TAMPA ELECTRIC

December 5, 2002

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BUREAU OF AIR REGULATION

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. 7927 8682 7908

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.

TAMPA ELECTRIC COMPANY
P. O. BOX 111 TAMPA, FL 33601-0111
(813) 228-4111
CUSTOMER SERVICE:
HILLSBOROUGH COUNTY (813) 223-0800
OUTSIDE HILLSBOROUGH COUNTY 1 (888) 223-0800

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

TAMPA ELECTRIC

Heat Recovery Steam Generator Deposit

Polk Power Station Unit 1

SEVERN TRENT SERVICES

STL Billerica
149 Rangeway Road
North Billerica, MA 01862

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

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

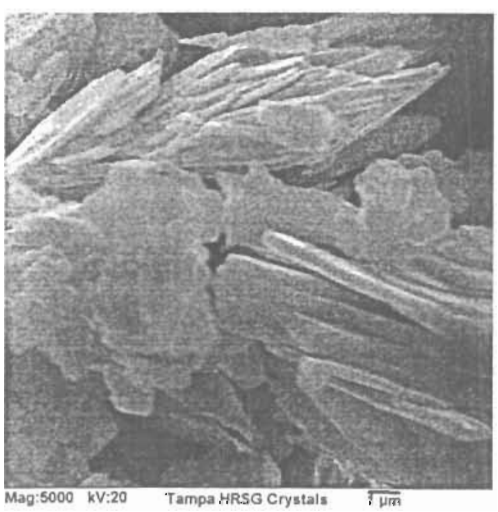
Dear Bret:

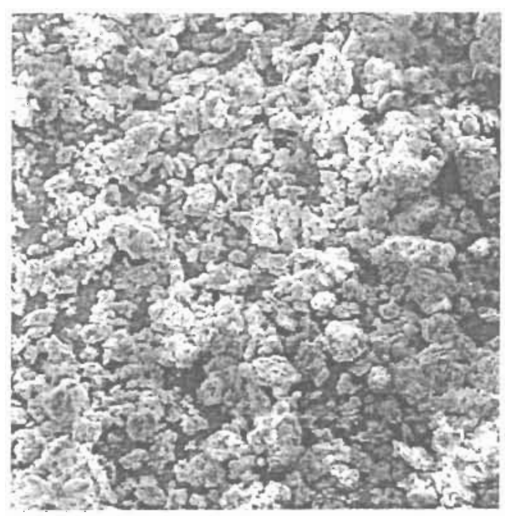
Please find enclosed one (1) PLM photomicrograph, one (1) EDX spectrograph and two (2) SEM photomicrographs of the material submitted for SEM/EDX analysis.

METHODS:

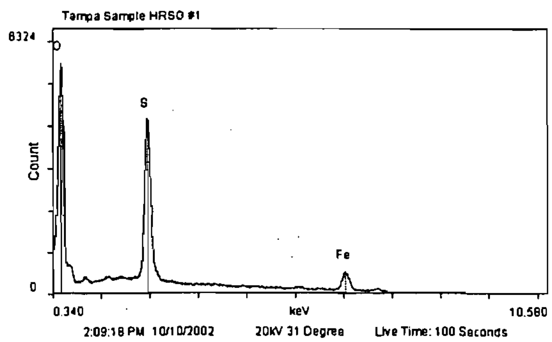
A representative portion of the material was prepared in R.I. index 1.65 oil on a glass slide for the initial Polarized Light Microscopy (PLM) analysis. Another portion of the sample was transferred to double-sided tape on SEM stubs. This mount was then coated with evaporated graphite for the Scanning 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 photomicrgraph, 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 flocutlant 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 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

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June 5, 2002

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BUREAU OF AIR REGULATION

Via FedEx
Airbill No. 7920 4628 3541

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 (SO_2) - 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 (H_2SO_4) - 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 SO_2 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.

TAMPA ELECTRIC COMPANY
P. O. BOX 111 TAMPA, FL 33601-0111
(813) 228-4111

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HTTP://WWW.TAMPAELECTRIC.COM

Presented below in Table 1 is Polk Power Station's historical NO_x and SO_2 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 SO_2.

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:

$$0.100\ \frac{lb\ NOx}{MMBtu} * 1{,}610\ \frac{MMBtu}{hr} * 5{,}580\ \frac{Hours}{yr} \div 2{,}000\ \frac{tons}{lb} + \left(.16\ \frac{tons\ NOx}{hr} * 673\ \frac{Oil\ fired\ hrs}{yr}\right) = 557\ \frac{tons\ NOx}{yr}$$

Sample Calculation for 2002 SO_2 Emissions:

$$0.200\ \frac{lb\ SO2}{MMBtu} * 1{,}610\ \frac{MMBtu}{hr} * 5{,}580\ \frac{Hours}{yr} \div 2{,}000\ \frac{tons}{lb} + \left(.0461\ \frac{tons\ SO2}{hr} * 673\ \frac{Oil\ fired\ hrs}{yr}\right) = 929\ \frac{tons\ SO2}{yr}$$

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_2SO_4 [tons/yr]	86.8	77.3	-10	No

(2) Sample Calculation for 2002 H_2SO_4 Emissions:

$$27.7\ \frac{lb\ H2SO4}{hr} * 5{,}580\ \frac{Hours}{yr} \div 2{,}000\ \frac{tons}{lb} = 77.3\ \frac{tons\ H2SO4}{yr}$$

As evidenced by the data above, NO_x, SO_2 and H_2SO_4 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 N. Crouch

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

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
Polk 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 [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 [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 [signature]

Coordinator
Air Services
Environmental Affairs
Tampa Electric Company

TABLE OF CONTENTS

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 (SO_2) 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 SO_2 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 SO_2 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 NOx O2 Summary", representing hourly NO_x concentrations corrected to 15% O_2. 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.

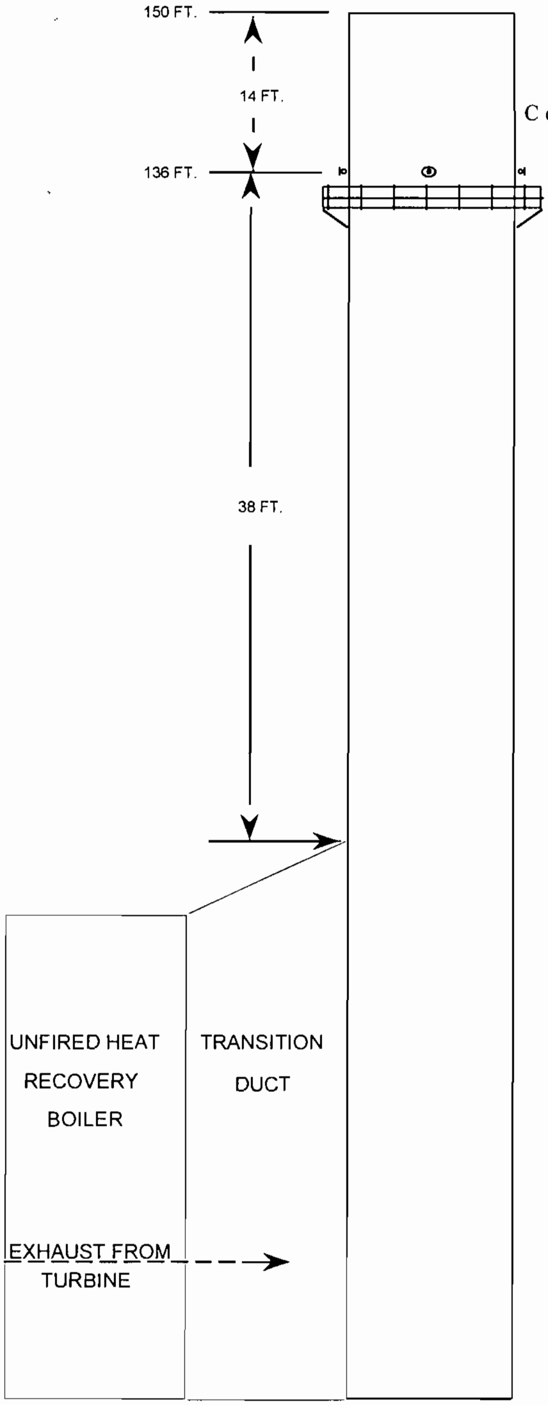
3.0 SAMPLING LOCATION TRAVERSE DIAGRAM

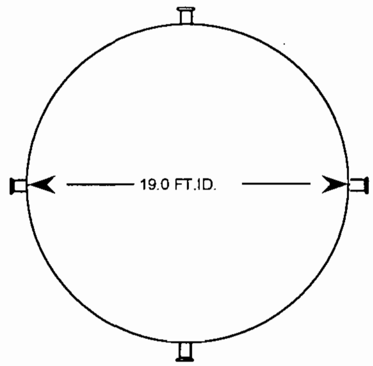
Polk Power Station

Unit No. 1

Combined Cycle Combustion Turbine

Test Location





PORT LOCATION PLAN

STACK DIAMETERS DOWNSTREAM FROM DISTURBANCE = 2.0
STACK DIAMETERS UPSTREAM FROM DISTURBANCE = 0.7
STACK DIAMETER = 19.0 FT.
STACK AREA = 283.529 SQ. FT.
STACK AREA =40828.138 SQ. IN.

TRAVERSE POINTS
1 - 4.79 "
2 - 15.28 "
3 - 26.90 "
4 - 40.36 "
5 - 57.00 "
6 - 80.17 "

ADD 13" PORT LENGTH TO POINTS

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4.0 TEST RESULTS

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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, %H2O	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_{H2SO4}, lb/dscf	5.384E-07	6.031E-07	4.317E-07	5.244E-07
E_{H2SO4}, lbs/hr =	28.1	32.0	22.8	27.65

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POLK POWER STATION
SULFUR DIOXIDE and NITROGEN OXIDES from CEMS

COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
April 23, 2002

	Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)			
Time of Day	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 NOx 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:

lbs NOx/MMBtu x Heat Input in MMBtu/hr

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POLK POWER STATION
GAS DENSITY and HEAT INPUT CALCULATIONS

COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
April 23, 2002

Sample #1		Molecular	Density	Density	
Gaseous Component	Mole %	Weight	lbs./ft^3	lbs./ft^3	HHV
Hydrogen	27.441680	2.016	0.0053	0.0014544	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				Fractional	
		Molecular	Density	Density	
Gaseous Component	Mole %	Weight	lbs./ft^3	lbs./ft^3	HHV
Hydrogen	27.402340	2.016	0.0053	0.0014523	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	

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POLK POWER STATION
GAS DENSITY and HEAT INPUT CALCULATIONS

COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
April 23, 2002

Sample #3

Gaseous Component	Mole %	Molecular Weight	Density lbs./ft^3	Fractional Density lbs./ft^3	HHV
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./ft^3	

Average Constituent Density = 0.0606165 lbs./ft^3
Average Fuel Flow for Test Period = 101.27431 lbs./sec.
Volumetric Fuel Flow Rate, F = 6.015E+06 ft^3/hr.
Average Higher Heating Value of syngas fuel, H_g = 267.66667 Btu/ft^3
Average Heat Input = $H_g \times F$
= 1.610E+09 Btu/hr.
= 1609.9 MMBtu/hr.

SHARDATA\AIRSERVICES\WPSOURCE\POLK

APPENDIX A

SULFURIC ACID MIST CALCULATIONS

TECO
TAMPA ELECTRIC

Environmental Affairs
Air Services Group

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_2O
Effective Stack Area, A_s:	283.528737	ft^2	Sample Volume, V_m:	40.328	ft^3
Pitot Coefficient, Cp:	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_2O
	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:

$V_{w(std)} = 4.714E\text{-}02 \times V_{lc}$	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
$I = (T_s + 460) \times ((2.67E\text{-}03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / (\theta \times P_s \times A_n \times v_s$	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:

$C_{H2SO4} = 1.081E\text{-}04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)} =$	5.384E-07	lb/dscf
$E_{H2SO4} = C_{H2SO4} \times Q_{s(std)} \times 60 =$	28.13	lb/hr

TECO
TAMPA ELECTRIC

Environmental Affairs
Air Services Group

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_2O
Effective Stack Area, A_s:	283.528737 ft^2	Sample Volume, V_m:	40.802 ft^3
Pitot Coefficient, Cp:	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_2O
	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:

$V_{w(std)} = 4.714E\text{-}02 \times V_{lc}$	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
$I = (T_s + 460) \times ((2.67E\text{-}03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / (\theta \times P_s \times A_n \times v_s$	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:

$C_{H2SO4} = 1.081E\text{-}04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)} =$	6.031E-07 lb/dscf
$E_{H2SO4} = C_{H2SO4} \times Q_{s(std)} \times 60 =$	32.0 lb/hr

TECO
TAMPA ELECTRIC

Environmental Affairs
Air Services Group

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, θ:	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_2O
Effective Stack Area, A_s:	283.528737 ft^2	Sample Volume, V_m:	40.802 ft^3
Pitot Coefficient, Cp:	0.84 dimensionless	Average Meter Temp., T_m:	98.2 ^oF
Gas Analysis:	8.0 % CO_2	Average Stack Temp., T_s:	309.2 ^oF
	12.0 % O_2	Average $\sqrt{\Delta p}$:	1.186 "H_2O
	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:

$V_{w(std)} = 4.714E\text{-}02 \times V_{lc}$	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
$I = (T_s + 460) \times ((2.67E\text{-}03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / (\theta \times P_s \times A_n \times v_s$	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:

$C_{H2SO4} = 1.081E\text{-}04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)} =$	4.317E-07 lb/dscf
$E_{H2SO4} = C_{H2SO4} \times Q_{s(std)} \times 60 =$	22.8 lb/hr

TECO
TAMPA ELECTRIC

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
Location Code: PK-STK-S
Location Description: Polk Stack test ,SO3 analysis
Project Account Code:

Sampled By: JUAN RAMIREZ
Date Sampled: 04/23/2002
Time Sampled: 5:00:00 PM

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

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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 So2	30-DAY Oil (lbs)	30-DAY Gas (lbs)	Daily Oil (lbs)	Daily Gas (lbs)	Hours Boiler
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 Nox	30-DAY Oil (lbs)	30-DAY Gas (lbs)	Daily Oil (lbs)	Daily Gas (lbs)	Hours Boiler
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 1TSYFI910	GT GEN LOAD WATTS 1PWRJI900	GT GENERATOR WATTS 1GMLJI962	GT N2 FLOW 1NITFI920A	GT CPRSR MAX INL FLANGE TE 1TMSTI922M	AMBIENT BAR PRESSURE 1TMSPI909
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	101.52402496	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	100.88351746	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	77.6552	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	121.4664	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	121.3588	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

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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
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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	189.616	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	189.882	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.

SINCE 1908®

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

April 25, 2002

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 %

TEST	RESULTS
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

Commercial Testing & Engineering Co.
SINCE 1908

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

Victoria A. Linde
Operations Manager

VAL/ne

SINCE 1908®

Commercial Testing & Engineering Co.

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

April 25, 2002

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**

TEST	(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

	(B)	(C)
RELATIVE DENSITY	0.7974	0.7828

TAMPA ELECTRIC COMPANY
5010 Causeway Blvd.
Tampa, FL 33619

CERTIFICATE OF ANALYSIS - 08-5625 (continued)

	RESULTS (B)	(C)
HEATING VALUE, BTU/cf, GROSS, 14.73 psia, 60 deg. F		
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

Victoria A. Linde
Operations Manager

VAL/ne

APPENDIX F

FIELD DATA SHEETS

Sulfuric Acid Mist Field Data Form

Plant	Elk Power Sta.	Nozzle I.D. No.	#6	Dry Gas Meter Volume	
Location	Unit 1	Nozzle Diameter	0.196	Final	107.863 Ft³
Date	4/23/02	Pitot Tube No.		Initial	67.535 Ft³
Method No.	USEPA Method 8	Pitot Tube (C_p)	.84	Net	40.328 Ft³
Run No.	1	Probe Length	12 ft		
Box Operator	JFR	Probe Liner Material	Pyrex Glass	Equipment Leak Checks	
Probe Operator	JAV/CD/MPS	Probe Heater Setting	250	Initial	0.000 CFM @ 15 "Hg
Time - Start: 1008 End: 1116		Pressure	Pb ("Hg): 29.73 Pg ("H2O): Ps ("Hg):	Final	0.000 CFM @ 8 "Hg
Sampling Time	60	Ambient Temperature	81	Pitot Tube	5.7 "H2O
Min.\Pt.	2.5	Assumed Moisture (%)	6.5	Moisture Determination	
Meter Box No.	1	Filter Holder No.	021	Impinger	32/144/120 ml
Stack Area Ft³	283.529	Comments		Silica Gel	19.1 gm
Meter Cal. (ΔH)	1.837			Total	55.1 ml
Meter Cal. (ΔY)	1.000				

Traverse Point No.	Clock Time	Gas Sample Volume (Ft³)	ΔP (In. H_2O)	ΔH (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
A1	1008	67.535	1.35	1.43	240	307	77/77	—	66	4.0
2		69.23	1.50	1.59	244	308	77/79	—	67	4.5
3		70.95	1.50	1.59	240	307	76/81	—	66	4.5
4		72.71	1.40	1.48	244	307	76/80	—	68	4.5
5		74.39	1.50	1.59	242	307	76/80	—	68	4.5
6		76.07	1.40	1.49	241	307	77/81	—	68	4.5
END	1023	77.777	—	—	—	—	—	—	—	—
B1	1026	77.777	1.30	1.38	242	305	77/79	—	68	4.5
2		79.41	1.30	1.38	240	308	77/81	—	67	4.0
3		81.04	1.30	1.38	241	308	78/82	—	66	4.0
4		82.68	1.40	1.49	241	308	78/83	—	61	4.0
5		84.34	1.40	1.49	240	308	78/83	—	61	4.0
6		86.01	1.20	1.28	241	307	79/83	—	61	4.0
END	1041	87.586	—	—	—	—	—	—	—	—

Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (Ft^3)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
C 1	1043	87.586	1.40	1.49	240	307	79/80	—	66	4.0
2		89.22	1.30	1.38	247	308	80/83	—	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		94.27	1.40	1.49	240	307	80/84	—	61	4.0
6		95.90	1.20	1.28	234	306	81/85	—	63	4.0
END	1058	97.527	—	—	—	—	—	—	—	—
~~B1~~		~~97.527~~	~~1.40~~	~~1.49~~	~~240~~	~~307~~	~~81/83~~	—	66	~~4.0~~
B1	1101	97.527	1.40	1.49	240	307	81/83	—	66	4.0
2		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	POLK POWER STATION	Nozzle I.D. No.	#6	Dry Gas Meter Volume	
Location	UNIT 1	Nozzle Diameter	0.198	Final	159.285 Ft³
Date	4/23/02	Pitot Tube No.		Initial	118.483 Ft³
Method No.	Method 8	Pitot Tube (C_p)	0.84	Net	40.802 Ft³
Run No.	2	Probe Length	14'		
Box Operator	JER	Probe Liner Material	glass	Equipment Leak Checks	
Probe Operator	JAV/LD/MPS	Probe Heater Setting	250	Initial	0.000 CFM @ 15 "Hg
Time - Start:	1152 End: 1301	Pressure	Pb ("Hg): Pg ("H20): Ps ("Hg):	Final	CFM @ "H20
Sampling Time	60	Ambient Temperature	55	Pitot Tube	~~0.84~~ 6.0 "H20
Min.\Pt.	2.5	Assumed Moisture (%)	6.5		
Meter Box No.	1	Filter Holder No.	003	Moisture Determination	
Stack Area Ft³	283.529	Comments		Impinger	76, 126, 116 ml
Meter Cal. (ΔH)	1.833			Silica Gel	28.1 gm
Meter Cal. (ΔY)	1.000			Total	46.1 ml

Traverse Point No.	Clock Time	Gas Sample Volume (Ft³)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
B1	~~11~~ 1152	118.483	1.40	1.49	200	308	81/81	—	68	5.5
2		120.20	1.40	1.49	244	~~308~~ 310	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	~~1.50~~ 1.60	1.71	241	310	82/87	—	~~0~~ 68	5.5
6		127.20	1.60	1.72	246	308	83/88	—	68	6.0
END	1207	129.000	—	—	—	—	—	—	—	—
C1	1240	129.000	1.40	1.49	246	308	83/82	—	68	6.5
2		130.66	1.50	1.61	242	308	82/87	—	68	5.0
3		132.41	1.40	1.50	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	240	307	83/90	—	63	4.0
END	1215	139.102								

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Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (Ft³)	Δ P (In. H_2O)	Δ H (In. H_2O)	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	84/92	—	61	4.5
3		142.37	1.30	1.40	242	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		147.53	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	1.42	241	307	88/99	—	62	5.5
END	1301	159.285	—	—	—	—	—	—	—	—

Sulfuric Acid Mist Field Data Form BEST AVAILABLE COPY

Plant	Polk Power Station	Nozzle I.D. No.	#6	Dry Gas Meter Volume Final	311,657 Ft³
Location	Unit 1	Nozzle Diameter	0.198	Initial	169,494 Ft³
Date	4/23/02	Pitot Tube No.		Net	42,163 Ft³
Method No.	method 8	Pitot Tube (C_p)	0.84		
Run No.	3	Probe Length	14'	Equipment Leak Checks	
Box Operator	JFR	Probe Liner Material	glass	Initial	0.000 CFM @ 15 "Hg
Probe Operator	JAV / CO / MPS	Probe Heater Setting		Final	0.000 CFM @ 8 "H2O
Time - Start:	1346 End: 1453	Pressure	Pb ("Hg): Pg ("H2O): Ps ("Hg):	Pitot Tube	7.0 "H2O
Sampling Time	60	Ambient Temperature	90		
Min.\ Pt.	2.5	Assumed Moisture (%)	6.5	Moisture Determination	
Meter Box No.	1	Filter Holder No.	002	Impinger	78, 126, 112 ml
Stack Area Ft.³	283.529	Comments		Silica Gel	31.4 gm
Meter Cal. (ΔH)	1.833			Total	471 ml
Meter Cal. (ΔY)	1.00				

Traverse Point No.	Clock Time	Gas Sample Volume (Ft³)	Δ P (In. H_2O)	Δ H (In. H_2O)	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	95/104	—	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	2~~4~~0	308	93/95	—	60	4.0
2		181.71	1.40 ~~1.30~~	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 ~~240~~	310	93/100	—	65	4.0
5		186.94	1.50	1.64	261	311	93/100	—	65	4
6		188.72	~~1.30~~ 1.30	1.42	254	310	94/101	—	65	
End	1418	190.402	JM							

shardata\air&wast\testform\samfdf

Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (Ft^3)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
C 1	1421	190.402	1.40	~~1.40~~ 1.53	252	308	95 / 98	—	63	4.0
2		192.19	1.40	1.54	250	310	95/104	—	66	4.0
3		193.90	1.50	1.65	250	308	95/104	—	66	5.0
4		195.71	1.50	1.65	248	305	96/104	—	67	5.0
5		197.54	~~1.44~~ 1.49	1.54	248	308	96/104	—	67	5.0
6		199.34	1.20	1.32	248	307	96/104	—	68	5.0
END	1436	200.988	—	—	—	—	—	—	—	—
B 1	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 Polk Unit #1 Location Polk Power Station

Run No.	Date	Gas	Orsat Analysis, Dry Basis (% Volume)				Remarks
			1	2	3	Avg.	
1	4/23/02	CO2	8	8	8	8	F_0 = 1.11
		O2	12	12	12	12	
		CO	0	0	0		
		N2	80	80	80	80	
2	4/23/02	CO2	8	8	8	8	F_0 = 1.11
		O2	12	12	12	12	
		CO	0	0	0	0	
		N2	80	80	80	80	
3	4/23/02	CO2	8	8	8	8	F_0 = 1.11
		O2	12	12	12	12	
		CO	0	0	0	0	
		N2	80	80	80	80	

APPENDIX G

SAMPLING EQUIPMENT CALIBRATIONS

Thermo Andersen

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_2O	Spirometer (wet meter) gas volume V_w ft^3	Dry gas meter volume V_m ft^3	Temperatures: Spirometer (wet meter) t_w °F	Temperatures: Dry Gas Meter: Inlet t_i °F	Temperatures: Dry Gas Meter: Outlet t_o °F	Temperatures: Dry Gas Meter: Average t_m °F	Time Θ min
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_2O	Y: $\frac{V_w\ P_b\ (t_m + 460)}{V_m\ [P_b + \frac{\Delta H}{13.6}]\ (t_w + 460)}$	$\Delta H@$: $\frac{0.0319\ \Delta H}{P_b\ (t_o + 460)}\left[\frac{(t_w + 460)\ \Theta}{V_w}\right]^2$
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. H_2O; tolerance for individual values ± 0.20 from average.

Calibrated by: [signature]

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 Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Ambient Temperature Initial (deg F)	Ambient Temperature Final (deg F)	Ambient Temperature 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 --- VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	-------- ORIFICE -------- VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	-- DRY GAS METER -- CALIBRATION FACTOR Y Value (number)	Y Variation (number)	-------- ORIFICE -------- CALIBRATION FACTOR dH@ Value (in H2O)	dH@ Value (mm H2O)	dH@ Variation (in H2O)
6.055	171.5	6.046	171.2	6.105	0.998	-0.001	1.736	44.08	0.002
6.044	171.2	6.046	171.2	6.105	1.000	0.001	1.732	44.00	-0.001
6.044	171.2	6.046	171.2	6.105	1.000	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 H20 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] TAM 5/24/2002 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.) D1	D2	D3	D diff.	D avg
#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: [signature]
DATE: 4/5/2002

Page 1 OF 1

FINAL NOZZLE CALIBRATION DATA FORM

NOZZLE SET NO. 1

DATE: 05/14/2002

CALIBRATED BY: R. A. Barthelette Jr.

NOZZLE IDENTIFICATION	NOZZLE DIAMETER			¼D (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.

¼D= maximum difference between any two diameters,(in). ¼D¥ 0.004 in.

D AVG= average of D1,D2 and D3.

SHARDATA\AIR SERVICES\CALS\NOZZLES\POSTTEST\NOZCALF

Reviewed By: [signature]
Date: 5/21/2002

Environmental Affairs
Air Services

TECO
TAMPA ELECTRIC

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

α 1	0.7	degrees	*Pass*
α 2	0.1	degrees	*Pass*
β 1	0.9	degrees	*Pass*
β 2	0.1	degrees	*Pass*

Gamma, Theta, A, Z, and W Determinations

ψ	0.3	degrees	
A	2.5	cm	
Z	0.013	cm	*Pass*
o	0.5	degrees	
W	0.0218	cm	*Pass*

Acceptable Limits:

Dt 0.48 < Dt > 0.95 cm
α < 10 degrees
(α1 measured across top impact openings)
(α2 measured across bottom impact openings)
β1 < 5 degrees (alongside top impact openings)
β2 < 5 degrees (alongside bottom impact openings)
Z < 0.32 cm (Asinψ)
W < 0.08 cm (Asino)
A distance between tips
o 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: 4/12/2002

5010 Causeway Blvd., Tampa, FL. 33619

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

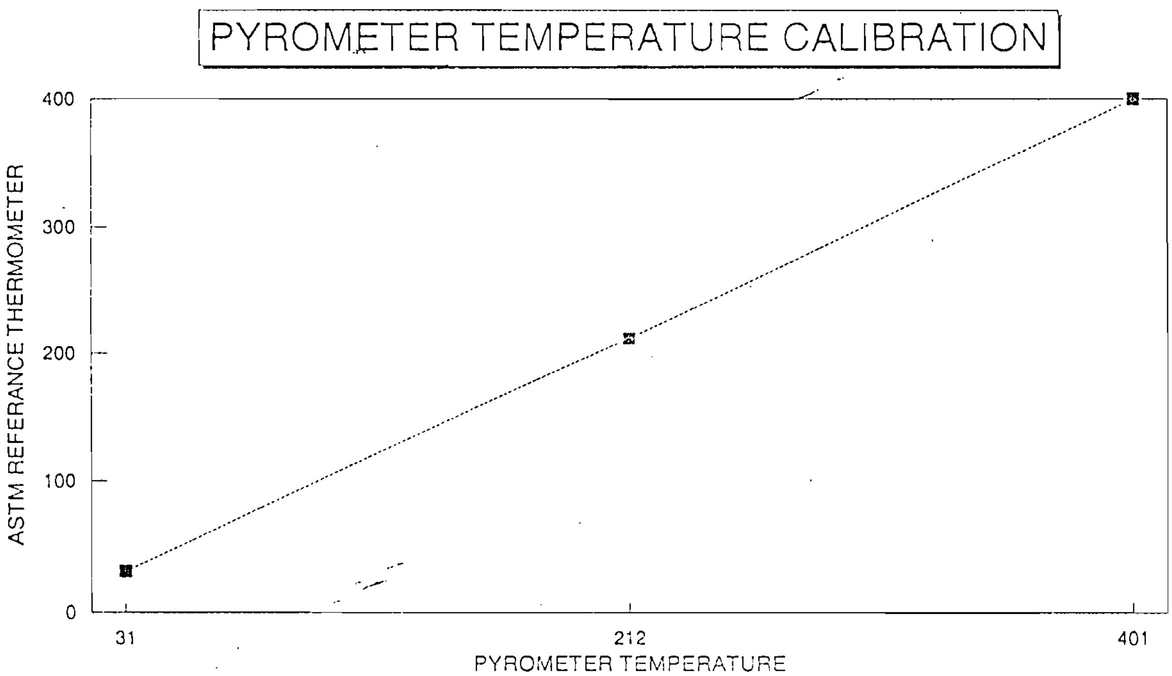
PYROMETER CALIBRATION

PYROMETER NO.: 15 REFERENCE THERMOMETER: HART SCIENTIFIC

CTL SERIAL NO.: 15 SERIAL NO.: CAL01

DATE: 05/13/02 CALIBRATOR: crd

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



REVIEWED BY: [signature] DATE: 5/13/2002

shardata\airservices\cals\pyros\pyro#15

APPENDIX H

CHAIN OF CUSTODY

ANALYSIS REQUEST & CHAIN OF CUSTODY

TECO TAMPA ELECTRIC

ENVIRONMENTAL SERVICES

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

PROJECT REFERENCE	PROJECT NO.	PROJECT LOCATION (STATE)	REQUIRED ANALYSIS	DUE DATE
SAMPLER'S PRINTED NAME Juan Ramirez	SAMPLER'S SIGNATURE Juan Ramirez		503	26 APR 02
P.O. NUMBER	CONTRACT NO.	SITE		☐ EMAIL RESULTS
CLIENT NAME	CLIENT PHONE	CLIENT FAX		☐ FAX RESULTS ☐ MAIL RESULTS
CLIENT EMAIL	CLIENT ADDRESS		PRESERVATIVE	NUMBER OF COOLERS SUBMITTED PER SHIPMENT:

SAMPLE ID	SAMPLE DESCRIPTION	SAMPLING DATE	SAMPLING TIME	* MATRIX	NUMBER OF CONTAINERS SUBMITTED						REMARKS
Run #1		23APR02	1700	IPA	1						AA65187 gah
Run #2		23APR02	1700	IPA	1						
Run #3		23APR02	1700	IPA	1						
Blank		23APR02	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 ☐ Yes ☐ No ON ICE/ 4°C ☐ Yes ☐ No

SAMPLE TRANSFERS

RELINQUISHED BY:	RECEIVED BY:	DATE	TIME
PERSON'S NAME: Juan Ramirez FACILITY NAME: Air group	PERSON'S NAME: Gail A. Harrison FACILITY NAME:	4-23-02	9:20
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		
PERSON'S NAME: FACILITY NAME:	PERSON'S 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: 630-953-9306
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 Indentification:
CTE #13 - 300cc Cylinder
CTE #26 - 300cc Cylinder
CTE #33 - 300cc Cylinder

Received by: [signature]

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.

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

-$\widehat{\alpha}_p$-

TAMPA ELECTRIC

RECEIVED

APR 24 2002

BUREAU OF AIR REGULATION

April 11, 2002

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

Raiza Calderon
Engineer
Environmental Affairs

EA/bmr/RC119

c: Mr. I. 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.
SS

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 Ed Svec

Considerations for Title V permit
SH
7/17

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

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 qualitatitive 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.

<u>**TEC Response**</u>
This Condition has been satisfied; the log is provided in the Attachment A-Test Burn Report, Appendix A.

<u>FDEP Condition 3</u>
Emissions due to biomass gasification shall not exceed any current limits in existing permits for all impacted emission units.

<u>**TEC Response**</u>
There was no exceedance of emissions of any current limits in existing permits.

<u>FDEP Condition 4</u>
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.

<u>**TEC Response**</u>
The analysis is provided in the Attachment A-Test Burn Report, Table 5.

<u>FDEP Condition 5</u>
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.

<u>**TEC Response**</u>
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 that 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.

<u>FDEP Condition 6</u>
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."

<u>**TEC Response**</u>
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.

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

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

TECO

TAMPA ELECTRIC

Biomass Test Burn Report

Polk Power Station Unit 1

April 2002

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.

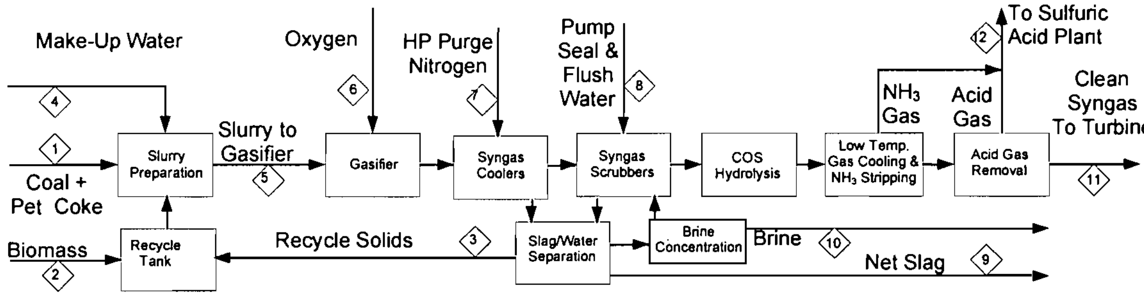
The IGCC process consists of several steps that ultimately result in the production of electrical power (Figure 1). Solid fuel is homogenized and mixed with water to produce slurry. The slurry is then passed to the gasifier that produces a high-pressure combustible gas (synthetic gas or "syngas"). After 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-parametricWilcoxon rank rum 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 81and 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 vales 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
	Units	COKE + COAL (Lab)	COKE + COAL (Calculated)	BIOMASS	COMBINED FRESH FUELS	RECYCLE SOLIDS	MAKE-UP WATER	SLURRY TO GASIFIER
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 FLOW	KPPH DRY	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 Solids	"	151950	151950	1035	152985	14196		167181
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.

		GASIFICATION SYSTEM INPUTS					GASIFICATION SYSTEM OUTPUTS					
STREAM NUMBER		**5**	**6**	**7**	**8**		**9**	**3**	**10**	**11**	**12**	
GAS STREAMS	UNITS	SLURRY TO GASIFIER	OXYGEN	HP PURGE NITROGEN	SEAL & FLUSH WATER	TOTAL SYSTEM INPUT	SLAG	RECYCLE SOLIDS	BRINE (NH_4Cl)	CLEAN SYNGAS	ACID GASES	TOTAL SYSTEM OUTPUT
CO	VOL %		0	0						44.72	2.06	
H2	VOL %		0	0						36.02	0.52	
CH4	VOL %		0	0						0.02	0.02	
CO2	VOL %		0	0						15.01	66.42	
N2	VOL %		1.08	99.99						3.33	0	
Ar	VOL %		2.01	0						0.65	0	
H2O	VOL %		0	0						0.21	5.26	
H2S	VOL %		0	0						0.01	21.02	
COS	VOL %		0	0						0.01	0.06	
NH3	VOL %		0	0						0	4.62	
O2	VOL %		96.9	0.01						0	0.01	
TOTAL	VOL %		100	100						100	100	
MOLECULAR WT	LB/MOLE		32.12	28.02						21.1	38.76	
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			
H2O	WT %	36.77					30	82.5				
H2O FLOW	KPPH	97.22			19.489		5.207	66.924				
TOTAL FLOW	KPPH	264.401					17.356	81.12				
ELEMENTAL FLOWS / BALANCE:												
C	LB/HR	134877	0	0		**134877**	5148	9406		114880	5443	**134877**
H	LB/HR	18130	0	0	2181	**20311**	620	7530	2	11709	450	**20311**
N	LB/HR	2911	1580	11066		**15558**	53	135	6	14936	428	**15558**
S	LB/HR	5119	0	0		**5119**	179	328		144	4469	**5119**
O	LB/HR	92331	161177	1	17308	**270817**	4624	59435		191926	14832	**270817**
ASH	LB/HR	11031	0	0		**11031**	6732	4286	14	0	0	**11031**
Ar	LB/HR	0	4184	0		**4184**				4184	0	**4184**
TOTAL	LB/HR	264401	166941	11067	19489	461898	17356	81120	21	337779	25623	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 then 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
	Units		
Total Moisture	Wt %	7.82	46.8
Ultimate Analysis			
Ash	Wt % (Dry Basis)	4.25	5.32
C	Wt % (Dry Basis)	82.88	49.18
H	Wt % (Dry Basis)	4.5	5.78
N	Wt % (Dry Basis)	1.85	0.24
S	Wt % (Dry Basis)	2.99	0.06
O	Wt % (Dry Basis)	3.53	39.42
Heating Value			
Measured HHV	BTU/Lb (Dry Basis)	14435	8213
Calculated HHV	BTU/Lb (Dry Basis)	14490	8419
Miscellaneous			
T_{250}	Deg F	2560	2188
Chlorine	Wt % (Dry Basis in Coal)	0.02	0.07
Fluorine	Wt % (Dry Basis in Coal)	<0.01	34
Chromium	PPM (Wt) In Ash	136	85.9
Vanadium	Wt % In Ash	2.286	0.63
Nickel	ug/g dry coal	166	1300
Arsenic	ug/g dry coal	2.1	35.3
Mercury	ug/g dry coal	0.03	0.02
Lead	ug/g dry coal	2.6	116
Beryllium	ug/g dry coal	1.3	9.2
Ash Minerals			
CrO	Wt % In Ash	0.02	0.01
V_2O_5	Wt % In Ash	4.08	1.12
NiO	Wt % In Ash	0.50	0.17
As_2O_3	Wt % In Ash	0.0065	0.0050
Hg	Wt % In Ash	0.000071	0.000002
PbO	Wt % In Ash	0.0066	0.0120
BeO	Wt % In Ash	0.0085	0.0030
SiO_2	Wt % In Ash	49.21	40.70
Al_2O_3	Wt % In Ash	20.52	4.98
TiO_2	Wt % In Ash	0.93	0.29
Fe_2O_3	Wt % In Ash	12.89	6.12
CaO	Wt % In Ash	3.34	22.31
MgO	Wt % In Ash	1.91	1.85
Na_2O	Wt % In Ash	0.57	1.41
K_2O	Wt % In Ash	2.04	3.64
P_2O_5	Wt % In Ash	0.16	1.44
SO_3	Wt % In Ash	3.4	3.67
Sum of Determined Minerals	Wt % In Ash	99.07	87.73
Undetermined Ash Minerals	Wt % In Ash	0.93	12.27

3.5 Emissions

A statistical analysis was performed comparing the mean NO_x and SO_2 emissions from the test burn to baseline emissions obtained immediately prior to the test burn. NO_x and SO_2 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 SO_2 emissions during the test burn were found to be slightly lower than NQ and SO_2 emissions during the baseline period. Figures 2 and 3 show graphs of test burn emissions compared to baseline emissions for NO_x and SO_2, 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 SO_2, 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 SO_2 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.

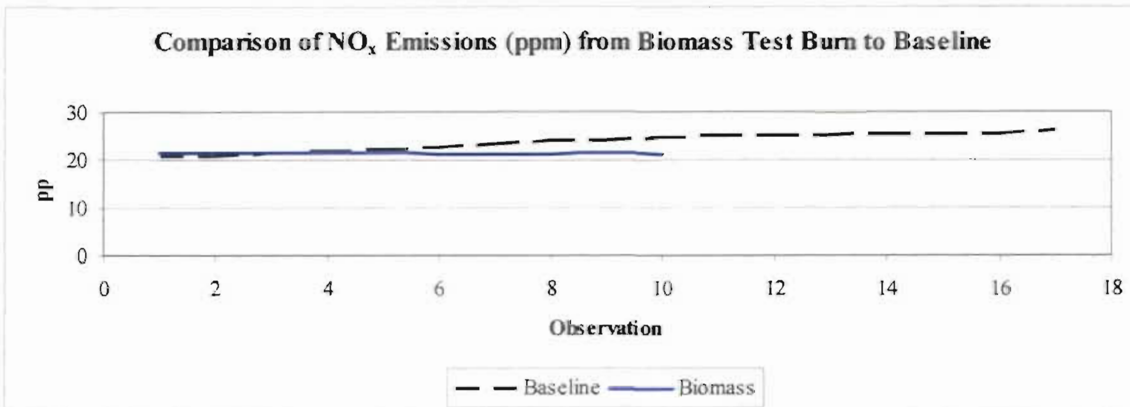
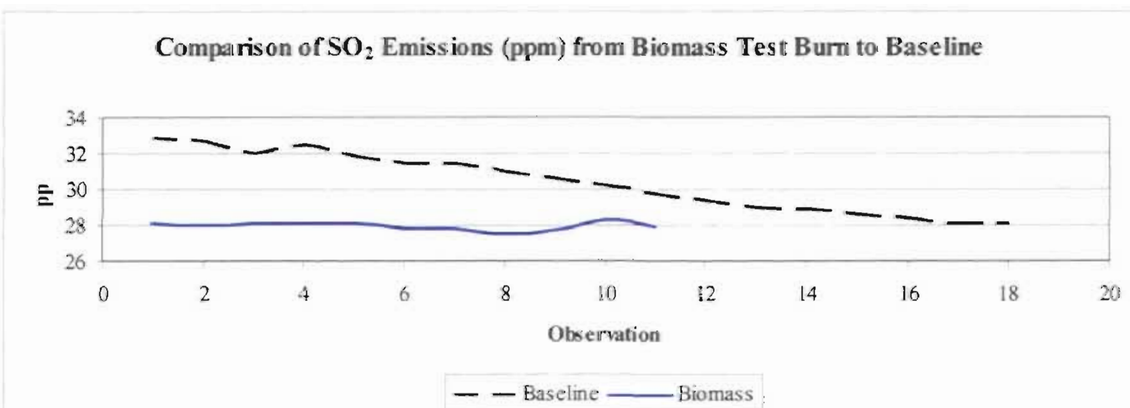


Figure 3. SO_2 emissions (ppm) from PPS Unit 1 during baseline and test burn periods.



Populations' mean and variance frequency distributions as measured by skewness and kurtosis approximated a normal distribution for both NQ and SO_2 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 NQ and SO_2 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 SO_2. 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 SO_2 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.

	NO_x				SO_2			
	ppm		lb/hr		ppm		lb/hr	
Parameter	**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 be required to accommodate the changes necessary to handle the biomass fuel. TEC appreciates the Department's attention to this process.

Appendix A
Biomass Logs

BEST AVAILABLE COPY

DELIVERY TICKET

№ 100451

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

TARE WT: 17.08 LBS. TN

NET WT: ________ LBS.

MILEAGE:

DELIVER TO: Teco Power Plant

DIRECTIONS: Mulberry 37 south

RECEIVED BY:______

COMPANY: Wherry

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

4:46PM 12-30-2001

LOOP ID 02
PRODUCT 02

INBOUND 25.89 TN

POLK POWER STATION
9995 SR37 SOUTH
MULBERRY FL 33860
MT WEST

5:46PM 12-30-2001

TICKET NUMBER 2

LOOP ID 02
PRODUCT 02

17.08 TN GROSS

POLK POWER STATION
9995 SR37 SOUTH
MULBERRY FL 33860
MT WEST

25.89 t
17.08 t
8.81 t

12/31/01

BIOMASS TEST

780 LB TOTES - DUMP TIMES

WOOD DUMP TIMES

	START	DONE
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

SEVERN TRENT SERVICES
6712 Benjamin Road • Suite 100 • Tampa, FL 33634 • Tel: 813 885 7427 • Fax: 813 885 7049 • www.stl-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

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

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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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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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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

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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

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

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	

PARAMETER	10196-8	10196-9	10196-10	10196-11
Color (110.2)	<5	100 %	0 %	TS
Analysis Date	01.17.02	01.17.02	---	---
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	---	---
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	---	---
Biochemical Oxygen Demand carbonaceous BOD-5 (SM5210B), mg/l	<2.0	97 %	10 %	EM
Analysis Date	01.16.02	01.16.02	---	---

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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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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	---	---

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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	---	---

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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
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

Serial Number 005362

SEVERN TRENT SERVICES

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
SAMPLER'S SIGNATURE	P.O. NUMBER	CONTRACT NO.
CLIENT (SITE) PM MIKE VALDER	CLIENT PHONE 630-7378	CLIENT FAX 630-7366
CLIENT NAME TPC ENVIRON. AFFAIRS	CLIENT E-MAIL	
CLIENT ADDRESS 5010 CAUSEWAY BLVD. TAMPA, FL 33619		
COMPANY CONTRACTING THIS WORK (if applicable)		

PAGE 1 OF 1

STANDARD REPORT DELIVERY
DATE DUE

EXPEDITED REPORT DELIVERY (SURCHARGE)
DATE DUE

NUMBER OF COOLERS SUBMITTED PER SHIPMENT: 2

MATRIX TYPE: COMPOSITE (C) OR GRAB (G) INDICATE / AQUEOUS (WATER) / SOLID OR SEMISOLID / AIR / NONAQUEOUS LIQUID (OIL, SOLVENT, ...)

REQUIRED ANALYSIS — PRESERVATIVE — NUMBER OF CONTAINERS SUBMITTED

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	C/G	AQUEOUS	SOLID	AIR	NONAQUEOUS	602 NAPHTHALENE (HCl)	610 METHYL NAPH	COLOR	CBOD	SPLP (SEE ATTACHMENT)	VOLATILES	SEMI-VOLATILES	TOTAL As, Ba, Cd, Cr, Pb, Se, Ag	TOTAL CHLORIDE		REMARKS
1-15-02	1405	PK-2S-SA	G	✓				3	2	1	—	—	—	—	—			DUE: 2-5-02
1-15-02	1510	PK-2LI-Q	G	✓				3	2	1	—	—	—	—	—			DUE: 2-5-02
1-15-02	1435	PK-2F-Q	G	✓				3	2	1	—	—	—	—	—			DUE: 2-5-02
1-15-02	1155	AA63846	G	✓				—	—	—	1	—	—	—	—	→		DUE: 1-29-02
12-31-01	1500	SPECL-PK	C		✓			—	—	—	—	1	—	—	—	→		SEE ATTACHMENT DUE: 2-1-02
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)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
~~[signature]~~	~~12-26-01~~	~~0815~~	[signature]	1-16-02	0925			
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
[signature]	1-15-02		[signature]	011602	0925			

LABORATORY USE ONLY 4.0

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	STL TAMPA WEST LOG NO.	LABORATORY REMARKS
[signature]	1-16-02	1230	YES ✗ NO ○	N/S	BZ10196	

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

-file-

TAMPA ELECTRIC

RECEIVED

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.*

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

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

-9-

TAMPA ELECTRIC

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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.

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

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

-file-

TECO SM

TAMPA ELECTRIC

RECEIVED

APR 01 2002

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-Fl-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 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

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

-fle-

TAMPA ELECTRIC

March 21, 2002

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

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

TAMPA ELECTRIC

RECEIVED
MAR 08 2002
BUREAU OF AIR REGULATION

March 4, 2002

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

Via FedEx
Airbill No. 7924 9647 0770

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\gm\JJH947

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

ORIGINAL: Scott S
XC: HLP 2/14

RECEIVED
FEB 0 2002
DIVISION OF AIR RESOURCES MANAGEMENT

RECEIVED
FEB 15 2002
BUREAU OF AIR REGULATION

TECO
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

Via Fax and Mail

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.

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

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% O_2 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% O_2, 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

Gregory M. Nelson
Director
Environmental Affairs

EA/bmr/GMN128

FLORIDA

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.

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

COMPLETE THIS SECTION ON DELIVERY

A. Received by *(Please Print Clearly)* Brandy Rhind

B. Date of Delivery 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
X☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Copy from service label)*
7000 0520 0020 9371 2653

PS Form 3811, July 1999 Domestic Return Receipt 102595-00-M-0952

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7000 0520 0020 9371 2653

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

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

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

- 610 -

TECO

TAMPA ELECTRIC

RECEIVED

JAN 22 2002

BUREAU OF AIR REGULATION

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

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 SO_2 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

components (CO, H_2, CO_2, N_2, Ar, H_2S, 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 SO_2, NO_x and CO_2. 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

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

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

EA/bmr/DNL107

TAMPA ELECTRIC

REC ED
JAN 07 2002
BUREAU OF AIR REGULATION

December 28, 2001

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

Via FedEx
Airbill No. 7902 5966 8946

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

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL106

cc: Mr. Scott Sheplak, FDEP

TAMPA ELECTRIC COMPANY
P. O. BOX 111 TAMPA, FL 33601-0111
(813) 228-4111

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OUTSIDE HILLSBOROUGH COUNTY 1 (888) 223-0800

TEC0

TAMPA ELECTRIC

December 28, 2001

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

Via FedEx
Airbill No.7902 5966 5980

RECEIVED
DEC 31 2001
BUREAU OF AIR REGULATION

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

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL105

cc: Mr. William A. Proses, P.E.

-file-

TAMPA ELECTRIC

RECEIVED

DEC 24 2001

BUREAU OF AIR REGULATION

December 21, 2001

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. 7917 3941 6735

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

Dear Mr. Sheplak:

Tampa Electric Company (TEC) has received the Florida Department of Environmental Protection's (the Department) second letter of incompleteness dated December 14, 2001 addressing TEC's request for permission to conduct a biomass test burn at Polk Power Station Unit 1 (Polk Unit 1). The intent of the test burn is to answer questions concerning any emissions impact that the biomass will have on Polk Unit 1. In addition, the proposed test burn will allow TEC to evaluate any additional fuel handling and operational impacts associated with gasifying biomass in Polk Unit 1.

This correspondence is intended to provide a response to each specific issue raised by the Department. For your convenience, TEC has restated each point and provided a response below each specific issue.

FDEP Issue 1
It remains unclear to the Department how the existing handling and feed systems will be utilized with the biomass fuel. For example, will the fuel be transported from the trucks to a storage pile? Where will the pile be located? Will the pile be covered or open to atmospheric conditions? How will the fuel be ground, and how will it be moved to the grinding equipment? Will it be batch-fed or will an effort be made to maintain a continuous coal/biomass ratio (please be specific)? Will it be slurried directly with the coal? These questions are representative of level of description, which the Departments seeks, regarding storage, handling and feed systems.

TEC Response
For the purposes of the proposed test burn, the fuel is expected to be ground by the supplier or at F.J. Gannon Station and trucked to Polk. Tampa Electric is already permitted to burn wood derived fuel at F.J. Gannon Station and the associated wood grinding operations were included in the Title V permit modification. To the extent possible, TEC will use existing fuel

handling and feed systems that are in place at the plant. As such, it is expected that the biomass material will be unloaded from the delivery trucks to the conveyors that feed the fuel silos. The material will then be batch-fed to the system, but will ultimately be mixed with coal in the silos in an effort to maintain a continuous biomass/coal ratio. The biomass material will be directly slurried with the coal.

FDEP Issue 2

Biomass fuels typically have higher water contents than coal. Please explain how moisture removal and disposal will be accommodated, or will the additional water end up in the syngas?

TEC Response

The fuel being gasified at Polk is introduced in a slurry state, i.e., a mix of crushed fuel and water. Therefore, Tampa Electric does not expect the moisture content in the biomass to be an issue of concern.

FDEP Issue 3

In the December response, TEC indicated that it is not aware of any other IGCC facility that has attempted to gasify a blend of 5% biomass and coal. Inasmuch as this appears to be the first attempt at such a venture, the Department's opinion is that this request is not identical to other requests it has received to combust biomass. Therefore, the Department maintains that it wishes written confirmation by the manufacturer of the gasifier, that it is currently capable of accommodating the proposed fuel mix of coal (and/or petcoke) and biomass.

TEC Response

The gasifier at Polk was designed to accommodate a variety of fuels and Tampa Electric does not expect that the introduction of the biomass fuel will cause detrimental effects to the gasifier. However, through the performance of a test burn, TEC will observe the behavior of the gasifier in response to the proposed introduction of a blend of 5% biomass and coal. It is from the results of the test burn that TEC will determine if the gasifier will be truly capable of accommodating the proposed fuel mix. Obtaining written confirmation from the manufacturer that the gasifier is currently capable of accommodating the proposed fuel mix will be a lengthy process. In the interest of moving the test burn forward, TEC requests that the Department allow TEC to move forward and consider the operational results of the test burn to be confirmation that the gasifier is capable, or not capable, of accommodating the proposed fuel mix

FDEP Issue 4

As previously indicated, the Department is aware that one of the largest impediments to the widespread use of biomass is its tendency to form unmanageable ash deposits. In the event that TEC intends to ultimately combust the (beneficiated) slag, the Department will require TEC to segregate the "co-fired" gasifier slag and provide a protocol for analysis of the quantity and quality. Based upon these results, TEC may propose a method for disposal after the test burn.

<u>**TEC Response**</u>

Though the firing of biomass in traditional coal-fired boilers may lead to increased ash deposits due to the nature of the materials combusted, TEC does not expect the gasification process at Polk to be affected by these concerns. Gasification is a separate and unique process in comparison to traditional coal-fired boilers. Due to the unique nature of the gasification process and the small amount of biomass proposed for gasification, TEC does not expect the gasification of biomass to impact the quantity or quality of the residual fuel from gasification. Because of this, TEC requests that the Department consider postponing the decision to segregate the residual fuel produced from the gasification of the 5% biomass and coal blend from the residual fuel currently produced at the facility until the results of the test burn are complete. Should issues arise indicating a need for additional requirements related to the residual fuel, the Department and TEC can develop a protocol for the analysis of the quantity and quality at that time.

<u>FDEP Issue 5</u>

The Department needs TEC to provide a protocol for syngas fuel analysis for each blend of biomass and coal/petcoke tested.

<u>**TEC Response**</u>

Due to the physical nature of biomass and coal, it is difficult to perform laboratory analyses that are representative of the exact percentages of blended materials. Therefore, TEC proposes to perform individual fuel analyses on the biomass and coal separately, then develop blend analyses by combining the individual fuel analyses using the percent by weight of the materials in the various blends incorporated during the test burn. These values, as they vary throughout the test burn, will be reported in the final test burn report.

<u>FDEP Issue 6</u>

In order to have reasonable assurance that a PSD review and associated public notices are not triggered for the proposed co-firing, the Department requires a summary of the *estimated* emission increases/decreases. This should be done at TEC's proposed maximum blend for each biomass and coal/petcoke fuel to be combusted. All assumptions should be clearly stated.

<u>**TEC Response**</u>

Due to the small amount of biomass that TEC is proposing to burn during the test burn, it is extremely unlikely that PSD review and the associated public notices will be triggered by the performance of the test burn. In addition, the unique nature of the Polk IGCC facility leads to a limited availability of emission factors for any fuel from an IGCC gasifier. The performance of the test burn will allow TEC to obtain actual data from the CEM system to evaluate emissions impact for PSD applicability. Should the results of the test burn suggest that the permanent inclusion of a 5% biomass/fuel blend in the unit's operation would trigger PSD review, then TEC would perform the necessary modeling and analysis required.

Provided in Attachment 1 of this document is the Responsible Official Certification. TEC appreciates the cooperation and consideration of the Department in this matter. If further questions or concerns arise pertaining to the additional information TEC has provided please contact me (813) 641-5376.

Sincerely,

Laura R. Crouch

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL104

Enclosure

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

Attachment 1

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 12-21-01 Signature Mark Hornick

General Manager

Polk Power Station

Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

December 21, 2001

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
Polk Power Station Unit 1
Facility ID No. 1050233

Dear Ms. Crouch:

The Department has reviewed the request from Tampa Electric Company received on October 25, 2001, and the supplementary information dated December 4 and December 21, 2001 concerning the gasification of 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.

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 28 days, and within 45 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 April 30, 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 30 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.

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. Additionally, metals contents (fluorides, chromium, arsenic, cadmium, mercury, lead, and beryllium) phosphorous, amines and organic silicon 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 within 14 days of sample collection.

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. 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.

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.

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.

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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

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

December 21, 2001

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. 7917 3941 6735

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

Dear Mr. Sheplak:

Tampa Electric Company (TEC) has received the Florida Department of Environmental Protection's (the Department) second letter of incompleteness dated December 14, 2001 addressing TEC's request for permission to conduct a biomass test burn at Polk Power Station Unit 1 (Polk Unit 1). The intent of the test burn is to answer questions concerning any emissions impact that the biomass will have on Polk Unit 1. In addition, the proposed test burn will allow TEC to evaluate any additional fuel handling and operational impacts associated with gasifying biomass in Polk Unit 1.

This correspondence is intended to provide a response to each specific issue raised by the Department. For your convenience, TEC has restated each point and provided a response below each specific issue.

FDEP Issue 1
It remains unclear to the Department how the existing handling and feed systems will be utilized with the biomass fuel. For example, will the fuel be transported from the trucks to a storage pile? Where will the pile be located? Will the pile be covered or open to atmospheric conditions? How will the fuel be ground, and how will it be moved to the grinding equipment? Will it be batch-fed or will an effort be made to maintain a continuous coal/biomass ratio (please be specific)? Will it be slurried directly with the coal? These questions are representative of level of description, which the Departments seeks, regarding storage, handling and feed systems.

TEC Response
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TEC Response

The fuel being gasified at Polk is introduced in a slurry state, i.e., a mix of crushed fuel and water. Therefore, Tampa Electric does not expect the moisture content in the biomass to be an issue of concern.

FDEP Issue 3

In the December response, TEC indicated that it is not aware of any other IGCC facility that has attempted to gasify a blend of 5% biomass and coal. Inasmuch as this appears to be the first attempt at such a venture, the Department's opinion is that this request is not identical to other requests it has received to combust biomass. Therefore, the Department maintains that it wishes written confirmation by the manufacturer of the gasifier, that it is currently capable of accommodating the proposed fuel mix of coal (and/or petcoke) and biomass.

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FDEP Issue 4

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<u>TEC Response</u>

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<u>FDEP Issue 5</u>

The Department needs TEC to provide a protocol for syngas fuel analysis for each blend of biomass and coal/petcoke tested.

<u>TEC Response</u>

Due to the physical nature of biomass and coal, it is difficult to perform laboratory analyses that are representative of the exact percentages of blended materials. Therefore, TEC proposes to perform individual fuel analyses on the biomass and coal separately, then develop blend analyses by combining the individual fuel analyses using the percent by weight of the materials in the various blends incorporated during the test burn. These values, as they vary throughout the test burn, will be reported in the final test burn report.

<u>FDEP Issue 6</u>

In order to have reasonable assurance that a PSD review and associated public notices are not triggered for the proposed co-firing, the Department requires a summary of the *estimated* emission increases/decreases. This should be done at TEC's proposed maximum blend for each biomass and coal/petcoke fuel to be combusted. All assumptions should be clearly stated.

<u>TEC Response</u>

Due to the small amount of biomass that TEC is proposing to burn during the test burn, it is extremely unlikely that PSD review and the associated public notices will be triggered by the performance of the test burn. In addition, the unique nature of the Polk IGCC facility leads to a limited availability of emission factors for any fuel from an IGCC gasifier. The performance of the test burn will allow TEC to obtain actual data from the CEM system to evaluate emissions impact for PSD applicability. Should the results of the test burn suggest that the permanent inclusion of a 5% biomass/fuel blend in the unit's operation would trigger PSD review, then TEC would perform the necessary modeling and analysis required.

Provided in Attachment 1 of this document is the Responsible Official Certification. TEC appreciates the cooperation and consideration of the Department in this matter. If further questions or concerns arise pertaining to the additional information TEC has provided please contact me (813) 641-5376.

Sincerely,

Laura R. Crouch

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL104

Enclosure

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

Attachment 1

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 ________________ Signature Mark Hornick
General Manager
____________ Power Station

Sheplak, Scott

From: Sheplak, Scott
Sent: Monday, December 17, 2001 10:13 AM
To: Halpin, Mike
Cc: Rhodes, Howard
Subject: FW: TECO Polk Power Station Energy Crop Test Burn

fyi

-----Original Message-----
From: Steve Segrest [mailto:commonpurpose@serve.com]
Sent: Monday, December 17, 2001 7:11 AM
To: Sheplak, Scott
Cc: Alexander Mack; Edward Cobham
Subject: TECO Polk Power Station Energy Crop Test Burn

Dear Mr. Sheplak,

My name is Steve Segrest and I am a Director of the Common Purpose Institute (a non profit environmental organization). Common Purpose, in conjunction with the State of Florida Energy Office, the U.S. Department of Energy, the University of Florida, Tampa Electric, the Electric Power Research Institute (EPRI) and others has developed a ~140 acre dedicated Energy Crop Tree Farm in Polk County. A description of the project is at the website: http://www.treepower.org

My background is in electric utility engineering and finance (CPA). I am not an employee of Tampa Electric, nor can I speak for TECO.

Hopefully through Mr. Mack's correspondences, you are aware of the significance of conducting some type of test burn at the Polk Power Station by December 31st in order to "grandfather" the power plant for the Section 45 Income Tax Credit. In talking to the U.S. Department of Treasury (IRS), it is my understanding that the energy crop fuel must be co-fired at Polk for a duration between 24 and 72 hours in order to achieve "grandfather status". It is my understanding that the cofiring rate would be between 1 and 3 percent.

If TECO does not "grandfather" the Polk Power Station by December 31st, TECO will lose any FUTURE potential of claiming this tax credit (that Congress has provided to encourage the development of renewable energy resources) -- which will severely damage the financial feasibility of using energy crop fuel.

TECO has told me that they can not possibly provide the full Florida DEP's data request in order to perform the test burn by December 31st.

With this background information, I wish to make the following request:

It is requested that you contact Tampa Electric (perhaps Mr. Mark Hornick, the Polk Power Station Manager) to see if something can be worked out between TECO and the Florida DEP to conduct some type of limited test burn by December 31st (e.g., under IRS guidelines 24 to 72 hours).

All I am requesting is the ability to keep our options OPEN for future testing. Without attaining Section 45 "grandfather status", there may never be any future requests to perform renewable energy, energy crop cofiring test burns at the Polk Power Station.

