-Apr-02 10:12:00	101.32275391	190.534	191.209	121.5437	77.5390	29.8907
23-Apr-02 10:13:00	101.01505280	189.462	190.280	120.5755	77.7443	29.8907
23-Apr-02 10:14:00	100.94841766	189.374	190.031	120.8406	77.5439	29.8907
23-Apr-02 10:15:00	101.17130280	189.982	190.515	120.1951	77.6121	29.8907
23-Apr-02 10:16:00	101.03944397	190.210	190.476	121.4395	77.6803	29.8907
23-Apr-02 10:17:00	101.58338165	190.219	190.710	121.0366	77.7485	29.8907
23-Apr-02 10:18:00	101.14363861	190.228	190.897	121.2736	77.8167	29.8907
23-Apr-02 10:19:00	100.81035614	189.431	190.169	121.0549	77.8849	29.8907
23-Apr-02 10:20:00	101.23615265	189.303	190.056	120.2793	77.9531	29.8907
23-Apr-02 10:21:00	100.81789398	189.407	190.014	120.5802	78.0213	29.8907
23-Apr-02 10:22:00	101.45332336	189.298	190.030	120.7153	78.0895	29.8907
23-Apr-02 10:23:00	101.55492401	189.990	190.704	121.4042	77.9845	29.8907
23-Apr-02 10:24:00	101.51079559	190.109	190.690	121.7452	77.9484	29.8907
23-Apr-02 10:25:00	101.36161041	189.212	190.086	121.9168	77.9924	29.8907
23-Apr-02 10:26:00	101.14994049	189.008	190.092	121.1694	77.8552	29.8907
23-Apr-02 10:27:00	100.98931885	190.164	190.479	120.5608	77.9570	29.8907
23-Apr-02 10:28:00	101.46939087	190.550	190.866	121.5437	78.0588	29.8907
23-Apr-02 10:29:00	101.67027283	190.168	191.253	119.8746	78.1607	29.8907
23-Apr-02 10:30:00	101.07654572	190.229	191.140	121.5520	78.2625	29.8907
23-Apr-02 10:31:00	101.00024414	189.891	190.717	121.2550	78.3643	29.8907
23-Apr-02 10:32:00	100.90892029	190.088	190.421	120.1309	78.3555	29.8907
23-Apr-02 10:33:00	101.31033325	189.638	190.621	121.0250	78.4390	29.8907
23-Apr-02 10:34:00	101.34632874	189.615	190.513	119.8243	78.7283	29.8907
23-Apr-02 10:35:00	101.45375061	190.322	190.710	120.8921	78.6262	29.8802
23-Apr-02 10:36:00	101.58093262	190.607	191.314	121.3569	78.5241	29.8859
23-Apr-02 10:37:00	101.11389923	189.902	190.353	120.7590	78.4644	29.8907
23-Apr-02 10:38:00	101.45741272	190.476	190.462	120.9434	78.6172	29.8907
23-Apr-02 10:39:00	101.32367706	190.411	190.811	121.1963	78.7156	29.8907
23-Apr-02 10:40:00	101.61579132	190.346	191.073	121.6678	78.7167	29.8907
23-Apr-02 10:41:00	101.60466003	190.280	191.282	121.1511	78.4912	29.8907
23-Apr-02 10:42:00	101.88412476	190.505	191.246	121.1999	78.7723	29.8907
23-Apr-02 10:43:00	101.44688416	190.212	190.904	120.5797	79.0548	29.8907
23-Apr-02 10:44:00	101.33377838	190.226	190.812	120.9310	78.7726	29.8907
23-Apr-02 10:45:00	101.40019226	190.606	190.993	121.4654	79.3750	29.8907
23-Apr-02 10:46:00	101.31336212	189.504	190.243	121.1470	79.1719	29.8907
23-Apr-02 10:47:00	101.07186127	189.774	189.957	121.4417	78.9687	29.8907
23-Apr-02 10:48:00	101.59703064	190.044	190.841	120.7402	78.7656	29.8907
23-Apr-02 10:49:00	101.78930664	190.720	190.991	121.2441	78.8671	29.8907
23-Apr-02 10:50:00	101.36672211	190.760	190.886	121.4129	78.9903	29.8907
23-Apr-02 10:51:00	100.85033417	189.814	190.420	120.2661	79.1135	29.8907
23-Apr-02 10:52:00	100.93074036	189.337	190.379	120.4691	79.2367	29.8907
23-Apr-02 10:53:00	100.30273438	188.950	190.048	120.3544	79.3599	29.8907
23-Apr-02 10:54:00	100.69911957	188.892	190.031	119.9332	79.3219	29.8907
23-Apr-02 10:55:00	101.24881744	189.910	190.515	120.1667	79.2536	29.8907
23-Apr-02 10:56:00	100.33898163	189.282	189.955	120.7210	79.1009	29.8907
23-Apr-02 10:57:00	100.73408508	189.374	189.834	120.0682	79.3013	29.8907
23-Apr-02 10:58:00	101.04071045	189.713	190.390	120.8650	79.1435	29.8907
23-Apr-02 10:59:00	101.60862732	190.309	190.946	121.3321	79.2962	29.8907
23-Apr-02 11:00:00	101.56903839	190.569	191.249	120.9683	79.6183	29.8907

23-Apr-02 11:01:00	101.37196350	190.941	191.394	121.0576	79.5162	29.8907
23-Apr-02 11:02:00	101.48350525	191.130	191.539	121.3870	79.4141	29.8907
23-Apr-02 11:03:00	101.53843689	190.802	191.326	121.2443	79.4447	29.8907
23-Apr-02 11:04:00	101.22928619	189.774	190.384	121.3113	79.5468	29.8907
23-Apr-02 11:05:00	100.08763123	189.934	190.151	120.5447	79.6489	29.8907
23-Apr-02 11:06:00	101.26510620	190.173	190.554	120.8277	79.6009	29.8907
23-Apr-02 11:07:00	101.45497131	190.412	190.956	121.4263	79.4456	29.8907
23-Apr-02 11:08:00	101.40934753	190.650	191.245	121.2379	79.7713	29.8907
23-Apr-02 11:09:00	101.30847931	190.879	191.462	121.1020	79.9210	29.8907
23-Apr-02 11:10:00	100.92010498	190.470	191.183	121.0847	79.9210	29.8907
23-Apr-02 11:11:00	100.77944183	189.921	190.595	120.0340	79.7713	29.8907
23-Apr-02 11:12:00	100.79930115	189.773	190.007	120.1831	79.7380	29.8907
23-Apr-02 11:13:00	101.00192261	190.054	190.206	120.1307	79.8378	29.8933
23-Apr-02 11:14:00	101.66787720	190.436	190.895	120.5595	79.9377	29.9035
23-Apr-02 11:15:00	101.54927063	190.585	190.719	120.9883	80.4322	29.8930
23-Apr-02 11:16:00	101.40709686	190.278	190.006	120.6945	80.3898	29.9038
23-Apr-02 11:17:00	101.31602478	189.972	190.210	119.8829	80.0502	29.8907
23-Apr-02 11:18:00	100.26718903	189.417	190.116	120.1042	80.2055	29.8907
23-Apr-02 11:19:00	100.57160950	189.324	189.482	120.0890	80.5246	29.8907
23-Apr-02 11:20:00	100.93468475	189.505	189.709	119.7876	80.3552	29.8907
23-Apr-02 11:21:00	101.02595520	189.989	189.669	120.9944	80.5092	29.8907
23-Apr-02 11:22:00	100.83284760	189.676	189.721	119.9238	80.8582	29.8907
23-Apr-02 11:23:00	101.11399841	189.884	190.619	120.3669	80.7658	29.8907
23-Apr-02 11:24:00	101.38127136	190.578	191.062	120.5614	81.2218	29.8907
23-Apr-02 11:25:00	101.18594360	190.297	190.392	121.1915	81.0990	29.8907
23-Apr-02 11:26:00	101.25766754	190.118	190.258	120.2866	80.9762	29.8907
23-Apr-02 11:27:00	101.49932098	190.390	190.717	120.3188	80.8534	29.8907
23-Apr-02 11:28:00	101.66304779	190.989	191.176	120.7113	80.7306	29.8907
23-Apr-02 11:29:00	101.88983154	190.932	191.069	122.0096	80.6928	29.8907
23-Apr-02 11:30:00	101.22198486	189.821	190.610	121.0801	81.2223	29.9050
23-Apr-02 11:31:00	100.98428345	189.949	190.151	120.9080	81.2586	29.8918
23-Apr-02 11:32:00	101.13467407	189.493	190.340	120.5214	81.4126	29.9048
23-Apr-02 11:33:00	101.60273743	190.010	190.932	120.5202	81.5510	29.8922
23-Apr-02 11:34:00	101.70202637	191.014	191.144	120.6161	81.5615	29.8907
23-Apr-02 11:35:00	101.67740631	190.721	191.120	120.7119	81.4594	29.8907
23-Apr-02 11:36:00	101.48640442	190.437	191.096	121.3155	81.3573	29.8907
23-Apr-02 11:37:00	101.45722198	190.671	191.072	121.4463	81.2552	29.8907
23-Apr-02 11:38:00	100.97271729	190.055	190.168	121.3528	81.5406	29.9035
23-Apr-02 11:39:00	100.94271851	189.439	190.238	120.0966	81.3895	29.8935
23-Apr-02 11:40:00	101.32349396	190.050	190.523	120.8577	81.5435	29.8907
23-Apr-02 11:41:00	101.60791779	190.725	191.010	120.8700	81.2938	29.9028
23-Apr-02 11:42:00	101.79808044	191.001	191.323	120.6843	81.3803	29.8942
23-Apr-02 11:43:00	101.94786835	190.583	190.708	120.6644	81.5356	29.8907
23-Apr-02 11:44:00	101.73775482	190.079	190.506	121.1062	81.7499	29.9024
23-Apr-02 11:45:00	102.00346375	189.872	190.780	121.5688	81.5971	29.8945
23-Apr-02 11:46:00	102.31236267	190.630	191.054	121.9697	81.6402	29.9018
23-Apr-02 11:47:00	102.36318970	190.627	190.973	121.2275	81.7428	29.8951
23-Apr-02 11:48:00	101.67056274	190.468	190.671	121.4495	81.8455	29.8907
23-Apr-02 11:49:00	101.60198212	190.379	190.709	121.3544	81.7642	29.8907
23-Apr-02 11:50:00	101.61008453	190.375	190.959	121.3843	81.6102	29.8907
23-Apr-02 11:51:00	101.65204620	190.715	191.208	121.3561	81.4606	29.9007
23-Apr-02 11:52:00	101.45686340	190.107	190.857	120.9645	81.3147	29.8961
23-Apr-02 11:53:00	101.18446350	189.585	190.132	121.2455	81.4168	29.8907
23-Apr-02 11:54:00	101.17550659	189.455	189.854	120.4054	81.5189	29.8907
23-Apr-02 11:55:00	101.68436432	189.973	190.286	119.4871	81.3788	29.8907
23-Apr-02 11:56:00	100.68869019	189.231	189.675	120.5482	81.5615	29.8907
23-Apr-02 11:57:00	101.38196564	189.966	190.157	120.5343	81.5615	29.8907
23-Apr-02 11:58:00	101.39134979	190.691	190.584	120.5266	82.1827	29.8907
23-Apr-02 11:59:00	101.58354187	190.375	190.835	120.5825	82.3935	29.8907
23-Apr-02 12:00:00	101.33065033	190.344	190.690	121.5104	82.1634	29.8907
23-Apr-02 12:01:00	101.12913513	190.438	190.645	120.4362	81.9334	29.8907
23-Apr-02 12:02:00	101.75747681	190.710	190.947	121.7725	81.7033	29.8981

23-Apr-02 12:03:00	101.17130280	190.601	190.749	121.3170	81.6402	29.8990
23-Apr-02 12:04:00	101.80051422	190.695	190.555	121.6321	81.8455	29.8907
23-Apr-02 12:05:00	101.16503906	190.575	190.555	121.5965	82.0508	29.8907
23-Apr-02 12:06:00	101.12404633	189.913	190.301	120.7451	82.1364	29.8907
23-Apr-02 12:07:00	100.59384918	189.696	189.891	120.4130	81.9824	29.8849
23-Apr-02 12:08:00	101.35277557	189.843	190.061	120.6665	81.9009	29.8755
23-Apr-02 12:09:00	101.41438293	190.305	190.593	121.0908	81.9885	29.8807
23-Apr-02 12:10:00	101.29848480	190.536	190.633	121.1331	82.0760	29.8907
23-Apr-02 12:11:00	101.49691772	190.607	190.367	121.0022	82.1636	29.8907
23-Apr-02 12:12:00	101.76206207	191.186	190.593	121.5962	82.2512	29.8907
23-Apr-02 12:13:00	101.65211487	190.998	190.628	122.2522	82.3388	29.8907
23-Apr-02 12:14:00	101.32694244	190.555	190.354	121.5286	82.4264	29.8864
23-Apr-02 12:15:00	101.49174500	189.827	190.080	121.0878	82.5474	29.8797
23-Apr-02 12:16:00	101.12400055	190.121	189.937	121.5436	82.8580	29.8867
23-Apr-02 12:17:00	100.94049072	189.724	189.877	120.9277	83.0463	29.8792
23-Apr-02 12:18:00	99.98138428	189.603	189.816	120.5997	82.5161	29.8871
23-Apr-02 12:19:00	101.27954102	189.535	189.755	120.1977	82.6689	29.8755
23-Apr-02 12:20:00	100.95767212	190.040	190.034	121.0097	82.8458	29.8755
23-Apr-02 12:21:00	101.01794434	189.765	190.067	120.9837	83.1271	29.8755
23-Apr-02 12:22:00	101.07216644	189.655	189.826	120.7401	83.1271	29.8755
23-Apr-02 12:23:00	101.52312469	190.959	190.478	121.1700	83.1271	29.8755
23-Apr-02 12:24:00	101.13468170	191.225	190.892	121.1572	82.2180	29.8755
23-Apr-02 12:25:00	101.79713440	190.404	190.811	121.0704	82.6380	29.8755
23-Apr-02 12:26:00	101.33752441	189.582	190.731	121.6273	83.1038	29.8755
23-Apr-02 12:27:00	101.09186554	189.939	189.942	121.6989	82.3863	29.8755
23-Apr-02 12:28:00	101.13925934	189.005	189.641	121.3888	81.9281	29.8755
23-Apr-02 12:29:00	101.32768250	190.546	189.878	120.0996	82.4187	29.8755
23-Apr-02 12:30:00	101.28457642	190.157	190.114	121.0754	83.0347	29.8755
23-Apr-02 12:31:00	101.52273560	190.497	190.101	120.7760	82.7312	29.8755
23-Apr-02 12:32:00	101.80349731	190.916	190.590	121.1179	82.2654	29.8755
23-Apr-02 12:33:00	101.69087982	191.020	190.862	121.5730	82.2503	29.8755
23-Apr-02 12:34:00	101.44641876	190.404	190.733	121.5175	82.7461	29.8755
23-Apr-02 12:35:00	101.09679413	190.296	190.604	121.6447	82.6195	29.8755
23-Apr-02 12:36:00	100.83136749	190.129	190.041	121.3501	82.7710	29.8755
23-Apr-02 12:37:00	100.74442291	189.155	189.207	121.6852	82.5932	29.8755
23-Apr-02 12:38:00	101.49906921	189.747	190.005	121.5682	82.7200	29.8755
23-Apr-02 12:39:00	101.49174500	190.560	190.774	121.2319	82.5714	29.8755
23-Apr-02 12:40:00	101.40166473	190.985	190.895	121.7620	82.6746	29.8755
23-Apr-02 12:41:00	101.17267609	190.377	190.494	122.1291	82.7778	29.8755
23-Apr-02 12:42:00	100.61048126	189.405	189.769	121.7856	82.8369	29.8755
23-Apr-02 12:43:00	100.79236603	189.568	189.516	121.7017	82.3786	29.8755
23-Apr-02 12:44:00	100.90922546	189.644	189.819	120.6032	82.5008	29.8755
23-Apr-02 12:45:00	101.25119019	189.949	190.021	121.4375	83.1989	29.8755
23-Apr-02 12:46:00	101.13903046	190.252	190.382	121.3277	83.6693	29.8755
23-Apr-02 12:47:00	100.76557159	189.787	189.675	122.0143	83.5166	29.8755
23-Apr-02 12:48:00	101.04618073	189.659	190.008	121.6024	83.5942	29.8629
23-Apr-02 12:49:00	101.51345062	190.002	190.048	121.0718	83.6045	29.8709
23-Apr-02 12:50:00	101.26758575	190.233	190.031	121.1371	83.7995	29.8637
23-Apr-02 12:51:00	101.48967743	190.659	190.515	121.3188	83.9022	29.8704
23-Apr-02 12:52:00	101.16671753	190.498	190.211	122.0591	84.0048	29.8637
23-Apr-02 12:53:00	100.63825226	189.625	189.419	121.1451	83.8240	29.8703
23-Apr-02 12:54:00	100.16245270	189.711	189.892	120.6569	83.4402	29.8640
23-Apr-02 12:55:00	100.72620392	189.477	189.579	120.7420	83.2210	29.8587
23-Apr-02 12:56:00	100.75594330	189.366	189.550	121.7052	83.1788	29.8587
23-Apr-02 12:57:00	101.16928101	189.880	190.214	121.2912	83.3341	29.8587
23-Apr-02 12:58:00	101.32640839	190.322	190.420	121.7861	83.7315	29.8587
23-Apr-02 12:59:00	101.28305054	190.549	190.360	121.8968	83.6545	29.8587
23-Apr-02 13:00:00	101.52369690	190.734	190.635	121.8355	83.5775	29.8587
23-Apr-02 13:01:00	101.85118103	190.809	191.119	122.4634	83.5005	29.8587
23-Apr-02 13:02:00	101.30812073	190.652	190.932	123.3130	83.1579	29.8587
23-Apr-02 13:03:00	101.34701538	190.409	190.804	123.0951	83.3119	29.8587
23-Apr-02 13:04:00	101.35411072	190.415	190.384	122.5796	83.5429	29.8587

