One Energy Place
Pensacola, Florida 32520

Tel 850.444.6111

GULF POWER
A SOUTHERN COMPANY

September 21, 2012

Jeff Koerner
Office of Permitting and Compliance
Florida Department of Environmental Protection
2600 Blair Stone Road
Mail Stop 5500
Tallahassee, Florida 32399-2400

Subject: ***Gulf Power Company Crist Plant***
Air Construction Permit Nos .0330045 - 028 and 029
Sulfuric Acid Mist Testing Completion Report

Dear Mr. Koerner:

Attached please find the Sulfuric Acid Mist Testing Completion Report for Gulf Power's Plant Crist, located in Pensacola, Florida. Gulf Power believes that the attached report demonstrates reasonable assurance that operation of the plant's hydrated lime injection and flue gas desulfurization systems provide adequate compliance with the plant's SAM emission cap, and verifies the use of the EPRI SO3 prediction equations.

Should you have any questions regarding the report please feel free to contact me at 850.444.6144.

Sincerely,

Greg Terry, P.E.
Air Quality Programs Supervisor
Gulf Power Environmental Affairs

cc: Rick Bradburn-FDEP Northwest District
Jim Vick-Gulf Power
Dwain Waters- Gulf Power
Terry Wright-Gulf Power
Jora Maxwell-Gulf Power
Robert Jernigan-Gulf Power

GULF POWER
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Gulf Power Plant Crist
Sulfuric Acid Mist Testing Completion Report

CERTIFICATION BY RESPONSIBLE OFFICIAL

"I, the undersigned, am the responsible official, as defined in Chapter 62-210.200, F.A.C., for the Title V source for which this report is being submitted. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made and data contained in this report are true, accurate and complete."

Responsible Official Signature:

Michael L. Burroughs

Michael L. Burroughs
Vice-President and Senior Production Officer

Sept. 21, 2012
Date: 9/21/2012

Gulf Power Company Plant Crist
Sulfuric Acid Mist Testing Completion Report

On March 22, 2010, Gulf Power Company's Plant Crist was issued a final air construction permit (Permit # 0330045-028-AC) which authorized a Selective Catalytic Reduction (SCR) system to be constructed and operated on Unit 6. This permit also included the installation of a Hydrated Lime Injection (HLI) system in the combined ductwork prior to the FGD. A second Air Construction Permit (Permit # 0330045-029-AC) was granted to Plant Crist on May 3, 2010, which allowed the plant to burn a higher sulfur coal (HSC) blend in Units 4-7. Both the SCR construction permit and HSC construction permit incorporate testing requirements to quantify the impact of various control equipment on Sulfuric Acid Mist (SAM). On October 24, 2011, Gulf Power was granted permission to delay the testing requirements set forth in the HSC construction permit until after completion of the Unit 6 SCR.

The SCR on Unit 6 was brought into service on May 16, 2012. Gulf Power's contractor conducted SAM (SO3) testing at the inlet and outlet of the Unit 6 SCR on July 25, 2012. Testing was conducted at the outlet of the FGD over the course of several days. Low load testing was completed on June 29, 2012, and mid and full load testing was conducted on August 6-10, 2012. The operational parameters recorded during each test run, as required by Conditions 8 and 13 of the HSC Permit, can be found in Appendix A, Tables 1 and 2. All test reports are attached in Appendix B.

Test Results and Discussion

On July 25, 2012, Gulf Power's contractor conducted SO3 testing at the inlet and outlet of Unit 6's SCR. The inlet and outlet were tested concurrently during 3 test runs with Unit 6 at full load. The operating data from this testing can be found in Appendix A, Table A1. Table 1, below, is a comparison of the inlet and outlet test rate to EPRI predicted SO3 conversion rates.

Table 1. Unit 6 SCR SO3 Conversion Data

Run #	Run Date mm/dd/yy	Run Start hh:mm	Run End hh:mm	Inlet Test SO3 lbm/hr	Inlet EPRI SO3 lbm/hr	Outlet Test SO3 lbm/hr	Outlet EPRI SO3 lbm/hr
1	7/25/12	9:15	10:15	123.2	123.4	181.3	226.7
2	7/25/12	12:20	13:20	132.4	124.3	230.9	228.2
3	7/25/12	13:55	14:55	124.7	124.2	259.8	228.2
Average	**7/25/2012**	-	-	**126.8**	**124.0**	**224.0**	**227.7**

As shown above, the average tested conversion across the Unit 6 SCR catalyst is within 3% difference from the average EPRI predicted SO3 conversion. As a result, Gulf believes the use of the EPRI methodology is verified and will continue to utilize the EPRI SO3 prediction equations to demonstrate permit compliance

Additional testing was conducted on Units 5, 6, and 7 at the outlet of the FGD on June 29, 2012 and from August 6, 2012 to August 10, 2012 to determine the optimum hydrated lime injection rate, quantify the SO3 reductions resultant from the HLI system and FGD, and further verify the EPRI SO3 conversion equations. Operational data, as required by

Conditions 8 and 13 of the HSC Permit can be found in Appendix A, Table A2, and complete test reports from Gulf's contractor and be found in Appendix B.

To determine the optimum HLI operating rate, full load testing was conducted on August 6, 2012 using varying hydrated lime injection rates. A total of 6 1-hour runs were completed utilizing duplicate runs with hydrated lime feedrates of 5%, 10%, and 20% feeder speed. Table 2 below summarizes the test results.

Table 2. Hydrated Lime Injection Optimization

Run #	Run Date dd/mm/yy	Run Start hh:mm	Run End hh:mm	HLI Speed %	HLI Rate lbm/hr	Actual Test SO3 lbm/hr	Projected EPRI SO3 lbm/hr	Control Efficiency %
1	8/6/12	9:45	10:45	5.2	210.0	107.9	110.9	2.7
2	8/6/12	11:00	12:00	5.2	211.9	101.6	110.8	8.3
3	8/6/12	12:20	13:20	10.1	396.7	73.9	110.6	33.2
4	8/6/12	13:30	14:30	10.1	384.8	60.9	111.1	45.1
5	8/6/12	14:40	15:40	19.6	689.4	50.3	110.7	54.6
6	8/6/12	15:50	16:50	19.7	713.5	42.9	110.6	61.3

These results verified 58% average reduction from the EPRI predicted pre-HLI and FGD calculation, and established an optimum injection rate of 20% HLI feeder speed for the remainder of the testing program.

Upon determining the optimum HLI rate, the Gulf test plan included optimization study of two operating conditions: FGD without HLI and FGD with HLI. The results of these testsare summarized in Tables 3 and 4 and illustrated in Chart 1.

For the FGD without HLI, as shown in Table 3, the study shows that FGD control efficiency decreases as plant load increases, as the FGD is designed to control SO2 primarily, as opposed to SO3.

For the FGD and HLI, as presented in Table 4, the study shows a range of SO3 control efficiencies based on load. At full load, the HLI feed rate was 19%, and at low load the HLI rate was 10%. These study results compare favorably with EPRI projections.

Table 3. FGD SO3 Control Efficiency

Run #	Run Date dd/mm/yy	Run Start hh:mm	Run End hh:mm	Plant Load MW	HLI Speed %	HLI Rate lbm/hr	Actual Test SO3 lbm/hr	Projected EPRI SO3 lbm/hr	Reduction %
1	6/29/12	9:20	10:20	446.6	0.0	0.0	12.6	64.6	80.5
2	6/29/12	11:10	12:10	450.1	0.0	0.0	27.7	64.4	57.0
1	8/7/12	9:30	10:30	580.1	0.0	0.0	26.3	72.2	63.6
2	8/7/12	10:40	11:40	581.3	0.0	0.0	33.3	72.3	54.0
3	8/7/12	12:45	13:45	772.2	0.0	0.0	60.3	100.4	39.9
4	8/7/12	13:55	14:55	775.2	0.0	0.0	54.6	101.0	46.0
1	8/8/12	10:45	11:45	875.2	0.0	0.0	78.4	113.8	31.1
2	8/8/12	11:55	12:55	874.8	0.0	0.0	86.9	113.6	23.5
3	8/8/12	13:50	14:50	907.8	0.0	0.0	106.9	124.3	14.0
4	8/8/12	15:05	16:05	907.8	0.0	0.0	52.8	124.5	57.6

Table 4. Combined FGD and HLI SO3 Control Efficiency

Run #	Run Date dd/mm/yy	Run Start hh:mm	Run End hh:mm	Plant Load MW	HLI Speed %	HLI Rate lbm/hr	Actual Test SO3 lbm/hr	Projected EPRI SO3 lbm/hr	Reduction %
1	6/29/12	12:55	13:55	452.5	4.5	161.4	26.83	64.6	58.5
2	6/29/12	14:40	15:40	448.2	4.5	141.6	27.78	64.4	56.9
1	8/9/12	9:10	10:10	566.3	10.1	355.2	27.79	72.2	61.5
2	8/9/12	10:20	11:20	565.9	10.1	359.9	15.14	72.3	79.1
3	8/9/12	12:40	13:40	759.8	15.1	509.9	27.51	100.4	72.6
4	8/9/12	13:50	14:50	759.6	15.1	558.0	21.15	101.0	79.1
1	8/10/12	8:55	9:55	869.4	18.2	595.1	37.11	113.8	67.4
2	8/10/12	10:05	11:05	875.8	18.2	591.4	57.58	113.6	49.3
3	8/10/12	11:35	12:35	872.1	18.2	596.8	57.92	124.3	53.4
4	8/10/12	13:25	14:25	911.4	19.1	606.9	55.36	134.9	59.0
5	8/10/12	14:35	15:35	914.1	19.4	607.4	49.61	145.5	65.9

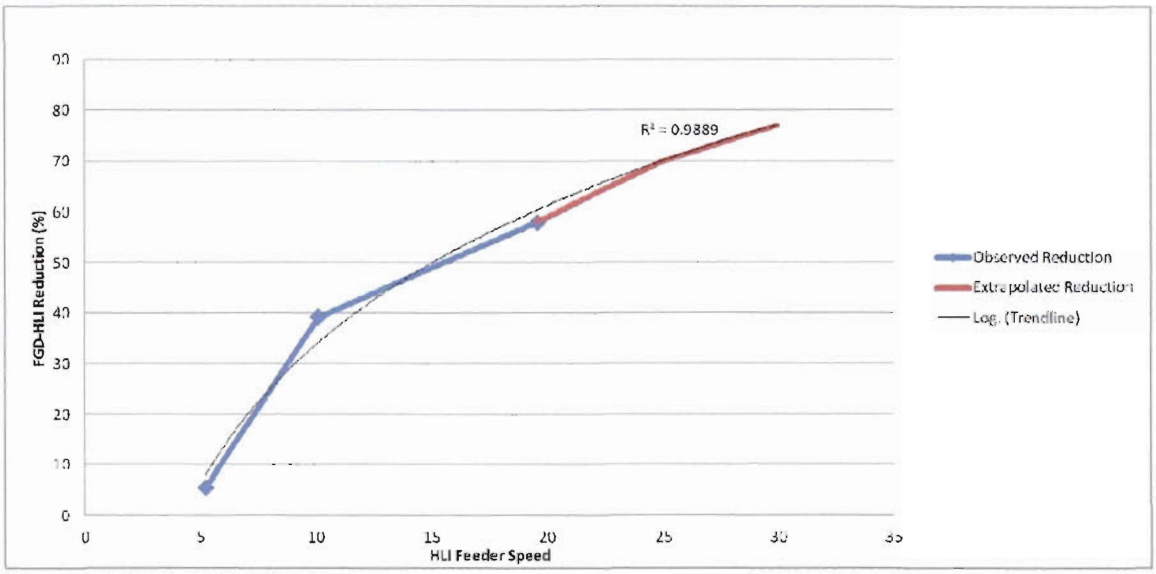

Chart 1. FGD-HLI SO3 Reduction

An extrapolation of the HLI optimization study data was performed to determine the effect of increasing HLI feedrates on FGD and HLI control efficiency. Based off of the results of the extrapolation, Gulf proposes to operate the Plant Crist hydrated lime injection system at 25% feeder speed at full plant load. The extrapolation shows that operating the HLI at 25% feeder speed yields a combined FGD and HLI control efficiency of 70%. This operating speed gives an increase of 20% control efficiency over operating at the tested feeder speeds during the full load optimization study. By operating the HLI system at 25% feeder speed, Gulf concludes that applying the extrapolated 20% increase in control efficiency to the average control efficiencies observed over all load ranges tested on June 29, 2012 and August 9 and 10, 2012, an ultimate combined FGD and HLI control efficiency of 75% is achieved.

Table A1. Unit 6 SCR SO3 Coversion Testing Operating Parameters

Run #	Run Date mm/dd/yy	Run Start hh:mm	Run End hh:mm	6 Load MW	6 Coal kips/hr	6 HI mmbtu/hr	6 Opacity %	6 SCR NH3 lbm/hr
1	7/25/12	9:15	10:15	328.1	287.1	3363.3	2.6	377.3
2	7/25/12	12:20	13:20	329.9	289.2	3387.9	2.9	372.1
3	7/25/12	13:55	14:55	328.9	289.2	3387.5	3.0	426.0