Thank you,
Steve Segrest
813 987 9728

P.S.: If you email me or leave me a voice mail, I will be more than willing to travel to Tallahassee as soon as tomorrow (Tuesday) to provide you and the Florida DEP additional information.

Planet Power
energy and the environment

Power Plant Engineering

Accomplishments: During the past 2 years, our collaborative engineering research efforts have resulted in EPA/State of Florida DEP permitting at two coal-fired power plants (pulverized coal and cyclone units) to co-fire wood fuel biomass. Our third endeavor, at TECO Energy's IGCC coal gasification unit, is scheduled to begin in the Fall of 2001.

Lakeland Electric's McIntosh Unit #3 (pulverized coal)
TECO Energy's Gannon Unit #3 (coal-fired cyclone)
TECO Energy's Polk Power Station (coal gasification).

Combined, these three Units have ~900 MWs of generation capacity. At a biomass co-firing rate of 3 percent (by heat input), this would be a Renewable Energy equivalent of installing 54,000 large solar panels.

Since all three of these power plants are high capacity factor, base-load units (i.e., plants that run 24 hours a day), our initial engineering focus has been on operational issues of integrating biomass co-firing without jeopardizing overall Unit availability. Primarily, these efforts have focused on wood fuel pre-processing (mesh size reduction through grinding), and air flows into the boiler.

Test-burn results have shown that wood fuel must be double ground (i.e., through a tub grinder or Montgomery type hog) to a fine mesh size [click here for a picture] for co-firing in pulverized coal and cyclone units. In using larger mesh size biomass (i.e., a single pass through the tub grinder or hog) the material did not burn well as it fell through a pulverized coal boiler's combustion zones (i.e., suspension firing) -- accumulating un-burned wood on the grate. For wet bottom boilers, inadequate suspension firing especially creates a totally un-acceptable operational problem.

For Pulverized Coal Units, controlling air flows with the pneumatic lifting of wood fuel to the boiler's fuel ports has also been shown to be exceedingly important. In initial test-burns at McIntosh Unit 3, even though wood fuel contains almost no sulfur, overall SO2 emissions significantly increased! In our opinion, we believe that this

Project Index:
Quick Facts
Economics & Research
Crop Yields
Energy Crop Fuel Analysis
Model Fuel Contract
Co-Firing Engineering
Education Outreach
Energy Crop Pictures
Biomass Co-Firing Pictures
Questions & Answers
Technical & White Papers

More Enviro Benefits:
Habitat & Reforestation
Urban Heat Islands
Recycling & Water Quality

Project Partners:
Common Purpose Institute
Shell Energy Projects
Tampa Electric
University of Florida
Florida Energy Office
Institute Phosphate Research
Southern States Energy Board

Other Resources:
Visit Our Plantation!
Educational Reading
Rainfall & Soil Moisture

Outside Resources:
Biomass Discussion Group
Renewables In Your State

vividly illustrates why research needs to be conducted on large commercial scale units -- compared to small prototype boilers at research labs.

Future Focus: We strongly believe that as power plant management becomes more familiar with co-firing, that more advanced engineering methods will be tested, especially those directly addressing NOx formation (i.e., Reburn, Separated Overfire Air, etc.).

In addition to completed and current engineering work, within the next year, our goal is to conduct test burns and permit power plants for biomass co-firing at the following generating stations:

- Wheelabrator's Ridge Generation Station (stoker unit).
- TECO Energy's Big Bend Units (pulverized coal).
- Florida Power's Crystal River Units (pulverized coal).
- Orlando Utilities' Stanton Units (pulverized coal).
- Gulf Power's Crist Units (pulverized coal).

Our intermediate goal is to implement an external biomass gasification project at an existing coal or natural gas fired power plant in Florida -- such as the Battelle bio-gas technology being commercially developed by FURCO [pdf document]

Lakeland Electric's McIntosh #3 Unit

Lakeland Electric's McIntosh Unit #3 is a 365 MW Babcock and Wilcox boiler, rated at 2,900,000 pph steam, at 2250 psig. The biomass co-firing technique used at Unit #3 has involved the direct injection of shredded wood fiber material (e.g., closed-loop & open-loop biomass) into a pulverized coal fired furnace. Biomass was shredded to the consistency of fine mulch and blown into the furnace through existing fuel injection ports. Coal and wood handling processing were separate.

In one of several co-firing test burns at Unit #3, in late 1998, approximately 125 tons of shredded/chipped eucalyptus trees were co-fired over a single continuous 6 hour period (~21 tons per hour) -- representing a co-firing level at full load of ~5% (by heating value).

The pre-processed wood fuel was deposited in a live bottom storage bin and then was pneumatically transported to the boiler and injected above the coal burners. Wood particles that did not burn in suspension, fell to a dump grate. Combustion air was introduced below the grate to complete the combustion of the larger fuel particles.

Pulverized coal was fired through existing coal burners. There are a total of four refuse/biomass injection ports, two each on opposing sidewalls above the coal burners. Two opposite wall injection ports were used during the co-firing test burn.

Boiler efficiency was lower with wood co-firing, due predominantly to fuel moisture of ~50% and increased excess air associated with the wood fuel injection. With wood co-firing, boiler efficiency was reduced from baseline condition (100% coal blend) by approximately 1.3 boiler efficiency points.

For the six hour test duration, accumulations of unburned wood were not noted in the air heater. Also, unusual slagging or fouling was not noted.

Fuel Ultimate Analyses:

Element:	Measurement	Eucalyptus	Coal
Carbon	(% wt.)	24.91	74.24
Hydrogen	(% wt.)	2.73	4.57
Oxygen	(% wt.)	19.81	5.33
Nitrogen	(% wt.)	0.11	1.43
Sulfur	(% wt.)	0.04	2.14
Ash	(% wt.)	0.94	7.45
Moisture	(% wt.)	51.46	4.83
Higher Heating Value	(BTU/lb)	4,238	13,305

Stack Test Results:

Emission:	Measurment	Coal Only	Co-Firing
NOx	ppmv,dry basis	249.4	238.6
NOx	lbs/MMBtu	0.504	0.481
PM	grams/DSCF	0.00009	0.00011

PM	lbs/MMBtu	0.0035	0.0040

Effect On Boiler Efficiency:

Test Name:	Measurment	Coal Only	Co-Firing
Dry Gas	%	5.61	5.74
H2 & H2O in Fuel	%	3.94	4.76
Moisture in Air	%	0.15	0.15
Unburned Carbon	%	0.50	0.50
Radiation	%	0.16	0.16
Total Heat Loss	%	10.37	11.32
Boiler Efficiency	%	89.63	88.68

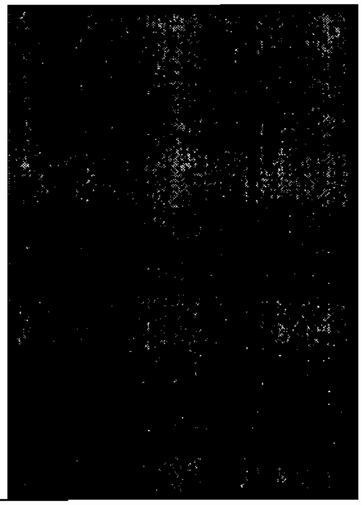
TECO Energy's Gannon Power Generating Station:

Tampa Electric's Gannon Power Generating Station is comprised of 7 Cyclone Units (~1,000 MWs) using 100% coal. During 2000 and 2001, a series of co-firing test burns were conducted at Unit #3 (wet bottom) with Yardwaste Biomass (~5,000 BTUs per pound) and Powder River Basin Coal (~9,000 BTUs per pound).

In 2000, a 72 hour continuous Test Burn was conducted with a biomass fuel blend of approximately 5% (i.e.,5% biomass wood fuel, and 95% coal, by volume). By Heat Input Value, biomass co-firing rate was approximately 2.75%.

Pre-processed biomass wood fuel was delivered "double ground" by initially grinding in a Tub Grinder (4"x 6" openings), screened (1/2" openings), and then re-ground through a Tub Grinder (1/2" grates). The biomass fuel was conveyed (a controlled variable speed conveyor) onto the main coal conveyor belt to be bunkered. Bunkering for Unit #3 (a base load unit) occurred twice per day.

During the Test Burn the focus was primarily on "Power Plant operational issues" associated with blending biomass fuels with the Powder River Basin Coal. While the Unit tripped numerous times during the Test Burn, none of the "trips" appeared to be directly the result of the biomass fuel. We experienced problems where the wood fuel conveyor continued to run, but the coal feed had been tripped. For the Test Burn, we did not mechanically link the separate biomass conveyor to stop when the coal feed tripped. This resulted in the coal conveyor continuing to run (without any coal on the conveyor), and the biomass conveyor continuing to dump. When this has occurred, clumps of 100% wood fuel would occur in the bunker -- which eventually tripped the Unit (after bunkering) because sensors detected low Heat Input Value fuel (i.e., 5,000 BTUs per pound of biomass fuel, versus normal operations of 9,000 to 10,000 BTUs per pound of Powder River Basin coal).



Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

December 14, 2001

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ms. Laura R. Crouch
Manager, Air Programs – Environmental Affairs
Tampa Electric Company
P.O. Box 111
Tampa, Florida 33601

Re: Proposed Biomass Test Burn
Polk Power Station Unit 1
Facility ID 1050233

Dear Ms. Crouch:

On October 25, 2001 the Department received your request to conduct a biomass test burn. On December 5, 2001 we received your responses to our November 20th request for additional information. Your request was for authorization to conduct a baseline test burn of 5% switch grass and/or eucalyptus/cottonwood to establish the representative emissions from Unit 1. Based upon those results, TEC might apply for a permit modification for the introduction of biomass into the gasifier on a more permanent basis. TEC has proposed to conduct a test burn for a period of 28 days to allow TEC to evaluate the impacts of the material on the fuel handling systems and other associated process equipment as well as evaluate the effects of firing syngas produced from a blend of biomass and other currently permitted fuels.

The Department finds that the request is yet incomplete. We understand that TEC wishes to pursue this test burn on a very fast track and we are endeavoring to provide a quick review. In order to continue processing your request, the Department will need the additional information below. Should your response to any of these items require new calculations, please submit the new calculations, assumptions, reference material and appropriate revised pages of the application. The Department needs satisfactory written responses to these issues by **Tuesday, December 18th** in order to allow for the possibility of a test burn authorization by the end of this calendar year.

1. It remains unclear to the Department how the existing handling and feed systems will be utilized with the biomass fuel. For example, will the fuel be transported from the trucks to a storage pile? Where will the pile be located? Will the pile be covered, or open to atmospheric conditions? How will the fuel be ground, and how will it be moved to the grinding equipment? Will it be batch-fed or will an effort be made to maintain a continuous coal/biomass ratio (please be specific)? Will it be slurried directly with the coal? These questions are representative of level of description, which the Departments seeks, regarding storage, handling and feed systems.

2. Biomass fuels typically have higher water contents than coal. Please explain how moisture removal and disposal will be accommodated, or will the additional water end up in the syngas?

3. In the December response, TEC indicated that it is not aware of any other IGCC facility that has attempted to gasify a blend of 5% biomass and coal. Inasmuch as this appears to be the first attempt at such a venture, the Department's opinion is that this request is not identical to other requests it has received to combust biomass. Therefore, the Department maintains that it wishes written confirmation by the manufacturer of the gasifier, that it is currently capable of accommodating the proposed fuel mix of coal (and/or petcoke) and biomass.

4. As previously indicated, the Department is aware that one of the largest impediments to the widespread use of biomass is its tendency to form unmanageable ash deposits. In the event that TEC intends to ultimately combust the (beneficiated) slag, the Department will require TEC to segregate the "co-fired" gasifier slag and provide a protocol for analysis of the quantity and quality. Based upon these results, TEC may propose a method for disposal after the test burn.

5. The Department needs TEC to provide a protocol for syngas fuel analyses for each blend of biomass and coal/petcoke tested.

6. In order to have reasonable assurance that a PSD review and associated public notices are not triggered for the proposed co-firing, the Department requires a summary of the *estimated* emission increases/decreases. This should be done at TEC's proposed maximum blend for each biomass and coal/petcoke fuel to be combusted. All assumptions should be clearly stated.

7. The Department previously inquired as to TEC's expectations regarding the performance of an SCR in light of the fuel proposed within the test burn request. TEC responded that it does not expect the application of an SCR to be successful on any IGCC Unit that fires a sulfur bearing fuel, and that the gasification of a 5% biomass blend will not significantly change the composition of the resulting syngas, nor affect TEC's position regarding the application of an SCR. DOAH will soon hear the case concerning the Department's recent BACT Determination for this unit, which had required SCR.

8. The Department still maintains its position on SCR for this facility.

We have included the EPA and the National Park Service within this review. Should we receive written comments, we will forward them to you when received and they will comprise part of this completeness review.

Rule 62-4.050(3), F.A.C. requires that all applications for a Department permit must be certified by a professional engineer registered in the State of Florida. This requirement also applies to responses to Department requests for additional information of an engineering nature.

If you should have any questions, please call me at 850/921-9532 or Al Linero at 850/921-9523.

Sincerely,

Scott M. Sheplak, P.E.
Administrator
Title V Section

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

TAMPA ELECTRIC

RECEIVED
DEC 05 2001
BUREAU OF AIR REGULATION

December 4, 2001

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. 7902 3447 0167

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

Dear Mr. Sheplak:

Tampa Electric Company (TEC) has received the Florida Department of Environmental Protection's (the Department) letter of incompleteness dated November 20, 2001 addressing TEC's request for permission to conduct a biomass test burn at Polk Power Station Unit 1 (Polk Unit 1). The intent of the test burn is to answer questions concerning any emissions impact that the biomass will have on Polk Unit 1. In addition, the test burn will allow TEC to evaluate any additional fuel handling and operational impacts associated with gasifying biomass in Polk Unit 1.

This correspondence is intended to provide a response to each specific issue raised by the Department. For your convenience, TEC has restated each point and provided a response below each specific issue.

FDEP Issue 1
A generic description of each specific biomass fuel contemplated for gasification. Please indicate whether any of the material has been subjected to any treatment processes (e.g. pressure treated wood).

TEC Response
The potential biomass fuels that TEC has considered are switch grass and/or purpose-grown energy crops such as eucalyptus and cottonwood. TEC may include other sources of wood material, such as sawdust; to provide the initial quantities required for a test burn. Treated wood products will not be used.

FDEP Issue 2
The source(s) of the planned biomass fuel(s) including an ultimate analysis of each specific fuel contemplated for gasification. Please indicate heat value, moisture content and metals within these analyses. Provide the same data for the coal that is to be blended. Indicate how the fuel will be transported to Polk Power Station.

TEC Response
As mentioned above, the sources of the biomass fuel will include switch grass and/or eucalyptus/cottonwood. At this time, TEC does not have a complete analysis of the material to be

gasified at Polk Power Station. TEC expects that the biomass fuel will be consistent with that material that is currently fired at F.J. Gannon Station. A representative analysis of the material from F.J. Gannon Station is provided in Attachment A for your review. TEC will perform the requested analyses for each biomass fuel gasified during the test burn and will submit the results to the department as available. TEC will not change the fuel type used during this test burn The fuel that will be blended with the biomass for the purposes of this test burn will be consistent with the types of fuels that TEC is currently permitted to gasify. The fuel will be transported in enclosed trucks to Polk.

<u>FDEP Issue 3</u>
Wood materials at existing biomass cogeneration facilities have been found to contain measurable amounts of arsenic, cadmium, chromium, copper, fluorides, lead, and mercury. Does the current gasification system remove these types of contaminants? Please explain

<u>TEC Response</u>
It is unclear what types of wood materials the Department is referring to in the above referenced question. The biomass material proposed for gasification at Polk will not have been subject to painting, pressure treating or other industrial chemical treatments that other wood derived fuels can be subject to. It is not expected that the introduction of the biomass fuel will lead to an increase in the concentrations of any of these constituents. TEC is not currently required to evaluate the removal efficiency of the gasifier for these metals, as such data regarding the removal capability are not available.

<u>FDEP Issue 4</u>
The estimated annual quantity of each fuel available by supplier and estimated annual gasifier throughput at the proposed maximum blend rate of 5%.

<u>TEC Response</u>
At this point, TEC is not requesting to gasify biomass fuel on an annual basis. Based on the results of the test burn TEC may request permission to modify the facility's Title V permit to allow for the gasification of biomass fuel on an annual basis. The quantity of biomass proposed for test burn is 500 tons, which is reasonably available from our current suppliers.

<u>FDEP Issue 5</u>
A general description of how the existing handling and feed systems will be utilized with the biomass fuel. Please explain if changes in handling systems or methods are to be utilized (e.g. sizing, drying, pulverizing, etc.) and how moisture removal and disposal will be accommodated.

<u>TEC Response</u>
TEC expects the existing handling and feed systems to be able to accommodate the biomass fuel blend. TEC will any necessary changes to the existing fuel handling and feed systems discovered during the test burn in the report to be submitted to the Department after the test burn is completed. TEC will supply the Department with information about any necessary changes to the fuel handling and feed systems prior to making the change.

<u>FDEP Issue 6</u>
Written confirmation by the manufacturer of the gasifier, that it is currently capable of accommodating each specifically proposed fuel mix of biomass.

<u>TEC Response</u>
The gasifier was designed to accommodate a variety of fuels. It is not expected that the introduction of the biomass fuel would cause detrimental effects to the gasifier. TEC is not aware of any requirement that such written confirmation is obtained in order conduct a test burn, therefore it is not included.

<u>FDEP Issue 7</u>
Based upon Department information, one of the largest impediments to the widespread use of biomass is its tendency to form unmanageable ash deposits. Accordingly, provide the estimated impact on the quantity and quality (chemical make-up) of gasifier residuals (ash or slag) generated and how TEC intends to dispose of the newly composed "non-coal" ash or slag.

<u>TEC Response</u>
Though the firing of biomass in typical coal-fired boilers may lead to increased ash deposits due to the nature of the materials combusted, the gasification process at Polk is not expected to be affected by these concerns. Gasification is a separate and unique process as compared to coal- fired boilers. TEC does not expect the gasification of biomass to impact the quantity or quality of the residual fuel from gasification. TEC expects no changes to be necessary in the beneficiation of the residual fuel generated from Polk Unit 1, since a maximum of only 5% of the total fuel throughput to the gasifier will be biomass.

<u>FDEP Issue 8</u>
The estimated impact to the syngas composition, based upon mathematical analyses of actual syngas composition blend at the proposed ratio. Ensure halogen (e.g. chlorine) and alkali levels (e.g. potassium, sodium) are included.

<u>TEC Response</u>
A typical analysis of the syngas fired in Polk Unit 1 contains over 90% hydrogen, carbon monoxide and carbon dioxide. Halogen and alkali levels are minimal and the gasification of a blend of 5% biomass is not expected to affect these concentrations. Further, halogen and alkali compounds are not regulated under the PSD program and are not subject to evaluation for the purposes of this test burn.

<u>FDEP Issue 9</u>
Written confirmation by the manufacturer of the combustion turbine, that it is currently capable of accommodating each specifically proposed syngas fuel mix of biomass.

<u>TEC Response</u>
The syngas produced by the gasification of the 5% biomass fuel blend is not expected to be substantially different from the syngas currently produced. Therefore, TEC is confident that the combustion turbine will be able to fire the resulting syngas. TEC is not aware of any requirement that such written confirmation is obtained in order conduct a test burn, therefore it is not included.

<u>FDEP Issue 10</u>
Written confirmation by the manufacturer of the HRSG, that it is currently capable of accommodating each specifically proposed fuel mix of biomass.

<u>TEC Response</u>
Please see the response to Question 9.

FDEP Issue 11

The Department understands that TEC is currently experiencing deposit buildups in the HRSG. Please estimate the impacts to the quality and quantity of these deposits.

TEC Response

TEC does not expect the firing of syngas resulting from gasification of the 5% biomass blend to have a measurable impact on deposit build up. Therefore, the impacts to the quantity and quality of deposits on the HRSG will not be evaluated as part of this test burn.

FDEP Issue 12

A summary of the estimated emission changes for each criteria pollutant at TEC's proposed maximum blend of 5 % for each biomass fuel contemplated. All assumptions should be clearly stated.

TEC Response

Gasification of a 5% biomass fuel blend is not expected to change the composition of the syngas fired in Polk Unit 1 because the syngas is primarily composed hydrogen, carbon monoxide and carbon dioxide. TEC is proposing to gasify a relatively small quantity of biomass and does not anticipate any impact on the emission of criteria pollutants. To support this assertion, TEC will evaluate NOx and SO2 emissions during the test burn.

FDEP Issue 13

A modeling analysis to evaluate ambient impacts for any criteria pollutant where emissions are estimated to increase beyond the PSD thresholds.

TEC Response

TEC does not expect any emissions to increase beyond the PSD threshold and therefore a modeling analysis has not been completed. If the results of the test burn demonstrate that there is a significant increase in NOx or SO2 and TEC elects to apply for a permit requesting permission to permanently gasify the biomass material, the required modeling will then be performed as described in Chapter 62-212 F.A.C.

FDEP Issue 14

The past 2 year emissions of PSD pollutants.

TEC Response

If TEC elects to apply for a permit requesting permission to permanently gasify the biomass material, the required emissions analysis will then be performed as described in Chapter 62-212 F.A.C.

FDEP Issue 15

The Department has made a recent determination that Polk Unit 1 should be fitted with an SCR. In the event that this is ultimately required, pleases discuss TEC's expectations regarding the performance of the SCR in light of the proposed change in (gasified) fuel slate.

TEC Response

As explained to the Department previously, TEC does not expect the application of an SCR to be successful on any IGCC Unit that fires a sulfur bearing fuel. The gasification of a 5% biomass blend will not significantly change the composition of the resulting syngas, nor affect TEC's position regarding the application of an SCR.

FDEP Issue 16
Additional approvals for the test-burn should be sought from the appropriate regulating agencies on issues such as biomass storage, fuel pile, storm-water runoff, etc.

TEC Response
TEC will maintain compliance with all existing permits as identified in this question, should permits be necessary TEC will coordinate with the appropriate regulating agencies.

FDEP Issue 17
Indicate whether other IGCC facilities (with an entrained-flow gasifier) have combusted a blend of coal and biomass fuel. Provide the Department with any information available to TEC concerning that experience, particularly related to the Department's questions noted above.

TEC Response
TEC is not aware of any other IGCC facility that has attempted to gasify a blend of 5% biomass and coal.

FDEP Issue 18
Indicate whether models are available for conducting heat and material balances (e.g. EPRI, DOE, etc.) and if available, provide the Department with such analysis.

TEC Response
The purpose of conducting the test burn is to evaluate the emission impacts of firing syngas related to the gasification of a 5% biomass blend. Operational issues, such as heat and material balances, will be monitored and maintained by plant personnel as part of the test burn.

FDEP Issue 19
Please provide approval by the facility Designated Representative on the test burn request and response letter.

TEC Response
Approval of the facility Designated Representative will be provided in Attachment B.

TEC appreciates the cooperation and consideration of the Department in this matter. However, based the based on the Department's additional information requests it appears that clarification of the intent and purpose of the test burn is necessary. The intent of performing a test burn is to determine the emission impacts, if any, of a proposed alternative fuel. In addition, test burns are used to resolve operational and engineering challenges that arise as a result of attempting projects of this kind. In this instance, the test burn protocol proposed by TEC places a limit on the time frame and quantity of biomass that will be gasified. Because a test burn is an evaluative procedure, a modification of the facility's operating permit is not always pursued as result of a test burn.

In recent years, TEC has performed numerous test burns of alternative fuels at all of its generating facilities. The results of these test burns, both environmental and operational, have determined if the proposed alternative fuels are feasible for the facility and if modification of the existing operating permits will be pursued. The protocols of these past test burns, which have all been reviewed and approved by the Department, have become somewhat standard in nature. The biomass test burn protocol associated with TEC's request is not substantially different from past submittals. For this reason, TEC is concerned with the extent and nature of the Department's request for additional information. The proposed gasification of biomass in Polk Unit 1 would utilize renewable fuel sources that may have a beneficial impact on emissions from the facility. In light of this, TEC has attempted to answer any questions the Department has asked and has provided available information as appropriate. If further questions or concerns arise pertaining to the additional information TEC has provided please contact me at (813) 641-5376.

Sincerely,

Laura R. Crouch

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/DNL103

Enclosure

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

Attachment A
Typical Wood Derived Fuel Analyses

GANNON STATION
TYPICAL WOOD DERIVED FUEL ANALYSES

Parameter	Yard Waste	Wood Chips	Units
Total Moisture	29	29.00	%
Ash, as Received	1.4	0.72	%
Ash, Dry Basis	1.97	0.82	%
Carbon, as Received	35.59	41.50	%
Carbon, Dry Basis	50.13	47.78	%
Fixed Carbon, as Received	10.92	15.54	%
Fixed Carbon, Dry Basis	15.38	17.89	%
Hydrogen, as Received	3.87	5.12	%
Hydrogen, Dry Basis	5.45	5.89	%
Nitrogen, as Received	0.39	0.22	%
Nitrogen, Dry Basis	0.549	0.25	%
Sulfur, as Received	0.04	0.13	%
Sulfur, Dry Basis	0.06	0.15	%
Pounds SO_2/Million BTU, Coal	0.145	0.37	lbs. SO_2/MMBTU
Volatiles, as Received	58.68	70.60	%
Volatiles, Dry Basis	82.65	81.29	%
BTU, as Received	5832	7199.00	BTU/lb
BTU, Dry Basis	8214	8286.35	BTU/lb
BTU, Moisture-Ash Free, Calc.	8379	8354.95	BTU/lb

Attachment B
Responsible Official Certification

Responsible Official Certification

I have reviewed the previous letter of request for authorization to conduct a biomass test burn at Polk Power Station and also the response to the Department's request for additional information. I hereby certify that these documents are authentic and accurate to the best of my knowledge.

Date: 12/3/01

Signature: Mark Hornick
General Manager
Polk Power Station

Scott Sheplak

Department of
Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

December 4, 2001

Mr. Gregg Worley, Chief
Air, Radiation Technology Branch
Preconstruction/HAP Section
U.S. EPA – Region IV
61 Forsyth Street
Atlanta, Georgia 30303

Re: Tampa Electric Company, Polk Power Station

Dear Mr. Worley:

We have provided a submittal from Tampa Electric Company (TEC) concerning their Polk Power Station. That facility incorporates an IGCC electrical generating unit, which combusts synthetic gas. You may recall that we issued a Draft BACT Determination earlier this year, concluding that the unit should be fitted with an SCR; and that the permittee has disputed the Determination, with the matter scheduled to be heard by an Administrative Law Judge.

The applicant recently submitted a request to conduct a test burn of a modified syngas, which is to be generated by a combination of coal and some form of biomass. As a result of our preliminary review, we had determined that the application was incomplete and forwarded a request for additional information to the applicant. We would appreciate your review and comments on TEC's responses, as well as any input that you may have regarding the proposed test burn. Of particular interest to the Department is whether EPA can offer guidance on the impact of biomass firing or coal/biomass co-firing on SCR design and operation.

Your comments can be forwarded to my attention at the letterhead address or faxed to me at (850) 922-6979. Please be aware that our review time of 30 days expires on January 3, and that TEC had hoped to be able to conduct the test burn by the end of this calendar year. If you have any questions, please contact me at 850/921-9532.

Sincerely,

Scott M. Sheplak

Scott M. Sheplak, P.E.
Administrator
Title V Section

cc: Mr. Jerry Kissel, FDEP-SWD
Mr. A. A. Linero, FDEP – BAR
Mr. John Bunyak, NPS-Air Quality Division

w/ enclosures

thank you SA 11/2

Halpin, Mike

From: Oven, Hamilton
Sent: Wednesday, November 28, 2001 10:01 AM
To: Halpin, Mike
Subject: FW: Florida DEP Problems

Since Al is out, I am sending this to you.

-----Original Message-----
From: Oven, Hamilton
Sent: Wednesday, November 28, 2001 9:58 AM
To: 'Alexander Mack'; edward.cobham@dca.state.fl.us; commonpurpose@serve.com; Goorland, Scott
Cc: Brenda Menendez; Lena Price; Shirley Collins; raymond.costello@hq.doe.gov; bbuchan@psc.state.fl.us; btrapp@psc.state.fl.us; jdean@psc.state.fl.us; tballing@psc.state.fl.us
Subject: RE: Florida DEP Problems

This project is news to me. If approved, it would require a modification to the Conditions of Certification. There is a significant difference between the Gannon Plant which has pulverized coal units and the Polk Power Station which is an Integrated Coal Gasification Combined Cycle facility with natural gas fired combustion turbines. Are they trying to gasify biomass? Brightstar has a pyrolysis process that gasifies municipal solid waste. I am not sure how compatible the coal and biomass would be in a gasification process. That may explain the detailed info request.
I have passed your inquiry to the Bureau of Air Regulation.
-----Original Message-----
From: Alexander Mack [mailto:Alexander.Mack@dca.state.fl.us]
Sent: Wednesday, November 28, 2001 8:52 AM
To: edward.cobham@dca.state.fl.us; commonpurpose@serve.com
Cc: Alexander Mack; Brenda Menendez; Lena Price; Shirley Collins; Oven, Hamilton; raymond.costello@hq.doe.gov; bbuchan@psc.state.fl.us; btrapp@psc.state.fl.us; jdean@psc.state.fl.us; tballing@psc.state.fl.us
Subject: Re: Florida DEP Problems

<< File: TEXT.htm >>
Steve is this the same engineer that approved the Tampa Electric biomass co-firing at Gannon Power Plant? What is the difference between Gannon and Polk? DEP and the EPA previously approved the co-firing.

>>> Steve Segrest <commonpurpose@serve.com> 11/28/01 07:47AM >>>
Dear Alexander and Ed,
Tampa Electric submitted a permit request to the Florida DEP last summer to conduct a co-firing test burn using energy crop fuel (closed-loop biomass) at the Polk Power Station (a DOE sponsored, Clean Coal IGCC Coal Gasification Facility). Attached is a letter from the DEP (in pdf file format) responding to this request that TECO just received on Monday (November 26th).

According to Tampa Electric, the level of detail required by the Florida DEP on this request is far beyond any they have seen in previous requests to test burn alternative fuels. As a result of the DEP's tremendous "data requests", the test burn at Polk Power Station, scheduled to occur by December 31st is now in serious jeopardy.

The December 31st date is critical, as Tampa Electric must at least perform co-firing tests in order to grandfather the Polk Power Station for the Section 45 Income Tax Credit (Credit for wind and closed loop biomass energy) before December 31st. Without the Tax Credit, which Congress has provided to encourage the development of renewable energy, the economic viability of the Energy Crop Plantation which you, the DOE, and SERBEP have supported is placed in serious jeopardy.

The Florida DEP "data requests" make even the testing of this environmentally beneficial fuel source very difficult to achieve, and clearly is not possible to achieve by December 31st-which will deprive TECO the ability to ever qualify the power plant for the Section

Again, TECO's request is for a test burn, not a request to permit the power plant for co-firing energy crop fuel.

I am wondering if you could discuss with the Florida DEP (Mr. Scott Sheplak or perhaps the Director of Title V Section at the Florida DEP) the importance of conducting a test burn of energy crop fuel at the Polk Power Station by December 31st. Maybe a joint response to the Florida DEP could be made by the Florida Energy Office and Ray Costello of the U.S. DOE.

I am certainly NOT asking for you to provide any letter of support for TECO, or to get into any engineering issues. My request is for you inform the DEP on how this test burn directly supports Federal and State of Florida efforts to develop renewable energy resources in Florida.

Unless some compromise can be achieved on the DEP "data requirements", allowing a test burn by December 31st, all of our hard work in developing energy crops is seriously jeopardized. What I fear is that this goes through a maze of administrative levels at the DEP, finally allowing TECO to perform the test burn in say March of 2002 -- where qualifying the power plant for the Section 45 Tax Credit is lost forever.

Perhaps I need to be clearer on the Section 45 Tax Credit. No grower of energy crop closed loop biomass benefits directly from the Tax Credit (the Tax Credit can only be taken by the Generator of electricity). The economics of what an electric utility could pay for fuel and modify their power plants to co-fire the fuel is significantly enhanced.

Thank you,
Steve Segrest
813 987 9728

Department of Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

David B. Struhs
Secretary

November 20, 2001

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ms. Dru Latchman
Associate Engineer – Environmental Affairs
Tampa Electric Company
P.O. Box 111
Tampa, Florida 33601

Re: Proposed Biomass Test Burn
Polk Power Station Unit 1
Facility ID No. 1050233

Dear Ms. Latchman:

The Department is in receipt of the your request for authorization to conduct a baseline test burn to establish the representative emissions from Unit 1 prior to the introduction of biomass into the gasifier on a more permanent basis.

TEC has proposed to conduct a test burn for a period of 28 days to allow TEC to evaluate the impacts of the material on the fuel handling systems and other associated process equipment as well as evaluate the effects of firing syngas produced from a blend of biomass and other currently permitted fuels. The Department finds that the request is incomplete. In order to continue processing your request, the Department will need the additional information below. Should your response to any of these items require new calculations, please submit the new calculations, assumptions, reference material and appropriate pages of the Department's permit application form.

1. A generic description of each specific biomass fuel contemplated for gasification. Please indicate whether any of the material has been subjected to any treatment processes (e.g. pressure treated wood).

2. The source(s) of the planned biomass fuel(s) including an ultimate analysis of each specific fuel contemplated for gasification. Please include heat value, moisture content and metals within these analyses. Provide the same data for the coal that is to be blended. Indicate how the fuel will be transported to Polk Power Station.

3. Wood materials at existing biomass cogeneration facilities have been found to contain measurable amounts of arsenic, cadmium, chromium, copper, fluorides, lead, and mercury. Does the current gasification system remove these types of contaminants? Please explain.

4. The estimated annual quantity of each fuel available by supplier and estimated annual gasifier throughput at the proposed maximum blend rate of 5%.

5. A general description of how the existing handling and feed systems will be utilized with the biomass fuel. Please explain if changes in handling systems or methods are to be utilized (e.g. sizing, drying, pulverizing, etc.) and how moisture removal and disposal will be accommodated.

6. Written confirmation by the manufacturer of the gasifier, that it is currently capable of accommodating each specifically proposed fuel mix of biomass.

7. Based upon Department information, one of the largest impediments to the widespread use of biomass is its tendency to form unmanageable ash deposits. Accordingly, provide the estimated impact on the quantity and quality (chemical make-up) of gasifier residuals (ash or slag) generated and how TEC intends to dispose of the newly composed "non-coal" ash or slag. Please indicate whether the coal/biomass ash or slag is to be segregated from that produced by coal only.

8. The estimated impact to the syngas composition, based upon mathematical analyses of actual syngas composition blended at the proposed ratio. Ensure that halogen (e.g. chlorine) and alkali levels (e.g. potassium, sodium) are included.

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

Ms. Dru Latchman

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

7000 0520 0020 9371 1779

Recipient's Name (Please Print Clearly) (To be completed by mailer)
Ms. Dru Latchman
Street, Apt. No.; or PO Box No.
P.O. Box 111
City, State, ZIP+ 4
Tampa, Florida 33601

PS Form 3800, February 2000 See Reverse for Instructions

SENDER: CO

- 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. Dru Latchman
Associate Engineer -
Environmental Affairs
Tampa Electric Company
P.O. Box 111
Tampa, Florida 33601

IVERY

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

C. Signature
X B. Eu [signature] ☐ 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

2. Article Number *(Copy from service label)*
7000 0520 0020 9371 1779

PS Form 3811, July 1999 Domestic Return Receipt 102595-00-M-0952

9. Written confirmation by the manufacturer of the combustion turbine, that it is currently capable of accommodating each specifically proposed syngas fuel mix of biomass.
10. Written confirmation by the manufacturer of the HRSG, that it is currently capable of accommodating each specifically proposed fuel mix of biomass.
11. The Department understands that TEC is currently experiencing deposit buildups in the HRSG. Please estimate the impacts to the quality and quantity of these deposits.
12. A summary of the estimated emission changes for each criteria pollutant at TEC's proposed maximum blend of 5% for each biomass fuel contemplated. All assumptions should be clearly stated.
13. A modeling analysis to evaluate ambient impacts for any criteria pollutant where emissions are estimated to increase beyond the PSD thresholds.
14. The past 2 year emissions of PSD pollutants.
15. The Department has made a recent determination that Polk Unit 1 should be fitted with an SCR. In the event that this is ultimately required, please discuss TEC's expectations regarding the performance of the SCR in light of the proposed change in (gasified) fuel slate.
16. Additional approvals for the test-burn should be sought from the appropriate regulating agencies on issues such as biomass storage, fuel pile storm-water runoff, etc.
17. Indicate whether other IGCC facilities (with an entrained-flow gasifier) have combusted a blend of coal and biomass fuel. Provide the Department with any information available to TEC concerning that experience, particularly related to the Department's questions noted above.
18. Indicate whether models are available for conducting heat and material balances (e.g. EPRI, DOE, etc.) and if available, provide the Department with such analyses.
19. Please provide an approval by the facility Designated Representative on the test burn request and response letter.

We will include the EPA and the National Park Service within this review. Should we receive written comments, we will forward them to you when received and they will comprise part of this completeness review.

Rule 62-4.050(3), F.A.C. requires that all applications for a Department permit must be certified by a professional engineer registered in the State of Florida. This requirement also applies to responses to Department requests for additional information of an engineering nature. Please note that per Rule 62-4.055(1): *"The applicant shall have ninety days after the Department mails a timely request for additional information to submit that information to the Department."*

If you have any questions, please call me at 850/921-9532 or Al Linero at 850/921-9523.

Sincerely,

Scott M. Sheplak

Scott M. Sheplak, P.E.
Administrator
Title V Section

cc: Mr. Jerry Kissel, FDEP-SWD
Mr. A.A. Linero, FDEP-BAR

11/20/01 cc: Mike Halpin
Reading File
Mailed 11/20/01

copy [illegible]
m/thy H/pi-

TAMPA ELECTRIC

RECEIVED

OCT 25 2001

BUREAU OF AIR REGULATION

October 24, 2001

Mr. Clair Fancy
Chief Bureau of Air Regulation
Florida Department of Environmental Protection
111 South Magnolia Drive, Suite 4
Tallahassee, FL 32301

Via FedEx
Airbill No. 7901 9545 4825

Re: Tampa Electric Company (TEC)
Polk Power Station
Biomass Test Burn Project No. 1050233 —010

Dear Mr. Fancy:

Tampa Electric Company (TEC) requests permission to conduct a test burn at Polk Power Station (PPS) Unit 1 under the authority of the current Title V operating permit (PSD-FL-194). The test burn would be conducted to test the feasibility of firing syngas produced from the gasification of a biomass based renewable resource fuel (biomass) blended with other currently permitted fuels (coal and petcoke). Biomass fuel is defined here as a renewable resource fuel consisting primarily of natural vegetative matter.

TEC requests authorization to conduct the comparison test burn for a period of up to 28-days (see Attachment A for details). This will allow TEC to evaluate the impacts of the material on the fuel handling systems and other associated process equipment as well as evaluate the effects, if any, of firing syngas produced from the gasification of a blend of biomass and other currently permitted fuels.

TEC will conduct a baseline test burn to establish the representative emissions from Unit 1 prior to the introduction of biomass into the gasifier. Baseline testing will last up to seven days and will consist of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) data collection through the use of Continuous Emissions Monitors (CEMs).

Following the baseline test, TEC will conduct a biomass blend test burn of syngas produced from the gasification of up to 5% biomass and up to 95% fuel blend. Biomass blend testing will last up to 21 days and will consist of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) data collection through the use CEMs. Because of the nature of the gasification process, it is logical to assume that particulate matter emissions and sulfuric acid mist emissions will not be affected by the firing of the syngas produced from the gasification of the biomass blend.

The baseline and biomass blend test burns will be conducted under standard PPS operating conditions and, to the extent possible, at least 90% of the maximum permitted heat input. Data will be compiled and results reported to the Florida Department of Environmental Protection (DEP) within 60 days of the completion of the test burn. Any residual biomass fuel stock that is on hand after the test burn will be consumed immediately after the test burn is completed. TEC will bring enough fuel on-site to supply the needs of the test burn, with perhaps a slight margin to compensate for unforeseen circumstances. TEC intends to begin the test burn upon receiving approval from DEP.

PPS is interested in firing syngas produced from the gasification of biomass for several reasons. First, certain governmental initiatives may make it financially advantageous to gasify biomass at the PPS. The possible economic advantages of one particular program are currently under investigation, and this test burn is being proposed to allow for further evaluation. Second, biomass is a renewable resource, and utilizing it as a fuel source at Polk Power Station will help support the Company's commitment to the use of renewable energy sources. Biomass contains less sulfur than coal, so there may be a measurable reduction in SO_2 emissions. Given the variability of fuel pricing, biomass may be less expensive then coal and may improve the economic feasibility of PPS.

TEC appreciates the cooperation and consideration of the Department in this matter. If you have any questions or comments pertaining to this request please direct them to Dru Latchman at (813) 641-5034.

Sincerely,

DLatchman

Dru Latchman
Associate Engineer
Environmental Affairs

EA/br/DNL102

Enclosure

c/enc: Mr. Jerry Kissel - FDEP SW
Mr. Scott Sheplak, FDEP

Attachment A
Polk Power Station Unit 1
Biomass Test Protocol

Tampa Electric Company (TEC) proposes to conduct a test burn at Polk Power Station Unit 1 (PPS) to compare the standard fuel blend of up to 60% petcoke and coal by weight to a blend containing up to 5% biomass and 95% of the standard blend.

The baseline test burn will evaluate SO_2 and NO_x emissions as a result of firing syngas produced from the gasification of a petcoke and coal fuel blend consisting of up to 60% petcoke. This baseline test will last for up to seven days to facilitate collection of representative data.

The biomass blend test burn will evaluate the SO_2 and NO_x emissions produced from the gasification of the above mentioned biomass fuel blend. This biomass blend test burn will last for up to 21 days to facilitate collection of representative data. Any residual biomass fuel stock that is on hand after the test burn will be consumed immediately after the test burn is completed.

The SO_2 and NO_x test burn data will be collected and analyzed using the methodologies found in Table 1. Prior to blending, fuel testing will be done on the standard fuel blend and the biomass fuel individually. Continuous emissions monitors (CEMS), located in the combustion turbine stack, will be used to collect representative data for SO_2 and NO_x, emissions during the test burn. CEMS will be quality assured pursuant to 40 CFR 75, Appendix B. The data assessment report from 40 CFR 60, Appendix F, for the most recent relative accuracy test audit (RATA) and most recent cylinder gas audit (CGA), will be submitted with the test burn report.

During these tests, PPS Unit 1 will be operated at a minimum of 90% of the maximum permitted heat input. Upon completion of all testing, TEC will compile test results in a report to be submitted to the Florida Department of Environmental Protection within 60 days of completion of the test burn.

Table 1. Summary of data collection and monitoring methodologies to be used during the PPS biomass test burn.

Test	SO_2	NO_x	Fuel Analysis
Baseline Test 7 Days	CEM Data[1]	CEM Data[1]	Weekly composite fuel analysis[2]
Biomass Test 21 Days	CEM Data[1]	CEM Data[1]	Weekly composite fuel analysis[2]

[1]Equivalent CEM data will be used in lieu of stack test data.

[2]Composite weekly fuel analysis results will be supplied during the baseline and test burn. Fuel analyses will include the following:

Fuel Analysis: Sulfur, wt. %,Volatiles, Content, wt. %, Nitrogen, wt. %, Ash, wt. %, Calorific Value, BTU/#, Carbon, wt. %, Moisture, wt. %

File

Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

July 25, 2001

Mr. Mark J. Hornick
General Manager, Polk Power Station
Tampa Electric Company
P. O. Box 111
Tampa, Florida 33601-0111

Re: Request for Guidance
Polk Power Station

Dear Mr. Hornick:

The Title V Section has received and reviewed your request for guidance to combust a combination of syngas and fuel oil dated July 10, 2001. Our review of your current operating permit has yielded the following:

The current Title V operating permit for the facility allows for the combustion of either syngas or Number 2 fuel oil in Polk Unit 1. Syngas is permitted as the primary fuel. Fuel oil is permitted to be fired no more than 876 hours per year, determined by using an annual capacity factor calculation. Recordkeeping requirements are included in the permit to assure compliance with this capacity factor limitation. The permit contains emission limits when firing either fuel is fired. The permit does not address emission limits when a combination of the two fuels are fired.

Since there are no emission limits included in the permit for the co-firing of syngas and fuel oil, it is presumed that co-firing of the two fuels was not anticipated at the time Polk Unit 1 underwent PSD and Preconstruction review. Since the Title V operating permit is dependent on these permits, it appears that the co-firing of the two fuels is not currently allowed.

If you have any other questions, please contact Edward J. Svec at 850/921-8985.

Sincerely,

Scott M. Sheplak

Scott M. Sheplak, P.E.
Administrator
Title V Section

SMS/es

copy furnished to:
Mr. A. Linero, P.E., FDEP, NSR
Mr. J. Kissel, P.E., FDEP, SWD

Department of
Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

David B. Struhs
Secretary

July 23, 2001

Ms. Laura R. Crouch
Manager – Air Programs
Environmental Affairs
Tampa Electric Company
6499 U.S. Highway 41 North
Apollo Beach, FL 33572-9200

Re: Tampa Electric Polk Power Station
Coal Residual Beneficiation

Dear Ms. Crouch:

The Department has received your letter dated June 25, 2001, which requests confirmation that the coal residual beneficiation process planned for the Polk Power Station qualifies for the generic emissions unit exemption pursuant to Rule 62-210.300(3)(b)1., F.A.C.

As the potential particulate matter emissions from this process are projected to be less than one ton per year; there is no unit-specific applicable requirement; and the particulate matter emissions, in combination with the emissions of other units and activities at the facility, would not result in a modification subject to preconstruction review requirements; the Department hereby confirms that the coal residual beneficiation process planned for the Polk Power Station qualifies for the generic emissions unit permit exemption pursuant to Rule 62-210.300(3)(b)1., F.A.C.

At the time of application for renewal of the Title V Operation Permit for this facility, please include this emissions unit in the list of Insignificant Emissions Units.

Please contact Mr. Buck Oven of the Department's Siting Coordination Office to address any necessary revisions to the Polk Power Station's Site Certification.

Sincerely,

Stm. Sheplee

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

c: Mr. Buck Oven, FDEP
Mr. Bill Thomas, SWD-FDEP

June 25, 2001

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

Via FedEx
Airbill No. 7900 8642 6427

Re: Tampa Electric Polk Power Station
Coal Residual Beneficiation

Dear Mr. Sheplak:

Tampa Electric Company (TEC) presently generates coal residual material, or slag, at its Polk Power Station as a by-product of the coal gasification process. An air source construction permit application to handle, store, beneficiate, and combust this by-product material at TEC's Big Bend Station was previously submitted to the Department and the Hillsborough County Environmental Protection Commission in May 2001. TEC now plans to install and operate the coal residual beneficiation process (i.e., the Charah Environmental Slag Beneficiation Process) at the Polk Power Station instead of the Big Bend Station. Coal residual beneficiated at the Polk Power Station will transferred by truck to the Big Bend Station for use as a supplemental fuel.

The coal residual beneficiation process is essentially a wet process and therefore will have insignificant fugitive particulate matter (PM) emissions. A process description, process flow diagram, and PM emission estimates are included with this letter as Attachments I through III, respectively. A professional engineer certification is provided in Attachment IV.

Estimates of potential fugitive PM emissions are projected to be less than one ton per year. Accordingly, the coal residual beneficiation process qualifies for the generic emissions unit exemption pursuant to Rule 62-210.300(3)(b)1., F.A.C. Department confirmation that the proposed Polk Power Station coal residual beneficiation process is exempt from permitting is requested. If you have any questions regarding this matter, please feel free to contact me at (813) 641-5376.

Sincerely,

Laura R. Crouch
Manager-Air Programs
Environmental Affairs

EA\tl\SKT262

Enclosures

c: Mr. Jerry Kissel, FDEP SW

ATTACHMENT I

TAMPA ELECTRIC COMPANY
POLK POWER STATION

COAL RESIDUAL BENEFICIATION
PROCESS DESCRIPTION

Coal residual material, or slag, is a by-product of the Polk Power Station (PPS) coal gasification process. Tampa Electric Company (TEC) plans to install the Charah Environmental slag beneficiation process at the PPS to process this by-product coal residual and produce a material suitable for use as a supplemental fuel at TEC's Big Bend Station. The Charah beneficiation process is essentially a wet process and therefore will have insignificant emissions of particulate matter. A process flow diagram of the Charah beneficiation process is provided as Attachment II. A description of the Charah beneficiation process follows this introduction.

Slag currently stockpiled at the PPS will be transported to the inlet feed hopper of the beneficiation process by a rubber tired front-end loader. The slag is then transferred from the feed hopper to the slurry blunger by means of a conveyor belt. Water is added and the slag crushed in the blunger to produce a slag slurry that is subsequently pumped to a three deck primary screen.

Spray water is added at the primary screen to wash fines from the +0.5 inch oversize material. The +0.5 inch oversized material will be recycled to the blunger for recrushing. The primary screen will produce a washed 20 mesh to 0.5 inch material that will be transported of-site by truck and sold as an aggregate product. Material passing through the bottom of the primary screen will be pumped to a high frequency dewatering screen.

Underflow from the high frequency dewatering screen will be pumped to cyclones for additional water separation. Underflow from the cyclones will combine with the oversize material from the high frequency dewatering screen to feed a centrifuge for final dewatering. The centrifuge produces a moist, beneficiated coal residual that will be transported from the PPS by truck for use at the Big Bend Station as a supplemental fuel.

The overheads of the cyclones will combine with the centrifuge underflow and be pumped to a thickener. Cationic and anionic polymers will be added to the thickener to improves solids concentration. Underflow (i.e., concentrated solids) from the thickener will be pumped to a filter press for dewatering. Overflow water from the thickener will be recycled and used as process water.

Dewatered cake from the filter press will be initially trucked to a landfill for disposal. In the future, this material may also be blended with the beneficiated coal residual. The underflow from the filter press will be recycled to the feed section of the thickener.

ATTACHMENT II

TAMPA ELECTRIC COMPANY
POLK POWER STATION

COAL RESIDUAL BENEFICIATION
PROCESS FLOW DIAGRAM

ATTACHMENT III

TAMPA ELECTRIC COMPANY
POLK POWER STATION

COAL RESIDUAL BENEFICIATION
EMISSION ESTIMATES

As previously noted in Attachment I (Process Description), the Charah beneficiation process is essentially a wet process and therefore will have insignificant emissions of particulate matter (PM).

Potential fugitive PM emission points include:

- Transfer of slag from the existing slag stockpile to the beneficiation process inlet feed hopper by front-end loader;
- Transfer of slag from the inlet feed hopper to the slurry blunger; and
- Truck traffic on plant roadways.

The slag inlet feed rate will be up to 100 tons per hour, on a dry basis. Up to 200 tons per day of beneficiated coal residual will be produced by the Charah Environmental process.

Estimates of potential fugitive PM/PM_{10} emissions due to slag handling (upstream of the slurry blunger) are projected to be less than one ton per year using EPA AP-42 algorithms. Details of the potential fugitive PM/PM_{10} emission estimates are provided on the attached worksheets.

Downstream of the slurry blunger, fugitive PM/PM_{10} emissions will be minimal since the coal residual will be in a slurry form or as a moist, solid material. Fugitive PM/PM_{10} emissions due to truck traffic will be insignificant since all PPS roadways are paved and the trucks will be hauling a moist material.

ATTACHMENT IV

TAMPA ELECTRIC COMPANY
POLK POWER STATION
COAL RESIDUAL BENEFICIATION

Professional Engineer Certification

Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the permit exemption requested by Tampa Electric Company for the Polk Power Station residual coal beneficiation process permit exemption is in accordance with all applicable Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of air pollutants not regulated for an emissions unit, based solely upon the materials, information and calculations provided with this certification.

Signature ______________________ Date ______________________

(seal)

* Certification is applicable to the permit exemption request for the Tampa Electric Company Polk Power Station coal residual beneficiation process.

General file -

TAMPA ELECTRIC

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MAY 03 2004

BUREAU OF AIR REGULATION

April 29, 2004

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

Via FedEx
Airbill No. 7912 2667 1351

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

Dear Mr. Smolen:

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

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

Sincerely,

Laura Crouch

Laura Crouch
Manager - Air Programs
Environmental, Health & Safety

Enclosure

EA/gm/SSC190

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

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

(813) 228-4111

CUSTOMER SERVICE:
HILLSBOROUGH COUNTY (813) 223-0800
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1.0 INTRODUCTION

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

2.0 DISCUSSION OF RESULTS

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

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

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

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

3.0 SOURCE DESCRIPTION/TEST PROCEDURES

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

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

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

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

4.0 TEST RESULTS

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POLK POWER STATION
CARBON MONOXIDE DATA

BASELINE

UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

March 30, 2004

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

CO, lbs/hr calculated as:

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

where:

C_f = 7.2725E-08 lb/scf

F_d = 8276 dscf/mmBtu, from fuel analysis

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
CARBON MONOXIDE DATA

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

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

CO, lbs/hr calculated as:

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

where:

C_f = 7.2725E-08 lb/scf

F_d = 8286 dscf/mmBtu, from fuel analysis

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
NITROGEN OXIDES DATA FROM CEMS

BASELINE

UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

March 30, 2004

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

NO_x, lbs/hr is calculated as:

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

where:

C_f = 1.1946E-07 lb/scf

F_c = 2336 dscf/mmBtu, from fuel analysis

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

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

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POLK POWER STATION
NITROGEN OXIDES DATA FROM CEMS

BIOMASS

UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

April 1, 2004

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

NO_x, lbs/hr is calculated as:

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

where:

C_f = 1.1946E-07 lb/scf

F_c = 2350 dscf/mmBtu, from fuel analysis

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

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

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TAMPA ELECTRIC

POLK POWER STATION
SULFUR DIOXIDE DATA FROM CEMS

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

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

SO_2, lbs/hr is calculated as:

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

C_f = 1.6635E-07 lb/scf
F_c = 2336 dscf/mmBtu, from fuel analysis
Heat Input = 1739.5 mmBtu/hr, from heat input calculations

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

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TAMPA ELECTRIC

POLK POWER STATION
SULFUR DIOXIDE DATA FROM CEMS

BIOMASS

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

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

SO_2, lbs/hr is calculated as:

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

where:

C_f = 1.6635E-07 lb/scf

F_c = 2350 dscf/mmBtu, from fuel analysis

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

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

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POLK POWER STATION
HEAT INPUT CALCULATIONS

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

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

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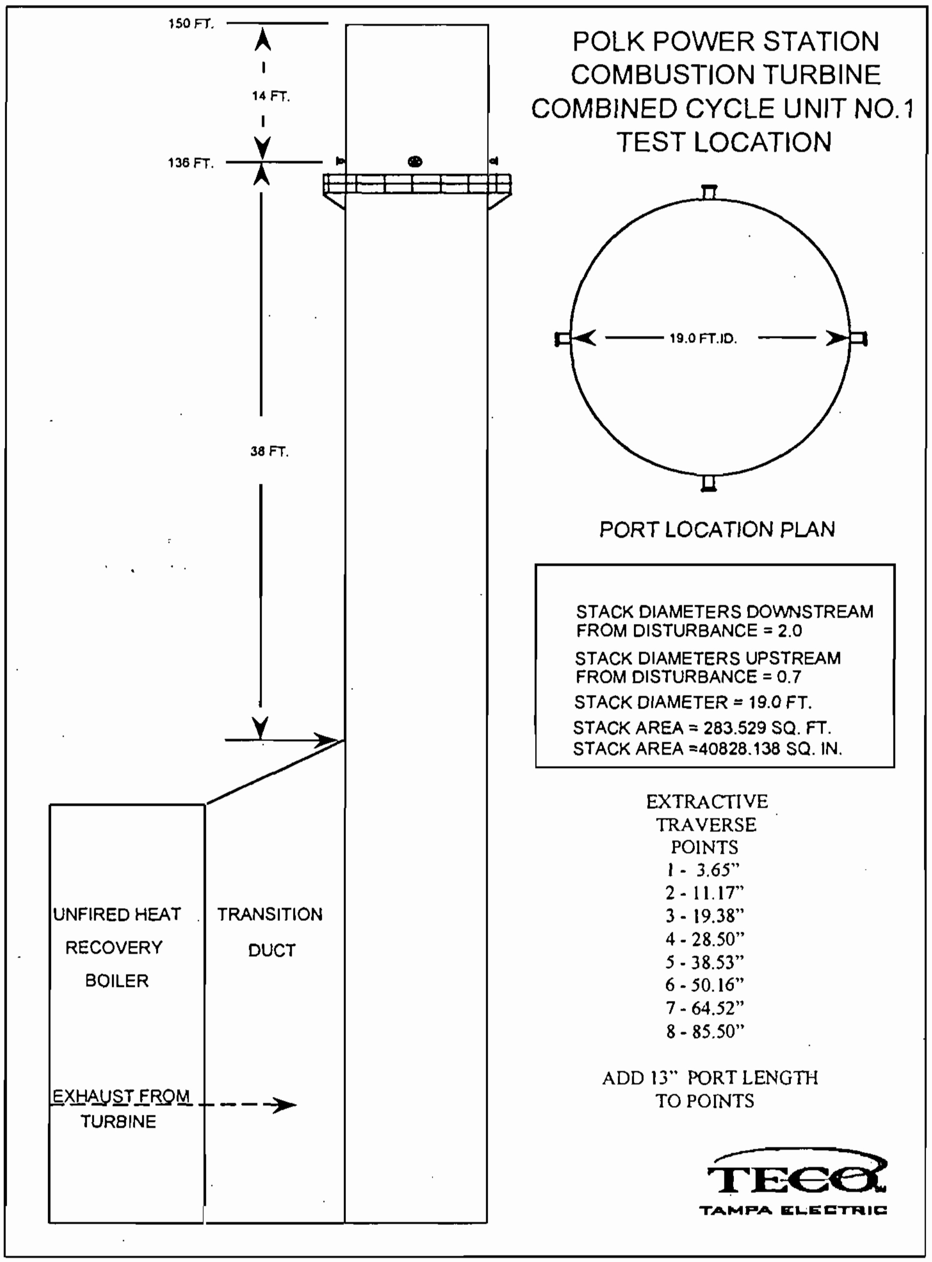
POLK POWER STATION
HEAT INPUT CALCULATIONS

BIOMASS

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

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

5.0 SAMPLING LOCATION TRAVERSE DIAGRAM



150 FT.
14 FT.
136 FT.
38 FT.
POLK POWER STATION
COMBUSTION TURBINE
COMBINED CYCLE UNIT NO.1
TEST LOCATION
19.0 FT.ID.
PORT LOCATION PLAN
STACK DIAMETERS DOWNSTREAM FROM DISTURBANCE = 2.0
STACK DIAMETERS UPSTREAM FROM DISTURBANCE = 0.7
STACK DIAMETER = 19.0 FT.
STACK AREA = 283.529 SQ. FT.
STACK AREA =40828.138 SQ. IN.
EXTRACTIVE
TRAVERSE
POINTS
1 - 3.65"
2 - 11.17"
3 - 19.38"
4 - 28.50"
5 - 38.53"
6 - 50.16"
7 - 64.52"
8 - 85.50"
ADD 13" PORT LENGTH
TO POINTS
UNFIRED HEAT
RECOVERY
BOILER
TRANSITION
DUCT
EXHAUST FROM
TURBINE
TECO
TAMPA ELECTRIC

-6-

TAMPA ELECTRIC

June 30, 2003

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JUL 01 2003

BUREAU OF AIR REGULATION

Via FedEx

Airbill No: 7916 2290 7129

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 May 20, 2003.

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

- Nitrogen Oxides (NO_x) - calculated average was 85.7 pounds per hour and 30-day rolling average was 106.9 pounds per hour; 30-day rolling average permit limit is 220.25 pounds per hour
- Sulfur Dioxide (SO_2) - calculated average was 274.7 pounds per hour and 30-day rolling average was 188.0 pounds per hour; 30-day rolling average permit limit is 357 pounds per hour
- Sulfuric Acid Mist (H_2SO_4) - calculated average was 27 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 SO_2 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.

Presented below in Table 1 is Polk Power Station's historical NO_x and SO_2 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 2003 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 SO_2.

TABLE 2. Analysis - 55% Petcoke, 45% Coal Blend (Based on 2003 data)

Parameter	2-year Average Historical Emissions	2003 Actual Emissions (1) (55% Petcoke 45% Coal Blend)	Difference	Above Actual Coal Levels?
NO_x [tons/yr]	599	335	-264	No
SO_2 [tons/yr]	1,252	742	-510	No

(1) Sample Calculation for 2003 NO_x Emissions:

$$0.048\ \frac{lb\ NOx}{MMBtu} * 1{,}699\ \frac{MMBtu}{hr} * 5{,}580\ \frac{Hours}{yr} \div 2{,}000\ \frac{tons}{lb} + \left(.16\ \frac{tons\ NOx}{hr} * 673\ \frac{Oil\ fired\ hrs}{yr} \right) = 335\ \frac{tons\ NOx}{yr}$$

Sample Calculation for 2003 SO_2 Emissions:

$$0.150\ \frac{lb\ SO2}{MMBtu} * 1{,}699\ \frac{MMBtu}{hr} * 5{,}580\ \frac{Hours}{yr} \div 2{,}000\ \frac{tons}{lb} + \left(.0461\ \frac{tons\ SO2}{hr} * 673\ \frac{Oil\ fired\ hrs}{yr} \right) = 742\ \frac{tons\ SO2}{yr}$$

Table 3 provides Polk Power Station's analyses based on the 2003 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 2003 Stack Test Data)

Parameter	2000 Baseline Historical Emissions	2003 Actual Emissions (2) (55% Petcoke 45% Coal Blend)	Difference	Above Actual Coal Levels?
H_2SO_4 [tons/yr]	86.8	76.2	-11	No

(2) Sample Calculation for 2003 H_2SO_4 Emissions:

$$27.3\ \frac{lb\ H2SO4}{hr} * 5{,}580\ \frac{Hours}{yr} \div 2{,}000\ \frac{tons}{lb} = 76.2\ \frac{tons\ H2SO4}{yr}$$

As evidenced by the data above, NO_x, SO_2 and H_2SO_4 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 R. Crouch

Laura Crouch
Manager - Air Programs
Environmental Affairs

EA/bmr/RC160

c/enc: Mr. Jerry Kissel, FDEP SW

EMISSIONS TEST REPORT

SULFURIC ACID MIST (SAM)
May 20, 2003
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

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

EMISSIONS TEST REPORT

SULFURIC ACID MIST (SAM)
May 20, 2003
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

TECO
TAMPA ELECTRIC

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 herby certify that this test report is authentic and accurate to the best of my knowledge.