23-Apr-02 13:05:00	101.47709656	191.011	190.653	121.7848	84.0813	29.8587
23-Apr-02 13:06:00	101.34075165	190.525	190.416	122.1865	84.1806	29.8587
23-Apr-02 13:07:00	100.84546661	189.284	189.486	121.8895	84.2799	29.8587
23-Apr-02 13:08:00	101.26743317	189.198	189.464	121.6812	84.3459	29.8587
23-Apr-02 13:09:00	101.90802765	189.376	190.008	122.0495	84.0764	29.8587
23-Apr-02 13:10:00	101.89001465	190.965	190.959	122.8885	84.2261	29.8587
23-Apr-02 13:11:00	101.45481873	189.609	190.663	123.4786	84.3610	29.8587
23-Apr-02 13:12:00	101.30792999	189.325	189.956	122.2190	84.0664	29.8587
23-Apr-02 13:13:00	101.00959778	189.722	189.533	121.7774	84.3709	29.8587
23-Apr-02 13:14:00	101.41135406	190.111	189.825	121.5041	83.9176	29.8587
23-Apr-02 13:15:00	100.59542084	189.992	189.418	120.6409	83.7636	29.8587
23-Apr-02 13:16:00	101.21482849	189.872	189.232	120.8630	84.0408	29.8587
23-Apr-02 13:17:00	101.06661224	189.753	189.594	120.9959	83.9728	29.8587
23-Apr-02 13:18:00	101.15666962	189.546	189.957	121.4008	83.8707	29.8587
23-Apr-02 13:19:00	100.77714539	189.334	189.425	121.7716	83.7686	29.8587
23-Apr-02 13:20:00	101.10375977	189.946	189.559	120.8397	84.0240	29.8587
23-Apr-02 13:21:00	101.39847565	190.309	190.454	121.5347	83.9894	29.8587
23-Apr-02 13:22:00	101.13468170	190.232	189.843	123.0151	83.5317	29.8587
23-Apr-02 13:23:00	101.11690521	190.133	189.652	121.9244	83.6866	29.8587
23-Apr-02 13:24:00	101.04142761	190.031	190.305	122.9544	83.9203	29.8587
23-Apr-02 13:25:00	101.73751831	190.708	190.510	122.5566	83.9052	29.8587
23-Apr-02 13:26:00	101.74674988	190.360	190.438	122.5957	84.1076	29.8587
23-Apr-02 13:27:00	101.32091522	190.382	190.365	121.5637	84.3101	29.8587
23-Apr-02 13:28:00	101.02206421	189.536	189.890	121.9498	84.6890	29.8587
23-Apr-02 13:29:00	100.73641205	189.735	189.761	121.3817	85.1436	29.8587
23-Apr-02 13:30:00	101.51898193	190.363	190.599	121.4400	85.3752	29.8587
23-Apr-02 13:31:00	101.10422516	190.019	190.615	122.0944	85.4779	29.8587
23-Apr-02 13:32:00	101.60296631	190.355	190.561	122.0727	85.5806	29.8587
23-Apr-02 13:33:00	101.66570282	190.707	190.923	123.9362	85.0844	29.8587
23-Apr-02 13:34:00	101.71667480	190.875	190.980	123.1725	84.7418	29.8584
23-Apr-02 13:35:00	101.86787415	190.853	190.848	122.9301	84.8439	29.8437
23-Apr-02 13:36:00	100.88170624	190.272	190.066	122.5712	84.9461	29.8587
23-Apr-02 13:37:00	101.45761871	189.600	189.759	122.1456	84.6840	29.8587
23-Apr-02 13:38:00	100.73366547	189.255	189.264	121.9294	84.5375	29.8439
23-Apr-02 13:39:00	100.71657562	189.460	189.547	122.0149	84.6527	29.8434
23-Apr-02 13:40:00	100.67288971	189.861	189.754	122.2783	84.9284	29.8434
23-Apr-02 13:41:00	101.16602325	189.939	189.910	121.9514	84.7756	29.8434
23-Apr-02 13:42:00	101.00952911	190.047	189.947	121.6264	84.9284	29.8434
23-Apr-02 13:43:00	100.92511749	190.174	190.227	121.1780	85.5393	29.8434
23-Apr-02 13:44:00	101.71253204	190.535	190.831	122.4101	85.8718	29.8434
23-Apr-02 13:45:00	101.46575928	190.771	190.652	123.4584	85.6870	29.8434
23-Apr-02 13:46:00	101.74443817	190.343	190.858	123.2362	85.5022	29.8434
23-Apr-02 13:47:00	101.27677155	190.719	190.661	123.0227	85.3174	29.8434
23-Apr-02 13:48:00	101.36225891	190.586	190.706	123.0722	85.1326	29.8434
23-Apr-02 13:49:00	101.52149963	190.611	190.854	122.3431	84.9564	29.8434
23-Apr-02 13:50:00	100.70894623	189.638	190.369	122.3877	84.8036	29.8434
23-Apr-02 13:51:00	100.80110168	188.972	189.656	121.0598	84.7372	29.8434
23-Apr-02 13:52:00	101.01660156	189.021	189.912	120.5240	84.9828	29.8434
23-Apr-02 13:53:00	101.73894501	190.799	190.813	122.1553	85.2284	29.8434
23-Apr-02 13:54:00	101.26432037	189.592	190.578	121.4345	85.4739	29.8434
23-Apr-02 13:55:00	101.37888336	189.900	190.366	121.9974	85.7195	29.8434
23-Apr-02 13:56:00	100.78488922	189.571	189.872	123.1908	85.6295	29.8434
23-Apr-02 13:57:00	101.17973328	189.922	189.491	123.2385	85.6909	29.8325

APPENDIX E

FUEL ANALYSIS



Commercial Testing & Engineering Co.

April 25, 2002

1212 N. 39th Street
Suite 323
Tampa, FL 33605
Tel: (813) 248-6566
Fax: (813) 247-2562

TAMPA ELECTRIC COMPANY
5010 Causeway Blvd.
Tampa, FL 33619

CERTIFICATE OF ANALYSIS

RE: SUBMITTED SAMPLE
PRODUCT: SAID TO BE SYNGAS
SUBMITTED BY: TAMPA ELECTRIC COMPANY on 04/23/02
SAMPLE MARKED: TECO - POLK POWER STATION UNIT #1 - SAMPLE 1 DTD. 4/23/02
YOUR REF.: P.O..NO. EN-98006
OUR REF: 08-5625A

COMPONENTS, MOLE %

<u>TEST</u>	<u>RESULTS</u>
METHANE	0.125
ETHANE	0.0218
PROPANE	0.00225
I-BUTANE	0.00212
N-BUTANE	0.00231
NEO-PENTANE	ND
I-PENTANE	0.00098
N-PENTANE	0.00141
N-HEXANES	0.00288
N-HEPTANES	ND
N-OCTANES	0.00112
N-NONANES	0.00062
N-DECANES	0.00026
HENDECANES	0.00042
DODECANES	ND
TRIDECANES	ND
TETRADECANES	ND
HYDROGEN	27.44168
NITROGEN	3.38513
OXYGEN	1.16245
ARGON	ND
CARBON DIOXIDE	13.49446
CARBON MONOXIDE	54.35506
WATER	DETECTED

CALCULATED PROPERTIES

RELATIVE DENSITY 0.7985



Member of the SGS Group (Société Générale de Surveillance)

ALL INSPECTIONS ARE CARRIED OUT TO THE BEST OF OUR KNOWLEDGE AND ABILITY AND OUR RESPONSIBILITY IS LIMITED TO THE EXERCISE OF REASONABLE CARE

TERMS AND CONDITIONS ON REVERSE



Commercial Testing & Engineering Co.

TAMPA ELECTRIC COMPANY
5010 Causeway Blvd.
Tampa, FL 33619

CERTIFICATE OF ANALYSIS - 08-5625A (continued)

RESULTS

HEATING VALUE, BTU/cf, GROSS, 14.73 psia, 60 deg. F

SATURATED	261
HIGHER HEATING VALUE (DRY)	266
LOWER HEATING VALUE (NET)	252

ND = NOT DETECTED

Note: Above results reported as normalized Mole Percent.

COMMERCIAL TESTING & ENGINEERING CO.

Victoria A. Linde
Operations Manager

VAL/ne



Member of the SGS Group (Société Générale de Surveillance)

ALL INSPECTIONS ARE CARRIED OUT TO THE BEST OF OUR KNOWLEDGE AND ABILITY AND OUR RESPONSIBILITY IS LIMITED TO THE EXERCISE OF REASONABLE CARE

TERMS AND CONDITIONS ON REVERSE



Commercial Testing & Engineering Co.

April 25, 2002

1212 N. 39th Street
Suite 323
Tampa, FL 33605
Tel: (813) 248-6566
Fax: (813) 247-2562

TAMPA ELECTRIC COMPANY
5010 Causeway Blvd.
Tampa, FL 33619

CERTIFICATE OF ANALYSIS

RE: SUBMITTED SAMPLES
PRODUCT: SAID TO BE SYNGAS
SUBMITTED BY: TAMPA ELECTRIC COMPANY on 04/23/02
SAMPLES MARKED: TECO - POLK POWER STATION UNIT #1 DTD. 4/23/02
SAMPLE # 2 (B)
SAMPLE # 3 (C)
YOUR REF.: P.O. NO. EN-98006
OUR REF.: 08-5625

COMPONENTS, MOLE %

RESULTS

<u>TEST</u>	(B)	(C)
METHANE	0.252	0.158
ETHANE	0.0242	0.0212
PROPANE	0.00224	0.00592
I-BUTANE	0.00211	0.00363
N-BUTANE	0.00229	0.00505
NEO-PENTANE	ND	ND
I-PENTANE	0.00465	0.00532
N-PENTANE	0.00560	0.00599
N-HEXANES	0.01411	0.02019
HYDROGEN	27.40234	28.95886
NITROGEN	3.47197	3.29269
OXYGEN	1.17140	1.12252
ARGON	ND	ND
CARBON DIOXIDE	13.27471	13.06752
CARBON MONOXIDE	54.37265	53.33284
WATER	DETECTED	DETECTED

CALCULATED PROPERTIES

RELATIVE DENSITY	0.7974	0.7828
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Member of the SGS Group (Société Générale de Surveillance)

ALL INSPECTIONS ARE CARRIED OUT TO THE BEST OF OUR KNOWLEDGE AND ABILITY AND OUR RESPONSIBILITY IS LIMITED TO THE EXERCISE OF REASONABLE CARE

TERMS AND CONDITIONS ON REVERSE



Commercial Testing & Engineering Co.

TAMPA ELECTRIC COMPANY
5010 Causeway Blvd.
Tampa, FL 33619

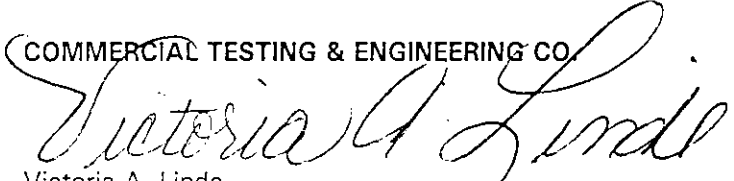
CERTIFICATE OF ANALYSIS - 08-5625 (continued)

RESULTS

	(B)	(C)
<u>HEATING VALUE, BTU/cf, GROSS, 14.73 psia, 60 deg. F</u>		
SATURATED	263	265
HIGHER HEATING VALUE (DRY)	268	269
LOWER HEATING VALUE (NET)	254	254

ND = NOT DETECTED

Note: Above results reported as normalized Mole Percent.

COMMERCIAL TESTING & ENGINEERING CO.

 Victoria A. Linde
 Operations Manager

VAL/ne



Member of the SGS Group (Société Générale de Surveillance)

ALL INSPECTIONS ARE CARRIED OUT TO THE BEST OF OUR KNOWLEDGE AND ABILITY AND OUR RESPONSIBILITY IS LIMITED TO THE EXERCISE OF REASONABLE CARE

TERMS AND CONDITIONS ON REVERSE

APPENDIX F

FIELD DATA SHEETS

Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (F ³)	ΔP (In. H ₂ O)	ΔH (In. H ₂ O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
01	1043	87.586	1.40	1.49	240	307	79/80	—	66	4.0
2		89.22	1.30	1.38	247	308	80/87	—	61	4.0
3		90.82	1.40	1.49	240	307	80/84	—	61	4.0
4		92.54	1.50	1.60	244	307	80/84	—	61	4.0
5		94.77	1.40	1.49	240	307	84/84	—	61	4.0
6		96.90	1.20	1.28	234	306	81/85	—	63	4.0
END	1058	97.533	—	—	—	—	—	—	—	—
07		97.533	1.40	1.49	240	307	81/87	—	66	4.0
08	1101	97.533	1.40	1.49	240	307	81/87	—	66	4.0
09		99.15	1.40	1.50	242	308	81/86	—	61	4.0
3		100.90	1.40	1.49	241	308	82/87	—	61	4.0
4		102.58	1.50	1.61	241	308	82/88	—	61	4.0
5		104.41	1.50	1.61	239	308	82/90	—	63	5.0
6		106.15	1.50	1.61	241	308	83/90	—	63	5.0
END	1116	107.863	—	—	—	—	—	—	—	—

Sulfuric Acid Mist Field Data Form

Plant POIK POWER STATION
 Location UNIT 1
 Date 4/25/02
 Method No. META-18
 Run No. 2
 Box Operator J.E.Z
 Probe Operator JAV/LO/PS
 Time - Start: 1152 End: 1201
 Sampling Time 60
 Min. \ Pt. 2.5
 Meter Box No. 1
 Stack Area Ft² 283.329
 Meter Cal. (ΔH) 1.833
 Meter Cal. (ΔY) 1.000

Nozzle I.D. No. #6
 Nozzle Diameter 0.198
 Pitot Tube No. _____
 Pitot Tube (C_p) 0.84
 Probe Length 14'
 Probe Liner Material 9/16 SS
 Probe Heater Setting 250
 Pressure Pb ("Hg): _____ Pg ("H₂O): _____ Ps ("Hg): _____
 Ambient Temperature 55
 Assumed Moisture (%) 6.5
 Filter Holder No. 003
 Comments _____

Dry Gas Meter Volume
 Final 159.285 FL³
 Initial 118.483 FL³
 Net 40.802 FL³

Equipment Leak Checks
 Initial 0.000 CFM @ 15 "Hg
 Final _____ CFM @ _____ "H₂O
 Pitot Tube 0.84 6.0 "H₂O

Moisture Determination
 Impinger 76, 126, 116 ml
 Silica Gel 2831 gm
 Total 46.1 ml

Traverse Point No.	Clock Time	Gas Sample Volume (FL ³)	ΔP (In. H ₂ O)	ΔH (In. H ₂ O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
B1	1152	118.483	1.40	1.49	260	308	81/51	—	68	5.5
2		120.20	1.40	1.49	244	308	82/84	—	67	5.5
3		121.94	1.50	1.60	241	310	82/86	—	61	5.5
4		123.67	1.50	1.60	240	309	82/87	—	61	5.5
5		125.41	1.60	1.71	241	310	82/87	—	68	5.5
6		127.20	1.60	1.72	246	308	83/88	—	68	5.0
END	1207	129.000	—	—	—	—	—	—	—	—
C1	1240	129.000	1.70	1.49	246	308	83/82	—	68	6.50
2		130.66	1.50	1.61	242	308	82/87	—	68	5.0
3		132.41	1.40	1.58	240	307	83/90	—	68	5.5
4		134.09	1.40	1.51	240	307	83/89	—	63	5.0
5		135.80	1.40	1.51	240	307	83/89	—	63	5.0
6		137.45	1.40	1.51	242	307	83/90	—	63	5.0

END 1215 139.107
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Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (Ft ³)	ΔP (In. H ₂ O)	ΔH (In. H ₂ O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
D 1	1228	139.107	1.30	1.40	240	307	84/87	—	61	4.5
2	1	140.74	1.30	1.40	240	307	84/90	—	61	4.5
3		142.37	1.30	1.40	240	307	84/91	—	61	4.5
4		144.03	1.50	1.62	240	308	85/90	—	61	5.5
5		145.77	1.50	1.62	244	308	85/92	—	63	5.5
6		149.53	1.30	1.41	242	307	86/95	—	63	5.0
END.	1243	149.162	—	—	—	—	—	—	—	—
A 1	1246	149.162	1.30	1.40	241	307	86/89	—	68	5.0
2		150.81	1.30	1.41	242	307	87/96	—	62	5.0
3		152.47	1.30	1.41	241	307	87/98	—	61	5.0
4		154.11	1.40	1.52	244	308	88/99	—	61	5.0
5		155.83	1.50	1.63	247	308	88/99	—	62	5.5
6		157.62	1.30	1.47	241	307	88/95	—	62	5.5
END	1301	159.285	—	—	—	—	—	—	—	—

Sulfuric Acid Mist Field Data Form

Plant Po/K Power Station
 Location Unit 1
 Date 1/23/02
 Method No. method 8
 Run No. 3
 Box Operator JFR
 Probe Operator JAV/CO/MS
 Time - Start 1349 End: 1453
 Sampling Time 60
 Min. \ Pt. 2.5
 Meter Box No. 1
 Stack Area Ft² 283.529
 Meter Cal. (ΔH) 1.833
 Meter Cal. (ΔY) 1.00

Nozzle I.D. No. 16
 Nozzle Diameter 0.198
 Pitot Tube No. _____
 Pitot Tube (C_p) 0.87
 Probe Length 14"
 Probe Liner Material glass
 Probe Heater Setting _____
 Pressure Pb ("Hg): _____ Pg ("H₂O): _____ Ps ("Hg): _____
 Ambient Temperature 90
 Assumed Moisture (%) 6.5
 Filter Holder No. 002
 Comments _____

Dry Gas Meter Volume
 Final 311.657 FL³
 Initial 169.494 FL³
 Net 142.163 FL³

Equipment Leak Checks
 Initial 0.000 CFM @ 15 "Hg
 Final 0.000 CFM @ 5 "H₂O
 Pitot Tube 7.0 "H₂O

Moisture Determination
 Impinger 78, 126.112 ml
 Silica Gel 31.4 gm
 Total 47.1 ml

Traverse Point No.	Clock Time	Gas Sample Volume (FL ³)	Δ P (In. H ₂ O)	Δ H (In. H ₂ O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
A1	1346	169.494	1.30	1.41	240	309 ³¹⁰	93/94	—	68	4.0
2		171.21	1.50	1.64	242	310	93/101	—	66	4.0
3		173.02	1.40	1.54	240	310	94/104	—	65	4.0
4		174.77	1.40	1.54	245	308	95/104	—	66	4.0
5		176.53	1.50	1.65	241	308	95/101	—	66	4.0
6		178.34	1.30	1.42	236	309	95/101	—	65	4.0
End	1401	180.038	—	—	—	—	—	—	—	—
D1	1403	180.038	1.30	1.42	240	308	93/95	—	60	4.0
2		181.71	1.40 ^{1.40}	1.53	255	309	94/98	—	63	4.0
3		183.45	1.40	1.52	257	311	93/98	—	65	4.0
4		185.20	1.40	1.53	255/40	310	93/100	—	65	4.0
5		186.94	1.50	1.64	261	311	93/100	—	65	4
6		188.72	1.40	1.42	254	310	94/101	—	65	4