Table A2. Plant Wide SO3 Testing Operating Parameters

Run #	Run Date mm/dd/yy	Run Start hh:mm	Run End hh:mm	5 Load MW	6 Load MW	7 Load MW	Plant Load MW	5 Coal klbm/hr	6 Coal klbm/hr	7 Coal klbm/hr	5 HI mmbtu/hr	6 HI mmbtu/hr	7 HI mmbtu/hr	5 Opacity %	6 Opacity %	7 Opacity %
1	8/6/12	9:45	10:45	80.2	326.8	508.5	915.5	68.8	289.5	439.9	807.0	3388.5	5275.4	11.5	2.4	0.8
2	8/6/12	11:00	12:00	80.0	326.9	507.9	914.8	68.7	289.5	438.9	806.2	3388.7	5263.7	10.4	2.6	0.8
3	8/6/12	12:20	13:20	77.7	328.2	508.0	913.9	66.3	289.4	439.2	777.3	3387.5	5267.4	7.2	2.5	1.0
4	8/6/12	13:30	14:30	80.0	327.9	507.9	915.8	68.8	290.4	440.1	807.0	3398.7	5278.7	9.9	2.3	0.9
5	8/6/12	14:40	15:40	80.0	328.0	507.9	915.8	68.5	290.7	437.9	803.8	3403.0	5251.2	8.7	2.2	1.0
6	8/6/12	15:50	16:50	80.0	327.8	508.0	915.8	68.4	290.0	437.9	802.5	3393.9	5252.2	8.9	2.2	0.9
1	6/29/12	9:20	10:20	45.1	0.0	401.5	446.6	42.0	0.0	340.0	612.7	0.0	4881.5	6.3	3.3	0.9
2	6/29/12	11:10	12:10	46.9	0.0	403.2	450.1	43.0	0.0	338.2	628.2	0.0	4855.3	7.8	3.5	0.9
1	8/7/12	9:30	10:30	79.6	220.2	280.3	580.1	68.4	194.7	250.7	828.7	2285.0	2864.9	7.9	2.4	0.5
2	8/7/12	10:40	11:40	80.0	220.2	281.1	581.3	67.8	195.3	250.7	821.4	2292.3	2865.1	7.7	2.6	0.4
3	8/7/12	12:45	13:45	80.0	324.8	367.4	772.2	67.8	285.1	320.4	811.0	3348.4	3601.4	8.2	2.9	0.4
4	8/7/12	13:55	14:55	80.0	324.9	370.3	775.2	67.7	286.3	323.3	810.2	3362.0	3634.0	8.3	2.9	0.4
1	8/8/12	10:45	11:45	50.0	324.9	500.2	875.2	44.0	286.3	427.1	516.7	3337.1	5045.3	6.6	2.4	0.6
2	8/8/12	11:55	12:55	50.0	325.0	499.7	874.8	43.9	285.9	426.4	515.9	3331.9	5036.6	6.6	2.5	0.7
3	8/8/12	13:50	14:50	76.0	324.9	506.9	907.8	65.1	285.0	433.7	783.6	3412.5	5095.4	6.3	2.5	0.8
4	8/8/12	15:05	16:05	76.0	325.0	506.8	907.8	64.7	285.1	435.5	778.9	3413.2	5116.3	6.3	2.3	0.7
1	6/29/12	12:55	13:55	48.1	0.0	404.5	452.5	44.2	0.0	340.6	645.2	0.0	4890.3	6.3	3.9	0.8
2	6/29/12	14:40	15:40	45.0	0.0	403.1	448.2	41.8	0.0	340.4	610.2	0.0	4887.1	6.7	3.9	0.9
1	8/9/12	9:10	10:10	55.0	230.6	280.7	566.3	47.4	203.1	252.3	559.0	2387.6	2952.3	6.7	2.3	0.5
2	8/9/12	10:20	11:20	55.0	230.0	280.9	565.9	47.8	202.8	253.8	563.8	2384.0	2969.5	13.2	2.4	0.5
3	8/9/12	12:40	13:40	55.0	324.9	379.9	759.8	47.7	284.0	332.3	564.2	3273.8	3819.8	7.6	2.3	0.7
4	8/9/12	13:50	14:50	55.0	324.9	379.8	759.6	47.9	284.5	331.2	566.1	3278.7	3808.0	8.7	2.3	0.6
1	8/10/12	8:55	9:55	72.6	308.1	488.8	869.4	61.2	269.6	425.0	729.2	3155.9	5030.4	8.4	2.3	0.9
2	8/10/12	10:05	11:05	79.0	307.9	489.0	875.8	66.2	269.0	425.0	788.8	3149.2	5030.4	8.6	2.4	1.0
3	8/10/12	11:35	12:35	79.0	299.6	493.5	872.1	66.3	256.8	424.2	790.1	3006.4	5020.4	8.4	2.5	0.9
4	8/10/12	13:25	14:25	75.1	327.5	508.7	911.4	60.4	283.1	440.2	720.0	3359.7	5258.2	8.6	2.3	1.0
5	8/10/12	14:35	15:35	76.8	328.1	509.2	914.1	65.5	284.2	443.3	780.5	3372.4	5294.9	7.4	2.4	1.1

Table A2. Plant Wide SO3 Testing Operating Parameters (continued)

Run #	Run Date mm/dd/yy	Run Start hh:mm	Run End hh:mm	FGD Inlet SO2 lbm/mmbtu	FGD Outlet SO2 lbm/mmbtu	5 SNCR Urea lbm/hr	6 SCR NH3 lbm/hr	7 SCR NH3 lbm/hr	HLI Speed %	HLI Rate lbm/hr	FGD Lime Feed gal/min	Test SO3 lbm/hr
1	8/6/12	9:45	10:45	2.734	0.061	43.9	417.9	564.9	5.2	210.0	161.3	107.9
2	8/6/12	11:00	12:00	2.771	0.052	43.6	425.3	576.3	5.2	211.9	179.5	101.6
3	8/6/12	12:20	13:20	2.762	0.036	42.0	434.0	576.0	10.1	396.7	194.0	73.92
4	8/6/12	13:30	14:30	2.810	0.030	42.5	430.6	581.4	10.1	384.8	200.3	60.94
5	8/6/12	14:40	15:40	2.857	0.031	45.0	427.5	586.4	19.6	689.4	198.1	50.28
6	8/6/12	15:50	16:50	2.856	0.026	42.9	431.6	590.5	19.7	713.5	189.8	42.87
1	6/29/12	9:20	10:20	2.771	0.066	0.0	0.2	457.5	0.0	12.1	132.5	12.59
2	6/29/12	11:10	12:10	2.779	0.057	12.3	0.0	461.7	0.0	5.8	132.6	27.7
1	8/7/12	9:30	10:30	3.063	0.033	43.0	294.7	258.7	0.0	13.6	136.3	26.29
2	8/7/12	10:40	11:40	3.106	0.033	44.3	297.1	251.5	0.0	21.6	134.5	33.25
3	8/7/12	12:45	13:45	3.135	0.048	44.1	424.1	354.0	0.0	16.7	156.2	60.34
4	8/7/12	13:55	14:55	3.152	0.051	42.7	409.9	361.8	0.0	30.9	176.7	54.55
1	8/8/12	10:45	11:45	3.126	0.085	25.1	455.3	629.6	0.0	15.6	208.4	78.42
2	8/8/12	11:55	12:55	3.128	0.079	24.6	456.4	641.0	0.0	33.8	211.2	86.9
3	8/8/12	13:50	14:50	3.168	0.064	40.8	455.7	646.4	0.0	6.5	219.8	106.9
4	8/8/12	15:05	16:05	3.165	0.065	40.7	459.9	650.2	0.0	9.2	221.5	52.82
1	6/29/12	12:55	13:55	2.785	0.053	19.7	0.4	472.8	4.5	161.4	119.3	26.83
2	6/29/12	14:40	15:40	2.765	0.069	0.0	0.2	455.2	4.5	141.6	105.1	27.75
1	8/9/12	9:10	10:10	3.091	0.127	34.6	315.6	190.8	10.1	355.2	103.2	27.79
2	8/9/12	10:20	11:20	3.118	0.113	34.4	319.4	256.8	10.1	359.9	118.3	15.14
3	8/9/12	12:40	13:40	3.148	0.070	34.9	455.3	397.3	15.1	509.9	184.1	27.51
4	8/9/12	13:50	14:50	3.154	0.060	34.7	458.2	396.5	15.1	558.0	200.3	21.15
1	8/10/12	8:55	9:55	3.227	0.090	37.8	350.1	564.8	18.2	595.1	221.4	37.11
2	8/10/12	10:05	11:05	3.286	0.073	42.6	351.1	563.9	18.2	591.4	226.4	57.58
3	8/10/12	11:35	12:35	3.307	0.075	43.2	371.2	561.9	18.2	596.8	223.4	57.92
4	8/10/12	13:25	14:25	3.280	0.066	42.3	434.6	626.5	19.1	606.9	235.4	55.36
5	8/10/12	14:35	15:35	3.190	0.069	40.8	435.1	629.7	19.4	607.4	233.4	49.61

SANDERS ENGINEERING & ANALYTICAL SERVICES, INC.

SULFUR DIOXIDE AND SULFURIC ACID MIST EMISSIONS TEST REPORT

FOR

GULF POWER COMPANY

Plant Crist

Combined Scrubber Stack

Pensacola, Florida

June 29, 2012

2255 SCHILLINGER RD. N.
SEMMES, ALABAMA 36575-7463
(251) 633-4120
FAX: (251) 633-2285
E-MAIL: sanders@sandersengineering.com

REPORT CERTIFICATION

I have reviewed the "Sulfur Dioxide and Sulfuric Acid Mist Emissions Test Report" for the testing performed for Gulf Power Company on the Combined Scrubber Stack located at the Pensacola, Florida facility. I hereby certify that it is authentic and accurate to the best of my knowledge.

Date: 9/7/12

Signature: ____________________
Isaac Smith
Operations Manager

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ILLUSTRATIONS

1. INTRODUCTION

Sanders Engineering & Analytical Services, Inc. (SEAS) performed sulfur dioxide and sulfuric acid mist emissions testing June 29, 2012, for Gulf Power Company on the Combined Scrubber Stack located at the Plant Crist facility in Pensacola, Florida. The testing was performed in accordance with the applicable procedures as specified at **CTM Method 013** as published by the National Council of Air and Stream Improvement for the determination of sulfuric acid vapor or mist and sulfur dioxide emissions from Kraft Recovery Furnaces. Further discussions of the test methods are included later in the report.

The purpose of the testing was to gain additional information concerning the emission rate of sulfuric acid mist from the unit. The testing was conducted by Mr. Mark Christian, Mr. Brett Horton, Mr. Bill Ward, Mr. Chase Stanley, and Mr. Andrew Byerley of Sanders Engineering & Analytical Services, Inc., and was coordinated with Mr. John Rampulla of Gulf Power Company.

2. DESCRIPTION OF SAMPLING PROGRAM

The sampling program consisted of sulfuric acid mist emissions testing in compliance with US EPA methods. The following is a brief description of these types of tests. The gas sample was extracted from the stack through a glass probe onto a quartz fiber filter for CTM-013 maintained at 500 degrees Fahrenheit. The filter catches all solid sulfates. Upon leaving the filter, the gas passes through a condenser and a series of impingers containing peroxide and silica gel. Calibrations of the testing equipment are included in Appendix A. A detailed description of the testing procedures and schematic of the sampling train is presented in Section 6. The field data sheets for this testing are presented in Appendix B. Sample calculations of Run 1 are included in Appendix C.

3. SUMMARY AND DISCUSSION OF RESULTS

There were no unusual problems experienced during the performance of the testing. The results of the sulfuric acid mist emissions testing are presented in Table I.

TABLE I. SULFUR DIOIXDE AND SULFURIC ACID MIST TEST RESULTS
GULF POWER COMPANY
PLANT CRIST - FGD STACK
CTM-013 Controlled Condensation Quartz Filter

Title of Run		RUN 1	RUN 2	RUN 3	RUN 4
Date	Month/Day/Year	6/29/2012	6/29/2012	6/29/2012	6/29/2012
Sampling Time -Start	Military	0920	1110	1255	1440
Sampling Time -Stop	Military	1020	1210	1355	1540
Number of Ports	dimensionless	1	1	1	1
Number of Points per Port	dimensionless	1	1	1	1
Stack Static Pressure	Inches Water	-0.35	-0.35	-0.35	-0.35
Barometric Pressure	Inches Mercury	29.69	29.69	29.69	29.69
Standard Orifice Pressure ΔH@	Inches Water	1.971	1.971	1.971	1.971
Meter Correction Factor	dimensionless	0.978	0.978	0.978	0.978
Oxygen Concentration	Mole Percent O2	10.00	10.00	9.50	9.50
Carbon Dioxide Concentration	Mole Percent CO2	10.0	10.0	10.0	10.0
Volume of Gas Metered	Actual Cubic Feet	40.802	40.676	42.826	41.557
Volume of Water Collected	Milliliters	115.50	108.80	110.20	97.00
Sampling Time	Minutes	60.0	60.0	60.0	60.0
Area of Stack	Square Feet	962.113	962.113	962.113	962.113
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5	1.5
Average Stack Temperature	Degrees F	121	122	123	124
Average Meter Temperature	Degrees F	91	94	94	92
Final Volume of SO2 Solution	Milliliters	360	389.00	393.00	347.00
Final Volume of H2SO4 Solution	Milliliters	36.00	41.00	49.00	34.00
Normality of Titrant (BaCl2)	Equivalence/Liter	0.00473	0.00473	0.00473	0.00473
Volume of Aliquot (SO2)	Milliliters	5.00	5.00	5.00	5.00
Volume of Aliquot (H2SO4)	Milliliters	25.00	25.00	25.00	25.00
Volume of Titrant for SO2 Blank	Milliliters	0.00	0.00	0.00	0.00
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	4.46	3.69	3.01	3.58
Volume of Titrant For H2SO4 Aliquot	Milliliters	6.56	12.65	10.91	15.47
Mass of Sulfur Dioxide Collected	ug	48,702	43,539	35,821	37,628
Mass of Sulfuric Acid Mist Collected	ug	2,193	4,817	4,965	4,885

Calculations

Standard Temperature (° F) =	68	RUN 1	RUN 2	RUN 3	RUN 4
Standard Pressure (inches of Hg) =	29.92				
Volume of Gas Sampled	Standard Dry Cubic Feet	38.102	37.739	39.739	38.742
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	30.00	30.00	29.98	29.98
Water vapor in Stack Gas	Percent	12.0 Saturated	11.9	11.5	10.5
Average Stack Gas Velocity	Feet per second	36.1	35.9	35.4	35.9
Stack Gas Flow Rate	Actual Cubic Feet Per Minute	2,085,094	2,069,866	2,042,269	2,073,161
Stack Gas Flow Rate	Standard Wet Cubic Feet Per Minute	1,877,802	1,862,859	1,835,129	1,859,560
Stack Gas Flow Rate	Standard Dry Cubic Feet Per Minute	1,653,367	1,640,313	1,623,288	1,663,553
Post Test Meter Correction Check	dimensionless	0.97	0.97	0.93	0.95
Percent Difference	Allowed 5% Average	-1.0	-0.3	-5.3	-2.7
CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	Sulfur Dioxide	45,139	40,743	31,833	34,299
	Sulfuric Acid	2,033	4,508	4,412	4,453
CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	Sulfur Dioxide	16.94	15.29	11.95	12.87
	Sulfuric Acid	0.50	1.11	1.08	1.09
EMISSION RATE OF CHEMICAL (LBS/HR)	Sulfur Dioxide	279.54	250.32	193.55	213.72
	Sulfuric Acid	12.59	27.70	26.83	27.75

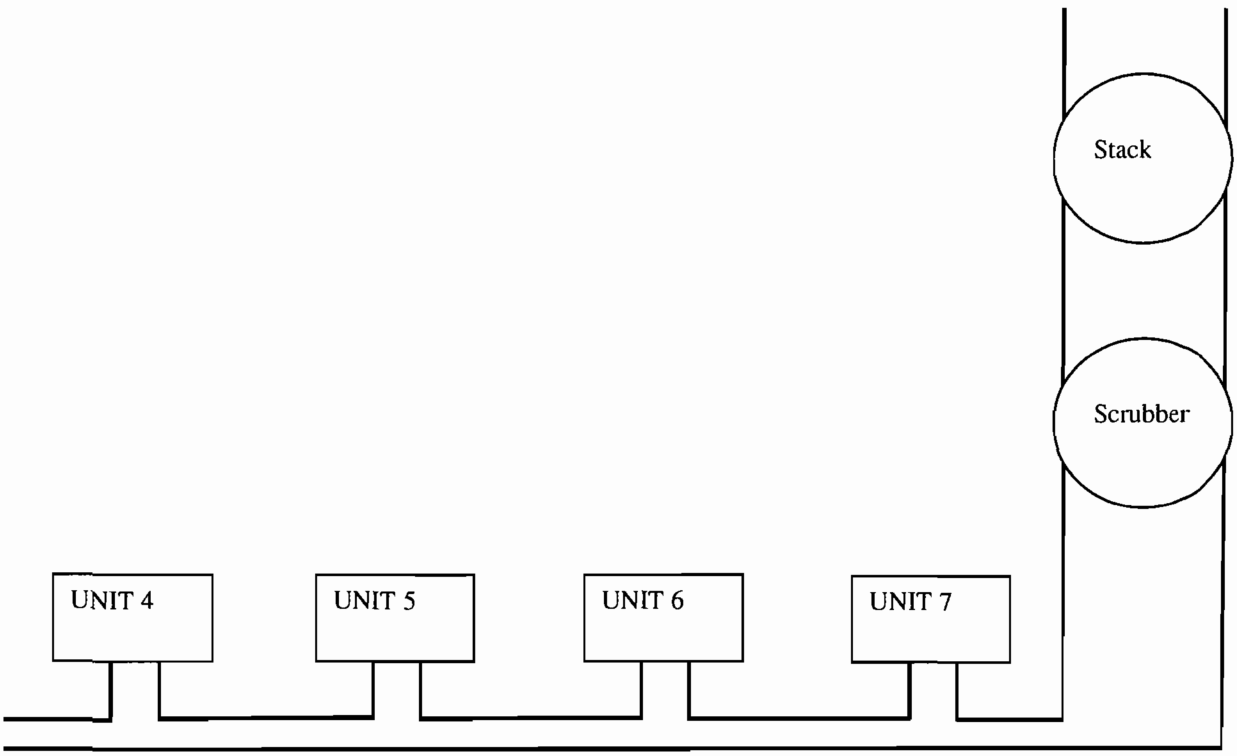
4. PROCESS DESCRIPTION

The process consists of a steam electric generating unit firing bituminous coal for the production of electric energy. The coal is received by barge, and loaded directly onto the conveyor feeding the plant or onto the stockpile and later loaded onto the conveyor belt transporting the coal to the plant. The coal from the conveyor is loaded into bunkers capable of holding between 36 to 48 hours supply of coal. The coal is then fed to pulverizing mills before being fired in the unit through the burners. Upon combustion of the coal in the fire box, approximately 20 percent of the ash falls to the bottom of the boiler and is removed by the ash removal system. The remaining 80 percent exits with the flue gases through the heat exchange and economizer sections of the furnace, and is collected by electrostatic precipitators.