Date 6/26/03

Signature Mark Hornick

Mark Hornick
General Manager
Polk and Phillips Power Stations

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 6/23/2003 Signature

Raymond A. McDarby, Jr.
Senior Environmental Technician
Quality Assurance/ Quality Control Specialist
Air Services Group
Environmental Services
Tampa Electric Company

The sampling and analysis 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 6/23/2003 Signature

Charles R. Dufeny
Environmental Technician
Air Services Group
Environmental Services
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 6/24/03 Signature

David A. Smith
Coordinator – Air Services Group
Environmental Services
Tampa Electric Company

TABLE OF CONTENTS

1.0 SUMMARY OF RESULTS

On May 20, 2003, 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 petroleum coke and 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 5.32E-07 lbs/dscf, and the average H_2SO_4 emission rate was 27 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 0.15 lbs/MMBtu; the average SO_2 emission rate was 274.72 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 concentration was 10 ppmvd @ 15% O_2, the average emission rate was 86 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. Effective July 1, 2003, the permitted concentration becomes 15 ppmvd @ 15% O_2, and 132 lbs/hr based on a 30 day rolling average.

During the tests on May 20, 2003, Unit No. 1 Combustion Turbine was operated at an average load of 190 megawatts and an average heat input of 1699 MMBtu/hr. The average quantity of fuel burned was 369,447 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 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 (SO_2) 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 SO_2 emission rates for the test period were derived from the report titled "Daily EPA CEM Summary". All data averages were calculated over the time frame corresponding to the sulfuric acid mist test (08:00 through 12:00, DST). The SO_2 30-day rolling average was taken from the 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 NOx O2 Summary", representing hourly NO_x concentrations corrected to 15% O_2. 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 report titled "Polk County Quarterly Emission Report". All reports are included in Appendix C of this report.

3.0 TEST RESULTS

TECO
TAMPA ELECTRIC

Environmental Services
Air Services Group

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

Customer: Polk Power Station
Facility: Unit 1 - HRSG
Sampling Location: Stack
Operating Conditions: Based at Full Load
Test Date: May 20, 2003

	Run #1	Run #2	Run #3	Average
Gas Flow Rates				
Q_s, acfm:	1352037.7	1323765.9	1301556.4	1325786.65
$Q_{s(std)}$, dscfm:	866622.3	863383.9	843906.6	857970.92
Sampled Volume, $V_{m(std)}$, dscf:	38.76	38.07	37.52	38.117
Stack Moisture, B_{ws} x 100, %:	6.11	4.39	5.18	5.228
Isokinetic Sampling Rate, I, %:	99.9	98.4	99.3	99.2
C_{H2SO4}, lb/dscf:	4.732E-07	4.745E-07	6.488E-07	5.322E-07
E_{H2SO4}, lb/mmBtu:	0.01002	0.00657	0.00885	0.00848
E_{H2SO4}, lbs/hr:	24.60407	24.58285	32.85067	27.34586

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TAMPA ELECTRIC

POLK POWER STATION
SULFUR DIOXIDE and NITROGEN OXIDES from CEMS

COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
May 20, 2003

	Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)			
Time of Day	lbs/MMBtu	lbs/hr	ppmvd @ 15% O_2	lbs/MMBtu	Heat Input	lbs/hr
8:00	0.150	266.5	10.3	0.050	1769	88.450
9:00	0.150	280.3	10.1	0.049	1822	89.278
10:00	0.160	294.6	9.9	0.048	1821	87.408
11:00	0.150	278.6	9.5	0.046	1800	82.800
12:00	0.140	253.6	9.4	0.046	1756	80.776
Averages:	0.1500	274.72	9.84	0.0478	1794	85.7424

Notes to data:
Sulfur Dioxide data from DAILY EPA CEM SUMMARY report from CEM data acquisition and handling system. Nitrogen Oxides ppmvd @15% O_2 data from Daily NOx O2 Summary report from CEM data acquisition and handling system. Nitrogen Oxides in lbs/MMBtu and Heat input from DAILY EPA CEM SUMMARY report from CEM data acquisition and handling system.
Nitrogen Oxides lbs/hr calculated as:

lbs NO_x/MMBtu x Heat Input in MMBtu/hr

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POLK POWER STATION
HEAT INPUT CALCULATIONS

COMBINED CYCLE COMBUSTION TURBINE SYSTEM - SYNGAS
05/20/03

Gaseous Component	Mole %	Molecular Weight	Density lbs/ft^3	Volume Density lbs/ft^3
Hydrogen	34.05667	2.016	0.0053	0.0018050
Oxygen	0.00000	32.000	0.0846	0.0000000
Nitrogen	4.16667	28.016	0.0744	0.0031000
CO2	14.05000	44.010	0.1170	0.0164385
CO	46.90333	28.010	0.0740	0.0347085
Argon	0.84000	39.948	0.1065	0.0008946
COS	0.00000	60.070	0.1602	0.0000000
Methane	0.02000	16.041	0.0424	0.0000085
				0.0569551 lbs/ft^3

Average Fuel Flow for Test Period = 102.62417 lbs/sec

Volumetric Fuel Flow Rate, F = 6.487E+06 ft^3/hr

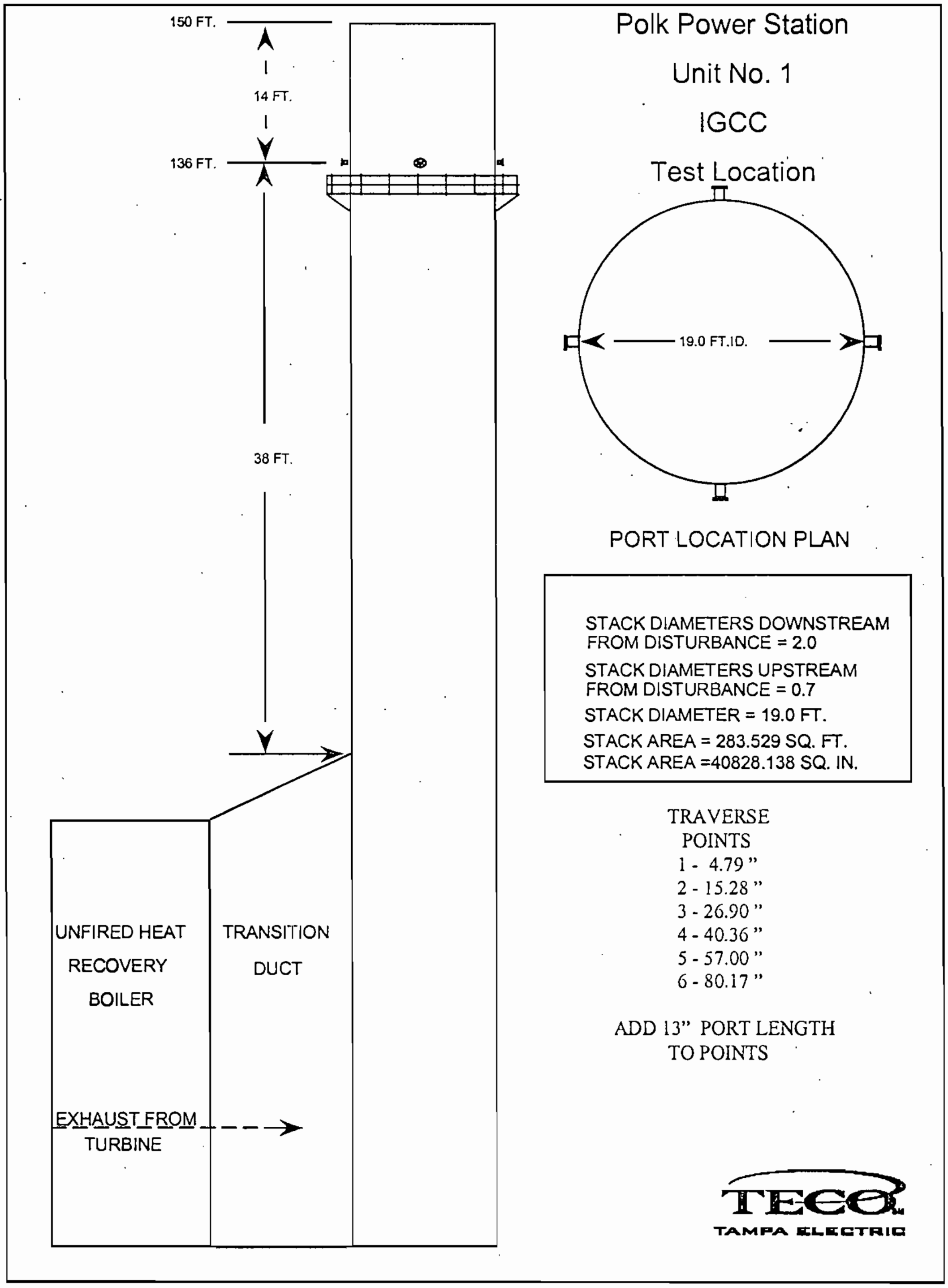
Higher Heating Value of syngas fuel, H_g = 262 Btu/ft^3

Average Heat Input = $H_g \times F$

= 1.699E+09 Btu/hr

= 1699.0 mmBtu/hr

4.0 SAMPLING LOCATION TRAVERSE DIAGRAM


Polk Power Station
Unit No. 1
IGCC
Test Location
150 FT.
14 FT.
136 FT.
38 FT.
19.0 FT.I.D.
PORT LOCATION PLAN
STACK DIAMETERS DOWNSTREAM FROM DISTURBANCE = 2.0
STACK DIAMETERS UPSTREAM FROM DISTURBANCE = 0.7
STACK DIAMETER = 19.0 FT.
STACK AREA = 283.529 SQ. FT.
STACK AREA =40828.138 SQ. IN.
TRAVERSE POINTS
1 - 4.79"
2 - 15.28"
3 - 26.90"
4 - 40.36"
5 - 57.00"
6 - 80.17"
ADD 13" PORT LENGTH TO POINTS
UNFIRED HEAT RECOVERY BOILER
TRANSITION DUCT
EXHAUST FROM TURBINE
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APPENDIX A

SULFURIC ACID MIST CALCULATIONS

TECO
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Environmental Services
Air Services Group

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

Customer: Polk Power Station
Facility: Unit 1 - HRSG
Sampling Location: Stack
Operating Conditions: Based at Full Load
Run Number: 1
Date: 05/20/03

Sample Time, θ:	60 minutes	Nozzle Diameter, D_n:	0.197 inches
Barometric Pressure, P_b:	29.75 "Hg	Nozzle Area, A_n:	0.0002117 ft^2
Stack Pressure, P_s:	29.70 "Hg	Average Orifice Meter ΔH:	1.402 "H_2O
Effective Stack Area, A_s:	283.529 ft^2	Sample Volume, V_m:	40.352 ft^3
Pitot Coefficient, Cp:	0.84 dimensionless	Average Meter Temp., T_m:	85.7 °F
Gas Analysis:	8.5 % CO_2	Average Stack Temp., T_s:	307.8 °F
	13.0 % O_2	Average $\sqrt{\Delta p}$:	1.175 "H_2O
	0.0 % CO	Condensate Volume, V_{lc}:	53.5 ml
	78.5 % N_2	Meter Box Y:	0.995 dimensionless

Data Calculated from Source Measurements:

$V_{w(std)} = 4.714E\text{-}02 \times V_{lc}$	2.522 scf
$V_{m(std)} = 17.647 \times V_m \times Y \times (P_b + (\Delta H / 13.6)) / (T_m + 460)$	38.760 dscf
$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$	0.061 %
$FDA = 1.0 - B_{ws}$	0.939 %
$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	29.88 lb./lb. mole
$M_s = (M_d \times FDA) + (18.0 \times B_{ws})$	29.15 lb./lb. mole
$v_s = 85.49 \times C_p \times (\sqrt{\Delta p}) \times (\sqrt{(T_s + 460) / (M_s \times P_s)})$	79.48 ft/second
$Q_s = v_s \times A_s \times 60$	1352037.7 acf/minute
$Q_{s(std)} = Q_s \times FDA \times (528 / (T_s + 460)) \times (P_s / 29.92)$	866622.3 dscf/minute
$I = (T_s + 460) \times ((2.67E\text{-}03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / \theta \times P_s \times A_n \times v_s \times 60)$	99.9 %

Data from Laboratory Analysis:

	H_2SO_4
Normality of Barium Chloride titrant, N	0.01019
Volume Titrant Blank, V_{tb}	0.02
Volume Titrant Sample, V_t	3.35
Volume of Sample Aliquot, V_a	100
Total Volume of Solution, V_{soln}	500

Calculated Concentration and Emission Rate Data:

$C_{H2SO4} = 1.081E\text{-}04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)} =$	4.732E-07 lb/dscf
F_c-factor =	1800 dscf/mmBtu
$E_{H2SO4} = C_{H2SO4} \times F_c\text{-factor} \times (100/\%CO_2) =$	0.01002 lb/mmBtu
$E_{H2SO4} = C_{H2SO4} \times Q_{s(std)} \times 60 =$	24.6041 lb/hr

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Environmental Services
Air Services Group

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

Customer: Polk Power Station
Facility: Unit 1 - HRSG
Sampling Location: Stack
Operating Conditions: Based at Full Load
Run Number: 2
Date: 05/20/03

Sample Time, θ:	60 minutes	Nozzle Diameter, D_n:	0.197 inches
Barometric Pressure, P_b:	29.74 "Hg	Nozzle Area, A_n:	0.0002117 ft^2
Stack Pressure, P_s:	29.69 "Hg	Average Orifice Meter ΔH:	1.393 "H_2O
Effective Stack Area, A_s:	283.529 ft^2	Sample Volume, V_m:	40.097 ft^3
Pitot Coefficient, Cp:	0.84 dimensionless	Average Meter Temp., T_m:	91.9 °F
Gas Analysis:	13.0 % CO_2	Average Stack Temp., T_s:	308.0 °F
	8.5 % O_2	Average $\sqrt{\Delta p}$:	1.164 "H_2O
	0.0 % CO	Condensate Volume, V_{lc}:	37.1 ml
	78.5 % N_2	Meter Box Y:	0.995 dimensionless

Data Calculated from Source Measurements:

$V_{w(std)} = 4.714E\text{-}02 \times V_{lc}$	1.749 scf
$V_{m(std)} = 17.647 \times V_m \times Y \times (P_b + (\Delta H / 13.6)) / (T_m + 460)$	38.069 dscf
$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$	0.044 %
$FDA = 1.0 - B_{ws}$	0.956 %
$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$	30.42 lb./lb. mole
$M_s = (M_d \times FDA) + (18.0 \times B_{ws})$	29.87 lb./lb. mole
$v_s = 85.49 \times C_p \times (\sqrt{\Delta p}) \times (\sqrt{(T_s + 460) / (M_s \times P_s)})$	77.81 ft/second
$Q_s = v_s \times A_s \times 60$	1323765.9 acf/minute
$Q_{s(std)} = Q_s \times FDA \times (528 / (T_s + 460)) \times (P_s / 29.92))$	863383.9 dscf/minute
$I = (T_s + 460) \times ((2.67E\text{-}03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / \theta \times P_s \times A_n \times v_s \times 60)$	98.4 %.

Data from Laboratory Analysis:

	H_2SO_4
Normality of Barium Chloride titrant, N	0.01019
Volume Titrant Blank, V_{tb}	0.02
Volume Titrant Sample, V_t	3.3
Volume of Sample Aliquot, V_a	100
Total Volume of Solution, V_{soln}	500

Calculated Concentration and Emission Rate Data:

$C_{H2SO4} = 1.081E\text{-}04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)} =$	4.745E-07 lb/dscf
F_c-factor =	1800 dscf/MMBtu
$E_{H2SO4} = C_{H2SO4} \times F_c\text{-factor} \times (100/\%CO_2) =$	0.00657 lb/MMBtu
$E_{H2SO4} = C_{H2SO4} \times Q_{s(std)} \times 60 =$	24.5828 lb/hr

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Environmental Services
Air Services Group

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

Customer: Polk Power Station
Facility: Unit 1 - HRSG
Sampling Location: Stack
Operating Conditions: Based at Full Load
Run Number: 3
Date: 05/20/03

Sample Time, θ:	60 minutes	Nozzle Diameter, D_n:	0.197 inches
Barometric Pressure, P_b:	29.80 "Hg	Nozzle Area, A_n:	0.0002117 ft^2
Stack Pressure, P_s:	29.75 "Hg	Average Orifice Meter ΔH:	1.360 "H_2O
Effective Stack Area, A_s:	283.529 ft^2	Sample Volume, V_m:	39.836 ft^3
Pitot Coefficient, Cp:	0.84 dimensionless	Average Meter Temp., T_m:	97.4 °F
Gas Analysis:	13.2 % CO_2	Average Stack Temp., T_s:	307.8 °F
	8.5 % O_2	Average $\sqrt{\Delta p}$:	1.145 "H_2O
	0.0 % CO	Condensate Volume, V_{lc}:	43.5 ml
	78.3 % N_2	Meter Box Y:	0.995 dimensionless

Data Calculated from Source Measurements:

$V_{w(std)} = 4.714E-02 \times V_{lc}$	2.051	scf
$V_{m(std)} = 17.647 \times V_m \times Y \times (P_b + (\Delta H / 13.6)) / (T_m + 460)$	37.523	dscf
$B_{ws} = V_{w(std)} / (V_{m(std)} + V_{w(std)})$	0.052	%
$FDA = 1.0 - B_{ws}$	0.948	%
$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \% CO))$	30.45	lb./lb. mole
$M_s = (M_d \times FDA) + (18.0 \times B_{ws})$	29.81	lb./lb. mole
$v_s = 85.49 \times C_p \times (\sqrt{\Delta p}) \times (\sqrt{(T_s + 460) / (M_s \times P_s)})$	76.51	ft/second
$Q_s = v_s \times A_s \times 60$	1301556.4	acf/minute
$Q_{s(std)} = Q_s \times FDA \times (528 / (T_s + 460)) \times (P_s / 29.92))$	843906.6	dscf/minute
$I = (T_s + 460) \times ((2.67E-03 \times V_{lc}) + (V_{m(std)} / 17.647)) \times 100 / \theta \times P_s \times A_n \times v_s \times 60)$	99.3	%.

Data from Laboratory Analysis:

	H_2SO_4
Normality of Barium Chloride titrant, N	0.01019
Volume Titrant Blank, V_{tb}	0.02
Volume Titrant Sample, V_t	4.44
Volume of Sample Aliquot, V_a	100
Total Volume of Solution, V_{soln}	500

Calculated Concentration and Emission Rate Data:

$C_{H2SO4} = 1.081E-04 \times (N \times (V_t - V_{tb}) \times (V_{soln} / V_a)) / V_{m(std)} =$	6.488E-07	lb/dscf
F_c-factor =	1800	dscf/MMBtu
$E_{H2SO4} = C_{H2SO4} \times F_c\text{-factor} \times (100/\%CO_2) =$	0.00885	lb/MMBtu
$E_{H2SO4} = C_{H2SO4} \times Q_{s(std)} \times 60 =$	32.8507	lb/hr

APPENDIX B

SULFURIC ACID MIST LABORATORY ANALYTICAL DATA

TECO TAMPA ELECTRIC

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: 05/27/03

Laboratory ID: AA69850

Sample Information

Location Code: PK-STK-S
Location Description: Polk Stack test ,SO3 analysis
Project Account Code:
Sample Collection Method:

Sampled By: C. DUFENY
Date Collected: 05/20/03
Time Collected: 10:45:00 AM
Date of Sample Receipt: 05/21/03

Laboratory Results

Parameter	Result	Units	MDL	Qualifier Code	Lower Limit	Upper Limit	Violation Check
Normality of BaCl2 * 2H2O	0.01019		0.0001				
SO3, Avg. of Blank Titrations	0.02	milliliters	0.01	PQL			
SO3, Run #1, Avg. of Titrations	3.35	milliliters	0.01				
SO3, Run #2, Avg. of Titrations	3.30	milliliters	0.01				
SO3, Run #3, Avg. of Titrations	4.44	milliliters	0.01				
SO3, Volume of Contained Sample	500	milliliters	1				
SO3, Volume of Sample Aliquot	100	milliliters	0.1				

Comments:

All results calculated on a wet to wet basis, unless otherwise indicated.
EPA Method 8
Polk Unit 1 Sulfuric Acid Mist Test

Data Qualifier Codes Explanation:
PQL - The reported value is between the laboratory method detection limit (MDL) and the laboratory practical quatitation limit (PQL). PQL = 4 x MDL.

Subcontracted Laboratories:

Robert Dorey,
Manager, Environmental Services

Laboratory Services certifies that the test results in this report meet all requirements of the NELAC standards, unless indicated otherwise in the body of the report.

SO3 ANALYSIS
EPA METHOD 8

UNIT: Polk Unit 1 SAM **COLLECTION DATE:** 5/20/03

Run date 5-23-03 @ 13:00 IPA PORTION

IPA-C-771 30% H_2O_2 - RW-2436 $BaCl_2$ - RW-2402		Final Vol	Aliquot	$BaCl_2$ (ml)	$BaCl_2$ Avg (ml)
AA69850 Sample Number	Field ISOP. BLANK	already not over 500ml	100 mL	0.03	0.02
	ISOP. BLANK - DUP	"	100 mL	0.02	
	RUN 1	500 ml	100 ml	3.35	3.35
	RUN 1 - DUP	500 ml	100 ml	3.35	
	RUN 2	500 ml	100 ml	3.30	3.30
	RUN 2 - DUP	500 ml	100 ml	3.30	
	RUN 3	500 ml	100 ml	4.42	4.44
	RUN 3	500 ml	100 ml	4.45	
	RUN 4				
	RUN 4 - DUP				
	RUN 5				
	RUN 5 - DUP				
	RUN 6				
	RUN 6				

Used standardized $BaCl_2$ from 5-13-03

~~FV = 400~~

405

20 ml of sample + 80 ml of 100% IPA #1 5.27 ml $BaCl_2$ ⇒ 409.5 101.1%

#2 5.26 ml $BaCl_2$

atend #3 5.23 ml $BaCl_2$

80% Lab IPA Blank 100 ml = 0.02 ml $BaCl_2$

P

Best Available Copy

NaOH - RW-1834
Ngd 5-14-03
H_2SO_4 - RW-2403
$BaCl_2$ - RW-2402

SO3 ANALYSIS
EPA METHOD 8

ANALYSIS DATE: 5-13-03

UNIT: POLK ACID PLANT

ANALYSIS TIME: 10:00

COLLECTION DATE: 5-13-03

ANALYST: Gail A. Harrison

NaOH STANDARDIZATION:

1) 0.0240 gm KHP ----> 12.60 mL NaOH RW-1834 0.0093265N
2) 0.0239 gm KHP ----> 12.91 mL NaOH 0.0090646N
3) 0.0216 gm KHP ----> 11.78? mL NaOH -0.0089781N
3) 0.0199 gm KHP -> 11.10 mL NaOH 0.0087782
2) 0.0189 gm KHP -> 10.29 mL NaOH 0.008993
1) 0.0194 gm KHP -> 10.60 mL NaOH 0.008961

0.021283 gm KHP
(0.20423 x 11.5464 mL NaOH)

0.00903 N. NaOH

H2SO4 STANDARDIZATION:

1) 10 mL H2SO4 ----> 11.13 mL NaOH
2) 10 mL H2SO4 ----> 11.42 mL NaOH
3) 10 mL H2SO4 ----> 11.30 mL NaOH

AVG = 11.2833

(11.2833 mL NaOH)(0.00903 N. NaOH)
10 mL H2SO4

0.010189
~~0.0102~~ N. H2SO4
gah 5-13-03

BaCl2 - 2H2O STANDARDIZATION:

1) 10 mL H2SO4 + 40 mL ISOPROPANOL ----> 10.02 mL BaCl2 - 2H2O
2) 10 mL H2SO4 + 40 mL ISOPROPANOL ----> 10.01 mL BaCl2 - 2H2O
3) 10 mL H2SO4 + 40 mL ISOPROPANOL ----> 9.98 mL BaCl2 - 2H2O

((0.010189 N. H2SO4)(10 mL H2SO4)
10.00333 mL BaCl2 - 2H2O

= 0.01019 N. BaCl2 - 2H2O

H2O2 - C-798
phenolphthalein - RW-1947

APPENDIX C

DATA ACQUISITION AND HANDLING SYSTEM REPORTS

Polk Station
HRSG
Tampa

Today's Date: 06/17/2003
Time: 05:24:31

Reporting Period
Day: 05/20/2003

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	8.1	37.8	0.180	322.8	13.8	0.047	51438	1803
0100	8.2	36.1	0.170	306.7	14.0	0.047	51186	1816
0200	8.1	33.4	0.160	281.7	14.3	0.049	50802	1781
0300	8.2	30.9	0.140	262.0	14.7	0.049	51078	1813
0400	8.2	29.0	0.140	245.9	14.9	0.050	51084	1813
0500	8.2	28.8	0.130	245.3	14.8	0.050	51306	1821
0600	8.2	29.9	0.140	252.9	15.1	0.051	50952	1808
0700	8.3	30.8	0.140	302.7	15.0	0.050M	59208M	2127
0800	8.3	32.6	0.150	266.5	14.9	0.050	49242	1769
0900	8.3	33.3	0.150	280.3	14.6	0.049	50712	1822
1000	8.3	35.0	0.160	294.6	14.3	0.048	50700	1821
1100	8.3	33.5	0.150	278.6	13.7	0.046	50106	1800
1200	8.1	30.5	0.140	253.6	13.4	0.046	50094	1756
1300	8.0	26.3	0.130	215.7	12.5	0.043	49404	1710
1400	8.2	27.9	0.130	227.9	14.3	0.048	49200	1746
1500	8.3	32.8	0.150	270.6	14.8	0.049	49704	1785
1600	8.3	33.0	0.150	275.2	14.5	0.048	50244	1805
1700	8.2	32.1	0.150	267.1	14.2	0.048	50124	1779
1800	8.2	31.9	0.150	265.9	14.3	0.048	50220	1782
1900	8.2	31.8	0.150	265.5	14.3	0.048	50304	1785
2000	8.2	31.4	0.150	264.2	14.1	0.047	50694	1799
2100	8.2	30.9	0.140	260.2	14.0	0.047	50730	1800
2200	8.2	32.4	0.150	274.1	14.2	0.048	50970	1809
2300	8.2	33.5	0.160	283.6	13.8	0.046	51000	1810
AVRGE	8.2	31.9	0.148	269.3	14.3	0.048	50854	1807

Daily SO2 3.2 Tons
Daily CO2 5710.8 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: 06/17/2003
Time: 05:25:20

Reporting Period
Day: 05/20/2003

Daily NOx O2 Summary

Dry Values are corrected to 7% moisture

Time	O2 %	O2 dry	NOx ppm	NOx dry	NOx @15% O2
0000	11.0	11.8	13.8	14.8	9.7
0100	11.0	11.8	14.0	15.1	9.8
0200	11.0	11.8	14.3	15.4	10.0
0300	11.0	11.8	14.7	15.8	10.3
0400	11.0	11.8	14.9	16.0	10.4
0500	11.0	11.8	14.8	15.9	10.3
0600	11.0	11.8	15.1	16.2	10.6
0700	10.9	11.7	15.0	16.1	10.4
0800	10.9	11.7	14.9	16.0	10.3
0900	10.9	11.7	14.6	15.7	10.1
1000	10.9	11.7	14.3	15.4	9.9
1100	10.9	11.7	13.7	14.7	9.5
1200	11.0	11.8	13.4	14.4	9.4
1300	11.1	11.9	12.5	13.4	8.8
1400	11.1	11.9	14.3	15.4	10.1
1500	11.0	11.8	14.8	15.9	10.3
1600	11.0	11.8	14.5	15.6	10.1
1700	11.0	11.8	14.2	15.3	9.9
1800	11.0	11.8	14.3	15.4	10.0
1900	11.0	11.8	14.3	15.4	10.0
2000	11.0	11.8	14.1	15.2	9.9
2100	11.0	11.8	14.0	15.1	9.8
2200	11.0	11.8	14.2	15.3	9.9
2300	11.0	11.8	13.8	14.8	9.7
AVRGE	11.0	11.8	14.3	15.3	10.0

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 Nox	30-DAY Oil lbs/hr	30-DAY Gas lbs/hr	Daily Oil lbs/hr	Daily Gas lbs/hr	Hrs Oil	Hrs Gas	30-DAY Gas ppmvd	Daily Gas ppmvd	Gas&Oil Total tons/yr
04/19/2003	196.5	108.4	207.4	174.9	19	5	0.00	0.00	0.00
04/20/2003	197.0	109.0	196.5	142.2	7	15	0.00	0.00	0.00
04/24/2003	197.6	109.0	214.3	0.0	8	0	0.00	0.00	0.00
04/25/2003	196.0	109.0	165.8	0.0	5	0	0.00	0.00	0.00
04/26/2003	195.4	109.0	130.9	0.0	4	0	0.00	0.00	0.00
04/27/2003	196.2	108.3	180.0	98.6	8	7	0.00	0.00	0.00
04/28/2003	197.8	109.6	255.7	163.7	4	18	0.00	0.00	0.00
04/29/2003	198.7	110.4	232.6	142.4	2	22	0.00	0.00	0.00
04/30/2003	198.7	109.6	0.0	144.2	0	24	0.00	0.00	0.00
05/01/2003	198.7	110.3	0.0	161.8	0	24	0.00	0.00	0.00
05/02/2003	198.7	111.4	0.0	150.3	0	24	0.00	20.96	0.00
05/03/2003	199.2	111.6	186.1	118.5	1	23	0.00	16.28	0.00
05/04/2003	199.2	111.8	0.0	120.0	0	24	0.00	15.29	0.00
05/05/2003	199.8	113.1	231.2	146.5	3	21	0.00	20.06	0.00
05/06/2003	199.8	113.3	0.0	108.0	0	24	0.00	12.77	0.00
05/07/2003	199.8	113.1	0.0	98.6	0	24	0.00	11.49	0.00
05/08/2003	199.8	112.4	0.0	96.2	0	24	0.00	11.26	0.00
05/09/2003	199.8	111.7	0.0	94.1	0	24	0.00	10.90	0.00
05/10/2003	199.8	110.8	0.0	91.0	0	24	0.00	10.44	0.00
05/11/2003	199.8	108.6	0.0	75.8	0	24	0.00	8.93	0.00
05/12/2003	199.8	108.5	0.0	90.2	0	24	15.04	10.42	134.99
05/13/2003	199.8	108.5	0.0	91.3	0	24	15.04	10.55	136.09
05/14/2003	199.8	108.7	0.0	92.8	0	24	15.06	10.68	137.20
05/15/2003	199.8	108.0	0.0	93.0	0	24	14.86	10.73	138.32
05/16/2003	193.9	107.7	202.2	101.4	12	12	14.90	13.61	140.14
05/17/2003	193.9	107.1	0.0	98.1	0	24	14.85	11.58	141.27
05/18/2003	193.9	107.3	0.0	98.5	0	24	14.88	11.38	142.30
05/19/2003	193.9	107.1	0.0	95.1	0	24	14.87	10.86	143.35
05/20/2003	193.9	106.9	0.0	85.8	0	24	14.86	9.96	144.34

POLK COUNTY QUARTERLY EMISSION REPORT
HRSG

DATE So2	30-DAY Oil lbs	30-DAY Gas lbs	Daily Oil lbs	Daily Gas lbs	Hours Boiler
04/19/2003	44.9	283.2	42.3	118.0	24
04/20/2003	45.0	277.7	46.6	183.9	22
04/24/2003	44.7	277.7	45.5	0.0	8
04/25/2003	44.0	277.7	38.2	0.0	5
04/26/2003	43.5	277.7	21.0	0.0	4
04/27/2003	43.5	267.9	40.0	64.5	15
04/28/2003	43.6	257.8	54.6	54.1	22
04/29/2003	44.0	247.9	54.3	56.6	24
04/30/2003	44.0	242.4	0.0	48.2	24
05/01/2003	44.0	233.2	0.0	70.4	24
05/02/2003	44.0	224.9	0.0	82.8	24
05/03/2003	44.3	215.7	49.1	66.6	24
05/04/2003	44.3	207.5	0.0	77.6	24
05/05/2003	44.4	200.0	58.6	110.9	24
05/06/2003	44.4	196.5	0.0	253.2	24
05/07/2003	44.4	194.7	0.0	301.1	24
05/08/2003	44.4	197.2	0.0	367.5	24
05/09/2003	44.4	194.9	0.0	263.1	24
05/10/2003	44.4	195.2	0.0	326.5	24
05/11/2003	44.4	200.8	0.0	245.0	24
05/12/2003	44.4	202.0	0.0	312.9	24
05/13/2003	44.4	200.3	0.0	230.1	24
05/14/2003	44.4	200.5	0.0	310.0	24
05/15/2003	44.4	200.7	0.0	332.6	24
05/16/2003	43.3	196.8	47.9	218.9	24
05/17/2003	43.3	194.9	0.0	290.8	24
05/18/2003	43.3	191.8	0.0	256.1	24
05/19/2003	43.3	190.7	0.0	310.7	24
05/20/2003	43.3	188.0	0.0	267.8	24

APPENDIX D

TURBINE DATA

Polk Power Station Unit 1 SAM Compliance
May 20, 2003

Test Period:	05/20/2003 9:13			
1 Min	05/20/2003 13:41			
	CT Syngas Mass Flow	Saturator Moisture, %	CT Gen Watts	Mass Flow Corrected for Moisture
	1TSYFI910	1TSYAI202	1GMLJI962	
Test Period Averages	**108.9922193**	**5.8426679**	**189.7803389**	**102.624166**
20-May-03 09:13:00	109.658806	5.778050	192.111938	
20-May-03 09:14:00	109.290398	5.772137	192.055069	
20-May-03 09:15:00	109.047401	5.766224	191.600555	
20-May-03 09:16:00	108.666481	5.760312	191.513519	
20-May-03 09:17:00	108.367569	5.754398	190.643509	
20-May-03 09:18:00	108.598015	5.748486	191.308212	
20-May-03 09:19:00	108.856483	5.742573	191.819824	
20-May-03 09:20:00	109.147163	5.736660	191.507217	
20-May-03 09:21:00	109.357277	5.730747	192.139359	
20-May-03 09:22:00	108.750702	5.724833	191.695908	
20-May-03 09:23:00	109.277786	5.718921	191.373001	
20-May-03 09:24:00	109.362892	5.713008	191.726364	
20-May-03 09:25:00	109.020042	5.707095	190.778214	
20-May-03 09:26:00	109.324318	5.702879	191.365509	
20-May-03 09:27:00	109.233498	5.713943	191.912476	
20-May-03 09:28:00	109.328896	5.725006	192.154190	
20-May-03 09:29:00	109.107132	5.736068	192.348892	
20-May-03 09:30:00	109.407982	5.747131	192.187759	
20-May-03 09:31:00	109.092354	5.758194	192.026611	
20-May-03 09:32:00	109.311897	5.769258	191.947372	
20-May-03 09:33:00	109.483078	5.780320	192.388641	
20-May-03 09:34:00	109.756424	5.790036	192.183182	
20-May-03 09:35:00	109.492050	5.787624	192.069580	
20-May-03 09:36:00	109.585457	5.785213	192.364914	
20-May-03 09:37:00	109.429314	5.782802	191.558685	
20-May-03 09:38:00	109.797234	5.780390	191.668365	
20-May-03 09:39:00	109.428978	5.777978	191.715881	
20-May-03 09:40:00	109.223610	5.775567	191.443161	
20-May-03 09:41:00	110.256203	5.773156	191.805725	
20-May-03 09:42:00	110.338989	5.770744	192.063416	
20-May-03 09:43:00	109.802444	5.768332	191.527191	
20-May-03 09:44:00	110.039528	5.765921	191.084656	
20-May-03 09:45:00	108.948624	5.763510	191.332031	
20-May-03 09:46:00	108.906769	5.761098	191.919144	
20-May-03 09:47:00	109.135406	5.758687	190.932205	
20-May-03 09:48:00	108.916901	5.756275	191.362823	
20-May-03 09:49:00	109.086891	5.753864	191.195404	
20-May-03 09:50:00	108.991989	5.751452	191.804916	
20-May-03 09:51:00	109.216743	5.749041	191.539047	
20-May-03 09:52:00	109.559616	5.746629	191.345078	

20-May-03 09:53:00	109.548927	5.739188	191.695541
20-May-03 09:54:00	109.603394	5.693663	191.850266
20-May-03 09:55:00	108.290482	5.648138	190.690231
20-May-03 09:56:00	108.939781	5.608118	190.617722
20-May-03 09:57:00	109.050240	5.617635	190.618988
20-May-03 09:58:00	109.327370	5.627152	191.099731
20-May-03 09:59:00	109.812729	5.636669	191.580475
20-May-03 10:00:00	109.544708	5.646186	192.012177
20-May-03 10:01:00	109.850159	5.655704	192.072601
20-May-03 10:02:00	109.654289	5.665221	192.027878
20-May-03 10:03:00	108.901337	5.674738	191.186981
20-May-03 10:04:00	108.751572	5.685878	190.501358
20-May-03 10:05:00	108.639183	5.714870	190.824951
20-May-03 10:06:00	108.622612	5.750603	191.113632
20-May-03 10:07:00	109.318687	5.860469	191.137894
20-May-03 10:08:00	109.716949	5.957111	191.162140
20-May-03 10:09:00	109.683144	5.908282	191.186386
20-May-03 10:10:00	108.717003	5.859452	191.210648
20-May-03 10:11:00	108.992546	5.814522	191.276779
20-May-03 10:12:00	109.225395	5.812488	191.615173
20-May-03 10:13:00	109.846626	5.810453	191.953552
20-May-03 10:14:00	109.859924	5.806426	192.230713
20-May-03 10:15:00	109.896614	5.780485	192.109863
20-May-03 10:16:00	109.636681	5.757720	191.989014
20-May-03 10:17:00	110.001831	5.769876	191.868149
20-May-03 10:18:00	109.616409	5.782033	191.747299
20-May-03 10:19:00	109.464279	5.794190	191.564255
20-May-03 10:20:00	109.704964	5.806350	190.976974
20-May-03 10:21:00	109.144829	5.818557	190.570053
20-May-03 10:22:00	109.335655	5.830765	191.411545
20-May-03 10:23:00	109.772026	5.842972	191.491669
20-May-03 10:24:00	109.417480	5.853724	191.571793
20-May-03 10:25:00	109.686707	5.844086	191.614365
20-May-03 10:26:00	109.380783	5.834448	191.372650
20-May-03 10:27:00	109.846344	5.824811	191.257843
20-May-03 10:28:00	110.006111	5.815174	192.005127
20-May-03 10:29:00	109.516586	5.805536	192.005127
20-May-03 10:30:00	109.941063	5.795899	191.886688
20-May-03 10:31:00	109.258247	5.786262	191.036957
20-May-03 10:32:00	109.356888	5.776624	191.439804
20-May-03 10:33:00	109.848061	5.766986	191.842636
20-May-03 10:34:00	109.765884	5.757349	192.176865
20-May-03 10:35:00	109.871826	5.747712	191.991562
20-May-03 10:36:00	109.317497	5.738074	191.806244
20-May-03 10:37:00	109.422287	5.729482	191.670761
20-May-03 10:38:00	109.850761	5.732386	191.822235
20-May-03 10:39:00	109.669617	5.735291	191.368973
20-May-03 10:40:00	109.541725	5.738194	191.509964
20-May-03 10:41:00	109.648689	5.741099	191.650955
20-May-03 10:42:00	109.913742	5.744003	191.791962

20-May-03 10:43:00	109.874817	5.746907	191.932953
20-May-03 10:44:00	109.956276	5.749812	192.073944
20-May-03 10:45:00	109.567131	5.752716	192.194962
20-May-03 10:46:00	110.062485	5.755620	192.164749
20-May-03 10:47:00	109.810326	5.758524	192.134537
20-May-03 10:48:00	110.436195	5.761428	192.104324
20-May-03 10:49:00	110.256706	5.764333	191.928177
20-May-03 10:50:00	109.611877	5.767237	190.793777
20-May-03 10:51:00	110.080315	5.770141	190.769608
20-May-03 10:52:00	109.617302	5.773045	190.832840
20-May-03 10:53:00	109.796135	5.775949	191.366211
20-May-03 10:54:00	109.095428	5.778854	190.625977
20-May-03 10:55:00	109.550613	5.781758	191.235321
20-May-03 10:56:00	109.696854	5.784662	191.763428
20-May-03 10:57:00	110.103561	5.787566	191.763428
20-May-03 10:58:00	109.850327	5.789824	191.650635
20-May-03 10:59:00	109.516884	5.783030	190.843597
20-May-03 11:00:00	109.557175	5.776235	191.246445
20-May-03 11:01:00	110.394173	5.769441	191.649277
20-May-03 11:02:00	109.842506	5.762646	191.998077
20-May-03 11:03:00	109.738373	5.755852	191.937653
20-May-03 11:04:00	109.740746	5.749057	191.816605
20-May-03 11:05:00	109.896545	5.742263	191.321106
20-May-03 11:06:00	109.522690	5.735468	191.466125
20-May-03 11:07:00	109.715263	5.731958	191.532181
20-May-03 11:08:00	109.996338	5.764579	191.110016
20-May-03 11:09:00	110.289330	5.797200	191.517517
20-May-03 11:10:00	110.461716	5.829821	191.869720
20-May-03 11:11:00	110.202187	5.862441	191.724091
20-May-03 11:12:00	110.560318	5.895062	191.578461
20-May-03 11:13:00	110.549858	5.927682	191.432831
20-May-03 11:14:00	109.886261	5.955943	191.290207
20-May-03 11:15:00	109.644768	5.923155	191.170349
20-May-03 11:16:00	109.526688	5.890367	191.077026
20-May-03 11:17:00	109.857758	5.857579	191.222656
20-May-03 11:18:00	110.034172	5.824792	191.368286
20-May-03 11:19:00	109.777519	5.792004	191.513916
20-May-03 11:20:00	109.762260	5.759216	191.615753
20-May-03 11:21:00	109.669106	5.726429	191.385941
20-May-03 11:22:00	109.653839	5.693641	191.156113
20-May-03 11:23:00	109.828789	5.660853	190.949631
20-May-03 11:24:00	109.667801	5.628066	191.069824
20-May-03 11:25:00	109.412910	5.601563	191.190002
20-May-03 11:26:00	109.578972	5.644200	191.286057
20-May-03 11:27:00	109.640190	5.686837	190.951691
20-May-03 11:28:00	109.691048	5.729475	191.153107
20-May-03 11:29:00	110.188377	5.772111	191.354538
20-May-03 11:30:00	110.088806	5.814749	191.536301
20-May-03 11:31:00	109.926987	5.857386	191.344528
20-May-03 11:32:00	110.311600	5.900023	191.164551

20-May-03 11:33:00	110.224693	5.938597	191.326584
20-May-03 11:34:00	109.814140	5.920286	191.488632
20-May-03 11:35:00	110.575851	5.901975	191.615982
20-May-03 11:36:00	110.201263	5.883663	191.125916
20-May-03 11:37:00	110.147232	5.865352	191.428055
20-May-03 11:38:00	110.158134	5.847041	191.712509
20-May-03 11:39:00	109.968872	5.828730	191.661148
20-May-03 11:40:00	109.786827	5.810419	191.609787
20-May-03 11:41:00	110.018311	5.792108	191.558426
20-May-03 11:42:00	109.663078	5.773797	191.507065
20-May-03 11:43:00	109.450897	5.755486	191.455704
20-May-03 11:44:00	110.184937	5.742544	191.404343
20-May-03 11:45:00	110.194435	5.804771	191.352982
20-May-03 11:46:00	109.707275	5.866998	191.289078
20-May-03 11:47:00	109.727776	5.929225	190.986938
20-May-03 11:48:00	109.754784	5.991452	190.684799
20-May-03 11:49:00	109.470352	6.053679	190.382675
20-May-03 11:50:00	109.530319	6.110054	190.101593
20-May-03 11:51:00	110.150040	6.102042	190.246811
20-May-03 11:52:00	110.160042	6.094031	191.096909
20-May-03 11:53:00	109.514557	6.086020	190.818954
20-May-03 11:54:00	109.283119	6.078009	190.606857
20-May-03 11:55:00	110.194397	6.069998	191.592224
20-May-03 11:56:00	110.290886	6.061987	191.552155
20-May-03 11:57:00	110.819000	6.053976	191.512100
20-May-03 11:58:00	111.081017	6.049811	191.448792
20-May-03 11:59:00	110.746178	6.087959	190.678711
20-May-03 12:00:00	109.547104	6.126108	189.288071
20-May-03 12:01:00	109.107796	6.164256	188.046799
20-May-03 12:02:00	108.813019	6.196386	188.216705
20-May-03 12:03:00	108.526260	6.162319	188.386597
20-May-03 12:04:00	108.783737	6.128252	188.556503
20-May-03 12:05:00	108.376724	6.094184	188.708237
20-May-03 12:06:00	108.738991	6.060117	188.482254
20-May-03 12:07:00	107.997299	6.024320	187.675552
20-May-03 12:08:00	107.890129	5.964304	187.615128
20-May-03 12:09:00	107.881172	5.904287	187.636276
20-May-03 12:10:00	108.473671	5.844271	189.056305
20-May-03 12:11:00	107.913010	5.784255	187.709991
20-May-03 12:12:00	108.313545	5.729291	188.338440
20-May-03 12:13:00	108.640923	5.729901	188.885529
20-May-03 12:14:00	108.131813	5.730512	187.950104
20-May-03 12:15:00	107.843094	5.731122	188.782654
20-May-03 12:16:00	108.101456	5.731732	187.859970
20-May-03 12:17:00	107.563530	5.735554	187.620255
20-May-03 12:18:00	107.869049	5.774699	187.416733
20-May-03 12:19:00	108.475143	5.813843	188.239929
20-May-03 12:20:00	108.782082	5.852988	188.403091
20-May-03 12:21:00	109.148605	5.892133	188.566238
20-May-03 12:22:00	109.070442	5.931278	188.729401

20-May-03 12:23:00	109.382904	5.970423	188.862534
20-May-03 12:24:00	108.801628	6.007003	188.145676
20-May-03 12:25:00	108.124939	6.007683	187.819366
20-May-03 12:26:00	107.943359	6.008362	187.529922
20-May-03 12:27:00	108.425240	6.009042	187.973785
20-May-03 12:28:00	108.293121	6.009721	188.966995
20-May-03 12:29:00	108.803139	6.010401	187.814545
20-May-03 12:30:00	108.591873	6.011080	188.116684
20-May-03 12:31:00	108.643562	6.011760	188.391815
20-May-03 12:32:00	108.219246	6.012439	188.129761
20-May-03 12:33:00	108.278122	6.008313	187.219330
20-May-03 12:34:00	108.934067	5.951328	187.944458
20-May-03 12:35:00	108.395027	5.894344	188.635239
20-May-03 12:36:00	108.315826	5.837359	188.330582
20-May-03 12:37:00	108.404411	5.784587	188.076797
20-May-03 12:38:00	108.430603	5.790804	188.747177
20-May-03 12:39:00	108.048454	5.797021	188.174377
20-May-03 12:40:00	107.813660	5.803237	187.631439
20-May-03 12:41:00	107.387733	5.809454	187.655396
20-May-03 12:42:00	107.965843	5.815671	187.696854
20-May-03 12:43:00	108.597107	5.821888	188.245270
20-May-03 12:44:00	108.299133	5.828104	188.748444
20-May-03 12:45:00	108.626205	5.834321	188.391922
20-May-03 12:46:00	108.454163	5.840538	188.035400
20-May-03 12:47:00	107.600327	5.846755	187.678894
20-May-03 12:48:00	107.511520	5.852972	187.347855
20-May-03 12:49:00	107.778160	5.859188	187.500931
20-May-03 12:50:00	107.965508	5.865405	187.654007
20-May-03 12:51:00	108.618195	5.871622	187.776474
20-May-03 12:52:00	108.455368	5.877839	187.363159
20-May-03 12:53:00	108.278755	5.884055	187.853821
20-May-03 12:54:00	109.075600	5.890272	188.869141
20-May-03 12:55:00	108.342392	5.896489	188.509567
20-May-03 12:56:00	108.474686	5.902706	188.164688
20-May-03 12:57:00	108.163780	5.908922	188.245712
20-May-03 12:58:00	108.564560	5.915139	188.326736
20-May-03 12:59:00	108.438431	5.921356	188.373489
20-May-03 13:00:00	108.007957	5.927572	187.769211
20-May-03 13:01:00	107.780029	5.933789	187.218933
20-May-03 13:02:00	108.013931	5.940006	187.630234
20-May-03 13:03:00	107.588547	5.946223	186.228348
20-May-03 13:04:00	107.042107	5.951725	185.786942
20-May-03 13:05:00	107.065117	5.947233	186.078400
20-May-03 13:06:00	106.870628	5.942740	184.588730
20-May-03 13:07:00	107.066422	5.938248	185.152039
20-May-03 13:08:00	107.678612	5.933756	185.689697
20-May-03 13:09:00	107.485756	5.929263	185.483398
20-May-03 13:10:00	107.487579	5.924771	185.277084
20-May-03 13:11:00	107.316727	5.920279	185.070786
20-May-03 13:12:00	107.235504	5.915786	184.901367

20-May-03 13:13:00	107.311699	5.911294	185.433121
20-May-03 13:14:00	107.905769	5.906801	185.911926
20-May-03 13:15:00	106.704529	5.902309	185.384567
20-May-03 13:16:00	106.826759	5.897816	184.882034
20-May-03 13:17:00	106.303108	5.893324	185.076752
20-May-03 13:18:00	107.004860	5.888832	184.647888
20-May-03 13:19:00	107.558777	5.884339	184.944351
20-May-03 13:20:00	107.366608	5.879847	185.240814
20-May-03 13:21:00	107.483406	5.876507	185.515244
20-May-03 13:22:00	107.921951	5.885854	185.150650
20-May-03 13:23:00	106.894455	5.895200	184.786072
20-May-03 13:24:00	106.837837	5.904546	184.453812
20-May-03 13:25:00	107.064079	5.913893	184.735809
20-May-03 13:26:00	107.293762	5.923239	185.017792
20-May-03 13:27:00	107.007965	5.932585	185.327988
20-May-03 13:28:00	107.477951	5.941932	186.095703
20-May-03 13:29:00	107.212822	5.951278	185.376572
20-May-03 13:30:00	107.117065	5.960624	184.681412
20-May-03 13:31:00	107.699211	5.969971	184.718277
20-May-03 13:32:00	107.377457	5.979317	185.769104
20-May-03 13:33:00	107.685478	5.988663	185.216385
20-May-03 13:34:00	107.634445	5.998010	185.313080
20-May-03 13:35:00	107.765358	6.007356	185.430710
20-May-03 13:36:00	107.578934	6.016702	186.098877
20-May-03 13:37:00	106.976379	6.024380	185.167160
20-May-03 13:38:00	107.552727	6.013710	185.201584
20-May-03 13:39:00	107.445007	6.003039	184.506943
20-May-03 13:40:00	106.471756	5.992369	183.835449
20-May-03 13:41:00	106.701973	5.981699	183.835449

APPENDIX E

FUEL ANALYSIS

TECO
TAMPA ELECTRIC

Synthetic Gas and Heating Value Calculations

Client Tampa Electric Company - Polk Power Unit 1
Sample ID Polk Laboratory
Date 05/24/03

CALCULATION OF DENSITY AND HEATING VALUE @ 60°F and 30 in Hg

Component	% Volume	Molecular Wt.	Density (lb/ft3)	% volume x Density	weight %	Component Gross Btu/lb	Weight Fract. Btu	Gross Heating Value (Btu/SCF)	Volume Fract. Btu
Hydrogen	34.05667	2.016	0.0053	0.00181	3.1692	61100	1936.36	325.0	110.684178
Oxygen	0.00000	32.000	0.0846	0.00000	0.0000	0	0.00	0.0	0
Nitrogen	4.16667	28.016	0.0744	0.00310	5.4429	0	0.00	0.0	0
CO2	14.05000	44.010	0.1170	0.01644	28.8622	0	0.00	0.0	0
CO	46.90333	28.010	0.0740	0.03471	60.9401	4347	2649.07	322.0	151.028723
Argon	0.84000	39.948	0.1065	0.00089	1.5707	0	0.00	0.0	0
COS	0.00000	60.070	0.1602	0.00000	0.0000	0	0.00	0.0	0
Methane	0.02000	16.041	0.0424	0.00001	0.0149	23879	3.56	1013.0	0.2026
Ethane		30.067	0.0803	0.00000	0.0000	22320	0.00	1792.0	0
Ethylene		28.051	0.0746	0.00000	0.0000	21644	0.00	1614.0	0
Propane		44.092	0.1196	0.00000	0.0000	21661	0.00	2590.0	0
propylene		42.077	0.1110	0.00000	0.0000	21041	0.00	2336.0	0
Isobutane		58.118	0.1582	0.00000	0.0000	21257	0.00	3363.0	0
n-butane		58.118	0.1582	0.00000	0.0000	21308	0.00	3370.0	0
Isobutene		56.102	0.1480	0.00000	0.0000	20730	0.00	3068.0	0
Isopentane		72.144	0.1904	0.00000	0.0000	21052	0.00	4008.0	0
n-pentane		72.144	0.1904	0.00000	0.0000	21091	0.00	4016.0	0
n-hexane		86.169	0.2274	0.00000	0.0000	20940	0.00	4762.0	0
H2S	0.00000	34.076	0.0911	0.00000	0.0000	7100	0.00	647.0	0
Total:	100.04	Average Density		0.05696	100.0000	**Gross Heating Value**		**Gross Heating Value**	
		Specific Gravity		0.74451		**Btu/lb**	**4589**	**Btu/SCF**	**262**

TECO
TAMPA ELECTRIC

Synthetic Gas and Heating Value Calculations

Client Tampa Electric Company - Polk Power Unit 1
Sample ID Polk Laboratory
Date 05/24/03

CALCULATION OF F FACTORS

						Weight Percents				
Component	**Mol. Wt.**	**C Factor**	**H Factor**	**% volume**	**Fract. Wt.**	**Carbon**	**Hydrogen**	**Nitrogen**	**Oxygen**	**Sulfur**
Hydrogen	2.016	0	1	34.057	68.6582		3.191370898			
Oxygen	32.000	0	0	0.000	0.0000				0	
Nitrogen	28.016	0	0	4.167	116.7334			5.426000206		
CO2	44.010	0.272273	0	14.050	618.3405	7.825585501			20.89520687	
CO	28.010	0.42587	0	46.903	1313.7623	26.00629026			35.09478247	
Argon	39.948	0	0	0.840	33.5563	0				
COS	60.070	0.1998	0	0.000	0.0000	0				
Methane	16.041	0.75	0.25	0.020	0.3208	0.01118426	0.003728087			
Ethane	30.067	0.8	0.2	0.000	0.0000	0	0			
Ethylene	28.051	0.85714	0.14286	0.000	0.0000	0	0			
Propane	44.092	0.81818	0.181818	0.000	0.0000	0	0			
Propene	42.077	0.85714	0.14286	0.000	0.0000	0	0			
Isobutane	58.118	0.82759	0.17247	0.000	0.0000	0	0			
n-butane	58.118	0.82759	0.17247	0.000	0.0000	0	0			
Isobutene	56.102	0.85714	0.14286	0.000	0.0000	0	0			
Isopentane	72.144	0.83333	0.16667	0.000	0.0000	0	0			
n-pentane	72.144	0.83333	0.16667	0.000	0.0000	0	0			
n-hexane	86.169	0.83721	0.16279	0.000	0.0000	0	0			
H2S	34.076	0	0.058692335	0.000	0.0000	0	0			0
Totals				100.03667	2151.3716	33.84306002	3.20	5.426000206	55.98998933	0

CALCULATED VALUES		
O2 F Factor (dry), Fd	**8371**	DSCF of Exhaust/mm Btu of Fuel Burned @ 0% excess air
O2 F Factor (wet), Fw	**9715**	SCF of Exhaust/mm Btu of Fuel Burned @ 0% excess air
Moisture F Factor	**1344**	SCF of Water/mm Btu of Fuel Burned @ 0% excess air
Combust. Moisture	**13.83**	volume % water in flue gas @ 0% excess air
CO2 F Factor, Fc	**2367**	DSCF of CO2/mm Btu of Fuel Burned @ 0% excess air
Carbon Dioxide	**28.28**	volume % CO2 in flue gas @ 0% O2
Predicted Fo Factor	**0.74**	EPA Method 3a Fo value

APPENDIX F

FIELD DATA SHEETS

BEST AVAILABLE COPY

Sulfuric Acid Mist Field Data Form

...n	Polk	Nozzle I.D. No.	6	Dry Gas Meter Volume		
...n	Unit 1	Nozzle Diameter	0.197	Final	391,599	Ft.³
...e	5-20-03	Pitot Tube No.	PT09	Initial	351,247	Ft.³
Method No.	8	Pitot Tube (C_p)	0.84	Net	40.352	Ft.³
Run No.	1	Probe Length	8'			
Box Operator	cnD	Probe Liner Material	P/nox	Equipment Leak Checks		
Probe Operator	JAV/JFR	Probe Heater Setting	250	Initial	0.00 CFM @ 15	"Hg
Time - Start: 913	End: 1019	Pressure	Pb ("Hg): 29.75 Pg ("H2O): -0.65 Ps ("Hg): 29.70	Final	0.00 CFM @ 7	"H2O
Sampling Time	60	Ambient Temperature	89	Pitot Tube	OK 5	"H2O
Min.\ Pt.	2.5	Assumed Moisture (%)	6.5			
Meter Box No.	MB07	Filter Holder No.		Moisture Determination		
Stack Area Ft.³		Comments	O_2 - 13	Impinger	36.0	ml
Meter Cal. (Δ H)	1.766		CO_2 - 8.5	Silica Gel	17.5	gm
Meter Cal. (Δ Y)	0.995			Total	53.5	

Traverse Point No.	Clock Time	Gas Sample Volume (Ft³)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
1	913	352.87	1.3	1.31	259	308	83	266	60	4
2		354.46	1.3	1.31	259	308	83	267	60	4
3		356.15	1.4	1.41	258	308	83	265	58	4
4		357.88	1.6	1.62	259	308	84	266	58	5
5		359.55	1.4	1.41	259	308	84	267	58	4
6	928	361.187	1.3	1.32	259	308	85	268	56	4
	–	–	–	–	–	–	–	–	–	–
1	930	362.76	1.2	1.21	260	308	85	267	61	3
2		364.39	1.3	1.32	261	308	85	268	64	3
3		366.06	1.4	1.42	261	308	85	268	65	4
4		367.74	1.3	1.32	263	308	85	268	62	4
5		369.44	1.4	1.42	262	308	86	268	63	4
6	945	371.073	1.3	1.32	262	308	86	268	64	4

Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (Ft^3)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
1	947	372.79	1.4	1.42	257	308	86	269	58	4
2		374.43	1.3	1.32	257	308	86	265	60	3
3	376.14	~~377.88~~	1.4	1.42	256	308	86	268	61	4
4		377.88	1.5	1.52 ~~1.32~~	257	308	87	267	63	~~4~~ 5
5		379.51	1.3	1.32	258	307	87	256	63	4
6	1002	381.145	1.3	1.32	258	307	87	256	63	4
	—	—	—	—	—	—	—	—	—	—
1	1004	382.87	1.4	1.42	260	307	87	269	63	4
2		384.62	1.5	1.53	260	307	87	270	64	5
3		386.42	1.6	1.63	260	307	87	270	64	5
4		388.19	1.5	1.52	258	308	87	268	65	5
5		389.96	1.5	1.53	258	308	88	268	65	5
6	1019	391.599	1.3	1.32	260	308	88	269	65	4

Sulfuric Acid Mist Field Data Form

Plant	Polk	Nozzle I.D. No.	MA06	Dry Gas Meter Volume	
Location	Unit 1	Nozzle Diameter	.197	Final	441.161 Ft.³
Date	5/20/03	Pitot Tube No.	PT09	Initial	401.064 Ft.³
Method No.	Am 8 H2SO4	Pitot Tube (C_p)	.84	Net	~~41.16~~ 40.097 Ft.³
Run No.	2	Probe Length	8'		
Box Operator	JAV	Probe Liner Material	Pyrex	Equipment Leak Checks	
Probe Operator	LAD/JFR	Probe Heater Setting	250	Initial	0.000 CFM @ 10 "Hg
Time - Start:	1058 End: 1205	Pressure	Pb ("Hg): 29.74 Pg ("H2O): -.7 Ps ("Hg):	Final	0.000 CFM @ 4.0 "H2O
Sampling Time	60	Ambient Temperature	89	Pitot Tube	OK @ 3.6 "H2O
Min.\ Pt.	2.5	Assumed Moisture (%)	6.5		
Meter Box No.	MB07	Filter Holder No.		Moisture Determination	
Stack Area Ft.³	1149.089	Comments	O_2 - 13 1.70	Impinger	~~38~~ 16.0 ml
Meter Cal. (Δ H)	1.766		CO_2 - 8.3 2.134	Silica Gel	~~17.5~~ 21.1 gm
Meter Cal. (Δ Y)	.993		3.112	Total	37.1

Traverse Point No.	Clock Time	Gas Sample Volume (Ft³)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
1	1058	402.8	1.4	1.59	307	308	90	276	46	3.5
2		404.7	1.5	1.71	308	308	90	276	47	3.5
3		406.5	1.5	1.71	308	308	90	270	48	3.5
4		408.4	1.6	1.82	298	308	90	266	50	3.5
5		410.26	1.5	1.71	294	307	90	266	50	3.5
6	11:14	411.848	1.1	1.25	284	308	90	266	50	3.0
1	11:16	413.45	1.2	1.23	266	307	91	266	47	2.0
2		415.1	1.4	1.44	266	308	92	266	48	2.3
3		416.8	1.4	1.44	266	308	92	267	48	2.3
4		418.38	1.3	1.33	266	309	92	266	49	2.0
5		420.03	1.4	1.44	266	307	92	266	49	2.3
6	1131	421.643	1.3	1.34	266	307	92	266	49	2.0

Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (Ft^3)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	Umbilical Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
1	1133	423.27	1.3	1.34	268	307	92	269	48	2.0
2		424.92	1.4	1.44	269	307	92	268	49	2.2
3		426.41	1.2	1.23	270	308	92	270	50	2.0
4		428.1	1.4	1.44	270	308	92	270	50	2.2
5		429.8	1.4	1.44	272	308	93	269	51	2.2
6	1147	431.300	1.2	1.23	271	308	93	267	51	2.0
1	~~1149~~ 1150	432.8	1.3	1.34	266	308	93	269	49	2.3
2		434.42	1.3	1.34	266	308	93	269	50	2.3
3		436.12	1.4	1.44	263	309	93	268	50	2.5
4		437.82	1.4	1.44	264	310	94	266	51	2.5
5		439.52	1.4	1.44	266	309	94	270	50	2.5
6	1205	441.161	1.3	1.34	266	310	94	264	51	2.0

Sulfuric Acid Mist Field Data Form

Plant	Polk Power	Nozzle I.D. No.	AN 06	Dry Gas Meter Volume	
Location	Unit 1 Stack	Nozzle Diameter	0.157	Final	489.525 Ft.³
Date	20 MAY 03	Pitot Tube No.	PT09	Initial	449.689 Ft.³
Method No.	Rm 8	Pitot Tube (C_p)	0.84	Net	39.836 Ft.³
Run No.	3.	Probe Length	8' unk		
Box Operator	JER	Probe Liner Material	Pyrex	Equipment Leak Checks	
Probe Operator	JAV, CRD	Probe Heater Setting	250°F	Initial	0.000 CFM @ 10 "Hg
Time - Start:	1235 End: 1341	Pressure	Pb ("Hg): 29.80 Pg ("H2O): -.68 Ps ("Hg): 29.75	Final	0.000 CFM @ 10 "H2O
Sampling Time	60 min	Ambient Temperature	88°F	Pitot Tube	3.7 / 5.2 @ 0.00 "H2O
Min.\ Pt.	2.5 min	Assumed Moisture (%)	6.5		
Meter Box No.	MB07	Filter Holder No.	—	Moisture Determination	20.0
Stack Area Ft.³	1149.089	Comments		Impinger	~~80/131/109~~ ml
Meter Cal. (Δ H)	1.766		O_2 - 8.5	Silica Gel	23.5 gm
Meter Cal. (Δ Y)	0.995		CO_2 - 13.2	Total	43.5

Traverse Point No.	Clock Time	Gas Sample Volume (Ft³)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	~~Umbilical~~ Oven Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
A 1	1235	449.689	1.25	1.29	268	307	96	269	62	2.0
2	1237.5	451.46	1.25	1.29	267	307	96	269	58	2.0
3	1240	452.91	1.30	1.35	266	307	96	268	58	2.0
4	1242.5	454.6	1.30	1.34	257	308	96	258	58	2.0
5	1245.	456.32	1.30	1.34	257	308	96	258	58	2.0
6	1247.5	457.95	1.25	1.29	258	308	96	257	58	2.0
END	1250	459.582	—	—	—	—	—	—	—	—
B 1	1252	459.582	1.30	1.35	255	308	97	263	58	2.0
2	1254.5	461.25	1.30	1.35	254	308	97	263	54	2.0
3	1257	462.88	1.35	1.40	257	308	97	261	55	2.0
4	1259.5	464.38	1.35	1.40	257	308	97	261	59	2.0
5	1302	466.15	1.35	1.40	258	308	97	262	62	2.0
6	1304.5	467.81	1.20	1.24	258	309	97	261	64	2.0
END	1307	469.354	—	—						

shardata\air&wast\testform\samfdf

Sulfuric Acid Mist Field Data Form (Continued)

Traverse Point No.	Clock Time	Gas Sample Volume (Ft^3)	Δ P (In. H_2O)	Δ H (In. H_2O)	Probe Temp. (°F)	Stack Temp. Ts (°F)	Meter Temp. (°F)	~~Umbilical~~ Oven Temp. Tm (°F)	Last Imp. Temp. (°F)	Vacuum (In. Hg)
C1	1309	469.354	1.25	1.30	252	308	99	263	68	2.0
2	1311.5	471.00	1.35	1.40	252	308	98	263	65	2.0
3	1314	472.72	1.20	1.24	254	308	98	261	64	2.0
4	1316.5	474.30	1.35	~~1.35~~ 1.40	254	308	98	260	62	2.0
5	1319	475.98	1.35	1.40	253	308	98	262	60	2.0
6	1321.5	477.66	1.20	1.24	255	307	98	262	64	2.0
END	1324	479.266	—	—	—	—	—	—	—	—
D1	1324	479.266	1.25	1.30	252	307	98	262	64	2.0
2	1328.5	480.90	1.35	1.40	253	308	98	264	62	2.0
3	1331	482.57	1.50	1.56	254	308	98	261	67	2.0
4	1333.5	484.35	1.50	1.56	254	307	98	261	67	2.0
5	1336	486.14	1.50	1.56	256	307	98	263	~~67~~ 64	2.0
6	1338.5	487.92	1.20	1.25	~~255~~ 256	307	98	264	62	2.0
END	1341	489.525	—	—	—	—	—	—	—	—

APPENDIX G

SAMPLING EQUIPMENT CALIBRATIONS

SUMMARY OF EQUIPMENT CALIBRATIONS

EQUIPMENT	CAL DATE	METHOD	RESULTS
CONSOLE (MB 07)		USEPA RM 5	
INITIAL	04/02/2003	(ORIFICE)	0.995
POST TEST	05/21/2003		1.000
NOZZLE (MN 06)		CALIPER	
INITIAL	04/07/2003	MEASUREMENTS	0.197
POST TEST	05/21/2003		0.196
PYROMETER (PY 09)	04/02/2003	ASTM THERMOMETER	$\pm$ 2° F
PITOT TUBE (PT 09)	04/08/2003	USEPA RM 2	C_p = 0.84
BAROMETER (BR 01)	05/07/2003	NWS COMPARISON	$\pm$ 0.01" Hg

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

Revised: 7/25/95 Version: 2.2

Model #:	Thermo Environmental MST		
IMC #:	^MB07	Date: ------------------------>	04/02/2003
Labworks Sample #	AA69~~303~~ 422	Barometric Pressure: ----------->	30.32 (in. Hg)
		Theoretical Critical Vacuum:--->	14.30 (in. Hg)
		Calibrated By------------------------------>	R A Barthelette Jr

!!!!!!!!
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 Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Ambient Temperature Initial (deg F)	Ambient Temperature Final (deg F)	Ambient Temperature Average (deg F)
0.64	10	849.505	854.087	4.582	74	74	75	74	48	0.3483	20	74	74	74
1.15	10	856.455	862.540	6.085	75	74	77	75	55	0.4660	19	74	74	74
1.95	7	865.828	871.345	5.517	77	75	79	75	63	0.5971	17	74	74	74
3.75	7	872.913	880.468	7.555	77	76	80	77	73	0.8177	15	74	74	74

.... RESULTS ....