End 1418
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 190.402

Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (F ³)	Δ P (In. H ₂ O)	Δ H (In. H ₂ O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
C1	1421	190.402	1.40	1.53	252	308	95/98	—	63	4.0
2		192.4 ¹⁹ 450	1.40	1.54	250	310	95/104	—	66	4.0
3		193.90	1.50	1.65	250	308	95/104	—	66	4.0
4		195.71	1.50	1.65	248	305	96/104	—	67	5.0
5		197.54	1.40	1.54	248	308	96/104	—	67	5.0
6		199.34	1.20	1.32	245	307	96/104	—	68	5.0
END	1436	200.988	—	—	—	—	—	—	—	—
B1	1438	200.988	1.40	1.54	251	308	96/99	—	68	4.0
2		202.77	1.40	1.54	250	309	97/105	—	66	4.0
3		204.52	1.50	1.65	239	310	97/103	—	57	4.0
4		206.37	1.50	1.65	239	310	97/102	—	57	5.0
5		208.18	1.60	1.75	240	310	96/102	—	57	5.0
6		210.03	1.30	1.41	240	310	96/100	—	58	5.0
END	1457	211.657	—	—	—	—	—	—	—	—

ORSAT DATA AND CALCULATION SHEET

Source Palk Unit #7 Location Palk Power Station

Run No.	Date	Gas	Orsat Analysis, Dry Basis (% Volume)				Remarks
			1	2	3	Avg.	
1	4/23/02	CO ₂	8	8	8	8	$F_0 = 1.11$
		O ₂	12	12	12	12	
		CO	0	0	0		
		N ₂	80	80	80	80	
2	4/23/02	CO ₂	8	8	8	8	$F_0 = 1.11$
		O ₂	12	12	12	12	
		CO	0	0	0	0	
		N ₂	80	80	80	80	
3	4/23/02	CO ₂	8	8	8	8	$F_0 = 1.11$
		O ₂	12	12	12	12	
		CO	0	0	0	0	
		N ₂	80	80	80	80	

APPENDIX G

SAMPLING EQUIPMENT CALIBRATIONS

Box # 7

500 Technology Court
Smyrna, GA 30082-5211

(770) 319-9999
(800) 241-6898
Fax: (770) 319-0336
www.thermoandersen.com

CONTROL UNIT CALIBRATION

(English units)

PROCEDURE: 40 CFR 60, APP A, METH 5, SEC 5.3 & 7

Date 4/11/02

Metering System
Identification: 90660

DGM Number: 28639

Barometric pressure, $P_b =$ 29.58 in. Hg

Model Number MST


Orifice manometer setting ΔH in. H ₂ O	Spirometer (wet meter) gas volume V_w ft ³	Dry gas meter volume V_m ft ³	Temperatures				Time \ominus min
			Spirometer (wet meter) t_w °F	Dry Gas Meter			
				Inlet t_i °F	Outlet t_o °F	Average t_m °F	
1.0	5.0	5.090	72.6	88	78	83.0	8.87
2.0	5.0	5.079	72.8	91	78	84.5	6.38
4.0	5.0	5.092	73.0	96	79	87.5	4.52

Calculations

ΔH in. H ₂ O	Y	$\Delta H@$
	$\frac{V_w P_b (t_m + 460)}{V_m \left[P_b + \frac{\Delta H}{13.6} \right] (t_w + 460)}$	$\frac{0.0319 \Delta H}{P_b (t_o + 460)} \left[\frac{(t_w + 460) \ominus}{V_w} \right]^2$
1.0	0.999	1.787
2.0	1.001	1.853
4.0	0.999	1.859
Average	1.000	1.833
As Found	NEW	NEW

Y = Ratio of reading of wet test meter to dry test meter; tolerance for individual values ± 0.02 from average.

$\Delta H@$ = Orifice pressure differential that equates to 0.75 cfm of air @ 68 °F and 29.92 inches of mercury, in. H₂O; tolerance for individual values ± 0.20 from average.

Calibrated by: 

NIST TRACEABLE (ID # C-0701)

EPA Method 5
 Meter Box Calibration
 Post-Test Orifice Method
 English Meter Box Units, English K' Factor

Revised: 7/25/95 Version: 2.2

Model #: Thermo Environmental MST
 Serial #: Box 7 DGM 28639

Date: -----> 05/20/2002
 Barometric Pressure: -----> 29.98 (in. Hg)
 Theoretical Critical Vacuum:----> 14.14 (in. Hg)

!!!!!!!
 IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
 IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).
 !!!!!!!!

----- DRY GAS METER READINGS -----

----- CRITICAL ORIFICE READINGS -----

dH (in H2O)	Time (min)	Volume		Volume Total (cu ft)	Initial Temps.		Final Temps.		Orifice K' Orifice		Actual -- Ambient Temperature --			
		Initial (cu ft)	Final (cu ft)		Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
1.15	10.00	117.420	123.580	6.160	79.0	79.0	80.0	80.0	55	0.466	17.0	74.0	74.0	74.0
1.15	10.00	123.580	129.740	6.160	80.0	80.0	81.0	81.0	55	0.466	17.0	74.0	74.0	74.0
1.15	10.00	129.740	135.900	6.160	80.0	80.0	81.0	81.0	55	0.466	17.0	74.0	74.0	74.0

----- RESULTS -----

--- DRY GAS METER ---

----- ORIFICE -----

-- DRY GAS METER --

----- ORIFICE -----

VOLUME CORRECTED	VOLUME CORRECTED
Vm(std) (cu ft)	Vm(std) (liters)
6.055	171.5
6.044	171.2
6.044	171.2

VOLUME CORRECTED	VOLUME CORRECTED	VOLUME NOMINAL
Vcr(std) (cu ft)	Vcr(std) (liters)	Vcr (cu ft)
6.046	171.2	6.105
6.046	171.2	6.105
6.046	171.2	6.105

CALIBRATION FACTOR Y	
Value (number)	Variation (number)
0.998	-0.001
1.000	0.001
1.000	0.001

CALIBRATION FACTOR dH@		
Value (in H2O)	Value (mm H2O)	Variation (in H2O)
1.736	44.08	0.002
1.732	44.00	-0.001
1.732	44.00	-0.001

Average Y ----->

1.000

1.733 44.03 <----- Average dH@

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H2O that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

SIGNED: *[Signature]* *[Signature]*

Date: 5/20/02

NOZZLE CALIBRATION DATA FORM

NOZZLE SET NO. 1

DATE: 04/03/02 CALIBRATOR: M P Skirvin

NOZZLE I. D.	NOZZLE DIAMETER (IN.)			D. diff.	D. avg.
	D1	D2	D3		
#1	0.113	0.113	0.114	0.001	0.113
#4	0.123	0.124	0.123	0.001	0.123
#5	0.149	0.151	0.15	0.002	0.150
#6	0.197	0.198	0.197	0.001	0.197
#9	0.276	0.276	0.276	0.000	0.276
#10	0.297	0.295	0.295	0.002	0.296
#12	0.389	0.388	0.388	0.001	0.388
#15	0.166	0.166	0.165	0.001	0.166
#16	0.197	0.198	0.198	0.001	0.198
#19	0.280	0.281	0.280	0.001	0.280
#22	0.368	0.368	0.369	0.001	0.368
#30	0.312	0.313	0.312	0.001	0.312
#36	0.187	0.188	0.188	0.001	0.188
#37	0.213	0.213	0.213	0.000	0.213
#38	0.252	0.252	0.252	0.000	0.252
#46	0.191	0.191	0.192	0.001	0.191
#47	0.203	0.203	0.204	0.001	0.203
#48	0.253	0.252	0.252	0.001	0.252
#50	0.311	0.312	0.313	0.002	0.312
#58	0.244	0.243	0.245	0.002	0.244
#68	0.248	0.247	0.248	0.001	0.248

where:

D 1,2,3 = three different nozzle diameters (in); each diameter must be measured to the nearest 0.001 in.

D. diff. = maximum difference between any two diameters. (in.) must be .004 in. or less.

D. avg. = average of D1, D2, and D3.

REVIEWED BY: *RM*
 DATE: 4/5/02

FINAL NOZZLE CALIBRATION DATA FORM

NOZZLE SET NO. 1

DATE: 05/14/2002

CALIBRATED BY: R. A. Barthelette Jr.

NOZZLE IDENTIFICATION	NOZZLE DIAMETER			1/2 D (IN.)	D AVG
	D1 (IN.)	D2 (IN.)	D3 (IN.)		
16	0.197	0.198	0.197	0.001	0.197

where:

D1,2,3= three different nozzle diameters, (in); each diameter must be measured to the nearest 0.001 in.

1/2 D= maximum difference between any two diameters, (in.) 1/2 D \leq 0.004 in.

D AVG= average of D1, D2 and D3.

Reviewed By: R.A.B.
 Date: 5/21/2002



PITOT TUBE CALIBRATION
DATA SHEET

Pitot Tube ID # 112
Calibration Date: 04/03/2002
Openings Damaged? Y N

Operating Quarter: Qtr2
Repaired? Y N N/A

Alpha and Beta Angle Determinations

$\alpha 1$ 0.7 degrees *Pass*
 $\alpha 2$ 0.1 degrees *Pass*
 $\beta 1$ 0.9 degrees *Pass*
 $\beta 2$ 0.1 degrees *Pass*

Gamma, Theta, A, Z, and W Determinations

ψ 0.3 degrees
 Λ 2.5 cm
 Z 0.013 cm *Pass*

 θ 0.5 degrees
 W 0.0218 cm *Pass*

Acceptable Limits:
Dt 0.48 < Dt > 0.95 cm
$\alpha < 10$ degrees ($\alpha 1$ measured across top impact openings) ($\alpha 2$ measured across bottom impact openings)
$\beta 1 < 5$ degrees (alongside top impact openings)
$\beta 2 < 5$ degrees (alongside bottom impact openings)
Z < 0.32 cm (Asin ψ)
W < 0.08 cm (Asino)
A distance between tips
θ angle of plane on side of pitots
ψ angle between tips

NOTES

All measurements are taken in accordance with the requirements of 40 CFR 60 Appendix A - Test Methods, Method 2, "Determination of stack gas velocity and volumetric flow rate (Type S pitot tube)". Measurement details are found in EPA/600/4-77/027b, "Quality Assurance Handbook for Air Pollution Measurement Systems: Stationary Source Specific Methods", sub-section 3.1.1. Procurement of Apparatus and Supplies.

Comments: REMOVABLE

Calibrated by: JAV
Printed Name: JORGE A VARINO Date: 04/03/2002

Quality Assurance Review / Approval: [Signature]
Date: 4/2/2002

BAROMETER CALIBRATION DATA FORM

DATE: 04/02/02 CALIBRATOR: J.A. Varino

INST. NO: 224

COMMENTS:

TIME OF READING	BAROMETER READING (HG")	REFERENCE STANDARD READING (HG")	DIFFERENCE (HG")
9:45	30.15	30.03	0.12
10:45	30	30.03	-0.03
11:45	30.03	30.03	0
12:45	30.03	30.03	0

*NOTE: BAROMETRIC READINGS MUST AGREE WITHIN 0.1 INCHES HG OF READINGS OBTAINED FROM THE REFERENCE STANDARD, THE NATIONAL WEATHER SERVICE, RUSKIN FL. TO BE DEEMED ACCEPTABLE.

REVIEWED BY: *[Signature]*
DATE: 4/3/2002

PYROMETER CALIBRATION

PYROMETER NO.: 15

REFERENCE THERMOMETER: HART SCIENTIFIC

CTL SERIAL NO.: 15

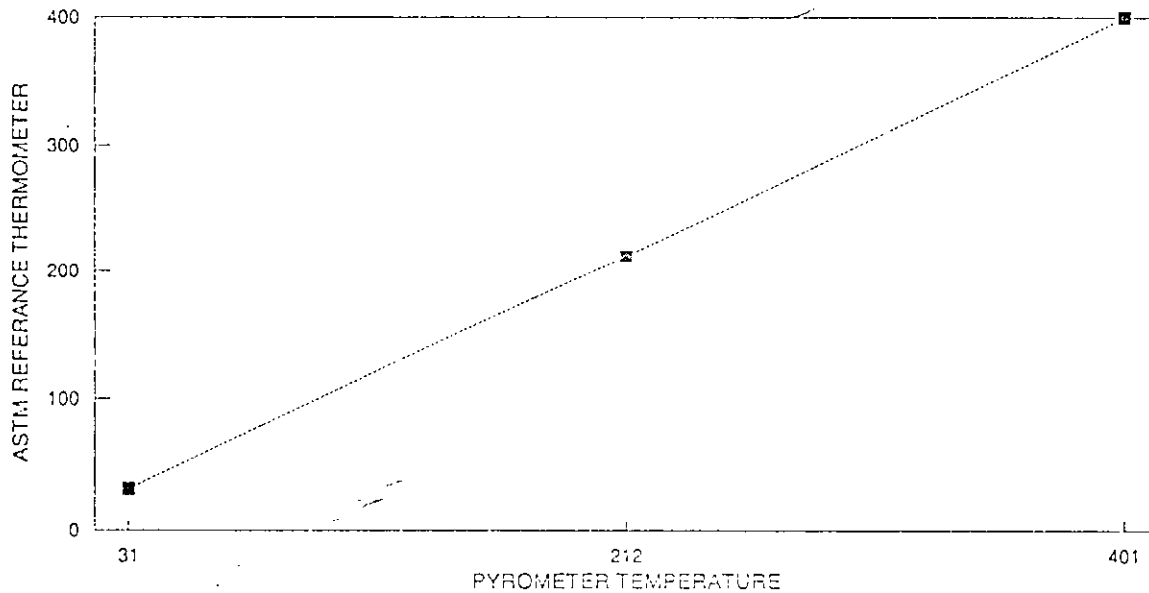
SERIAL NO.: CA101

DATE: 05/13/02

CALIBRATOR: crd

REFERENCE TEMP. (F)	PYROMETER INDICATION
32	31
212	212
400	401

PYROMETER TEMPERATURE CALIBRATION



REVIEWED BY: *[Signature]*

DATE: 5/13/2002

APPENDIX H

CHAIN OF CUSTODY



ANALYSIS REQUEST & CHAIN OF CUSTODY

ENVIRONMENTAL SERVICES

5012 CAUSEWAY BLVD., TAMPA, FL, 33619 PHONE: (813)228-4111

PROJECT REFERENCE		PROJECT NO.	PROJECT LOCATION (STATE)	REQUIRED ANALYSIS				DUE DATE <div style="border: 1px solid black; padding: 5px; display: inline-block;">26 APR 02</div>	
SAMPLER'S PRINTED NAME <i>Juan Ramirez</i>		SAMPLER'S SIGNATURE <i>Juan Ramirez</i>							
P.O. NUMBER		CONTRACT NO.	SITE	503				<input type="checkbox"/> EMAIL RESULTS <input type="checkbox"/> FAX RESULTS <input type="checkbox"/> MAIL RESULTS	
CLIENT NAME		CLIENT PHONE	CLIENT FAX						
CLIENT EMAIL		CLIENT ADDRESS		PRESERVATIVE				NUMBER OF COOLERS SUBMITTED PER SHIPMENT:	

SAMPLE ID	SAMPLE DESCRIPTION	SAMPLING		* MATRIX	NUMBER OF CONTAINERS SUBMITTED				REMARKS	
		DATE	TIME							
R _n #1		23 APR 02	1700	IPA	1					AA65187 gals
R _n #2		23 APR 02	1700	IPA	1					
R _n #3		23 APR 02	1700	IPA	1					
Blank		23 APR 02	1700	IPA	1					

* GW - GROUND WATER, SW - SURFACE WATER, DW - DRINKING WATER, WW - WASTE WATER, C - COAL, O - OIL, SO - SOLID/SOIL, SL - SLUDGE, W - WASTE SAMPLE, A - AIR

CONTAINERS/SEALS INTACT <input type="checkbox"/> Yes <input type="checkbox"/> No	ON ICE/ 4°C <input type="checkbox"/> Yes <input type="checkbox"/> No
---	---

SAMPLE TRANSFERS

RELINQUISHED BY:	RECEIVED BY:	DATE:	TIME:
PERSON'S NAME: <i>Juan Ramirez</i> FACILITY NAME: <i>Air Group</i>	PERSON'S NAME: <i>Haul A. Harrison</i> FACILITY NAME:	4-24-02	9:20
PERSON'S NAME:	PERSON'S NAME:		
FACILITY NAME:	FACILITY NAME:		
PERSON'S NAME:	PERSON'S NAME:		
FACILITY NAME:	FACILITY NAME:		
PERSON'S NAME:	PERSON'S NAME:		
FACILITY NAME:	FACILITY NAME:		
SHIPPING VENDOR:	BILL OF LADING NO:		
LOGGED IN BY:	DATE:		



COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • TEL: 630-953-9300 FAX: 630-953-9308

SINCE 1908

PLEASE ADDRESS ALL CORRESPONDENCE TO:
1212 N. 39TH STREET, SUITE 323
TAMPA, FL 33605
TEL: (813) 248-6566
FAX: (813) 247-2562

****CYLINDER RENTAL FEE WAIVED IF CYLINDERS RETURNED
WITHIN 3-5 DAYS!**

RECEIPT FOR SAMPLE CYLINDERS / SAMPLE BAGS

TO: TAMPA ELECTRIC COMPANY

DATE: APRIL 22, 2002

I acknowledge receipt of the following sample cylinders and/or sample bags. I assume responsibility of the return of these cylinders/bags. I also understand that a fee of \$10.00 will be charged to my account for rental use of each cylinders/bags. Replacement of lost or damaged cylinders/bags will be at the expense of the company listed above.

Cylinder/Bag Identification:	<u>CTE #13 - 300cc Cylinder</u>
	<u>CTE #26 - 300cc Cylinder</u>
	<u>CTE #33 - 300cc Cylinder</u>
	<u> </u>
	<u> </u>
	<u> </u>
	<u> </u>

Received by: 

Date Received: 4/22/02

Approved By:

***PLEASE SIGN AND FAX TO US UPON RECEIPT OF CYLINDER(S) AND/OR BAG(S). 813/247-2562**

Note: When marking samples, please do not write or apply labels on cylinders. Please use sample Tags provided Thank you!

Replacement cost of \$150.00 will apply for any cylinder that is not returned.