4.1. Source Air Flow

The air flow schematic which depicts the passage of the flue gases exhausted from Plant Crist, Scrubber Stack, is presented in Figure 1.

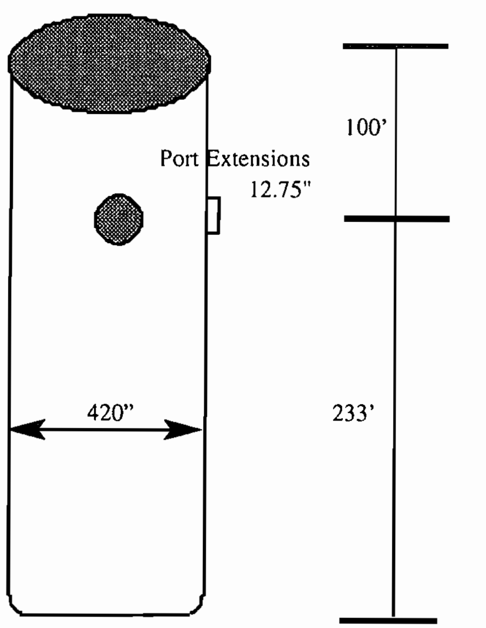
FIGURE 1. AIR FLOW SCHEMATIC

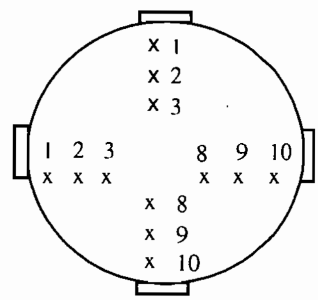


5. SAMPLE POINT LOCATION

The sample point locations and outlet duct schematic for the combined scrubber stack are presented in Figure 2.

Figure 2. Stack Outlet Sample Point Location





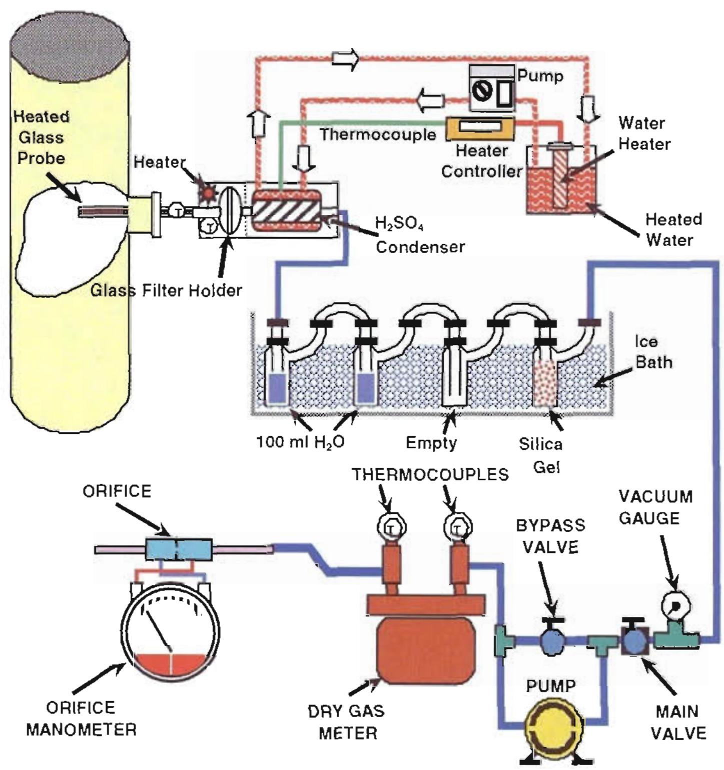
Point Number	Distance From Stack Wall (Inches)
1	143.64
2	94.92
3	61.32
4	34.44
5	10.92

Stack Area = 962.113 $ft.^2$

6. SULFUR DIOXIDE AND SULFURIC ACID MIST SAMPLE PROCEDURE (CTM-013)

The sampling procedure utilized is that approved by the United States Environmental Protection Agency for sampling and analysis of sulfuric acid mist for certain sources at kraft pulp mills. A brief description of the procedure is as follows:

Figure 3. CTM-013 Sampling Train



The glass sample probe and quartz filter and filter holder are heated to 500 degrees Fahrenheit or greater to prevent condensation of sulfuric acid mist. The filter was used to collect any particulate which may contain sulfates (sodium sulfate, calcium sulfate, etc). If any sulfuric acid mist was collected on the filter it was evaporated to the gaseous state and passed through the train to be collected in the condenser portion.

The condenser was maintained between 167 and 187 degrees Fahrenheit to allow condensation of the sulfuric acid mist without collecting other sulfur compounds particularly sulfur dioxide. The temperature was maintained by circulating heated water through the shell of the condenser. The temperature of the circulating water was controlled by a thermocouple inserted in the condenser.

Upon leaving the condenser, the gas enters a series of impingers. The first two impingers were partially filled with 100 milliliters of three percent hydrogen peroxide. The next impinger was left empty. Preweighed 6 to 16-mesh indication

silica gel was added to the last impinger. The sampling equipment, manufactured by Lear Siegler (Model 100) or Sanders Engineering (Model 200), was assembled as shown in the attached drawing. The system was leak checked by plugging the inlet to the nozzle and pulling a 15-inch mercury vacuum. A leakage rate not in excess of 0.02 cubic feet per minute was considered acceptable.

Crushed ice was placed around the impingers. The probe and hot box were preheated to 500 degrees Fahrenheit and the condenser water was heated to between 167 and 187 degrees Fahrenheit and circulated through the condenser. When the equipment reached the desired temperature, the flow was adjusted to one-half cubic foot per minute. Readings of the dry gas meter volume, temperature, and flow rate were recorded on the field data sheet every five minutes. At the conclusion of each run, the pump was turned off, final readings were recorded, and final system leak checks were performed. The sample train was purged by drawing clean ambient air through the system for five minutes at the average flow rate used for sampling.

6.1. Sample Recovery

The impingers were disconnected after purging. The nozzle, probe, and filter were rinsed with deionized water using multiple rinses for good washing, and the rinse was then discarded. The sulfuric acid mist condenser was rinsed with deionized water and the wash solution was collected in Container 1. The volume of liquids in the first two impingers were recorded to determine stack gas moisture content and then placed in container 2 and rinsed with deionized water.

6.2. Sample Analysis Procedures

The volume of sample for the container was recorded on the data sheet. If a noticeable amount of liquid was lost, the sample was either voided or methods, subject to the approval of the test administrator, were used to correct the final results. The entire contents of Container 1 were transferred into a 250 milliliter Erlenmeyer flask and 100% isopropyl alcohol was added to give an 80 percent isopropyl alcohol solution. An aliquot of this solution was pipetted into a 250

milliliter Erlenmeyer flask; two to four drops of thorin indicator were added and titrated to a pink endpoint barium chloride. The titration was repeated with a second aliquot of sample and the values were averaged. Replicate titrations must agree within one percent or 0.2 milliliters, whichever is greater.

For container 2, an aliquot of the solution was pipetted into a 250 ml Erlenmeyer flask and a volume of 100% Isopropanol equal to four times the sample aliquot was added to the sample. The sample was titrated in the same procedure as container 1.

6. QUALITY ASSURANCE

In order to ensure the accuracy of all the data collected in the field and at the laboratory, SEAS has instituted a comprehensive quality assurance and quality control program. New or repaired items requiring calibration are calibrated before their initial use in the field. Equipment with calibration that may change with use is calibrated before and after each use. When an item is found to be out of calibration, the unit is either discarded or repaired, and then recalibrated before being returned to service. All equipment is periodically recalibrated in full regardless of the results of the regular inspections or its present calibration status. Calibrations are performed in a manner consistent with the EPA reference methods recommended in the "Quality Assurance Handbook for Air Pollution Measurement Systems" published by the US Environmental Protection Agency. To the maximum degree possible all calibrations are traceable to the National Institute of Standards & Technology (NIST).

In order to ensure that the test will be performed in a timely manner without undue delays, SEAS sampling vans are equipped with duplicate sampling devices for almost every device needed to perform the test. If a particular device is broken or does not pass inspection, a second device is available immediately at the site for use. Any device which appears to be outside calibration, or in need of repair is tagged in the field and repaired, calibrated, or discarded immediately upon return to the laboratory.

6.1. Calibrations

Certain pieces of equipment need to be calibrated before and after each test. Those items include the pitot tubes, the differential pressure gauges, the dry gas meter, and the nozzles used for the particulate testing. The following is a brief description of the calibration procedures for each of these important devices.

6.1.1. *Pitot Tubes*

All pitot tubes are the S-type as required by EPA Reference Method 2 (40 CFR, Part 60, Appendix A, Method 2). This method contains certain geometric standards for the construction of S-type pitot tubes. All of SEAS pitot tubes are constructed according to these standards. According to the EPA any pitot tube constructed to these standards will have a coefficient of 0.84 ± 0.02. To ensure the exact value of SEAS pitot tubes, all pitot tubes are initially calibrated in SEAS wind tunnel to determine the exact pitot coefficient. This coefficient should not change unless the pitot is physically damaged. Each pitot tube is checked before going to the field to make sure it meets the geometry as specified. Any pitot tube which does not meet the specifications is not used in the test.

6.1.2. *Differential Pressure Gauges*

SEAS uses several different types of pressure gauges including oil tube manometers, water tube manometers, magnehelics, and current output electronic load cells. Each of these devices are inspected before taken to the field and are inspected for leaks during each test. The magnehelics and load cells are tested against an incline manometer water gauge to ensure accuracy.

6.1.3. *Temperature Sensors*

All temperature sensors used in SEAS sampling program are either mercury in-glass thermometers or type K thermocouples. These thermocouples are physical devices which produce a voltage proportional to the temperature. The thermocouple reading device is calibrated before and after each series of tests to ensure accuracy of ± 2 percent. The calibration of the thermocouple is accomplished by NIST traceable calibrated reference thermocouple potentiometer system.

6.1.4. *Nozzles*

The inside diameter of each nozzle is measured to the nearest 0.001 inches prior to its initial use. Upon arriving in the field each nozzle is again measured

with a micrometer on three different points on the diameter to ensure its original measurement and that the nozzle is perfectly round. If the difference between the maximum and minimum diameters measured does not exceed 0.003 inches, the nozzle is acceptable; otherwise, this nozzle is discarded and another is selected. At the end of each test the nozzles are again remeasured on three different points on the diameter to ensure that during the test the nozzle has not become dented or deformed.

6.1.5. *Dry Gas Meter*

The dry gas meter is initially calibrated against a spirometer transfer standard. During the initial calibration, a five point calibration curve is made at a minimum of one-half inch water column orifice pressure up to four inches water column orifice pressure. After each test, the dry gas meter calibration factor is checked by performing three repetitions at a representative flow rate experienced during the test. If the final calibration does not agree with the initial calibration within five percent the calibration which yields the lowest volume of sample pulled is used in the calculations. The dry gas meter is repaired and a new five initial five point calibration is performed.

6.1.6. *Orifice*

The flow meter orifice is used to establish isokinetic sampling rates during the test. The orifice is calibrated with the dry gas meter at the same time under the same conditions. The orifice is calibrated over a wide range of flow rates and the arithmetic mean of the orifice calibration is used for sampling purposes. The orifice is recalibrated every time the gas meter is recertified.

APPENDIX A QUALITY CONTROL OF TESTING EQUIPMENT

INITIAL METER BOX CALIBRATION

Calibrated By: MMC **BOX #:** S-101 **Date:** 10/26/2009

		Orifice #:	1	Orifice #:	3	Orifice #:	8	Reference 33103	Unit	RUN 4	RUN 5	
	Unit	RUN 1	RUN 2	RUN 1	RUN 2	RUN 1	RUN 2	Field Meter DH	In. H_2O	3.00	3.00	
Meter DH	In. H_2O	0.70	0.70	1.18	1.17	1.74	1.75	*Initial* Gas Volume	$Ft.^3$	822.694	840.724	
Initial Gas Volume	$Ft.^3$	746.000	751.300	758.200	767.400	777.400	784.800	*Final* Gas Volume	$Ft.^3$	840.724	855.503	
Final Gas Volume	$Ft.^3$	750.900	757.700	766.800	776.800	784.400	795.500	*Initial* Temp. Out	°F	80	81	
Initial Temp. Out	°F	72	73	75	75	76	77	*Final* Temp. Out	°F	80	79	
Final Temp. Out	°F	73	75	75	76	77	75	Reference Meter Y	*Dimensionless*	0.952	0.952	
Vacuum	In. Hg	21.5	22.0	21.5	21.5	20.5	20.5	*Initial* Gas Volume	$Ft.^3$	653.674	671.391	
Ambient Temp.	°F	73	73	74	76	76	75	*Final* Gas Volume	$Ft.^3$	671.391	685.968	
Barometric Pressure	In. Hg	29.81	29.81	29.81	29.81	29.81	29.81	*Initial* Temp.	°F	77	75	
Time	sec	629	820	860	939	576	882	*Final* Temp.	°F	75	74	
K'		0.3506	0.3506	0.4476	0.4476	0.5423	0.5423	Barometric Pressure	In. Hg	29.81	29.81	
CALCULATIONS								Time	sec	1155	944	
Total Meter Gas Volume	Actual $Ft.^3$	4.900	6.400	8.600	9.400	7.000	10.700	Volume Field Meter	ACF	18.03	14.779	
Time	Minutes	10.483	13.667	14.333	15.650	9.600	14.700	Volume Field Meter	SDCF	17.687	14.498	
Volume through the Meter	*SDCF without Y*	4.847	6.313	8.477	9.257	6.890	10.562	Volume Reference Meter	ACF	17.72	14.577	
Volume through the Orifice	*SDCF*	4.746	6.187	8.276	9.020	6.703	10.274	Volume Reference Meter	SDCF	17.381	14.341	
Calculated Y	*Dimensionless*	**0.979**	**0.980**	**0.976**	**0.974**	**0.973**	**0.973**			0.983	0.989	**0.978**
Difference	*Allowable 0.02*	0.001	0.002	-0.002	-0.004	-0.006	-0.006			0.004	0.011	
Calculated DH@		**1.905**	**1.899**	**1.969**	**1.958**	**1.985**	**1.999**			2.046	2.008	**1.971**
Difference	*Allowable 0.2*	-0.066	-0.072	-0.002	-0.013	0.014	0.028			0.075	0.037	