--- DRY GAS METER --- VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	--------- ORIFICE --------- VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	-- DRY GAS METER -- CALIBRATION FACTOR Y Value (number)	Variation (number)	--------- ORIFICE --------- CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)
4.594	130.11	4.570	129.42	4.563	0.995	0.000	1.726	43.85	-0.039
6.097	172.68	6.114	173.16	6.105	1.003	0.008	1.730	43.93	-0.036
5.526	156.50	5.484	155.31	5.475	0.992	-0.003	1.782	45.27	0.017
7.586	214.84	7.510	212.69	7.498	0.990	-0.005	1.824	46.33	0.059

Average Y -------> 0.995

1.766 44.85 <------- 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 H20 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.

REVIEWED BY: [signature] Date: 4/10/2003

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

Revised: 7/25/95 Version: 2.2

lodel #:	ThermoAnderson MST		
nstrument Code No.	MB07	Date: ----------------------->	05/21/2003
ample No.		Barometric Pressure: ---------->	30.07 (in. Hg)
est Designation	Polk Unit1 SAM	Theoretical Critical Vacuum:--->	14.18 (in. Hg)
		Calibration By: ----------------------->	crd

!!!!!!
MPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
MPORTANT 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 Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Ambient Temperature Initial (deg F)	Ambient Temperature Final (deg F)	Ambient Temperature Average (deg F)
1.15	11	505.500	512.211	6.711	73	74	74	76	55	0.466	17.5	72	72	72
1.15	10	512.211	518.307	6.096	74	76	74	77	55	0.466	17.5	72	73	72.5
1.15	10	518.307	524.427	6.12	74	77	74	77	55	0.466	17.5	73	73	73

*************************** RESULTS ***************************

--- DRY GAS METER --- VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	--- ORIFICE --- VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	-- DRY GAS METER -- CALIBRATION FACTOR Y Value (number)	Y Variation (number)	--- ORIFICE --- CALIBRATION FACTOR dH@ Value (in H2O)	dH@ Value (mm H2O)	dH@ Variation (in H2O)
6.682	189.23	6.683	189.26	6.702	1.000	0.000	1.741	44.22	0.001
6.058	171.57	6.072	171.97	6.096	1.002	0.002	1.739	44.18	-0.001
6.079	172.16	6.070	171.89	6.099	0.998	-0.002	1.740	44.20	0.000

Average Y -------> **1.000** 1.740 44.20 <------- Average dH@
Prior Y **0.995**
% Difference **-0.53%**

lote: 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 H20 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.

REVIEWED BY: [signature] Date: 5/27/2003

NOZZLE CALIBRATION DATA FORM

STAINLESS STEEL NOZZLE SET

DATE: 04/07/03 CALIBRATOR: JAV

NOZZLE I. D.	NOZZLE DIAMETER (IN.) D1	D2	D3	D diff.	D avg.
^SN01	0.114	0.114	0.113	0.001	0.114
^SN04	0.126	0.126	0.126	0.000	0.126
^SN05	0.150	0.150	0.150	0.000	0.150
^SN06	0.197	0.197	0.197	0.000	0.197
^SN09	0.277	0.276	0.276	0.001	0.276
^SN10	0.295	0.295	0.295	0.000	0.295
^SN12	0.390	0.390	0.388	0.002	0.389
^SN15	0.169	0.169	0.171	0.002	0.170
^SN16	0.199	0.200	0.200	0.001	0.200
^SN19	0.285	0.287	0.289	0.004	0.287
^SN22	0.368	0.370	0.370	0.002	0.369
^SN30	0.315	0.315	0.315	0.000	0.315
^SN36	0.187	0.189	0.189	0.002	0.188
^SN37	0.215	0.216	0.216	0.001	0.216
^SN38	0.256	0.256	0.254	0.002	0.255
^SN46	0.192	0.191	0.193	0.002	0.192
^SN47	0.205	0.205	0.205	0.000	0.205
^SN48	0.253	0.254	0.253	0.001	0.253
^SN50	0.313	0.314	0.314	0.001	0.314
^SN58	0.246	0.246	0.248	0.002	0.247
^SN68	0.242	0.244	0.242	0.002	0.243

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: [signature]
DATE: 4/11/2003

POST TEST NOZZLE CALIBRATION DATA FORM

DATE: 5/218/03 CALIBRATOR: crd

SAMPLE NO. TEST DESIGNATION: Polk 1 SAM

NOZZLE I. D.	NOZZLE DIAMETER (IN.) D1	D2	D3	D diff.	D avg
Mn06	0.197	0.196	0.196	0.001	0.196

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: [signature]
DATE: 5/27/2003

Page 1
OF 1

TECO
TAMPA ELECTRIC

Pyrometer Calibration

Pyrometer Under Test

Pyrometer Serial Number/IMC Number: ^PY09

Labworks Sample # AA69~~365~~422 RHA

Calibration Date: 04/02/2003

Calibrator Information

Calibrator Type/Manufacturer: Hart Scientific

Calibrator Serial Number: AOA024

Date of Last Calibration: 02/10/2003

Calibration Personnel (Typed and Signature): R A Barthelette Jr.

Calibration Data

Calibration Point	Reference Temperature	Pyrometer Indication	Difference
1	32	33	-1
2	212	213	-1
3	400	399	1

Reference temperatures must encompass the expected range of measurement. These three points should be ~ 32 degrees, ~212 degrees, and ~ 400 degrees Farenheit.
Difference is calculated as follows:

(reference temperature) – (pyrometer indication)

Qaulity Control Data

Calibration Point	Difference
1	Pass
2	Pass
3	Pass

This data has been reviewed and is certified as meeting all project quality objectives.

Reviewer: [signature] Date: 4/10/2003

TECO
TAMPA ELECTRIC

PITOT TUBE CALIBRATION DATA SHEET

Pitot Tube ID # pt09
Calibration Date: 04/08/2003 Operating Quarter: Qtr2
Openings Damaged? ☐ Y ☑ N Repaired? ☐ Y ☑ N ☐ N/A

Alpha and Beta Angle Determinations

α 1	1.7	degrees	*Pass*
α 2	0.8	degrees	*Pass*
β 1	1.1	degrees	*Pass*
β 2	0.7	degrees	*Pass*

Gamma, Theta, A, Z, and W Determinations

ψ	0.1	degrees	
A	2.32	cm	
Z	0.004	cm	*Pass*
o	1.6	degrees	
W	0.065	cm	*Pass*

Acceptable Limits:

Dt 0.48 < Dt > 0.95 cm
α < 10 degrees
(α1 measured across top impact openings)
(α2 measured across bottom impact openings)
β1 < 5 degrees (alongside top impact openings)
β2 < 5 degrees (alongside bottom impact openings)
Z < 0.32 cm (Asinψ)
W < 0.08 cm (Asino)
A distance between tips
o 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:

Calibrated by: [signature]
Printed Name: CHARLES DUFENY Date: 04/08/2003

Quality Assurance Review / Approval: [signature]
Date: 4/9/2003

5010 Causeway Blvd., Tampa, FL. 33619

BAROMETER CALIBRATION DATA FORM

05/07/2003 CALIBRATOR: RAB

INST. NO: ^BR01

COMMENTS:

TIME OF READING	BAROMETER READING (HG")	REFERENCE STANDARD READING (HG")	DIFFERENCE (HG")
12:13	30.12	30.12	0
13:21	30.10	30.11	-0.01
14:15	30.08	30.09	-0.01

**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: 5/27/2003

G:\Environmental Services\Air\Calibration Data\Barometer\2003\[05-07-03.xls]^BR02
REVISED 5-9-96

APPENDIX H

CHAIN OF CUSTODY

TECO TAMPA ELECTRIC

ANALYSIS REQUEST & CHAIN OF CUSTODY

ENVIRONMENTAL SERVICES

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

PROJECT REFERENCE: Polk - Unit 1 SAM	PROJECT NO.	PROJECT LOCATION (STATE): Fl	
SAMPLER'S PRINTED NAME: Charles Difeniy	SAMPLER'S SIGNATURE		
P.O. NUMBER	CONTRACT NO.	SITE: Polk	
CLIENT NAME: TEC - Polk	CLIENT PHONE	CLIENT FAX	
CLIENT EMAIL	CLIENT ADDRESS		

REQUIRED ANALYSIS: EPA Method 8 H_2SO_4

PRESERVATIVE

DUE DATE

☐ EMAIL RESULTS
☐ FAX RESULTS
☐ MAIL RESULTS

NUMBER OF COOLERS SUBMITTED PER SHIPMENT:

SAMPLE ID	SAMPLE DESCRIPTION	SAMPLING DATE	SAMPLING TIME	* MATRIX	NUMBER OF CONTAINERS SUBMITTED						REMARKS
Run 1	Impinger #1 and Rinse	5/20/03	1045	IPA	1						AA69850
Run 2	"	5/20/03	1215	IPA	1						
Run 3	"	5/20/03	1410	"	1						
Blank	80% IPA Blank	5/20/03	1410	"	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 ☒ Yes ☐ No

ON ICE/ 4°C ☐ Yes ☒ No

COLD

SAMPLE TRANSFERS

RELINQUISHED BY:	RECEIVED BY:	DATE	TIME
PERSON'S NAME: [signature] FACILITY NAME: TEC	PERSON'S NAME: Gail A. Harrison FACILITY NAME: Laboratory Services	5-21-03	8:00 AM
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		

APPENDIX I

TEST PARTICIPANTS

TEST PARTICIPANTS

AIR SERVICES GROUP
ENVIRONMENTAL SERVICES

Charles R. Dufeny	Environmental Technician
Juan Ramirez	Environmental Technician
Jorge Varino	Technician

POLK POWER STATION

Michael Perkins	Environmental Coordinator

TAMPA ELECTRIC

RECEIVED
DEC 04 2002
BUREAU OF AIR REGULATION

November 18, 2002

Ms. Trina Vielhauer
Bureau Chief
Florida Department of
Environmental Protection
111 S. Magnolia Drive, Suite 23
Tallahassee, Florida 32301

Via FedEx
Airbill No. 7901 4212 0674

Re: Tampa Electric Company
Change in Responsible Officials/Alternate Responsible Officials at Big Bend Station, F.J. Gannon Station/Bayside Power Station, Polk Power Station, Hookers Point Station

Dear Ms. Vielhauer:

Tampa Electric Company has made personnel changes at our Big Bend Station, Hookers Point Station and F.J. Gannon Station/Bayside Power Station. The following changes took effect on November 15, 2002. Please note that we have also assigned alternate Responsible Officials at these facilities, including Polk Power Station. Please find below the names of Tampa Electric Company's Responsible Officials for each of these power plants:

Karen A. Sheffield	Big Bend Station
Wade A. Maye	F.J. Gannon Station/Bayside Power Station
Joseph M. Wiley	Hookers Point Station
Mark J. Hornick	Polk Power Station

If you have any questions please call Laurie Pence or me at 641-5060.

Sincerely,

Laura R. Crouch

Laura R. Crouch
Manager – Air Programs
Environmental Affairs

EA\bmr\LAB145

c: Jerry Campbell, EPCHC
Alice Harmon, EPCHC
Jerry Kissell, FDEP – SW
Al Linero, FDEP
Buck Oven, FDEP
Scott Sheplak, FDEP

Department of Environmental Protection

Division of Air Resource Management

RESPONSIBLE OFFICIAL NOTIFICATION FORM

Note: A responsible official is not necessarily a designated representative under the Acid Rain Program. To become a designated representative, submit a certificate of representation to the U.S. Environmental Protection Agency (EPA) in accordance with 40 CFR Part 72.24.

Identification of Facility

1. Facility Owner/Company Name: Tampa Electric Company	
2. Site Name: Polk Power Station	3. County: Polk
4. Title V Air Operation Permit/Project No. *(leave blank for initial Title V applications)*: 1050233-009-AV	

Notification Type *(Check one or more)*

_ **INITIAL:**	Notification of responsible officials for an initial Title V application.
_ **RENEWAL:**	Notification of responsible officials for a renewal Title V application.
X **CHANGE:**	Notification of change in responsible official(s).
	Effective date of change in responsible official(s) 11/15/2002

Primary Responsible Official

1. Name and Position Title of Responsible Official:
   Mark J. Hornick

2. Responsible Official Mailing Address: Tampa Electric Company
   Organization/Firm: Polk Power Station
   Street Address: 6944 U.S. Highway 41
   City: Apollo Beach State: Florida Zip Code: 33572-9200

3. Responsible Official Telephone Numbers:
   Telephone: (813) 641 - 5060 Fax: (813) 641 - 5081

4. Responsible Official Qualification *(Check one or more of the following options, as applicable)*:

[X] For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C.

[ ] For a partnership or sole proprietorship, a general partner or the proprietor, respectively.

[ ] For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official.

[ ] The designated representative at an Acid Rain source.

5. Responsible Official Statement:

I, the undersigned, am a responsible official, as defined in Rule 62-210.200, F.A.C., of the Title V source addressed in this notification. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this notification are true, accurate and complete. Further, I certify that I have authority over the decisions of all other responsible officials, if any, for purposes of Title V permitting.

Mark J Hornick 11/1/02

Signature Date

Additional Responsible Official

1. Name and Position Title of Responsible Official: Gregory M. Nelson, Designated Acid Rain Representative	
2. Responsible Official Mailing Address: Tampa Electric Company Organization/Firm: Environmental Affairs Street Address: 6944 U.S. Highway 41 City: Apollo Beach State: Florida Zip Code: 33572-9200	
3. Responsible Official Telephone Numbers: Telephone: (813) 641-5060 Fax: (813) 641 - 5081	
4. Responsible Official Qualification *(Check one or more of the following options, as applicable)*: [ ] For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C. [ ] For a partnership or sole proprietorship, a general partner or the proprietor, respectively. [ ] For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official. [X] The designated representative at an Acid Rain source.	

Additional Responsible Official

1. Name and Position Title of Responsible Official: Laura R. Crouch, Manager – Air Programs	
2. Responsible Official Mailing Address: Tampa Electric Company Organization/Firm: Environmental Affairs Street Address: 6944 U.S. Highway 41 City: Apollo Beach State: Florida Zip Code: 33572-9200	
3. Responsible Official Telephone Numbers: Telephone: (813) 641 - 5060 Fax: (813) 641 - 5081	
4. Responsible Official Qualification *(Check one or more of the following options, as applicable)*: [X] For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C. [ ] For a partnership or sole proprietorship, a general partner or the proprietor, respectively. [ ] For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official. [ ] The designated representative at an Acid Rain source.	

TAMPA ELECTRIC

May 14, 2004

RECEIVED
MAY 24 2004
BUREAU OF AIR REGULATION

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.7926 4081 8953

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 approximately 95% petcoke/coal with a 5% 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 approximately 95% petcoke/coal with a 5% 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 the initial receipt of biomass, one day prior to gasifying biomass and 7 days prior to commencement of any stack performance testing. 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 1
This Condition has been satisfied per TEC's letter to the Department and DEP Southwest District dated March 18, 2004.

FDEP Condition 2
Biomass shall be continuously fed so as to maintain a homogenous stream of syngas for combustion gasification. 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 blend of Bahia grass with 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.

<u>TEC Response 2</u>
The log is provided in Attachment A – the Biomass Test Burn Report, Appendix A. The material balance for the syngas test constituents and ash is provided in Attachment A – the Biomass Test Burn Report in Sections 3.2 and 3.3.

<u>FDEP Condition 3</u>
Emissions due to biomass gasification shall not exceed any current limit in existing permits for all impacted emission units. This test-burn shall not result in the release of objectionable odors pursuant to Rule 62-296.320(2). F.A.C. 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. The test burn 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.

<u>TEC Response 3</u>
There was no exceedance of emissions of any current limits in TEC's existing permits. Also, no release of objectionable odors occurred during the test burn.

<u>FDEP Condition 4</u>
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.

<u>TEC Response 4</u>
The analysis is provided in Attachment A – the Biomass Test Burn Report, Table 5.

<u>FDEP Condition 5</u>
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 coal or petcoke. Sample results shall be provided to the DEP Southwest District and the Bureau of Air Regulation with the final report.

<u>TEC Response 5</u>
A syngas fuel analysis is provided in Attachment A – the Biomass Test Burn Report, Table 4.

<u>FDEP Condition 6</u>
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."

<u>TEC Response 6</u>
The TCLP analysis of the slag is provided in Attachment A – the Biomass Test Burn Report, Appendix B.

<u>FDEP Condition 7</u>
Stack gas emissions testing for SO2, NOx and CO 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. Alternatively, CEM data may be utilized (if

available) provided that the CEMS are quality assured pursuant to 40 CFR 75. The data assessment reports from 40 CFR 60 for the most recent RATA and CGA shall be submitted along with the most recent CEMS QA reports.

<u>TEC Response 7</u>
The emissions data is provided in Attachment A – the Biomass Test Burn Report, Appendix C. Attachment G contains the most recent CEMS QA reports. The Polk Power Station Title V Permit 1050233-009-AV does not require data assessment report for the RATA and CGA. Therefore, this information is not included.

<u>FDEP Condition 8</u>
All stack 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 Emissions 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.

<u>TEC Response 8</u>
This Condition has been satisfied through the use of CEMS, TEC's primary method of compliance. In addition, TEC submitted to the Department the stack performance test results for the biomass test burn in a letter dated April 29, 2004 and the results are in Attachment G.

<u>FDEP Condition 9</u>
This Department action is only to authorize the temporary blend performance testing of biomass consisting of Bahia grass.

<u>TEC Response 9</u>
This test burn was conducted using Bahia grass. The previous biomass test was conducted using eucalyptus. The two consecutive biomass tests have demonstrated that the gasification of biomass is technically feasible and will not adversely impact emissions from PPS Unit 1. Based on these favorable results, TEC would like the Department to consider granting PPS the flexibility to gasify a variety of non-treated biomass without the requirement of additional testing.

<u>FDEP Condition 10</u>
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 program.

<u>TEC Response 10</u>
This Condition has been satisfied per TEC's letter to the Department and DEP Southwest District data April 5, 2004.

<u>FDEP Condition 11</u>
All testing series shall include emissions testing for emissions units operating at permitted capacity. Permitted capacity is defined at 90-100 percent of the capacity allowed by existing permits.

<u>TEC Response 11</u>
The biomass test was conducted between 90 and 100 percent of the allowed capacity. Therefore, this condition has been satisfied.

TEC has conducted two test burns of untreated biomass at PPS to date; the first with eucalyptus and this one with Bahia grass. Neither biomass test burn showed emissions increases as a result of including untreated biomass in the fuel blend at PPS. Accordingly, TEC would like the Department to consider authorizing TEC to include other similar non-treated biomass products in the fuel blend at PPS without further testing. TEC will formally pursue this request.

TEC thanks the Department for its cooperation in allowing TEC to perform the test burn. If you have any questions please call Shelly Castro or me at (813) 228-4408.

Sincerely,

Shelley Castro for

Laura R. Crouch
Manager- Air Programs
Environmental, Health & Safety

EHS/gm/SSC193

Enclosures

c/enc: Mr. Jerry Kissel - FDEP
Mr. Tina Vielhauer - FDEP

Attachment A
Polk Power Station Unit 1
May 2004 Biomass Test Burn Report

Tampa Electric Company

Biomass Test Burn Report
Polk Power Station Unit 1

TECO
TAMPA ELECTRIC

May 2004

1.0 INTRODUCTION

Tampa Electric Company (TEC) conducted a test burn on April 1, 2004 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 synthesis 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 November 25, 2003. The data from this test indicate there is no increase in monitored air emissions (NO_x, SO_2 and CO) 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 approximately 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 52% petcoke, 43% coal, and 5% biomass.

The test on April 1, 2004 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.

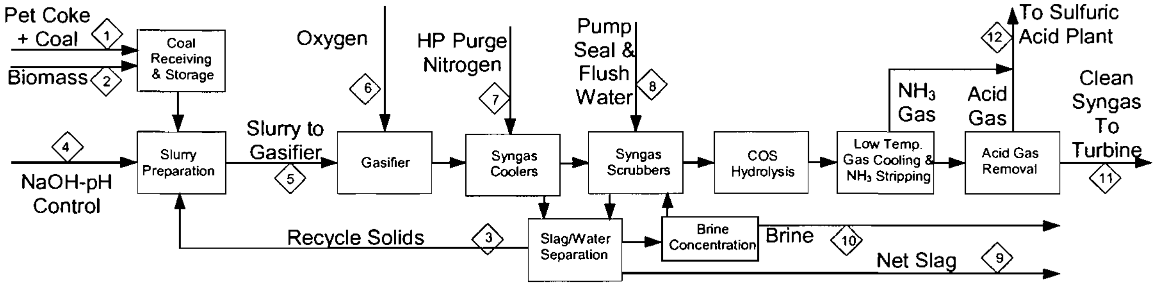
The IGCC process consists of several steps that ultimately result in the production of electrical power (Figure 1). Solid fuel is homogenized and mixed with water to produce slurry. The slurry is then passed to the gasifier which produces a high pressure combustible gas (synthesis gas or "syngas"). After 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

In the course of conducting this test burn, 52.9 tons of field chopped Bahia grass was harvested, stored, and gasified at the Polk Power Station site. The objective was to demonstrate and test all aspects of generating electricity from biomass including field harvesting, material size reduction, field storage, handling and feeding, and gasification. The Bahia grass was successfully stored on site for approximately ten months without cover using the self-thatching properties and the shedding ability of grass stack piling.

The biomass was loaded in a walking floor conveyor truck by pay loader and introduced into the plant along with the petroleum coke/coal mixture through the fuel truck unloading facility. The biomass was unloaded and sent to the "A" silo while maintaining a ratio of biomass to coal/coke of approximately 5.0% by weight to assure that test permit conditions were met. Finally, the fuel mixture was sent from the silo to the slurry processing equipment and consumed over a period of approximately 13 hours.

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. Stack emissions data were collected for CO by the stack performance test. Emissions data were reported in ppm for each pollutant.

2.3 EMISSIONS DATA COMPARISONS

Emissions data obtained during the test burn were compared to representative emissions data from March 30, 2004 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.

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 equal 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 population means are equal at a given significance level. The significance level for this report is 95% ($\alpha = 0.10$) 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 48, it is prudent to verify that the Central Limit Theorem applies by calculating the skewness and kurtosis for each variable in each dataset. 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 rum 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 4.5% by weight of the fuel for PPS Unit 1 during the 13 hour test burn. Biomass fuel generated approximately 4640 kW of electrical power during the test burn. The addition of biomass into the feedstock tended to 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 PPS Unit 1 did not increase with respect to baseline emissions during the test burn. There were no major technical impediments to the introduction of biomass into the feedstock of PPS Unit 1. A log of the biomass feed rate and weights of the biomass delivery was maintained, and is provided in Appendix A.

3.1 PROCESS

Biomass was introduced to the gasifier at a rate of 8,200 lb/hr. The biomass fuel accounted for approximately 4640 kW of electrical power out of a total of 243.4 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. Gasifier performance from the operators' standpoint was indistinguishable from the normal petcoke/coal feedstock.

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)	172,651	8,164	180,815	Total
Moisture Content (Wt%)	8.43%	29.23%	9.37%	Avg
Higher Heating Value (Btu/lb)	13,268	5,449	12,916	Avg
Higher Heating Value (MMBtu/hr)	2,291	44.5	2,335	Total
Net Power Production (kW)	238,760	4,640	243,400	Total

3.2 MASS BALANCE

Multiple flow and composition measurements were made on the 12 key process streams identified in Figure 1. Closed heat and mass balances shown in Tables 2, 3, and 4 were calculated using a least-squares technique. All key values reported in the tables were within 1 standard deviation of the mean value of the measurements. 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 433 thousand pounds per hour (KPPH). Process streams 9-12 are output streams and have a total flow rate of 433 KPPH. Process streams 3 and 5 are key internal streams and have flow rates of 152 and 333 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	172.65
2	Biomass	8.16
4	NaOH for pH Adjustment	0.61
6	Oxygen To Gasifier	188.42
7	High Pressure Purge/Sootblowing N_2	23.65
8	Pump Seal/Instrument Flush Water	39.31
TOTAL SYSTEM INPUT		**432.8**

Product (Output) Streams		
Stream Number	Stream Description	Flow (KPPH)
9	Slag	8.29
10	Brine	0.04
11	Clean Syngas To Combustion Turbine	399.12
12	Acid and NH_3 Gas To Sulfuric Acid Plant	25.34
TOTAL SYSTEM OUTPUT STREAMS		**432.8**

Key Internal Streams		
5	Slurry To Gasifier	333.48
3	Recycle Solids To Slurry	152.06

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 flow (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 laboratory analytical values agree within the sampling and analytical accuracy range of the measurements. 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.

	Units	COAL + COKE	BIOMASS	NaOH-pH CONTROL	COMBINED FUELS	RECYCLE CHAR	SLURRY TO GASIFIER
COMPOSITION							
C	Wt % Dry	82.83	47.87		81.44	73.84	79.88
H	"	4.45	5.04	1.93	4.47	0.74	3.7
N	"	1.61	1.22		1.59	1.29	1.53
S	"	3.40	0.15		3.27	3.01	3.22
O	"	3.27	40.54	30.96	4.63	0.00	3.68
ASH	"	4.44	5.18	67.11	4.59	21.12	7.99
TOTAL	"	100	100	100	100	100	100
SUBTOTAL FLOW	KPPH DRY	158.088	5.778	0.304	164.169	42.317	206.660
H2O	Wt % AR	8.43	29.23	50.00	9.51	72.14	38.03
H2O	KPPH	14.563	2.386	0.304	17.253	109.571	126.824
TOTAL FLOW	KPPH AR	172.651	8.164	0.608	181.423	151.888	333.484
MASS FLOW							
C	Dry Lb/Hr	130938	2766		133704	31376	165080
H	"	7034	291	6	7331	315	7646
N	"	2542	70		2612	550	3162
S	"	5368	9		5376	1278	6654
O	"	5168	2343	94	7605	0	7605
ASH	"	7037	298	204	7540	8972	16512
Ar	"	0	0				
SUBTOTAL-Dry Solids	"	158087	5777	304	164169	42491	206660
WATER / MOISTURE	lb/hr	14563	2386	304	17253	109571	126824
TOTAL	"	172650	8163	608	181423	152061	333484
HEAT CONTENT							
Calculated HHV	BTU/Lb (Dry)	14490	7699		14222	11122	13578
Measured HHV	BTU/Lb (Dry)	14435	8159			11223	13663
Total HHV	MMBTU/Hr	2291	44.5	0	2335	471	2806

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 STREAMS	UNITS	SLURRY TO GASIFIER	OXYGEN	HP PURGE NITROGEN	SEAL & FLUSH WATER	TOTAL SYSTEM INPUT	SLAG	RECYCLE SOLIDS	BRINE (NH4Cl)	CLEAN SYNGAS	ACID GASES	TOTAL SYSTEM OUTPUT
CO	VOL %									42.68	1.51	
H2	VOL %									32.84	0.48	
CH4	VOL %									0.03	0.03	
CO2	VOL %									15.36	70.40	
N2	VOL %		0.86	99.99						5.34	1.00	
Ar	VOL %		2.64							0.84	0.05	
H2O	VOL %									2.89	0.00	
H2S	VOL %									0.02	26.28	
COS	VOL %									0.00	0.04	
NH3	VOL %									0.00	0.19	
O2	VOL %		96.50	0.01						0.00	0.02	
TOTAL	VOL %		100	100						100	100	
MOLE WT	LB/MOLE		32.15	28.00						21.73	40.74	
FLOW	KSCFH		2224	320						6971	236	
SOLID AND LIQUID STREAMS												
C	WT %	80.68					3.50	73.84				
H	WT %	4.34					0.00	0.74	7.49			
N	WT %	1.74					0.00	1.29	26.22			
S	WT %	3.06					0.00	3.01				
O	WT %	3.58					0.00	0.00				
ASH	WT %	6.60					96.50	21.12	66.29			
TOTAL	WT %	100					100	100	100			
DRY FLOW	KPPH	167.181					7.783	42.317	0.044			
H2O	WT %	36.77					6.12	72.14	0.00			
H2O FLOW	KPPH	97.220			39.309		0.507	109.571	0.000			
TOTAL FLOW	KPPH	264.401					8.290	151.888	0.044			
ELEMENTAL FLOWS / BALANCE:												
C	LB/HR	165080	0	0		**165080**	272	31376		128054	5378	**165080**
H	LB/HR	21838	0	0	4399	**26237**	57	12576	3	13261	340	**26236.8**
N	LB/HR	3162	1406	23643		**28211**	0	550	12	27459	190	**28211**
S	LB/HR	6654	0	0		**6654**	0	1278		127	5250	**6654.59**
O	LB/HR	120237	180833	3	34911	**335984**	451	97310		224052	14171	**335984**
ASH	LB/HR	16512	0	0		**16512**	7511	8972	29	0	0	**16512.1**
Ar	LB/HR	0	6180	0		**6180**				6168	12	**6179.96**
TOTAL	LB/HR	333484	188419	23646	39309	**584859**	8290	152061	44	399120	25342	**584858**

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 then for the base fuel (biomass fuel heat content was 41% 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 the biomass test burn.

		Fuel Units	Coal/Coke Blend	Biomass
Total Moisture		Wt %	8.43	29.23
Ultimate Analysis				
	Ash	Wt % (Dry Basis)	4.44	5.18
	C	Wt % (Dry Basis)	82.83	47.87
	H	Wt % (Dry Basis)	4.45	5.04
	N	Wt % (Dry Basis)	1.61	1.22
	S	Wt % (Dry Basis)	3.40	0.15
	O	Wt % (Dry Basis)	3.27	40.54
Heating Value				
	Measured HHV	BTU/Lb (Dry Basis)	14435	8159
	Calculated HHV	BTU/Lb (Dry Basis)	14490	7699
Miscellaneous				
	Chlorine	Wt % (Dry Basis)	0.02	0.06
	Fluorine	Wt % (Dry Basis)	<0.01	<0.01
Ash Minerals				
	Cr	ppmw in Ash	180	37.9
	V	ppmw in Ash	23804	68.5
	Ni	ppmw in Ash	5244	60.7
	As	ppmw in Ash	28.3	7.6
	Hg	ppmw in Ash	1.03	0.425
	Pb	ppmw in Ash	51.4	7.4
	Be	ppmw in Ash	7.7	N/D
	SiO_2	Wt % In Ash	51.74	64.29
	Al_2O_3	Wt % In Ash	18.3	2.03
	TiO_2	Wt % In Ash	0.92	0.25
	Fe_2O_3	Wt % In Ash	11.1	0.74
	CaO	Wt % In Ash	4.59	18.12
	MgO	Wt % In Ash	1.59	3.58
	Na_2O	Wt % In Ash	0.55	N/D
	K_2O	Wt % In Ash	1.82	3.15
	P_2O_5	Wt % In Ash	0.14	3.42
	SO_3	Wt % In Ash	3.54	4.06
	Sum of Determined Minerals	Wt % In Ash	97.22	99.66
	Undetermined Ash Minerals	Wt % In Ash	2.78	0.34

3.5 EMISSIONS

A statistical analysis was performed comparing the mean NO_x, SO_2 and CO emissions from the test burn to baseline emissions obtained immediately prior to the test burn. NO_x, SO_2 and CO emissions were analyzed for both baseline and test burn periods on a volumetric (ppm or ppmvd) 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, SO_2 and CO emissions during the test burn were found to be statistically the same as the NO_x, SO_2 and CO emissions during the baseline period. Figures 2, 3 and 4 show graphs of test burn emissions compared to baseline emissions for NO_x, SO_2 and CO, respectively. Tables 6, 7 and 8 present the summary results of the statistical analyses for the test burn and baseline emissions data for NO_x, SO_2 and CO, respectively. The results presented are in volumetric units (ppm or ppmvd), but identical relationships and statistical conclusions are obtained using mass flow units (lb/hr). Table 9 summarizes the statistics for NO_x, SO_2 and CO 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.

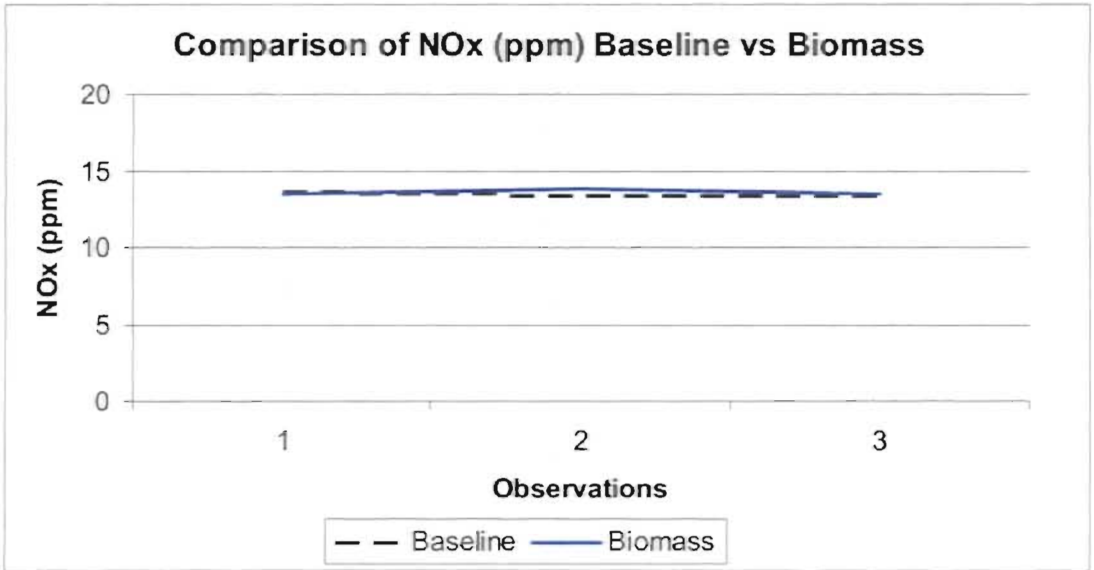


Figure 3. SO_2 emissions (ppm) from PPS Unit 1 during baseline and test burn periods.

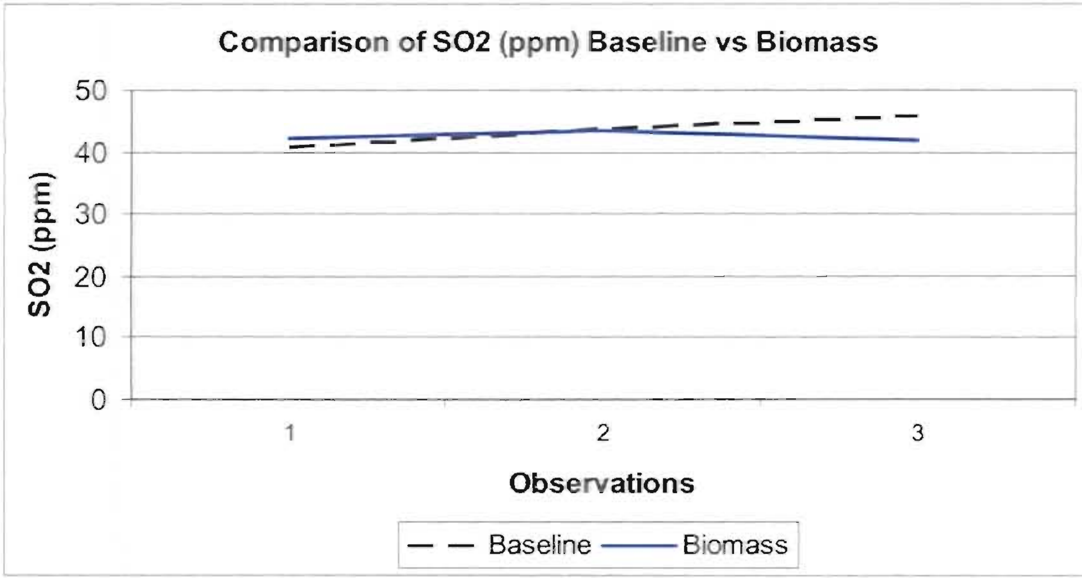
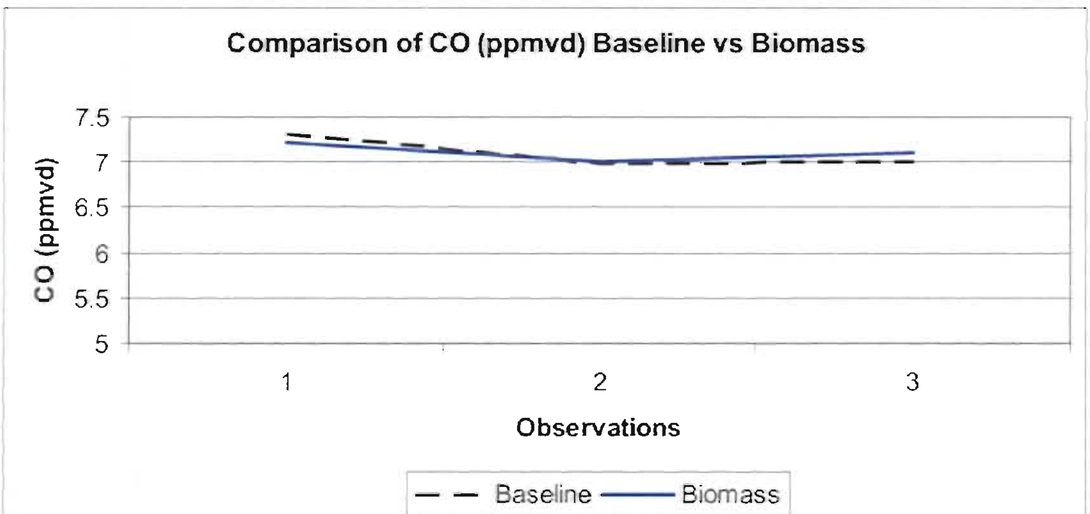


Figure 4. CO emissions (ppmvd) from PPS Unit 1 during baseline and test burn periods.



Populations' mean and variance frequency distributions as measured by skewness and kurtosis approximated a normal distribution for both NO_x, SO_2 and CO when the sizes of the datasets were considered. Two sample t-tests assuming equal variances were used to test if the mean values for NO_x, SO_2 and CO emissions were equal between the test burn and baseline emissions data. This was done because F-tests accepted the hypothesis that the variances were equal between the test burn and the baseline emissions for both NO_x, SO_2 and CO. 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)	12.08	12.47
Variance	2.02	1.36
Observations	24	24
Hypothesized Difference in Variance or Mean	0	
df F-test (t-test)	23	23
F_{calc}	1.49	
Probability that calculated F is less than or equal to F_{crit}	0.17	
F_{Crit}	2.01	
t_{calc}	1.04	
Probability that calculated t_{calc} is less than or equal to t_{crit}	0.30	
t_{crit}	1.68	
Conclusion: Accept hypothesis that Variances or Means are equal.		

Table 7. Statistical analysis comparing variances and means of baseline and test burn data for SO_2 emissions (ppm).

Parameter	Baseline	Biomass
Mean (ppm)	44.65	42.69
Variance	27.06	22.37
Observations	24	24
Hypothesized Difference in Variance or Mean	0	
df F-test (t-test)	23	23
F_{calc}	1.21	
Probability that calculated F is less than or equal to F_{crit}	0.33	
F_{Crit}	2.01	
t_{calc}	1.36	
Probability that calculated t_{calc} is less than or equal to t_{crit}	0.18	
t_{crit}	1.68	
Conclusion: Accept hypothesis that Variances or Means are equal.		

Table 8. Statistical analysis comparing variances and means of baseline and test burn data for CO emissions (ppmvd).

Parameter	Baseline	Biomass
Mean (ppm)	7.10	7.11
Variance	0.03	0.01
Observations	3	3
Hypothesized Difference in Variance or Mean	0	
df F-test (t-test)	2	2
F_{calc}	3.20	
Probability that calculated F is less than or equal to F_{crit}	0.24	
F_{Crit}	19.00	
t_{calc}	0.03	
Probability that calculated t_{calc} is less than or equal to t_{crit}	0.98	
t_{crit}	2.35	

Conclusion: Accept hypothesis that Variances or Means are equal.

Table 9. Comparison of baseline and test burn emissions in volumetric and mass flow units.

	NO_x				SO_2				CO			
	ppm		lb/hr		ppm		lb/hr		ppmvd		lb/hr	
Parameter	Baseline	Test	Baseline	Test	Baseline	Test	Baseline	Test	Baseline	Test	Baseline	Test
Mean	12.1	12.5	103.7	104.5	44.6	42.7	372.4	351.8	7.1	7.1	16.7	17
Number of Observations	24	24	24	24	24	24	24	24	3	3	3	3
Standard Deviation	1.4	1.2	11.4	10.3	5.2	4.7	44	38.5	0.2	0.1	0.4	0.2
Range	4.3	3.5	34.4	28.8	24.1	23.7	197.8	192.1	0.3	0.2	0.74	0.4
Minimum	9.6	10.4	83.5	87.6	37.9	37.1	322.8	303.1	7	7	16.6	16.8
Maximum	13.9	13.9	117.9	116.4	62	60.8	520.6	495.2	7.31	7.2	17.5	17.1
95% Confidence Level	0.60	0.50	4.8	4.4	2.2	2	18.6	16.3	0.4	0.2	1	0.5

4.0 CONCLUSION

The test burn data indicate that the gasification of biomass is technically feasible and will not adversely impact emissions from PPS Unit 1. Based on the success of this biomass test burn and the success of the previous biomass test burn firing eucalyptus, PPS requests the Department to consider allowing PPS the flexibility to gasify a variety of non-treated biomass without additional testing. TEC appreciates the Department's attention to this process.

Appendix A
Biomass Log

Polk Power Station Unit 1
Bahia Biomass Test
Silo A Loading Sheet

Date	Time	Truck Count	Fuel Truck No.	Coal / Pet Coke Fuel Weight (tn)	Bahia Buckets	Bahia Wt. (tn)
03/29/2004	15:47	1	14360	26.61	4	1.73
03/29/2004	15:56	2	14353	26.56	3	1.92
03/31/2004	7:37	3	14355	26.73	2	1.3
03/31/2004	8:00	4	14356	26.61	2	0.98
03/31/2004	8:15	5	14359	26.67	2	0.71
03/31/2004	8:50	6	14352	26.67	3	1.5
03/31/2004	8:58	7	14351	26.88	2	0.89
03/31/2004	9:19	8	14360	26.64	2.5	1.03
03/31/2004	9:40	9	14355	26.9	2.5	1.02
03/31/2004	9:58	10	14356	26.56	3	1.46
03/31/2004	10:10	11	14359	26.7	3	1.25
03/31/2004	10:25	12	14353	26.73	3	1.38
03/31/2004	10:50	13	14352	26.63	3	1.37
03/31/2004	11:05	14	14351	26.66	3	1.3
03/31/2004	11:20	15	14360	26.75	3	1.04
03/31/2004	11:55	16	14355	26.67	3	1.23
03/31/2004	12:02	17	14356	26.78	3	1.4
03/31/2004	12:07	18	14359	26.63	3	1.47
03/31/2004	12:38	19	14352	26.73	3	1.07
03/31/2004	13:00	20	14360	26.71	3	1.08
03/31/2004	13:20	21	14355	26.75	4	1.45
03/31/2004	13:40	22	14356	26.61	4	1.18
03/31/2004	13:47	23	14354	26.8	4	1.44
03/31/2004	14:07	24	14359	26.75	4	0.93
03/31/2004	14:22	25	14351	26.65	5	1.58
03/31/2004	14:37	26	14353	26.65	4	0.99
03/31/2004	15:00	27	14355	26.62	5	1.61
03/31/2004	15:25	28	14356	26.73	5	1.66
03/31/2004	15:35	29	14354	26.75	5	1.48
03/31/2004	15:58	30	14360	26.73	5	1.83
03/31/2004	16:18	31	14351	26.66	4	1.39
03/31/2004	16:38	32	14359	26.78	4	1.2
03/31/2004	16:48	33	14353	26.72	4	1.39
03/31/2004	17:05	34	14352	26.6	3	1.26
03/31/2004	17:25	35	14354	27.18	3	1.17
03/31/2004	17:45	36	14360	26.57	3	0.84
03/31/2004	17:55	37	14355	26.73	3	1.19
03/31/2004	18:05	38	14356	26.59	3	1.11
03/31/2004	18:13	39	14351	26.64	3	1.02
03/31/2004	18:28	40	14359	26.83	3	0.78
03/31/2004	18:38	41	14356	26.68	7	2.3
03/31/2004	19:00	42	14352	26.66		

Total Fuel trucks	42 trucks
Average weight fuel trucks	26.70 tn
Total fuel weight	1121.5 tn
Total Bahia grass trucks	41 trucks
Average weight Bahia trucks	2581.95 lbs
Total Bahia Weight	52.93 tn
Percentage Bahia grass	4.72 %

Appendix B
Test Burn Slag Analysis

SEVERN TRENT STL

STL Tampa 6712 Benjamin Road, Suite 100 - Tampa FL 33634 Telephone:(813) 885-7427 Fax:(813) 885-7049

Analytical Report

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

CC:

Order Number: B422088
SDG Number:
Client Project ID:
Project: TCLP/BIOMASS SLAG
Report Date: 05/06/2004
Sampled By: Client
Sample Received Date: 05/04/2004
Requisition Number:
Purchase Order:

Michael F. Valder, Project Manager
mvalder@stl-inc.com

STL Tampa 6712 Benjamin Road, Suite 100 - Tampa FL 33634 Telephone:(813) 885-7427 Fax:(813) 885-7049

Sample Summary

Order: B422088
Date Received: 05/04/2004

Client: Tampa Electric Company
Project: TCLP/BIOMASS SLAG

Client Sample ID	Lab Sample ID	Matrix	Date Sampled
BIOMASS SLAG	B422088*1	Solid	04/01/2004 12:00

SEVERN TRENT STL

STL Tampa 6712 Benjamin Road, Suite 100 - Tampa FL 33634 Telephone:(813) 885-7427 Fax:(813) 885-7049

Analytical Data Report

Lab Sample ID	Description	Matrix	Date Received	Date Sampled	SDG#
22088-1	BIOMASS SLAG	Solid	05/04/04	04/01/04 12:00	

Parameter	Units	Lab Sample IDs 22088-1
Metals in TCLP (6010)		
Arsenic (TCLP)	mg/l	0.20U
Barium (TCLP)	mg/l	1.0U
Cadmium (TCLP)	mg/l	0.10U
Chromium (TCLP)	mg/l	0.20U
Lead (TCLP)	mg/l	0.20U
Selenium (TCLP)	mg/l	0.50U
Silver (TCLP)	mg/l	0.10U
Prep Date		05/05/04
Prep Time		09:30
Analysis Date		05/05/04
Beryllium (TCLP) (6010)		
Beryllium (TCLP)	mg/l	0.020U
Prep Date		05/05/04
Prep Time		09:30
Analysis Date		05/05/04
Thallium (TCLP) (6010)		
Thallium (TCLP)	mg/l	0.050U
Prep Date		05/05/04
Prep Time		09:30
Analysis Date		05/05/04

SEVERN TRENT STL

STL Tampa 6712 Benjamin Road, Suite 100 - Tampa FL 33634 Telephone:(813) 885-7427 Fax:(813) 885-7049

Analytical Data Report

Lab Sample ID	Description	Matrix	Date Received	Date Sampled	SDG#
22088-1	BIOMASS SLAG	Solid	05/04/04	04/01/04 12:00	

Parameter	Units	Lab Sample IDs 22088-1
Nickel (TCLP)		
Nickel (TCLP)	mg/l	11
Prep Date		05/05/04
Prep Time		09:30
Analysis Date		05/05/04
Antimony (TCLP) (6010)		
Antimony (TCLP)	mg/l	0.030U
Prep Date		05/05/04
Prep Time		09:30
Analysis Date		05/05/04
Mercury in TCLP Extract (7470)		
Mercury in TCLP Extract	mg/l	0.020U
Prep Date		05/05/04
Prep Time		10:00
Analysis Date		05/05/04
TCLP extraction - non-volatile (1311)		
Phases *		1
% Solids *	%	100 %
% that passes 9.5 mm sieve *	%	100 %
pH (7.1.4.2) *		5.5
pH (7.1.4.4) *		1.6
Extraction Fluid *		1
Prep Date		05/04/04
Prep Time		16:11
Analysis Date		05/04/04

SEVERN TRENT STL

STL Tampa 6712 Benjamin Road, Suite 100 - Tampa FL 33634 Telephone:(813) 885-7427 Fax:(813) 885-7049

Order Number: B422088

Method :EPA SW-846
DOH Certification #:E84282

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.
The estimated uncertainty associated with these reported results is available upon request.
I = The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

U = Indicates that the compound was analyzed for but not detected.

TECO TAMPA ELECTRIC

ANALYSIS REQUEST & CHAIN OF CUSTODY

LABORATORY SERVICES

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

42 2088

PROJECT REFERENCE	PROJECT NO.	PROJECT LOCATION (STATE) FLORIDA	REQUIRED ANALYSIS: TCLP: As, Pb, Be, Th, Cd, Sb, Cr, Se, Hg, Ba, Ag, Ni
SAMPLER'S PRINTED NAME JOHN McDANIEL	SAMPLER'S SIGNATURE		
P.O. NUMBER	CONTRACT NO.	SITE POLK POWER STATION	
CLIENT NAME ROBERT L. DOREY	CLIENT PHONE 813-630-7378	CLIENT FAX	
CLIENT EMAIL RLDOREY@TECOENERGY.COM	CLIENT ADDRESS		PRESERVATIVE: NONE

Sample Kit Number

DUE DATE 5-6-04

☑ EMAIL OR FAX RESULTS

☑ MAIL RESULTS

NUMBER OF COOLERS SUBMITTED PER SHIPMENT:

SAMPLE ID	SAMPLE DESCRIPTION	SAMPLING DATE	SAMPLING TIME	* MATRIX	NO. OF CONTAINERS SUBMITTED					Sample Kit Number	REMARKS
	BIOMASS SLAG	4-1-04	1200	SO	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 ☐ Yes ☐ No

ON ICE/ 4°C ☐ Yes ☑ No

SAMPLE TRANSFERS

RELINQUISHED BY:	RECEIVED BY:	DATE	TIME
PERSON'S NAME: Robert L. Dorey FACILITY NAME: TEC	PERSON'S NAME: [signature] FACILITY NAME: STL Tampa	05/4/03	9:40
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		
PERSON'S NAME: FACILITY NAME:	PERSON'S NAME: FACILITY NAME:		
SHIPPING VENDOR:	BILL OF LADING NO:		
LOGGED IN BY: DATE:			

H:\Environmental Services\Lab\Forms\Admin Forms\Chain of Custody

SEVERN TRENT STL

Remit To: SEVERN TRENT LABORATORIES,INC. P.O. Box 7777 W4305 Philadelphia, PA 19175-4305
STL Tampa 6712 Benjamin Road, Suite 100 - Tampa FL 33634 Tel:813-885-7427 Fax:813-885-7049

INVOICE

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

Federal ID# 23-2919996

Invoice CC:

DATE	TERMS	CLIENT PO #	CLIENT PROJECT #	PROJECT
05/06/04	Net 0 Days			TCLP/BIOMASS SLAG

INVOICE #	CONTRACT #	CODE	
66016426		MV*426918	

LOG #	CREDIT / DEBIT	ORIGINATING LOG #	SDG #	REQUISITION #
B422088				

QUANTITY	MATRIX	METHOD	DESCRIPTION	UNIT PRICE	EXTENDED AMOUNT
1	Solid	6010	Metals in TCLP	105.00	105.00
1	Solid	6010	Beryllium (TCLP)	15.00	15.00
1	Solid	6010	Thallium (TCLP)	15.00	15.00
1	Solid	****	Nickel (TCLP)	15.00	15.00
1	Solid	6010	Antimony (TCLP)	15.00	15.00
1	Solid	7470	Mercury in TCLP Extract	42.00	42.00
1	Solid	1311	TCLP extraction - non-volatile	53.00	53.00
			Total for this page		$260.00
			INVOICE TOTAL		$260.00

REPORTED TO	OFFICE	OFFICE PHONE
Mr. Robert Dorey	Tampa Electric Company	(813) 630-7378

For proper credit, please show INVOICE NUMBER on your remittance.
After 30 days, service charges of 1.5% per 30 days will be applied to unpaid balance.

Appendix C
Biomass Emissions Data

Baseline Emissions Data for Coal and Petcoke Blend

Begin Date	SO2 (ppm)	SO2 (lb/hr)	NOx (ppm)	NOx (lb/hr)	CO (ppmvd)	CO lb/hr
3/30/04 7:00 AM	40.4	334.4	12.9	108.9	-	-
3/30/04 8:00 AM	40.8	336.6	13.6	115.9	7.3	17.4
3/30/04 9:00 AM	43.8	361.7	13.4	114.6	7.0	16.6
3/30/04 10:00 AM	45.9	375.8	13.4	112.7	7.0	16.6
3/30/04 11:00 AM	43.5	357.5	13.8	115.5	-	-
3/30/04 12:00 PM	42.6	351.2	13.7	114.4	-	-
3/30/04 1:00 PM	38.9	325.5	13.9	117.9	-	-
3/30/04 2:00 PM	41.9	354.8	13.5	115.9	-	-
3/30/04 3:00 PM	37.9	322.8	13.2	113.0	-	-
3/30/04 4:00 PM	40.2	339.8	13.1	113.6	-	-
3/30/04 5:00 PM	43.8	371.2	12.9	112.0	-	-

Test Burn Emissions Data for Coal, Petcoke and Biomass Blend

Begin Date	SO2 (ppm)	SO2 (lb/hr)	NOx (ppm)	NOx (lb/hr)	CO (ppmvd)	CO lb/hr
4/1/04 7:00 AM	46.5	385.7	13.2	110.9	-	-
4/1/04 8:00 AM	42.4	350.5	13.5	113.4	7.2	17.2
4/1/04 9:00 AM	43.3	358.4	13.8	116.3	7.0	16.8
4/1/04 10:00 AM	42.1	346.4	13.5	112.1	7.1	17.0
4/1/04 11:00 AM	42.9	353.3	13.6	114.2	-	-
4/1/04 12:00 PM	39.0	325.4	13.6	115.7	-	-
4/1/04 1:00 PM	39.3	325.6	13.8	116.4	-	-
4/1/04 2:00 PM	45.2	373.5	13.9	116.3	-	-
4/1/04 3:00 PM	40.6	335.8	13.0	109.2	-	-
4/1/04 4:00 PM	38.5	316.7	12.1	100.7	-	-
4/1/04 5:00 PM	39.7	323.7	10.9	90.0	-	-

Attachment B
Responsible Official Signature

I, the undersigned, am the responsible official as defined in Chapter 62-213, F.A.C., of the Title V source for which this document is being submitted. I have reviewed the letter of request for authorization to conduct a biomass test burn at Polk Power Station. I hereby certify, based on the information and belief formed after reasonable inquiry, that the statements made and data contained in this document are true, accurate, and complete to the best of my knowledge.

Mark J Hornick | 05/13/04

Signature | Date

Mark J. Hornick | General Manager, Polk Power Station

Name | Title

Attachment C
Professional Engineer's Certification

ATTACHMENT B

TAMPA ELECTRIC COMPANY
POLK POWER STATION UNIT 1
BIOMASS TEST BURN REPORT

Professional Engineer Certification

Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, the information provided in this submittal concerning tested emissions from Unit 1 while burning biomass at the Tampa Electric Company (TEC) Polk Power Station is true, accurate, and complete based on my review of material provided by TEC engineering and environmental staff; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this submittal are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of air pollutants not regulated for an emissions unit, based solely upon the materials, information and calculations provided with this certification.