Member of the SGS Group (Société Générale de Surveillance)

APPENDIX I

TEST PARTICIPANTS

TEST PARTICIPANTS

Environmental Services

Juan Ramirez	Environmental Technician
Mike Skirvin	Environmental Technician
Jorge Varino	Associate Technician
Chuck Dufeny	Environmental Technician

Polk Power Station

Michael Perkins	Environmental Coordinator
-----------------	---------------------------

-014-



TAMPA ELECTRIC

RECEIVED

APR 24 2002

April 11, 2002

BUREAU OF AIR REGULATION

Mr. Bill Proses
Florida Department of
Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619

Certified Mail No. 7000 0520 0016 5452 7002
Return Receipt Requested

**Re: Tampa Electric Company (TEC)
Polk Power Station Unit 3
Part 60 Actual Initial Startup Notification
FDEP File No. PSD-FL-263**

Dear Messrs. Haynes and Proses:

As required by 40 CFR 60.7(a)(3) and Condition 3 of permit PSD-FL-263, the designated representative for an affected unit shall submit written notification for the actual date of initial startup within 15 days after such date. *TEC hereby gives notice of an actual initial startup date of April 6, 2002.*

If you have any questions or comments, please contact me at (813) 641-5261.

Sincerely,

Raiza Calderon
Engineer
Environmental Affairs

EA/bmr/RC119

- c: Mr. J. Kissel – FDEP SW
- Mr. A. Linero – FDEP
- Mr. H. Oven – FDEP
- Mr. S. Sheplak – FDEP

Sheplak, Scott

From: Proses, Bill
Sent: Tuesday, April 23, 2002 8:01 AM
To: Sheplak, Scott
Subject: RE: TECO-Polk Power Station biomass test burn report

No problems per Bill Schroeder.
JSB

Once I find a copy of the report we will review it. Bill Schroeder is out on sick leave and I think it may be in his office some where.

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

From: Sheplak, Scott
Sent: Friday, April 19, 2002 1:01 PM
To: Proses, Bill
Cc: Kissel, Gerald
Subject: TECO-Polk Power Station biomass test burn report

We received the original TECO-Polk Power Station biomass test burn report dated April 16. Will your office (compliance) review the report?

Sheplak, Scott

copy El Surc

From: Halpin, Mike
Sent: Monday, April 22, 2002 8:37 AM
To: Sheplak, Scott
Cc: Linero, Alvaro
Subject: RE: Green Energy

Considerations for Title V permit

SAH
7/17

Scott -

If you would like me to look at it, I will. Otherwise, I have no special interest, and even a preference to be uninvolved. Based upon only what I have heard, TECO has indicated that the biomass combustion does not trigger a PSD Review. In this regard, my cautions/suggestions would be:

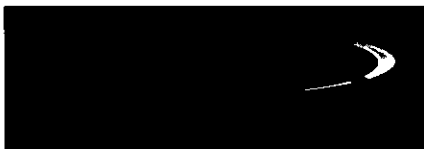
- 1) Clearly define the biomass (e.g. switch grass) rather than using "biomass" in the general context. This should be defined as only that fuel that has been successfully tested, and only at the tested combustion rates (or less).
- 2) Ensure that the maximum permitted percentage of biomass is one for which TECO has presented solid evidence/data supporting their claim that a PSD review is not triggered. Closely scrutinize related assumptions for validity.
- 3) Address the waste/slag issue. I believe that we previously authorized TECO to use the gasifier slag as combustion material in another one of their facilities based upon the assumption that it was still basically coal. If my understanding is correct, then it is unlikely that we can continue to make that statement, with biomass slag now mixed in. If TECO wishes to continue to utilize the slag as combustion fuel at another facility, we must require that the facility which will be ultimately combusting the slag has permits which also allow combustion of that specific biomass.
- 4) Limit the hourly throughput of biomass to the percentage identified in item 2) above. The concern here is related to the maximum hourly emissions and related modeling. When facilities obtain PSD permits they are required to model emissions representing worst case for each hour. Since the combustion of biomass is likely to make some pollutants increase, lacking an hourly limit on biomass throughput essentially permits the biomass combustion to be at 100% for a single hour. For example, if the biomass throughput limit were set at 5% on a 24-hour basis, the facility may wish to combust biomass at 100% for 1 hour and 0% for the remaining 23 hours, "averaging" about 4% over the 24-hour period; the aforementioned hypothetical limit would seem to allow this. However, technically the facility is now required to re-model each hour at 100% biomass as well as at 100% coal in order to adequately assess the ambient air impacts. Accordingly, the permit should also specifically require continuous feeding rather than batch feeding.
- 5) Ask for a future engineering report detailing the qualitative and quantitative impacts of slag/buildup within the HRSG, including removal/disposal methods.
- 6) Consider how the facility must demonstrate annual compliance in the future. Do you want them to demonstrate at 0% biomass combustion, maximum biomass combustion, or both. As previously indicated, since it is likely that some pollutants will increase, whereas others will decrease, my inclination would be to require an annual demonstration of both, but only in the event that biomass combustion has exceeded a prescribed annual value (such as 400 hours) for the prior year.
- 7) Ask the District folks about storage, waste and fuel runoff issues.
- 8) Keep Buck tied in (it's a PPS project).

Mike

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

From: Sheplak, Scott
Sent: Friday, April 19, 2002 1:11 PM
To: Halpin, Mike
Cc: Linero, Alvaro
Subject: Green Energy

We received the original TECO-Polk Power Station biomass test burn report. Let me know if you want to look at it. I plan to review it along w/ SWD.



TAMPA ELECTRIC

RECEIVED

APR 17 2002

BUREAU OF AIR REGULATION

April 16, 2002

Mr. Scott Sheplak, P.E.
Administrator- Title V Section
Florida Department of Environmental Protection
111 South Magnolia Drive, Suite 4
Tallahassee, FL 32301

Via FedEx
Airbill No. 7903 8425 0086

**Re: Tampa Electric Company
Polk Power Station Unit 1
Biomass Test Burn Report
Facility ID No. 1050233-009-AV**

Dear Mr. Sheplak:

Please find enclosed the biomass test burn report for the gasification of 99% petcoke/coal with a 1% biomass blend test burn at the Polk Power Station (PPS). As evidenced by the report, combusting syngas produced from the gasification of a fuel blend of 99% petcoke/coal with a 1% biomass does not result in a significant increase in any regulated pollutant as defined in Table 212.400-2 F.A.C.

This correspondence is intended to provide a response to each specific condition issued by the Florida Department of Environmental Protection (Department) in the Test Burn Authorization Conditions. For your convenience, Tampa Electric Company (TEC) has restated each point and provided a response below each specific issue.

FDEP Condition 1

The permittee shall notify the DEP Southwest District, and the Bureau of Air Regulation upon receipt of any biomass, 1 day prior to gasifying biomass and 7 days prior to commencement of any stack performance testing. Because of the end of the year tax credit, the permittee may give 1 day testing notification. A written final report shall be submitted to these offices within 45 days of completion of the last day that biomass is gasified.

TEC Response

This Condition has been satisfied per TEC's letter to the Department and DEP Southwest District dated December 28, 2001.

FDEP Condition 2

While gasifying biomass, it shall be continuously fed so as to maintain a homogenous stream of syngas for combustion. The maximum biomass content shall not exceed 5 percent by weight of fuels gasified, as measured during each calendar day. A log shall be maintained at the facility demonstrating compliance with this condition, documenting the unique type of biomass being gasified (eucalyptus, cottonwood or switch grass) along with the unique blend of coal or petcoke. This log shall be available for inspection and submitted with the final test report. Performance testing (mass balance, syngas testing and stack testing) shall be conducted for each unique blend of biomass gasified with each unique blend of coal or petcoke.

TAMPA ELECTRIC COMPANY
P. O. BOX 111 TAMPA, FL 33601-0111

(813) 228-4111

AN EQUAL OPPORTUNITY COMPANY
HTTP://WWW.TAMPAELECTRIC.COM

CUSTOMER SERVICE:
HILLSBOROUGH COUNTY (813) 223-0800
OUTSIDE HILLSBOROUGH COUNTY 1 (888) 223-0800

TEC Response

This Condition has been satisfied; the log is provided in the Attachment A-Test Burn Report, Appendix A.

FDEP Condition 3

Emissions due to biomass gasification shall not exceed any current limits in existing permits for all impacted emission units.

TEC Response

There was no exceedance of emissions of any current limits in existing permits.

FDEP Condition 4

Representative samples of "as-burned" coal, petcoke and biomass shall be taken and analyzed for each unique blend of biomass gasified with each unique blend of coal or petcoke. All sample results shall be submitted with the final report.

TEC Response

The analysis is provided in the Attachment A-Test Burn Report, Table 5.

FDEP Condition 5

As-burned (syngas) fuel samples shall be collected and analyzed as "refinery gas" (as has been done with past compliance tests) upon initial gasification of each unique blend of biomass gasified with each unique blend of coal or petcoke. Data collected by the inline mass spectrometer and gas chromatograph is sufficient for the purpose of satisfying this requirement. Additionally, metals contents (fluorides, chromium, arsenic, cadmium, mercury, lead, and beryllium) and phosphorous compounds shall be measured for each unique blend of biomass gasified with each unique blend of coal or petcoke. Sample results shall be provided to the DEP Southwest District and the Bureau of Air Regulation with the final written report.

TEC Response

The data collected by the inline mass spectrometer is enclosed in Attachment A- Test Burn Report Table 3 and Table 4. TEC was unable to complete the metal analysis on the syngas because the inline mass spectrometer does not have the capability to perform this analysis. However, a metal analysis was done on the feedstock and this information is provided in Attachment A-Test Burn Report, Table 5.

FDEP Condition 6

To provide reasonable assurance that the ash generated from any fuel blend can be disposed of in a method to be proposed by TEC, as well as to ensure compliance with the solid and hazardous waste regulations, representative samples of the gasifier slag generated as the result of gasifying coal and petcoke with biomass shall be segregated, sampled and analyzed in accordance with the requirements set forth in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA Publication SW-846, Third Edition."

TEC Response

The analysis is provided in Attachment A-Test Burn Report, Appendix B.

FDEP Condition 7

A material balance of all measured syngas constituents shall be performed for each unique blend of biomass and coal or petcoke based on all test/analytical data. A material balance for syngas test constituents including C, H, N, O, S and ash, and will satisfy this requirement. Such material balances shall be provided with the final test report.

TEC Response

The material balance for syngas test constituents including C, H, N, O, S and ash is provided in the Attachment A-Test Burn Report in Sections 3.2 and 3.3.

FDEP Condition 8

Stack gas emissions shall be conducted for each unique blend of biomass gasified with each unique blend of coal or petcoke and results reported for all measured syngas constituents as well as all currently regulated pollutants. CEMS data is sufficient to satisfy this request.

TEC Response

The emissions data is provided in Attachment A- Test Burn Report Appendix C.

FDEP Condition 9

Performance tests shall be conducted using EPA Reference Methods, as contained in 40 CFR 60 (Standards of Performance for New Stationary Sources), 40 CFR 61 (National Emission Standards for Hazardous Air Pollutants), and 40 CFR 266, Appendix IX (Multi-metals), unless otherwise approved by the Department, in writing, in accordance with Chapter 62-297, F.A.C. All performance testing shall be submitted with the final report.

TEC Response

This Condition has been satisfied through the use of CEMS, TEC's primary method of compliance.

FDEP Condition 10

Upon completion of the test burn period and upon the first unit shutdown, representative HRSG deposits shall be obtained. The Department's Southwest District, and the Bureau of Air Regulation shall be notified immediately upon such shutdown, as to the expected duration. TEC shall provide photographic evidence of the magnitude and location of such deposits upon conclusion of the unit shutdown. HRSG deposits shall be analyzed in a scanning electron microscope (SEM) using energy dispersive X-ray spectroscopy (EDS) to identify the elements present. The Southwest District and the Bureau of Air Regulation shall be provided with a copy of any and all sample analyses or results obtained for HRSG deposits upon receipt of any analyses or results, regardless of the purpose of such sample collection, analyses or results.

TEC Response

This Condition will be completed when Polk Unit 1 is shutdown for its planned outage. The Department's Southwest District and the Bureau of Air Regulation will be notified immediately upon such a shutdown, and as to the expected duration of the outage.

FDEP Condition 11

This test-burn shall not result in the release of objectionable odors pursuant to Rule 62-296.320(2). F.A.C.

TEC Response

No release of any objectionable odors occurred during the test burn.

Mr. Sheplak
April 16, 2002
Page 4 of 4

FDEP Condition 12

Performance testing shall cease as soon as possible if the test results in any emissions, which are not in accordance with the conditions in existing permits, or this authorization protocol. Performance testing shall not resume until appropriate measures to correct the problem(s) have been implemented. The Southwest District shall be notified immediately upon such cessation and resumption.

TEC Response

There was no exceedance of emissions of any current limits in existing permits.

FDEP Condition 13

This Department action is only to authorize the biomass blend performance testing of biomass consisting of eucalyptus, cottonwood and switch grass.

TEC Response

The test burn was conducted using eucalyptus. However, TEC requests that biomass be defined as any non-treated biomass product for example: e-grass, specially grown bahia grass.

FDEP Condition 14

The Department's Southwest District, and the Bureau of Air Regulation shall be notified within 5 days, in writing, upon completion of the biomass test burn.

TEC Response

This Condition has been satisfied per TEC's letter to the Department and DEP Southwest District dated February 11, 2002.

FDEP Condition 15

All testing series shall include emissions testing for emissions units operating at permitted capacity. Permitted capacity is defined as 90-100 percent of the capacity allowed by existing permits.

TEC Response

This Condition has been satisfied.

TEC thanks the Department for its cooperation in allowing TEC to perform the test burn. If you have any questions please call Dru Latchman or me at (813) 641-5034.

Sincerely,



Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL116

Enclosure

c/enc: Mr. Jerry Kissel - FDEP
Mr. Clair Fancy, FDEP

Tampa Electric Company



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APR 17 2002

BUREAU OF AIR REGULATION

Biomass Test Burn Report

Polk Power Station Unit 1

April 2002

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1.0 Introduction

Tampa Electric Company (TEC) conducted a test burn on December 31, 2001 at the Polk Power Station (PPS) Unit 1. The purpose of this test burn was to investigate the effects of gasifying a small portion of biomass as a constituent of the feedstock that is processed to form the synthetic gas (syngas) fired in the combustion turbine (CT). TEC performed this test under the authority of the temporary permit issued by the Florida Department of Environmental Protection (the Department) dated December 21, 2001. The data from this test indicate there is no increase in monitored air emissions (NO_x and SO_2) from PPS Unit 1 as a result of the addition of a small amount of biomass as a constituent of the feedstock for PPS Unit 1. This report constitutes the required Test Burn Report for the biomass test burn. The background for this test including materials and methods used for the test are presented within. Also, the results of the test are presented and discussed.

2.0 Background

PPS Unit 1 uses an Integrated Gasification Combined Cycle Process (IGCC) to convert solid fuels into a syngas that can be fired in a CT. The IGCC process is capable of handling a variety of fuels as feedstock to the gasification process. Currently, PPS Unit 1 is typically fired on a blend of 55% petcoke and 45% coal. Thus, a similar blend was used during the test burn with biomass fuel added to allow for direct comparisons. This biomass test burn fired a fuel blend that consisted of approximately 55% petcoke, 44% coal, and 1% biomass.

The test conducted on December 31, 2001 was conducted:

- To determine if any technical impediments exist to co-firing biomass as a small portion of the feedstock to the gasifier, and
- To characterize the emissions resulting from co-firing biomass.

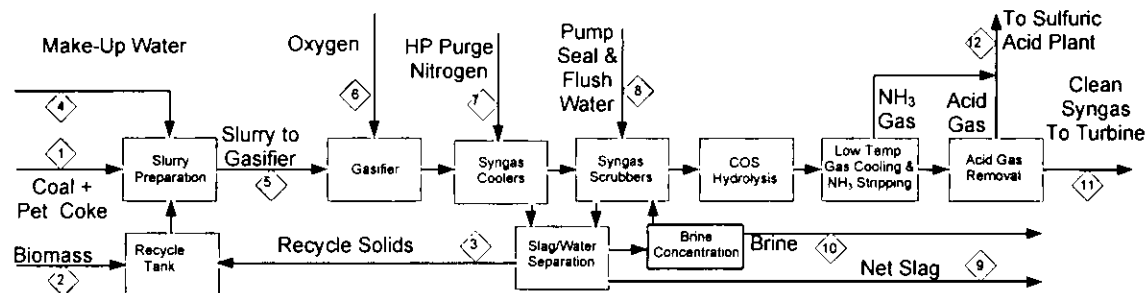
The IGCC process consists of several steps that ultimately result in the production of electrical power (Figure 1). Solid fuel is homogenized and mixed with water to produce slurry. The slurry is then passed to the gasifier that produces a high-pressure combustible gas (synthetic gas or "syngas"). After cooling the syngas, residual material from the gasification process is separated, the slag is rejected and the water and combustible fines are recycled back into the gasifier. Cooled syngas is passed through scrubbers that remove any remaining particulate matter. The syngas then is subjected to a series of steps that remove sulfur and convert the removed sulfur to H_2SO_4 . This clean syngas is then fired in a CT that turns an electrical generator. Hot exhaust gasses from the CT are used to create steam that powers a steam turbine that also produces electrical power. This system is an efficient means to produce electrical power on a commercial scale.

2.1 Biomass Fuel Handling

This test used 8.8 tons of coarsely ground eucalyptus as the biomass fuel. Approximately 60 eucalyptus trees were harvested from the Common Purpose, Inc. grove located on land provided by the Tampa Airport Authority. The felled trees were sectioned into 4 foot lengths and passed through a portable hammer mill and trommel screen up to 5 times to produce material fine enough to avoid fouling the pumps and screens of PPS Unit 1's slurry feed system. The biomass fuel was transported to PPS in an enclosed trailer.

Biomass fuel was stored, handled, at processed at PPS. Biomass fuel was staged in a cleaned bin. Approximately 800 pounds of biomass fuel were loaded with a small loader into each of 22 tote sacks. The tote sacks were suspended individually over the recycled fines tank (Figure 1). The biomass fuel was introduced into the process via a stirred recycle tank and mixed with water over a period of 8 ½ hours. The mixed biomass fuel was blended with the normal coal and petcoke mixture to form slurry that was fed to the gasifier.

Figure 1. Block flow diagram of PPS Unit 1 gasifier section showing process stream designations.



2.2 Process Data Collection

Data were collected for key variables throughout IGCC process to allow for analysis of air quality impacts of this test burn. Feedstock analyses were conducted on both the standard petcoke/coal blend and the biomass fuel. Feedstock analyses include elemental, metals, and ash mineral compositions and heating value for each fuel type. Process streams were analyzed for elemental and ash composition, mass flow, and heat content at 12 points in the IGCC process corresponding to the 12 numerical labels shown in Figure 1. An overall mass balance for the gasifier was calculated during the test burn for each of the 12 process points indicated in Figure 1. Stack emissions data were collected for NO_x and SO_2 by the Continuous Emissions Monitoring System (CEMS) and reported at one-hour intervals throughout the test burn. Emissions data were reported in parts per million (ppm) for each pollutant.