Magnehelic Calibrations

Device	Calibration	Delta P	
	Standard	Magnehelic	
Units	inches water	inches water	*Percent*
Reading	Reference	Sample	*Error*
1	0.35	0.36	*0.0*
2	0.96	0.98	*2.1*
3	1.73	1.75	*1.2*

Allowed Error = 5% of Reading

Thermocouple Calibrations

Device	Calibration	Thermocouple	
	Standard	Detector	
Units	Degrees F.	Degrees F.	*Percent*
Reading	Reference	Sample	*Error*
1	32	33	*0.2*
2	165	165	*0.0*
3	500	494	*-0.6*

Allowed Error = 1.5% of Absolute Temperature (Degrees Rankin);
Absolute Temperature = Temperature in Degrees Fahrenheit. + 460

Magnehelic Calibration

serial number	101			102A			102C			103A		
Span (in H2O)	0.25	2	25	0.25	2	25	0.25	2	25	0.25	2	10
Reference Reading @ 0% Span (in H2O)	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Device Reading (in H2O)	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Difference (Allowed = 0.05)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.120	0.95	4.73	0.125	1.00	9.64	0.131	0.90	9.30	0.12	0.95	5.15
Device Reading (in H2O)	0.122	0.96	4.90	0.126	0.98	9.75	0.129	0.88	9.00	0.12	0.92	5.20
% Difference (Allowed = 0.05)	1.67	1.05	3.59	0.80	2.00	1.14	1.53	2.22	3.23	2.56	3.16	0.97
Reference Reading @ 90% Span (in H2O)	0.220	1.88	23.50	2.32	1.85	23.30	0.250	2.00	22.80	0.248	1.91	9.50
Device Reading (in H2O)	0.222	1.83	24.20	2.300	1.90	24.00	0.243	1.97	23.30	0.240	1.95	9.20
% Difference (Allowed = 0.05)	0.91	2.66	2.98	0.86	2.70	3.00	2.80	1.50	2.19	3.23	2.09	3.16

serial number	103B						104		
Span (in H2O)	0.25	0.5	1	2	5	25	0.25	2	10
Reference Reading @ 0% Span (in H2O)	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00
Device Reading (in H2O)	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00
% Difference (Allowed = 0.05)	0.000	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.130	0.260	0.50	9.40	2.43	9.70	0.120	0.99	4.73
Device Reading (in H2O)	0.124	0.260	0.48	9.40	2.54	9.50	0.120	0.98	4.90
% Difference (Allowed = 0.05)	4.615	0.00	4.00	0.00	4.53	2.06	0.000	1.02	3.47
Reference Reading @ 90% Span (in H2O)	0.261	0.500	0.85	1.89	4.52	24.5	0.248	1.67	8.20
Device Reading (in H2O)	0.249	0.495	0.81	1.88	4.64	25.0	0.240	1.74	8.60
% Difference (Allowed = 0.05)	4.598	1.00	4.71	0.53	2.65	2.04	3.333	4.02	4.65

serial number	105			106		
Span (in H2O)	0.25	2	25	0.5	4	15
Reference Reading @ 0% Span (in H2O)	0.000	0.00	0.00	0.000	0.00	0.00
Device Reading (in H2O)	0.000	0.00	0.00	0.000	0.00	0.00
% Difference (Allowed = 0.05)	0.000	0.00	0.00	0.000	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.122	0.97	8.90	0.233	1.86	8.00
Device Reading (in H2O)	0.123	0.95	9.30	0.232	1.95	7.90
% Difference (Allowed = 0.05)	0.820	2.11	4.30	0.431	4.62	1.27
Reference Reading @ 90% Span (in H2O)	0.239	1.92	24.5	0.470	3.60	14.4
Device Reading (in H2O)	0.235	1.98	23.7	0.461	3.60	14.8
% Difference (Allowed = 0.05)	1.702	3.03	3.38	1.952	0.00	2.70
Calibration Date 12/30/2008 By MC						

APPENDIX B FIELD DATA

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 6-28-12 OPERATOR TBH

PLANT Crist BOX No. S-101 DHa 1.971 Y .978

UNIT FGD Stack METHOD ctm-013 PROBE # ______

BALANCE No. 105 STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 2000.4

	Run 1	Run 2	Run 3
Nozzle Calibration (inches)	/	/	/
Filter Number	/	/	/
METER READING Final	523.802	565.076	608.026
Initial	483.000	524.400	565.200
Net	40.802	40.676	42.826
LEAK CHECK System Pre (in. Hg)	12	10	10
System Post (in. Hg)	10	11	9
System Pre (cfm)	.004	.001	.000
System Post (cfm)	.002	.003	.000
Pitot Pre Impact / Static	X	/	/
Pitot Post Impact / Static	/	/	/
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final	194	188	185
Imp 1 Initial	100	100	100
Imp 1 Net	94	88	85
Imp 2 Final	110	110	110
Imp 2 Initial	100	100	100
Imp 2 Net	10	10	10
Imp 3 Final / Initial / Net	/	/	/
Imp 4 Final	1832.7	1843.5	1909.8
Imp 4 Initial	1821.2	1832.7	1894.6
Imp 4 Net	11.5	10.8	15.2
Total	115.5	108.8	110.2
GAS ANALYSIS O_2	10%	10%	9.5%
CO_2	10%	10%	10%
CO	/	/	/
STATIC (in. H_2O)	-.35	-.35	-.35
BAROMETRIC (in. Hg)	29.69	29.69	29.69

Form Revised 10/10/06

Page 1 of ______

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 6-29-12 OPERATOR TBH

PLANT Crist BOX No. S-101 DHa 1.971 Y .978

UNIT FGD Stack METHOD ctm-013 PROBE # ______

BALANCE No. 105 STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 2000.4

	Run 4	Run ____	Run ____
Nozzle Calibration (inches)	/		
Filter Number	/		
METER READING Final	649.757 / ____	____ / ____	____ / ____
Initial	608.200 / ____	____ / ____	____ / ____
Net	41.557 / ____	____ / ____	____ / ____
LEAK CHECK System Pre (in. Hg / cfm)	12 / .001		
System Post (in. Hg / cfm)	10 / .000		
Pitot Pre (Impact / Static)	/		
Pitot Post (Impact / Static)	/		
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final / Initial / Net	182 / 100 / 82		
Imp 2 Final / Initial / Net	107 / 100 / 7		
Imp 3 Final / Initial / Net	/		
Imp 4 Final / Initial / Net	917.8 / 909.8 / 8.0		
Total	97.0		
GAS ANALYSIS O_2	9.5%		
CO_2	10%		
CO	/		
STATIC (in. H_2O)	-.35		
BAROMETRIC (in. Hg)	29.69		

Form Revised 10/10/06

Page 1 of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Temperature °F Filter	Temperature °F Cond. ~~Imp.~~	Temperature °F Gas Meter	Vac. (In. Hg)
	9 :20	483.000		1.5		505	171	91	4
	:25	485.6		1.5		511	169	90	4
	:30	489.9		1.5		510	163	89	4
	:35	492.1		1.5		512	165	89	4
	:40	496.7		1.5		503	166	90	4
	:45	499.4		1.5		505	168	90	4
	:50	503.6		1.5		506	174	91	4
	:55	506.8		1.5		512	175	91	4
	10 :00	510.0		1.5		508	174	91	4
	:05	513.4		1.5		502	176	92	4
	:10	517.0		1.5		504	175	92	4
	:15	520.9		1.5		505	172	92	4
Stop	10 :20	523.802							
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Form Revised 8/24/02

Company: Gulf Power - Crist Date: 6-29-12 Page ____

Site: FGD Stack ctm-013 Run #: 1 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Temperature °F Filter	Temperature °F Cond. ~~Imp.~~	Temperature °F Gas Meter	Vac. (In. Hg)
	11:10	524.4		1.5		513	178	93	4
	:15	527.0		1.5		510	176	93	4
	:20	530.8		1.5		511	175	94	4
	:25	534.1		1.5		515	177	94	4
	:30	537.2		1.5		517	179	94	4
	:35	539.9		1.5		509	180	94	4
	:40	543.3		1.5		503	175	95	4
	:45	546.7		1.5		510	172	95	4
	:50	550.4		1.5		514	169	95	4
	:55	554.3		1.5		516	170	95	4
	12:00	558.4		1.5		512	172	95	4
	:05	562.1		1.5		511	167	95	4
Stop	12:10	565.076							
	:								
	:								
	:								
	:								
	:								
	:								
	:								
	:								
	:								
	:								
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	:								
	:								
	:								

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Company: Gulf Power - Crist Date: 6-29-12 Page ______

Site: FGD Stack Ctm-013 Run #: 2 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. ~~Imp.~~	Gas Meter	Vac. (In. Hg)
	12:55	565.200		1.5		516	178	93	4
	13:00	568.7		1.5		517	177	93	4
	:05	571.5		1.5		520	177	93	4
	:10	574.6		1.5		514	178	94	4
	:15	578.0		1.5		512	179	94	4
	:20	581.1		1.5		513	176	94	4
	:25	584.4		1.5		513	174	95	4
	:30	587.8		1.5		515	175	95	4
	:35	593.5		1.5		516	176	95	4
	:40	598.0		1.5		515	177	95	4
	:45	601.1		1.5		511	176	95	4
	:50	604.2		1.5		510	172	95	4
Stop	13:55	608.026							
	:								
	:								
	:								
	:								
	:								
	:								
	:								
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Company: Gulf Power - Crist Date: 6-29-12 Page ____

Site: FGD Stack ctm-013 Run #: 3 Of ____

Port # Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. Imp.	Gas Meter	Vac. (In. Hg)
	14:40	608.200		1.5		509	173	91	4
	:45	611.5		1.5		515	175	91	4
	:50	614.6		1.5		516	176	91	4
	:55	620.2		1.5		517	177	91	4
	15:00	623.4		1.5		516	178	92	4
	:05	626.8		1.5		511	177	92	4
	:10	630.0		1.5		513	178	92	4
	:15	633.1		1.5		515	176	92	4
	:20	637.2		1.5		517	175	92	4
	:25	640.4		1.5		520	169	92	4
	:30	643.3		1.5		509	173	92	4
	:35	646.7		1.5		513	172	92	4
Stop	15:40	649.757							
	:								
	:								
	:								
	:								
	:								
	:								
	:								
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Company: Gulf Power - Crist   Date: 6-29-12   Page ______

Site: FGD Stack ctm-013   Run #: 4   Of ______

TITLE **PROJECT**

Continued From Page

CTM-013 (Controlled Condensates)

H_2SO_4	SO_2
Run 1) H_2SO_4	SO_2
sample volume = 36 mL	sample volume = 360 mL
aliquot = 25 mL	aliquot = 5 mL
Final 7.06	Final 4.95 4.97
Initial 0.5	Initial 0.5 0.5
6.56	4.45 4.47
	$\bar{x}$ = 4.46
Run 2] H_2SO_4	SO_2
sample volume = 41 mL	sample volume = 389 mL
aliquot = 25 mL	aliquot = 5 mL
Final 9.5 + 4.15	Final 4.18 4.20
Initial 0.5 0.5	Initial 0.5 0.5
9.0 3.65	3.68 3.70
12.65	$\bar{x}$ = 3.69
Run 3] H_2SO_4	SO_2
sample volume = 49 mL	sample volume = 393 mL
aliquot = 25 mL	aliquot = 5 mL
Final 9.5 + 2.41	Final 3.49 3.52
Initial 0.5 0.5	Initial 0.5 0.5
9.0 1.91	2.99 3.02
10.91	$\bar{x}$ = 3.005
Run 4] H_2SO_4	SO_2
sample volume = 34 mL	sample volume = 347 mL
aliquot = 25 mL	aliquot = 5 mL
Final 9.5 6.97	Final 4.07 4.08
Initial 0.5 + 0.5	Initial 0.5 0.5
9.0 6.47	3.57 3.58
15.47	$\bar{x}$ = 3.575

[signature]
7-2-12

Continued To Page

SIGNATURE DATE

ctm-013
filter
Runs 1-4 | sample volume = 75 mL
aliquot = 25 mL

Final	0.61	0.62
Initial	0.5	0.5
	0.11	0.12

$\bar{X} = 0.115$

Audit
sample volume = 100 mL
aliquot = 10 mL

Final	1.81	1.81
Initial	0.5	0.5
	1.31	1.31

$\bar{X} = 1.31$

Continued To Page

SIGNATURE Brett Hatton
DATE 7-3-12

APPENDIX C SAMPLE CALCULATIONS

SAMPLE CALCULATIONS, RUN 1
GULF POWER COMPANY
PLANT CRIST - FGD STACK
CTM-013 Controlled Condensation Quartz Filter

Absolute Stack Pressure (inches Mercury)

$$P_s = P_{bar} + \frac{\overline{P_g}}{13.6}$$

P_g = Stack Static Pressure (inches Water) =	-0.35
P_{bar} = Barometric Pressure (inches Mercury) =	29.69
P_s =	29.66

Absolute Pressure at the Dry Gas Meter (inches Mercury)

$$P_m = P_{bar} + \frac{\overline{\Delta H}}{13.6}$$

P_{bar} = Barometric Pressure (inches Mercury) =	29.69
ΔH = Average pressure difference of orifice (inches Water) =	1.88
P_m =	29.83

Average Stack Gas Velocity (feet per second)

$$V_s = K_p C_p \overline{\sqrt{\Delta P}} \sqrt{\frac{\overline{T_s}}{M_s P_s}}$$

Kp = Pitot tube constant $\sqrt{\frac{(\text{lb/lb - mole})\ (\text{inches Hg})}{(^\circ\text{R})\ (\text{inches H2O})}}$ =	85.49
C_p = Pitot tube coefficient (dimensionless) =	0.84
$\overline{\sqrt{\Delta P}}$ = Velocity head of stack gas (inches H2O) =	0.6112
Ts = Average absolute temperature of stack, degrees Rankin =	581.2
M_s = Molecular weight of stack gas; wet basis (lb/lb mole) =	28.59
P_s = Absolute stack pressure (inches Mercury) =	29.66
V_s =	36.3

Volume of Gas Sampled Measured by Dry Gas Meter

(corrected to standard conditions, SDCF)

$$Vm(Std) = K_1 V_m Y \left[\frac{P_{bar} + \frac{\overline{\Delta H}}{13.6}}{\overline{T_m}} \right]$$

K_1 = Degrees R/inches Mercury =	17.64
V_m = Volume of gas sample as measured by dry gas meter (actual cubic feet) =	47.42
Y = Dry gas meter calibration factor (dimensionless) =	0.9890
P_{bar} = Barometric Pressure (inches Mercury) =	29.69
Δ H = Average pressure difference of orifice (inches H2O) =	1.88
T_m = Average absolute temperature of the dry gas, degrees Rankin =	542.4
$V_{m\,(Std)}$ =	45.485

Volume of Water Vapor in Gas Sample

$$V_{w\,(Std)} = 0.04707\ V_{lc}$$

V_{lc} = Total volume of liquid collected in impingers and silica gel (milliliters) =	129.0
$V_{w\,(Std)}$ =	6.071