Signature

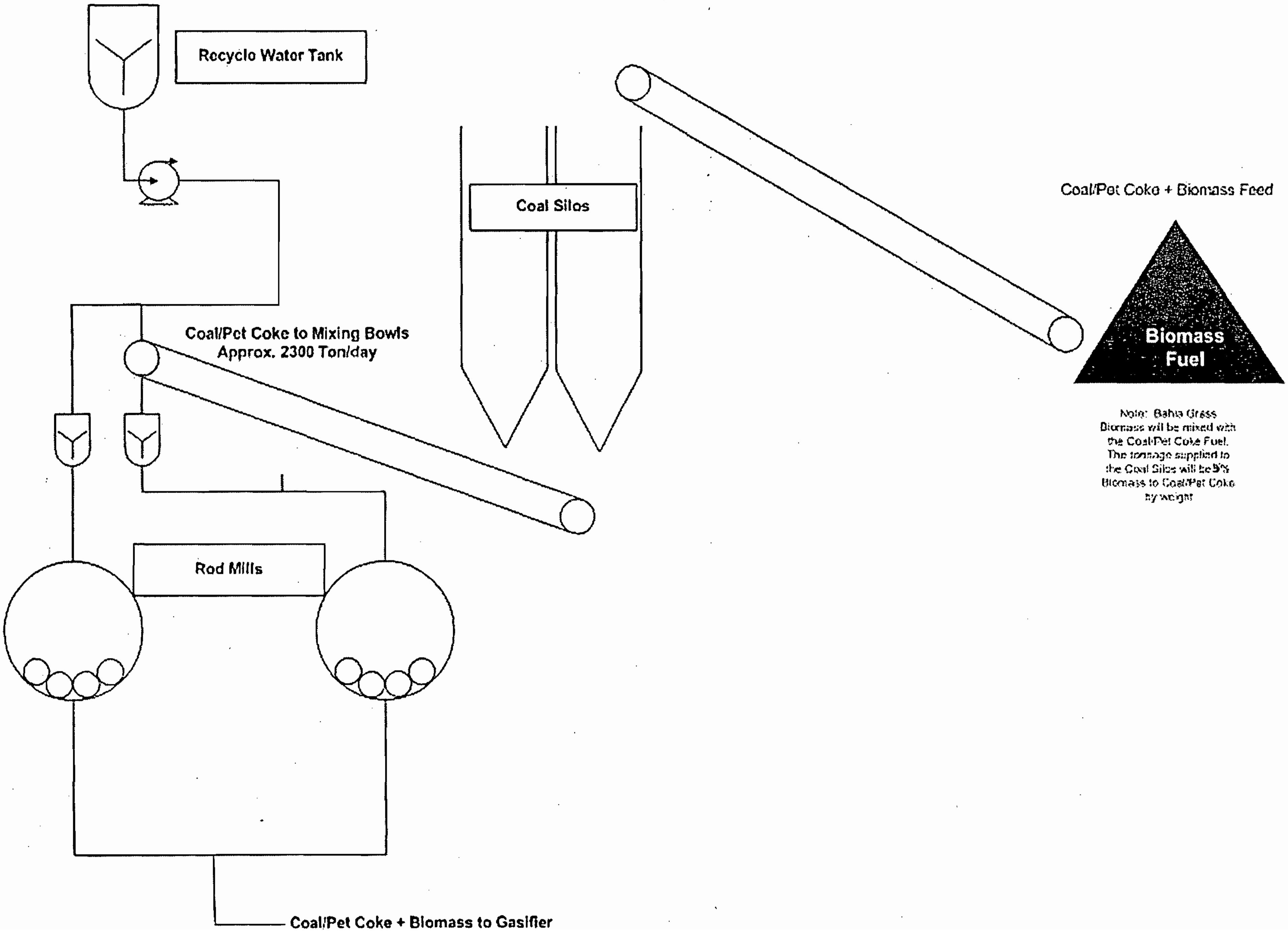
Date 5/13/04

(seal)

* Certification is applicable to the Tampa Electric Company (TEC) Biomass Test Burn Report for Polk Power Station Unit 1.

Attachment D
Biomass Process Flow Diagram

Polk Power Station Unit 1
Bahia Grass Biomass Burn Test
Process Flow Diagram
Revised 2/2/04



Attachment E
Biomass Representative Analysis

General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6081

CERTIFICATE OF ANALYSIS

TO: Mr. Robert Dorey
Central Testing Lab
Tampa Electric

Customer Account :
Sample Date : 01-Apr-04

Laboratory Account CTAMPA

Description : Tampa Electric

Received Date : 07-Apr-04

BIOMASS / Bahia Grass

Laboratory ID Number : AI09783

Test Name	Reference	Result	
Dry Basis			
Ash, Dry	ASTM D 5142	5.12	% By Weight
Heat of Combustion, Dry	ASTM D 5865	8159	Btu/lb
Carbon, Dry Basis	ASTM D 5373	47.87	% By Weight
Hydrogen, Dry Basis	ASTM D 5373	5.04	% By Weight
Nitrogen, Dry Basis	ASTM D 5373	1.22	% By Weight
Oxygen, Dry Basis	ASTM D 3176	40.60	% By Weight
Carbon Fixed, Dry	ASTM D 3172	13.43	% By Weight
Volatiles, Dry Basis	ASTM D 5142	81.45	% By Weight
Chlorine, Dry Basis	XRF	555	mg/kg
Fluorine, Dry Basis	XRF	49.	mg/kg
Sulfur, Dry Basis	ASTM D 4239	0.15	% By Weight
Aluminum, Dry Basis	XRF	0.055	% By Weight
Barium, Dry Basis	XRF	0.017	mg/kg
Calcium, Dry Basis	XRF	0.663	% By Weight
Iron, Dry Basis	XRF	0.027	% By Weight
Magnesium, Dry Basis	XRF	0.111	% By Weight
Phosphorus, Dry Basis	XRF	0.076	% By Weight
Potassium, Dry Basis	XRF	0.134	% By Weight
Silicon, Dry Basis	XRF	1.539	% By Weight
Antimony, Dry Basis	ASTM D 6357	0.2	mg/kg
Sodium, Dry Basis	XRF	Not Detected	% By Weight
Strontium, Dry Basis	XRF	Not Detected	per cent
Titanium, Dry Basis	XRF	0.008	% By Weight

This Certificate states the physical and/or chemical characteristics of the sample as submitted.

Comments:

CC:

Quality Control ______________________
Supervision__________________________

Date : 5/7/2004

smk/coal

General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6081

CERTIFICATE OF ANALYSIS

TO: Mr. Robert Dorey
Central Testing Lab
Tampa Electric

Customer Account :
Sample Date : 01-Apr-04

Laboratory Account CTAMPA

Description : Tampa Electric

Received Date : 07-Apr-04

BIOMASS / Bahia Grass

Laboratory ID Number : AI09783

Test Name	Reference	Result	
Beryllium, Dry Basis	ASTM D 6357	Not Detected	mg/kg
Cadmium, Dry Basis	ASTM D 6357	0.36	mg/kg
Chromium, Dry Basis	ASTM D 6357	1.9	mg/kg
Cobalt, Dry Basis	ASTM D 6357	0.3	mg/kg
Copper, Dry Basis	ASTM D 6357	6.1	mg/kg
Manganese, Dry Basis	ASTM D 6357	75.2	mg/kg
Nickel, Dry Basis	ASTM D 6357	3.1	mg/kg
Vanadium, Dry Basis	ASTM D 6357	3.5	mg/kg
Zinc, Dry Basis	ASTM D 6357	36.9	mg/kg
Arsenic, Dry Basis	ASTM D6357	0.4	mg/kg
Lead, Dry Basis	ASTM D6357	0.4	mg/kg
Mercury, Dry	ASTM D6414	0.022	mg/kg
As Received			
Moisture, Total	ASTM D 2013	29.23	% By Weight
Ash, As Received	ASTM D 5142	3.62	% By Weight
Heat of Combustion, As Received	ASTM D 5865	5774	Btu/lb
Carbon, As Received	ASTM D 5373	33.88	% By Weight
Hydrogen, As Received	ASTM D 5373	3.57	% By Weight
Nitrogen, As Received	ASTM D 5373	0.86	% By Weight
Oxygen, As Received	ASTM D 3176	28.73	% By Weight
Carbon Fixed, As Received	ASTM D 3172	9.50	% By Weight
Volatiles, As Received	ASTM D 5142	57.64	% By Weight
Chlorine, As Received	XRF	393.	mg/kg
Fluorine, As Received	XRF	35.	mg/kg

This Certificate states the physical and/or chemical characteristics of the sample as submitted.

Comments:

CC:

Quality Control ______________________
Supervision__________________________

Date : 5/7/2004

smk/coal

General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6081

CERTIFICATE OF ANALYSIS

TO: Mr. Robert Dorey
Central Testing Lab
Tampa Electric

Customer Account :
Sample Date : 01-Apr-04
Laboratory Account CTAMPA
Received Date : 07-Apr-04

Description : Tampa Electric

BIOMASS / Bahia Grass

Laboratory ID Number : AI09783

Test Name	Reference	Result	
Sulfur, As Received	ASTM D 4239	0.11	% By Weight
Aluminum, As Received	XRF	0.039	% By Weight
Barium, As Received	XRF	0.012	mg/kg
Calcium, As Received	XRF	0.469	% By Weight
Iron, As Received	XRF	0.019	% By Weight
Magnesium, As Received	XRF	0.078	% By Weight
Phosphorus, As Received	XRF	0.054	% By Weight
Potassium, As Received	XRF	0.094	% By Weight
Silicon, As Received	XRF	1.088	% By Weight
Sodium, As Received	XRF	Not Detected	% BY Weight
Antimony, As Received	ASTM D 6357	0.1	mg/kg
Strontium, As Received	XRF	Not Detected	per cent
Titanium, As Received	XRF	0.005	% By Weight
Beryllium, As Received	ASTM D 6357	Not Detected	mg/kg
Cadmium, As Received	ASTM D 6357	0.26	mg/kg
Chromium, As Received	ASTM D 6357	1.4	mg/kg
Cobalt, As Received	ASTM D 6357	0.2	mg/kg
Copper, As Received	ASTM D 6357	4.3	mg/kg
Manganese, As Received	ASTM D 6357	53.1	mg/kg
Nickel, As Received	ASTM D 6357	2.2	mg/kg
Vanadium, As Received	ASTM D 6357	2.5	mg/kg
Zinc, As Received	ASTM D 6357	26.1	mg/kg
Arsenic, As Received	ASTM D6357	0.3	mg/kg
Lead, As Received	ASTM D6357	0.3	mg/kg

This Certificate states the physical and/or chemical characteristics of the sample as submitted.

Comments:

CC:

Quality Control ______________________
Supervision__________________________

Date : 5/7/2004

smk/coal

General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6081

CERTIFICATE OF ANALYSIS

TO: Mr. Robert Dorey
Central Testing Lab
Tampa Electric

Customer Account :
Sample Date : 01-Apr-04

Laboratory Account CTAMPA

Description : Tampa Electric

Received Date : 07-Apr-04

BIOMASS / Bahia Grass

Laboratory ID Number : AI09783

Test Name	Reference	Result	
Mercury, As Received	ASTM D6414	0.016	mg/kg
Ignited as Element			
Sulfur, Ignited	XRF	1.62	% By Weight
Antimony, Ignited Basis	ASTM D 6357	3.6	mg/kg
Beryllium, Ignited Basis	ASTM D 6357	Not Detected	mg/kg
Cadmium, Ignited Basis	ASTM D 6357	7.10	mg/kg
Chromium, Ignited Basis	ASTM D 6357	37.9	mg/kg
Cobalt, Ignited Basis	ASTM D 6357	6.2	mg/kg
Arsenic, Ignited Basis	ASTM D 6357	7.6	mg/kg
Selenium, Ignited Basis	ASTM D 6357	10.6	mg/kg
Copper, Ignited Basis	ASTM D 6357	119.3	mg/kg
Lead, Ignited Basis	ASTM D 6357	7.4	mg/kg
Aluminum, Ignited Basis	XRF	1.07	% By Weight
Barium, Ignited Basis	XRF	0.336	% by Wt.
Manganese, Ignited Basis	ASTM D 6357	1468.0	mg/kg
Nickel, Ignited Basis	ASTM D 6357	60.7	mg/kg
Calcium, Ignited	XRF	12.95	% By Weight
Vanadium, Ignited Basis	ASTM D 6357	68.5	mg/kg
Zinc, Ignited Basis	ASTM D 6357	721.3	mg/kg
Iron, Ignited	XRF	0.52	% By Weight
Magnesium, Ignited	XRF	2.16	% By Weight
Phosphorus, Ignited	XRF	1.49	% By Weight
Potassium, Ignited	XRF	2.61	% By Weight
Silicon, Ignited	XRF	30.05	% By Weight

This Certificate states the physical and/or chemical characteristics of the sample as submitted.

Comments:

CC:

Quality Control ____________________
Supervision________________________

Date : 5/7/2004

smk/coal

General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6081

CERTIFICATE OF ANALYSIS

TO: Mr. Robert Dorey
Central Testing Lab
Tampa Electric

Customer Account :
Sample Date : 01-Apr-04
Laboratory Account CTAMPA
Received Date : 07-Apr-04

Description : Tampa Electric

BIOMASS / Bahia Grass

Laboratory ID Number : AI09783

Test Name	Reference	Result	
Sodium, Ignited Basis	XRF	Not Detected	% By Weight
Titanium, Ignited	XRF	0.15	% By Weight
Ignited as Oxide			
Aluminum Oxide, Ignited Basis	XRF	2.03	% By Weight
Calcium Oxide, Ignited Basis	XRF	18.12	% By Weight
Iron Oxide, Ignited Basis	XRF	0.74	% By Weight
Magnesium Oxide, Ignited Basis	XRF	3.58	% By Weight
Phosphorus Oxide, Ignited Basis	ASTM D 3682	3.42	% By Weight
Potassium Oxide, Ignited Basis	XRF	3.15	% By Weight
Silicon Oxide, Ignited Basis	XRF	64.29	% By Weight
Sodium Oxide, Ignited	XRF	Not Detected	% By Weight
Sulfur Trioxide, Ignited	XRF	4.06	% By Weight
Titanium Oxide, Ignited	XRF	0.25	% By Weight
Antimony Oxide, Ignited	ASTM D 6357	4.8	mg/kg
Barium Oxide, Ignited	XRF	0.375	% by Wt.
Beryllium Oxide, Ignited	ASTM D 6357	Not Detected	mg/kg
Cadmium Oxide, Ignited	ASTM D 6357	8.11	mg/kg
Chromium Oxide, Ignited	ASTM D 6357	49.6	mg/kg
Cobalt Oxide (Co2O3), Ignited	ASTM D 6357	8.7	mg/kg
Copper Oxide, Ignited	ASTM D 6357	149.3	mg/kg
Lead Oxide, Ignited	ASTM D 6357	8.5	mg/kg
Manganese Oxide, Ignited	ASTM D 6357	2323.1	mg/kg
Nickel Oxide, Ignited	ASTM D 6357	77.2	mg/kg
Vanadium Pentoxide, Ignited	ASTM D 6357	122.3	mg/kg

This Certificate states the physical and/or chemical characteristics of the sample as submitted.

Comments:

CC:

Quality Control ____________________
Supervision________________________

Date : 5/7/2004

smk/coal

General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6081

CERTIFICATE OF ANALYSIS

TO: Mr. Robert Dorey
Central Testing Lab
Tampa Electric

Customer Account :
Sample Date : 01-Apr-04

Laboratory Account CTAMPA
Received Date : 07-Apr-04

Description : Tampa Electric

BIOMASS / Bahia Grass

Laboratory ID Number : AI09783

Test Name	Reference	Result	
Zinc Oxide, Ignited Basis	ASTM D 6357	897.8	mg/kg
General			
Heat of Combustion, MAF	ASTM D 5865	8599	Btu/lb
Sulfur, lbs/mmBTU	ASTM D 3180	0.184	lbs/mmBTU

This Certificate states the physical and/or chemical characteristics of the sample as submitted.

Comments:

CC:

Quality Control ______________________
Supervision ______________________

Date : 5/7/2004

smk/coal

Attachment F
Biomass Test Protocol

Tampa Electric Company

Biomass Test Protocol
Polk Power Station Unit 1

TECO
TAMPA ELECTRIC

May 2004

Tampa Electric Company (TEC) proposes to conduct a test burn at Polk Power Station Unit 1 (PPS) to compare the standard fuel blend of up to 60% petcoke and coal by weight to a blend containing up to 5% biomass and 95% of the standard blend.

The baseline test burn will evaluate NO_x, SO_2 and CO emissions as a result of firing syngas produced from the gasification of a petcoke and coal fuel blend consisting of up to 60% petcoke. This baseline test will last for one day to facilitate collection of representative data.

The biomass blend test burn will evaluate the NO_x, SO_2 and CO emissions produced from the gasification of the above mentioned biomass fuel blend. This biomass blend test burn will last for one day to facilitate collection of representative data. Any residual biomass fuel stock that is on hand after the test burn will be consumed immediately after the test burn is completed.

The NO_x, SO_2 and CO test burn data will be collected and analyzed using the methodologies found in Table 1. Prior to blending, fuel testing will be done on the standard fuel blend and the biomass fuel individually. Continuous emissions monitors (CEMS), located in the combustion turbine stack, will be used to collect representative data for SO_2 and NO_x, emissions during the test burn. A stack test will be performed to collect representative data for CO. CEMS will be quality assured pursuant to 40 CFR 75, Appendix B. The data assessment report from 40 CFR 60, Appendix F, for the most recent relative accuracy test audit (RATA) and most recent cylinder gas audit (CGA), will be submitted with the test burn report.

During these tests, PPS Unit 1 will be operated at a minimum of 90% of the maximum permitted heat input. Upon completion of all testing, TEC will compile test results in a report to be submitted to the Florida Department of Environmental Protection within 45 days of completion of the test burn.

Table 1. Summary of data collection and monitoring methodologies to be used during the PPS biomass test burn.

Test	SO_2	NO_x	CO	Fuel Analysis
Baseline Test 1 Day	CEM Data[1]	CEM Data[1]	Stack Test Data	Weekly composite fuel analysis[2]
Biomass Test 1 Day	CEM Data[1]	CEM Data[1]	Stack Test Data	Weekly composite fuel analysis[2]

[1]Equivalent CEM data will be used in lieu of stack test data.

[2]Composite weekly fuel analysis results will be supplied during the baseline and test burn. Fuel analyses will include the following:

Fuel Analysis: Sulfur, wt. %,Volatiles, Content, wt. %, Nitrogen, wt. %, Ash, wt. %, Calorific Value, BTU/#, Carbon, wt. %, Moisture, wt. %

Attachment G
Biomass Stack Performance Test Report

EMISSIONS TEST REPORT

CARBON MONOXIDE, NITROGEN OXIDE, and SULFUR DIOXIDE
MARCH 30, 2004 and APRIL 1, 2004
POLK POWER STATION
BIOMASS TEST BURN
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, Health & Safety
Environmental Services
Air Services Group

TECO
TAMPA ELECTRIC

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

REPORT CERTIFICATION

I have reviewed the test performance, associated quality assurance activities, the resultant calculations, and the contents of this report, and certify that all project quality objectives have been met. This report is approved for submittal.

Date: 13 May 2004 Signature: ____________

Raymond A. McDarby, Jr.
Senior Environmental Technician
Quality Assurance/Quality Control Specialist
Air Services Group
Environmental Health & Safety
Tampa Electric Company

The sampling and subsequent data entry/reduction detailed in this report were conducted at my direction, and I hereby certify that this test report is authentic and accurate to the best of my knowledge.

Date: 13 May 2004 Signature: RAM for

Juan F. Ramirez
Environmental Technician
Test Team Lead
Air Services Group
Environmental Health & Safety
Tampa Electric Company

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

Date: 5/13/04 Signature: ____________

David A. Smith
Coordinator – Air Services Group
Environmental Health & Safety
Tampa Electric Company

TABLE OF CONTENTS

1.0 INTRODUCTION

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

2.0 DISCUSSION OF RESULTS

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

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

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

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

3.0 SOURCE DESCRIPTION/TEST PROCEDURES

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

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

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

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

4.0 TEST RESULTS

TECO
TAMPA ELECTRIC

POLK POWER STATION
CARBON MONOXIDE DATA

BASELINE

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

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

CO, lbs/hr calculated as:

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

where:

C_f = 7.2725E-08 lb/scf

F_d = 8276 dscf/mmBtu, from fuel analysis

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
CARBON MONOXIDE DATA

BIOMASS

UNIT # 1

COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS

April 1, 2004

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

CO, lbs/hr calculated as:

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

where:

C_f = 7.2725E-08 lb/scf

F_d = 8286 dscf/mmBtu, from fuel analysis

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
NITROGEN OXIDES DATA FROM CEMS

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

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

NO_x, lbs/hr is calculated as:

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

where:

C_f = 1.1946E-07 lb/scf

F_c = 2336 dscf/mmBtu, from fuel analysis

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

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
NITROGEN OXIDES DATA FROM CEMS

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

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

NO_x, lbs/hr is calculated as:

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

where:

C_f = 1.1946E-07 lb/scf

F_c = 2350 dscf/mmBtu, from fuel analysis

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

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
SULFUR DIOXIDE DATA FROM CEMS

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

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

SO_2, lbs/hr is calculated as:

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

where:

C_f = 1.6635E-07 lb/scf

F_c = 2336 dscf/mmBtu, from fuel analysis

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

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
SULFUR DIOXIDE DATA FROM CEMS

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

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

SO_2, lbs/hr is calculated as:

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

where:

C_f = 1.6635E-07 lb/scf

F_c = 2350 dscf/mmBtu, from fuel analysis

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

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

TECO
TAMPA ELECTRIC

POLK POWER STATION
HEAT INPUT CALCULATIONS

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

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

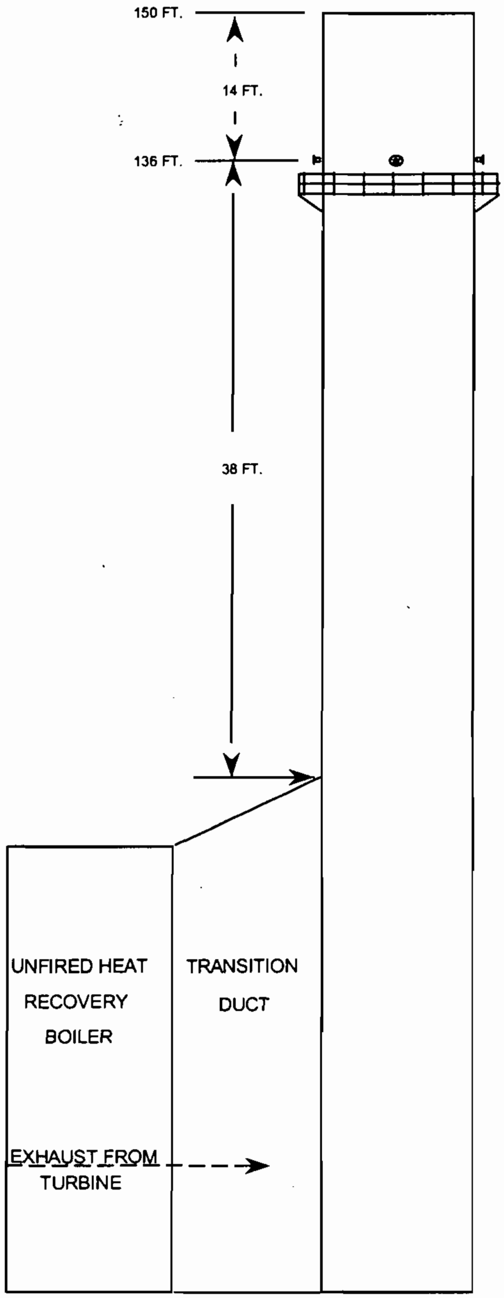
TECO
TAMPA ELECTRIC

POLK POWER STATION
HEAT INPUT CALCULATIONS

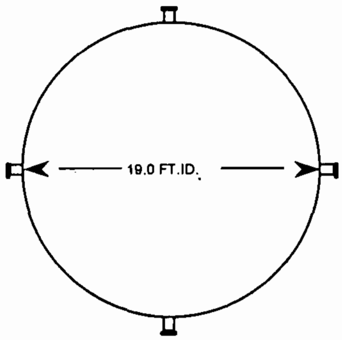
BIOMASS
UNIT # 1
COMBINED CYCLE COMBUSTION TURBINE - FIRING SYNGAS
April 1, 2004

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

5.0 FIGURES



POLK POWER STATION
COMBUSTION TURBINE
COMBINED CYCLE UNIT NO.1
TEST LOCATION



PORT LOCATION PLAN

STACK DIAMETERS DOWNSTREAM FROM DISTURBANCE = 2.0
STACK DIAMETERS UPSTREAM FROM DISTURBANCE = 0.7
STACK DIAMETER = 19.0 FT.
STACK AREA = 283.529 SQ. FT.
STACK AREA =40828.138 SQ. IN.

EXTRACTIVE
TRAVERSE
POINTS
1 - 3.65"
2 - 11.17"
3 - 19.38"
4 - 28.50"
5 - 38.53"
6 - 50.16"
7 - 64.52"
8 - 85.50"

ADD 13" PORT LENGTH
TO POINTS

TECO
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APPENDIX A

CARBON MONOXIDE TEST AND SUPPORTING DATA

A-1 RM 10/3A BASELINE DATA REPORT

Polk Unit 1 Biomass - Report			
RUN 1			
03/30/2004			
7:58			
Linearity Check - Calibration Error	O2	CO2	CO
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Low Level Certified Value (PPM or %)	6.27	5.02	6.02
Mid Level Certified Value (PPM or %)	12.3	11	12.6
High Level Certified Value (PPM or %	20.9	18	
Zero Level Observed	0.014	0.095	-0.186
Low Level Observed	6.301	4.978	6.045
Mid Level Observed	12.41	11.18	12.32
High Level Observed	21.01	18.31	-
% Difference from Zero to Target	0.06	0.47	-0.93
% Difference from Low to Target	0.12	-0.21	0.13
% Difference from Mid to Target	0.42	0.9	-1.38
% Difference from High to Target	0.45	1.55	0
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Actual Zero From Linearity	0.014	0.095	-0.186
Actual Span From Linearity	12.41	11.18	6.045
Initial Readings			
Zero	0.014	0.095	-0.127
Span	12.34	11.18	6.123
Final Readings			
Zero	0.014	0.095	-0.03
Span	12.34	11.18	6.152
Initial Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.29
Span Bias	-0.24	0	0.39
Final Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.78
Span Bias	-0.24	0	0.54
Calculated Drift			
Zero Drift (Run-Run)	0	0	0.48
Span Drift	0	0	0.14
Run Results			
Raw Results	11.72	9.15	7.47
Corrected Results (ppmv)	11.68	8.98	7.31

Polk Unit 1 Biomass - Report			
RUN 2			
03/30/2004			
9:05			
Linearity Check - Calibration Error	O2	CO2	CO
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Low Level Certified Value (PPM or %)	6.27	5.02	6.02
Mid Level Certified Value (PPM or %)	12.3	11	12.6
High Level Certified Value (PPM or %	20.9	18	
Zero Level Observed	0.014	0.095	-0.186
Low Level Observed	6.301	4.978	6.045
Mid Level Observed	12.41	11.18	12.32
High Level Observed	21.01	18.31	-
% Difference from Zero to Target	0.06	0.47	-0.93
% Difference from Low to Target	0.12	-0.21	0.13
% Difference from Mid to Target	0.42	0.9	-1.38
% Difference from High to Target	0.45	1.55	0
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Actual Zero From Linearity	0.014	0.095	-0.186
Actual Span From Linearity	12.41	11.18	6.045
Initial Readings			
Zero	0.014	0.095	-0.03
Span	12.34	11.18	6.152
Final Readings			
Zero	0.014	0.095	-0.049
Span	12.34	11.18	6.123
Initial Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.78
Span Bias	-0.24	0	0.54
Final Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.69
Span Bias	-0.24	0	0.39
Calculated Drift			
Zero Drift (Run-Run)	0	0	-0.1
Span Drift	0	0	-0.14
Run Results			
Raw Results	11.73	9.13	7.13
Corrected Results (ppmv)	11.69	8.96	6.99

Polk Unit 1 Biomass - Report			
RUN 3			
03/30/2004			
10:15			
Linearity Check - Calibration Error	O2	CO2	CO
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Low Level Certified Value (PPM or %)	6.27	5.02	6.02
Mid Level Certified Value (PPM or %)	12.3	11	12.6
High Level Certified Value (PPM or %	20.9	18	
Zero Level Observed	0.014	0.095	-0.186
Low Level Observed	6.301	4.978	6.045
Mid Level Observed	12.41	11.18	12.32
High Level Observed	21.01	18.31	-
% Difference from Zero to Target	0.06	0.47	-0.93
% Difference from Low to Target	0.12	-0.21	0.13
% Difference from Mid to Target	0.42	0.9	-1.38
% Difference from High to Target	0.45	1.55	0
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Actual Zero From Linearity	0.014	0.095	-0.186
Actual Span From Linearity	12.41	11.18	6.045
Initial Readings			
Zero	0.014	0.095	-0.049
Span	12.34	11.18	6.123
Final Readings			
Zero	0.014	0.095	-0.049
Span	12.34	11.18	6.123
Initial Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.69
Span Bias	-0.24	0	0.39
Final Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.69
Span Bias	-0.24	0	0.39
Calculated Drift			
Zero Drift (Run-Run)	0	0	0
Span Drift	0	0	0
Run Results			
Raw Results	11.72	9.14	7.14
Corrected Results (ppmv)	11.68	8.97	7.01

A-2 RM 10/3A BASELINE DATA LOG

Date	Time	O2 (PPM)	CO2 (PPM)	CO (PPM)	CO (PPM) @ 15% O2	Status
03/30/2004	7:14:29 AM	11.73	9.23	6.84	4.400061	
03/30/2004	7:14:59 AM	11.67	9.18	6.91	4.42091	
03/30/2004	7:15:29 AM	11.73	9.18	6.65	4.280626	
03/30/2004	7:15:59 AM	11.67	9.18	6.7	4.283531	
03/30/2004	7:16:29 AM	11.55	7.57	6.38	4.024221	
03/30/2004	7:16:59 AM	12.34	11.03	2.22	1.528548	
03/30/2004	7:17:29 AM	12.34	11.18	-0.03	-0.020398	Linearity Check
03/30/2004	7:17:59 AM	15.4	9.37	-0.12	-0.125932	Linearity Check
03/30/2004	7:18:29 AM	21.01	5.03	-0.19	9.778046	Linearity Check
03/30/2004	7:18:59 AM	21.5	4.98	-0.12	1.154252	Linearity Check
03/30/2004	7:19:29 AM	6.3	18.12	-0.09	-0.035635	Linearity Check
03/30/2004	7:19:59 AM	6.12	18.26	-0.11	-0.04299	Linearity Check
03/30/2004	7:20:29 AM	0.08	0.14	0.59	0.165929	Linearity Check
03/30/2004	7:20:59 AM	-0.05	0.09	5.56	1.565061	Linearity Check
03/30/2004	7:21:29 AM	0.01	0.09	6.14	1.735159	Linearity Check
03/30/2004	7:21:59 AM	0.01	0.09	6.16	1.740676	Linearity Check
03/30/2004	7:22:29 AM	0.01	0.09	6.04	1.707571	Linearity Check
03/30/2004	7:22:59 AM	21.26	0.09	9.13	-151.197527	Linearity Check
03/30/2004	7:23:29 AM	21.38	0.09	11.96	-147.54181	Linearity Check
03/30/2004	7:23:59 AM	21.38	0.09	12.25	-151.034721	Linearity Check
03/30/2004	7:24:29 AM	21.38	0.09	12.26	-151.155218	Linearity Check
03/30/2004	7:24:59 AM	21.38	0.09	12.42	-153.202791	Linearity Check
03/30/2004	7:25:29 AM	2.15	0.05	12.19	3.835102	Linearity Check
03/30/2004	7:25:59 AM	0.01	0.09	8.98	2.537948	Linearity Check
03/30/2004	7:26:29 AM	0.01	0.09	6.04	1.707571	Linearity Check
03/30/2004	7:26:59 AM	11.98	10.84	6.04	3.990912	Linearity Check
03/30/2004	7:27:29 AM	12.41	11.18	0.76	0.528874	Linearity Check
03/30/2004	7:27:59 AM	12.47	11.23	-0.2	-0.136837	Linearity Check
03/30/2004	7:28:29 AM	18.75	1.32	-0.12	-0.322908	
03/30/2004	7:28:59 AM	19.18	0.68	-0.18	-0.60427	
03/30/2004	7:29:29 AM	11.67	9.13	2.91	1.860674	
03/30/2004	7:29:59 AM	8.25	3.61	7.6	3.544809	
03/30/2004	7:30:29 AM	12.28	11.08	5.01	3.430155	
03/30/2004	7:30:59 AM	12.34	11.13	0.27	0.188373	
03/30/2004	7:31:29 AM	12.34	11.13	-0.14	-0.094478	Initial Span - Span
03/30/2004	7:31:59 AM	12.34	11.18	-0.1	-0.067539	Initial Span - Span
03/30/2004	7:32:29 AM	3.07	1.41	-0.04	-0.013016	Initial Span - Span
03/30/2004	7:32:59 AM	0.01	0.14	3.92	1.106169	Initial Span - Span
03/30/2004	7:33:29 AM	0.01	0.09	6.04	1.704813	Initial Span - Zero
03/30/2004	7:33:59 AM	0.08	0.09	6.11	1.731944	Initial Span - Zero
03/30/2004	7:34:29 AM	0.01	0.09	6.14	1.735159	Initial Span - Zero
03/30/2004	7:34:59 AM	11.49	8.98	6.29	3.943011	Initial Span - Zero
03/30/2004	7:35:29 AM	11.73	9.13	7.4	4.764653	Initial Span - Zero
03/30/2004	7:35:59 AM	11.73	9.13	7.76	4.997238	Initial Span - Zero
03/30/2004	7:36:29 AM	11.73	9.13	7.7	4.959521	Initial Span - Zero
03/30/2004	7:36:59 AM	11.73	9.13	7.64	4.915519	Initial Span - Zero
03/30/2004	7:37:29 AM	11.73	9.13	7.63	4.909233	Initial Span - Zero
03/30/2004	7:37:59 AM	11.73	9.18	7.63	4.909233	Initial Span - Zero
03/30/2004	7:38:29 AM	11.73	9.18	7.78	5.009809	Initial Span - Zero
03/30/2004	7:38:59 AM	11.73	9.18	7.73	4.978379	Initial Span - Zero
03/30/2004	7:39:29 AM	11.73	9.23	7.62	4.902947	Initial Span - Zero
03/30/2004	7:39:59 AM	11.67	9.18	7.86	5.026624	Initial Span - Zero
03/30/2004	7:40:29 AM	11.67	9.18	7.9	5.051602	Initial Span - Zero
03/30/2004	7:40:59 AM	11.67	9.18	7.71	4.932957	Initial Span - Zero
03/30/2004	7:41:29 AM	11.67	9.18	7.69	4.914224	Initial Span - Zero

03/30/2004	7:41:59 AM	11.73	9.18	7.66	4.928091	Initial Span - Zero
03/30/2004	7:42:29 AM	11.73	9.18	7.64	4.915519	Initial Span - Zero
03/30/2004	7:42:59 AM	11.73	9.18	7.6	4.890374	Initial Span - Zero
03/30/2004	7:43:29 AM	11.73	9.13	7.62	4.902947	Initial Span - Zero
03/30/2004	7:43:59 AM	11.67	9.13	7.61	4.864268	Initial Span - Zero
03/30/2004	7:44:29 AM	11.73	9.18	7.5	4.827514	Initial Span - Zero
03/30/2004	7:44:59 AM	11.67	9.18	7.78	4.976668	Initial Span - Zero
03/30/2004	7:45:29 AM	11.67	9.18	7.91	5.057846	Initial Span - Zero
03/30/2004	7:45:59 AM	11.73	9.23	8.05	5.179533	Initial Span - Zero
03/30/2004	7:46:29 AM	11.73	9.23	7.81	5.028668	Initial Span - Zero
03/30/2004	7:46:59 AM	11.73	9.18	7.7	4.953235	Initial Span - Zero
03/30/2004	7:47:29 AM	11.73	9.18	7.77	5.003523	Initial Span - Zero
03/30/2004	7:47:59 AM	11.73	9.13	7.71	4.965807	Initial Span - Zero
03/30/2004	7:48:29 AM	11.73	9.13	7.8	5.022382	Initial Span - Zero
03/30/2004	7:48:59 AM	11.73	9.18	7.77	5.003523	Initial Span - Zero
03/30/2004	7:49:29 AM	11.73	9.18	7.7	4.953235	Initial Span - Zero
03/30/2004	7:49:59 AM	11.73	9.18	7.81	5.028668	Initial Span - Zero
03/30/2004	7:50:29 AM	11.73	9.18	7.71	4.965807	Initial Span - Zero
03/30/2004	7:50:59 AM	11.73	9.18	7.8	5.022382	Initial Span - Zero
03/30/2004	7:51:29 AM	11.67	9.18	7.65	4.889245	Initial Span - Zero
03/30/2004	7:51:59 AM	11.67	9.18	7.77	4.970424	Initial Span - Zero
03/30/2004	7:52:29 AM	11.67	9.23	7.94	5.07658	Initial Span - Zero
03/30/2004	7:52:59 AM	11.73	9.13	7.8	5.022382	Initial Span - Zero
03/30/2004	7:53:29 AM	11.73	9.13	7.7	4.959521	Initial Span - Zero
03/30/2004	7:53:59 AM	11.73	9.18	7.48	4.814942	Initial Span - Zero
03/30/2004	7:54:29 AM	11.73	9.23	7.52	4.840086	Initial Span - Zero
03/30/2004	7:54:59 AM	11.73	9.23	7.84	5.047526	Initial Span - Zero
03/30/2004	7:55:29 AM	11.73	9.18	7.88	5.07267	Initial Span - Zero
03/30/2004	7:55:59 AM	11.73	9.13	7.84	5.047526	Initial Span - Zero
03/30/2004	7:56:29 AM	11.73	9.13	7.8	5.022382	Initial Span - Zero
03/30/2004	7:56:59 AM	11.73	9.18	7.58	4.877803	Initial Span - Zero
03/30/2004	7:57:29 AM	11.73	9.18	7.64	4.915519	Initial Span - Zero
03/30/2004	7:57:59 AM	11.73	9.18	7.84	5.047526	Initial Span - Zero
03/30/2004	7:58:29 AM	11.73	9.18	7.7	4.959521	Initial Span - Zero
03/30/2004	7:58:59 AM	11.67	9.18	7.62	4.870512	Run 1 - 1
03/30/2004	7:59:29 AM	11.73	9.13	7.92	5.097815	Run 1 - 1
03/30/2004	7:59:59 AM	11.67	9.13	7.9	5.051602	Run 1 - 1
03/30/2004	8:00:29 AM	11.73	9.18	8	5.148103	Run 1 - 1
03/30/2004	8:00:59 AM	11.73	9.18	7.6	4.890374	Run 1 - 1
03/30/2004	8:01:29 AM	11.67	9.23	7.56	4.833046	Run 1 - 1
03/30/2004	8:01:59 AM	11.73	9.18	7.58	4.877803	Run 1 - 1
03/30/2004	8:02:29 AM	11.73	9.18	7.9	5.085243	Run 1 - 1
03/30/2004	8:02:59 AM	11.73	9.18	7.76	4.997238	Run 1 - 1
03/30/2004	8:03:29 AM	11.73	9.23	7.66	4.928091	Run 1 - 1
03/30/2004	8:03:59 AM	11.73	9.18	7.64	4.915519	Run 1 - 1
03/30/2004	8:04:29 AM	11.73	9.18	7.62	4.902947	Run 1 - 1
03/30/2004	8:04:59 AM	11.73	9.18	7.6	4.890374	Run 1 - 1
03/30/2004	8:05:29 AM	11.73	9.18	7.6	4.890374	Run 1 - 1
03/30/2004	8:05:59 AM	11.73	9.13	7.76	4.997238	Run 1 - 1
03/30/2004	8:06:29 AM	11.73	9.13	7.54	4.852658	Run 1 - 1
03/30/2004	8:06:59 AM	11.73	9.18	7.5	4.827514	Run 1 - 1
03/30/2004	8:07:29 AM	11.67	9.18	7.54	4.820556	Run 1 - 1
03/30/2004	8:07:59 AM	11.67	9.18	7.6	4.858023	Run 1 - 1
03/30/2004	8:08:29 AM	11.67	9.23	7.76	4.96418	Run 1 - 1
03/30/2004	8:08:59 AM	11.67	9.18	7.88	5.039113	Run 1 - 1
03/30/2004	8:09:29 AM	11.67	9.18	7.64	4.883001	Run 1 - 1

03/30/2004	8:09:59 AM	11.67	9.13	7.62	4.870512	Run 1 - 1
03/30/2004	8:10:29 AM	11.67	9.18	7.66	4.89549	Run 1 - 1
03/30/2004	8:10:59 AM	11.67	9.18	7.68	4.907979	Run 1 - 1
03/30/2004	8:11:29 AM	11.73	9.18	7.78	5.009809	Run 1 - 1
03/30/2004	8:11:59 AM	11.67	9.18	7.5	4.795579	Run 1 - 1
03/30/2004	8:12:29 AM	11.67	9.18	6.64	4.246065	Run 1 - 1
03/30/2004	8:12:59 AM	11.67	9.18	7	4.47711	Run 1 - 1
03/30/2004	8:13:29 AM	11.73	9.18	7.8	5.022382	Run 1 - 1
03/30/2004	8:13:59 AM	11.73	9.18	7.8	5.022382	Run 1 - 1
03/30/2004	8:14:29 AM	11.67	9.13	7.81	4.995402	Run 1 - 1
03/30/2004	8:14:59 AM	11.67	9.13	7.98	5.101558	Run 1 - 1
03/30/2004	8:15:29 AM	11.67	9.13	7.94	5.07658	Run 1 - 1
03/30/2004	8:15:59 AM	11.67	9.13	7.94	5.07658	Run 1 - 1
03/30/2004	8:16:29 AM	11.67	9.08	7.88	5.039113	Run 1 - 1
03/30/2004	8:16:59 AM	11.67	9.13	7.96	5.089068	Run 1 - 1
03/30/2004	8:17:29 AM	11.73	9.18	7.84	5.047526	Run 1 - 1
03/30/2004	8:17:59 AM	11.67	9.18	7.63	4.876757	Run 1 - 1
03/30/2004	8:18:29 AM	11.73	9.18	7.74	4.984665	Run 1 - 1
03/30/2004	8:18:59 AM	11.67	9.18	7.67	4.901735	Run 1 - 1
03/30/2004	8:19:29 AM	11.73	9.13	7.58	4.877803	Run 1 - 1
03/30/2004	8:19:59 AM	11.73	9.18	7.44	4.789797	Run 1 - 1
03/30/2004	8:20:29 AM	11.67	9.18	7.47	4.776845	Run 1 - 1
03/30/2004	8:20:59 AM	11.73	9.18	7.72	4.972093	Run 1 - 1
03/30/2004	8:21:29 AM	11.73	9.18	7.92	5.097815	Run 1 - 1
03/30/2004	8:21:59 AM	11.73	9.13	7.73	4.978379	Run 1 - 1
03/30/2004	8:22:29 AM	11.73	9.18	7.38	4.752081	Run 1 - 1
03/30/2004	8:22:59 AM	11.73	9.23	7.49	4.821228	Run 1 - 1
03/30/2004	8:23:29 AM	11.67	9.13	7.32	4.683178	Run 1 - 1
03/30/2004	8:23:59 AM	11.67	9.18	7.58	4.845535	Run 1 - 1
03/30/2004	8:24:29 AM	11.73	9.13	7.38	4.752081	Run 1 - 1
03/30/2004	8:24:59 AM	11.67	9.18	7.44	4.758111	Run 1 - 1
03/30/2004	8:25:29 AM	11.73	9.18	7.46	4.802369	Run 1 - 1
03/30/2004	8:25:59 AM	11.73	9.13	7.74	4.984665	Run 1 - 1
03/30/2004	8:26:29 AM	11.73	9.13	7.62	4.902947	Run 1 - 1
03/30/2004	8:26:59 AM	11.73	9.08	7.48	4.814942	Run 1 - 1
03/30/2004	8:27:29 AM	11.73	9.13	7.29	4.689221	Run 1 - 1
03/30/2004	8:27:59 AM	11.73	9.13	7.42	4.777226	Run 1 - 1
03/30/2004	8:28:29 AM	11.73	9.13	7.32	4.714365	Run 1 - 1
03/30/2004	8:28:59 AM	11.73	9.13	7.52	4.840086	Run 1 - 1
03/30/2004	8:29:29 AM	11.73	9.18	7.92	5.097815	Run 1 - 1
03/30/2004	8:29:59 AM	11.67	9.18	7.54	4.820556	Run 1 - 1
03/30/2004	8:30:29 AM	11.73	9.18	7.36	4.739509	Run 1 - 1
03/30/2004	8:30:59 AM	11.67	9.18	7.4	4.733134	Run 1 - 1
03/30/2004	8:31:29 AM	11.67	9.13	7.5	4.795579	Run 1 - 1
03/30/2004	8:31:59 AM	11.73	9.13	7.46	4.802369	Run 1 - 1
03/30/2004	8:32:29 AM	11.73	9.13	7.66	4.928091	Run 1 - 1
03/30/2004	8:32:59 AM	11.73	9.13	7.5	4.827514	Run 1 - 1
03/30/2004	8:33:29 AM	11.73	9.18	7.58	4.877803	Run 1 - 1
03/30/2004	8:33:59 AM	11.73	9.13	7.15	4.601216	Run 1 - 1
03/30/2004	8:34:29 AM	11.73	9.18	7.36	4.739509	Run 1 - 1
03/30/2004	8:34:59 AM	11.73	9.18	7.42	4.777226	Run 1 - 1
03/30/2004	8:35:29 AM	11.67	9.13	7.44	4.758111	Run 1 - 1
03/30/2004	8:35:59 AM	11.67	9.13	7.54	4.820556	Run 1 - 1
03/30/2004	8:36:29 AM	11.73	9.13	7.51	4.8338	Run 1 - 1
03/30/2004	8:36:59 AM	11.73	9.18	7.2	4.632646	Run 1 - 1
03/30/2004	8:37:29 AM	11.67	9.13	7.18	4.58951	Run 1 - 1

03/30/2004	8:37:59 AM	11.67	9.18	7.31	4.676933	Run 1 - 1
03/30/2004	8:38:29 AM	11.67	9.13	7.66	4.89549	Run 1 - 1
03/30/2004	8:38:59 AM	11.73	9.13	7.52	4.840086	Run 1 - 1
03/30/2004	8:39:29 AM	11.73	9.13	7.4	4.764653	Run 1 - 1
03/30/2004	8:39:59 AM	11.73	9.13	7.42	4.777226	Run 1 - 1
03/30/2004	8:40:29 AM	11.73	9.13	7.31	4.708078	Run 1 - 1
03/30/2004	8:40:59 AM	11.73	9.18	7.36	4.739509	Run 1 - 1
03/30/2004	8:41:29 AM	11.67	9.18	7.29	4.6582	Run 1 - 1
03/30/2004	8:41:59 AM	11.73	9.13	7.52	4.840086	Run 1 - 1
03/30/2004	8:42:29 AM	11.73	9.18	7.37	4.745795	Run 1 - 1
03/30/2004	8:42:59 AM	11.73	9.18	7.11	4.576072	Run 1 - 1
03/30/2004	8:43:29 AM	11.67	9.13	7.18	4.58951	Run 1 - 1
03/30/2004	8:43:59 AM	11.67	9.13	7.32	4.683178	Run 1 - 1
03/30/2004	8:44:29 AM	11.73	9.13	7.52	4.840086	Run 1 - 1
03/30/2004	8:44:59 AM	11.73	9.18	7.34	4.726937	Run 1 - 1
03/30/2004	8:45:29 AM	11.79	9.13	7.36	4.771283	Run 1 - 1
03/30/2004	8:45:59 AM	11.73	9.13	7.16	4.607502	Run 1 - 1
03/30/2004	8:46:29 AM	11.67	9.13	7.13	4.558288	Run 1 - 1
03/30/2004	8:46:59 AM	11.67	9.13	7.23	4.620733	Run 1 - 1
03/30/2004	8:47:29 AM	11.73	9.18	7.27	4.676648	Run 1 - 1
03/30/2004	8:47:59 AM	11.73	9.18	7.21	4.638932	Run 1 - 1
03/30/2004	8:48:29 AM	11.73	9.13	7.25	4.664076	Run 1 - 1
03/30/2004	8:48:59 AM	11.73	9.18	7.17	4.613788	Run 1 - 1
03/30/2004	8:49:29 AM	11.73	9.13	7.29	4.695507	Run 1 - 1
03/30/2004	8:49:59 AM	11.73	9.13	7.29	4.689221	Run 1 - 1
03/30/2004	8:50:29 AM	11.73	9.13	7.11	4.576072	Run 1 - 1
03/30/2004	8:50:59 AM	11.73	9.18	7.18	4.620074	Run 1 - 1
03/30/2004	8:51:29 AM	11.79	9.13	7.18	4.651046	Run 1 - 1
03/30/2004	8:51:59 AM	11.79	9.13	7.08	4.587765	Run 1 - 1
03/30/2004	8:52:29 AM	11.73	9.13	7.06	4.544641	Run 1 - 1
03/30/2004	8:52:59 AM	11.73	9.13	7.2	4.632646	Run 1 - 1
03/30/2004	8:53:29 AM	11.73	9.13	7.22	4.645218	Run 1 - 1
03/30/2004	8:53:59 AM	11.67	9.13	7.06	4.514577	Run 1 - 1
03/30/2004	8:54:29 AM	11.73	9.18	7.23	4.651504	Run 1 - 1
03/30/2004	8:54:59 AM	11.73	9.13	7.32	4.714365	Run 1 - 1
03/30/2004	8:55:29 AM	11.67	9.13	7.08	4.527066	Run 1 - 1
03/30/2004	8:55:59 AM	11.73	9.13	7.28	4.682934	Run 1 - 1
03/30/2004	8:56:29 AM	11.73	9.13	6.96	4.48178	Run 1 - 1
03/30/2004	8:56:59 AM	11.73	9.13	7.32	4.714365	Run 1 - 1
03/30/2004	8:57:29 AM	11.73	9.13	7.32	4.714365	Run 1 - 1
03/30/2004	8:57:59 AM	11.73	9.13	7.07	4.550927	Run 1 - 1
03/30/2004	8:58:29 AM	11.73	9.13	6.96	4.48178	Run 1 - 1
03/30/2004	8:58:59 AM	11.73	9.13	7.11	4.576072	Run 1 - 2
03/30/2004	8:59:29 AM	11.67	9.13	7.26	4.639466	
03/30/2004	8:59:59 AM	12.16	10.99	6.22	4.199821	
03/30/2004	9:00:29 AM	12.28	11.13	0.87	0.594936	Run 1 Span - Span
03/30/2004	9:00:59 AM	12.34	11.18	-0.03	-0.020398	Run 1 Span - Zero
03/30/2004	9:01:29 AM	12.28	11.18	-0.03	-0.020253	Run 1 Span - Span
03/30/2004	9:01:59 AM	0.56	0.34	0.08	0.022584	Run 1 Span - Span
03/30/2004	9:02:29 AM	0.08	0.14	4.17	1.181349	Run 1 Span - Span
03/30/2004	9:02:59 AM	0.01	0.14	6.1	1.724124	Run 1 Span - Zero
03/30/2004	9:03:29 AM	0.01	0.09	6.16	1.740676	Run 1 Span - Span
03/30/2004	9:03:59 AM	10.39	8.79	6.17	3.464966	Run 1 Span - Span
03/30/2004	9:04:29 AM	11.73	9.13	7.17	4.613788	Run 1 Span - Span
03/30/2004	9:04:59 AM	11.73	9.18	7.42	4.777226	Run 1 Span - Span
03/30/2004	9:05:29 AM	11.73	9.18	7.21	4.638932	Run 2 - 1

03/30/2004	9:05:59 AM	11.73	9.23	7.38	4.752081	Run 2 - 1
03/30/2004	9:06:29 AM	11.73	9.13	7.44	4.789797	Run 2 - 1
03/30/2004	9:06:59 AM	11.67	9.18	7.36	4.708156	Run 2 - 1
03/30/2004	9:07:29 AM	11.73	9.18	7.36	4.739509	Run 2 - 1
03/30/2004	9:07:59 AM	11.73	9.18	7.02	4.519497	Run 2 - 1
03/30/2004	9:08:29 AM	11.73	9.18	7.08	4.557213	Run 2 - 1
03/30/2004	9:08:59 AM	11.73	9.23	7.32	4.714365	Run 2 - 1
03/30/2004	9:09:29 AM	11.79	9.13	7.17	4.644719	Run 2 - 1
03/30/2004	9:09:59 AM	11.73	9.13	6.86	4.412634	Run 2 - 1
03/30/2004	9:10:29 AM	11.73	9.18	7.28	4.682934	Run 2 - 1
03/30/2004	9:10:59 AM	11.79	9.13	7.2	4.663703	Run 2 - 1
03/30/2004	9:11:29 AM	11.73	9.13	6.9	4.444064	Run 2 - 1
03/30/2004	9:11:59 AM	11.79	9.18	6.94	4.49917	Run 2 - 1
03/30/2004	9:12:29 AM	11.73	9.13	6.87	4.425206	Run 2 - 1
03/30/2004	9:12:59 AM	11.73	9.13	6.16	3.966324	Run 2 - 1
03/30/2004	9:13:29 AM	11.73	9.18	6.02	3.872033	Run 2 - 1
03/30/2004	9:13:59 AM	11.73	9.13	6.97	4.488066	Run 2 - 1
03/30/2004	9:14:29 AM	11.73	9.13	7.16	4.607502	Run 2 - 1
03/30/2004	9:14:59 AM	11.73	9.13	7.09	4.563499	Run 2 - 1
03/30/2004	9:15:29 AM	11.73	9.13	6.87	4.41892	Run 2 - 1
03/30/2004	9:15:59 AM	11.73	9.13	7.13	4.588643	Run 2 - 1
03/30/2004	9:16:29 AM	11.73	9.13	7.08	4.557213	Run 2 - 1
03/30/2004	9:16:59 AM	11.73	9.13	6.87	4.425206	Run 2 - 1
03/30/2004	9:17:29 AM	11.73	9.13	6.89	4.437778	Run 2 - 1
03/30/2004	9:17:59 AM	11.73	9.13	7.16	4.607502	Run 2 - 1
03/30/2004	9:18:29 AM	11.73	9.13	7.15	4.601216	Run 2 - 1
03/30/2004	9:18:59 AM	11.79	9.13	7.06	4.575108	Run 2 - 1
03/30/2004	9:19:29 AM	11.73	9.13	6.79	4.368631	Run 2 - 1
03/30/2004	9:19:59 AM	11.73	9.18	6.84	4.400061	Run 2 - 1
03/30/2004	9:20:29 AM	11.73	9.13	6.86	4.412634	Run 2 - 1
03/30/2004	9:20:59 AM	11.67	9.13	6.91	4.42091	Run 2 - 1
03/30/2004	9:21:29 AM	11.73	9.08	7.14	4.59493	Run 2 - 1
03/30/2004	9:21:59 AM	11.79	9.13	7.04	4.562452	Run 2 - 1
03/30/2004	9:22:29 AM	11.73	9.13	6.86	4.412634	Run 2 - 1
03/30/2004	9:22:59 AM	11.67	9.13	6.88	4.402177	Run 2 - 1
03/30/2004	9:23:29 AM	11.73	9.18	7.13	4.588643	Run 2 - 1
03/30/2004	9:23:59 AM	11.73	9.13	7.24	4.65779	Run 2 - 1
03/30/2004	9:24:29 AM	11.73	9.08	7.02	4.519497	Run 2 - 1
03/30/2004	9:24:59 AM	11.73	9.13	7.17	4.613788	Run 2 - 1
03/30/2004	9:25:29 AM	11.67	9.13	7.2	4.602	Run 2 - 1
03/30/2004	9:25:59 AM	11.73	9.13	7.5	4.827514	Run 2 - 1
03/30/2004	9:26:29 AM	11.73	9.13	7.22	4.645218	Run 2 - 1
03/30/2004	9:26:59 AM	11.73	9.13	7.18	4.620074	Run 2 - 1
03/30/2004	9:27:29 AM	11.79	9.13	6.96	4.511826	Run 2 - 1
03/30/2004	9:27:59 AM	11.73	9.08	7	4.506925	Run 2 - 1
03/30/2004	9:28:29 AM	11.73	9.13	6.92	4.456636	Run 2 - 1
03/30/2004	9:28:59 AM	11.73	9.13	7.08	4.557213	Run 2 - 1
03/30/2004	9:29:29 AM	11.67	9.18	7.42	4.745623	Run 2 - 1
03/30/2004	9:29:59 AM	11.73	9.18	7.71	4.965807	Run 2 - 1
03/30/2004	9:30:29 AM	11.67	9.13	7.32	4.683178	Run 2 - 1
03/30/2004	9:30:59 AM	11.73	9.13	7.24	4.65779	Run 2 - 1
03/30/2004	9:31:29 AM	11.73	9.13	7.26	4.670362	Run 2 - 1
03/30/2004	9:31:59 AM	11.67	9.13	7.27	4.645711	Run 2 - 1
03/30/2004	9:32:29 AM	11.73	9.13	7.27	4.676648	Run 2 - 1
03/30/2004	9:32:59 AM	11.67	9.13	7.33	4.689422	Run 2 - 1
03/30/2004	9:33:29 AM	11.73	9.13	7.33	4.720651	Run 2 - 1

03/30/2004	9:33:59 AM	11.73	9.13	7.5	4.827514	Run 2 - 1
03/30/2004	9:34:29 AM	11.73	9.13	7.49	4.821228	Run 2 - 1
03/30/2004	9:34:59 AM	11.67	9.13	7.27	4.645711	Run 2 - 1
03/30/2004	9:35:29 AM	11.73	9.08	7.18	4.620074	Run 2 - 1
03/30/2004	9:35:59 AM	11.67	9.13	7.06	4.514577	Run 2 - 1
03/30/2004	9:36:29 AM	11.67	9.08	7.54	4.820556	Run 2 - 1
03/30/2004	9:36:59 AM	11.67	9.13	7.46	4.7706	Run 2 - 1
03/30/2004	9:37:29 AM	11.67	9.13	7.26	4.639466	Run 2 - 1
03/30/2004	9:37:59 AM	11.73	9.18	7.3	4.701792	Run 2 - 1
03/30/2004	9:38:29 AM	11.79	9.13	7.2	4.663703	Run 2 - 1
03/30/2004	9:38:59 AM	11.73	9.08	6.92	4.456636	Run 2 - 1
03/30/2004	9:39:29 AM	11.73	9.08	6.86	4.412634	Run 2 - 1
03/30/2004	9:39:59 AM	11.73	9.08	6.89	4.437778	Run 2 - 1
03/30/2004	9:40:29 AM	11.73	9.13	7.02	4.519497	Run 2 - 1
03/30/2004	9:40:59 AM	11.73	9.13	7	4.506925	Run 2 - 1
03/30/2004	9:41:29 AM	11.73	9.08	6.91	4.45035	Run 2 - 1
03/30/2004	9:41:59 AM	11.73	9.08	6.87	4.41892	Run 2 - 1
03/30/2004	9:42:29 AM	11.79	9.13	6.96	4.511826	Run 2 - 1
03/30/2004	9:42:59 AM	11.73	9.13	6.91	4.45035	Run 2 - 1
03/30/2004	9:43:29 AM	11.73	9.08	6.87	4.425206	Run 2 - 1
03/30/2004	9:43:59 AM	11.73	9.13	6.98	4.494352	Run 2 - 1
03/30/2004	9:44:29 AM	11.67	9.13	7.08	4.527066	Run 2 - 1
03/30/2004	9:44:59 AM	11.79	9.13	7.19	4.657375	Run 2 - 1
03/30/2004	9:45:29 AM	11.73	9.13	6.76	4.349773	Run 2 - 1
03/30/2004	9:45:59 AM	11.73	9.13	6.97	4.488066	Run 2 - 1
03/30/2004	9:46:29 AM	11.73	9.13	7.22	4.645218	Run 2 - 1
03/30/2004	9:46:59 AM	11.67	9.13	7.18	4.58951	Run 2 - 1
03/30/2004	9:47:29 AM	11.67	9.08	7.08	4.527066	Run 2 - 1
03/30/2004	9:47:59 AM	11.73	9.13	6.9	4.444064	Run 2 - 1
03/30/2004	9:48:29 AM	11.73	9.13	6.91	4.45035	Run 2 - 1
03/30/2004	9:48:59 AM	11.73	9.13	7.14	4.59493	Run 2 - 1
03/30/2004	9:49:29 AM	11.79	9.13	7.04	4.562452	Run 2 - 1
03/30/2004	9:49:59 AM	11.73	9.18	7.07	4.550927	Run 2 - 1
03/30/2004	9:50:29 AM	11.67	9.13	7.25	4.633222	Run 2 - 1
03/30/2004	9:50:59 AM	11.67	9.13	7.27	4.645711	Run 2 - 1
03/30/2004	9:51:29 AM	11.73	9.13	7.15	4.601216	Run 2 - 1
03/30/2004	9:51:59 AM	11.67	9.18	7.3	4.670689	Run 2 - 1
03/30/2004	9:52:29 AM	11.73	9.13	7.14	4.59493	Run 2 - 1
03/30/2004	9:52:59 AM	11.67	9.13	7.06	4.514577	Run 2 - 1
03/30/2004	9:53:29 AM	11.73	9.13	7.28	4.682934	Run 2 - 1
03/30/2004	9:53:59 AM	11.73	9.13	7.22	4.645218	Run 2 - 1
03/30/2004	9:54:29 AM	11.67	9.08	7.36	4.708156	Run 2 - 1
03/30/2004	9:54:59 AM	11.67	9.13	7.41	4.739378	Run 2 - 1
03/30/2004	9:55:29 AM	11.67	9.13	7.27	4.645711	Run 2 - 1
03/30/2004	9:55:59 AM	11.73	9.13	7.29	4.689221	Run 2 - 1
03/30/2004	9:56:29 AM	11.67	9.13	6.96	4.452132	Run 2 - 1
03/30/2004	9:56:59 AM	11.73	9.18	7.06	4.544641	Run 2 - 1
03/30/2004	9:57:29 AM	11.73	9.08	7.17	4.613788	Run 2 - 1
03/30/2004	9:57:59 AM	11.73	9.08	7.2	4.632646	Run 2 - 1
03/30/2004	9:58:29 AM	11.67	9.13	7.19	4.595755	Run 2 - 1
03/30/2004	9:58:59 AM	11.73	9.13	7.02	4.519497	Run 2 - 1
03/30/2004	9:59:29 AM	11.67	9.13	7.16	4.577022	Run 2 - 1
03/30/2004	9:59:59 AM	11.67	9.08	7.32	4.683178	Run 2 - 1
03/30/2004	10:00:29 AM	11.73	9.13	7.31	4.708078	Run 2 - 1
03/30/2004	10:00:59 AM	11.73	9.13	7.2	4.632646	Run 2 - 1
03/30/2004	10:01:29 AM	11.73	9.13	7.24	4.65779	Run 2 - 1