2.3 Emissions data comparisons

Emissions data obtained during the test burn were compared to representative emissions data from December 29, 2001. The baseline data from December 29, 2001 were chosen as representative since those data are from the same petcoke/coal feedstock, were obtained immediately prior to the test burn, and Unit 1 was functioning normally and operating under similar conditions as those during the test burn. Larger baseline data sets were examined for possible comparison, but it was found that variability in process parameters such as heat input made statistical comparisons problematic for data that were obtained more than a few days prior to the test burn. For example, for the time period of December 26, 2001 to December 30, 2001 the sample variance for heat input in MMBtu was 12.4 times higher than the sample variance for the period December 29, 2001 to December 30, 2001 ($\sigma^2_{5\text{-day}} = 1639$ compared to $\sigma^2_{1\text{-day}} = 133$). Sample variance increased with time for heat input, power output, and for NO_x and SO_2 emissions levels.

2.4 Statistical Methods for Comparing Emissions Data

Emissions data from the test burn were analyzed and compared to the baseline data using a variety of statistical measures. Emissions data from both the test burn and the baseline periods were evaluated using the same statistical measures. Data from the CEMS were reported as the variables Heat Input (MMBtu), Power Output (MW), SO_2 (lb/MMBtu), SO_2 (ppm), NO_x (lb/MMBtu), NO_x (ppm). The statistics mean (μ), variance (σ^2), kurtosis, skewness, range, and 95% confidence interval were calculated for each variable. The mean and variance were used to compare the test burn emissions data to the baseline emissions data. Kurtosis, skewness, range, and 95% confidence interval were used to evaluate the quality of the emissions data and to make decisions about which comparative methods were appropriate to use in comparing test burn and baseline data. To compare test burn data to baseline data, each set of variables was examined using a two-sample F-test to make inferences about population variances and a two-sample t-test assuming unequal variances to make inferences about population means.

The comparative statistical methods used in this report require that certain assumptions be met before the results of these methods can be considered valid. Comparisons between the means of the test burn data and the baseline data are most useful in determining if there is a change in a process after a treatment is applied.

The statistic that is used to make comparisons between sample means is called a two-sample t-test. A t-test can be used to determine if two populations' means are equal at a given significance level. The significance level for this report is 95% ($\alpha = 0.05$) in all cases. A t-test compares the ratio of the sample means and variances to expected frequency distribution of a normal population at a specified error rate. The two-sample t-test is used to evaluate the hypothesis that two populations' means are equal against the alternative hypothesis that the two populations' means are unequal. The hypothesis of equal means is rejected when the calculated t-statistic is greater than the t-critical value at a given significance level. The validity of the t-test is based on several assumptions.

First, the two samples are independent. In practical terms, the assumption of independence means that the two samples are drawn from two different populations and that the elements of one sample are unrelated to those of the second sample. This assumption is met since the data for the test burn and the baseline emissions were taken by a discrete sampling device at different times with all variables controlled except for biomass used as a feedstock in the test burn.

Second, the two samples are drawn from a normally distributed population. Though the assumption of a normal population distribution is less critical than the assumption of independent samples it is still important to verify that the assumption is met. Since each data point collected by the CEMS is actually a discrete point sample of a continuously variable exhaust stream the potential sample population is quite large. For modest-sized samples (combined sample size ≥ 30) drawn from a large population the distribution approaches normal even with modest skewness in the two populations. The tendency of a relative frequency histogram to approach normal when samples are repeatedly drawn from a large population is called the Central Limit Theorem. Since the combined sample size of the test burn and baseline data is 28, it is prudent to verify that the Central Limit Theorem applies by calculating the skewness and kurtosis for each variable in each data set. Skewness is a measure of the central tendency of a frequency distribution that relates to the symmetry of the peak in relation to the mean, mode, and median of the distribution. Normal distributions have a skewness of 0. Kurtosis is a measure of the size of the tails of a frequency distribution. Normal distributions have a kurtosis of 0. If the sample's frequency distribution does not approximate normality, then the non-parametric Wilcoxon rank sum statistic can be used to compare population means. The Wilcoxon rank sum test is not as likely to declare a difference in population means when it exists as is a t-test since the Wilcoxon rank sum is based on relative magnitudes rather than the magnitudes of the observations.

Third, variances are assumed to be equal. Since the t-test pools sample variances when computing the test statistic, unequal variances can have an effect on the nominal significance and confidence probabilities of the statistical test, especially when sample sizes are different. However, a computationally more difficult version of the t-test that allows for the use of separate variances for each sample can be used when variances are not equal.

A statistical test for comparing two population variances is the F-test. The F-test is used to check the validity of the equal variance assumption for a two-sample t-test. The F-test compares the ratio of the sample variances to an expected population variance frequency distribution that is defined by the degrees of freedom associated with the samples. The F-test can be used to test the hypothesis that two sample variances are equal against the alternative hypothesis that two sample variances are not equal. The hypothesis of equal sample variances is rejected when the calculated F-statistic exceeds the F-critical value of the frequency distribution that is defined by the degrees of freedom for the two samples.

3.0 Results and Discussion

Biomass fuel comprised approximately 1.2% of PPS Unit 1's fuel during the 8-½ hour test burn. Biomass fuel generated approximately 860 kW of electrical power during the test burn. The addition of biomass into the feedstock tended cause a decrease in the heat content of the feedstock due to biomass' elemental composition relative to the composition of the base fuel. Emissions from Unit 1 did not increase with respect to baseline

during the test burn. There were no major technical impediments to the introduction of biomass into the feedstock of Unit 1. Logs of the biomass feed rate and certified truck scale tickets of the biomass delivery were maintained, and are provided in Appendix A.

3.1 Process

Biomass was introduced to the gasifier at a rate of 1,945 lb/hr. The biomass feed rate was approximately 1.2% of the base fuel feed rate of 164,840 lb/hr. The biomass fuel accounted for approximately 860 kW of electrical power out of a total of 220.5 MW generated during the test burn based on relative heating value and feed rates of the biomass fuel and the base fuel. Process results are summarized in Table 1. Plant performance from the operators' standpoint was indistinguishable from the normal petcoke/coal feedstock. Heat input to the CT during the test burn was on average 1667 ± 9.5 MMBtu compared to the heat input during the baseline period of 1681 ± 11.5 MMBtu, which were obtained from CEM data. (Note: The actual LHV to the CT during the test was 1473 mmbtu/hr, and HHV was 1583 mmbtu/hr. The CEMS reported HHV to the CT has a large error and this is why it should not be used.) Average CT power output was steady at 167.6 ± 0.1 MW during the test burn compared to 167.5 ± 0.08 MW during the baseline period.

Table 1. General process parameters for biomass and base fuels during the biomass test burn.

Parameter	Base Fuel	Biomass Fuel	Total or Weighted Average
Feed Rate (lb/hr)	164,840	1,945	166,786 Total
Moisture Content (Wt%)	7.82%	46.8%	8.27% Avg
Higher Heating Value (Btu/lb)	13,322	4,424	13,218 Avg
Higher Heating Value (MMBtu/hr)	2,196	8.6	2,205 Avg
Net Power Production (kW)	219,640	860	220,500 Total

3.2 Mass Balance

The overall mass balance for the gasification process was estimated at 12 different process points. The mass balance is presented in Table 2 and the stream numbers correspond to the numerical labels in Figure 1. Process streams 1-2 and 4-8 are feed streams and have a total flow rate of 381 thousand pounds per hour (KPPH). Process streams 9-12 are output streams and have a total flow rate of 381 KPPH. Process streams 3 and 5 are key internal streams and have flow rates of 81 and 264 KPPH, respectively.

Table 2. Overall mass balance for PPS Unit 1 gasifier section during biomass test burn. Units are in thousand pounds per hour (KPPH). Stream number corresponds to numerical labels in Figure 1.

Input (Feed) Streams		
Stream Number	Stream Description	Flow (KPPH)
1	Coal / Petroleum Coke Blend	164.84
2	Biomass	1.95
4	Make-Up Water To Slurry	16.5
6	Oxygen To Gasifier	166.94
7	High Pressure Purge/Sootblowing N ₂	11.07
8	Pump Seal/Instrument Flush Water	19.49
TOTAL SYSTEM INPUT		380.79

Product (Output) Streams		
Stream Number	Stream Description	Flow (KPPH)
9	Slag	17.36
10	Brine	0.02
11	Clean Syngas To Combustion Turbine	337.78
12	Acid and NH ₃ Gas To Sulfuric Acid Plant	25.62
TOTAL SYSTEM OUTPUT STREAMS		380.78

Key Internal Streams		
5	Slurry To Gasifier	264.4
3	Recycle Solids To Slurry Preparation	81.12

3.3 Process Stream Flows and Compositions

Each of the 12 process streams identified by numerical labels in Figure 1 was analyzed for composition and mass flows (Tables 3 and 4). Table 3 presents the stream flows and compositions for the slurry preparation area (streams 1-5). Table 3 also presents the heat content of streams 1-3 and 5. Calculated and analytically derived values for all parameters of stream 1 (base fuel) are presented in Table 3 for comparison purposes. Calculated and laboratory analytical values agree within the sampling and analytical accuracy range of the measurements. The addition of the biomass fuel to the base fuel resulted in a net decrease in composition (as a dry weight %) for all constituents except oxygen which increased by 0.25% and ash which increased by 0.01% over the calculated base fuel composition. Table 4 presents the flows and compositions for the gasification system (streams 3 and 5-12). Table 4 presents the compositional analysis of the clean syngas (stream 11) and residual materials from the gasification process (streams 9 and 3) as requested by the Department.

**Table 3. Slurry preparation area stream flows and compositions during test burn.
KPPH = thousand pounds per hour, AR = as received.**

Stream Number		1	1	2	3	4	5	
		COKE + COAL (Lab)	COKE + COAL (Calculated)	BIOMASS	COMBINED FRESH FUELS	RECYCLE SOLIDS	MAKE-UP WATER	SLURRY TO GASIFIER
Units								
COMPOSITION								
C	Wt % Dry	82.88	82.24	49.18	82.02	66.26		80.68
H	"	4.5	4.71	5.78	4.71	0.29		4.34
N	"	1.85	1.83	0.24	1.81	0.95		1.74
S	"	2.99	3.15	0.06	3.13	2.31		3.06
O	"	3.53	3.67	39.42	3.92	0		3.58
ASH	"	4.25	4.4	5.32	4.41	30.19		6.6
TOTAL	"	100	100	100	100	100		100
SUBTOTAL	KPPH DRY FLOW	151.95	151.95	1.035	152.985	14.196		167.181
H2O	Wt % AR	7.82	7.82	46.8	8.27	82.5		36.77
H2O	KPPH	12.891	12.891	0.91	13.801	66.924	16.496	97.22
TOTAL FLOW	KPPH AR	164.841	164.841	1.945	166.786	81.12		264.401
MASS FLOW								
C	Dry Lb/Hr	125936	124962	509	125471	9406		134877
H	"	6838	7150	60	7210	41		7251
N	"	2811	2774	2	2777	135		2911
S	"	4543	4791	1	4791	328		5119
O	"	5364	5582	408	5990	0		5990
ASH	"	6458	6691	55	6746	4286		11031
Ar	"	0	0	0	0	0		0
SUBTOTAL-Dry	"	151950	151950	1035	152985	14196		167181
Solids								
WATER / MOISTURE	lb/hr	12891	12891	910	13801	66924	16496	97220
TOTAL	"	164841	164841	1945	166786	81120		264401
HEAT CONTENT								
Calculated HHV	BTU/Lb (Dry)	14491	14511	8419	14470	9698		14065
Measured HHV	BTU/Lb (Dry)	14435		8213		9811		13990
Balance HHV	BTU/Lb (Dry)	14452	14452	8315	14411	9701		14011
Balance HHV	BTU/Lb (AR)	13322	13322	4424	13218	1698		
Balance HHV	MMBTU/Hr	2196	2196	8.6	2205	138		2342

**Table 4. Gasification system stream flows and compositions during test burn.
KPPH = thousand pounds per hour.**

STREAM NUMBER	GASIFICATION SYSTEM INPUTS					GASIFICATION SYSTEM OUTPUTS				
	5	6	7	8	9	3	10	11	12	
GAS	SLURRY TO		HP PURGE	SEAL &	TOTAL	RECYCLE	BRINE	CLEAN	ACID	TOTAL
STREAMS	GASIFIER	OXYGEN	NITROGEN	FLUSH	SYSTEM	SOLIDS	(NH ₄ Cl)	SYNGAS	GASES	SYSTEM
UNITS				WATER	INPUT	SLAG				OUTPUT
CO	VOL %		0	0				44.72	2.06	
H ₂	VOL %		0	0				36.02	0.52	
CH ₄	VOL %		0	0				0.02	0.02	
CO ₂	VOL %		0	0				15.01	66.42	
N ₂	VOL %		1.08	99.99				3.33	0	
Ar	VOL %		2.01	0				0.65	0	
H ₂ O	VOL %		0	0				0.21	5.26	
H ₂ S	VOL %		0	0				0.01	21.02	
COS	VOL %		0	0				0.01	0.06	
NH ₃	VOL %		0	0				0	4.62	
O ₂	VOL %		96.9	0.01				0	0.01	
TOTAL	VOL %		100	100				100	100	
MOLECULAR	LB/MOL		32.12	28.02				21.1	38.76	
R WT	E									
FLOW	KSCFH		1972.6	149.9				6075.5	250.9	
SOLID AND LIQUID STREAMS										
C	WT %	80.68				42.37	66.26			
H	WT %	4.34				0.31	0.29	7.49		
N	WT %	1.74				0.44	0.95	26.22		
S	WT %	3.06				1.47	2.31			
O	WT %	3.58				0	0			
ASH	WT %	6.6				55.41	30.19	66.29		
TOTAL	WT %	100				100	100	100		
DRY FLOW	KPPH	167.181				12.149	14.196	0.021		
H ₂ O	WT %	36.77				30	82.5			
H ₂ O FLOW	KPPH	97.22		19.489		5.207	66.924			
TOTAL	KPPH	264.401				17.356	81.12			
FLOW										
ELEMENTAL FLOWS / BALANCE:										
C	LB/HR	134877	0	0	134877	5148	9406	114880	5443	134877
H	LB/HR	18130	0	0	2181	620	7530	2	11709	20311
N	LB/HR	2911	1580	11066	15558	53	135	6	14936	15558
S	LB/HR	5119	0	0	5119	179	328		144	4469
O	LB/HR	92331	161177	1	17308	4624	59435	191926	14832	270817
ASH	LB/HR	11031	0	0	11031	6732	4286	14	0	11031
Ar	LB/HR	0	4184	0	4184				4184	4184
TOTAL	LB/HR	264401	166941	11067	19489	17356	81120	21	337779	25623
					461898					461898

3.4 Feedstock Analysis

A complete feedstock laboratory analysis is presented in Table 5. Both the base fuel and the biomass fuel were analyzed for elemental composition, ash composition, metal, and heat content. Compared to the base fuel, biomass fuel has greater moisture content, ash, hydrogen, oxygen, and some metals. Compared to the base fuel, biomass fuel has lesser carbon, nitrogen, and sulfur content. The difference in elemental composition results in a much lesser heat content for biomass fuel than for the base fuel (biomass fuel heat content was 56.8% of the heat content of the base fuel) and accounts for the dilution effect observed when the fuels are blended.

Table 5. Feed stock analysis of fuels used during test burn.

	Fuel	Coal/Coke Blend	Biomass
Total Moisture	Units		
Ultimate Analysis	Wt %	7.82	46.8
	Ash	Wt % (Dry Basis)	4.25
	C	Wt % (Dry Basis)	82.88
	H	Wt % (Dry Basis)	4.5
	N	Wt % (Dry Basis)	1.85
	S	Wt % (Dry Basis)	2.99
	O	Wt % (Dry Basis)	3.53
Heating Value			
	Measured HHV	BTU/Lb (Dry Basis)	14435
	Calculated HHV	BTU/Lb (Dry Basis)	14490
Miscellaneous			
	T ₂₅₀	Deg F	2560
	Chlorine	Wt % (Dry Basis in Coal)	0.02
	Fluorine	Wt % (Dry Basis in Coal)	<0.01
	Chromium	PPM (Wt) In Ash	136
	Vanadium	Wt % In Ash	2.286
	Nickel	ug/g dry coal	166
	Arsenic	ug/g dry coal	2.1
	Mercury	ug/g dry coal	0.03
	Lead	ug/g dry coal	2.6
	Beryllium	ug/g dry coal	1.3
Ash Minerals			
	CrO	Wt % In Ash	0.02
	V ₂ O ₅	Wt % In Ash	4.08
	NiO	Wt % In Ash	0.50
	As ₂ O ₃	Wt % In Ash	0.0065
	Hg	Wt % In Ash	0.000071
	PbO	Wt % In Ash	0.0066
	BeO	Wt % In Ash	0.0085
	SiO ₂	Wt % In Ash	49.21
	Al ₂ O ₃	Wt % In Ash	20.52
	TiO ₂	Wt % In Ash	0.93
	Fe ₂ O ₃	Wt % In Ash	12.89
	CaO	Wt % In Ash	3.34
	MgO	Wt % In Ash	1.91
	Na ₂ O	Wt % In Ash	0.57
	K ₂ O	Wt % In Ash	2.04
	P ₂ O ₅	Wt % In Ash	0.16
	SO ₃	Wt % In Ash	3.4
	Sum of Determined Minerals	Wt % In Ash	99.07
	Undetermined Ash Minerals	Wt % In Ash	0.93

3.5 Emissions

A statistical analysis was performed comparing the mean NO_x and SO₂ emissions from the test burn to baseline emissions obtained immediately prior to the test burn. NO_x and SO₂ emissions were analyzed for both baseline and test burn periods on a volumetric (ppm) and mass flow (lb/hr) basis. The statistical analyses consisted of calculating descriptive statistics and making pair-wise comparisons of each pollutant's variance and mean for the baseline data and the test burn data. The results of the analyses conducted using volumetric data were consistent with the results obtained using mass data.