Water Vapor in the Gas Stream proportion by volume (dimensionless)

$$B_{ws} = \frac{V_{w(Std)}}{V_{m(Std)} + V_{w(Std)}}$$

$V_{w\,(std)}$ = Volume of water in gas sample (corrected to standard conditions) =	6.071
$V_{m(std)}$ = Volume of sample measured by dry gas meter (standard conditions) =	45.485
B_{ws} =	0.118

Molecular Weight of Stack Gas (dry basis, lb/lb mole)

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$$

$\%CO_2$ = Number percent by volume (dry basis from gas analysis) =	10.0
$\%O_2$ = Number percent by volume (dry basis from gas analysis) =	10.0
$\%N_2+\%CO$ = Number percent by volume (dry basis from gas analysis) =	80.0
M_d =	30.00

Molecular Weight of Stack Gas (wet basis, lb/lb mole)

$$M_s = M_d(1 - B_{ws}) + 18(B_{ws})$$

M_d = Molecular weight of stack gas (dry basis, lb/lb mole) =	30.00
B_{ws} = Water vapor in the gas stream (proportion by volume, dimensionless) =	0.118
M_s =	28.59

Volumetric Flow Rate (actual cubic feet per minute)

$$Q_a = (V_s)(A_s)(60)$$

V_s = Average stack gas velocity (feet per second) =	36.3
A_s = Cross sectional area of stack (feet squared) =	962.1128
Q_a =	2,097,585

Volumetric Flow Rate (standard dry cubic feet per minute)

$$Q_s = Q_a(1 - B_{ws})\frac{(528)}{\overline{T_s}}\frac{(P_s)}{29.92}$$

Q_a = Volumetric flow rate (actual cubic feet per minute) =	2,097,585
B_{ws} = Water vapor in the gas stream (proportion by volume, dimensionless) =	0.118
Ts = Average absolute temperature of stack, degrees Rankin =	581.2
P_s = Absolute stack pressure (inches Mercury) =	29.66
Q_s =	1,665,684

Volumetric Flow Rate (standard wet cubic feet per minute)

$$Q_{sw} = Q_a \frac{(528)}{\overline{T_s}} \frac{(P_s)}{29.92}$$

Q_a = Volumetric flow rate (actual cubic feet per minute) = 2,097,585

Ts = Average absolute temperature of stack, degrees Rankin = 581.2

P_s = Absolute stack pressure (inches Mercury) = 29.66

Q_{sw} = 1,887,996

Volume of Gas Sampled Through Nozzle (actual cubic feet)

$$V_n = \left[(0.002669)(V_{lc}) + Y \frac{V_m}{\overline{T_m}} \left(P_{bar} + \frac{\overline{\Delta H}}{13.6} \right) \right] \frac{\overline{T_s}}{P_s}$$

V_{lc} = Total volume of liquid collected in impingers and silica gel (milliliters) = 129.0

Y = Dry gas meter calibration factor (dimensionless) = 0.9890

V_m = Volume of gas sample as measured by dry gas meter (actual cubic feet) = 47.423

Tm = Average absolute temperature of dry gas meter, degrees Rankin = 542.4

P_{bar} = Barometric Pressure (inches Mercury) = 29.69

ΔH = Average pressure difference of orifice (inches Water) = 1.88

Ts = Average absolute temperature of stack, degrees Rankin = 581.2

P_s = Absolute stack pressure (inches Mercury) = 29.66

V_n = 57.281

SANDERS ENGINEERING & ANALYTICAL SERVICES, INC.

SULFUR DIOXIDE AND SULFURIC ACID MIST EMISSIONS TEST REPORT

FOR

GULF POWER COMPANY

Plant Crist

Unit 6 SCR

Pensacola, Florida

July 25, 2012

2255 SCHILLINGER RD. N.
SEMMES, ALABAMA 36575-7463
(251) 633-4120
FAX: (251) 633-2285
E-MAIL: sanders@sandersengineering.com

REPORT CERTIFICATION

I have reviewed the "Sulfur Dioxide and Sulfuric Acid Mist Emissions Test Report" for the testing performed for Gulf Power Company on the Plant Crist Unit 6 SCR located at the Pensacola, Florida facility. I hereby certify that it is authentic and accurate to the best of my knowledge.

Date: 8/16/12

Signature: [signature]

Eric Jones
Environmental Engineer

TABLE OF CONTENTS

LIST OF TABLES

ILLUSTRATIONS

1. INTRODUCTION

Sanders Engineering & Analytical Services, Inc. (SEAS) performed sulfur dioxide and sulfuric acid mist emissions testing on July 25, 2012, for Gulf Power Company on the Plant Crist 6 SCR and outlet located at the Plant Crist facility in Pensacola, Florida. The testing was performed in accordance with the applicable procedures as specified at **CTM Method 013 and 013a** as published by the National Council of Air and Stream Improvement for the determination of sulfuric acid vapor or mist and sulfur dioxide emissions from Kraft Recovery Furnaces. Further discussions of the test methods are included later in the report.

The purpose of the testing was to gain additional information concerning the emission rate of sulfuric acid mist from the unit. The testing was conducted by Mr. Mark Christian, Mr. Brett Horton, and Mr. Thomas Creighton of Sanders Engineering & Analytical Services, Inc., and was coordinated with Mr. John Rampulla of Gulf Power Company.

2. DESCRIPTION OF SAMPLING PROGRAM

The sampling program consisted of sulfuric acid mist emissions testing in compliance with US EPA methods. The following is a brief description of these types of tests. The gas sample was extracted from the stack through a glass probe onto a glass fiber filter for CTM-013A and a quartz fiber filter for CTM-013, all maintained at 500 degrees Fahrenheit. The filter catches all solid sulfates. Upon leaving the filter, the gas passes through a condenser and a series of impingers and silica gel directly into a series of impingers containing Isopropanol and peroxide. Calibrations of the testing equipment are included in Appendix A. A detailed description of the testing procedures and schematic of the sampling train is presented in Section 6. The field data sheets for this testing are presented in Appendix B. Sample calculations of Run 1 are included in Appendix C.

3. SUMMARY AND DISCUSSION OF RESULTS

There were no unusual problems experienced during the performance of the testing. The results of the sulfuric acid mist emissions testing are presented in Tables I and II.

TABLE I. SULFUR DIOXIDE AND SULFURIC ACID MIST TEST RESULTS (METHOD 13A) GULF POWER COMPANY CRIST UNIT 6 - SCR INLET PENSACOLA, FLORIDA

Title of Run		RUN 1	RUN 2	RUN 3
Date	Month/Day/Year	7/25/2012	7/25/2012	7/25/2012
Sampling Time -Start	Military	0915	1220	1355
Sampling Time -Stop	Military	1015	1320	1455
Number of Ports	dimensionless	1	1	1
Number of Points per Port	dimensionless	1	1	1
Stack Static Pressure	Inches Water	-22.00	-22.00	-22.00
Barometric Pressure	Inches Mercury	29.94	29.94	29.94
Standard Orifice Pressure ΔH@	Inches Water	1.869	1.869	1.869
Meter Correction Factor	dimensionless	0.989	0.989	0.989
Oxygen Concentration	Mole Percent O2	8.50	8.50	8.00
Carbon Dioxide Concentration	Mole Percent CO2	12.0	10.0	10.0
Volume of Gas Metered	Actual Cubic Feet	40.101	40.615	40.904
Volume of Water Collected	Milliliters	74.6	71.1	57.5
Sampling Time	Minutes	60.0	60.0	60.0
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5
Average Stack Temperature	Degrees F	573	575	575
Average Meter Temperature	Degrees F	93	98	98
Final Volume of SO2 Solution	Milliliters	382	424	360
Final Volume of H2SO4 Solution	Milliliters	138	168	188
Normality of Titrant (BaCl2)	Equivalence/Liter	0.0097	0.0097	0.0097
Volume of Aliquot (SO2)	Milliliters	1	1	1
Volume of Aliquot (H2SO4)	Milliliters	25	25	25
Volume of Titrant for SO2 Blank	Milliliters	0.00	0.00	0.00
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	28.28	22.75	25.48
Volume of Titrant For H2SO4 Aliquot	Milliliters	0.68	3.75	4.48
Mass of Sulfur Dioxide Collected	ug	3,359,299	3,000,060	2,852,327
Mass of Sulfuric Acid Mist Collected	ug	1,774	12,000	16,025

Calculations

		RUN 1	RUN 2	RUN 3	AVERAGE
Standard Temperature (° F) =	68				
Standard Pressure (inches of Hg) =	29.92				
Volume of Gas Sampled	Standard Dry Cubic Feet	38.065	38.179	38.439	38.228
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	30.26	29.94	29.92	30.04
Water vapor in Stack Gas	Percent	8.4	8.1	6.6	7.7
Post Test Meter Correction Check	dimensionless	1.00	1.00	1.00	1.00
Percent Difference	Allowed 5% Average	1.6	1.4	0.7	1.2
CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	Sulfur Dioxide	3,116,563	2,775,016	2,620,508	2,837,362
	Sulfuric Acid	1,646	11,100	14,722	9,156
CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	Sulfur Dioxide	1,169.56	1,041.39	983.41	1,064.79
	Sulfuric Acid	0.40	2.72	3.61	2.24

TABLE II. SULFUR DIOXIDE AND SULFURIC ACID MIST TEST RESULTS (METHOD 13) GULF POWER COMPANY PLANT CRIST UNIT 6 - SCR OUTLET PENSACOLA, FLORIDA

Title of Run		RUN 1	RUN 2	RUN 3
Date	Month/Day/Year	7/25/2012	7/25/2012	7/25/2012
Sampling Time -Start	Military	0915	1220	1355
Sampling Time -Stop	Military	1015	1320	1455
Number of Ports	dimensionless	1	1	1
Number of Points per Port	dimensionless	1	1	1
Stack Static Pressure	Inches Water	-24.00	-24.00	-24.00
Barometric Pressure	Inches Mercury	29.94	29.94	29.94
Standard Orifice Pressure ΔH@	Inches Water	2.491	2.491	2.491
Meter Correction Factor	dimensionless	0.962	0.962	0.962
Oxygen Concentration	Mole Percent O2	8.00	7.00	7.00
Carbon Dioxide Concentration	Mole Percent CO2	11.0	12.5	12.5
Volume of Gas Metered	Actual Cubic Feet	37.774	34.350	32.424
Volume of Water Collected	Milliliters	56.7	71.3	69.2
Sampling Time	Minutes	60.0	60.0	60.0
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5
Average Stack Temperature	Degrees F	537	540	539
Average Meter Temperature	Degrees F	91	94	93
Final Volume of SO2 Solution	Milliliters	320	350	340
Final Volume of H2SO4 Solution	Milliliters	48	47	38
Normality of Titrant (BaCl2)	Equivalence/Liter	0.0097	0.0097	0.0097
Volume of Aliquot (SO2)	Milliliters	1	1	1
Volume of Aliquot (H2SO4)	Milliliters	3	5	5
Volume of Titrant for SO2 Blank	Milliliters	0.00	0.00	0.00
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	21.60	25.70	28.15
Volume of Titrant For H2SO4 Aliquot	Milliliters	3.35	12.53	16.23
Mass of Sulfur Dioxide Collected	ug	2,149,742	2,797,588	2,976,734
Mass of Sulfuric Acid Mist Collected	ug	25,524	56,064	58,718

Calculations

		RUN 1	RUN 2	RUN 3	AVERAGE
Standard Temperature (° F) =	68				
Standard Pressure (inches of Hg) =	29.92				
Volume of Gas Sampled	Standard Dry Cubic Feet	34.967	31.625	29.888	32.160
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	30.08	30.28	30.28	30.21
Water vapor in Stack Gas	Percent	7.1	9.6	9.8	8.8
Post Test Meter Correction Check	dimensionless	0.93	1.02	1.08	1.01
Percent Difference	Allowed 5% Average	-3.8	5.8	12.0	4.65

CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	Sulfur Dioxide	2,171,108	3,123,952	3,517,203	2,937,421
	Sulfuric Acid	25,777	62,604	69,380	52,587

CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	Sulfur Dioxide	814.76	1,172.34	1,319.91	1,102.34
	Sulfuric Acid	6.32	15.35	17.01	12.89

4. PROCESS DESCRIPTION

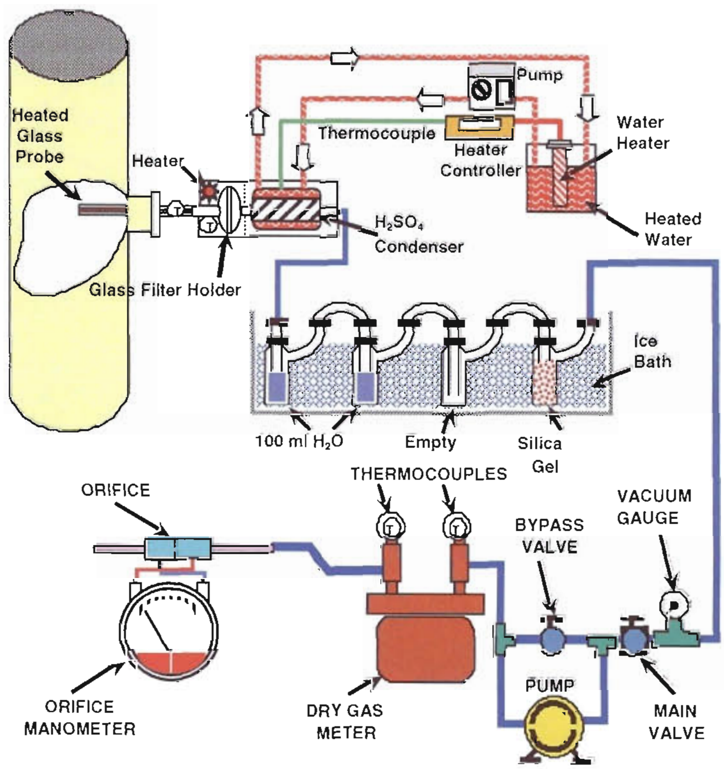
The process consists of a steam electric generating unit firing bituminous coal for the production of electric energy. The coal is received by barge, and loaded directly onto the conveyor feeding the plant or onto the stockpile and later loaded onto the conveyor belt transporting the coal to the plant. The coal from the conveyor is loaded into bunkers capable of holding between 36 to 48 hours supply of coal. The coal is then fed to pulverizing mills before being fired in the unit through the burners. Upon combustion of the coal in the fire box, approximately 20 percent of the ash falls to the bottom of the boiler and is removed by the ash removal system. The remaining 80 percent exits with the flue gases through the heat exchange and economizer sections of the furnace, and is collected by electrostatic precipitators.

5. SULFUR DIOXIDE AND SULFURIC ACID MIST SAMPLING PROCEDURE (EPA Method CTM-013)

The sampling procedure utilized is that approved by the United States Environmental Protection Agency for sampling and analysis of sulfuric acid mist for certain sources at kraft pulp mills. A brief description of the procedure is as follows:

The glass sample probe and quartz filter and filter holder are heated to 500 degrees Fahrenheit or greater to prevent condensation of sulfuric acid mist. The filter was used to collect any particulate which may contain sulfates (sodium sulfate, calcium sulfate, etc). If any sulfuric acid mist was collected on the filter it was evaporated to the gaseous state and passed through the train to be collected in the condenser portion.

Figure 1. CTM-013 Sampling Train



The condenser was maintained between 167 and 187 degrees Fahrenheit to allow condensation of the sulfuric acid mist without collecting other sulfur compounds particularly sulfur dioxide. The temperature was maintained by circulating heated water through the shell of the condenser. The temperature of the circulating water was controlled by a thermocouple inserted in the condenser.