03/30/2004	10:01:59 AM	11.73	9.13	7.37	4.745795	Run 2 - 1
03/30/2004	10:02:29 AM	11.73	9.13	7.29	4.695507	Run 2 - 1
03/30/2004	10:02:59 AM	11.73	9.13	7.22	4.645218	Run 2 - 1
03/30/2004	10:03:29 AM	11.73	9.13	7.29	4.689221	Run 2 - 1
03/30/2004	10:03:59 AM	11.67	9.13	7.1	4.539555	Run 2 - 1
03/30/2004	10:04:29 AM	11.67	9.13	7.29	4.6582	Run 2 - 1
03/30/2004	10:04:59 AM	11.67	9.13	7.48	4.78309	Run 2 - 1
03/30/2004	10:05:29 AM	11.67	9.13	7.27	4.645711	Run 2 - 2
03/30/2004	10:05:59 AM	11.67	9.13	7.27	4.645711	
03/30/2004	10:06:29 AM	9.11	9.52	7.25	3.625806	
03/30/2004	10:06:59 AM	12.34	11.13	3.12	2.148126	
03/30/2004	10:07:29 AM	12.28	11.18	0.09	0.059989	
03/30/2004	10:07:59 AM	12.34	11.18	-0.06	-0.040601	
03/30/2004	10:08:29 AM	12.28	11.18	-0.05	-0.033627	
03/30/2004	10:08:59 AM	12.28	11.18	-0.05	-0.033627	
03/30/2004	10:09:29 AM	12.28	11.18	-0.05	-0.033627	Run 2 Span - Span
03/30/2004	10:09:59 AM	12.04	11.18	-0.03	-0.019695	Run 2 Span - Span
03/30/2004	10:10:29 AM	0.01	0.14	1.94	0.548907	Run 2 Span - Span
03/30/2004	10:10:59 AM	0.01	0.09	5.65	1.597222	Run 2 Span - Span
03/30/2004	10:11:29 AM	0.01	0.09	6.09	1.721365	Run 2 Span - Span
03/30/2004	10:11:59 AM	0.01	0.09	6.11	1.726882	Run 2 Span - Span
03/30/2004	10:12:29 AM	0.01	0.09	6.12	1.729641	Run 2 Span - Span
03/30/2004	10:12:59 AM	0.01	0.09	6.12	1.729641	Run 2 Span - Span
03/30/2004	10:13:29 AM	0.01	0.09	6.11	1.726882	Run 2 Span - Span
03/30/2004	10:13:59 AM	11.55	8.98	6.21	3.919451	Run 2 Span - Span
03/30/2004	10:14:29 AM	11.73	9.08	7.26	4.670362	Run 2 Span - Span
03/30/2004	10:14:59 AM	11.73	9.08	7.6	4.890374	Run 2 Span - Span
03/30/2004	10:15:29 AM	11.73	9.13	7.34	4.726937	Run 3 - 1
03/30/2004	10:15:59 AM	11.73	9.08	7.32	4.714365	Run 3 - 1
03/30/2004	10:16:29 AM	11.67	9.13	7.12	4.552044	Run 3 - 1
03/30/2004	10:16:59 AM	11.73	9.13	7.5	4.827514	Run 3 - 1
03/30/2004	10:17:29 AM	11.73	9.13	7.32	4.714365	Run 3 - 1
03/30/2004	10:17:59 AM	11.73	9.13	7.36	4.739509	Run 3 - 1
03/30/2004	10:18:29 AM	11.73	9.18	7.26	4.670362	Run 3 - 1
03/30/2004	10:18:59 AM	11.73	9.08	6.93	4.462922	Run 3 - 1
03/30/2004	10:19:29 AM	11.73	9.13	6.88	4.431492	Run 3 - 1
03/30/2004	10:19:59 AM	11.73	9.18	7.04	4.532069	Run 3 - 1
03/30/2004	10:20:29 AM	11.73	9.18	7.15	4.601216	Run 3 - 1
03/30/2004	10:20:59 AM	11.73	9.18	7.12	4.582357	Run 3 - 1
03/30/2004	10:21:29 AM	11.73	9.18	7.23	4.651504	Run 3 - 1
03/30/2004	10:21:59 AM	11.73	9.13	7.08	4.557213	Run 3 - 1
03/30/2004	10:22:29 AM	11.79	9.13	6.88	4.461201	Run 3 - 1
03/30/2004	10:22:59 AM	11.73	9.13	6.74	4.337201	Run 3 - 1
03/30/2004	10:23:29 AM	11.73	9.13	6.96	4.48178	Run 3 - 1
03/30/2004	10:23:59 AM	11.73	9.18	7.22	4.645218	Run 3 - 1
03/30/2004	10:24:29 AM	11.73	9.18	7.3	4.701792	Run 3 - 1
03/30/2004	10:24:59 AM	11.73	9.18	7.18	4.620074	Run 3 - 1
03/30/2004	10:25:29 AM	11.73	9.18	7.2	4.632646	Run 3 - 1
03/30/2004	10:25:59 AM	11.73	9.18	7.08	4.557213	Run 3 - 1
03/30/2004	10:26:29 AM	11.73	9.18	7.21	4.638932	Run 3 - 1
03/30/2004	10:26:59 AM	11.73	9.13	7.18	4.620074	Run 3 - 1
03/30/2004	10:27:29 AM	11.73	9.18	7.23	4.651504	Run 3 - 1
03/30/2004	10:27:59 AM	11.67	9.18	7.36	4.708156	Run 3 - 1
03/30/2004	10:28:29 AM	11.73	9.18	7.21	4.638932	Run 3 - 1
03/30/2004	10:28:59 AM	11.67	9.18	7.1	4.539555	Run 3 - 1
03/30/2004	10:29:29 AM	11.73	9.18	7.15	4.601216	Run 3 - 1

03/30/2004	10:29:59 AM	11.73	9.18	7.06	4.544641	Run 3 - 1
03/30/2004	10:30:29 AM	11.73	9.13	7.08	4.557213	Run 3 - 1
03/30/2004	10:30:59 AM	11.73	9.18	7.19	4.62636	Run 3 - 1
03/30/2004	10:31:29 AM	11.73	9.13	7.16	4.607502	Run 3 - 1
03/30/2004	10:31:59 AM	11.73	9.13	7.06	4.544641	Run 3 - 1
03/30/2004	10:32:29 AM	11.73	9.18	6.96	4.48178	Run 3 - 1
03/30/2004	10:32:59 AM	11.73	9.13	7.06	4.544641	Run 3 - 1
03/30/2004	10:33:29 AM	11.79	9.13	6.83	4.423232	Run 3 - 1
03/30/2004	10:33:59 AM	11.73	9.13	6.8	4.374917	Run 3 - 1
03/30/2004	10:34:29 AM	11.79	9.13	6.9	4.473857	Run 3 - 1
03/30/2004	10:34:59 AM	11.73	9.13	7	4.506925	Run 3 - 1
03/30/2004	10:35:29 AM	11.73	9.13	7.16	4.607502	Run 3 - 1
03/30/2004	10:35:59 AM	11.73	9.18	7.14	4.59493	Run 3 - 1
03/30/2004	10:36:29 AM	11.73	9.18	7.15	4.601216	Run 3 - 1
03/30/2004	10:36:59 AM	11.79	9.23	7	4.537139	Run 3 - 1
03/30/2004	10:37:29 AM	11.73	9.18	6.94	4.469208	Run 3 - 1
03/30/2004	10:37:59 AM	11.73	9.13	7.04	4.532069	Run 3 - 1
03/30/2004	10:38:29 AM	11.73	9.18	6.94	4.469208	Run 3 - 1
03/30/2004	10:38:59 AM	11.73	9.13	7	4.506925	Run 3 - 1
03/30/2004	10:39:29 AM	11.73	9.13	7.14	4.59493	Run 3 - 1
03/30/2004	10:39:59 AM	11.73	9.13	7.24	4.65779	Run 3 - 1
03/30/2004	10:40:29 AM	11.73	9.18	7.14	4.59493	Run 3 - 1
03/30/2004	10:40:59 AM	11.73	9.18	7.04	4.532069	Run 3 - 1
03/30/2004	10:41:29 AM	11.73	9.18	7.06	4.544641	Run 3 - 1
03/30/2004	10:41:59 AM	11.73	9.13	7.16	4.607502	Run 3 - 1
03/30/2004	10:42:29 AM	11.73	9.18	6.98	4.494352	Run 3 - 1
03/30/2004	10:42:59 AM	11.73	9.13	6.86	4.412634	Run 3 - 1
03/30/2004	10:43:29 AM	11.73	9.18	6.78	4.362345	Run 3 - 1
03/30/2004	10:43:59 AM	11.67	9.18	6.98	4.464621	Run 3 - 1
03/30/2004	10:44:29 AM	11.73	9.13	7.17	4.613788	Run 3 - 1
03/30/2004	10:44:59 AM	11.67	9.18	7.16	4.577022	Run 3 - 1
03/30/2004	10:45:29 AM	11.73	9.13	7.28	4.682934	Run 3 - 1
03/30/2004	10:45:59 AM	11.73	9.13	7.22	4.645218	Run 3 - 1
03/30/2004	10:46:29 AM	11.73	9.13	6.96	4.48178	Run 3 - 1
03/30/2004	10:46:59 AM	11.79	9.18	6.84	4.429559	Run 3 - 1
03/30/2004	10:47:29 AM	11.73	9.13	7.12	4.582357	Run 3 - 1
03/30/2004	10:47:59 AM	11.73	9.13	7.38	4.752081	Run 3 - 1
03/30/2004	10:48:29 AM	11.73	9.13	7.2	4.632646	Run 3 - 1
03/30/2004	10:48:59 AM	11.73	9.13	7.4	4.764653	Run 3 - 1
03/30/2004	10:49:29 AM	11.73	9.13	7.08	4.557213	Run 3 - 1
03/30/2004	10:49:59 AM	11.73	9.13	6.9	4.444064	Run 3 - 1
03/30/2004	10:50:29 AM	11.73	9.13	6.84	4.400061	Run 3 - 1
03/30/2004	10:50:59 AM	11.73	9.13	7	4.506925	Run 3 - 1
03/30/2004	10:51:29 AM	11.73	9.13	7.06	4.544641	Run 3 - 1
03/30/2004	10:51:59 AM	11.73	9.13	7.02	4.519497	Run 3 - 1
03/30/2004	10:52:29 AM	11.73	9.13	7.16	4.607502	Run 3 - 1
03/30/2004	10:52:59 AM	11.73	9.18	6.94	4.469208	Run 3 - 1
03/30/2004	10:53:29 AM	11.67	9.13	7.04	4.502088	Run 3 - 1
03/30/2004	10:53:59 AM	11.73	9.08	7.29	4.689221	Run 3 - 1
03/30/2004	10:54:29 AM	11.73	9.18	7.14	4.59493	Run 3 - 1
03/30/2004	10:54:59 AM	11.67	9.13	7.21	4.608244	Run 3 - 1
03/30/2004	10:55:29 AM	11.73	9.18	7.32	4.714365	Run 3 - 1
03/30/2004	10:55:59 AM	11.67	9.13	7.29	4.6582	Run 3 - 1
03/30/2004	10:56:29 AM	11.73	9.13	7.52	4.840086	Run 3 - 1
03/30/2004	10:56:59 AM	11.73	9.13	7.29	4.695507	Run 3 - 1
03/30/2004	10:57:29 AM	11.73	9.13	7.38	4.752081	Run 3 - 1

03/30/2004	10:57:59 AM	11.73	9.13	7.22	4.645218	Run 3 - 1
03/30/2004	10:58:29 AM	11.73	9.13	7.08	4.557213	Run 3 - 1
03/30/2004	10:58:59 AM	11.73	9.13	7.28	4.682934	Run 3 - 1
03/30/2004	10:59:29 AM	11.67	9.18	7.37	4.714401	Run 3 - 1
03/30/2004	10:59:59 AM	11.67	9.18	7.23	4.620733	Run 3 - 1
03/30/2004	11:00:29 AM	11.73	9.13	7.24	4.65779	Run 3 - 1
03/30/2004	11:00:59 AM	11.73	9.13	7.19	4.62636	Run 3 - 1
03/30/2004	11:01:29 AM	11.73	9.13	7.08	4.557213	Run 3 - 1
03/30/2004	11:01:59 AM	11.73	9.13	7.06	4.544641	Run 3 - 1
03/30/2004	11:02:29 AM	11.73	9.08	7.02	4.519497	Run 3 - 1
03/30/2004	11:02:59 AM	11.73	9.13	7	4.506925	Run 3 - 1
03/30/2004	11:03:29 AM	11.73	9.18	6.88	4.431492	Run 3 - 1
03/30/2004	11:03:59 AM	11.73	9.13	7.04	4.532069	Run 3 - 1
03/30/2004	11:04:29 AM	11.67	9.13	7.27	4.645711	Run 3 - 1
03/30/2004	11:04:59 AM	11.67	9.13	7.3	4.670689	Run 3 - 1
03/30/2004	11:05:29 AM	11.67	9.08	7.37	4.714401	Run 3 - 1
03/30/2004	11:05:59 AM	11.73	9.13	7.22	4.645218	Run 3 - 1
03/30/2004	11:06:29 AM	11.67	9.13	7.33	4.689422	Run 3 - 1
03/30/2004	11:06:59 AM	11.67	9.13	7.3	4.670689	Run 3 - 1
03/30/2004	11:07:29 AM	11.73	9.13	7.22	4.645218	Run 3 - 1
03/30/2004	11:07:59 AM	11.67	9.13	7.18	4.58951	Run 3 - 1
03/30/2004	11:08:29 AM	11.73	9.13	7.23	4.651504	Run 3 - 1
03/30/2004	11:08:59 AM	11.67	9.13	7.37	4.714401	Run 3 - 1
03/30/2004	11:09:29 AM	11.67	9.13	7.39	4.726889	Run 3 - 1
03/30/2004	11:09:59 AM	11.73	9.13	7.54	4.852658	Run 3 - 1
03/30/2004	11:10:29 AM	11.67	9.13	7.36	4.708156	Run 3 - 1
03/30/2004	11:10:59 AM	11.73	9.13	7.6	4.890374	Run 3 - 1
03/30/2004	11:11:29 AM	11.67	9.13	7.5	4.795579	Run 3 - 1
03/30/2004	11:11:59 AM	11.73	9.13	7.38	4.752081	Run 3 - 1
03/30/2004	11:12:29 AM	11.67	9.13	7.21	4.608244	Run 3 - 1
03/30/2004	11:12:59 AM	11.73	9.13	7.2	4.632646	Run 3 - 1
03/30/2004	11:13:29 AM	11.73	9.13	6.94	4.469208	Run 3 - 1
03/30/2004	11:13:59 AM	11.73	9.13	6.43	4.136047	Run 3 - 1
03/30/2004	11:14:29 AM	11.73	9.13	6.54	4.21148	Run 3 - 1
03/30/2004	11:14:59 AM	11.73	9.18	7.18	4.620074	Run 3 - 1
03/30/2004	11:15:29 AM	11.73	9.18	7.34	4.726937	
03/30/2004	11:15:59 AM	11.92	10.94	6.1	4.008692	
03/30/2004	11:16:29 AM	12.28	11.13	0.88	0.601623	
03/30/2004	11:16:59 AM	12.28	11.18	-0.03	-0.020253	
03/30/2004	11:17:29 AM	12.34	11.18	-0.03	-0.020398	
03/30/2004	11:17:59 AM	12.34	11.18	-0.03	-0.020398	
03/30/2004	11:18:29 AM	12.28	11.18	-0.06	-0.040314	
03/30/2004	11:18:59 AM	12.28	11.18	-0.06	-0.040314	Run 3 Span - Span
03/30/2004	11:19:29 AM	9.9	10.06	-0.06	-0.031587	Run 3 Span - Span
03/30/2004	11:19:59 AM	0.08	0.19	3.36	0.951703	Run 3 Span - Span
03/30/2004	11:20:29 AM	0.01	0.14	5.94	1.677225	Run 3 Span - Span
03/30/2004	11:20:59 AM	0.01	0.09	6.09	1.721365	Run 3 Span - Span
03/30/2004	11:21:29 AM	0.01	0.09	6.14	1.735159	Run 3 Span - Span
03/30/2004	11:21:59 AM	11.37	8.98	6.28	3.886464	Run 3 Span - Span
03/30/2004	11:23:21 AM	11.73	9.08	7.38	4.752081	Run 3 Span - Span
03/30/2004	11:23:22 AM	11.79	9.08	7.38	4.783939	Run 3 Span - Span
03/30/2004	11:23:52 AM	11.67	9.13	7.44	4.758111	Run 3 Span - Span
03/30/2004	11:24:22 AM	11.67	9.13	7.54	4.820556	Run 3 Span - Span
03/30/2004	11:24:52 AM	11.67	9.13	7.49	4.789334	Run 3 Span - Span
03/30/2004	11:25:23 AM	11.67	9.13	7.57	4.839289	Run 3 Span - Span
03/30/2004	11:25:52 AM	11.73	9.13	7.44	4.789797	Run 3 Span - Span

03/30/2004	11:26:23 AM	11.73	9.13	7.32	4.714365	Run 3 Span - Span
03/30/2004	11:26:52 AM	11.73	9.13	7.1	4.569785	Run 3 Span - Span
03/30/2004	11:27:23 AM	11.73	9.13	7.24	4.65779	Run 3 Span - Span
03/30/2004	11:27:52 AM	11.73	9.13	7.54	4.852658	Run 3 Span - Span
03/30/2004	11:28:22 AM	11.73	9.13	7.38	4.752081	Run 3 Span - Span
03/30/2004	11:28:52 AM	11.67	9.18	7.49	4.789334	Run 3 Span - Span

A-3 RM 10/3A BIOMASS DATA REPORT

Polk Unit 1 Biomass - Report			
RUN 1			
04/01/2004			
8:01			
Linearity Check - Calibration Error	O2	CO2	CO
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Low Level Certified Value (PPM or %)	6.27	5.02	6.02
Mid Level Certified Value (PPM or %)	12.3	11	12.6
High Level Certified Value (PPM or %	20.9	18	
Zero Level Observed	0.014	0.095	0.009
Low Level Observed	6.24	4.978	6.123
Mid Level Observed	12.41	11.18	12.43
High Level Observed	20.89	18.36	-
% Difference from Zero to Target	0.06	0.47	0.04
% Difference from Low to Target	-0.12	-0.21	0.52
% Difference from Mid to Target	0.42	0.9	-0.84
% Difference from High to Target	-0.04	1.8	0
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Actual Zero From Linearity	0.014	0.095	0.009
Actual Span From Linearity	12.41	11.18	6.123
Initial Readings			
Zero	0.014	0.095	0.097
Span	12.41	11.28	6.201
Final Readings			
Zero	0.014	0.144	0.088
Span	12.41	11.28	6.123
Initial Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.44
Span Bias	0	0.49	0.39
Final Sampling System Bias			
Zero Bias (Run-System Cal)	0	0.24	0.4
Span Bias	0	0.49	0
Calculated Drift			
Zero Drift (Run-Run)	0	0.24	-0.05
Span Drift	0	0	-0.39
Run Results			
Raw Results	11.78	9.2	7.36
Corrected Results (ppmv)	11.68	8.95	7.21

Polk Unit 1 Biomass - Report			
RUN 2			
04/01/2004			
9:07			
Linearity Check - Calibration Error	O2	CO2	CO
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Low Level Certified Value (PPM or %)	6.27	5.02	6.02
Mid Level Certified Value (PPM or %)	12.3	11	12.6
High Level Certified Value (PPM or %	20.9	18	
Zero Level Observed	0.014	0.095	0.009
Low Level Observed	6.24	4.978	6.123
Mid Level Observed	12.41	11.18	12.43
High Level Observed	20.89	18.36	-
% Difference from Zero to Target	0.06	0.47	0.04
% Difference from Low to Target	-0.12	-0.21	0.52
% Difference from Mid to Target	0.42	0.9	-0.84
% Difference from High to Target	-0.04	1.8	0
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Actual Zero From Linearity	0.014	0.095	0.009
Actual Span From Linearity	12.41	11.18	6.123
Initial Readings			
Zero	0.014	0.144	0.088
Span	12.41	11.28	6.123
Final Readings			
Zero	0.014	0.144	0.068
Span	12.34	11.28	6.162
Initial Sampling System Bias			
Zero Bias (Run-System Cal)	0	0.24	0.4
Span Bias	0	0.49	0
Final Sampling System Bias			
Zero Bias (Run-System Cal)	0	0.24	0.3
Span Bias	-0.24	0.49	0.19
Calculated Drift			
Zero Drift (Run-Run)	0	0	-0.1
Span Drift	-0.24	0	0.19
Run Results			
Raw Results	11.79	9.18	7.14
Corrected Results (ppmv)	11.72	8.93	7.01

Polk Unit 1 Biomass - Report			
RUN 3			
04/01/2004			
10:14			
Linearity Check - Calibration Error	O2	CO2	CO
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Low Level Certified Value (PPM or %)	6.27	5.02	6.02
Mid Level Certified Value (PPM or %)	12.3	11	12.6
High Level Certified Value (PPM or %	20.9	18	
Zero Level Observed	0.014	0.095	0.009
Low Level Observed	6.24	4.978	6.123
Mid Level Observed	12.41	11.18	12.43
High Level Observed	20.89	18.36	-
% Difference from Zero to Target	0.06	0.47	0.04
% Difference from Low to Target	-0.12	-0.21	0.52
% Difference from Mid to Target	0.42	0.9	-0.84
% Difference from High to Target	-0.04	1.8	0
Analyzer Range	25	20	20
Units	PPM	PPM	PPM
Actual Zero From Linearity	0.014	0.095	0.009
Actual Span From Linearity	12.41	11.18	6.123
Initial Readings			
Zero	0.014	0.144	0.068
Span	12.34	11.28	6.162
Final Readings			
Zero	0.014	0.095	0.127
Span	12.41	11.28	6.23
Initial Sampling System Bias			
Zero Bias (Run-System Cal)	0	0.24	0.3
Span Bias	-0.24	0.49	0.19
Final Sampling System Bias			
Zero Bias (Run-System Cal)	0	0	0.59
Span Bias	0	0.49	0.54
Calculated Drift			
Zero Drift (Run-Run)	0	-0.24	0.29
Span Drift	0.24	0	0.34
Run Results			
Raw Results	11.77	9.19	7.29
Corrected Results (ppmv)	11.7	8.94	7.1

A-4 RM 10/3A BIOMASS DATA LOG

Date	Time	O2 (PPM)	CO2 (PPM)	CO (PPM)	CO (PPM) @ 15% O2	Status
04/01/2004	7:32:46 AM	9.9	8.49	-0.03	-0.015869	Linearity Check
04/01/2004	7:33:15 AM	12.34	11.13	-0.11	-0.074274	Linearity Check
04/01/2004	7:33:46 AM	12.34	11.18	0.01	0.00654	Linearity Check
04/01/2004	7:34:15 AM	20.89	4.98	-0.03	-17.539283	Linearity Check
04/01/2004	7:34:46 AM	20.89	4.98	-0.07	-40.702511	Linearity Check
04/01/2004	7:35:15 AM	0.26	0.14	0.4	0.114365	Linearity Check
04/01/2004	7:35:46 AM	0.01	0.09	5.16	1.456528	Linearity Check
04/01/2004	7:36:15 AM	0.01	0.09	6.22	1.757229	Linearity Check
04/01/2004	7:36:45 AM	0.01	0.09	6.12	1.729641	Linearity Check
04/01/2004	7:37:16 AM	15.15	0.09	6.13	6.295077	Linearity Check
04/01/2004	7:37:45 AM	21.26	0.09	10.45	-173.028802	Linearity Check
04/01/2004	7:38:16 AM	21.32	0.09	12.33	-174.36752	Linearity Check
04/01/2004	7:38:45 AM	21.32	0.09	12.29	-173.815323	Linearity Check
04/01/2004	7:39:16 AM	21.38	0.14	12.43	-153.323164	Linearity Check
04/01/2004	7:39:45 AM	10.39	0.24	12.46	6.995884	Linearity Check
04/01/2004	7:40:16 AM	0.08	0.09	9.35	2.647759	Linearity Check
04/01/2004	7:40:45 AM	11.67	8.79	6.34	4.052486	Linearity Check
04/01/2004	7:41:15 AM	11.79	9.23	6.84	4.429559	Linearity Check
04/01/2004	7:41:46 AM	0.08	0.19	6.48	1.837083	Linearity Check
04/01/2004	7:42:15 AM	0.01	0.14	5.29	1.495149	Initial Span - Zero
04/01/2004	7:42:46 AM	0.08	0.09	6.2	1.756846	Initial Span - Span
04/01/2004	7:43:15 AM	0.01	0.14	6.24	1.762746	Initial Span - Span
04/01/2004	7:43:46 AM	12.1	10.89	6.04	4.046278	Initial Span - Span
04/01/2004	7:44:15 AM	12.34	11.18	1.49	1.030191	Initial Span - Span
04/01/2004	7:44:46 AM	12.41	11.28	0.13	0.087983	Initial Span - Span
04/01/2004	7:45:15 AM	12.41	11.28	0.11	0.074417	Initial Span - Zero
04/01/2004	7:45:46 AM	12.41	11.23	0.1	0.067634	Initial Span - Zero
04/01/2004	7:46:15 AM	0.08	0.19	0.61	0.171463	Initial Span - Zero
04/01/2004	7:46:46 AM	0.08	0.14	4.96	1.405461	Initial Span - Zero
04/01/2004	7:47:15 AM	0.08	0.09	6.22	1.762379	Initial Span - Zero
04/01/2004	7:47:46 AM	0.01	0.09	6.25	1.765505	Initial Span - Zero
04/01/2004	7:48:15 AM	0.01	0.09	6.22	1.757229	Initial Span - Zero
04/01/2004	7:48:45 AM	0.01	0.09	6.24	1.762746	Initial Span - Span
04/01/2004	7:49:16 AM	0.01	0.14	6.22	1.757229	Initial Span - Span
04/01/2004	7:49:45 AM	0.01	0.14	6.22	1.757229	Initial Span - Span
04/01/2004	7:50:16 AM	0.01	0.09	6.22	1.757229	Initial Span - Span
04/01/2004	7:50:45 AM	11.73	9.08	6.57	4.230338	Initial Span - Span
04/01/2004	7:51:16 AM	11.73	9.18	7.7	4.953235	
04/01/2004	7:51:45 AM	11.73	9.23	7.5	4.827514	
04/01/2004	7:52:16 AM	11.73	9.18	7.5	4.827514	
04/01/2004	7:52:45 AM	11.73	9.23	7.61	4.896661	
04/01/2004	7:53:16 AM	11.73	9.23	7.92	5.097815	
04/01/2004	7:53:45 AM	11.73	9.18	7.89	5.078956	
04/01/2004	7:54:15 AM	11.73	9.23	7.67	4.934377	
04/01/2004	7:54:46 AM	11.73	9.18	7.71	4.965807	
04/01/2004	7:55:15 AM	11.73	9.23	7.71	4.965807	
04/01/2004	7:55:46 AM	11.73	9.18	7.7	4.953235	
04/01/2004	7:56:15 AM	11.73	9.23	7.74	4.984665	
04/01/2004	7:56:46 AM	11.73	9.23	7.72	4.972093	
04/01/2004	7:57:15 AM	11.73	9.18	7.86	5.060098	
04/01/2004	7:57:46 AM	11.67	9.23	7.92	5.064091	
04/01/2004	7:58:16 AM	11.73	9.23	7.76	4.997238	
04/01/2004	7:58:46 AM	11.73	9.23	7.69	4.946949	
04/01/2004	7:59:15 AM	11.73	9.28	7.76	4.997238	
04/01/2004	7:59:46 AM	11.73	9.23	7.76	4.997238	
04/01/2004	8:00:15 AM	11.73	9.28	7.72	4.972093	

04/01/2004	8:00:46 AM	11.73	9.28	7.65	4.921805	
04/01/2004	8:01:16 AM	11.79	9.23	7.54	4.88519	
04/01/2004	8:01:46 AM	11.73	9.23	7.54	4.852658	Run 1 - 1
04/01/2004	8:02:15 AM	11.79	9.23	7.75	5.024411	Run 1 - 1
04/01/2004	8:02:45 AM	11.73	9.23	7.61	4.896661	Run 1 - 1
04/01/2004	8:03:16 AM	11.73	9.28	7.72	4.972093	Run 1 - 1
04/01/2004	8:03:45 AM	11.73	9.28	7.96	5.122958	Run 1 - 1
04/01/2004	8:04:16 AM	11.73	9.18	8	5.148103	Run 1 - 1
04/01/2004	8:04:45 AM	11.73	9.23	7.69	4.946949	Run 1 - 1
04/01/2004	8:05:16 AM	11.79	9.23	7.67	4.967457	Run 1 - 1
04/01/2004	8:05:45 AM	11.79	9.23	7.55	4.891518	Run 1 - 1
04/01/2004	8:06:16 AM	11.73	9.23	7.38	4.752081	Run 1 - 1
04/01/2004	8:06:45 AM	11.73	9.23	7.3	4.701792	Run 1 - 1
04/01/2004	8:07:16 AM	11.73	9.23	7.52	4.840086	Run 1 - 1
04/01/2004	8:07:45 AM	11.79	9.23	8.03	5.2016	Run 1 - 1
04/01/2004	8:08:15 AM	11.79	9.18	7.66	4.961128	Run 1 - 1
04/01/2004	8:08:46 AM	11.79	9.23	7.54	4.88519	Run 1 - 1
04/01/2004	8:09:15 AM	11.79	9.18	7.34	4.758626	Run 1 - 1
04/01/2004	8:09:46 AM	11.79	9.18	7.29	4.726985	Run 1 - 1
04/01/2004	8:10:15 AM	11.73	9.18	7.42	4.777226	Run 1 - 1
04/01/2004	8:10:46 AM	11.79	9.18	7.54	4.88519	Run 1 - 1
04/01/2004	8:11:15 AM	11.79	9.23	7.42	4.809252	Run 1 - 1
04/01/2004	8:11:46 AM	11.79	9.23	7.58	4.910503	Run 1 - 1
04/01/2004	8:12:15 AM	11.79	9.23	7.3	4.733313	Run 1 - 1
04/01/2004	8:12:46 AM	11.79	9.18	7.08	4.587765	Run 1 - 1
04/01/2004	8:13:15 AM	11.73	9.18	7.24	4.65779	Run 1 - 1
04/01/2004	8:13:46 AM	11.73	9.18	7.46	4.802369	Run 1 - 1
04/01/2004	8:14:15 AM	11.79	9.18	7.54	4.88519	Run 1 - 1
04/01/2004	8:14:46 AM	11.79	9.23	7.54	4.88519	Run 1 - 1
04/01/2004	8:15:15 AM	11.73	9.23	7.5	4.827514	Run 1 - 1
04/01/2004	8:15:45 AM	11.79	9.18	7.34	4.758626	Run 1 - 1
04/01/2004	8:16:15 AM	11.73	9.18	7.29	4.689221	Run 1 - 1
04/01/2004	8:16:45 AM	11.79	9.23	7.23	4.682687	Run 1 - 1
04/01/2004	8:17:16 AM	11.79	9.23	7.22	4.67636	Run 1 - 1
04/01/2004	8:17:45 AM	11.79	9.18	7.22	4.67636	Run 1 - 1
04/01/2004	8:18:16 AM	11.79	9.23	7.2	4.663703	Run 1 - 1
04/01/2004	8:18:45 AM	11.73	9.23	7.47	4.808656	Run 1 - 1
04/01/2004	8:19:16 AM	11.73	9.23	7.45	4.796083	Run 1 - 1
04/01/2004	8:19:45 AM	11.79	9.23	7.46	4.834564	Run 1 - 1
04/01/2004	8:20:16 AM	11.79	9.18	7.54	4.88519	Run 1 - 1
04/01/2004	8:20:45 AM	11.73	9.23	7.38	4.752081	Run 1 - 1
04/01/2004	8:21:16 AM	11.79	9.23	7.42	4.809252	Run 1 - 1
04/01/2004	8:21:45 AM	11.73	9.23	7.36	4.739509	Run 1 - 1
04/01/2004	8:22:15 AM	11.79	9.23	7.42	4.809252	Run 1 - 1
04/01/2004	8:22:45 AM	11.73	9.23	7.22	4.645218	Run 1 - 1
04/01/2004	8:23:16 AM	11.73	9.18	7.44	4.789797	Run 1 - 1
04/01/2004	8:23:45 AM	11.79	9.18	7.5	4.859878	Run 1 - 1
04/01/2004	8:24:16 AM	11.79	9.23	7.59	4.916831	Run 1 - 1
04/01/2004	8:24:45 AM	11.79	9.18	7.7	4.99277	Run 1 - 1
04/01/2004	8:25:16 AM	11.79	9.18	7.51	4.866205	Run 1 - 1
04/01/2004	8:25:45 AM	11.79	9.18	7.46	4.834564	Run 1 - 1
04/01/2004	8:26:15 AM	11.73	9.18	7.44	4.789797	Run 1 - 1
04/01/2004	8:26:46 AM	11.79	9.18	7.5	4.859878	Run 1 - 1
04/01/2004	8:27:15 AM	11.79	9.18	7.53	4.878862	Run 1 - 1
04/01/2004	8:27:46 AM	11.73	9.18	7.58	4.877803	Run 1 - 1
04/01/2004	8:28:15 AM	11.73	9.18	7.49	4.821228	Run 1 - 1
04/01/2004	8:28:46 AM	11.79	9.18	7.6	4.923159	Run 1 - 1

04/01/2004	8:29:15 AM	11.73	9.18	7.51	4.8338	Run 1 - 1
04/01/2004	8:29:46 AM	11.79	9.23	7.7	4.986441	Run 1 - 1
04/01/2004	8:30:15 AM	11.73	9.18	7.77	5.003523	Run 1 - 1
04/01/2004	8:30:46 AM	11.73	9.18	7.73	4.978379	Run 1 - 1
04/01/2004	8:31:15 AM	11.73	9.18	7.74	4.984665	Run 1 - 1
04/01/2004	8:31:46 AM	11.73	9.13	7.7	4.959521	Run 1 - 1
04/01/2004	8:32:15 AM	11.73	9.18	7.56	4.86523	Run 1 - 1
04/01/2004	8:32:45 AM	11.73	9.13	7.52	4.840086	Run 1 - 1
04/01/2004	8:33:16 AM	11.79	9.23	7.38	4.783939	Run 1 - 1
04/01/2004	8:33:45 AM	11.79	9.18	7.43	4.81558	Run 1 - 1
04/01/2004	8:34:16 AM	11.79	9.18	7.31	4.739641	Run 1 - 1
04/01/2004	8:34:45 AM	11.79	9.18	7.35	4.764954	Run 1 - 1
04/01/2004	8:35:16 AM	11.73	9.23	7.5	4.827514	Run 1 - 1
04/01/2004	8:35:45 AM	11.79	9.23	7.56	4.897847	Run 1 - 1
04/01/2004	8:36:16 AM	11.79	9.18	6.18	4.00557	Run 1 - 1
04/01/2004	8:36:45 AM	11.79	9.18	6.59	4.271354	Run 1 - 1
04/01/2004	8:37:15 AM	11.79	9.23	7.19	4.657375	Run 1 - 1
04/01/2004	8:37:46 AM	11.79	9.18	7.3	4.733313	Run 1 - 1
04/01/2004	8:38:15 AM	11.79	9.23	7.15	4.632062	Run 1 - 1
04/01/2004	8:38:46 AM	11.73	9.18	7.17	4.613788	Run 1 - 1
04/01/2004	8:39:15 AM	11.79	9.13	7.17	4.644719	Run 1 - 1
04/01/2004	8:39:46 AM	11.79	9.13	6.88	4.461201	Run 1 - 1
04/01/2004	8:40:15 AM	11.79	9.18	7.19	4.657375	Run 1 - 1
04/01/2004	8:40:46 AM	11.79	9.23	7.34	4.758626	Run 1 - 1
04/01/2004	8:41:15 AM	11.79	9.18	7.31	4.739641	Run 1 - 1
04/01/2004	8:41:46 AM	11.79	9.18	7.17	4.644719	Run 1 - 1
04/01/2004	8:42:15 AM	11.79	9.18	7.11	4.60675	Run 1 - 1
04/01/2004	8:42:45 AM	11.79	9.18	7.17	4.644719	Run 1 - 1
04/01/2004	8:43:16 AM	11.79	9.23	7.19	4.657375	Run 1 - 1
04/01/2004	8:43:45 AM	11.79	9.18	7.07	4.581436	Run 1 - 1
04/01/2004	8:44:16 AM	11.79	9.18	7.04	4.562452	Run 1 - 1
04/01/2004	8:44:45 AM	11.73	9.23	7.25	4.664076	Run 1 - 1
04/01/2004	8:45:16 AM	11.73	9.18	7.5	4.827514	Run 1 - 1
04/01/2004	8:45:45 AM	11.79	9.18	7.5	4.859878	Run 1 - 1
04/01/2004	8:46:15 AM	11.79	9.23	7.58	4.910503	Run 1 - 1
04/01/2004	8:46:46 AM	11.86	9.18	7.54	4.918161	Run 1 - 1
04/01/2004	8:47:15 AM	11.86	9.23	7.13	4.650583	Run 1 - 1
04/01/2004	8:47:46 AM	11.86	9.23	7.02	4.580503	Run 1 - 1
04/01/2004	8:48:15 AM	11.86	9.18	7.06	4.605987	Run 1 - 1
04/01/2004	8:48:46 AM	11.79	9.23	7.2	4.663703	Run 1 - 1
04/01/2004	8:49:15 AM	11.79	9.18	7.37	4.777611	Run 1 - 1
04/01/2004	8:49:46 AM	11.79	9.23	7.26	4.701672	Run 1 - 1
04/01/2004	8:50:15 AM	11.86	9.23	7	4.567761	Run 1 - 1
04/01/2004	8:50:45 AM	11.79	9.23	7.13	4.619406	Run 1 - 1
04/01/2004	8:51:16 AM	11.79	9.23	7.19	4.657375	Run 1 - 1
04/01/2004	8:51:45 AM	11.79	9.23	7.1	4.600421	Run 1 - 1
04/01/2004	8:52:16 AM	11.79	9.18	7.08	4.587765	Run 1 - 1
04/01/2004	8:52:45 AM	11.79	9.23	7.23	4.682687	Run 1 - 1
04/01/2004	8:53:16 AM	11.79	9.18	7.17	4.644719	Run 1 - 1
04/01/2004	8:53:45 AM	11.79	9.18	7	4.537139	Run 1 - 1
04/01/2004	8:54:16 AM	11.79	9.23	7	4.537139	Run 1 - 1
04/01/2004	8:54:45 AM	11.79	9.18	7.22	4.67636	Run 1 - 1
04/01/2004	8:55:16 AM	11.79	9.18	7.22	4.67636	Run 1 - 1
04/01/2004	8:55:45 AM	11.79	9.18	7.29	4.726985	Run 1 - 1
04/01/2004	8:56:15 AM	11.79	9.18	7.27	4.708	Run 1 - 1
04/01/2004	8:56:46 AM	11.79	9.18	7.24	4.689016	Run 1 - 1
04/01/2004	8:57:15 AM	11.79	9.18	7.06	4.575108	Run 1 - 1

04/01/2004	8:57:46 AM	11.79	9.18	7.14	4.625734	Run 1 - 1
04/01/2004	8:58:15 AM	11.79	9.18	7.16	4.63839	Run 1 - 1
04/01/2004	8:58:46 AM	11.79	9.23	7.1	4.600421	Run 1 - 1
04/01/2004	8:59:15 AM	11.79	9.28	7.25	4.695344	Run 1 - 1
04/01/2004	8:59:46 AM	11.86	9.23	7.22	4.707921	Run 1 - 1
04/01/2004	9:00:16 AM	11.79	9.18	7.29	4.720657	Run 1 - 1
04/01/2004	9:00:45 AM	11.79	9.23	7.3	4.733313	Run 1 - 1
04/01/2004	9:01:16 AM	11.79	9.18	7.22	4.67636	Run 1 - 1
04/01/2004	9:01:45 AM	11.86	9.18	7.02	4.580503	Run 1 - 1
04/01/2004	9:02:16 AM	5.75	3.27	6.85	2.666273	
04/01/2004	9:02:45 AM	12.34	11.18	4.28	2.949537	
04/01/2004	9:03:16 AM	12.34	11.23	0.3	0.208577	Run 1 Span - Span
04/01/2004	9:03:45 AM	12.41	11.28	0.02	0.01337	Run 1 Span - Zero
04/01/2004	9:04:16 AM	0.56	0.34	0.3	0.087749	Run 1 Span - Zero
04/01/2004	9:04:45 AM	0.01	0.14	4.56	1.288245	Run 1 Span - Zero
04/01/2004	9:05:15 AM	0.08	0.14	6.08	1.723644	Run 1 Span - Zero
04/01/2004	9:05:46 AM	0.08	0.14	6.12	1.734711	Run 1 Span - Span
04/01/2004	9:06:15 AM	2.33	0.58	6.14	1.951937	Run 1 Span - Zero
04/01/2004	9:06:46 AM	11.73	9.13	6.74	4.337201	Run 1 Span - Zero
04/01/2004	9:07:15 AM	11.79	9.13	7.28	4.714329	Run 1 Span - Zero
04/01/2004	9:07:45 AM	11.79	9.23	6.96	4.511826	Run 2 - 1
04/01/2004	9:08:16 AM	11.79	9.23	7.13	4.619406	Run 2 - 1
04/01/2004	9:08:45 AM	11.79	9.23	7.13	4.619406	Run 2 - 1
04/01/2004	9:09:15 AM	11.79	9.18	7.14	4.625734	Run 2 - 1
04/01/2004	9:09:46 AM	11.79	9.18	7.07	4.581436	Run 2 - 1
04/01/2004	9:10:15 AM	11.86	9.18	7.08	4.618729	Run 2 - 1
04/01/2004	9:10:46 AM	11.79	9.18	7.03	4.556124	Run 2 - 1
04/01/2004	9:11:15 AM	11.79	9.18	7.24	4.689016	Run 2 - 1
04/01/2004	9:11:46 AM	11.79	9.18	7.34	4.758626	Run 2 - 1
04/01/2004	9:12:15 AM	11.79	9.18	7.22	4.67636	Run 2 - 1
04/01/2004	9:12:46 AM	11.79	9.18	7.1	4.600421	Run 2 - 1
04/01/2004	9:13:15 AM	11.79	9.18	6.98	4.524482	Run 2 - 1
04/01/2004	9:13:45 AM	11.79	9.18	6.96	4.511826	Run 2 - 1
04/01/2004	9:14:16 AM	11.79	9.23	7.07	4.581436	Run 2 - 1
04/01/2004	9:14:45 AM	11.79	9.23	7.3	4.733313	Run 2 - 1
04/01/2004	9:15:16 AM	11.79	9.18	7.33	4.752298	Run 2 - 1
04/01/2004	9:15:45 AM	11.79	9.18	7.12	4.613077	Run 2 - 1
04/01/2004	9:16:16 AM	11.79	9.23	7.1	4.600421	Run 2 - 1
04/01/2004	9:16:45 AM	11.79	9.23	7.02	4.549796	Run 2 - 1
04/01/2004	9:17:16 AM	11.86	9.18	7.1	4.63147	Run 2 - 1
04/01/2004	9:17:45 AM	11.86	9.23	6.79	4.427601	Run 2 - 1
04/01/2004	9:18:15 AM	11.79	9.23	6.94	4.49917	Run 2 - 1
04/01/2004	9:18:46 AM	11.79	9.23	7.3	4.733313	Run 2 - 1
04/01/2004	9:19:15 AM	11.73	9.18	7.3	4.701792	Run 2 - 1
04/01/2004	9:19:46 AM	11.86	9.23	7.22	4.707921	Run 2 - 1
04/01/2004	9:20:15 AM	11.73	9.23	7.15	4.601216	Run 2 - 1
04/01/2004	9:20:46 AM	11.86	9.23	7.15	4.663325	Run 2 - 1
04/01/2004	9:21:15 AM	11.86	9.18	6.87	4.484939	Run 2 - 1
04/01/2004	9:21:46 AM	11.79	9.23	6.94	4.49917	Run 2 - 1
04/01/2004	9:22:15 AM	11.79	9.23	6.95	4.505498	Run 2 - 1
04/01/2004	9:22:45 AM	11.73	9.18	7.07	4.550927	Run 2 - 1
04/01/2004	9:23:16 AM	11.79	9.18	7.04	4.562452	Run 2 - 1
04/01/2004	9:23:45 AM	11.79	9.18	7.22	4.67636	Run 2 - 1
04/01/2004	9:24:16 AM	11.79	9.18	7.14	4.625734	Run 2 - 1
04/01/2004	9:24:45 AM	11.79	9.23	7.11	4.60675	Run 2 - 1
04/01/2004	9:25:16 AM	11.79	9.18	7.29	4.726985	Run 2 - 1
04/01/2004	9:25:45 AM	11.86	9.18	7.24	4.720663	Run 2 - 1

04/01/2004	9:26:16 AM	11.79	9.18	7.18	4.651046	Run 2 - 1
04/01/2004	9:26:45 AM	11.73	9.18	7.36	4.739509	Run 2 - 1
04/01/2004	9:27:16 AM	11.73	9.18	7.36	4.739509	Run 2 - 1
04/01/2004	9:27:45 AM	11.73	9.23	7.34	4.726937	Run 2 - 1
04/01/2004	9:28:16 AM	11.73	9.23	7.47	4.808656	Run 2 - 1
04/01/2004	9:28:45 AM	11.79	9.23	7.4	4.796595	Run 2 - 1
04/01/2004	9:29:16 AM	11.79	9.18	7.06	4.575108	Run 2 - 1
04/01/2004	9:29:45 AM	11.79	9.23	6.77	4.385262	Run 2 - 1
04/01/2004	9:30:16 AM	11.79	9.23	6.79	4.397918	Run 2 - 1
04/01/2004	9:30:46 AM	11.79	9.18	6.98	4.524482	Run 2 - 1
04/01/2004	9:31:15 AM	11.73	9.18	7.15	4.601216	Run 2 - 1
04/01/2004	9:31:46 AM	11.79	9.18	7.26	4.701672	Run 2 - 1
04/01/2004	9:32:15 AM	11.79	9.18	7.32	4.74597	Run 2 - 1
04/01/2004	9:32:46 AM	11.86	9.18	7.16	4.669696	Run 2 - 1
04/01/2004	9:33:15 AM	11.86	9.18	7.14	4.656954	Run 2 - 1
04/01/2004	9:33:46 AM	11.86	9.23	6.87	4.484939	Run 2 - 1
04/01/2004	9:34:15 AM	11.79	9.18	6.92	4.486513	Run 2 - 1
04/01/2004	9:34:46 AM	11.79	9.23	6.74	4.366278	Run 2 - 1
04/01/2004	9:35:15 AM	11.86	9.18	6.87	4.478568	Run 2 - 1
04/01/2004	9:35:46 AM	11.73	9.23	6.94	4.469208	Run 2 - 1
04/01/2004	9:36:15 AM	11.79	9.23	6.84	4.429559	Run 2 - 1
04/01/2004	9:36:45 AM	11.86	9.18	5.96	3.886074	Run 2 - 1
04/01/2004	9:37:16 AM	11.79	9.18	6.94	4.49917	Run 2 - 1
04/01/2004	9:37:45 AM	11.79	9.18	7.1	4.600421	Run 2 - 1
04/01/2004	9:38:16 AM	11.86	9.18	6.91	4.510423	Run 2 - 1
04/01/2004	9:38:45 AM	11.79	9.23	6.96	4.511826	Run 2 - 1
04/01/2004	9:39:16 AM	11.79	9.23	6.89	4.467529	Run 2 - 1
04/01/2004	9:39:45 AM	11.79	9.18	7.17	4.644719	Run 2 - 1
04/01/2004	9:40:16 AM	11.79	9.18	7.17	4.644719	Run 2 - 1
04/01/2004	9:40:45 AM	11.79	9.18	7.17	4.644719	Run 2 - 1
04/01/2004	9:41:15 AM	11.79	9.18	7.13	4.619406	Run 2 - 1
04/01/2004	9:41:46 AM	11.79	9.23	7.09	4.594093	Run 2 - 1
04/01/2004	9:42:15 AM	11.79	9.13	6.98	4.524482	Run 2 - 1
04/01/2004	9:42:46 AM	11.79	9.13	7.02	4.549796	Run 2 - 1
04/01/2004	9:43:15 AM	11.79	9.13	7.08	4.587765	Run 2 - 1
04/01/2004	9:43:46 AM	11.86	9.13	7.17	4.676067	Run 2 - 1
04/01/2004	9:44:15 AM	11.86	9.13	6.98	4.555019	Run 2 - 1
04/01/2004	9:44:46 AM	11.86	9.13	6.94	4.529536	Run 2 - 1
04/01/2004	9:45:15 AM	11.79	9.13	6.84	4.429559	Run 2 - 1
04/01/2004	9:45:46 AM	11.79	9.18	6.96	4.511826	Run 2 - 1
04/01/2004	9:46:15 AM	11.79	9.13	7.22	4.67636	Run 2 - 1
04/01/2004	9:46:45 AM	11.79	9.08	7.16	4.63839	Run 2 - 1
04/01/2004	9:47:16 AM	11.73	9.18	7.13	4.588643	Run 2 - 1
04/01/2004	9:47:45 AM	11.79	9.18	7.29	4.720657	Run 2 - 1
04/01/2004	9:48:16 AM	11.73	9.13	7.4	4.764653	Run 2 - 1
04/01/2004	9:48:45 AM	11.79	9.13	7.4	4.796595	Run 2 - 1
04/01/2004	9:49:16 AM	11.79	9.18	7.3	4.733313	Run 2 - 1
04/01/2004	9:49:45 AM	11.79	9.18	7.32	4.74597	Run 2 - 1
04/01/2004	9:50:16 AM	11.73	9.13	7.38	4.752081	Run 2 - 1
04/01/2004	9:50:45 AM	11.79	9.13	7.49	4.853549	Run 2 - 1
04/01/2004	9:51:15 AM	11.79	9.13	7.42	4.809252	Run 2 - 1
04/01/2004	9:51:46 AM	11.79	9.13	7.48	4.847221	Run 2 - 1
04/01/2004	9:52:15 AM	11.79	9.18	7.34	4.758626	Run 2 - 1
04/01/2004	9:52:46 AM	11.79	9.18	7.3	4.733313	Run 2 - 1
04/01/2004	9:53:15 AM	11.79	9.18	7.3	4.733313	Run 2 - 1
04/01/2004	9:53:46 AM	11.79	9.13	7.34	4.758626	Run 2 - 1
04/01/2004	9:54:15 AM	11.79	9.18	7.36	4.771283	Run 2 - 1

04/01/2004	9:54:46 AM	11.79	9.13	7.32	4.74597	Run 2 - 1
04/01/2004	9:55:15 AM	11.79	9.18	7.22	4.67636	Run 2 - 1
04/01/2004	9:55:45 AM	11.73	9.18	7.18	4.620074	Run 2 - 1
04/01/2004	9:56:16 AM	11.73	9.18	7.32	4.714365	Run 2 - 1
04/01/2004	9:56:45 AM	11.73	9.18	7.29	4.695507	Run 2 - 1
04/01/2004	9:57:16 AM	11.79	9.18	7.29	4.720657	Run 2 - 1
04/01/2004	9:57:45 AM	11.73	9.13	7.12	4.582357	Run 2 - 1
04/01/2004	9:58:16 AM	11.79	9.13	7.14	4.625734	Run 2 - 1
04/01/2004	9:58:45 AM	11.79	9.13	7.15	4.632062	Run 2 - 1
04/01/2004	9:59:16 AM	11.73	9.18	7.17	4.613788	Run 2 - 1
04/01/2004	9:59:46 AM	11.79	9.13	7.2	4.663703	Run 2 - 1
04/01/2004	10:00:15 AM	11.73	9.13	7.19	4.62636	Run 2 - 1
04/01/2004	10:00:46 AM	11.73	9.18	7.13	4.588643	Run 2 - 1
04/01/2004	10:01:15 AM	11.73	9.18	7.11	4.576072	Run 2 - 1
04/01/2004	10:01:46 AM	11.73	9.13	7.04	4.532069	Run 2 - 1
04/01/2004	10:02:15 AM	11.79	9.18	7.11	4.60675	Run 2 - 1
04/01/2004	10:02:46 AM	11.79	9.13	7.2	4.663703	Run 2 - 1
04/01/2004	10:03:15 AM	11.79	9.13	7.14	4.625734	Run 2 - 1
04/01/2004	10:03:45 AM	11.79	9.18	7.09	4.594093	Run 2 - 1
04/01/2004	10:04:16 AM	11.79	9.08	7.08	4.587765	Run 2 - 1
04/01/2004	10:04:45 AM	11.79	9.13	7.22	4.67636	Run 2 - 1
04/01/2004	10:05:16 AM	11.79	9.18	7.27	4.708	Run 2 - 1
04/01/2004	10:05:45 AM	11.79	9.18	7.12	4.613077	Run 2 - 1
04/01/2004	10:06:16 AM	11.79	9.23	7.23	4.682687	Run 2 - 1
04/01/2004	10:06:45 AM	11.73	9.13	7.38	4.752081	Run 2 - 1
04/01/2004	10:07:16 AM	11.79	9.18	7.2	4.663703	Run 2 - 1
04/01/2004	10:07:45 AM	11.79	9.13	7.4	4.796595	Run 2 - 2
04/01/2004	10:08:15 AM	1.42	0.58	7.3	2.212146	
04/01/2004	10:08:46 AM	12.34	11.23	3.94	2.713827	
04/01/2004	10:09:15 AM	12.41	11.23	0.28	0.19651	Run 2 Span - Span
04/01/2004	10:09:46 AM	12.34	11.23	0.05	0.033479	Run 2 Span - Span
04/01/2004	10:10:15 AM	12.34	11.23	0.07	0.046948	Run 2 Span - Zero
04/01/2004	10:10:46 AM	5.08	3.27	0.05	0.018106	Run 2 Span - Zero
04/01/2004	10:11:15 AM	0.08	0.14	3.13	0.888067	Run 2 Span - Zero
04/01/2004	10:11:46 AM	0.08	0.14	5.96	1.687675	Run 2 Span - Zero
04/01/2004	10:12:15 AM	0.01	0.09	6.16	1.740676	Run 2 Span - Zero
04/01/2004	10:12:46 AM	8.32	7.18	6.21	2.911845	Run 2 Span - Span
04/01/2004	10:13:15 AM	11.73	9.13	6.87	4.425206	Run 2 Span - Span
04/01/2004	10:13:46 AM	11.79	9.18	7.4	4.796595	Run 2 Span - Span
04/01/2004	10:14:15 AM	11.79	9.18	7.47	4.840893	Run 3 - 1
04/01/2004	10:14:46 AM	11.73	9.18	7.34	4.726937	Run 3 - 1
04/01/2004	10:15:15 AM	11.73	9.23	7.52	4.840086	Run 3 - 1
04/01/2004	10:15:46 AM	11.73	9.18	7.68	4.940663	Run 3 - 1
04/01/2004	10:16:15 AM	11.73	9.18	7.45	4.796083	Run 3 - 1
04/01/2004	10:16:46 AM	11.73	9.18	7.49	4.821228	Run 3 - 1
04/01/2004	10:17:15 AM	11.73	9.23	7.27	4.676648	Run 3 - 1
04/01/2004	10:17:46 AM	11.79	9.18	7.25	4.695344	Run 3 - 1
04/01/2004	10:18:16 AM	11.79	9.18	7.26	4.701672	Run 3 - 1
04/01/2004	10:18:45 AM	11.79	9.18	7.24	4.689016	Run 3 - 1
04/01/2004	10:19:16 AM	11.73	9.13	7.24	4.65779	Run 3 - 1
04/01/2004	10:19:45 AM	11.73	9.13	7.28	4.682934	Run 3 - 1
04/01/2004	10:20:16 AM	11.79	9.18	7.26	4.701672	Run 3 - 1
04/01/2004	10:20:45 AM	11.79	9.18	7.3	4.733313	Run 3 - 1
04/01/2004	10:21:16 AM	11.79	9.13	7.18	4.651046	Run 3 - 1
04/01/2004	10:21:45 AM	11.79	9.18	7.14	4.625734	Run 3 - 1
04/01/2004	10:22:16 AM	11.73	9.18	7.04	4.532069	Run 3 - 1
04/01/2004	10:22:45 AM	11.73	9.18	7.17	4.613788	Run 3 - 1

04/01/2004	10:23:15 AM	11.79	9.23	7.23	4.682687	Run 3 - 1
04/01/2004	10:23:46 AM	11.79	9.18	7.21	4.670031	Run 3 - 1
04/01/2004	10:24:15 AM	11.79	9.18	7.03	4.556124	Run 3 - 1
04/01/2004	10:24:46 AM	11.73	9.13	7.15	4.601216	Run 3 - 1
04/01/2004	10:25:15 AM	11.79	9.13	7.26	4.701672	Run 3 - 1
04/01/2004	10:25:46 AM	11.79	9.13	7.12	4.613077	Run 3 - 1
04/01/2004	10:26:15 AM	11.79	9.18	7.04	4.562452	Run 3 - 1
04/01/2004	10:26:46 AM	11.73	9.18	7.17	4.613788	Run 3 - 1
04/01/2004	10:27:15 AM	11.79	9.18	7.29	4.720657	Run 3 - 1
04/01/2004	10:27:46 AM	11.73	9.18	7.15	4.601216	Run 3 - 1
04/01/2004	10:28:16 AM	11.73	9.23	7.25	4.664076	Run 3 - 1
04/01/2004	10:28:45 AM	11.73	9.23	7.24	4.65779	Run 3 - 1
04/01/2004	10:29:16 AM	11.73	9.18	7.47	4.808656	Run 3 - 1
04/01/2004	10:29:45 AM	11.73	9.18	7.56	4.86523	Run 3 - 1
04/01/2004	10:30:16 AM	11.79	9.18	7.4	4.796595	Run 3 - 1
04/01/2004	10:30:45 AM	11.79	9.18	7.25	4.695344	Run 3 - 1
04/01/2004	10:31:16 AM	11.79	9.13	7.2	4.663703	Run 3 - 1
04/01/2004	10:31:45 AM	11.79	9.18	7.25	4.695344	Run 3 - 1
04/01/2004	10:32:16 AM	11.79	9.18	7.14	4.625734	Run 3 - 1
04/01/2004	10:32:45 AM	11.79	9.23	7.18	4.651046	Run 3 - 1
04/01/2004	10:33:16 AM	11.73	9.23	7.16	4.607502	Run 3 - 1
04/01/2004	10:33:45 AM	11.73	9.23	7.29	4.689221	Run 3 - 1
04/01/2004	10:34:16 AM	11.73	9.18	7.4	4.764653	Run 3 - 1
04/01/2004	10:34:45 AM	11.79	9.18	7.44	4.821908	Run 3 - 1
04/01/2004	10:35:16 AM	11.79	9.13	7.29	4.720657	Run 3 - 1
04/01/2004	10:35:45 AM	11.86	9.18	7.16	4.669696	Run 3 - 1
04/01/2004	10:36:15 AM	11.79	9.18	7.24	4.689016	Run 3 - 1
04/01/2004	10:36:46 AM	11.73	9.23	7.13	4.588643	Run 3 - 1
04/01/2004	10:37:15 AM	11.73	9.23	6.22	4.00404	Run 3 - 1
04/01/2004	10:37:46 AM	11.73	9.18	6.78	4.362345	Run 3 - 1
04/01/2004	10:38:15 AM	11.79	9.23	7.29	4.726985	Run 3 - 1
04/01/2004	10:38:46 AM	11.73	9.18	7.4	4.764653	Run 3 - 1
04/01/2004	10:39:15 AM	11.79	9.23	7.2	4.663703	Run 3 - 1
04/01/2004	10:39:46 AM	11.79	9.23	7.36	4.771283	Run 3 - 1
04/01/2004	10:40:15 AM	11.73	9.28	7.3	4.701792	Run 3 - 1
04/01/2004	10:40:46 AM	11.73	9.23	7.2	4.632646	Run 3 - 1
04/01/2004	10:41:15 AM	11.79	9.28	7.14	4.625734	Run 3 - 1
04/01/2004	10:41:45 AM	11.73	9.23	7.06	4.544641	Run 3 - 1
04/01/2004	10:42:16 AM	11.79	9.23	7.11	4.60675	Run 3 - 1
04/01/2004	10:42:45 AM	11.79	9.23	7.26	4.701672	Run 3 - 1
04/01/2004	10:43:16 AM	11.79	9.18	7.32	4.74597	Run 3 - 1
04/01/2004	10:43:45 AM	11.79	9.23	7.04	4.562452	Run 3 - 1
04/01/2004	10:44:16 AM	11.79	9.23	7.09	4.594093	Run 3 - 1
04/01/2004	10:44:45 AM	11.79	9.18	7.1	4.600421	Run 3 - 1
04/01/2004	10:45:16 AM	11.79	9.18	7.2	4.663703	Run 3 - 1
04/01/2004	10:45:46 AM	11.79	9.23	7.18	4.651046	Run 3 - 1
04/01/2004	10:46:15 AM	11.79	9.23	7.29	4.720657	Run 3 - 1
04/01/2004	10:46:46 AM	11.73	9.23	7.25	4.664076	Run 3 - 1
04/01/2004	10:47:15 AM	11.73	9.23	7.06	4.544641	Run 3 - 1
04/01/2004	10:47:46 AM	11.79	9.23	7.2	4.663703	Run 3 - 1
04/01/2004	10:48:15 AM	11.79	9.28	7.38	4.783939	Run 3 - 1
04/01/2004	10:48:46 AM	11.79	9.23	7.34	4.758626	Run 3 - 1
04/01/2004	10:49:15 AM	11.79	9.23	7.13	4.619406	Run 3 - 1
04/01/2004	10:49:46 AM	11.79	9.18	7.02	4.549796	Run 3 - 1
04/01/2004	10:50:15 AM	11.79	9.18	7.19	4.657375	Run 3 - 1
04/01/2004	10:50:45 AM	11.79	9.18	7.19	4.657375	Run 3 - 1
04/01/2004	10:51:16 AM	11.79	9.18	6.98	4.524482	Run 3 - 1