NO_x and SO₂ emissions during the test burn were found to be slightly lower than NQ and SO₂ emissions during the baseline period. Figures 2 and 3 show graphs of test burn emissions compared to baseline emissions for NO_x and SO₂, respectively. Tables 6 and 7 present the summary results of the statistical analyses for the test burn and baseline emissions data for NO_x and SO₂, respectively. The results presented are in volumetric units (ppm), but identical relationships and statistical conclusions are obtained using mass flow units (lb/hr). Table 8 summarizes the statistics for NO_x and SO₂ emissions for the baseline and test burn periods in both volumetric and mass- flow units, for comparison.

Figure 2. NO_x emissions (ppm) from PPS Unit 1 during baseline and test burn periods.

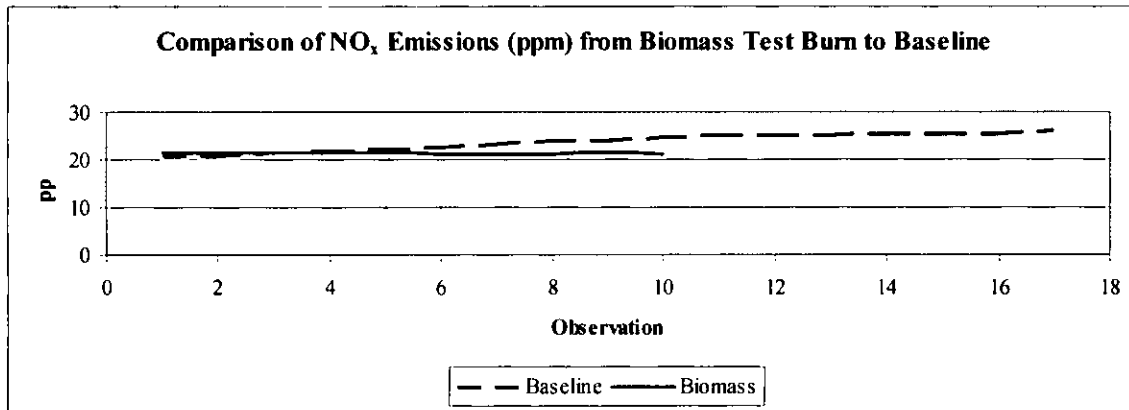
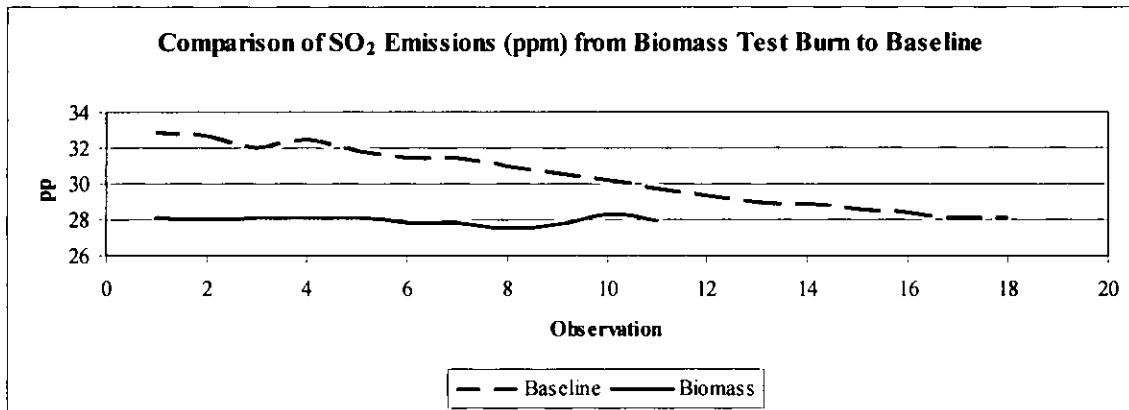


Figure 3. SO₂ emissions (ppm) from PPS Unit 1 during baseline and test burn periods.



Populations' mean and variance frequency distributions as measured by skewness and kurtosis approximated a normal distribution for both NO_x and SO₂ when the sizes of the data sets were considered. Two sample t-tests, assuming unequal variances, were used to test if the mean values for NO_x and SO₂ emissions were equal between the test burn and baseline emissions data. This was done because the F-tests rejected the hypothesis that the variances were equal between the test burn and the baseline emissions for

both NO_x and SO₂. The two sample t-tests results indicate that the observed differences in means are not due to chance at the 95% confidence level.

Table 6. Statistical analysis comparing variances and means of baseline and test burn data for NO_x emissions (ppm).

Parameter	Baseline	Biomass
Mean (ppm)	23.44	21.25
Variance	3.89	0.06
Observations	18	11
Hypothesized Difference in Variance or Mean	0	
df F-test (t-test)	17 (18)	10
F _{calc}	66.41	
Probability that calculated F is less than or equal to F _{crit}	5.02E-08	
F _{crit}	2.81	
t _{calc}	4.64	
Probability that calculated t _{calc} is less than or equal to t _{crit}	2.03E-04	
t _{crit}	2.10	

Conclusion: Reject hypothesis that Variances or Means are equal.

Table 7. Statistical analysis comparing variances and means of baseline and test burn data for SO₂ emissions (ppm).

Parameter	Baseline	Biomass
Mean (ppm)	30.36	27.95
Variance	2.73	0.05
Observations	18	11
Hypothesized Difference in Variance or Mean	0	
df F-test (t-test)	17 (18)	10
F _{calc}	51.99	
Probability that calculated F is less than or equal to F _{crit}	1.66E-07	
F _{crit}	2.81	
t _{calc}	6.11	
Probability that calculated t _{calc} is less than or equal to t _{crit}	9.00E-06	
t _{crit}	2.10	

Conclusion: Reject hypothesis that Variances or Means are equal.

Table 8. Comparison of baseline and test burn emissions in volumetric and mass flow units.

Parameter	NO _x				SO ₂			
	ppm		lb/hr		ppm		lb/hr	
	Baseline	Test	Baseline	Test	Baseline	Test	Baseline	Test
Mean	23.4	21.3	134.1	123.2	30.4	27.9	241.6	225.1
Number of Observations	18	11	18	11	18	11	18	11
Standard Deviation	1.97	0.24	11.35	2.2	1.7	0.2	13.1	2.5
Range	6	0.7	32.8	7.1	4.8	0.8	40.9	8.3
Minimum	19.9	20.8	114.75	119.1	28.1	27.5	221.9	221.3
Maximum	25.9	21.5	147.6	126.2	32.9	28.3	262.8	229.6
95% Confidence Interval	22.4 - 24.4	21.1 - 21.5	128.5 - 139.8	121.7 - 124.7	29.6 - 31.2	27.7 - 28.1	235.1 - 248.1	223.4 - 226.8

4.0 Conclusion

The test burn data indicates that the gasification of biomass is technically feasible and will not adversely impact emissions from PPS Unit 1. PPS requests the flexibility to gasify non-treated biomass. TEC understands that an air construction permit application is required to accommodate the changes necessary to handle the biomass fuel. TEC appreciates the Department's attention to this process.



Appendix A

Biomass Logs

DELIVERY TICKET

No 100451

Nutri-Source, Inc.

1212 Mt. Vernon Street
Orlando, Florida 32803-5418

Any questions regarding deliveries, contact:

MIKE LITVANY

(407) 876-1130

Telephone & Fax

(407) 257-2165

Mobile/Voice Mail

(800) 871-7773

Toll Free

DATE: 12-30-01

DRIVER: Ernest Powell

PRODUCT: SAW DUST

TRUCK NUMBER: 115

AMOUNT: YDS. OR
 TONS

ENDING HUB:
BEGINNING HUB:

GROSS WT: 25.89 LBS. TN

MILEAGE:

TARE WT: 17.08 LBS. TN

NET WT: LBS.

DELIVER TO: Teco Power Plant

DIRECTIONS: Mulberry 37 south

Richard M. B.

RECEIVED BY:

COMPANY: Wherry

4:46PM

12-30-2001

5:46PM

12-30-2001

LOOP ID 02
PRODUCT 02

TICKET NUMBER 2

INBOUND 25.89 TN

LOOP ID 02
PRODUCT 02

17.08 TN GROSS

POLK POWER STATION

POLK POWER STATION

9995 SR37 SOUTH

9995 SR37 SOUTH

MULBERRY FL 33860

MULBERRY FL 33860

MT WEST

MT WEST

25.89 t
17.08 t

8.81 t

12/31/01

BIO MASS TEST

780 LB NOTES - DUMP TIMES

Wood Dump Times

START DOWN

1 - 0713 - 0720

2 - 0725 - 0731

3 - 0735 - 0743

4 - 0828 - 0832

5 - 0850 - 0855

6 - 0915 - 0921

7 - 0942 - 0951

8 - 1005 - 1009

9 - 1033 - 1037

10 1055 - 1058

11 11:23 - 11:28

12 1145 - 1148

13 1210 - 1218

14 1235 - 1239

15 100 - 108

16 125 - 131

17 150 - 155

18 215 - 220

19 240 - 242

20 305 - 310

21 340 - 350



Appendix B

Test Burn Slag Analysis

LOG NO: B2-10196
Received: 16 JAN 02
Reported: 31 JAN 02

Mr. Robert Dorey
Tampa Electric Company
5010 Causeway Blvd.
Tampa, FL 33619

Project: PK-MW
Sampled By: Client
Code: 105220131
Page 3

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
10196-5	SPECL-PK	12-31-01/15:00
PARAMETER		10196-5
Aluminum (SPLP) (SPLP), mg/l		<0.20
Prep Date		01.21.02
Analysis Date		01.22.02
Antimony (SPLP), mg/l		0.047
Prep Date		01.21.02
Analysis Date		01.22.02
Arsenic (SPLP) (6010), mg/l		0.18
Prep Date		01.21.02
Analysis Date		01.22.02
Barium (SPLP), mg/l		0.10
Prep Date		01.21.02
Analysis Date		01.22.02
Beryllium (SPLP), mg/l		<0.040*F65
Prep Date		01.21.02
Analysis Date		01.23.01
Boron (SPLP) (6010), mg/l		0.13
Prep Date		01.28.02
Analysis Date		01.30.02
Vanadium (SPLP) (6010B), mg/l		9.1
Prep Date		01.21.02
Analysis Date		01.22.02

LOG NO: B2-10196
Received: 16 JAN 02
Reported: 31 JAN 02

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5010 Causeway Blvd.
Tampa, FL 33619

Project: PK-MW
Sampled By: Client
Code: 105220131
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
10196-5	SPECL-PK	12-31-01/15:00
PARAMETER		10196-5
Cadmium (SPLP), mg/l		<0.0050
Prep Date		01.21.02
Analysis Date		01.22.02
Chromium (SPLP), mg/l		<0.010
Prep Date		01.21.02
Analysis Date		01.22.02
Copper (SPLP), mg/l		<0.020
Prep Date		01.21.02
Analysis Date		01.22.02
Iron (SPLP), mg/l		<0.050
Prep Date		01.21.02
Analysis Date		01.22.02
Zinc (SPLP), mg/l		0.030
Prep Date		01.21.02
Analysis Date		01.22.02
Lead (SPLP) (6010), mg/l		<0.0050
Prep Date		01.21.02
Analysis Date		01.22.02
Magnesium (SPLP) (6010), mg/l		<0.50
Prep Date		01.21.02
Analysis Date		01.22.02

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Reported: 31 JAN 02

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5010 Causeway Blvd.
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Project: PK-MW
Sampled By: Client
Code: 105220131
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
10196-5	SPECL-PK	12-31-01/15:00
PARAMETER		10196-5
Manganese (SPLP) (6010), mg/l		<0.010
Prep Date		01.21.02
Analysis Date		01.22.02
Mercury (SPLP), mg/l		<0.00020
Prep Date		01.23.02
Analysis Date		01.24.02
Molybdenum (SPLP) (6010), mg/l		0.23
Prep Date		01.21.02
Analysis Date		01.22.02
Nickel (SPLP), mg/l		<0.040
Prep Date		01.21.02
Analysis Date		01.22.02
Selenium (SPLP), mg/l		0.085
Prep Date		01.21.02
Analysis Date		01.22.02
Silver (SPLP), mg/l		<0.10*F65
Prep Date		01.21.02
Analysis Date		01.23.02
Sodium (SPLP) (6010), mg/l		0.65
Prep Date		01.21.02
Analysis Date		01.22.02

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 5010 Causeway Blvd.
 Tampa, FL 33619

Project: PK-MW
 Sampled By: Client
 Code: 105220131
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
10196-5	SPECL-PK	12-31-01/15:00
PARAMETER		10196-5
Strontium (SPLP) (6010), mg/l		0.011
Prep Date		01.28.02
Analysis Date		01.30.02
Thallium (SPLP) (6010), mg/l		<0.010
Prep Date		01.21.02
Analysis Date		01.22.02

SEVERN

TRENT

SERVICES

6712 Benjamin Road • Suite 100 • Tampa, FL 33634 • Tel: 813 885 7427 • Fax: 813 885 7049 • www.stf-inc.com

STL Tampa West

LOG NO: B2-10196
Received: 16 JAN 02
Reported: 31 JAN 02

Mr. Robert Dorey
Tampa Electric Company
5010 Causeway Blvd.
Tampa, FL 33619

Project: PK-MW
Sampled By: Client
Code: 105220131
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
10196-6	SPECL-PK SPLP	12-31-01/15:00
PARAMETER		10196-6
Chloride (4500-Cl C), mg/l		<1.0
Analysis Date		01.23.02
Fluoride (340.2), mg/l		1.1
Analysis Date		01.22.02
Sulfate as SO4 (375.4), mg/l		12
Analysis Date		01.21.02

LOG NO: B2-10196
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Mr. Robert Dorey
 Tampa Electric Company
 5010 Causeway Blvd.
 Tampa, FL 33619

Project: PK-MW
 Sampled By: Client
 Code: 105220131
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED		
10196-8	Method Blank			
10196-9	Accuracy (%Rec)			
10196-10	Precision (%RPD)			
10196-11	Analyst Initials			
<hr/>				
PARAMETER	10196-8	10196-9	10196-10	10196-11
Color (110.2)	<5	100 %	0 %	TS
Analysis Date	01.17.02	01.17.02	---	---
<hr/>				
Polynuclear Aromatics (610)				
Naphthalene, ug/l	<10	82 %	21 %	JLB
2-Methylnaphthalene, ug/l	<10	---	---	---
1-Methylnaphthalene, ug/l	<10	---	---	---
Prep Date	01.21.02	01.21.02	---	---
Analysis Date	01.27.02	01.27.02	---	---
<hr/>				
Purgeable Aromatics (602)				
Benzene, ug/l	<1.0	98 %	4.1 %	JFB
Chlorobenzene, ug/l	<1.0	84 %	6.0 %	JFB
1,2-Dichlorobenzene, ug/l	<1.0	---	---	JFB
1,3-Dichlorobenzene, ug/l	<1.0	---	---	JFB
1,4-Dichlorobenzene, ug/l	<1.0	---	---	JFB
Ethylbenzene, ug/l	<1.0	---	---	JFB
Toluene, ug/l	<1.0	91 %	5.5 %	JFB
Xylenes, ug/l	<1.0	---	---	JFB
Methyl Tert Butyl Ether (MTBE), ug/l	<10	---	---	JFB
Analysis Date	01.24.02	01.24.02	---	---
<hr/>				
Biochemical Oxygen Demand carbonaceous	<2.0	97 %	10 %	EM
BOD-5 (SM5210B), mg/l				
Analysis Date	01.16.02	01.16.02	---	---

LOG NO: B2-10196
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Mr. Robert Dorey
 Tampa Electric Company
 5010 Causeway Blvd.
 Tampa, FL 33619

Project: PK-MW
 Sampled By: Client
 Code: 140820131

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED			

10196-12	Method Blank				
10196-13	Accuracy (%Rec)				
10196-14	Precision (%RPD)				
10196-15	Analyst Initials				

PARAMETER		10196-12	10196-13	10196-14	10196-15

Aluminum (SPLP) (SPLP), mg/l		<0.20	114 %	0.32 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Antimony (SPLP), mg/l		<0.0060	103 %	0.11 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Arsenic (SPLP) (6010), mg/l		<0.010	102 %	1.0 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Barium (SPLP), mg/l		<0.010	82 %	0.44 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Beryllium (SPLP), mg/l		<0.0040	103 %	0.53 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Boron (SPLP) (6010), mg/l		<0.050	124 %	2.4 %	BJB
Prep Date		01.28.02	01.28.02	---	---
Analysis Date		01.30.02	01.30.02	---	---

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED			
10196-12	Method Blank				
10196-13	Accuracy (%Rec)				
10196-14	Precision (%RPD)				
10196-15	Analyst Initials				
PARAMETER		10196-12	10196-13	10196-14	10196-15
Vanadium (SPLP) (6010B), mg/l		<0.010	104 %	0.21 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Cadmium (SPLP), mg/l		<0.0050	101 %	0.34 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Chromium (SPLP), mg/l		<0.010	106 %	0.34 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Copper (SPLP), mg/l		<0.020	106 %	0.76 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Iron (SPLP), mg/l		<0.050	111 %	0.89 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Zinc (SPLP), mg/l		<0.020	98 %	0.35 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---

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5010 Causeway Blvd.
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Project: PK-MW
Sampled By: Client
Code: 140820131
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED			
10196-12	Method Blank				
10196-13	Accuracy (%Rec)				
10196-14	Precision (%RPD)				
10196-15	Analyst Initials				
PARAMETER		10196-12	10196-13	10196-14	10196-15
Lead (SPLP) (6010), mg/l		<0.0050	101 %	0.46 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Magnesium (SPLP) (6010), mg/l		<0.50	103 %	1.8 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Manganese (SPLP) (6010), mg/l		<0.010	103 %	0.10 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Mercury (SPLP), mg/l		<0.00020	103 %	1.9 %	MEW
Prep Date		01.23.02	01.23.02	---	---
Analysis Date		01.24.02	01.24.02	---	---
Molybdenum (SPLP) (6010), mg/l		<0.010	102 %	0.060 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Nickel (SPLP), mg/l		<0.040	105 %	0.070 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---

LOG NO: B2-10196
Received: 16 JAN 02
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Mr. Robert Dorey
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5010 Causeway Blvd.
Tampa, FL 33619

Project: PK-MW
Sampled By: Client
Code: 140820131

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED			
10196-12	Method Blank				
10196-13	Accuracy (%Rec)				
10196-14	Precision (%RPD)				
10196-15	Analyst Initials				
PARAMETER		10196-12	10196-13	10196-14	10196-15
Selenium (SPLP), mg/l		<0.010	101 %	0.35 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Silver (SPLP), mg/l		<0.010	110 %	0.29 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Sodium (SPLP) (6010), mg/l		<0.50	102 %	1.5 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Strontium (SPLP) (6010), mg/l		<0.010	108 %	1.9 %	BJB
Prep Date		01.28.02	01.28.02	---	---
Analysis Date		01.30.02	01.30.02	---	---
Thallium (SPLP) (6010), mg/l		<0.010	103 %	1.2 %	LP
Prep Date		01.21.02	01.21.02	---	---
Analysis Date		01.22.02	01.22.02	---	---
Chloride (4500-Cl C), mg/l		<1.0	97 %	3.0 %	DN
Analysis Date		01.23.02	01.23.02	---	---
Fluoride (340.2), mg/l		<0.20	106 %	5.7 %	TS
Analysis Date		01.22.02	01.22.02	---	---

LOG NO: B2-10196
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 5010 Causeway Blvd.
 Tampa, FL 33619

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 Code: 140820131

REPORT OF RESULTS

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LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID	DATE/ TIME SAMPLED
10196-12	Method Blank	
10196-13	Accuracy (%Rec)	
10196-14	Precision (%RPD)	
10196-15	Analyst Initials	

PARAMETER	10196-12	10196-13	10196-14	10196-15
Sulfate as SO4 (375.4), mg/l	<5.0	97 %	2.6 %	MJC
Analysis Date	01.21.02	01.21.02	---	---

Method : SW-846, EPA 600/4-79-020, EPA 40 CFR PART 136
 DOH Certification #: E84282, E87052.
 These test results meet all the requirements of NELAC. All questions regarding this test report should be directed to the STL Project Manager who signed this test report.