Upon leaving the condenser, the gas enters a series of impingers. The first two impingers were partially filled with 100 milliliters of three percent hydrogen peroxide. The next impinger was left empty. Preweighed 6 to 16-mesh indication

silica gel was added to the last impinger. The sampling equipment, manufactured by Lear Siegler (Model 100) or Sanders Engineering (Model 200), was assembled as shown in the attached drawing. The system was leak checked by plugging the inlet to the nozzle and pulling a 15-inch mercury vacuum. A leakage rate not in excess of 0.02 cubic feet per minute was considered acceptable.

Crushed ice was placed around the impingers. The probe and hot box were preheated to 500 degrees Fahrenheit and the condenser water was heated to between 167 and 187 degrees Fahrenheit and circulated through the condenser. When the equipment reached the desired temperature, the flow was adjusted to one-half cubic foot per minute. Readings of the dry gas meter volume, temperature, and flow rate were recorded on the field data sheet every five minutes. At the conclusion of each run, the pump was turned off, final readings were recorded, and final system leak checks were performed. The sample train was purged by drawing clean ambient air through the system for five minutes at the average flow rate used for sampling.

5.1. Sample Recovery

The impingers were disconnected after purging. The nozzle, probe, and filter were rinsed with deionized water using multiple rinses for good washing, and the rinse was then discarded. The sulfuric acid mist condenser was rinsed with deionized water and the wash solution was collected in Container 1. The volume of liquids in the first two impingers were recorded to determine stack gas moisture content and then placed in container 2 and rinsed with deionized water.

5.2. Sample Analysis Procedures

The volume of sample for the container was recorded on the data sheet. If a noticeable amount of liquid was lost, the sample was either voided or methods, subject to the approval of the test administrator, were used to correct the final results. The entire contents of Container 1 were transferred into a 250 milliliter Erlenmeyer flask and 100% isopropyl alcohol was added to give an 80 percent isopropyl alcohol solution. An aliquot of this solution was pipetted into a 250

milliliter Erlenmeyer flask; two to four drops of thorin indicator were added and titrated to a pink endpoint barium chloride. The titration was repeated with a second aliquot of sample and the values were averaged. Replicate titrations must agree within one percent or 0.2 milliliters, whichever is greater.

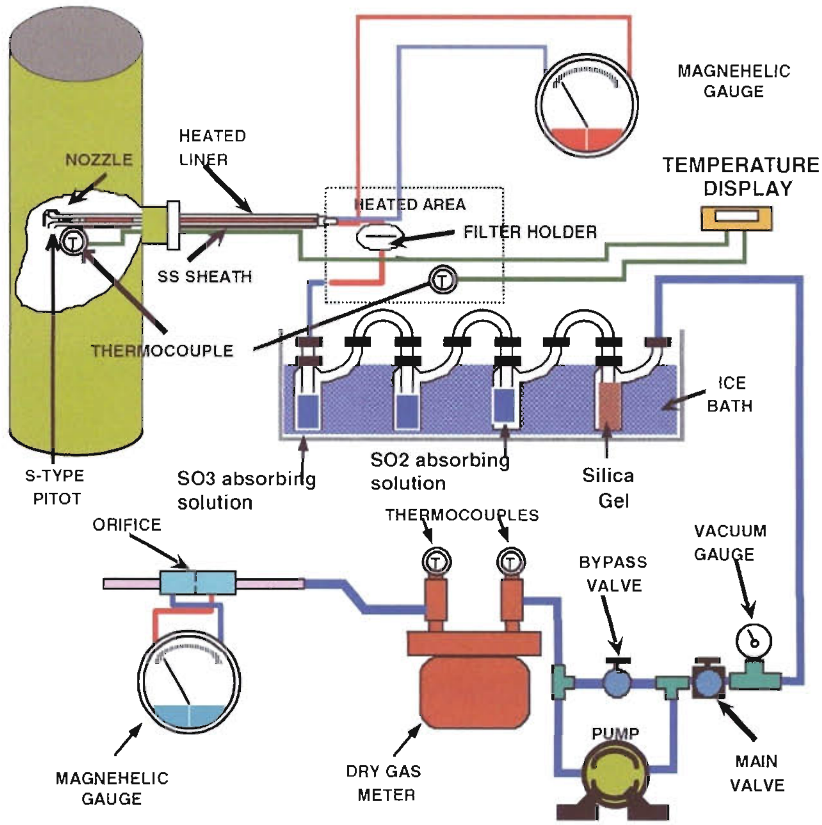
For container 2, an aliquot of the solution was pipetted into a 250 ml Erlenmeyer flask and a volume of 100% Isopropanol equal to four times the sample aliquot was added to the sample. The sample was titrated in the same procedure as container 1.

6. SULFURIC ACID MIST SAMPLING PROCEDURE (CTM-013A)

The sampling procedure is that specified in **CTM-013A.** A brief description of this procedure is as follows:

The first impinger was partially filled with 100 milliliters of 80 percent isopropyl alcohol. The second and third impingers were filled with 100 milliliters of three percent hydrogen peroxide. The forth impinger was left empty to act as a moisture trap. Preweighed 6 to 16 mesh indication silica gel was added to the last impinger. The sampling equipment manufactured by Lear Siegler (Model 100) or Sanders Engineering (Model 200) was assembled as shown in the attached drawing. The system was leak checked by plugging the inlet to the nozzle and pulling a 15-inch mercury vacuum. A leakage rate not in excess of 0.02 cubic feet per minute is considered acceptable.

Figure 2. CTM-013A Sampling Train



The inside dimensions of the stack liner were measured and recorded. The required numbers of sample points were marked on the probe for easy visibility. The range of velocity pressure, percent moisture, and temperature of the effluent gases were determined. From this data the correct nozzle size and nomograph multiplication factor were determined.

The probe and hotbox heaters were adjusted to provide a temperature of 500 degrees Fahrenheit (± 25). Crushed ice was placed around the impingers. The nozzle was placed on the first traverse point with the tip pointing directly into the gas stream. The pump was started immediately and the flow adjusted to a delta H of 1.5. At the conclusion of each run the pump was turned off, final readings recorded, and final system leak checks were performed. Clean air was then pulled through the sample train for 15 minutes at the rate during the test.

6.1. Sample Recovery

Care was exercised in moving the collection train to the sample recovery area to minimize the loss of collected sample. The volume of solution in the first impinger was measured. The contents of the first impinger was placed in container one along with the washings of the impingers with 80% Isopropanol. The volume of solution in the second and third impingers was measured. The contents of the second and third impingers were placed in container two, along with the washing of the glassware from the end of the second impinger to the inlet of the last impinger with deionized water. The contents of the last impinger were weighed and recorded on the field data sheet.

6.2. Analytical Procedures

The volume of sample containers were noted and recorded. An aliquot of each container was titrated using barium chloride as the titrate. This titrate was standardized against a standard 0.01 N sulfuric acid solution. Replicate titrations were performed until the volume of titrate agreed within 0.2 milliliters. The results of the titrations of the two containers were reported as sulfuric acid mist and sulfur dioxide.

7. QUALITY ASSURANCE

In order to ensure the accuracy of all the data collected in the field and at the laboratory, SEAS has instituted a comprehensive quality assurance and quality control program. New or repaired items requiring calibration are calibrated before their initial use in the field. Equipment with calibration that may change with use is calibrated before and after each use. When an item is found to be out of calibration, the unit is either discarded or repaired, and then recalibrated before being returned to service. All equipment is periodically recalibrated in full regardless of the results of the regular inspections or its present calibration status. Calibrations are performed in a manner consistent with the EPA reference methods recommended in the "Quality Assurance Handbook for Air Pollution Measurement Systems" published by the US Environmental Protection Agency. To the maximum degree possible all calibrations are traceable to the National Institute of Standards & Technology (NIST).

In order to ensure that the test will be performed in a timely manner without undue delays, SEAS sampling vans are equipped with duplicate sampling devices for almost every device needed to perform the test. If a particular device is broken or does not pass inspection, a second device is available immediately at the site for use. Any device which appears to be outside calibration, or in need of repair is tagged in the field and repaired, calibrated, or discarded immediately upon return to the laboratory.

7.1. Calibrations

Certain pieces of equipment need to be calibrated before and after each test. Those items include the pitot tubes, the differential pressure gauges, the dry gas meter, and the nozzles used for the particulate testing. The following is a brief description of the calibration procedures for each of these important devices.

7.1.1. *Pitot Tubes*

All pitot tubes are the S-type as required by EPA Reference Method 2 (40 CFR, Part 60, Appendix A, Method 2). This method contains certain geometric standards for the construction of S-type pitot tubes. All of SEAS pitot tubes are constructed according to these standards. According to the EPA any pitot tube constructed to these standards will have a coefficient of 0.84 $\pm$ 0.02. To ensure the exact value of SEAS pitot tubes, all pitot tubes are initially calibrated in SEAS wind tunnel to determine the exact pitot coefficient. This coefficient should not change unless the pitot is physically damaged. Each pitot tube is checked before going to the field to make sure it meets the geometry as specified. Any pitot tube which does not meet the specifications is not used in the test.

7.1.2. *Differential Pressure Gauges*

SEAS uses several different types of pressure gauges including oil tube manometers, water tube manometers, magnehelics, and current output electronic load cells. Each of these devices are inspected before taken to the field and are inspected for leaks during each test. The magnehelics and load cells are tested against an incline manometer water gauge to ensure accuracy.

7.1.3. *Temperature Sensors*

All temperature sensors used in SEAS sampling program are either mercury in-glass thermometers or type K thermocouples. These thermocouples are physical devices which produce a voltage proportional to the temperature. The thermocouple reading device is calibrated before and after each series of tests to ensure accuracy of $\pm$ 2 percent. The calibration of the thermocouple is accomplished by NIST traceable calibrated reference thermocouple potentiometer system.

7.1.4. *Nozzles*

The inside diameter of each nozzle is measured to the nearest 0.001 inches prior to its initial use. Upon arriving in the field each nozzle is again measured

with a micrometer on three different points on the diameter to ensure its original measurement and that the nozzle is perfectly round. If the difference between the maximum and minimum diameters measured does not exceed 0.003 inches, the nozzle is acceptable; otherwise, this nozzle is discarded and another is selected. At the end of each test the nozzles are again remeasured on three different points on the diameter to ensure that during the test the nozzle has not become dented or deformed.

7.1.5. *Dry Gas Meter*

The dry gas meter is initially calibrated against a spirometer transfer standard. During the initial calibration, a five point calibration curve is made at a minimum of one-half inch water column orifice pressure up to four inches water column orifice pressure. After each test, the dry gas meter calibration factor is checked by performing three repetitions at a representative flow rate experienced during the test. If the final calibration does not agree with the initial calibration within five percent the calibration which yields the lowest volume of sample pulled is used in the calculations. The dry gas meter is repaired and a new five initial five point calibration is performed.

7.1.6. *Orifice*

The flow meter orifice is used to establish isokinetic sampling rates during the test. The orifice is calibrated with the dry gas meter at the same time under the same conditions. The orifice is calibrated over a wide range of flow rates and the arithmetic mean of the orifice calibration is used for sampling purposes. The orifice is recalibrated every time the gas meter is recertified.

APPENDIX A QUALITY CONTROL OF TESTING EQUIPMENT

INITIAL METER BOX CALIBRATION

Calibrated By: JCS **BOX #:** C-133 **Date:** 3/9/2012

		Unit	Orifice #: RUN 1	1 RUN 2	Orifice #: RUN 1	3 RUN 2	Orifice #: RUN 1	8 RUN 2
Meter	DH	In. H_2O	0.97	0.97	1.53	1.52	2.17	2.17
	Initial Gas Volume	Ft.^{3}	242.700	252.900	258.100	263.200	269.400	274.500
	Final Gas Volume	Ft.^{3}	252.900	258.100	263.200	269.400	274.500	279.600
	Initial Temp. Out	°F	75	75	75	75	75	75
	Final Temp. Out	°F	75	75	75	75	75	76
	Vacuum	In. Hg	28.0	28.0	23.0	23.0	22.0	22.0
	Ambient Temp.	°F	72	72	72	72	72	72
	Barometric Pressure	In. Hg	30.26	30.26	30.26	30.26	30.26	30.26
	Time	sec	1279	644	500	608	416	416
	K'		0.3506	0.3506	0.4476	0.4476	0.5423	0.5423
CALCULATIONS								
	Total Meter Gas Volume	Actual Ft.^{3}	10.200	5.200	5.100	6.200	5.100	5.100
	Time	Minutes	21.317	10.733	8.333	10.133	6.933	6.933
	Volume through the Meter	*SDCF without Y*	10.201	5.200	5.107	6.209	5.115	5.110
	Volume through the Orifice	*SDCF*	9.805	4.937	4.894	5.951	4.933	4.933
	Calculated Y	*Dimensionless*	**0.961**	**0.949**	**0.958**	**0.958**	**0.964**	**0.965**
	Difference	*Allowable 0.02*	-0.001	-0.013	-0.004	-0.004	0.002	0.003
	Calculated DH@		**2.586**	**2.586**	**2.510**	**2.493**	**2.432**	**2.430**
	Difference	*Allowable 0.2*	0.096	0.096	0.019	0.003	-0.058	-0.061

Reference	33103	Unit	RUN 4	RUN 5	
Field Meter	DH	In. H_2O	2.50	3.50	
	Initial Gas Volume	Ft.^{3}	279.600	285.200	
	Final Gas Volume	Ft.^{3}	285.200	290.300	
	Initial Temp. Out	°F	77	77	
	Final Temp. Out	°F	77	77	
Reference Meter	Y	*Dimensionless*	0.952	0.952	
	Initial Gas Volume	Ft.^{3}	59.200	64.665	
	Final Gas Volume	Ft.^{3}	64.665	69.665	
	Initial Temp.	°F	77	77	
	Final Temp.	°F	77	77	
	Barometric Pressure	In. Hg	30.26	30.260	
	Time	sec	430	329	
Volume Field Meter		ACF	5.60	5.100	
Volume Field Meter		SDCF	5.600	5.113	
Volume Reference Meter		ACF	5.47	5.000	
Volume Reference Meter		SDCF	5.432	4.970	
Calculated Y			0.970	0.972	**0.962**
Difference			0.008	0.010	
Calculated DH@			2.463	2.424	**2.491**
Difference			-0.027	-0.067	

Magnehelic Calibrations

Device	Calibration	Delta P	
	Standard	Magnehelic	
Units	inches water	inches water	*Percent*
Reading	Reference	Sample	*Error*
1	0.49	0.49	*0.0*
2	1.80	1.87	*3.9*
3	0.90	0.87	*-3.3*

Allowed Error = 5% of Reading

Thermocouple Calibrations

Device	Calibration	Thermocouple	
	Standard	Detector	
Units	Degrees F.	Degrees F.	*Percent*
Reading	Reference	Sample	*Error*
1	100	96	*-0.7*
2	300	299	*-0.1*
3	450	446	*-0.4*

Allowed Error = 1.5% of Absolute Temperature (Degrees Rankin);
Absolute Temperature = Temperature in Degrees Fahrenheit. + 460