04/01/2004	10:51:45 AM	11.79	9.18	7.09	4.594093	Run 3 - 1
04/01/2004	10:52:16 AM	11.79	9.18	7.18	4.651046	Run 3 - 1
04/01/2004	10:52:45 AM	11.79	9.18	7.38	4.783939	Run 3 - 1
04/01/2004	10:53:16 AM	11.79	9.18	7.29	4.720657	Run 3 - 1
04/01/2004	10:53:45 AM	11.79	9.23	7.32	4.74597	Run 3 - 1
04/01/2004	10:54:16 AM	11.73	9.18	7.21	4.638932	Run 3 - 1
04/01/2004	10:54:45 AM	11.73	9.18	7.25	4.664076	Run 3 - 1
04/01/2004	10:55:16 AM	11.86	9.18	7.2	4.695179	Run 3 - 1
04/01/2004	10:55:46 AM	11.79	9.23	7.16	4.63839	Run 3 - 1
04/01/2004	10:56:15 AM	11.79	9.18	7.29	4.720657	Run 3 - 1
04/01/2004	10:56:46 AM	11.79	9.23	7.21	4.670031	Run 3 - 1
04/01/2004	10:57:15 AM	11.79	9.23	7.26	4.701672	Run 3 - 1
04/01/2004	10:57:46 AM	11.79	9.23	7.41	4.802924	Run 3 - 1
04/01/2004	10:58:15 AM	11.73	9.18	7.46	4.802369	Run 3 - 1
04/01/2004	10:58:46 AM	11.79	9.23	7.38	4.783939	Run 3 - 1
04/01/2004	10:59:15 AM	11.73	9.18	7.4	4.764653	Run 3 - 1
04/01/2004	10:59:46 AM	11.79	9.18	7.34	4.758626	Run 3 - 1
04/01/2004	11:00:15 AM	11.79	9.18	7.29	4.720657	Run 3 - 1
04/01/2004	11:00:46 AM	11.79	9.18	7.12	4.613077	Run 3 - 1
04/01/2004	11:01:15 AM	11.79	9.18	7.27	4.708	Run 3 - 1
04/01/2004	11:01:45 AM	11.79	9.23	7.44	4.821908	Run 3 - 1
04/01/2004	11:02:16 AM	11.73	9.18	7.41	4.770939	Run 3 - 1
04/01/2004	11:02:45 AM	11.79	9.23	7.38	4.783939	Run 3 - 1
04/01/2004	11:03:16 AM	11.73	9.18	7.44	4.789797	Run 3 - 1
04/01/2004	11:03:45 AM	11.73	9.18	7.6	4.890374	Run 3 - 1
04/01/2004	11:04:16 AM	11.79	9.18	7.53	4.878862	Run 3 - 1
04/01/2004	11:04:45 AM	11.73	9.23	7.25	4.664076	Run 3 - 1
04/01/2004	11:05:16 AM	11.79	9.18	7.26	4.701672	Run 3 - 1
04/01/2004	11:05:45 AM	11.79	9.18	7.18	4.651046	Run 3 - 1
04/01/2004	11:06:16 AM	11.73	9.18	7.24	4.65779	Run 3 - 1
04/01/2004	11:06:45 AM	11.79	9.18	7.34	4.758626	Run 3 - 1
04/01/2004	11:07:15 AM	11.79	9.23	7.44	4.821908	Run 3 - 1
04/01/2004	11:07:46 AM	11.79	9.18	7.4	4.796595	Run 3 - 1
04/01/2004	11:08:15 AM	11.79	9.18	7.44	4.821908	Run 3 - 1
04/01/2004	11:08:46 AM	11.73	9.18	7.53	4.846372	Run 3 - 1
04/01/2004	11:09:15 AM	11.73	9.18	7.69	4.946949	Run 3 - 1
04/01/2004	11:09:46 AM	11.73	9.18	7.69	4.946949	Run 3 - 1
04/01/2004	11:10:15 AM	11.79	9.18	7.78	5.043395	Run 3 - 1
04/01/2004	11:10:46 AM	11.73	9.13	7.61	4.896661	Run 3 - 1
04/01/2004	11:11:15 AM	11.73	9.18	7.6	4.890374	Run 3 - 1
04/01/2004	11:11:46 AM	11.73	9.18	7.82	5.034954	Run 3 - 1
04/01/2004	11:12:16 AM	11.73	9.23	7.63	4.909233	Run 3 - 1
04/01/2004	11:12:45 AM	11.67	9.18	7.65	4.889245	Run 3 - 1
04/01/2004	11:13:16 AM	11.73	9.18	7.9	5.085243	Run 3 - 1
04/01/2004	11:13:45 AM	11.73	9.18	7.81	5.028668	Run 3 - 1
04/01/2004	11:14:16 AM	11.73	9.18	7.76	4.997238	Run 3 - 2
04/01/2004	11:14:45 AM	1.72	0.68	7.62	2.3435	
04/01/2004	11:15:16 AM	12.34	11.18	4.88	3.367078	
04/01/2004	11:15:45 AM	12.41	11.28	0.47	0.325386	Run 3 Span - Span
04/01/2004	11:16:16 AM	12.34	11.23	0.13	0.087355	Run 3 Span - Span
04/01/2004	11:16:45 AM	12.34	11.23	0.14	0.09409	Run 3 Span - Span
04/01/2004	11:17:15 AM	12.34	11.28	0.11	0.073886	Run 3 Span - Zero
04/01/2004	11:17:46 AM	0.81	0.39	0.12	0.03433	Run 3 Span - Zero
04/01/2004	11:18:15 AM	0.08	0.19	3.63	1.029174	Run 3 Span - Zero
04/01/2004	11:18:46 AM	0.01	0.09	6.08	1.718606	Run 3 Span - Zero
04/01/2004	11:19:15 AM	0.01	0.09	6.22	1.757229	Run 3 Span - Span
04/01/2004	11:19:46 AM	11.31	8.98	6.25	3.843717	Run 3 Span - Span

04/01/2004	11:20:15 AM	11.73	9.13	6.96	4.48178	Run 3 Span - Span
04/01/2004	12:01:59 PM	CO*(5.9/(20.9-O2))	NaN			
04/01/2004	12:02:00 PM	92.48	73.98	7.4	-0.610219	

A-5 CALIBRATION GAS CERTIFICATIONS

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~~COMPLIANCE CLASS~~

Dual-Analyzed Calibration Standard

Scott Specialty Gases

6141 EASTON ROAD, BLDG 1,PLUMSTEADVILLE,PA 18949-0310 Phone: 800-331-4953 Fax: 215-766-7226

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
6141 EASTON ROAD, BLDG 1
PLUMSTEADVILLE,PA 18949-0310

P.O. No.: E-N06925
Project No.: 01-04230-003

Customer
TAMPA ELECTRIC COMPANY

CHARLES DUFENY
5010 CAUSEWAY BLVD
TAMPA FL 33619

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: AAL8100 **Certification Date:** 09Feb2004 **Exp. Date:** 02Aug2004
Cylinder Pressure*:** 1960 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY**	TRACEABILITY
CARBON MONOXIDE	6.02	PPM	+/- 2%	NIST and NMi
NITRIC OXIDE	8.24	PPM	+/- 2%	NIST and NMi
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	8.31	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol procedures , September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2635	01May2007	ALM016889	25.78 PPM	CARBON MONOXIDE
NTRM 2628	02Apr2005	AAL069685	10.35 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
SIEMENS/6E/KN-240	15Jan2004	NDIR
HORIBA/CLA220/5708850810	26Jan2004	CHEMILUMINESCENCE

APPROVED BY: KIMBERLY NILES

RD004

Scott Specialty Gases
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RATA CLASS

Dual-Analyzed Calibration Standard

6141 EASTON ROAD, BLDG 1,PLUMSTEADVILLE,PA 18949-0310 Phone: 800-331-4953 Fax

_CERTIFICATE_OF_ACCURACY:_EPA_Protocol_Gas

Assay_Laboratory
SCOTT SPECIALTY GASES
6141 EASTON ROAD, BLDG 1
PLUMSTEADVILLE,PA 18949-0310

P.O. No.: EN75516
Project No.: 01-73884-002

Customer_
TAMPA ELECTRIC COMPANY
Michael Skirvin
5010 CAUSEWAY BLVD
TAMPA FL 33619

_ANALYTICAL_INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certifi of Gaseous Calibration Standards; Procedure G-1; September, 1997.
Cylinder Number: ALM027916 Certification Date: 16Jul2002 Exp. Date: 15Jul2005
Cylinder Pressure***: 2000 PSIG

COMPONENT	CERTIFIED_CONCENTRATION_(Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON MONOXIDE	12.6	PPM	+/- 1%	Direct NIST and NMi
PROPANE	13.0	PPM	+/- 1%	Direct NIST and NMi
AIR		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September
__Product_certified_as_+/-_1%_analytical_accuracy_is_directly_traceable_to_NIST_or_NMI_stand

REFERENCE_STANDARD

TYPE/SRM_NO.	EXPIRATION_DATE	CYLINDER_NUMBER	CONCENTRATION	COMPONENT
NTRM 1678	01Jun2006	ALM024607	49.16PM	CARBON MONOXIDE
NTRM 1666	01May2004	ALM014096	9.470PM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE_LAST_CALIBRATED	ANALYTICAL_PRINCIPLE_
SIEMENS/6E/KN-240	01Jul2002	NDIR
VARIAN/3300/7945	16Jul2002	GC/FID

_ANALYZER_READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis	Second Triad Analysis	Calibration Curve	
CARBON MONOXIDE			
Date: 09Jul2002Resp Unit:VOLTS	Date: 16Jul2002Resp Unit: VOLTS	Concentration=A+Bx+Cx2+Dx3+	
Z1=-0.00780=2.48780T1=1.23620	Z1=-0.01100=4.849001=1.22970	r=0.99999	1678
R2=2.486202=-0.006302=1.23510	R2=4.848202=-0.01490=1.22030	Constants:	A=1.2346E-0
Z3=-0.00580=1.23380R3=2.48580	Z3=-0.01260=1.218903=4.84890	B=1.0133E+01	C=
Avg. Conc: 12.50 PPM	Avg. Conc: 12.60 PPM	D=	E=
PROPANE			
Date: 16Jul2002Resp Unit:AREA		Concentration=A+Bx+Cx2+Dx3+	
Z1=0.000001=45905.001=63594.00		r=0.99999	1666
R2=45962.00=0.00000T2=63482.00		Constants:	A=5.0257E-0
Z3=0.000003=63485.003=46013.00		B=2.0337E-04	C=4.6567E-1
Avg. Conc: 13.00 PPM		D=	E=

APPROVED BY: (signature on file)
B. LEWIS, JR.

BCU04

~~RATA CLASS~~

Scott Specialty Gases

Dual-Analyzed Calibration Standard

6141 EASTON ROAD, BLDG 1,PLUMSTEADVILLE,PA 18949-0310 Phone: 800-331-4953 Fax: 215-766-7226

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

P.O. No.: E-N06925
Project No.: 01-00520-002

SCOTT SPECIALTY GASES
6141 EASTON ROAD, BLDG 1
PLUMSTEADVILLE,PA 18949-0310

Customer

TAMPA ELECTRIC COMPANY
Charles Dufeny
5010 CAUSEWAY BLVD
TAMPA FL 33619

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM006274 Certification Date: 20Nov2003 Exp. Date: 19Nov2006
Cylinder Pressure***: 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	18.0 %	+/- 1%	Direct NIST and NMi
OXYGEN	6.27 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1800	01Jan2004	H049491	18.05 %	CARBON DIOXIDE
NTRM 2658	02Oct2006	ALM065189	9.930 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
MTI/M200/170927	11Nov2003	GC-TCD
MTI/M200/170927	11Nov2003	GC-TCD

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis | Second Triad Analysis | Calibration Curve

CARBON DIOXIDE

Date: 20Nov2003	Response Unit:VOLTS	
Z1=0.00000	R1=823429.0	T1=823280.0
R2=823861.0	Z2=0.00000	T2=823408.0
Z3=0.00000	T3=823205.0	R3=823980.0
Avg. Concentration:	18.00	%

Concentration=A+Bx+Cx2+Dx3+Ex4
r=.999998 1800
Constants: A=7.7960E-03
B=2.1765E-05 C=
D= E=

OXYGEN

Date: 20Nov2003	Response Unit:VOLTS	
Z1=0.00000	R1=323031.0	T1=204444.0
R2=323018.0	Z2=0.00000	T2=204073.0
Z3=0.00000	T3=203961.0	R3=322371.0
Avg. Concentration:	6.270	%

Concentration=A+Bx+Cx2+Dx3+Ex4
r=.999998 2658
Constants: A=-2.2257E-02
B=3.0739E-05 C=
D= E=

APPROVED BY: Bradley C Millman
BRADLEY C. MILLMAN

BL003

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

6141 EASTON ROAD, BLDG 1,PLUMSTEADVILLE,PA 18949-0310 Phone: 800-331-4953 Fax: 215-766-7226

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

P.O. No.: E-N06925

Project No.: 01-01676-001

SCOTT SPECIALTY GASES
6141 EASTON ROAD, BLDG 1
PLUMSTEADVILLE,PA 18949-0310

Customer

TAMPA ELECTRIC COMPANY
CHARLES DUFENY
5010 CAUSEWAY BLVD
TAMPA FL 33619

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM040741 Certification Date: 15Dec2003 Exp. Date: 14Dec2006

Cylinder Pressure***: 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	11.0 %	+/- 1%	Direct NIST and NMi
OXYGEN	12.6 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1675	01Jun2004	K001509	13.93 %	CARBON DIOXIDE
NTRM 2658	02Oct2006	ALM065189	9.930 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
MTI/M200/170927	12Dec2003	GC-TCD
MTI/M200/170927	12Dec2003	GC-TCD

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis — Second Triad Analysis — Calibration Curve

CARBON DIOXIDE

First Triad Analysis		
Date: 12Dec2003	Response Unit:VOLTS	
Z1=0.00000	R1=636210.0	T1=503192.0
R2=636484.0	Z2=0.00000	T2=503158.0
Z3=0.00000	T3=503152.0	R3=636384.0
Avg. Concentration:	11.00	%

Calibration Curve	
Concentration=A+Bx+Cx2+Dx3+Ex4	
r=.999998	1675
Constants:	A=2.1891E-05
B=9.5568E-03	C=
D=	E=

OXYGEN

First Triad Analysis		
Date: 12Dec2003	Response Unit:VOLTS	
Z1=0.00000	R1=323325.0	T1=408839.0
R2=323240.0	Z2=0.00000	T2=409029.0
Z3=0.00000	T3=408900.0	R3=323094.0
Avg. Concentration:	12.60	%

Calibration Curve	
Concentration=A+Bx+Cx2+Dx3+Ex4	
r=.999997	2658
Constants:	A=-1.5960E-02
B=3.0872E-05	C=
D=	E=

APPROVED BY: [signature] BRADLEY C. MILLMAN

DC1102

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

6141 EASTON ROAD, BLDG 1,PLUMSTEADVILLE,PA 18949-0310 Phone: 800-331-4953 Fax: 215-766-7226

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

P.O. No.: E-N06925

SCOTT SPECIALTY GASES
6141 EASTON ROAD, BLDG 1
PLUMSTEADVILLE,PA 18949-0310

Project No.: 01-00520-001

Customer

TAMPA ELECTRIC COMPANY
Charles Dufeny
5010 CAUSEWAY BLVD
TAMPA FL 33619

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM006593 Certification Date: 21Nov2003 Exp. Date: 20Nov2006

Cylinder Pressure***: 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	5.02 %	+/- 1%	Direct NIST and NMi
OXYGEN	20.9 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2000	01Jun2005	K026511	5.006 %	CARBON DIOXIDE
NTRM 2659	01Jun2004	K012946	20.85 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
MTI/M200/170927	11Nov2003	GC-TCD
MTI/M200/170927	11Nov2003	GC-TCD

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis — Second Triad Analysis — Calibration Curve

CARBON DIOXIDE

First Triad Analysis:

Date: 20Nov2003	Response Unit:VOLTS	
Z1=0.00000	R1=228179.0	T1=228800.0
R2=228167.0	Z2=0.00000	T2=228776.0
Z3=0.00000	T3=228802.0	R3=228087.0
Avg. Concentration:	5.020	%

Calibration Curve:

Concentration=A+Bx+Cx2+Dx3+Ex4	
r=.999998	2000
Constants:	A=7.7960E-03
B=2.1765E-05	C=
D=	E=

OXYGEN

First Triad Analysis:

Date: 20Nov2003	Response Unit:VOLTS	
Z1=0.00000	R1=676019.0	T1=678740.0
R2=676160.0	Z2=0.00000	T2=678810.0
Z3=0.00000	T3=678820.0	R3=675892.0
Avg. Concentration:	20.90	%

Calibration Curve:

Concentration=A+Bx+Cx2+Dx3+Ex4	
r=.999998	2659
Constants:	A=-2.2257E-02
B=3.0739E-05	C=
D=	E=

APPROVED BY: Bradley C Millman

BRADLEY C. MILLMAN

APPENDIX B
NITROGEN OXIDES / SULFUR DIOXIDE FROM CEMS

B-1 BASELINE DATA

DATE	TIME	PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1OXY15	PC1CO211
03/30/2004	075800	39.291	18.907	185.289	13.172	10.968	8.333
03/30/2004	075900	38.804	19.102	185.360	13.306	10.967	8.359
03/30/2004	080000	38.658	18.980	183.810	13.255	10.989	8.351
03/30/2004	080100	38.996	18.760	184.386	13.091	10.982	8.347
03/30/2004	080200	39.485	19.061	184.696	13.293	10.977	8.363
03/30/2004	080300	39.246	18.802	184.278	13.089	10.962	8.379
03/30/2004	080400	38.302	18.700	184.529	13.049	10.982	8.368
03/30/2004	080500	38.302	19.030	184.481	13.284	10.985	8.384
03/30/2004	080600	39.812	19.198	184.154	13.400	10.984	8.395
03/30/2004	080700	39.812	19.293	184.217	13.460	10.980	8.395
03/30/2004	080800	39.398	19.222	184.676	13.397	10.972	8.387
03/30/2004	080900	39.406	19.224	184.459	13.391	10.967	8.398
03/30/2004	081000	39.118	19.168	184.537	13.354	10.968	8.391
03/30/2004	081100	38.732	18.994	185.734	13.243	10.975	8.375
03/30/2004	081200	38.159	19.309	185.285	13.452	10.968	8.402
03/30/2004	081300	37.618	19.371	184.471	13.503	10.973	8.390
03/30/2004	081400	37.737	19.423	184.733	13.526	10.965	8.392
03/30/2004	081500	37.608	19.113	184.507	13.340	10.984	8.384
03/30/2004	081600	37.608	19.361	184.222	13.480	10.963	8.400
03/30/2004	081700	38.671	19.176	184.419	13.343	10.958	8.395
03/30/2004	081800	38.671	19.066	185.384	13.248	10.946	8.396
03/30/2004	081900	39.404	18.822	184.817	13.095	10.957	8.397
03/30/2004	082000	40.254	19.060	183.681	13.283	10.971	8.388
03/30/2004	082100	40.581	18.982	183.771	13.226	10.969	8.384
03/30/2004	082200	40.587	19.395	184.038	13.529	10.979	8.404
03/30/2004	082300	41.108	19.669	184.212	13.737	10.989	8.403
03/30/2004	082400	40.327	19.637	184.590	13.682	10.969	8.403
03/30/2004	082500	39.663	19.516	184.000	13.630	10.989	8.388
03/30/2004	082600	38.166	19.849	184.150	13.599	10.992	8.387
03/30/2004	082700	38.166	19.849	185.530	13.859	10.987	8.397
03/30/2004	082800	37.365	19.703	185.134	13.757	10.987	8.395
03/30/2004	082900	37.365	19.534	184.808	13.617	10.973	8.390
03/30/2004	083000	36.915	19.251	183.814	13.434	10.982	8.392
03/30/2004	083100	36.406	19.503	183.719	13.626	10.992	8.391
03/30/2004	083200	37.018	19.571	184.310	13.663	10.986	8.389
03/30/2004	083300	38.445	19.375	184.311	13.490	10.963	8.393
03/30/2004	083400	36.810	19.394	185.142	13.543	10.988	8.395
03/30/2004	083500	36.362	19.630	184.682	13.701	10.984	8.391
03/30/2004	083600	36.211	19.472	182.822	13.638	11.013	8.393
03/30/2004	083700	36.297	19.728	184.939	13.812	11.010	8.400

03/30/2004 083800	36.310	19.848	184.769	13.881	11.001	8.398
03/30/2004 083900	35.944	19.726	184.785	13.768	10.984	8.387
03/30/2004 084000	34.965	19.365	184.334	13.516	10.984	8.387
03/30/2004 084100	34.495	19.779	185.513	13.818	10.992	8.383
03/30/2004 084200	35.121	19.687	184.584	13.739	10.983	8.382
03/30/2004 084300	35.842	19.716	184.322	13.774	10.992	8.390
03/30/2004 084400	36.370	19.489	184.875	13.625	10.998	8.378
03/30/2004 084500	28.871	16.768	184.361	11.694	10.977	6.245
03/30/2004 084600	23.632	11.036	183.893	7.707	10.988	5.761
03/30/2004 084700	35.536	18.659	184.407	13.048	11.000	8.020
03/30/2004 084800	36.411	18.904	183.822	13.191	10.982	8.102
03/30/2004 084900	36.262	18.810	184.519	13.152	10.999	8.147
03/30/2004 085000	34.977	19.273	185.076	13.470	10.995	8.179
03/30/2004 085100	35.202	19.112	184.978	13.362	10.998	8.202
03/30/2004 085200	36.801	19.361	184.139	13.546	11.004	8.238
03/30/2004 085300	36.739	19.447	183.373	13.575	10.985	8.248
03/30/2004 085400	36.524	19.270	183.214	13.493	11.011	8.259
03/30/2004 085500	36.358	19.602	184.641	13.742	11.021	8.286
03/30/2004 085600	36.912	19.625	184.775	13.743	11.012	8.288
03/30/2004 085700	36.671	19.495	183.780	13.664	11.019	8.300
03/30/2004 085800	37.485	19.565	183.966	13.713	11.019	8.320
	PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1OXY15	PC1CO211
	37.349	19.143	184.463	13.358	10.984	8.275

DATE	TIME	PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1OXY15	PC1CO211
03/30/2004	090500	37.347	19.349	184.517	13.563	11.020	8.344
03/30/2004	090600	39.047	19.484	184.531	13.658	11.020	8.349
03/30/2004	090700	39.201	19.608	185.155	13.699	10.992	8.371
03/30/2004	090800	39.891	19.329	185.070	13.518	11.001	8.383
03/30/2004	090900	41.412	19.496	184.620	13.647	11.008	8.391
03/30/2004	091000	41.753	19.654	184.202	13.721	10.986	8.397
03/30/2004	091100	41.853	19.254	184.637	13.479	11.009	8.393
03/30/2004	091200	41.809	19.659	184.927	13.792	11.027	8.398
03/30/2004	091300	41.809	19.649	185.069	13.801	11.037	8.395
03/30/2004	091400	41.501	19.854	185.148	13.894	11.006	8.399
03/30/2004	091500	40.709	19.606	184.547	13.779	11.042	8.391
03/30/2004	091600	41.109	19.782	184.628	13.891	11.035	8.380
03/30/2004	091700	40.936	19.564	184.116	13.735	11.033	8.377
03/30/2004	091800	41.102	19.354	184.465	13.537	11.002	8.368
03/30/2004	091900	40.301	19.129	184.211	13.423	11.029	8.360
03/30/2004	092000	39.664	19.558	183.982	13.739	11.038	8.371
03/30/2004	092100	39.292	19.574	184.778	13.727	11.024	8.360
03/30/2004	092200	39.292	19.236	183.454	13.487	11.022	8.362
03/30/2004	092300	40.399	19.641	184.090	13.809	11.045	8.374
03/30/2004	092400	40.399	19.869	184.716	13.964	11.042	8.373
03/30/2004	092500	40.261	19.682	184.687	13.795	11.019	8.375
03/30/2004	092600	40.566	19.386	184.295	13.620	11.039	8.375
03/30/2004	092700	39.955	19.366	184.043	13.568	11.016	8.367
03/30/2004	092800	39.555	19.307	184.930	13.548	11.029	8.374
03/30/2004	092900	39.844	19.620	184.945	13.728	11.005	8.382
03/30/2004	093000	40.877	19.243	183.485	13.506	11.031	8.372
03/30/2004	093100	41.942	19.330	183.809	13.588	11.044	8.363
03/30/2004	093200	41.945	19.562	184.272	13.745	11.040	8.363
03/30/2004	093300	42.354	19.755	184.468	13.808	10.996	8.376
03/30/2004	093400	42.111	19.298	184.497	13.526	11.019	8.379
03/30/2004	093500	39.150	19.528	184.746	13.710	11.033	8.370
03/30/2004	093600	38.615	19.627	184.374	13.756	11.019	8.366
03/30/2004	093700	39.546	19.330	184.297	13.522	11.003	8.374
03/30/2004	093800	39.143	19.423	183.907	13.587	11.003	8.376
03/30/2004	093900	38.732	19.414	184.554	13.581	11.003	8.364
03/30/2004	094000	40.055	19.241	184.787	13.427	10.982	8.353
03/30/2004	094100	40.593	19.087	183.562	13.387	11.025	8.360
03/30/2004	094200	41.593	19.623	184.440	13.803	11.049	8.399
03/30/2004	094300	42.379	19.789	184.634	13.921	11.050	8.386
03/30/2004	094400	42.080	19.621	183.757	13.803	11.050	8.374

03/30/2004 094500	34.018	16.729	183.098	11.796	11.070	6.336
03/30/2004 094600	26.898	11.029	183.661	7.766	11.058	5.690
03/30/2004 094700	39.605	18.893	183.918	13.289	11.049	8.021
03/30/2004 094800	40.154	18.793	184.416	13.200	11.037	8.100
03/30/2004 094900	40.857	18.819	184.368	13.242	11.052	8.135
03/30/2004 095000	40.800	19.139	184.299	13.416	11.020	8.147
03/30/2004 095100	40.988	19.050	184.745	13.388	11.042	8.187
03/30/2004 095200	41.739	19.209	184.939	13.516	11.052	8.218
03/30/2004 095300	41.836	19.576	185.270	13.761	11.044	8.254
03/30/2004 095400	42.767	19.557	185.049	13.710	11.021	8.279
03/30/2004 095500	44.262	19.210	184.272	13.475	11.026	8.287
03/30/2004 095600	43.195	19.236	184.162	13.530	11.049	8.296
03/30/2004 095700	43.897	19.377	184.014	13.605	11.034	8.303
03/30/2004 095800	43.424	19.433	183.102	13.630	11.025	8.313
03/30/2004 095900	43.099	19.115	183.388	13.413	11.029	8.308
03/30/2004 100000	44.153	19.368	184.888	13.609	11.040	8.334
03/30/2004 100100	44.896	19.434	184.662	13.616	11.016	8.348
03/30/2004 100200	45.165	19.077	184.332	13.417	11.048	8.358
03/30/2004 100300	43.524	19.257	184.181	13.495	11.018	8.372
03/30/2004 100400	40.212	19.122	184.347	13.407	11.022	8.379
03/30/2004 100500	38.582	18.912	184.046	13.287	11.039	8.367
	PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1OXY15	PC1CO211
	40.724	19.217	184.369	13.481	11.027	8.263

DATE	TIME	PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1OXY15	PC1CO211
03/30/2004	101500	42.911	18.938	185.034	13.270	11.017	8.370
03/30/2004	101600	43.186	19.074	184.203	13.400	11.039	8.392
03/30/2004	101700	43.186	19.171	183.586	13.400	10.996	8.391
03/30/2004	101800	44.545	18.904	183.055	13.264	11.028	8.384
03/30/2004	101900	43.482	18.958	184.027	13.314	11.036	8.381
03/30/2004	102000	43.476	19.173	183.885	13.459	11.032	8.382
03/30/2004	102100	44.611	19.021	184.429	13.360	11.037	8.387
03/30/2004	102200	43.559	19.131	183.423	13.448	11.044	8.395
03/30/2004	102300	41.591	19.407	184.491	13.646	11.046	8.403
03/30/2004	102400	41.591	19.575	184.503	13.734	11.028	8.408
03/30/2004	102500	42.038	19.391	184.714	13.641	11.050	8.413
03/30/2004	102600	42.038	19.604	184.511	13.816	11.065	8.418
03/30/2004	102700	44.020	19.635	184.748	13.801	11.043	8.424
03/30/2004	102800	44.870	19.079	184.520	13.394	11.033	8.416
03/30/2004	102900	46.092	19.011	183.873	13.372	11.049	8.421
03/30/2004	103000	46.093	18.982	184.231	13.344	11.044	8.429
03/30/2004	103100	45.937	19.100	184.079	13.414	11.036	8.429
03/30/2004	103200	44.813	19.174	184.259	13.456	11.042	8.431
03/30/2004	103300	44.813	19.174	184.097	13.484	11.047	8.428
03/30/2004	103400	45.054	18.929	183.412	13.299	11.039	8.415
03/30/2004	103500	43.320	18.945	183.603	13.321	11.046	8.409
03/30/2004	103600	41.944	19.103	183.803	13.442	11.052	8.411
03/30/2004	103700	41.830	19.264	183.390	13.576	11.065	8.410
03/30/2004	103800	41.744	19.383	183.845	13.619	11.040	8.408
03/30/2004	103900	41.220	19.264	183.589	13.539	11.042	8.395
03/30/2004	104000	41.421	19.231	183.721	13.527	11.049	8.415
03/30/2004	104100	40.652	19.374	184.616	13.640	11.057	8.423
03/30/2004	104200	38.861	19.579	185.573	13.767	11.046	8.434
03/30/2004	104300	38.316	19.418	184.319	13.663	11.052	8.427
03/30/2004	104400	38.054	19.427	183.810	13.670	11.052	8.423
03/30/2004	104500	30.270	16.615	183.962	11.694	11.054	6.334
03/30/2004	104600	25.130	10.805	184.764	7.617	11.068	5.744
03/30/2004	104700	38.346	18.618	184.922	13.107	11.056	8.044
03/30/2004	104800	38.553	18.463	184.531	12.979	11.044	8.133
03/30/2004	104900	39.978	18.193	184.750	12.791	11.045	8.155
03/30/2004	105000	40.406	18.622	184.751	13.133	11.071	8.187
03/30/2004	105100	41.642	19.044	184.620	13.411	11.059	8.226
03/30/2004	105200	43.075	18.824	184.578	13.245	11.052	8.258
03/30/2004	105300	43.527	19.101	184.227	13.476	11.074	8.262
03/30/2004	105400	44.645	19.390	183.752	13.673	11.070	8.274

03/30/2004	105500	44.730	19.148	183.476	13.489	11.062	8.280
03/30/2004	105600	44.626	19.192	183.871	13.530	11.068	8.297
03/30/2004	105700	44.377	19.304	183.879	13.594	11.059	8.322
03/30/2004	105800	42.898	19.345	183.676	13.618	11.056	8.331
03/30/2004	105900	42.898	19.273	183.418	13.535	11.036	8.341
03/30/2004	110000	41.196	19.096	183.704	13.403	11.031	8.342
03/30/2004	110100	40.904	18.957	183.191	13.325	11.043	8.348
03/30/2004	110200	41.221	19.137	183.162	13.449	11.042	8.346
03/30/2004	110300	40.396	19.149	184.281	13.450	11.037	8.359
03/30/2004	110400	39.534	19.177	185.911	13.468	11.036	8.374
03/30/2004	110500	39.155	19.332	185.949	13.614	11.059	8.365
03/30/2004	110600	39.252	19.495	185.413	13.742	11.067	8.361
03/30/2004	110700	38.431	19.555	185.365	13.779	11.064	8.353
03/30/2004	110800	38.391	19.523	185.164	13.696	11.027	8.365
03/30/2004	110900	37.519	18.972	185.182	13.310	11.027	8.371
03/30/2004	111000	37.904	19.256	185.116	13.543	11.048	8.382
03/30/2004	111100	39.665	19.525	184.144	13.747	11.057	8.396
03/30/2004	111200	39.988	19.567	185.398	13.748	11.040	8.395
03/30/2004	111300	40.264	19.376	184.339	13.613	11.039	8.378
03/30/2004	111400	41.986	19.182	183.420	13.488	11.046	8.378
03/30/2004	111500	42.227	19.131	182.971	13.448	11.044	8.384
		PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1OXY15	PC1CO211
		41.449	18.996	184.250	13.357	11.046	8.285

B-2 BIOMASS DATA

DATE	TIME	PC1SO216	PC1NOX13	PC1GEN12	PC1NOXC15	PC1CO211
04/01/2004	080100	45.326	19.010	183.695	13.400	8.340
04/01/2004	080200	45.994	18.751	184.736	13.195	8.347
04/01/2004	080300	47.048	18.578	185.336	13.074	8.351
04/01/2004	080400	48.472	18.919	185.171	13.334	8.366
04/01/2004	080500	49.140	19.087	184.403	13.448	8.365
04/01/2004	080600	46.837	18.658	184.468	13.147	8.370
04/01/2004	080700	46.837	18.578	184.326	13.066	8.359
04/01/2004	080800	46.360	18.795	185.022	13.228	8.367
04/01/2004	080900	45.288	18.875	185.495	13.307	8.362
04/01/2004	081000	44.286	19.079	184.958	13.460	8.355
04/01/2004	081100	43.226	18.958	184.887	13.336	8.356
04/01/2004	081200	38.956	18.681	184.830	13.181	8.368
04/01/2004	081300	37.796	18.992	184.614	13.387	8.359
04/01/2004	081400	39.348	18.923	183.272	13.348	8.354
04/01/2004	081500	40.166	18.756	183.825	13.232	8.356
04/01/2004	081600	39.951	19.167	184.309	13.542	8.367
04/01/2004	081700	38.838	19.184	184.604	13.534	8.359
04/01/2004	081800	38.838	19.086	185.024	13.459	8.376
04/01/2004	081900	39.052	19.302	185.423	13.614	8.387
04/01/2004	082000	37.959	19.162	185.237	13.527	8.379
04/01/2004	082100	36.135	19.412	184.699	13.720	8.366
04/01/2004	082200	35.456	19.519	184.506	13.779	8.356
04/01/2004	082300	34.359	19.306	184.939	13.612	8.354
04/01/2004	082400	33.984	19.361	184.975	13.657	8.369
04/01/2004	082500	32.026	19.290	184.094	13.609	8.374
04/01/2004	082600	35.570	19.203	184.040	13.572	8.360
04/01/2004	082700	35.570	19.309	184.661	13.609	8.350
04/01/2004	082800	36.911	19.234	183.895	13.556	8.350
04/01/2004	082900	36.911	18.982	182.959	13.388	8.363
04/01/2004	083000	35.901	19.288	184.187	13.603	8.367
04/01/2004	083100	37.325	19.450	184.497	13.712	8.355
04/01/2004	083200	38.314	19.334	184.499	13.630	8.360
04/01/2004	083300	37.842	19.492	184.515	13.748	8.376
04/01/2004	083400	38.164	19.406	184.330	13.665	8.387
04/01/2004	083500	38.238	18.806	183.724	13.244	8.376
04/01/2004	083600	39.286	19.168	183.900	13.520	8.363
04/01/2004	083700	40.943	19.243	184.957	13.602	8.363
04/01/2004	083800	42.176	19.743	184.386	13.952	8.378
04/01/2004	083900	41.252	19.669	184.583	13.876	8.371
04/01/2004	084000	40.924	19.558	183.964	13.811	8.362

04/01/2004 084100	40.810	19.488	184.573	13.780	8.353
04/01/2004 084200	40.149	19.758	184.851	13.998	8.353
04/01/2004 084300	38.989	19.997	185.174	14.210	8.360
04/01/2004 084400	38.168	20.054	183.492	14.219	8.341
04/01/2004 084500	33.086	18.329	184.392	12.993	7.025
04/01/2004 084600	21.937	9.811	184.946	6.951	5.037
04/01/2004 084700	37.636	19.090	184.484	13.559	7.949
04/01/2004 084800	38.409	19.529	183.677	13.824	8.090
04/01/2004 084900	37.185	19.034	183.230	13.441	8.132
04/01/2004 085000	35.585	19.004	183.632	13.425	8.163
04/01/2004 085100	34.299	19.461	183.395	13.817	8.181
04/01/2004 085200	36.085	20.025	184.732	14.178	8.195
04/01/2004 085300	37.938	19.878	184.544	14.081	8.223
04/01/2004 085400	38.836	20.098	184.357	14.247	8.263
04/01/2004 085500	38.298	19.946	185.486	14.143	8.274
04/01/2004 085600	38.304	20.021	184.107	14.181	8.276
04/01/2004 085700	39.191	19.882	184.046	14.091	8.287
04/01/2004 085800	40.008	20.093	183.777	14.226	8.301
04/01/2004 085900	40.118	19.669	183.704	13.905	8.290
04/01/2004 090000	41.453	19.470	184.714	13.792	8.281
04/01/2004 090100	42.612	19.861	184.957	14.082	8.303
	PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1CO211
	39.280	19.144	184.430	13.522	8.250

DATE	TIME	PC1SO216	PC1NOX13	PC1GEN12	PC1NOXC15	PC1CO211
04/01/2004	090700	39.616	20.268	184.334	14.347	8.315
04/01/2004	090800	39.562	19.845	183.939	14.022	8.341
04/01/2004	090900	37.833	19.765	184.146	14.026	8.344
04/01/2004	091000	36.880	19.889	184.694	14.094	8.333
04/01/2004	091100	36.465	20.061	185.099	14.223	8.354
04/01/2004	091200	36.620	20.184	185.076	14.320	8.355
04/01/2004	091300	39.337	20.215	184.489	14.349	8.342
04/01/2004	091400	40.111	19.905	183.866	14.132	8.338
04/01/2004	091500	40.000	20.026	184.461	14.181	8.345
04/01/2004	091600	39.415	20.088	185.007	14.249	8.356
04/01/2004	091700	40.029	20.148	184.361	14.308	8.362
04/01/2004	091800	40.068	20.202	184.079	14.307	8.351
04/01/2004	091900	39.635	20.028	184.534	14.189	8.370
04/01/2004	092000	38.494	20.045	184.688	14.189	8.377
04/01/2004	092100	38.410	20.001	184.261	14.195	8.371
04/01/2004	092200	38.911	20.281	183.607	14.377	8.371
04/01/2004	092300	37.773	19.880	183.612	14.055	8.364
04/01/2004	092400	37.932	19.577	184.959	13.838	8.361
04/01/2004	092500	38.648	19.805	185.677	14.014	8.363
04/01/2004	092600	39.585	19.887	185.079	14.059	8.371
04/01/2004	092700	40.349	19.674	184.673	13.876	8.370
04/01/2004	092800	41.418	19.416	184.338	13.708	8.377
04/01/2004	092900	41.631	19.292	183.978	13.620	8.363
04/01/2004	093000	42.700	19.485	182.968	13.753	8.357
04/01/2004	093100	43.124	19.351	183.787	13.649	8.342
04/01/2004	093200	41.212	19.050	184.362	13.438	8.356
04/01/2004	093300	41.212	19.340	185.831	13.693	8.360
04/01/2004	093400	41.320	19.734	185.283	13.964	8.357
04/01/2004	093500	41.719	19.518	184.419	13.768	8.368
04/01/2004	093600	39.637	19.178	183.825	13.556	8.364
04/01/2004	093700	40.613	19.295	184.776	13.658	8.339
04/01/2004	093800	41.353	19.614	184.541	13.906	8.336
04/01/2004	093900	41.849	19.857	184.763	14.059	8.346
04/01/2004	094000	43.122	19.763	184.305	13.974	8.356
04/01/2004	094100	42.494	19.552	183.850	13.817	8.348
04/01/2004	094200	42.857	19.390	184.320	13.732	8.318
04/01/2004	094300	43.020	19.594	184.060	13.847	8.326
04/01/2004	094400	41.944	19.263	183.438	13.614	8.340
04/01/2004	094500	36.891	17.971	184.718	12.718	7.103
04/01/2004	094600	23.486	9.509	184.547	6.742	4.969

04/01/2004 094700	39.267	18.263	183.945	12.998	7.945
04/01/2004 094800	40.171	18.415	183.738	13.125	8.036
04/01/2004 094900	39.756	18.505	183.463	13.132	8.060
04/01/2004 095000	39.270	18.664	183.964	13.232	8.117
04/01/2004 095100	37.704	18.245	184.977	12.907	8.106
04/01/2004 095200	37.465	18.561	185.385	13.118	8.161
04/01/2004 095300	38.035	18.468	184.354	13.071	8.171
04/01/2004 095400	39.070	18.403	184.416	12.991	8.182
04/01/2004 095500	39.638	18.248	184.345	12.883	8.185
04/01/2004 095600	40.599	18.055	183.970	12.741	8.208
04/01/2004 095700	41.218	18.371	183.739	12.964	8.243
04/01/2004 095800	40.793	18.515	184.533	13.065	8.264
04/01/2004 095900	39.082	18.415	185.384	12.999	8.259
04/01/2004 100000	38.179	18.772	185.464	13.240	8.301
04/01/2004 100100	38.516	19.075	184.466	13.498	8.329
04/01/2004 100200	39.040	19.229	183.721	13.651	8.311
04/01/2004 100300	39.915	18.893	183.830	13.390	8.279
04/01/2004 100400	41.202	18.866	184.124	13.358	8.301
04/01/2004 100500	42.409	18.943	184.332	13.415	8.300
04/01/2004 100600	42.629	18.875	184.210	13.367	8.305
04/01/2004 100700	42.499	19.338	183.889	13.726	8.324
	PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1CO211
	39.733	19.165	184.377	13.565	8.227

DATE	TIME	PC1SO216	PC1NOX13	PC1GEN12	PC1NOXC15	PC1CO211
04/01/2004	101400	40.592	18.811	183.786	13.287	8.318
04/01/2004	101500	40.449	18.848	184.368	13.334	8.297
04/01/2004	101600	41.006	19.070	184.202	13.488	8.286
04/01/2004	101700	40.599	19.237	184.601	13.589	8.319
04/01/2004	101800	39.190	19.012	184.514	13.440	8.334
04/01/2004	101900	37.679	18.809	183.791	13.247	8.338
04/01/2004	102000	38.205	18.888	184.186	13.311	8.364
04/01/2004	102100	39.276	18.877	184.012	13.321	8.354
04/01/2004	102200	39.276	19.361	185.293	13.657	8.345
04/01/2004	102300	40.134	19.416	184.634	13.696	8.354
04/01/2004	102400	40.484	19.047	183.856	13.460	8.353
04/01/2004	102500	40.710	18.879	183.872	13.368	8.315
04/01/2004	102600	40.157	18.860	185.119	13.321	8.329
04/01/2004	102700	37.328	19.010	184.486	13.416	8.344
04/01/2004	102800	37.684	19.219	184.285	13.554	8.310
04/01/2004	102900	38.464	18.937	184.062	13.377	8.296
04/01/2004	103000	39.280	18.762	184.066	13.282	8.296
04/01/2004	103100	39.280	19.044	184.480	13.443	8.335
04/01/2004	103200	38.979	19.200	184.279	13.563	8.352
04/01/2004	103300	38.979	19.357	184.948	13.661	8.362
04/01/2004	103400	38.444	19.151	183.897	13.530	8.339
04/01/2004	103500	37.379	19.029	183.862	13.460	8.326
04/01/2004	103600	35.717	19.064	183.873	13.490	8.334
04/01/2004	103700	34.870	19.353	186.176	13.648	8.369
04/01/2004	103800	32.153	19.218	184.055	13.574	8.385
04/01/2004	103900	32.598	18.939	183.446	13.419	8.332
04/01/2004	104000	35.115	18.792	184.205	13.300	8.313
04/01/2004	104100	34.449	19.223	184.742	13.544	8.377
04/01/2004	104200	35.750	19.246	184.172	13.566	8.391
04/01/2004	104300	38.308	19.147	184.428	13.503	8.384
04/01/2004	104400	38.165	19.196	185.746	13.541	8.405
04/01/2004	104500	33.230	18.239	185.538	12.878	7.138
04/01/2004	104600	22.426	9.446	184.213	6.670	5.007
04/01/2004	104700	38.636	18.084	183.712	12.802	7.970
04/01/2004	104800	40.045	18.147	183.680	12.842	8.068
04/01/2004	104900	39.452	18.348	184.450	12.997	8.118
04/01/2004	105000	39.467	18.708	184.924	13.227	8.186
04/01/2004	105100	40.108	19.002	184.384	13.428	8.227
04/01/2004	105200	38.774	18.948	184.235	13.390	8.231
04/01/2004	105300	38.464	19.358	183.886	13.685	8.245

04/01/2004	105400	39.757	19.025	183.535	13.488	8.229
04/01/2004	105500	40.026	19.086	183.923	13.526	8.220
04/01/2004	105600	40.750	19.368	184.074	13.697	8.267
04/01/2004	105700	41.794	19.058	184.676	13.461	8.268
04/01/2004	105800	40.987	19.210	184.741	13.572	8.283
04/01/2004	105900	39.547	19.097	184.255	13.510	8.293
04/01/2004	110000	38.241	19.437	184.514	13.741	8.313
04/01/2004	110100	38.561	19.323	184.626	13.629	8.322
04/01/2004	110200	38.306	19.225	184.347	13.561	8.317
04/01/2004	110300	39.308	19.183	183.809	13.538	8.330
04/01/2004	110400	39.820	19.205	184.249	13.567	8.334
04/01/2004	110500	40.808	19.286	184.920	13.595	8.314
04/01/2004	110600	40.808	18.942	185.396	13.368	8.330
04/01/2004	110700	40.496	18.912	184.964	13.315	8.331
04/01/2004	110800	41.988	18.840	184.828	13.288	8.334
04/01/2004	110900	42.466	19.258	184.634	13.588	8.325
04/01/2004	111000	42.121	19.169	185.070	13.519	8.326
04/01/2004	111100	41.872	18.980	185.202	13.382	8.342
04/01/2004	111200	39.938	18.923	184.489	13.345	8.345
04/01/2004	111300	39.091	18.933	184.480	13.333	8.330
04/01/2004	111400	40.199	18.648	184.233	13.132	8.346
		PC1SO211	PC1NOX12	PC1GEN13	PC1NOXC14	PC1CO211
		38.659	18.859	184.417	13.319	8.234

B-3 BASELINE DAILY CALIBRATION

Daily Calibration Summary
Polk Station
HRSG

Report Period
Day: 03/30/2004

		ZERO CAL				SPAN CAL			
	IRTP	TIME	ZERO	%CE	%ID	TIME	SPAN	%CE	%ID
SO2	1	6:42	0.20	0.200P	0.400	6:33	56.20	0.700P	1.100
NOX	1	6:42	-0.30	0.300P	0.100	6:33	55.10	0.700P	1.800
CO2(R-A)	1	6:42	0.00	0.000P	0.000	6:33	7.80	0.000P	0.100
OXY(R-A)	1	6:28	4.10	0.100P	0.200	6:33	21.10	0.200P	0.400
FLOW	1	6:33	25.00	1.667P	2.200	6:43	1066.2	1.413P	2.253
OPACITY									

Today's Date: 05/12/2004
Time: 04:21:08

%CE = Percent Calibration Error: CO2 is R-A
%ID = Percent Integrated Difference
P - Calibration Passed F - Calibration Failed

B-4 BIOMASS DAILY CALIBRATIONS

Daily Calibration Summary
Polk Station
HRSG

Report Period
Day: 04/01/2004

	IRTP	ZERO CAL TIME	ZERO	%CE	%ID	SPAN CAL TIME	SPAN	%CE	%ID
SO2	1	6:43	0.80	0.800P	1.000	6:33	56.60	1.100P	1.700
NOX	1	6:43	-0.20	0.200P	0.100	6:33	55.70	1.300P	3.400
CO2(R-A)	1	6:43	0.00	0.000P	0.000	6:33	7.70	0.100P	0.100
OXY(R-A)	1	6:29	4.10	0.100P	0.200	6:34	21.10	0.200P	0.400
FLOW	1	6:33	1.00	0.067P	0.853	6:43	1055.1	0.673P	1.853
OPACITY									

Today's Date: 05/12/2004
Time: 04:21:50

%CE = Percent Calibration Error: CO2 is R-A
%ID = Percent Integrated Difference
P - Calibration Passed F - Calibration Failed

APPENDIX C

TURBINE OPERATIONS

C-1 BASELINE

		Moisture% (Saturator) 1tsyai202	Fuel Flow (lbs/sec) 1tsyfi910	MW 1pwrji900	Fuel Flow (KSCFH) 1tsyfi100	N2 Flow 1nitfi920a
3/30/04 7:58	3/30/04 7:58	1.76538527	109.3964157	184.7263947	6955.739746	116.2141037
3/30/04 8:58	3/30/04 7:59	1.762609005	109.8530502	184.9797058	6991.661133	116.416069
1 min	3/30/04 8:00	1.759832859	109.9243317	185.2693329	6975.687012	116.7645645
	3/30/04 8:01	1.757056713	109.8150558	184.8553162	6943.228516	116.7131348
	3/30/04 8:02	1.754280448	110.3925552	186.0701141	6970.430664	117.1457214
	3/30/04 8:03	1.751504302	109.9297638	186.6891937	6997.527344	116.9562073
	3/30/04 8:04	1.748728156	110.1875	184.7523346	6949.746094	115.7682571
	3/30/04 8:05	1.745951891	109.6374359	185.4406281	6975.936523	117.859581
	3/30/04 8:06	1.743175745	109.3733139	185.0984192	6972.348633	115.9691849
	3/30/04 8:07	1.740399599	109.7330704	184.9598694	6979.143555	115.7415619
	3/30/04 8:08	1.737623334	109.530014	184.5641937	6977.109863	116.0039749
	3/30/04 8:09	1.734847188	110.6361771	185.8937073	6980.116699	117.1636047
	3/30/04 8:10	1.732071042	110.2673416	185.9105225	6978.828613	117.2403336
	3/30/04 8:11	1.729294777	109.1910248	184.2625275	6953.067871	116.6913605
	3/30/04 8:12	1.726518631	109.0008698	184.8301697	6969.111328	116.6237793
	3/30/04 8:13	1.723742485	109.4174042	184.4722748	6971.256836	115.5866241
	3/30/04 8:14	1.72096622	110.1008453	184.6017914	6999.874512	115.760704
	3/30/04 8:15	1.718190074	109.4816284	184.1831665	7000.552734	116.8991165
	3/30/04 8:16	1.715413928	108.4911652	183.9909058	6896.012695	117.0049133
	3/30/04 8:17	1.712637663	109.5577087	184.454483	6925.945801	116.2807999
	3/30/04 8:18	1.709861517	109.9822159	186.0364532	6934.477051	115.7872238
	3/30/04 8:19	1.707085371	109.9588318	186.3286743	6981.508301	116.7410812
	3/30/04 8:20	1.713505268	109.8736496	185.5142822	6974.205078	116.923996
	3/30/04 8:21	1.720582008	109.507431	184.6425476	6966.901855	117.0596085
	3/30/04 8:22	1.727658749	109.6859589	184.4181671	6959.599121	115.6283264
	3/30/04 8:23	1.734735489	110.0898819	184.6770782	6963.66748	115.846283
	3/30/04 8:24	1.741812229	110.1601791	184.884201	6992.944336	116.8176651
	3/30/04 8:25	1.748888969	109.9499893	185.5506134	6998.23291	116.5549011
	3/30/04 8:26	1.75596571	109.6837692	185.5231323	6992.486328	117.2715912
	3/30/04 8:27	1.76304245	109.7257919	184.0486908	6957.35791	116.0881271
	3/30/04 8:28	1.770119309	109.1240387	184.7467194	6950.415527	115.9252319
	3/30/04 8:29	1.77719605	109.8496399	185.1670837	6979.67627	116.3096085
	3/30/04 8:30	1.78427279	109.7859879	185.1882782	6979.861328	117.4505005
	3/30/04 8:31	1.79134953	109.6699066	185.0453644	6983.480957	117.5829544
	3/30/04 8:32	1.79842627	109.9911499	185.1780853	6999.966309	116.1908875
	3/30/04 8:33	1.805503011	109.6068954	185.5502014	6980.850098	117.2687454
	3/30/04 8:34	1.812579751	109.8898621	185.0162811	6992.320801	117.7469406
	3/30/04 8:35	1.819656491	110.1504593	185.2407684	6987.457031	115.7506943
	3/30/04 8:36	1.826733351	110.2248764	184.3952026	7011.993164	115.7059784
	3/30/04 8:37	1.833810091	109.3958054	184.7246552	6949.658691	116.3743134
	3/30/04 8:38	1.840886831	109.951683	184.9681091	6970.268555	116.0002213
	3/30/04 8:39	1.847963572	110.0307999	184.7589874	6959.117676	116.1894531
	3/30/04 8:40	1.855040312	109.720871	184.5301666	6945.367188	116.3262558
	3/30/04 8:41	1.862117052	109.9266205	185.4401398	6980.955566	116.8601379
	3/30/04 8:42	1.869193792	110.0201416	185.1933746	7024.302734	117.0183334
	3/30/04 8:43	1.876270652	109.8362045	185.1205902	7002.45459	116.332634
	3/30/04 8:44	1.883347392	109.457077	184.2980042	6933.572754	117.4294281
	3/30/04 8:45	1.890424132	109.5471268	183.9546661	6945.006836	116.0095901
	3/30/04 8:46	1.897500873	109.3984833	184.0291901	6960.774414	116.2319489
	3/30/04 8:47	1.904577613	109.3407974	185.6825256	6966.366211	116.4543076
	3/30/04 8:48	1.911654353	109.2621155	184.6406403	6944.573242	116.5137787
	3/30/04 8:49	1.918731093	109.9269714	184.3031921	6943.651367	115.868927
	3/30/04 8:50	1.925807834	108.9558029	184.6905823	6977.470215	116.9951706
	3/30/04 8:51	1.932884693	109.7338791	184.385498	6961.984863	116.2148209
	3/30/04 8:52	1.939961433	109.5276718	184.9124908	7003.608398	118.2399063
	3/30/04 8:53	1.947038174	110.4175797	185.2105408	7019.821289	116.7566605
	3/30/04 8:54	1.954114914	110.7290344	184.4886932	7035.399414	118.1862106
	3/30/04 8:55	1.961191654	109.5824432	184.5224762	6969.825195	117.5701218
	3/30/04 8:56	1.968268394	109.6615448	185.4285736	6985.274414	115.5242081
	3/30/04 8:57	1.975345135	110.1821671	184.7779694	6986.240234	117.0749817
	3/30/04 8:58	1.982421875	110.2129822	185.6124268	6970.65625	117.9578171
	Average	**1.807668123**	**109.764672**	**184.96443**	**6973.558658**	**116.61612**

		Moisture% (Saturator) 1tsyai202	Fuel Flow (lbs/sec) 1tsyfi910	MW 1pwrji900	Fuel Flow (KSCFH) 1tsyfi100	N2 Flow 1nitfi920a
3/30/04 9:05	3/30/04 9:05	2.031959295	110.0579071	186.279953	7006.155273	118.1111832
3/30/04 10:05	3/30/04 9:06	2.039036036	109.8219528	185.7554779	7009.851563	117.3999863
1 min	3/30/04 9:07	2.046112776	109.8879547	185.2316895	7012.968262	117.826149
	3/30/04 9:08	2.053189516	109.967308	184.8297272	6947.45752	117.2484512
	3/30/04 9:09	2.060266256	110.1443558	184.7855988	6987.376465	118.1168747
	3/30/04 9:10	2.067342997	110.3689651	184.8081055	6997.893066	117.2408676
	3/30/04 9:11	2.074419737	109.136261	184.5792084	6988.910645	116.6715469
	3/30/04 9:12	2.081496477	110.2303696	185.6570587	6985.94043	118.4532471
	3/30/04 9:13	2.088573217	109.0709	184.379776	6972.501953	117.3464737
	3/30/04 9:14	2.095649958	109.8938522	184.5502472	6981.28418	116.35215
	3/30/04 9:15	2.102726698	109.9041672	185.2121429	6998.297852	117.3528595
	3/30/04 9:16	2.109803438	109.8623505	185.0518494	6993.481934	119.0173874
	3/30/04 9:17	2.116880178	110.4139023	184.6168518	6999.471191	117.172348
	3/30/04 9:18	2.123957157	110.0237885	184.7590179	7005.459961	119.3824463
	3/30/04 9:19	2.131033897	109.8341217	185.6865845	6951.202637	117.0094833
	3/30/04 9:20	2.138110638	110.1126099	185.609436	6969.140625	117.5929413
	3/30/04 9:21	2.145187378	109.430954	184.5934906	6967.40918	118.0369034
	3/30/04 9:22	2.152264118	109.694458	184.2569427	6975.598145	116.8482056
	3/30/04 9:23	2.159340858	110.0381012	184.7526855	6983.787598	116.9679794
	3/30/04 9:24	2.166417599	110.6173935	184.9164734	7028.237305	118.2610092
	3/30/04 9:25	2.173494339	110.4006042	185.1046753	7000.491699	118.5253983
	3/30/04 9:26	2.180571079	110.8082657	185.4106293	7001.033691	118.3078384
	3/30/04 9:27	2.18764782	109.590332	184.7965546	6988.135254	118.6975021
	3/30/04 9:28	2.19472456	109.5417633	184.8202667	6990.347168	118.4113464
	3/30/04 9:29	2.195682049	110.1125336	184.5635986	6996.580566	116.290062
	3/30/04 9:30	2.196202278	110.4367218	184.7486725	7002.813965	117.4493637
	3/30/04 9:31	2.196722746	110.0500107	185.5113831	6988.524414	118.804657
	3/30/04 9:32	2.197242975	109.7759933	184.7272034	6944.345215	117.7370911
	3/30/04 9:33	2.197763443	110.3573685	184.5230713	7010.562012	117.6245346
	3/30/04 9:34	2.198283672	110.5141754	185.2966461	7002.743652	119.1161652
	3/30/04 9:35	2.19880414	109.6486893	184.8387299	6970.901367	119.1380615
	3/30/04 9:36	2.199324369	109.9878769	183.9609833	6985.684082	117.5678024
	3/30/04 9:37	2.199844837	110.2490311	184.1079407	7015.385254	118.0394974
	3/30/04 9:38	2.200365067	110.0872879	184.6356354	7011.47998	118.2305908
	3/30/04 9:39	2.200885534	110.2333832	184.7189484	7027.266602	118.2396851
	3/30/04 9:40	2.201405764	111.0832367	185.2327118	7006.519043	116.6442413
	3/30/04 9:41	2.201926231	110.082283	184.7777252	6994.099121	118.7229156
	3/30/04 9:42	2.202446461	109.8291092	185.02388	7002.962402	117.9438019
	3/30/04 9:43	2.202966928	109.9278793	185.2700348	6988.682617	117.2348404
	3/30/04 9:44	2.203487158	110.2386856	185.6064301	7012.989258	118.2369766
	3/30/04 9:45	2.204007626	109.9072037	186.047699	7008.803223	119.0590286
	3/30/04 9:46	2.204527855	110.2436218	185.0883484	6987.761719	118.1286697
	3/30/04 9:47	2.205048323	109.9852142	184.759201	6992.528809	118.6914139
	3/30/04 9:48	2.205568552	109.701149	184.732605	6984.871094	117.1315536
	3/30/04 9:49	2.206088781	109.5097198	184.1892853	6959.576172	118.1371689
	3/30/04 9:50	2.206609249	109.6035614	183.1941223	6968.038574	117.8732681
	3/30/04 9:51	2.207129478	110.4418945	185.6619415	7001.433105	117.5041656
	3/30/04 9:52	2.207649946	110.373703	185.3871918	6998.64502	118.7617798
	3/30/04 9:53	2.208170176	109.9394608	184.9917908	7015.568359	118.5118561
	3/30/04 9:54	2.208690643	110.4717331	184.5963898	7050.054688	117.6840057
	3/30/04 9:55	2.209210873	109.9217224	185.0498962	7025.791504	118.1641541
	3/30/04 9:56	2.20973134	109.0977173	184.581604	6960.230469	118.1292419
	3/30/04 9:57	2.21025157	109.6783371	184.6548309	6972.337402	116.923996
	3/30/04 9:58	2.210772038	110.363472	185.8716125	6989.491211	117.0736771
	3/30/04 9:59	2.211292267	110.2490311	185.7136688	7013.741211	118.9646759
	3/30/04 10:00	2.211812735	109.7338562	185.0022888	6992.828125	118.8862457
	3/30/04 10:01	2.212332964	110.0582428	185.3306732	6987.841309	117.9479218
	3/30/04 10:02	2.212853432	110.3425522	185.248764	6996.8125	118.8679733
	3/30/04 10:03	2.213373661	110.4307938	185.8833466	7013.604004	117.7231522
	3/30/04 10:04	2.213894129	110.6605835	185.8744965	7038.106934	119.1161041
	3/30/04 10:05	2.214414358	109.7071762	184.6506042	7012.677246	118.6515427
	Average	**2.168967044**	**110.0309451**	**184.99178**	**6994.667472**	