*F65 = Elevated detection limits were reported due to sample matrix interference which required sample or extract dilution.


 Michael F. Valder, Project Manager



ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

STL Tampa West

2 10196

STL Tampa West
6712 Benjamin Road, Suite 100
Tampa, FL 33634

Website: www.stl-inc.com
Phone: (813) 885-7427
Fax: (813) 885-7049

Alternate Laboratory Name/Location

Phone:
Fax:

PROJECT REFERENCE PK-MW	PROJECT NO.	PROJECT LOCATION (STATE) FL	MATRIX TYPE	REQUIRED ANALYSIS							PAGE 1 OF 1					
SAMPLER'S SIGNATURE <i>Mike Vander</i>	P.O. NUMBER	CONTRACT NO.	COMPOSITE (C) OR GRAB (G) INDICATE AQUEOUS (WATER) SOLID OR SEMISOLID AIR NONAQUEOUS LIQUID (OIL, SOLVENT, ...)	He	Lea	NAPHTHALENE	METHYLNAPHTHA	COLPA	CBOD	SPLP (SEE ATTACHMENT)	VOLATILES	SPMI-Volatiles	TOTAL AS, B, C, D Pb, Se, Ag	TOTAL CHLORIDE	STANDARD REPORT DELIVERY	DATE DUE
CLIENT (SITE) PM MIKE VANDER	CLIENT PHONE 830-7378	CLIENT FAX 830-7360													EXPEDITED REPORT DELIVERY (SURCHARGE)	DATE DUE
CLIENT NAME FLORIDA ENVIRON. AFFAIRS	CLIENT E-MAIL														NUMBER OF COOLERS SUBMITTED PER SHIPMENT: 2	
CLIENT ADDRESS 5010 CAUSEWAY BLVD TAMPA, FL 33619	COMPANY CONTRACTING THIS WORK (if applicable)														REMARKS	

SAMPLE		SAMPLE IDENTIFICATION	COMPOSITE (C) OR GRAB (G) INDICATE	AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (OIL, SOLVENT, ...)	NUMBER OF CONTAINERS SUBMITTED							REMARKS		
DATE	TIME							1	2	3	4	5	6	7		8	9
1-15-02	1405	PK-7S-SA	G	✓				3	2	1							} DUE: 2-5-02 DUE: 2-5-02 DUE: 2-5-02
1-15-02	1510	PK-7LI-Q	G	✓				3	2	1							
1-15-02	1435	PK-7F-Q	G	✓				3	2	1							
1-15-02	1155	AA638 4L	G	✓							1						
12-31-01	1500	SPECL-PK	C	✓							1						
1-14-02	1015	WD02-008	C		✓							3	1	1			} CAUTION: HIGH PH (11.6) DUE: 2-4-02 *ACID NOT ADDED TO VOA VIALS

RELINQUISHED BY: (SIGNATURE) <i>Mike Vander</i>	DATE 12-26-01	TIME 0815	RELINQUISHED BY: (SIGNATURE) <i>Mike Vander</i>	DATE 1-16-02	TIME 0925	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY: (SIGNATURE) <i>Mike Vander</i>	DATE 1-15-02	TIME	RECEIVED BY: (SIGNATURE) <i>Mike Vander</i>	DATE 01/16/02	TIME 0925	RECEIVED BY: (SIGNATURE)	DATE	TIME

LABORATORY USE ONLY								
RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>Mike Vander</i>	DATE 1-16-02	TIME 1230	CUSTODY INTACT YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	CUSTODY SEAL NO. N/S	STL TAMPA WEST LOG NO. 8210196	LABORATORY REMARKS		



Appendix C

Biomass Emissions Data



Baseline Emissions Data for Coal and Petcoke Blend

Begin Date	Gross Unit Load (MWhr)	Heat Input (mmBtu)	SO2 (ppm)	SO2 (lb/hr)	NOx (ppm)	NOx (lb/hr)
12/29/2001 12:00:00 AM	177.00	1770.6	40.1	336.1	18.3	109.7772
12/29/2001 1:00:00 AM	177.00	1761	39.3	327.6	18.1	109.182
12/29/2001 2:00:00 AM	176.00	1771.3	39.3	329.5	17.7	106.278
12/29/2001 3:00:00 AM	174.00	1743.9	37	305.5	18.1	108.1218
12/29/2001 4:00:00 AM	174.00	1712.2	36.6	296.7	18.7	109.5808
12/29/2001 5:00:00 AM	173.00	1739.3	37.8	311.2	18.3	107.8366
12/29/2001 6:00:00 AM	170.00	1698.9	34.7	279.1	18.7	108.7296
12/29/2001 7:00:00 AM	168.00	1687.5	32.9	262.8	19.9	114.75
12/29/2001 8:00:00 AM	168.00	1694.9	32.7	262.4	20.6	118.643
12/29/2001 9:00:00 AM	168.00	1660.4	32	251.5	20.7	116.228
12/29/2001 10:00:00 AM	168.00	1696.7	32.5	257.9	21.3	122.1624
12/29/2001 11:00:00 AM	168.00	1675.3	31.8	252.2	21.7	123.9722
12/29/2001 12:00:00 PM	167.00	1668.2	31.4	248	22.2	126.7832
12/29/2001 1:00:00 PM	167.00	1679.3	31.4	249.6	22.4	127.6268
12/29/2001 2:00:00 PM	167.00	1680.6	30.9	245.8	23.3	132.7674
12/29/2001 3:00:00 PM	168.00	1681.9	30.6	243.6	23.8	136.2339
12/29/2001 4:00:00 PM	168.00	1687.1	30.2	241.2	24	138.3422
12/29/2001 5:00:00 PM	168.00	1691.7	29.7	237.9	24.6	142.1028
12/29/2001 6:00:00 PM	168.00	1672.4	29.3	232	24.9	142.154
12/29/2001 7:00:00 PM	168.00	1682.3	29	231	25.1	142.9955
12/29/2001 8:00:00 PM	168.00	1691.7	28.9	231.5	25.1	143.7945
12/29/2001 9:00:00 PM	168.00	1687.3	28.6	228.5	25.4	145.1078
12/29/2001 10:00:00 PM	168.00	1689.8	28.4	227.2	25.5	147.0126
12/29/2001 11:00:00 PM	168.00	1668	28.1	221.9	25.5	145.116

Test Burn Emissions Data for Coal, Petcoke, and Biomass Blend

Begin Date	Gross Unit Load (MWhr)	Heat Input (mmBtu)	SO2 (ppm)	SO2 (lb/hr)	NOx (ppm)	NOx (lb/hr)
12/31/2001 7:00:00 AM	167.00	1661.9	28.1	226.7	21.4	124.6425
12/31/2001 8:00:00 AM	168.00	1671.9	28	227.2	21.5	125.3925
12/31/2001 9:00:00 AM	168.00	1683	28.1	229.6	21.5	126.225
12/31/2001 10:00:00 AM	168.00	1656.7	28.1	226	21.5	124.2525
12/31/2001 11:00:00 AM	168.00	1681.5	28.1	226.5	21.4	124.431
12/31/2001 12:00:00 PM	168.00	1662.5	27.8	224.3	21.2	123.025
12/31/2001 1:00:00 PM	168.00	1659.4	27.8	223.9	21.2	122.7956
12/31/2001 2:00:00 PM	168.00	1670.3	27.5	223	21.1	123.6022
12/31/2001 3:00:00 PM	168.00	1670.9	27.7	221.8	21.3	121.9757
12/31/2001 4:00:00 PM	168.00	1664.6	28.3	225.8	20.9	119.8512
12/31/2001 5:00:00 PM	168.00	1654.4	27.9	221.3	20.8	119.1168



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APR 10 2002

BUREAU OF AIR REGULATION

April 5, 2002

Mr. Lynn Haynes
U.S. Environmental Protection Agency
Region IV
Atlanta Federal Center
61 Forsyth Street
Atlanta, Georgia 30303-3104

Via FedEx
Airbill No. 7918 1023 5327

Mr. Bill Proses
Florida Department of
Environmental Protection
3804 Coconut Palm Drive
Tampa, FL 33619

Via FedEx
Airbill No. 7920 1266 2822

Re: Tampa Electric Company (TEC)
Polk Power Station Unit 3
Part 75 Re-Notifications
FDEP File No. PSD-FL-263

Dear Messrs. Haynes and Proses:

As required by 40 CFR Part 75.61(a)(1)(i) and Condition 1 of Permit PSD-FL-263, initial certification test notifications shall be submitted not later than 45 days prior to the first scheduled day of initial certification testing. TEC notified the agency on March 25, 2002 of an initial CEMS performance testing to perform the cycle response time, linearity test, and seven day drift on April 10, 2002 and the stack stratification and stack RATA on May 6, 2002. Since then, the cycle response time, linearity test, and seven day drift were reschedule for April 8, 2002 and re-notified. *There has been another change and these tests have been rescheduled again for April 6, 2002. The stack stratification and stack RATA remain on schedule for May 6, 2002.*

Mr. Lynn Haynes
Mr. Bill Proses
April 5, 2002
Page 2 of 2

If there are any other changes regarding these dates, TEC will continue to notify the agency. If you have any questions or comments, please contact me at (813) 641-5261.

Sincerely,



Raiza Calderon
Engineer
Environmental Affairs

EA/gm/RC118

c: Mr. J. Kahn - FDEP
Mr. J. Kissel - FDEP SW
Mr. A. Linero - FDEP
Kim Nguyen - CAMD
Mr. H. Oven - FDEP
Mr. S. Sheplak - FDEP

-92-



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APR 08 2002

BUREAU OF AIR REGULATION

April 2, 2002

Mr. Lynn Haynes
U.S. Environmental Protection Agency
Region IV
Atlanta Federal Center
61 Forsyth Street
Atlanta, Georgia 30303-3104

Via FedEx
Airbill No. 7920 1060 2180

Mr. Bill Proses
Florida Department of
Environmental Protection
3804 Coconut Palm Drive
Tampa, FL 33619

Via FedEx
Airbill No. 7920 1060 4297

**Re: Tampa Electric Company (TEC)
Polk Power Station Unit 3
Part 60 & 75 Re-Notifications
FDEP File No. PSD-FL-263**

Dear Messrs. Haynes and Proses:

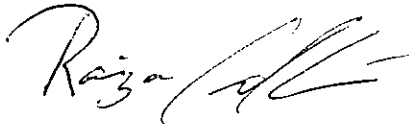
As required by 40 CFR 60.7 and Condition 3 of permit PSD-FL-263, the designated representative for an affected unit shall submit written notification for the anticipated date of initial startup. TEC re-notified the agency on March 25 2002 of an initial start up date of April 4, 2002. Since then, this date has been rescheduled for April 6, 2002.

As required by 40 CFR Part 75.61(a)(1)(i) and Condition 1 of permit PSD-FL-263, initial certification test notifications shall be submitted not later than 45 days prior to the first scheduled day of initial certification testing. TEC notified the agency on March 25, 2002 of an initial CEMS performance testing to perform the cycle response time, linearity test, and seven day drift on April 10, 2002 and the stack stratification and stack RATA on May 6, 2002. Since then, the cycle response time, linearity test, and seven day drift have been reschedule for April 8, 2002. The stack stratification and stack RATA remain on scheduled for May 6, 2002.

Mr. Lynn Haynes
Mr. Bill Proses
April 2, 2002
Page 2 of 2

If there are any other changes in regard to these dates, TEC will continue to notify the agency. If you have any questions or comments, please contact me at (813) 641-5261.

Sincerely,

A handwritten signature in black ink, appearing to read "Raiza Calderon", with a stylized flourish at the end.

Raiza Calderon
Engineer
Environmental Affairs

EA/bmr/RC116

c: Mr. J. Kahn - FDEP
Mr. J. Kissel - FDEP SW
Mr. A. Linero - FDEP
Kim Nguyen - CAMD
Mr. H. Oven - FDEP
Mr. S. Sheplak - FDEP



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BUREAU OF AIR REGULATION

March 25, 2002

Mr. Lynn Haynes
Region IV
U.S. Environmental Protection Agency
Atlanta Federal Center
61 Forsyth Street
Atlanta, Georgia 30303-3104

Via FedEx
Airbill No. 7903 5561 0396

Mr. Bill Proses
Florida Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619

Via FedEx
Airbill No. 7903 5560 3729

**Re: Tampa Electric Company (TEC)
Polk Power Station Unit 3
Part 60 & 75 Notifications and Re-Notifications
FDEP File No. PSD-FL-263**

Dear Messrs. Haynes and Proses:

As required by 40 CFR 60.7 and Condition 3 of permit PSD-FL-263, the designated representative for an affected unit shall submit written notification for the anticipated date of initial startup. TEC notified the agency of an initial start up date of April 7, 2002. Since then, this date has been rescheduled for April 4, 2002.

As required by 40 CFR Part 60.8(a) and Condition 3 of permit PSD-FI-263, within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of such facility, the owner or operator of such facility shall conduct performance test(s) and furnish the Administrator a written report of the results of such performance test(s). Also as required by 40 CFR Part 60.8(d) and Condition 3 of permit PSD-FL-263, the owner or operator of an affected facility shall provide the Administrator at least 30 days prior notice of any performance test. TEC hereby gives notice that the initial performance test for Polk Unit 3 will begin on May 6, 2002.

As required by 40 CFR 75.61(a)(2)(i) and Condition 1 of permit PSD-FL-263, the designated representative for an affected unit shall submit written notification for the planned date when a new unit will commence commercial operation. TEC notified the agency of a commence commercial operation date of May 10, 2002. Since then, this date has been rescheduled for May 1, 2002.

As required by 40 CFR Part 75.61(a)(1)(i) and Condition 1 of permit PSD-FL-263, initial certification test notifications shall be submitted not later than 45 days prior to the first scheduled day of initial certification testing. TEC notified the agency of an initial CEMS performance testing date of May 1, 2002 through the Acid Rain Program CEMS Monitoring plan. Since then, this date has been rescheduled

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Mr. Lynn Haynes
Mr. Bill Proses
March 25, 2002
Page 2 of 2

to perform the cycle response time, linearity test, and seven day drift on April 10, 2002 and the stack stratification and stack RATA on May 6, 2002.

If there are any other changes in regard to these dates, TEC will continue to notify the agency. If you have any questions or comments, please contact me at (813) 641-5261.

Sincerely,



Raiza Calderon
Engineer
Environmental Affairs

EA/bmr/RC113

c: Mr. J. Kahn - FDEP
Mr. J. Kissel - FDEP SW
Mr. A. Linero - FDEP
Kim Nguyen - CAMD
Mr. H. Oven - FDEP
~~Mr. S. Sheplak - FDEP~~

re-



TAMPA ELECTRIC

March 21, 2002

Mr. Bill Proses
Florida Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619

RECEIVED

MAR 27 2002

BUREAU OF AIR REGULATION

Via FedEx
Airbill No. 7903 5139 0036

**Re: Tampa Electric Company (TEC)
Polk Power Station Unit 3
Commercial Operation PSD Notification
FDEP File No. PSD-FL-263**

Dear Mr. Proses:

As required by 40 CFR 75.61(a)(2)(i) and Condition 1 of permit PSD-FL-263, the designated representative for an affected unit shall submit written notification: For a new unit or a newly affected unit, of the planned date when a new unit or newly affected unit will commence commercial operation or, for new stack or flue gas desulfurization system, of the planned date when a new stack or flue gas desulfurization system will be completed and emissions will first exit to the atmosphere. Notification of the planned date shall be submitted not later than 45 days prior to the date the unit commences commercial operation, or not later than 45 days prior to the date when a new stack or flue gas desulfurization system exhausts emissions to the atmosphere. TEC hereby gives notice that commercial operation of Polk Power Station Unit 3 will be on May 10, 2002.

If you have any questions, please feel free to call me at (813) 641-5261.

Sincerely,

Raiza Calderon
Engineer
Environmental Affairs

EA/bmr/RC111

- c: Mr. A. Linero – FDEP
- Mr. H. Oven – FDEP
- ~~Mr. S. Sheplak – FDEP~~
- Mr. J. Kissel – FDEP SW

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TAMPA ELECTRIC

March 4, 2002

Mr. Bill Proses
Florida Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619

Re: Tampa Electric Company
Polk Power Station Unit 3
Anticipated Startup Notification

Dear Mr. Proses:

As required by 40 CFR 60.7 and Condition 3 of permit PSD-FL-263, TEC hereby gives notice that the anticipated startup of Polk Power Station Unit 3 will be on April 7, 2002.

If you have any questions, please feel free to call me at (813) 641-5261.