INITIAL METER BOX CALIBRATION

Calibrated By: DM **BOX #:** SEAS-201 **Date:** 3/13/2012

			Orifice #:	1	Orifice #:	3	Orifice #:	8
		Unit	RUN 1	RUN 2	RUN 1	RUN 2	RUN 1	RUN 2
Meter	DH	In. H_2O	0.75	0.75	1.15	1.15	1.65	1.65
Initial Gas Volume		$Ft.^3$	0.000	0.000	0.000	0.000	0.000	0.000
Final Gas Volume		$Ft.^3$	6.971	5.579	5.323	5.921	6.435	9.333
Initial Temp. Out		°F	67	68	68	68	69	76
Final Temp. Out		°F	68	68	68	69	69	76
	Vacuum	In. Hg	21.0	21.0	21.0	21.0	20.0	20.0
	Ambient Temp.	°F	68	68	68	68	68	76
Barometric Pressure		In. Hg	30.24	30.24	30.24	30.24	30.24	30.24
	Time	sec	900	720	540	600	540	780
	K'		0.3506	0.3506	0.4476	0.4476	0.5423	0.5423
CALCULATIONS								
Total Meter Gas Volume		Actual $Ft.^3$	6.971	5.579	5.323	5.921	6.435	9.333
	Time	Minutes	15.000	12.000	9.000	10.000	9.000	13.000
Volume through the Meter		*SDCF without Y*	7.062	5.647	5.393	5.993	6.515	9.326
Volume through the Orifice		*SDCF*	6.921	5.537	5.301	5.891	6.423	9.208
Calculated Y		*Dimensionless*	**0.980**	**0.981**	**0.983**	**0.983**	**0.986**	**0.987**
	Difference	*Allowable 0.02*	-0.009	-0.009	-0.006	-0.006	-0.003	-0.002
Calculated DH@			**2.012**	**2.010**	**1.895**	**1.893**	**1.853**	**1.856**
	Difference	*Allowable 0.2*	0.143	0.141	0.026	0.024	-0.016	-0.012

Reference 33103		Unit	RUN 4	RUN 5	
Field Meter	DH	In. H_2O	2.50	3.50	
	Initial Gas Volume	$Ft.^3$	0.000	0.000	
	Final Gas Volume	$Ft.^3$	10.770	12.807	
	Initial Temp. Out	°F	70	76	
	Final Temp. Out	°F	71	76	
Reference Meter	Y	*Dimensionless*	0.952	0.952	
	Initial Gas Volume	$Ft.^3$	133.740	159.202	
	Final Gas Volume	$Ft.^3$	144.638	172.208	
	Initial Temp.	°F	70	76	
	Final Temp.	°F	71	76	
	Barometric Pressure	In. Hg	30.24	30.24	
	Time	sec	720	720	
Volume Field Meter		ACF	10.77	12.807	
Volume Field Meter		SDCF	10.895	12.854	
Volume Reference Meter		ACF	10.90	13.006	
Volume Reference Meter		SDCF	10.958	12.944	
Calculated Y			1.006	1.007	**0.989**
Difference			0.017	0.018	
Calculated DH@			1.717	1.713	**1.869**
Difference			-0.152	-0.155	

Magnehelic Calibrations

Device	Calibration	Delta P	
	Standard	Magnehelic	
Units	inches water	inches water	*Percent*
Reading	Reference	Sample	*Error*
1	1.32	1.31	*0.0*
2	0.72	0.71	*-1.4*
3	0.48	0.49	*2.1*

Allowed Error = 5% of Reading

Thermocouple Calibrations

Device	Calibration	Thermocouple	
	Standard	Detector	
Units	Degrees F.	Degrees F.	*Percent*
Reading	Reference	Sample	*Error*
1	150	150	*0.0*
2	212	213	*0.1*
3	400	400	*0.0*

Allowed Error = 1.5% of Absolute Temperature (Degrees Rankin);
Absolute Temperature = Temperature in Degrees Fahrenheit. + 460

Magnehelic Calibration

serial number	101			102A			102C			103A		
Span (in H2O)	**0.25**	**2**	**25**	**0.25**	**2**	**25**	**0.25**	**2**	**25**	**0.25**	**2**	**10**
Reference Reading @ 0% Span (in H2O)	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Device Reading (in H2O)	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Difference (Allowed = 0.05)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.120	0.95	4.73	0.125	1.00	9.64	0.131	0.90	9.30	0.12	0.95	5.15
Device Reading (in H2O)	0.122	0.96	4.90	0.126	0.98	9.75	0.129	0.88	9.00	0.12	0.92	5.20
% Difference (Allowed = 0.05)	1.67	1.05	3.59	0.80	2.00	1.14	1.53	2.22	3.23	2.56	3.16	0.97
Reference Reading @ 90% Span (in H2O)	0.220	1.88	23.50	2.32	1.85	23.30	0.250	2.00	22.80	0.248	1.91	9.50
Device Reading (in H2O)	0.222	1.83	24.20	2.300	1.90	24.00	0.243	1.97	23.30	0.240	1.95	9.20
% Difference (Allowed = 0.05)	0.91	2.66	2.98	0.86	2.70	3.00	2.80	1.50	2.19	3.23	2.09	3.16

serial number	103B						104		
Span (in H2O)	**0.25**	**0.5**	**1**	**2**	**5**	**25**	**0.25**	**2**	**10**
Reference Reading @ 0% Span (in H2O)	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00
Device Reading (in H2O)	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00
% Difference (Allowed = 0.05)	0.000	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.130	0.260	0.50	9.40	2.43	9.70	0.120	0.99	4.73
Device Reading (in H2O)	0.124	0.260	0.48	9.40	2.54	9.50	0.120	0.98	4.90
% Difference (Allowed = 0.05)	4.615	0.00	4.00	0.00	4.53	2.06	0.000	1.02	3.47
Reference Reading @ 90% Span (in H2O)	0.261	0.500	0.85	1.89	4.52	24.5	0.248	1.67	8.20
Device Reading (in H2O)	0.249	0.495	0.81	1.88	4.64	25.0	0.240	1.74	8.60
% Difference (Allowed = 0.05)	4.598	1.00	4.71	0.53	2.65	2.04	3.333	4.02	4.65

serial number	105			106		
Span (in H2O)	**0.25**	**2**	**25**	**0.5**	**4**	**15**
Reference Reading @ 0% Span (in H2O)	0.000	0.00	0.00	0.000	0.00	0.00
Device Reading (in H2O)	0.000	0.00	0.00	0.000	0.00	0.00
% Difference (Allowed = 0.05)	0.000	0.00	0.00	0.000	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.122	0.97	8.90	0.233	1.86	8.00
Device Reading (in H2O)	0.123	0.95	9.30	0.232	1.95	7.90
% Difference (Allowed = 0.05)	0.820	2.11	4.30	0.431	4.62	1.27
Reference Reading @ 90% Span (in H2O)	0.239	1.92	24.5	0.470	3.60	14.4
Device Reading (in H2O)	0.235	1.98	23.7	0.461	3.60	14.8
% Difference (Allowed = 0.05)	1.702	3.03	3.38	1.952	0.00	2.70
Calibration Date 12/30/2008 By MC						

APPENDIX B FIELD DATA

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 7-25-12 OPERATOR MC

PLANT Unit 6 ~~SCR Inlet~~ BOX No. S-201 DHa 1.869 Y 0.989

UNIT SCR Inlet METHOD CTM/3A PROBE # NA

BALANCE No. 102A STD. WT. (gm) 2000.0 BALANCE RESPONCE (gm) 2000.5

	Run 1	Run 2	Run 3
Nozzle Calibration (inches)	NA	NA	NA
Filter Number	NA	NA	NA
METER READING			
Final	40.101	40.615	40.904
Initial	0.000	0.00	0.00
Net	40.101	40.615	40.904
LEAK CHECK			
System Pre (in. Hg)	10	10	10
System Post (in. Hg)	11	16	11
System Pre (cfm)	~~0.00~~ 0.01	.002	0.000
System Post (cfm)	.01	.007	0.018
Pitot Pre Impact	NA	NA	NA
Pitot Post Impact	NA	NA	NA
Pitot Pre Static	NA	NA	NA
Pitot Post Static	NA	NA	NA

VOLUME OF LIQUID WATER COLLECTED

Run		Imp 1	Imp 2	Imp 3	Imp 4
1	Final	45	139	142	1979.3
1	Initial	100	100	100	1930.7
1	Net	-55	39	42	48.6
1	Total				74.6
2	Final	62	156	130	2002.4
2	Initial	100	100	100	1979.3
2	Net	-38	56	30	23.1
2	Total				71.1
3	Final	67	145	127	2020.9
3	Initial	100	100	100	2002.4
3	Net	-33	45	27	18.5
3	Total				57.5

	Run 1	Run 2	Run 3
GAS ANALYSIS O_2	8.5%	8.5%	8.0%
CO_2	12%	10%	10%
CO	/	/	/
STATIC (in. H_2O)	-22	-22	-22
BAROMETRIC (in. Hg)	29.94	29.94	29.94

Form Revised 10/10/06

Page 1 of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
1-1	9:15	0.050		1.5	573	502	41	92	7
	9:20	3.5		1.5		500	41	90	7
	9:25	7.0		1.5		503	41	90	7
	9:30	10.3		1.5		504	42	91	8
	9:35	14.0		1.5		502	43	92	8
	9:40	16.8		1.5		503	43	92	9
	9:45	19.5		1.5		503	43	92	9
	9:50	23.6		1.5		501	44	93	9
	9:55	26.8		1.5		502	45	94	9
	10:00	30.1		1.5		500 (AC 7-25-12)	46	94	10
	10:05	33.2		1.5		501	46	95	10
	10:10	36.5		1.5		502	47	95	10
end	10:15	40.101							
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Form Revised 8/24/02

Company: Gulf Power Date: 7-25-12 Page ____

Site: Crist 6 SCR Inlet Run #: 1 CTM-134 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Temperature °F Filter	Temperature °F Imp.	Temperature °F Gas Meter	Vac. (In. Hg)
	12:20	0.000		1.5	675	505	47	95	5
	:25	3.7		1.5		503	47	95	5
	:30	6.6		1.5		502	47	96	6
	:35	10.1		1.5		503	48	96	6
	:40	13.8		1.5		501	49	98	6
	:45	17.3		1.5		505	50	98	7
	:50	20.3		1.5		504	50	99	7
	:55	23.5		1.5		502	50	99	7
	13:00	27.0		1.5		503	50	99	7
	:05	30.6		1.5		502	51	100	8
	:10	33.5		1.5		504	51	100	8
	:15	37.4		1.5		506	51	100	8
end	13:20	40.615							
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Form Revised 8/24/02

Company: Gulf Power Date: 7-25-12 Page ______

Site: Crist 6 scr outlet Run #: 2 CTM-13A Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
1	13:55	0.000		1.5	575	506	47	99	8
	14:00	3.41		1.5		502	45	98	8
	14:05	6.8		1.5		501	43	99	8
	14:10	9.9		1.5		502	44	99	8
	14:15	13.3		1.5		503	44	98	9
	14:20	16.6		1.5		505	46	98	9
	14:25	19.7		1.5		506	45	98	10
	14:30	23.3		1.5		503	47	98	10
	14:35	26.7		1.5		504	48	98	10
	14:40	30.0		1.5		505	49	98	11
	14:45	33.7		1.5		502	50	97	11
	14:50	37.0		1.5		501	50	97	11
end	14:55	40.904							
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Form Revised 8/24/02

Company: Gulf Power Date: 7-25-12 Page ______

Site: Crist 6 SCR Inlet Run #: 3 CTM-13A Of ______

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 7-25-12 OPERATOR TBH
PLANT Crist BOX No. C-133 DHa 2.491 Y .962
UNIT 6 SCR Outlet METHOD ctm-013 PROBE # ____
BALANCE No. 102-B STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 2000.1

	Run 1	Run 2	Run 3
Nozzle Calibration (Inches)			
Filter Number			
Meter Reading Final	276.674	311.595	344.161
Meter Reading Initial	238.900	277.245	311.737
Meter Reading Net	37.774	34.350	32.424
Leak Check System Pre (in. Hg)	12	10	12
Leak Check System Post (in. Hg)	11	11	11
Leak Check System Pre (cfm)	.003	.003	.004
Leak Check System Post (cfm)	.002	.003	.005
Leak Check Pitot Pre Impact			
Leak Check Pitot Post Impact			
Leak Check Pitot Pre Static			
Leak Check Pitot Post Static			

VOLUME OF LIQUID WATER COLLECTED

	Run 1 Imp 1	Run 1 Imp 2	Run 1 Imp 3	Run 1 Imp 4	Run 2 Imp 1	Run 2 Imp 2	Run 2 Imp 3	Run 2 Imp 4	Run 3 Imp 1	Run 3 Imp 2	Run 3 Imp 3	Run 3 Imp 4
Final	132	112	/	1732.4	153	108	/	1742.7	154	107	/	1750.9
Initial	100	100	/	1719.7	100	100	∅	1732.4	100	100	/	1742.7
Net	32	12	/	12.7	53	8	/	10.3	54	7		8.2
Total	56.7				71.3				69.2			

	Run 1	Run 2	Run 3
Gas Analysis O_2	8%	7%	7%
Gas Analysis CO_2	11%	12.5%	12.5%
Gas Analysis CO	/	/	/
Static (in. H_2O)	-24.0	-24.0	-24.0
Barometric (in. Hg)	29.94	29.94	29.94

Form Revised 10/10/06

Page 1 of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. ~~Imp.~~	Gas Meter	Vac. (In. Hg)
	9:15	238.900	✗	1.5	537	500	165	89	5
	:20	243.5		1.5		510	168	89	5
	:25	246.1		1.5		511	172	89	5
	:30	249.4		1.5		508	175	90	6
	:35	253.0		1.5		511	176	90	6
	:40	255.6		1.5		513	172	91	6
	:45	258.8		1.5		507	173	92	7
	:50	261.6		1.5		512	175	92	8
	:55	264.5		1.5		515	176	92	8
	10:00	267.8		1.5		516	178	93	8
	:05	270.8		1.5		511	175	93	8
	:10	274.2		1.5		508	175	93	9
Stop	10:15	276.674							
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	:								
	:								
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Form Revised 8/24/02

Company: Gulf Power - Crist Date: 7-25-12 Page ______

Site: Unit 6 SCR Outlet (ctm-013) Run #: 1 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. Imp.	Gas Meter	Vac. (In. Hg)
	12:20	277.245		1.5	540	501	170	93	7
	:25	279.5		1.5		503	171	93	7
	:30	282.8		1.5		510	168	94	7
	:35	285.7		1.5		512	174	94	8
	:40	288.9		1.5		515	173	94	8
	:45	291.5		1.5		513	176	94	8
	:50	294.3		1.5		512	174	95	9
	:55	297.1		1.5		516	175	94	9
	13:00	300.0		1.5		519	176	94	9
	:05	303.1		1.5		518	174	94	9
	:10	305.7		1.5		513	173	95	9
	:15	308.9		1.5		510	170	95	9
	:20	311.595							
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Form Revised 8/24/02

Company: Gulf Power - Crist Date: 7-25-12 Page ______

Site: Unit 6 SCR Outlet dm-013 Run #: 2 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Temperature °F Filter	Temperature °F Cond. Imp.	Temperature °F Gas Meter	Vac. (In. Hg)
	13:55	311.737		1.5	539	508	170	94	7
	14:00	313.5		1.5		511	171	94	7
	:05	317.7		1.5		510	170	94	7
	:10	320.2		1.5		513	172	94	7
	:15	322.8		1.5		514	171	94	7
	:20	325.4		1.5		512	171	93	8
	:25	328.3		1.5		515	173	93	8
	:30	331.2		1.5		514	176	93	9
	:35	333.8		1.5		510	173	93	9
	:40	336.0		1.5		511	168	93	9
	:45	338.9		1.5		512	169	93	9
	:50	341.8		1.5		509	171	93	9
Stop	14:55	344.161							
	:								
	:								
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Form Revised 8/24/02