		Moisture% (Saturator)	Fuel Flow (lbs/sec)	MW	Fuel Flow (KSCFH)	N2 Flow
		1tsyai202	1tsyfi910	1pwrji900	1tsyfi100	1nitfi920a
3/30/04 10:15	3/30/04 10:15	2.219617844	110.6244049	185.2441711	7002.569336	119.2770081
3/30/04 11:15	3/30/04 10:16	2.220138073	110.3264389	185.3647614	7010.128418	118.7665024
1 min	3/30/04 10:17	2.220658541	110.6427231	185.0915527	7018.617676	117.8026962
	3/30/04 10:18	2.22117877	110.3354721	184.606308	7013.227539	117.9612961
	3/30/04 10:19	2.221699238	110.9603424	185.0807495	7002.59375	118.5072327
	3/30/04 10:20	2.222219467	109.7726212	184.6259613	7014.679199	118.6929092
	3/30/04 10:21	2.222739935	109.6072845	184.4364777	7015.286621	116.8398514
	3/30/04 10:22	2.223260164	109.7784348	184.7202911	6995.286133	118.0569916
	3/30/04 10:23	2.223780632	110.5633698	184.7554169	7035.753906	118.4259872
	3/30/04 10:24	2.224300861	110.6538239	184.8126831	7008.868652	118.3656006
	3/30/04 10:25	2.224821091	110.4001007	184.6370697	7012.592285	118.1162033
	3/30/04 10:26	2.225341558	109.7144852	184.0628967	6986.450684	119.6010284
	3/30/04 10:27	2.225861788	109.5898285	184.1754761	6977.525391	118.2646103
	3/30/04 10:28	2.226382256	109.6630783	184.4364777	6970.55957	117.4887924
	3/30/04 10:29	2.226902485	109.7561035	184.0740051	6970.362793	118.2031174
	3/30/04 10:30	2.227422953	109.5986176	184.3977509	6960.350098	118.9369812
	3/30/04 10:31	2.227943182	110.2083817	184.2422485	6978.405762	118.1287766
	3/30/04 10:32	2.22846365	110.2558594	184.8073883	7004.292969	117.5894012
	3/30/04 10:33	2.228983879	110.5065765	185.7363434	7015.319336	118.1069183
	3/30/04 10:34	2.229504347	110.3125153	185.5571136	7017.755859	118.6029816
	3/30/04 10:35	2.230024576	110.2753067	184.217041	6993.956543	118.2855835
	3/30/04 10:36	2.230545044	110.1854477	184.6301727	7001.006348	118.1539688
	3/30/04 10:37	2.231065273	110.8119431	184.855835	7008.056641	118.0392456
	3/30/04 10:38	2.231585741	110.8281174	185.7826385	7009.900391	117.2748337
	3/30/04 10:39	2.23210597	111.0026627	185.1234436	7011.228516	118.5289001
	3/30/04 10:40	2.232626438	111.0870667	185.1522369	7095.20166	119.0186691
	3/30/04 10:41	2.233146667	110.4794464	185.545639	7061.564453	117.5465622
	3/30/04 10:42	2.233667135	110.7192307	185.1057129	7029.806641	118.9435577
	3/30/04 10:43	2.234187365	110.1707535	185.2613983	7019.638672	118.8514786
	3/30/04 10:44	2.234707594	110.2909927	184.9229279	7047.893555	117.1307373
	3/30/04 10:45	2.235228062	110.5380325	184.6819153	7031.148438	118.6929855
	3/30/04 10:46	2.235748291	110.3447037	183.7736053	7014.40332	119.0962982
	3/30/04 10:47	2.236268759	110.5626068	184.3961029	7037.335449	118.9475327
	3/30/04 10:48	2.236788988	109.7766037	184.482254	7006.462402	118.6301575
	3/30/04 10:49	2.237309456	109.889679	184.4141541	7015.723633	117.7213211
	3/30/04 10:50	2.237829685	110.2258377	184.3460541	7011.305176	117.8353806
	3/30/04 10:51	2.238350153	110.2675705	184.4453278	7006.577637	119.6513062
	3/30/04 10:52	2.238870382	110.1123581	183.8930511	6991.177734	117.5981903
	3/30/04 10:53	2.23939085	109.921463	183.9121094	7002.704102	117.812851
	3/30/04 10:54	2.239911079	109.9743652	183.9892883	7015.171387	119.2767715
	3/30/04 10:55	2.240431547	111.1783981	186.2959747	7086.258301	118.2907944
	3/30/04 10:56	2.240951777	110.5730286	185.7728729	7045.764648	119.1470718
	3/30/04 10:57	2.241472244	111.0287781	186.0550537	7035.011719	118.1361465
	3/30/04 10:58	2.241992474	111.1682129	185.8282776	7058.274902	117.8429108
	3/30/04 10:59	2.242512941	110.4817123	185.6966095	7065.374512	118.3062515
	3/30/04 11:00	2.243033171	110.8009186	185.0326385	7039.225586	119.1815338
	3/30/04 11:01	2.243553638	110.9631653	185.6289673	7063.304199	117.9628296
	3/30/04 11:02	2.244073868	110.9240799	185.3747406	7085.598145	117.6538773
	3/30/04 11:03	2.244594097	111.1121292	185.6676636	7073.962402	118.3360519
	3/30/04 11:04	2.245114565	110.4901276	185.221756	7031.284668	118.7284393
	3/30/04 11:05	2.245634794	110.148674	184.5103302	7048.95459	118.916687
	3/30/04 11:06	2.246155262	110.1367111	183.2676239	7037.930176	119.2992401
	3/30/04 11:07	2.246675491	110.5999985	183.9151917	7030.66748	117.8761139
	3/30/04 11:08	2.247195959	110.8186417	185.0114441	7036.075684	118.1788101
	3/30/04 11:09	2.247716188	110.8204269	185.1786804	7041.483887	118.8627548
	3/30/04 11:10	2.248236656	111.1720428	184.6158295	7041.987793	118.247757
	3/30/04 11:11	2.248756886	111.1940842	185.2997589	7053.853516	118.0802994
	3/30/04 11:12	2.249277353	110.9536591	185.5827484	7059.273926	118.052124
	3/30/04 11:13	2.249797583	111.0080261	185.6736603	7040.416016	117.4967041
	3/30/04 11:14	2.25031805	110.5845337	185.5442963	7033.553711	118.5101318
	3/30/04 11:15	2.25083828	110.1272583	185.7365723	7055.59668	119.3498306
	Average	**2.23522805**	**110.4429386**	**184.89683**	**7024.34002**	**118.34799**

C-2 BIOMASS

		Moisture% (Saturatcuel Flow (lbs/se	MW	'uel Flow (KSCFH	N2 Flow	
		1tsyai202	1tsyfi910	1pwrji900	1tsyfi100	1nitfi920a
04/01/2004 8:01	01-Apr-04 08:01:00	2.74811554	111.9244232	185.7603	7108.290039	117.8719
04/01/2004 9:01	01-Apr-04 08:02:00	2.747807026	111.4752655	185.1209	7072.324219	118.586
1 min	01-Apr-04 08:03:00	2.747498512	111.7880783	185.2742	7095.119629	118.4672
	01-Apr-04 08:04:00	2.747189999	111.2373199	185.5632	7055.866211	118.3109
	01-Apr-04 08:05:00	2.746881247	110.9214554	184.2474	7040.135742	119.2814
	01-Apr-04 08:06:00	2.746572733	111.5707397	183.9541	7063.108398	118.4322
	01-Apr-04 08:07:00	2.746264219	111.3976974	184.7225	7069.580566	117.2664
	01-Apr-04 08:08:00	2.745955706	111.0573044	184.8082	7051.080078	118.4783
	01-Apr-04 08:09:00	2.745647192	111.2159882	185.4265	7050.819336	119.215
	01-Apr-04 08:10:00	2.745338678	112.1900101	185.9311	7089.191406	117.8492
	01-Apr-04 08:11:00	2.745029926	111.8054733	186.0875	7086.380371	119.478
	01-Apr-04 08:12:00	2.744721413	111.628067	185.5471	7061.415527	118.3162
	01-Apr-04 08:13:00	2.744412899	111.4392548	185.1598	7067.960938	118.7438
	01-Apr-04 08:14:00	2.744104385	111.6563339	185.1598	7062.260742	119.1267
	01-Apr-04 08:15:00	2.743795872	112.0091858	185.8966	7083.691406	118.4479
	01-Apr-04 08:16:00	2.743487358	111.8152847	184.9397	7066.774902	118.9002
	01-Apr-04 08:17:00	2.743178606	111.4171753	184.4199	7052.401367	117.8599
	01-Apr-04 08:18:00	2.742870092	111.3449478	184.9159	7052.510254	118.1177
	01-Apr-04 08:19:00	2.742561579	111.4642105	185.1457	7062.309082	120.4249
	01-Apr-04 08:20:00	2.742253065	111.9542542	183.1946	7065.941895	119.0127
	01-Apr-04 08:21:00	2.741944551	111.8738251	184.7185	7082.597656	118.881
	01-Apr-04 08:22:00	2.741636038	111.3946991	185.2377	7078.574707	118.2812
	01-Apr-04 08:23:00	2.741327286	111.8947754	185.1598	7072.666504	117.9667
	01-Apr-04 08:24:00	2.741018772	111.7516174	185.1152	7078.404297	118.2605
	01-Apr-04 08:25:00	2.740710258	111.7505417	185.1378	7077.312988	119.065
	01-Apr-04 08:26:00	2.740401745	111.4030838	184.4111	7066.043457	118.3535
	01-Apr-04 08:27:00	2.740093231	110.754303	184.0216	7046.446289	118.5797
	01-Apr-04 08:28:00	2.739784479	110.8915405	185.4985	7063.927246	117.6166
	01-Apr-04 08:29:00	2.739475965	112.1601181	184.3962	7087.876465	118.661
	01-Apr-04 08:30:00	2.739167452	110.8532944	184.7072	7078.615234	119.1496
	01-Apr-04 08:31:00	2.738858938	110.91922	184.4902	7055.875	117.6503
	01-Apr-04 08:32:00	2.738550425	111.4552765	184.5776	7049.137695	118.4986
	01-Apr-04 08:33:00	2.738241911	111.4253616	185.4685	7066.032227	118.7429
	01-Apr-04 08:34:00	2.737933159	111.4549484	185.8828	7083.605957	118.1597
	01-Apr-04 08:35:00	2.737624645	111.0364075	184.2717	7031.925781	118.1615
	01-Apr-04 08:36:00	2.737316132	111.0838928	184.4853	7037.227051	118.5027
	01-Apr-04 08:37:00	2.737007618	111.5596237	185.9046	7061.348145	118.4174
	01-Apr-04 08:38:00	2.736699104	111.6040497	185.987	7066.261719	118.4458
	01-Apr-04 08:39:00	2.736390591	111.1551666	184.5882	7047.732422	117.8689
	01-Apr-04 08:40:00	2.736081839	111.1197205	183.9263	7048.282227	119.2592
	01-Apr-04 08:41:00	2.735773325	111.4144135	184.7838	7058.366211	119.1761
	01-Apr-04 08:42:00	2.735464811	110.9517212	184.1124	7043.57666	117.671
	01-Apr-04 08:43:00	2.735156298	111.3117294	185.2903	7046.6875	118.1581
	01-Apr-04 08:44:00	2.734847784	111.6485977	185.5168	7059.597168	118.7771
	01-Apr-04 08:45:00	2.73453927	111.6432266	185.3021	7094.885254	118.551
	01-Apr-04 08:46:00	2.734230518	111.9833374	185.6132	7082.523926	118.498
	01-Apr-04 08:47:00	2.733922005	111.7995911	185.1917	7075.703613	118.7673
	01-Apr-04 08:48:00	2.733613491	111.4221649	184.7503	6995.489746	117.7027
	01-Apr-04 08:49:00	2.733304977	111.3459778	185.0998	7072.600586	118.2591
	01-Apr-04 08:50:00	2.732996464	111.0583801	184.2945	7059.691406	118.6778
	01-Apr-04 08:51:00	2.73268795	111.2754288	185.0065	7057.754883	118.661
	01-Apr-04 08:52:00	2.732379198	111.4361801	185.6267	7094.527344	117.8307
	01-Apr-04 08:53:00	2.732070684	111.251564	185.0001	7073.962402	118.8634
	01-Apr-04 08:54:00	2.731762171	112.0473099	185.1329	7081.10791	119.2049
	01-Apr-04 08:55:00	2.731453657	111.2334061	185.1326	7049.458008	118.2642
	01-Apr-04 08:56:00	2.731145144	111.5147858	184.2882	7078.190918	118.3785
	01-Apr-04 08:57:00	2.730836391	111.6537323	185.3154	7086.918457	116.7272
	01-Apr-04 08:58:00	2.730527878	111.0479355	185.3154	7071.564453	118.8344
	01-Apr-04 08:59:00	2.730219364	111.1191864	184.5471	7039.927246	119.6669
	01-Apr-04 09:00:00	2.729910851	110.8183975	184.6837	7038.626465	118.6488
	01-Apr-04 09:01:00	2.729602337	110.8628693	185.233	7015.586914	117.4967
	Average	**2.74**	**111.44**	**184.99**	**7064.16**	**118.48**

		Moisture% (Saturatcuel Flow (lbs/se	MW	'uel Flow (KSCFH	N2 Flow
		1tsyai202	1tsyfi910	1pwrji900	1tsyfi100	1nitfi920a
04/01/2004 9:07	01-Apr-04 09:07:00	2.727751017	111.8190155	185.5388	7057.291504	118.5493
04/01/2004 10:07	01-Apr-04 09:08:00	2.727442503	111.9098511	184.931	7048.745605	117.6337
1 min	01-Apr-04 09:09:00	2.727133751	111.2967911	184.5419	7060.023438	117.8337
	01-Apr-04 09:10:00	2.726825237	111.4832993	184.9438	7078.087402	118.2985
	01-Apr-04 09:11:00	2.726516724	111.6791763	185.2458	7064.123047	118.5544
	01-Apr-04 09:12:00	2.727150679	110.9891052	184.9469	7045.450195	118.069
	01-Apr-04 09:13:00	2.755120039	110.739769	184.4642	7019.742676	118.221
	01-Apr-04 09:14:00	2.783089161	110.3500366	183.7388	7005.19043	118.6988
	01-Apr-04 09:15:00	2.811058521	111.3905258	185.2986	7028.485352	118.8084
	01-Apr-04 09:16:00	2.839027643	112.1661987	186.3534	7068.522949	117.7681
	01-Apr-04 09:17:00	2.866997004	111.1004944	185.7241	7097.489746	118.454
	01-Apr-04 09:18:00	2.894966125	111.8500061	185.3491	7095.489746	119.1144
	01-Apr-04 09:19:00	2.921564341	111.7073593	184.9858	7051.861328	118.883
	01-Apr-04 09:20:00	2.922112703	111.7322311	184.9995	7085.714355	119.3001
	01-Apr-04 09:21:00	2.922661304	110.9265442	185.0133	7060.175293	117.6155
	01-Apr-04 09:22:00	2.923209667	110.912941	184.1906	7053.507324	119.0861
	01-Apr-04 09:23:00	2.92375803	111.2945175	184.208	7065.124512	119.0035
	01-Apr-04 09:24:00	2.924306631	112.1322327	186.1876	7136.59082	118.1215
	01-Apr-04 09:25:00	2.924854994	111.9628372	185.9581	7146.858398	117.6118
	01-Apr-04 09:26:00	2.925403357	112.3850174	185.1747	7068.598145	118.9167
	01-Apr-04 09:27:00	2.925951958	111.1165161	184.3417	7044.865723	118.3885
	01-Apr-04 09:28:00	2.92650032	111.1299286	185.4308	7042.470703	118.7147
	01-Apr-04 09:29:00	2.927048683	111.4466858	185.7274	7092.800781	118.0732
	01-Apr-04 09:30:00	2.927597284	111.7579956	186.0295	7101.197754	118.5188
	01-Apr-04 09:31:00	2.928145647	111.9877625	184.9559	7097.037598	118.4661
	01-Apr-04 09:32:00	2.92869401	111.1477051	184.2763	7028.511719	119.349
	01-Apr-04 09:33:00	2.929242611	111.1341858	184.4845	7055.517578	117.6016
	01-Apr-04 09:34:00	2.929790974	111.0916748	184.1013	7032.580078	117.9882
	01-Apr-04 09:35:00	2.930339336	111.2664185	184.7203	7043.209961	118.765
	01-Apr-04 09:36:00	2.930887938	110.9153976	185.2065	7036.762207	119.3672
	01-Apr-04 09:37:00	2.9314363	110.8505478	185.2749	7040.0625	118.2445
	01-Apr-04 09:38:00	2.931984663	110.9208374	185.4376	7041.067871	119.1245
	01-Apr-04 09:39:00	2.932533264	110.5076752	184.7327	7022.24707	119.2514
	01-Apr-04 09:40:00	2.933081627	111.4838867	184.1734	7056.61084	118.098
	01-Apr-04 09:41:00	2.93362999	111.4418869	184.1193	7059.404785	119.7562
	01-Apr-04 09:42:00	2.934178591	111.5426636	185.3333	7058.956543	118.3565
	01-Apr-04 09:43:00	2.934726954	111.2033463	186.1174	7068.755371	118.2495
	01-Apr-04 09:44:00	2.935275316	111.1746445	185.2744	7055.049805	118.2507
	01-Apr-04 09:45:00	2.935823917	110.8532944	184.8759	7055.54248	118.0521
	01-Apr-04 09:46:00	2.93637228	111.078476	185.0562	7022.382324	118.8088
	01-Apr-04 09:47:00	2.936920643	110.8358994	184.8491	7029.887207	117.6425
	01-Apr-04 09:48:00	2.937469244	111.1471939	184.642	7019.427734	118.1885
	01-Apr-04 09:49:00	2.938017607	111.1453781	184.808	7068.651367	118.2313
	01-Apr-04 09:50:00	2.938565969	111.6708069	185.9014	7063.719238	118.3844
	01-Apr-04 09:51:00	2.939114571	111.6856232	186.0576	7113.490234	118.2286
	01-Apr-04 09:52:00	2.939662933	111.6711426	185.4182	7101.587891	116.9815
	01-Apr-04 09:53:00	2.940211296	110.8574448	184.2827	7060.285156	118.4975
	01-Apr-04 09:54:00	2.940759897	110.9483643	184.5605	7035.430664	119.1543
	01-Apr-04 09:55:00	2.94130826	110.8760147	184.5668	7053.098145	119.0878
	01-Apr-04 09:56:00	2.941856623	111.8237915	184.8154	7080.708984	118.1053
	01-Apr-04 09:57:00	2.942405224	111.3969269	184.8471	7115.009766	117.5594
	01-Apr-04 09:58:00	2.942953587	111.2735672	184.6358	7127.710938	119.0453
	01-Apr-04 09:59:00	2.943501949	110.7548752	184.4245	7035.73584	118.757
	01-Apr-04 10:00:00	2.94405055	111.3212509	184.7368	7039.192383	118.0521
	01-Apr-04 10:01:00	2.944598913	111.7549667	185.5213	7068.03418	117.5695
	01-Apr-04 10:02:00	2.945147276	111.168457	185.6243	7078.49707	118.9225
	01-Apr-04 10:03:00	2.945695877	111.4905701	185.3789	7067.331543	119.0735
	01-Apr-04 10:04:00	2.94624424	110.5707932	184.4847	7042.373047	118.8824
	01-Apr-04 10:05:00	2.946792603	110.7777634	184.0884	7036.187012	118.8737
	01-Apr-04 10:06:00	2.947341204	111.098465	185.1636	7079.841309	118.5679
	01-Apr-04 10:07:00	2.947889566	110.7205429	184.78	7093.834961	118.2622
	Average	**2.90**	**111.29**	**185.00**	**7062.33**	

		Moisture% (Saturat	uel Flow (lbs/se	MW	uel Flow (KSCFH	N2 Flow
		1tsyai202	1tsyfi910	1pwrji900	1tsyfi100	1nitfi920a
04/01/2004 10:14	01-Apr-04 10:14:00	2.951728582	111.4110794	185.2832	7082.575195	118.7121
04/01/2004 11:14	01-Apr-04 10:15:00	2.952276945	111.1725998	183.8914	7061.727539	118.1087
1 min	01-Apr-04 10:16:00	2.952825546	110.5435333	184.834	7041.052734	118.8151
	01-Apr-04 10:17:00	2.953373909	111.7805481	184.6765	7066.903809	118.7584
	01-Apr-04 10:18:00	2.953922272	110.8304062	185.1614	7082.720215	118.2197
	01-Apr-04 10:19:00	2.954470873	111.3036804	184.9707	7061.146973	117.8789
	01-Apr-04 10:20:00	2.955019236	110.8274841	184.8476	7039.349121	119.1017
	01-Apr-04 10:21:00	2.955567598	111.2851028	184.7245	7050.996094	119.2455
	01-Apr-04 10:22:00	2.956116199	111.4618073	185.1065	7053.183594	118.435
	01-Apr-04 10:23:00	2.956664562	110.2151566	184.7949	7075.18457	117.8569
	01-Apr-04 10:24:00	2.957212925	111.3779831	184.9517	7063.450684	119.0335
	01-Apr-04 10:25:00	2.957761526	110.9759216	184.7719	7054.540039	117.551
	01-Apr-04 10:26:00	2.958309889	111.3385391	184.9166	7054.906738	118.6896
	01-Apr-04 10:27:00	2.958858252	111.3097153	184.4511	7085.732422	117.6955
	01-Apr-04 10:28:00	2.959406853	112.3257065	186.1769	7107.40332	118.8245
	01-Apr-04 10:29:00	2.959955215	111.7899094	185.5511	7089.900391	118.9045
	01-Apr-04 10:30:00	2.960503578	110.3440552	183.8771	7061.299316	118.8958
	01-Apr-04 10:31:00	2.961052179	111.7617416	184.5461	7079.26709	117.3686
	01-Apr-04 10:32:00	2.961600542	111.2616348	185.2189	7092.100586	117.9934
	01-Apr-04 10:33:00	2.962148905	111.7928848	184.9767	7080.733398	119.1024
	01-Apr-04 10:34:00	2.962697506	111.4054718	184.9609	7074.866699	118.7451
	01-Apr-04 10:35:00	2.963245869	112.199852	185.4832	7085.40625	117.859
	01-Apr-04 10:36:00	2.963794231	112.0043869	186.324	7087.456055	117.78
	01-Apr-04 10:37:00	2.964342833	111.9180832	185.1773	7102.67627	118.8114
	01-Apr-04 10:38:00	2.964891195	111.0064011	184.5848	7030.453125	118.6768
	01-Apr-04 10:39:00	2.965439558	111.3760757	184.3078	7020.628418	118.5076
	01-Apr-04 10:40:00	2.965988159	111.0830994	184.6852	7045.947754	118.8333
	01-Apr-04 10:41:00	2.966536522	111.8652954	185.4019	7079.500488	117.359
	01-Apr-04 10:42:00	2.967084885	111.7723618	185.2977	7106.213379	117.8476
	01-Apr-04 10:43:00	2.967633486	111.942131	184.8085	7073.229004	118.5476
	01-Apr-04 10:44:00	2.968181849	111.4653473	184.7463	7076.89209	118.3086
	01-Apr-04 10:45:00	2.968730211	110.857338	184.1925	7047.006836	118.6916
	01-Apr-04 10:46:00	2.969278812	111.0947189	184.0094	7055.815918	117.5131
	01-Apr-04 10:47:00	2.969827175	111.1188049	184.7642	7051.154785	118.1667
	01-Apr-04 10:48:00	2.970375538	111.2729492	184.7962	7046.366699	118.6153
	01-Apr-04 10:49:00	2.970924139	111.5165787	185.7324	7065.276367	118.7997
	01-Apr-04 10:50:00	2.971472502	111.4053802	184.7609	7069.45752	117.6976
	01-Apr-04 10:51:00	2.972020864	111.2611771	185.1704	7005.652832	118.6975
	01-Apr-04 10:52:00	2.972569466	111.3419037	185.023	7058.072754	118.9488
	01-Apr-04 10:53:00	2.973117828	111.2378311	185.2405	7067.361816	117.9418
	01-Apr-04 10:54:00	2.973666191	110.9631653	184.3854	7049.736816	118.2971
	01-Apr-04 10:55:00	2.974214792	111.7327423	184.6397	7072.931641	117.7198
	01-Apr-04 10:56:00	2.974763155	111.8564377	185.1255	7074.543945	118.4708
	01-Apr-04 10:57:00	2.975311518	112.7576523	186.2218	7135.838867	118.333
	01-Apr-04 10:58:00	2.975860119	111.9356155	185.4997	7104.250977	119.0375
	01-Apr-04 10:59:00	2.976408482	112.1120605	185.5254	7107.232422	118.6825
	01-Apr-04 11:00:00	2.976956844	111.8935242	184.94	7111.852051	118.4844
	01-Apr-04 11:01:00	2.977505445	111.4733963	185.4008	7100.792969	118.798
	01-Apr-04 11:02:00	2.978053808	111.931778	185.8615	7125.504883	119.0872
	01-Apr-04 11:03:00	2.978602171	111.6071091	185.138	7120.041016	118.1666
	01-Apr-04 11:04:00	2.979150772	111.1924744	184.3299	7053.941406	118.9954
	01-Apr-04 11:05:00	2.979699135	111.2302017	184.8392	7029.740723	117.8771
	01-Apr-04 11:06:00	2.980247498	110.7636108	184.1891	7050.910156	117.7721
	01-Apr-04 11:07:00	2.980796099	111.4506989	185.8007	7120.019531	118.5221
	01-Apr-04 11:08:00	2.981344461	112.0294418	185.2071	7081.615234	118.7168
	01-Apr-04 11:09:00	2.981892824	112.2556229	185.7709	7112.37793	118.8294
	01-Apr-04 11:10:00	2.982441425	111.0899429	184.3687	7037.619629	117.9702
	01-Apr-04 11:11:00	2.982989788	111.2047119	184.4516	7086.435547	118.1336
	01-Apr-04 11:12:00	2.983538151	112.4226532	185.1225	7098.719238	119.4743
	01-Apr-04 11:13:00	2.984086752	111.4131622	185.2177	7071.87207	119.4193
	01-Apr-04 11:14:00	2.984635115	111.6755753	185.7178	7079.03418	118.6839
	Average	**2.97**	**111.46**	**185.00**	**7073.09**	**118.44**

APPENDIX D

FUEL ANALYSIS

D-1 BASELINE

TECO
TAMPA ELECTRIC

Synthetic Gas and Heating Value Calculations

Customer: **Tampa Electric Company** **Sample ID:** **Polk Lab**

Facility: **Polk Power Station** **Analysis Date:** **03/30/2004**

Source: **Unit #1**

CALCULATION OF DENSITY AND HEATING VALUE @ 60°F and 30 in Hg

Component	% Volume	Molecular Wt.	Density * (lb/ft^3)	% volume x Density	weight %	Component Gross Btu/lb	Weight Fract. Btu	Gross * Heating Value (Btu/SCF)	Volume Fract. Btu
Hydrogen	35.0800	2.016	0.0053	0.00186	3.2904	61100	2010.41	325.0	114.01
Oxygen	0.9157	32.000	0.0846	0.00077	1.3710	0	0.00	0.0	0
Nitrogen	5.8505	28.016	0.0744	0.00435	7.7032	0	0.00	0.0	0
CO2	15.0529	44.010	0.1170	0.01761	31.1683	0	0.00	0.0	0
CO	43.0562	28.010	0.0740	0.03186	56.3865	4347	2451.12	322.0	138.641
Methane	0.0430	16.041	0.0424	0.00002	0.0323	23879	7.70	1013.0	0.43559
Ethane		30.067	0.0803	0.00000	0.0000	22320	0.00	1792.0	0
Ethylene		28.051	0.0746	0.00000	0.0000	21644	0.00	1614.0	0
Propane		44.092	0.1196	0.00000	0.0000	21661	0.00	2590.0	0
propylene		42.077	0.1110	0.00000	0.0000	21041	0.00	2336.0	0
Isobutane		58.118	0.1582	0.00000	0.0000	21257	0.00	3363.0	0
n-butane		58.118	0.1582	0.00000	0.0000	21308	0.00	3370.0	0
Isobutene		56.102	0.1480	0.00000	0.0000	20730	0.00	3068.0	0
Isopentane		72.144	0.1904	0.00000	0.0000	21052	0.00	4008.0	0
n-pentane		72.144	0.1904	0.00000	0.0000	21091	0.00	4016.0	0
n-hexane		86.169	0.2274	0.00000	0.0000	20940	0.00	4762.0	0
H2S	0.0300	34.076	0.0911	0.00003	0.0484	7100	3.43	647.0	0.1941
Total:	100.03	Average Density		0.05651	100.0000	**Gross Heating Value**			
		Specific Gravity		0.73864		**Btu/lb**	**4473**	**Btu/SCF**	**253.28**

* Density (lb/ft^3) and Gross Heating Value (Btu/scf) data from <u>Perry's Chemical Engineering Handbook</u>.

TECO
TAMPA ELECTRIC

Synthetic Gas and Heating Value Calculations

Customer: Tampa Electric Company **Sample ID: Polk Lab**
Facility: Polk Power Station **Analysis Date: 03/30/2004**
Source: Unit #1

CALCULATION OF F FACTORS

						Weight Percents			
Componen	**Mol. Wt.**	**C Factor**	**H Factor**	**% volume**	**Fract. Wt.**	**Carbon**	**Hydrogen**	**Nitrogen**	**Oxygen**
Hydrogen	2.016	0	1	35.080	70.7213		3.3138293		
Oxygen	32.000	0	0	0.916	29.3024				1.3730401
Nitrogen	28.016	0	0	5.851	163.9076			7.680316768	
CO2	44.010	0.272273	0	15.053	662.4781	8.45193487			22.567631
CO	28.010	0.42587	0	43.056	1206.0042	24.0661087			32.47656
Methane	16.041	0.75	0.25	0.043	0.6898	0.02424048	0.0080802		
Ethane	30.067	0.8	0.2	0.000	0.0000	0	0		
Ethylene	28.051	0.85714	0.14286	0.000	0.0000	0	0		
Propane	44.092	0.81818	0.181818	0.000	0.0000	0	0		
Propene	42.077	0.85714	0.14286	0.000	0.0000	0	0		
Isobutane	58.118	0.82759	0.17247	0.000	0.0000	0	0		
n-butane	58.118	0.82759	0.17247	0.000	0.0000	0	0		
Isobutene	56.102	0.85714	0.14286	0.000	0.0000	0	0		
Isopentane	72.144	0.83333	0.16667	0.000	0.0000	0	0		
n-pentane	72.144	0.83333	0.16667	0.000	0.0000	0	0		
n-hexane	86.169	0.83721	0.16279	0.000	0.0000	0	0		
H2S	34.076	0	0.0586923	0.030	1.0223	0	0.0028115		
Totals				100.02830	2134.1256	32.5422841	3.32	7.680316768	56.417231

CALCULATED VALUES		
O2 F Factor (dry), Fd	**8276**	DSCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
O2 F Factor (wet), Fw	**9710**	SCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
Moisture F Factor	**1435**	SCF of Water/MM Btu of Fuel Burned @ 0% excess air
Combust. Moisture	**14.77**	volume % water in flue gas @ 0% excess air
CO2 F Factor, Fc	**2336**	DSCF of CO2/MM Btu of Fuel Burned @ 0% excess air
Carbon Dioxide	**28.22**	volume % CO2 in flue gas @ 0% O2
Predicted Fo Factor	**0.74**	EPA Method 3a Fo value

D-2 BIOMASS

TECO
TAMPA ELECTRIC

Synthetic Gas and Heating Value Calculations

Customer: Tampa Electric Company **Sample ID: Polk Lab**

Facility: Polk Power Station **Analysis Date: 04/01/2004**

Source: Unit #1

CALCULATION OF DENSITY AND HEATING VALUE @ 60°F and 30 in Hg

Component	% Volume	Molecular Wt.	Density * (lb/ft^3)	% volume x Density	weight %	Component Gross Btu/lb	Weight Fract. Btu	Gross * Heating Value (Btu/SCF)	Volume Fract. Btu
Hydrogen	35.4000	2.016	0.0053	0.00188	3.3184	61100	2027.53	325.0	115.05
Oxygen	0.7996	32.000	0.0846	0.00068	1.1964	0	0.00	0.0	0
Nitrogen	5.3210	28.016	0.0744	0.00396	7.0019	0	0.00	0.0	0
CO2	15.7177	44.010	0.1170	0.01839	32.5254	0	0.00	0.0	0
CO	42.7000	28.010	0.0740	0.03160	55.8865	4347	2429.39	322.0	137.494
Methane	0.0373	16.041	0.0424	0.00002	0.0280	23879	6.68	1013.0	0.377849
Ethane		30.067	0.0803	0.00000	0.0000	22320	0.00	1792.0	0
Ethylene		28.051	0.0746	0.00000	0.0000	21644	0.00	1614.0	0
Propane		44.092	0.1196	0.00000	0.0000	21661	0.00	2590.0	0
propylene		42.077	0.1110	0.00000	0.0000	21041	0.00	2336.0	0
Isobutane		58.118	0.1582	0.00000	0.0000	21257	0.00	3363.0	0
n-butane		58.118	0.1582	0.00000	0.0000	21308	0.00	3370.0	0
Isobutene		56.102	0.1480	0.00000	0.0000	20730	0.00	3068.0	0
Isopentane		72.144	0.1904	0.00000	0.0000	21052	0.00	4008.0	0
n-pentane		72.144	0.1904	0.00000	0.0000	21091	0.00	4016.0	0
n-hexane		86.169	0.2274	0.00000	0.0000	20940	0.00	4762.0	0
H2S	0.0270	34.076	0.0911	0.00002	0.0435	7100	3.09	647.0	0.17469
Total:	100.00	Average Density		0.05654	100.0000	**Gross Heating Value**			
		Specific Gravity		0.73908		**Btu/lb**	**4467**	**Btu/SCF**	**253.10**

* Density (lb/ft^3) and Gross Heating Value (Btu/scf) data from Perry's Chemical Engineering Handbook.

TECO TAMPA ELECTRIC

Synthetic Gas and Heating Value Calculations

Customer: Tampa Electric Company **Sample ID: Polk Lab**

Facility: Polk Power Station **Analysis Date: 04/01/2004**

Source: Unit #1

CALCULATION OF F FACTORS

Componen	Mol. Wt.	C Factor	H Factor	% volume	Fract. Wt.	Weight Percents: Carbon	Hydrogen	Nitrogen	Oxygen
Hydrogen	2.016	0	1	35.400	71.3664		3.3422062		
Oxygen	32.000	0	0	0.800	25.5872				1.1982908
Nitrogen	28.016	0	0	5.321	149.0731			6.981340838	
CO2	44.010	0.272273	0	15.718	691.7360	8.82032107			23.551264
CO	28.010	0.42587	0	42.700	1196.0270	23.8537951			32.190049
Methane	16.041	0.75	0.25	0.037	0.5983	0.02101556	0.0070052		
Ethane	30.067	0.8	0.2	0.000	0.0000	0	0		
Ethylene	28.051	0.85714	0.14286	0.000	0.0000	0	0		
Propane	44.092	0.81818	0.181818	0.000	0.0000	0	0		
Propene	42.077	0.85714	0.14286	0.000	0.0000	0	0		
Isobutane	58.118	0.82759	0.17247	0.000	0.0000	0	0		
n-butane	58.118	0.82759	0.17247	0.000	0.0000	0	0		
Isobutene	56.102	0.85714	0.14286	0.000	0.0000	0	0		
Isopentane	72.144	0.83333	0.16667	0.000	0.0000	0	0		
n-pentane	72.144	0.83333	0.16667	0.000	0.0000	0	0		
n-hexane	86.169	0.83721	0.16279	0.000	0.0000	0	0		
H2S	34.076	0	0.0586923	0.027	0.9201	0	0.0025289		
Totals				100.00260	2135.3081	32.6951318	3.35	6.981340838	56.939604

CALCULATED VALUES		
O2 F Factor (dry), Fd	**8286**	DSCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
O2 F Factor (wet), Fw	**9734**	SCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
Moisture F Factor	**1448**	SCF of Water/MM Btu of Fuel Burned @ 0% excess air
Combust. Moisture	**14.88**	volume % water in flue gas @ 0% excess air
CO2 F Factor, Fc	**2350**	DSCF of CO2/MM Btu of Fuel Burned @ 0% excess air
Carbon Dioxide	**28.36**	volume % CO2 in flue gas @ 0% O2
Predicted Fo Factor	**0.74**	EPA Method 3a Fo value

APPENDIX E

TEST PARTICPANTS

TEST PARTICIPANTS

AIR SERVICES GROUP
ENVIRONMENTAL SERVICES

Juan Ramirez	Environmental Technician
Jorge Varino	Technician

AIR PROGRAMS GROUP
ENVIRONMENTAL HEALTH & SAFETY

Shelly Castro	Engineer

POLK POWER STATION

Michael Perkins	Environmental Coordinator
Brian Hall	Instrument & Controls Specialist

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

October 30, 2002

Ms. Laura R. Crouch
Manager-Air Programs, Environmental Affairs
Tampa Electric Company
P. O. Box 111
Tampa, Florida 33601-0111

Re: Polk Power Station Sale of Assets

Dear Ms. Crouch:

We received a request on October 29, 2002 from your office for an Administrative Permit Correction to the current Polk Power Station Title V Operating Permit 1050233-009-AV. The request involves the transfer of ownership of several regulated and unregulated emissions units. The removal of emissions units from a Title V permit cannot be accomplished through the Administrative Permit Correction process.

In order to remove regulated or unregulated emissions units from a Title V permit, an application for a Title V Permit Revision must be processed. Once the Title V Permit Revision becomes final, Tampa Electric Company will no longer be responsible for these emissions units. Of course, the company acquiring the emissions units will need to apply for and receive a transfer of ownership and a FINAL Initial Title V Permit before they can begin operation of the emissions units.

If you have any other questions, please write me at the above letterhead address or contact Edward J. Svec at 850/921-8985.

Sincerely,

Scott M. Sheplak

Scott M. Sheplak, P.E.
Title V Section

SMS/es

cc:
Gerald Kissel, PE, FDEP SWD
Buck Oven, PE, FDEP
Pat Comer, FDEP OGC

TEC

TAMPA ELECTRIC

RECEIVED

OCT 29 2002

BUREAU OF AIR REGULATION

October 25, 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

Via FedEx
Airbill No. 7912 1820 2536

Re: Tampa Electric Company
Polk Power Station
Operating Permit - Administrative Amendment
Permit No. 1050233-009-AV
AIRS #1050233, EU# 003 - 008

Dear Mr. Sheplak:

Tampa Electric Company (TEC) is currently in the process of finalizing documentation related to the sale of certain assets utilized in the operation of Polk Unit 1. These assets include, but are not limited to, the gasifier, sulfuric acid plant, air separation unit, solid fuel handling system, auxiliary boiler, and brine concentration facility. The Power Block and certain administrative facilities will remain with TEC. In addition, TEC will continue to function as the operator of all of the above mentioned assets pursuant to a contract with the new asset owner. In support of this upcoming asset sale, TEC respectfully requests an administrative amendment to the Title V operating permit (Final Permit Revision Number 1050233-009-AV, PSD-FL-194) for Polk Power Station (PPS) incorporating these changes. The new owner of the above mentioned assets will be Polk Gasification, LLC.

Currently, TEC is the owner and operator of Emission Unit (E.U.) ID's 003 - 006 of the Title V Operation Permit No. 1050233-009-AV. Upon sale closing, Polk Gasification, LLC will be the new owner of the following emission units:

- E.U. ID 003 (120 Million Btu per Hour Auxiliary Boiler),
- E.U. ID 004 (Sulfuric Acid Plant),
- E.U. ID 005 (Solid Fuel Handling System), and
- E.U. ID 006 (Solid Fuel Gasification System).

TEC and Polk Gasification, LLC intends to close sale during first quarter of 2003.

In addition, TEC is currently the owner and operator E.U. ID's 007 (One or more Emergency Generators) and 008 (One or more Heating Units and Internal Combustion Engines), which are groupings of unregulated emission units. Since these groupings of unregulated emission units relate to both the operation of the emission units for which Polk Gasification, LLC will be assuming ownership and the emission units that TEC will be retaining ownership of, TEC is requesting to divide the emission units and create two new E.U. ID's for permit clarity. This split of these groupings will not result in additional emissions from the facility. As of January 1, 2003, Polk Gasification, LLC will be the owner of the following two new emission units:

- E.U. ID 011 (Polk Gasification (PG) Emergency Generators) and
- E.U. ID 012 (PG Heating Units and Internal Combustion Engines).

While there will be a change in ownership, the operational control of E.U. ID's 003 - 006, 011, and 012 will still be handled by TEC as noted above. TEC understands that it may continue the operation of Polk Unit 1 as the Florida Department of Environmental Protection (FDEP) is processing this administrative amendment request. TEC appreciates the cooperation and consideration in this matter. If you have any questions or comments pertaining to this request or it is FDEP's opinion that permitting is required, please call Raiza Calderon or me at (813) 641-5261.

Sincerely,

Laura R. Crouch

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/RC141

c: Mr. Jerry Kissel - FDEP SW
Mr. Buck Oven - FDEP

Ed

TAMPA ELECTRIC

RECEIVED
JUL 23 2001
BUREAU OF AIR REGULATION

July 16, 2001

Mr. Scott Sheplak, P.E.
Division of Air Resources Management
Florida Department of Environmental Protection
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400

Via FedEx
Airbill No. 7926 7690 0110

Re: Tampa Electric Company – Polk Power Station
Title V Permit No. 1050233-001-AV
Request for Parallel Processing

Dear Mr. Sheplak:

Tampa Electric Company (TEC) would like to take this opportunity to request that the Polk Power Station Title V permit modifications addressing the discontinuing of Unit 1 opacity monitoring and the use of CEMs as an alternative method of fuel bound nitrogen sampling be processed simultaneously.

Please contact Shannon Todd at (813) 641-5125 if there are any questions regarding this matter.

Sincerely,

Mark Hornick

Mark Hornick
General Manager/ Responsible Official
Polk Power Station

EA\gm\SKT268

c: A.Linero, FDEP
J. Kissel, FDEP
E. Svec, FDEP

TECO
TAMPA ELECTRIC

RECEIVED
MAY 25 2001
BUREAU OF AIR REGULATION

May 24, 2001

Mr. Scott Sheplak, P.E.
Division of Air Resources Management
Florida Department of Environmental Protection
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400

Via FedEx
Airbill No. 8132 1667 4049

Re: Tampa Electric Company – Polk Power Station
Title V Permit No. 1050233-001-AV
Permit Modification
Project No.: 1050233-009-AV

Dear Mr. Sheplak:

On May 16, 2001, Tampa Electric Company (TEC) received a letter from the U.S. EPA Clean Air Markets Division (copy enclosed) granting TEC's petition for exemption from the opacity monitoring requirements of Part 75 for Polk Unit 1. This removes the only regulatory requirement to install, maintain and report data from a continuous opacity monitor system for this unit. Based on the fact that the continuous opacity monitor is no longer required, TEC requests that Condition III.A.52 in the above referenced Title V permit, which indicates the use of the continuous opacity monitor for purposes of periodic monitoring, be removed.

Please contact Jamie Hunter at (813) 641-5033 if there are any questions regarding this matter.

Sincerely,

Mark Hornick

Mark Hornick
General Manager/ Responsible Official
Polk Power Station

EP\gm\JJH954

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 9 2001

OFFICE OF
AIR AND RADIATION

RECEIVED
MAY 16 2001
ENVIRONMENTAL AFFAIRS

Gregory M. Nelson
Designated Representative
Tampa Electric Company
P.O. Box 111
Tampa, FL 33601-0111

Re: Petition for Exemption From the Opacity Monitoring Requirements of Part 75 for Polk Unit **1

Dear Mr. Nelson:

EPA has reviewed your February 19, 2001 petition under §75.66(a) of the Acid Rain regulations, in which Tampa Electric Company (TECO) requested an exemption from the opacity monitoring requirements of Part 75 for Unit **1 at the Polk Power Station (Polk). EPA hereby grants your petition, for the reasons stated below.

Background

Polk Unit **1 includes a coal gasifier and a combined-cycle combustion turbine, fired primarily on coal-derived gaseous fuel, with diesel fuel oil as a backup fuel. According to the February 19, 2001 petition, the unit is coal-fired. Section 75.14(a) requires the owner or operator of an affected coal-fired unit to install and operate a continuous opacity monitoring system. TECO has installed and operated an opacity monitoring system on Polk Unit **1 to satisfy this requirement.

In the February 19, 2001 petition, TECO requested an exemption from Part 75 opacity monitoring requirements for several reasons. First , the opacity levels from Unit **1 are typically in the range seen for units burning natural gas and diesel fuel, seldom exceeding 5% opacity. A full year of opacity data for the year 2000 and the results from six Method 9 visual emission reports from 1997-2000 were submitted for Unit **1 with the petition to document this. Second, twisting of the mounting brackets for the opacity monitor at the stack due to temperature effects has required frequent realignment of the monitor. Such realignment, which was performed six times in 2000, can only be done with the unit off-line. Third, an opacity monitoring exemption for Unit **1 would appear to be consistent with the intent of §§75.14 (c) and (d), which provide opacity monitoring exemptions for gas-fired or diesel-fired units.

EPA's Determination

EPA agrees that Polk Unit **1 should be exempt from the continuous opacity monitoring requirements of Part 75. As discussed below, the unit should be treated like a "diesel-fired" unit for purposes of opacity monitoring and granted an exemption from Part 75 opacity monitoring requirements.

Before discussing why the unit should be exempt from opacity monitoring, it is helpful to summarize the regulatory history of the opacity monitoring exemptions in Part 75. Sections 75.14(c) and (d), promulgated in 1993, provide that gas-fired units and diesel-fired units respectively are exempt from Part 75 opacity monitoring requirements. At the time that these exemptions were promulgated, "gas-fired unit" was defined as a unit combusting only "natural gas", "gaseous fuels containing no more sulfur than natural gas,", or "fuel oil." 58 FR 3590, 3655 (January 11,1993). Natural gas or coal-derived gaseous fuel had to account for at least 90% of the average annual heat input during the previous three years and at least 85% during each of these individual years. EPA explained that the exemptions from the opacity monitoring requirements were for "units that do not have significant opacity levels and for units that may not be able to provide meaningful opacity information." 58 FR 3645. In particular, gas-fired units were exempt because they have "very low opacity levels, and extremely few of them...are required to monitory opacity under other federal, State, or local regulations." Id. Similarly, the basis for exempting diesel-fired units was that States do not require opacity monitoring of diesel-fired units "because of low opacity levels (e.g., below 10 percent opacity, even during startup)." Id.

After 1993, EPA revised Part 75 several times in ways relevant to opacity monitoring exemptions. In 1995 EPA defined "natural gas" as including no more than 20 grains of sulfur per 100 scf and "diesel-fired unit" as a unit burning only diesel fuel and a supplementary fuel (if any) "limited to natural gas or gaseous fuels containing no more sulfur than natural gas." 60 FR 26510, 26514 (May 17,1995). In 1999 EPA revised the definition of "natural gas" as including less than 2 grains per 100 scf and added a definition for "very low sulfur fuel. 64 FR 28564, 28587-88 (May 26,1999). "Very low sulfur fuel" includes natural gas or "[a]ny gaseous fuel with a total sulfur content no greater than 20 grains of sulfur per 100 standard cubic feet." 40 CFR 72.2 (definition of "very low sulfur fuel"). EPA stated that it was replacing the phrase in Part 75 "fuel containing no more sulfur than natural gas" with the new term "very low sulfur fuel." Response to Comments Document, Part 75 Rule Revisions (Docket A-97-35) at 84-85 (April 1, 1999). Despite this stated intention, EPA did not actually make this change in the "diesel-fired unit" definition, which continues to require that the gas burned at the unit contain no more sulfur than natural gas," which is now limited to less than 2 grains per 100 scf. 40 CFR 72.2 (definition of "diesel-fired unit").

Applying the above-described definitions of "gas-fired unit" and "diesel-fired unit" in §72.2, Polk Unit **1 does not consistently qualify as a "gas-fired unit" since, among other things, TECO states that it may burn in the boiler in some years more diesel fuel and less coal-derived gas and may not meet the requirement that gas comprise 90% of annual heat input. Moreover, the unit also does not meet the definition of "diesel-fired unit" since, among other things, the coal-derived gas burned in the boiler has more than 2 grains of sulfur per 100 scf. However, as discussed below, the coal-derived fuel qualifies as "very low sulfur fuel", and EPA concludes that the unit should be treated like a "diesel-fired unit" and should be granted an exemption from opacity monitoring.

EPA determined that the coal-derived gaseous fuel combusted in the unit qualifies as "very low sulfur fuel," based on the unit's hourly sulfur dioxide (SO_2) mass emission and heat input data reported under Part 75 for 2000 and information supplied by TECO on the gross calorific value (GCV) of the fuel. For each hour in 2000 in which the coal-derived fuel was combusted, the sulfur content of the fuel (in grains per 100 standard cubic foot) was calculated from the SO_2 mass emission rate (in lb/hr, as reported in EDR record type 310), the heat input rate (in mmBtu, as reported in record type 300), and the GCV of the fuel (i.e., 250 Btu per standard cubic foot) using the following equation:

$$\underset{\text{(in gr S/100scf)}}{\text{Fuel Sulfur Content}} = \underset{\text{(in lb } SO_2\text{/hr)}}{SO_2 \text{ Mass Rate}} \div (2 \text{ lb } SO_2\text{/lb S}) \div \underset{\text{(in mmBtu/hr)}}{\text{Heat Input}} \div (10^6 \text{ Btu/mmBtu}) \times \underset{\text{(in Btu/scf)}}{\text{GCV}} \times (7000 \text{ gr S/lb S}) \times 100.$$

The results of EPA's data analysis were that, for the 7,440 hours of data reported in 2000, the average sulfur content of the coal-derived gaseous fuel was 12.5 grains per 100 standard cubic feet (gr/100 scf), with the standard deviation of 5.9 gr/100 scf. As noted above, "very low sulfur fuel" includes, among other things, any gaseous fuel with a total sulfur content no greater than 20 grains of sulfur per 100 standard cubic feet. The data analysis shows that the average sulfur content of the coal-derived gaseous fuel combusted in Unit **1 is below the 20-grain level and that, considering that the average plus one standard deviation is also below the 20-grain level, that about 90% of that fuel at the unit meets the 20-grain criterion. EPA therefore finds that the fuel qualifies as "very low sulfur fuel" and that, considering only the fuels combusted in Unit **1's boiler, the unit would qualify as a "diesel-fired unit," but for EPA's unintended failure to reference "very low sulfur fuel" in the definition of "diesel-fired unit."

Moreover, as a result of Unit **1's gasification of coal and the combustion of the resulting gaseous fuel in the boiler along with some diesel fuel, the unit appears to have opacity levels that are similar to those for units burning only natural gas and diesel fuel. In particular, Method 9 compliance tests for opacity consistently show opacity of 0% for Unit **1. Further, the unit's continuous opacity monitor data show consistent average daily opacity levels of 10% or less, except for a few opacity data spikes that appear to be the result of misalignment of the opacity monitor due to twisting of the monitor mounting brackets. See TECO's May 6, 2001 supplemental information.

For these reasons, EPA concludes that Unit **1 should be treated as a "diesel-fired unit" for purposes of applying opacity monitoring requirements under 75.14(d) and approves an exemption from Part 75 opacity monitoring requirements. EPA notes that the Florida Department of Environment Protection has been informed of EPA's approach in this case and concurs with the approval of the exemption.

EPA's determination in this letter relies on the accuracy and completeness of the information submitted by TECO, including the information in the February 19 and May 6, 2001 submissions, and is appealable under Part 78. If you have any questions about the findings and conclusions presented above, please contact Kim Nguyen of my staff, at (202) 564-9102. Thank you for your continued cooperation.

Sincerely,

Brian J. McLean

Brian J. McLean, Director
Clean Air Markets Division

cc: David McNeal, EPA Region 4
Lynn Haynes, EPA Region 4
Joseph Kahn, Florida Department of Environment Protection
Kim Nguyen, EPA Clean Air Markets Division

TAMPA ELECTRIC

November 22, 2002

RECEIVED
DEC 06 2002
Bureau of Air Monitoring & Mobile Sources

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

Via FedEx
Airbill No. 7912 3799 8401

Re: **Tampa Electric Company**
Polk Power Station
Sulfuric Acid Plant (SAP)
Change of Test Method for Sulfur Dioxide
Permit No. 1050233-009-AV
AIRS #1050233, EU# 004

Dear Mr. Sheplak:

Tampa Electric Company (TEC) herewith submits four signed and sealed copies of a completed Title V Permit Revision Application requesting to modify the Title V Air Operating Permit No. 1050233-009-AV at Polk Power Station. TEC requests a change in the sulfur dioxide (SO_2) compliance test method used at the sulfuric acid plant (E.U. ID No. 004). This permit revision is submitted in accordance with the Florida Department of Protection's (FDEP) Permit Action Tree (PAT) guidance (dated 11/07/02).

Emission Performance tests conducted on August 22-23, 2002 demonstrated that results using EPA Method 6C (Instrumental Analyzer Procedure) were comparable to those using an adapted version of the currently permitted EPA Method 8. TEC submitted the results to Mr. Bill Proses of FDEP on October 3, 2002. As we indicated in this prior correspondence, EPA Method 8 is not suitable to measure emissions from the SAP stack due to specific design aspects of the stack. These issues were also discussed with Mr. Martin Costello of FDEP. On November 20, 2002, Mr. Costello contacted Mr. Alvaro Linero to support TEC's request to substitute EPA Method 6C for the current method required on the SAP to demonstrate SO_2 compliance. Since EPA Method 6C is the best option evaluated for demonstrating compliance with the SO_2 emissions limit, TEC requests that Condition C.14 of our Title V Permit be revised as follows:

From:

Acid Mist/Sulfur Dioxide. The test method for acid mist/sulfur dioxide shall be EPA Method 8, incorporated and adopted by reference in Chapter 62-297, F.A.C. The minimum sample volume shall be 40 dry standard cubic feet.

To:

"Acid Mist/Sulfur Dioxide. The test method for acid mist shall be EPA Method 8, incorporated and adopted by reference in Chapter 62-297, F.A.C., or alternative method approved by FDEP. The minimum sample volume for the EPA Method 8 test shall be 40 dry standard cubic feet. The test method for sulfur dioxide shall be EPA Method 6C, incorporated and adopted by reference in Chapter 62-297, F.A.C., or alternative method approved by FDEP."

In support of this request, TEC has also provided with this correspondence, as Attachment 1, the October 3, 2002 letter submitted to Mr. Bill Proses with the August 22-23, 2002 emission performance test results. Enclosed, as Attachment 2 is Mr. Costello's November 20, 2002 email copy to Mr. Linero approving the change of test method for SO_2 compliance.

TEC appreciates the cooperation and consideration in this matter. If you have any questions or comments pertaining to this application, please call Raiza Calderon or me at (813) 641-5261.

Sincerely,

Laura R. Crouch

Laura R. Crouch
Manager- Air Programs
Environmental Affairs

EA/bmr/RC148

Enclosures

c: Mr. Martin Costello - FDEP
Mr. Jerry Kissel - FDEP SW
Mr. Bill Proses - FDEP SW
Ms. Sheila Schneider - FDEP SW

Attachment 1

(BY)

TECO SM

TAMPA ELECTRIC

October 3, 2002

Via FedEx
Airbill No. 7921 1285 2820

Mr. Bill Proses
Southwest District
Florida Department of
Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619-8318

Re: Tampa Electric Company (TEC)
Polk Power Station Sulfuric Acid Plant
Stack Emission Test
Permit No. 1050233-009-AV
AIRS #1050233, EU#004

Dear Mr. Proses:

According to Condition C.20 of the Title V Permit #1050233-009-AV, TEC is required to perform prior to renewal of the permit a formal compliance test demonstrating compliance for sulfuric acid mist (H_2SO_4) and sulfur dioxide (SO_2) at Polk Power Station for E.U. ID No. 004. As referenced in Condition C.14 and Chapter 62-297, F.A.C, EPA Method 8 is required to be used for sulfuric acid mist/sulfur dioxide compliance. Provided with this correspondence is the August 22 & 23, 2002 emission performance test. This emission performance test was performed in order to evaluate different methods for testing and to develop a recommended single method.

EPA Method 8 specifies that the stack velocity be determined by differential pressure using a manometer. Due to the very low velocity in the sulfuric acid plant stack at Polk Power Station, TEC testing personnel have found it impossible to register a differential pressure reading for the exit gas using a manometer. This, in turn, prevents the direct application of EPA Method 8. This problem was addressed on the April 26, 2000 letter to the Florida Department of Environmental Protection (FDEP), where TEC requested permission to use an alternative approach to determine the exit velocity of the sulfuric acid plant stack gas. Richard L. Davis of Davis & Associates Consulting, Inc developed an algorithm that allowed TEC to calculate the exit velocity of acid plant stack gas based on available plant operating data. TEC reviewed this algorithm and found it to be technically correct and precise, therefore TEC used it for the sulfuric acid plant initial compliance test and the August 22 & 23, 2002 emission performance test. Other than this adaptation, TEC strictly adhered to all requirements of EPA Method 8.

During the August 22 & 23, 2002 emission performance test, EPA Method 6C was simultaneously used along with the adapted EPA Method 8 for the determination of sulfur dioxide emissions from the sulfuric acid plant. This test method continuously extracts a gas sample from a stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of SO_2 gas concentration. Since the H_2SO_4 and SO_2 emission limits are of 0.15 pounds per ton of 100 percent acid produced and 4 pounds per ton of 100 percent acid produced, respectively, the concentrations would need to be converted to a lb/ton number. The results of this test method are included in Appendix A of the performance test report enclosed. This test method is considered an accurate representation of the emissions from the sulfuric acid plant, but it only is applicable for determining SO_2 gas concentrations and not H_2SO_4 gas concentrations.

Presented below in Table 1 is a comparison of the emission rates using the EPA Method 6C and the adapted EPA Method 8 for the August 22 & 23, 2002 sulfuric acid plant emission performance test..

TABLE 1. EPA Method 6C and Adapted Method 8 Comparison for Sulfuric Acid Plant Emission Performance Test (August 22 & 23, 2002)

Sulfuric Acid Plant August 22 & 23, 2002	SO_2 Concentration [EPA Method 8]	Conversion Facor lbs/dscf to ppm	SO_2 Concentration		Difference
			EPA Method 6C	Adapted EPA Method 8	
	lb/dscf		ppm	ppm	%
Run 1	2.380E-05	1.660E-07	135.03	143.37	-5.82
Run 2	2.564E-05	1.660E-07	147.72	154.46	-4.36
Run 3	2.756E-05	1.660E-07	161.13	166.02	-2.95
		Average	148.0	154.6	-4.38

The only other option at the present time to calculate the H_2SO_4 and SO_2 emissions from the sulfuric acid plant would be to use the following alternative equation for a source that processes "elemental sulfur or an ore that contains elemental sulfur" and uses air to supply oxygen as referenced in 60.84(d) :

$$E_S=(C_S\ S)/[\ 0.265-(0.126\%\ O_2)-(A\ \%\ CO_2)\ ]$$

At Polk, the source of the sulfur to the sulfuric acid plant is not "elemental sulfur or an ore containing elemental sulfur" as specified in 60.84. Rather, it is hydrogen sulfide (H_2S) in the acid gas stream from the solid fuel gasification plant's gas cleanup system. Also, the Polk Power Station sulfuric acid plant uses pure oxygen in addition to air to supply the oxygen for acid production. Consequently, the alternative equation above does not calculate an accurate emission rate for this process.

Presented below in Table 2 is a comparison of the emission rates using the alternative method referenced in 60.84(d) and the adapted EPA Method 8 for the sulfuric acid plant initial compliance test performed on June 25, 1999.

TABLE 2. Alternative Method and Adapted EPA Method 8 Comparison for Sulfuric Acid Plan Initial Compliance Test (June 25, 1999)

Sulfuric Acid Plant June 25, 1999	SO_2 Concentration [C_s]	H_2SO_4 Concentration [C_s]	SO_2 Emission Rate [E_s]		H_2SO_4 Emission Rate [E_s]	
			Alternative Method	Adapted EPA Method 8	Alternative Method	Adapted EPA Method 8
	lb/dscf	lb/dscf	lb/ton	lb/ton	lb/ton	lb/ton
Run 1	3.053E-05	7.873E-07	1.4035	2.107	0.0362	0.054
Run 2	2.755E-05	7.888E-07	1.2653	1.980	0.0362	0.057
Run 3	-	-	-	-	-	-
		Average	1.3344	2.0435	0.0362	0.0555

Presented below in Table 3 is a comparison of the emission rates using the alternative method referenced in 60.84(d) and the adapted EPA Method 8 for the August 22 & 23, 2002 sulfuric acid plant emission performance test.

TABLE 3. Alternative Method and Adapted EPA Method 8 Comparison for Sulfuric Acid Plant Emission Performance Test (August 22 & 23, 2002)

Sulfuric Acid Plant August 22 & 23, 2002	SO_2 Concentration [C_s]	H_2SO_4 Concentration [C_s]	SO_2 Emission Rate [E_s]		H_2SO_4 Emission Rate [E_s]	
			Alternative Method	Adapted EPA Method 8	Alternative Method	Adapted EPA Method 8
	lb/dscf	lb/dscf	lb/ton	lb/ton	lb/ton	lb/ton
Run 1	2.38017E-05	3.55016E-07	1.0883	2.2017	0.0162	0.0328
Run 2	2.56370E-05	3.58358E-07	1.1722	2.3426	0.0164	0.0327
Run 3	2.75575E-05	3.06610E-07	1.2600	2.5804	0.0140	0.0287
		Average	1.1735	2.3749	0.0155	0.0314

Although the alternative method calculates the emission rate to be lower than the adapted EPA Method 8, it is not an accurate representation of the emissions from the sulfuric acid plant. TEC is planning on submitting an administrative amendment requesting for official permission from FDEP to use the adapted EPA Method 8 for future sulfuric acid plant compliance tests in Quarter IV, 2002.

Enclosed please find the emissions performance report for tests performed on August 22 & 23, 2002 at the Sulfuric Acid Plant. As stated in the Summary of Results, below is a list of results:

- sulfur dioxide - calculated average was 2 lbs/ton; permit limit 4 lbs/ton.
- sulfuric acid mist – calculated average was 0.03 lbs/ton; permit limit 0.15 lbs/ton.
- average opacity observed during the 30-minute test was 0 percent; permit limit 10 percent.

If you have any questions, please call Raiza Calderon or me at (813) 641-5261.

Sincerely,

Laura R. Crouch

Laura R. Crouch
Manager - Air Programs
Environmental Affairs

bc: R.L. Dorey
M.J. Hornick
J.E. McDaniel
M.R. Perkins (enc)
D.A. Smith
L.T. Webb
AP 6.0
AR 6.5 (enc)
C 2.1

r: R. Calderon
S.S. Castro
L.R. Crouch
D. Latchman
L.A. Pence

EA/bmr/RC139

c/enc: Mr. Jerry Kissel, FDEP SW

Attachment 2

From: Costello, Martin
Sent: Wednesday, November 20, 2002 10:34 AM
To: Linero, Alvaro
Cc: Riza Calderon (E-mail)
Subject: TEC Polk Unit 1

I expect you to receive a request form TEC to substitute Method 6C for the current method required in the PSD permit (Method 8) on the acid plant. I support this change since the current port location has very low flow rates and the annual compliance tests for SO2 have required very long run times.

Let me know if you have any questions on this issue.

Martin Costello, P.E.
Florida Department of Environmental Protection
Bureau of Air Monitoring and Mobile Sources
Emissions Monitoring Section
850/921-9578 or Suncom 291-9578