Sincerely,

Raiza Calderon
Engineer
Environmental Affairs

EP\gmJJH947

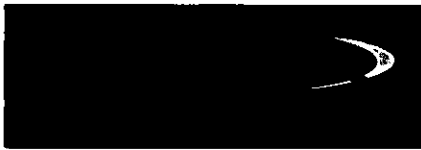
- c: Mr. A. Linero – FDEP
- Mr. H. Oven – FDEP
- ~~Mr. S. Sheplak – FDEP~~
- Mr. J. Kissel – FDEP SW

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MAR 08 2002

BUREAU OF AIR REGULATION

Via FedEx
Airbill No. 7924 9647 0770



TAMPA ELECTRIC

January 30, 2002

Mr. Howard Rhodes
Division Director
Division of Air Resources Management
Florida Department of Environmental Protection
2600 Blair Stone Road
MS 5500
Twin Towers Office Building
Tallahassee, Florida 32399-2400

**Re: Tampa Electric Company (TEC)
Polk Power Station
Biomass Test Burn**

Dear Mr. Rhodes:

The purpose of this letter is to update you on the progress of Tampa Electric Company's ("TEC") attempt to use biomass as a gasification feedstock in Polk Unit 1 and to request that you consider some additional factors in making a determination of Best Available Control Technology ("BACT"). As you are aware, TEC received authorization to perform the test burn from the Florida Department of Environmental Protection ("Department") on December 21, 2001. Upon receipt of the authorization, TEC immediately began procuring biomass fuel to facilitate the test burn. On December 30 and 31, 2001, TEC successfully gasified a blend of biomass, coal and pet coke, in accordance with the authorization. The blend consisted of approximately one percent biomass by weight, which equates to approximately one ton of biomass gasified per hour.

Due to the initial success of the biomass test burn, TEC would like to continue to test other renewable fuels in Polk Unit 1. This is a process that TEC is undertaking in an attempt to introduce a portion of biomass into the fuel mix for Polk Unit 1. At this time, TEC is evaluating the use of eucalyptus, cottonwood, switchgrass and other similar wood products. However, the introduction of biomass as a viable alternative fuel in Polk Unit 1 is developmental in nature and will need to be evaluated over a period of time based on numerous factors, including fuel suppliers, economics, operational constraints and unit capabilities. The ability to gasify these renewable fuels and other environmentally beneficial fuel sources complements TEC's green energy program for which it has an approved tariff in place. In addition, the use of biomass as a feedstock will provide environmental benefits to the public.

The recent Department draft determination (DEP File Nos. 1050233-007-AC and PSD-FL-194F), requiring the application of a Selective Catalytic Reduction System (SCR) on Polk Unit 1, would jeopardize the viability of TEC's renewable energy program at Polk Power Station. TEC believes that the application of an SCR to Polk Unit 1 will further complicate operation of the unit and thereby discourage further exploration of renewable fuel sources at the site. The application of SCR to Polk Unit 1 will also introduce additional factors that will make it difficult to determine the effects of biomass fuel and operation variations versus those caused by SCR on the overall reliability of Unit 1.

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RESOURCES MANAGEMENT

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FEB 15 2002

BUREAU OF AIR REGULATION **Via Fax and Mail**

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OUTSIDE HILLSBOROUGH COUNTY 1 (888) 223-0800

Mr. Howard Rhodes
January 30, 2002
Page 2 of 2

In light of our continued desire to test beneficial alternative feedstocks, TEC requests that the Department reconsider this determination and establish a BACT limit for NO_x, when firing syngas, of 15 ppmvd @ 15% O₂ on a 30-day rolling average. TEC will be able to achieve continuous compliance with this limit through the modification of existing equipment and control systems as well as the installation of additional equipment used to minimize NO_x emissions by July 1, 2003. TEC proposes to submit, for Department approval, a NO_x compliance plan outlining the specific modifications necessary to achieve continuous compliance with the proposed BACT limit for NO_x.

The current NO_x emission limit for Polk Unit 1, when firing syngas, is 25 ppmvd @ 15% O₂, which represents the interim BACT in accordance with the initial permit for this facility. The proposed NO_x emission limit will result in a reduction in allowed NO_x emissions from Polk Unit 1 of 40%, while maintaining the unit's ability to gasify renewable fuels.

We note that TEC is not inherently opposed to SCR technology on conventional combined cycle plants. In accordance with our agreements with the Department and EPA we will install SCR on eleven (11) new natural gas-fired combustion turbines at the nearby Bayside Station using combustion turbines manufactured by General Electric. On these new units, SCR will be applied to achieve 3.5 ppmvd on units that can achieve 9 ppmvd without SCR. Similarly, the United States Department of Energy is not inherently opposed to SCR as it has funded several demonstration projects on coal-fired plants and hosts conferences on this subject.

TEC believes that its BACT proposal fits well the utilization of biomass fuel. We would be happy to work with you to more definitively substantiate this position. TEC appreciates the Department's cooperation in the review of this matter. If you need any additional information or clarification on any of the issues presented above, please do not hesitate to contact me at (813) 641-5016

Sincerely,



Gregory M. Nelson
Director
Environmental Affairs



Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

February 5, 2002

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ms. Laura Crouch
Manager, Air Programs – Environmental Affairs
Tampa Electric Company
Post Office Box 111
Tampa, Florida 33601

Re: Biomass Test Burn (Modified)
Polk Power Station Unit 1
Facility ID No. 1050233

Dear Ms. Crouch:

On December 21, the Department granted Tampa Electric Company an authorization to gasify a blend of coal/petcoke and biomass (eucalyptus, cottonwood and switch grass) in your IGCC unit located at the Polk Power Station, Polk County, Florida.

On December 30 and 31 Tampa Electric Company gasified a blend of coal/petcoke and biomass (eucalyptus, cottonwood and switch grass) at the Polk Power Station. The Department has reviewed the request from Tampa Electric Company received on January 21 to change certain requirements of the original test burn. The authorization is hereby modified.

You are hereby authorized to conduct performance tests on these emissions units while gasifying and combusting a blend of up to 5 percent biomass by weight (eucalyptus, cottonwood and switch grass) for pollutants described herein, for a period not to exceed 60 days, and within 90 days from the first day biomass is gasified. Test results must include a material balance (fuels, emissions, gasifier slag, and boiler deposits) for each unique blend of fuels. All conditions of existing permits related to air pollution emission limits and control equipment remain in force during the test burn. This temporary permit shall expire on or before May 15, 2002.

The performance tests shall be conducted in order to gather data regarding air pollutant emissions, any operation limitations on gasifying a blend of up to 5 percent by weight biomass, to measure syngas characteristics and to determine the slag content from the gasifier and HRSG deposits. Unless otherwise specified, all test results shall be sent to the Department's Bureau of Air Regulation within 60 days of completion of the tests. Upon any requested change to allow permanent combustion of fuels not currently permitted for these emission units, the Department will evaluate the establishment of new or additional permit conditions resulting from either increases or improvements in emission quality or quantity.

"More Protection, Less Process"

Printed on recycled paper.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Ms. Laura Crouch
 Manager, Air Programs -
 Environmental Affairs
 Tampa Electric Company
 Post Office Box 111
 Tampa, Florida 33601

2. Article Number (Copy from service label)

7000 0520 0020 9371 2653

PS Form 3811, July 1999

Domestic Return Receipt

102595-00-M-0952

COMPLETE THIS SECTION ON DELIVERY

A. Received by (Please Print Clearly) B. Date of Delivery

Brandy Rhind 2-11-02

C. Signature

X B. Rhind

Agent

Addressee

D. Is delivery address different from item 1? Yes

If YES, enter delivery address below: No

3. Service Type

Certified Mail Express Mail

Registered

Return Receipt for Merchandise

Insured Mail

C.O.D.

4. Restricted Delivery? (Extra Fee)

Yes

**U.S. Postal Service
CERTIFIED MAIL RECEIPT**

(Domestic Mail Only: No Insurance Coverage Provided)

Ms. Laura Crouch

Postage \$

Certified Fee

Return Receipt Fee
(Endorsement Required)

Restricted Delivery Fee
(Endorsement Required)

Total Postage & Fees \$

Postmark
Here

Recipient's Name (Please Print Clearly) (To be completed by mailer)

Ms. Laura Crouch

Street, Apt. No.; or PO Box No.

Post Office Box 111

City, State, ZIP+4

Tampa, Florida 33601

PS Form 3800, February 2000

See Reverse for Instructions

7000 0520 0020 9371 2653

Ms. Laura Crouch
TEC / Biomass Test Burn (Modified)
Polk Power Station Unit 1
February 5, 2002
Page 2

The performance tests shall be subject to the following conditions:

1. The permittee shall notify the DEP Southwest District, and the Bureau of Air Regulation upon receipt of any biomass, 1 day prior to gasifying biomass and 7 days prior to commencement of any stack performance testing. Because of the end of the year tax credit, the permittee may give 1 day testing notification. A written final report shall be submitted to these offices within 45 days of completion of the last day that biomass is gasified.
2. While gasifying biomass, it shall be continuously fed so as to maintain a homogenous stream of syngas for combustion. The maximum biomass content shall not exceed 5 percent by weight of fuels gasified, as measured during each calendar day. A log shall be maintained at the facility demonstrating compliance with this condition, documenting the unique type of biomass being gasified (eucalyptus, cottonwood or switch grass) along with the unique blend of coal or petcoke. This log shall be available for inspection and submitted with the final test report. Performance testing (mass balance, syngas testing and stack testing) shall be conducted for each unique blend of biomass gasified with each unique blend of coal or petcoke.
3. Emissions due to biomass gasification shall not exceed any current limits in existing permits for all impacted emission units.
4. Representative samples of "as-burned" coal, petcoke and biomass shall be taken and analyzed for each unique blend of biomass gasified with each unique blend of coal or petcoke. All sample results shall be submitted with the final report.
5. As-burned (syngas) fuel samples shall be collected and analyzed as "refinery gas" (as has been done with past compliance tests) upon initial gasification of each unique blend of biomass gasified with each unique blend of coal or petcoke. Data collected by the inline mass spectrometer and gas chromatograph is sufficient for the purpose of satisfying this requirement. Additionally, metals contents (fluorides, chromium, arsenic, cadmium, mercury, lead, and beryllium) and phosphorous compounds shall be measured for each unique blend of biomass gasified with each unique blend of coal or petcoke. Sample results shall be provided to the DEP Southwest District and the Bureau of Air Regulation with the final written report.
6. To provide reasonable assurance that the ash generated from any fuel blend can be disposed of in a method to be proposed by TEC, as well as to ensure compliance with the solid and hazardous waste regulations, representative samples of the gasifier slag generated as the result of gasifying coal and petcoke with biomass shall be segregated, sampled and analyzed in accordance with the requirements set forth in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA Publication SW-846, Third Edition."
7. A material balance of all measured syngas constituents shall be performed for each unique blend of biomass and coal or petcoke, based on all test/analytical data. A material balance for syngas test constituents including C, H, N, O, S and ash, and will satisfy this requirement. Such material balances shall be provided with the final test report.
8. Stack gas emissions shall be conducted for each unique blend of biomass gasified with each unique blend of coal or petcoke and results reported for all measured syngas constituents as well as all currently regulated pollutants. CEMS data is sufficient to satisfy this request.
9. Performance tests shall be conducted using EPA Reference Methods, as contained in 40 CFR 60 (Standards of Performance for New Stationary Sources), 40 CFR 61 (National Emission Standards for Hazardous Air

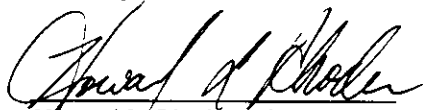
Ms. Laura Crouch
TEC / Biomass Test Burn (Modified)
Polk Power Station Unit 1
February 5, 2002.
Page 3

Pollutants), and 40 CFR 266, Appendix IX (Multi-metals), unless otherwise approved by the Department, in writing, in accordance with Chapter 62-297, F.A.C. All performance testing shall be submitted with the final report.

10. Upon completion of the test burn period and upon the first unit shutdown, representative HRSG deposits shall be obtained. The Department's Southwest District, and the Bureau of Air Regulation shall be notified immediately upon such shutdown, as to the expected duration. TEC shall provide photographic evidence of the magnitude and location of such deposits upon conclusion of the unit shutdown. HRSG deposits shall be analyzed in a scanning electron microscope (SEM) using energy dispersive X-ray spectroscopy (EDS) to identify the elements present. The Southwest District and the Bureau of Air Regulation shall be provided with a copy of any and all sample analyses or results obtained for HRSG deposits upon receipt of any analyses or results, regardless of the purpose of such sample collection, analyses or results.
11. This test-burn shall not result in the release of objectionable odors pursuant to Rule 62-296.320(2), F.A.C.
12. Performance testing shall cease as soon as possible if the test results in any emissions, which are not in accordance with the conditions in existing permits, or this authorization protocol. Performance testing shall not resume until appropriate measures to correct the problem(s) have been implemented. The Southwest District shall be notified immediately upon such cessation and resumption.
13. This Department action is only to authorize the biomass blend performance testing of biomass consisting of eucalyptus, cottonwood and switch grass.
14. The Department's Southwest District, and the Bureau of Air Regulation shall be notified within 5 days, in writing, upon completion of the biomass test burn.
15. All testing series shall include emissions testing for emissions units operating at permitted capacity. Permitted capacity is defined as 90-100 percent of the capacity allowed by existing permits.

This letter must be attached to permit No. PSD-FL-194 (current revision) and shall become a part of the permit.

Sincerely,



Howard L. Rhodes, Director
Division of Air Resources
Management

HLR/sms

cc: Mr. Jerry Kissel, FDEP/SW
Mr. A.A. Linero, FDEP - BAR
Mr. Gregg Worley, EPA-Region IV



TAMPA ELECTRIC

January 21, 2002

Mr. Scott Sheplak, P.E.
Administrator- Title V Section
Florida Department of Environmental Protection
111 South Magnolia Drive, Suite 4
Tallahassee, FL 32301

RECEIVED

JAN 22 2002

BUREAU OF AIR REGULATION

Via FedEx
Airbill No. 7902 7964 0691

**Re: Tampa Electric Company
Polk Power Station Unit 1
Biomass Test Burn**

Dear Mr. Sheplak:

The purpose of this letter is to update you on the progress of Tampa Electric Company's (TEC) attempt to gasify biomass in Polk Unit 1. As you are aware, TEC received authorization to perform the test burn from the Florida Department of Environmental Protection (Department) on December 21, 2001. Upon receipt of the authorization, TEC immediately began procuring biomass fuel to facilitate the test burn. On December 30 and 31, 2001, TEC successfully gasified a blend of biomass, coal and pet coke, per the authorization. The blend consisted of approximately one- percent biomass by weight, which equates to approximately one ton of biomass gasified per hour.

Due to the initial success of the biomass test burn, TEC would like to continue to test other renewable fuels in Polk Unit 1. At this time these fuels include eucalyptus, cottonwood, switch-grass and other similar wood products. However, the renewable fuel market is in the early stages of development, and there will be other sources of renewable fuel emerging that TEC may evaluate in the future. The ability to gasify these renewable fuels and other environmentally friendly fuel sources supports TEC's green energy program and provides benefit to both the environment and our customers.

During the initial gasification of the biomass material, TEC collected a significant amount of operational and process data. Including biomass and coal/pet coke fuel blend feed stock sample, a residual fuel (gasifier solid byproduct) sample, syngas in-line mass spectrometer analysis and continuous emissions monitor system (CEMS) data including measurements of NO_x and SO₂ emissions. The listed information is required by the test burn authorization. However, several conditions within the test burn authorization contain requirements that TEC would like to clarify with the Department, these include:

- Condition 5 requires that the sample results be provided to the Department within 14 days of sample collection. TEC is unable to issue a report within 14 days from sample collection due to the time necessary for the sample processing and will instead submit these results with the final report. TEC requests concurrence from the Department that submission of the analyses with the test burn final report on February 14, 2002 satisfies the requirements of Condition 5.
- Condition 5 also requires that "as-burned (syngas) fuel samples be collected and analyzed as "refinery gas" (as has been done with past compliance tests) upon initial gasification of each unique blend of biomass gasified with each unique blend of coal or petcoke." During this test, TEC collected syngas data using the in-line mass spectrometer and gas chromatograph, which provides data on key syngas

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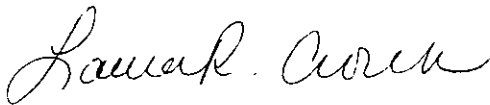
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components (CO, H₂, CO₂, N₂, Ar, H₂S, and COS), and will submit this analysis with the final report. When the mass spectrometer has been available, it has been used for this purpose in some previous compliance reports. TEC requests concurrence from the Department that the data collected by the in-line mass spectrometer and gas chromatograph is sufficient for the purpose of satisfying this Condition 5 requirement. It also requires that an analysis for metals contents (fluorides, chromium, arsenic, cadmium, mercury, lead, and beryllium) phosphorous, amines and organic silicon compounds be measured for each unique blend of biomass gasified with each unique blend of coal or petcoke. The pet coke/coal blend and the biomass samples will be analyzed separately for metals contents (fluorides, chromium, arsenic, cadmium, mercury, lead, and beryllium) and phosphorous and the results will be included with the final report. However, we are not familiar with validated procedures for analysis of amines and organic silicon compounds in solid fuels, so we request relief from this requirement.

- To satisfy Condition 7, TEC can provide a material balance for syngas test constituents including C, H, N, O, S and ash, and will submit these results with the final report. TEC requests concurrence from the Department that this information is sufficient to satisfy Condition 7.
- To fulfill the requirement of Condition 8, CEMS were used as the compliance method during this test burn and data was collected for SO₂, NO_x and CO₂. The CEM data will be submitted with the final report. TEC requests concurrence from the Department that the CEMs data is sufficient to satisfy Condition 8.

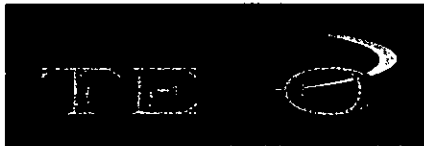
TEC appreciates the Department's cooperation in the review of this matter. In light of the fact that these conditions need to be resolved TEC would like to request a 90-day extension of the deadline to submit the final test burn report to the Department. If you need any additional information or clarification on any of the issues presented above, please do not hesitate to contact me at (813) 641- 5376.

Sincerely,



Laura R. Crouch
Manager- Air Programs
Environmental Affairs

c/enc: Mr. Jerry Kissel - FDEP SW
Mr. Al Linero, FDEP
Mr. Hamilton Oven, FDEP



TAMPA ELECTRIC

December 28, 2001

Mr. William A. Proses, P.E.
Florida Department of
Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

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

Dear Mr. Proses:

Per Condition 1 of the Polk Power Station Unit 1 Biomass Test Burn Authorization, which was issued by the Florida Department of Environmental Protection (DEP) on December 21, 2001, Tampa Electric Company (TEC) is required to notify the DEP Southwest District and the Bureau of Air Regulation one day prior to gasifying biomass. Through this correspondence TEC is providing notification that biomass is expected to arrive on-site on December 28, 2001 and that TEC will be attempting to gasify the biomass as it becomes available on-site.

If you have any questions please call Dru Latchman or me at (813) 641-5034.

Sincerely,

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL106

cc: Mr. Scott Sheplak, FDEP

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JAN 07 2002

BUREAU OF AIR REGULATION

**Via FedEx
Airbill No. 7902 5966 8946**