Company: Gulf Power - Crist Date: 7-25-12 Page ____

Site: Unit 6 SCR Outlet ctm-013 Run #: 3 Of ____

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BOOK PAGE

TITLE PROJECT

Continued From Page

Standardization of $BaCl_2$
1mL aliquot of 0.1005 N H_2SO_4 (Batch# 10696 L N)

Final	9.5	1.85	9.5	1.85
Initial	.5	.5	.5	.5
	10.35		10.35	

$N_1V_1 = N_2V_2$
$.1005(1) = N_2(10.35)$
$N_2 = 0.0097$

SCR Inlet CTM-13A

Run 1 Imp 1
Total sample = 138 mL
Aliquot = 25 mL

Final	1.15	1.20
Initial	.5	.5
	.65	.70

.675

Run 1 Imp 2-3
Total Sample = 382
Aliquot 1 mL

~~Final 9.5 9.5 7.95~~
~~Initial .5 .5 .5~~

Final	9.5	~~10~~ 9.5	10	1.30	28.3
Initial	.5	.5	.5	.5	

Final	25	3.75	28.25
Initial	0	.5	

$\bar{x} = 28.275$

Run 2 Imp 1
Total Sample = 168
Aliquot = 25 mL

Final	4.3	4.2
Initial	.5	.5
	3.8	3.7

3.75

Run 2 Imp 2-3
Total Sample = 424 mL
Aliquot 1 mL

Final	20	3.15	= 22.65
Initial	0	.5	

$\bar{x} = 22.75$

Final	20	3.35	= 22.85
Initial	0	.5	

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BOOK PAGE

TITLE PROJECT

Continued From Page

Run 3 Imp 1
Total Sample = 188 mL
Aliquot = 25 mL

Final 4.95 5.00
Initial .5 .5
4.45 4.5
4.475

Run 3 Imp 2-3
Total Sample = 360
Aliquot = 1 mL

Final 20 6.0 = 25.5
Initial 0 .5
25.475

Final 20 5.95 = 25.45
Initial 0 .5

SCR Outlet CTM-13

Run 1 Condensor (H_2SO_4)
Total Sample = 48 mL
Aliquot = ~~20 mL~~ ~~5 mL~~ 3 ml

~~Final 9.5 9.5~~
~~Initial .5 .5~~
Final 4.85
Initial 0.5
3.35

Run 1 SO_2 Imps
Total Sample = 320 mL
Aliquot = 1 ml

Final 9.5 9.5 4 = 21.5
Initial .5 .5 .5
$\bar{x}$ = 21.6
Final 20 2.2 = 21.7
Initial 0 .5

Run 2 condensor
Total Sample = 47 ml
Aliquot = 5 m

Final 9.5 + 4.05 9.5 + 4.0
Initial 0.5 0.5 0.5 0.5
9.0 3.55 9.0 3.5
12.55 12.5
12.525

Run 2 SO_2
Total Sample = 350 ml
Aliquot = 1 ml

Final 6.1 + 20 20 + 6.3
Initial 0.5 0 0 0.5
5.6 20 20 + 5.8
25.6 25.8
25.7

Run 3 condensor
Total Sample = 38 ml
Aliquot = 5 ml

Final 9.5 7.65 6.8 10.0
Initial 0.5 + 0.5 0.5 + 0.0
9.0 + 7.15 6.3 10
16.15 16.3
16.225

Run 3 SO_2
Total Sample = 340 ml
Aliquot = 1 ml

Final 20.0 8.55 20.0 8.75
Initial 0.0 + 0.5 0.0 + 0.5
20 8.05 20.0 + 8.25
28.05 28.25
28.15

Continued To Page

SIGNATURE DATE

APPENDIX C SAMPLE CALCULATIONS

SAMPLE CALCULATIONS, RUN 1
GULF POWER COMPANY
PLANT CRIST UNIT 6 - SCR OUTLET
PENSACOLA, FLORIDA

Absolute Stack Pressure (inches Mercury)

$$P_S = P_{bar} + \frac{\overline{P_g}}{13.6}$$

P_g = Stack Static Pressure (inches Water) = -24.00

P_{bar} = Barometric Pressure (inches Mercury) = 29.94

P_s = 28.18

Absolute Pressure at the Dry Gas Meter (inches Mercury)

$$P_m = P_{bar} + \frac{\overline{\Delta H}}{13.6}$$

P_{bar} = Barometric Pressure (inches Mercury) = 29.94

ΔH = Average pressure difference of orifice (inches Water) = 1.50

P_m = 30.05

Volume of Gas Sampled Measured by Dry Gas Meter

(corrected to standard conditions, SDCF)

$$Vm(Std) = K_1 V_m Y \left[\frac{P_{bar} + \frac{\overline{\Delta H}}{13.6}}{\overline{T_m}} \right]$$

K_1 = Degrees R/inches Mercury = 17.64

V_m = Volume of gas sample as measured by dry gas meter (actual cubic feet) = 37.77

Y = Dry gas meter calibration factor (dimensionless) = 0.9620

P_{bar} = Barometric Pressure (inches Mercury) = 29.94

ΔH = Average pressure difference of orifice (inches H2O) = 1.50

T_m = Average absolute temperature of the dry gas, degrees Rankin = 550.8

$V_{m(Std)}$ = 34.967

Volume of Water Vapor in Gas Sample

$$V_{w(Std)} = 0.04707\ V_{lc}$$

V_{lc} = Total volume of liquid collected in impingers and silica gel (milliliters) = 56.7

$V_{w(Std)}$ = 2.668

Water Vapor in the Gas Stream **proportion by volume (dimensionless)**

$$B_{ws} = \frac{V_{w(Std)}}{V_{m(Std)} + V_{w(Std)}}$$

$V_{w\,(std)}$ = Volume of water in gas sample (corrected to standard conditions) =	2.668
$V_{m(std)}$ = Volume of sample measured by dry gas meter (standard conditions) =	34.967
B_{ws} =	0.071

Molecular Weight of Stack Gas **(dry basis, lb/lb mole)**

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$$

$\%CO_2$ = Number percent by volume (dry basis from gas analysis) =	11.0
$\%O_2$ = Number percent by volume (dry basis from gas analysis) =	8.0
$\%N_2+\%CO$ = Number percent by volume (dry basis from gas analysis) =	81.0
M_d =	30.08

Molecular Weight of Stack Gas **(wet basis, lb/lb mole)**

$$M_s = M_d(1 - B_{ws}) + 18(B_{ws})$$

M_d = Molecular weight of stack gas (dry basis, lb/lb mole) =	30.08
B_{ws} = Water vapor in the gas stream (proportion by volume, dimensionless) =	0.071
M_s =	29.22

Volume of Gas Sampled Through Nozzle **(actual cubic feet)**

$$V_n = \left[(0.002669)(V_{lc}) + Y\frac{\overline{V_m}}{\overline{T_m}}\left(P_{bar} + \frac{\overline{\Delta H}}{13.6}\right)\right]\frac{\overline{T_s}}{P_s}$$

V_{lc} = Total volume of liquid collected in impingers and silica gel (milliliters) =	56.7
Y = Dry gas meter calibration factor (dimensionless) =	0.9620
V_m = Volume of gas sample as measured by dry gas meter (actual cubic feet) =	37.774
Tm = Average absolute temperature of dry gas meter, degrees Rankin =	550.8
P_{bar} = Barometric Pressure (inches Mercury) =	29.94
ΔH = Average pressure difference of orifice (inches Water) =	1.50
Ts = Average absolute temperature of stack, degrees Rankin =	996.7
P_s = Absolute stack pressure (inches Mercury) =	28.18
V_n =	75.489

SANDERS ENGINEERING & ANALYTICAL SERVICES, INC.

SULFUR DIOXIDE AND SULFURIC ACID MIST EMISSIONS TEST REPORT

RECEIVED

SEP 24 2012

DIVISION OF AIR RESOURCE MANAGEMENT

FOR

GULF POWER COMPANY

Plant Crist

Combined Scrubber Stack

Pensacola, Florida

August 6 through 10, 2012

2255 SCHILLINGER RD. N.
SEMMES, ALABAMA 36575-7463
(251) 633-4120
FAX: (251) 633-2285
E-MAIL: sanders@sandersengineering.com

REPORT CERTIFICATION

I have reviewed the "Sulfur Dioxide and Sulfuric Acid Mist Emissions Test Report" for the testing performed for Gulf Power Company on the Combined Scrubber Stack located at the Pensacola, Florida facility. I hereby certify that it is authentic and accurate to the best of my knowledge.

Date: 8/17/12

Signature: Eric Jones

Eric Jones
Environmental Engineer

TABLE OF CONTENTS

LIST OF TABLES

ILLUSTRATIONS

1. INTRODUCTION

Sanders Engineering & Analytical Services, Inc. (SEAS) performed sulfur dioxide and sulfuric acid mist emissions testing August 6 through 10, 2012, for Gulf Power Company on the Combined Scrubber Stack located at the Plant Crist facility in Pensacola, Florida. The testing was performed in accordance with the applicable procedures as specified at **CTM Method 013** as published by the National Council of Air and Stream Improvement for the determination of sulfuric acid vapor or mist and sulfur dioxide emissions from Kraft Recovery Furnaces. Further discussions of the test methods are included later in the report.

The purpose of the testing was to gain additional information concerning the emission rate of sulfuric acid mist from the unit. The testing was conducted by Mr. Mark Christian and Mr. Brett Horton of Sanders Engineering & Analytical Services, Inc., and was coordinated with Mr. John Rampulla of Gulf Power Company.

2. DESCRIPTION OF SAMPLING PROGRAM

The sampling program consisted of sulfuric acid mist emissions testing in compliance with US EPA methods. The following is a brief description of these types of tests. The gas sample was extracted from the stack through a glass probe onto a quartz fiber filter for CTM-013A maintained at 500 degrees Fahrenheit. The filter catches all solid sulfates. Upon leaving the filter, the gas passes through a condenser and a series of impingers containing peroxide and silica gel. Calibrations of the testing equipment are included in Appendix A. A detailed description of the testing procedures and schematic of the sampling train is presented in Section 6. The field data sheets for this testing are presented in Appendix B. Sample calculations of Run 1 are included in Appendix C. Flowrates were provided by Gulf Power Company using the CEMS located on the FGD stack.

3. SUMMARY AND DISCUSSION OF RESULTS

There were no unusual problems experienced during the performance of the testing. The results of the sulfuric acid mist emissions testing are presented in Tables I through V.

TABLE I. SULFURIC ACID MIST TEST RESULTS
GULF POWER COMPANY
PLANT CRIST - FGD STACK
Monday, August 06, 2012

CTM-013 (Controlled Condensation) quartz filter

Title of Run		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
Date	Month/Day/Year	8/6/2012	8/6/2012	8/6/2012	8/6/2012	8/6/2012	8/6/2012
Sampling Time -Start	Military	0945	1100	1220	1330	1440	1550
Sampling Time -Stop	Military	1045	1200	1320	1430	1540	1650
Number of Ports	dimensionless	1	1	1	1	1	1
Number of Points per Port	dimensionless	12	12	12	12	12	12
Stack Static Pressure	Inches Water	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
Barometric Pressure	Inches Mercury	29.77	29.77	29.77	29.77	29.77	29.77
Standard Orifice Pressure ΔH@	Inches Water	1.869	1.869	1.869	1.869	1.869	1.869
Meter Correction Factor	dimensionless	0.989	0.989	0.989	0.989	0.989	0.989
Oxygen Concentration	Mole Percent O2	11.0	11.0	10.0	10.0	10.0	10.0
Carbon Dioxide Concentration	Mole Percent CO2	10.5	10.5	11.0	11.0	10.0	10.0
Volume of Gas Metered	Actual Cubic Feet	40.110	40.461	39.858	39.761	39.660	39.416
Volume of Water Collected	Milliliters	135.8	146.4	142.6	144.2	142.0	136.2
Sampling Time	Minutes	60.0	60.0	60.0	60.0	60.0	60.0
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5	1.5	1.5	1.5
Average Stack Temperature	Degrees F	119	120	123	123	119	119
Average Meter Temperature	Degrees F	81	90	83	78	80	82
Final Volume of SO2 Solution	Milliliters	402.0	400	447	459	431	443
Final Volume of H2SO4 Solution	Milliliters	44.0	34.5	22.0	42.5	28.0	53.5
Normality of Titrant (BaCl2)	Equivalence/Liter	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049
Volume of Aliquot (SO2)	Milliliters	5.00	5.00	5.00	5.00	5.00	5.00
Volume of Aliquot (H2SO4)	Milliliters	25.00	10.00	10.00	10.00	10.00	10.00
Volume of Titrant for SO2 Blank	Milliliters	0.00	0.00	0.00	0.00	0.00	0.00
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	5.53	4.39	2.49	2.46	2.41	1.90
Volume of Titrant For H2SO4 Aliquot	Milliliters	26.98	12.76	14.85	6.34	7.81	3.44
Mass of Sulfur Dioxide Collected	ug	69,178	54,694	34,667	35,098	32,352	26,147
Mass of Sulfuric Acid Mist Collected	ug	11,322	10,497	7,790	6,420	5,214	4,388

Calculations

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
Standard Temperature (° F) =	68						
Standard Pressure (inches of Hg) =	29.92						
Volume of Gas Sampled	Standard Dry Cubic Feet	38.652	38.369	38.291	38.577	38.307	37.960
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	30.12	30.12	30.16	30.16	30.00	30.00
Water vapor in Stack Gas	Percent	11.2 Saturated	11.6 Saturated	12.6 Saturated	12.5 Saturated	11.3 Saturated	11.0 Saturated
Stack Gas Flow Rate	Actual Cubic Feet Per Minute	3,456,995	3,510,271	3,493,313	3,512,075	3,474,324	3,471,370
Stack Gas Flow Rate	Standard Wet Cubic Feet Per Minute	3,135,741	3,176,746	3,144,682	3,163,832	3,149,192	3,151,503
Stack Gas Flow Rate	Standard Dry Cubic Feet Per Minute	2,784,701	2,807,700	2,747,009	2,768,274	2,792,535	2,803,582
Percent Difference	Allowed 5% Average	1.1	1.0	1.8	1.5	2.3	3.1

CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	Sulfur Dioxide	63,206	50,340	31,973	32,130	29,826	24,325
	Sulfuric Acid	10,345	9,661	7,184	5,877	4,807	4,082
CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	Sulfur Dioxide	23.72	18.89	12.00	12.06	11.19	9.13
	Sulfuric Acid	2.54	2.37	1.76	1.44	1.18	1.00
EMISSION RATE OF CHEMICAL (LBS/HR)	Sulfur Dioxide	659.26	529.40	328.97	333.15	311.97	255.44
	Sulfuric Acid	107.90	101.60	73.92	60.94	50.28	42.87

TABLE II. SULFURIC ACID MIST TEST RESULTS
GULF POWER COMPANY
PLANT CRIST - FGD STACK
Tuesday, August 07, 2012

		CTM-013 (Controlled Condensation) quartz filter			
Title of Run		RUN 1	RUN 2	RUN 3	RUN 4
Date	Month/Day/Year	8/7/2012	8/7/2012	8/7/2012	8/7/2012
Sampling Time -Start	Military	0930	1040	1245	1355
Sampling Time -Stop	Military	1030	1140	1345	1455
Number of Ports	dimensionless	1	1	1	1
Number of Points per Port	dimensionless	12	12	12	12
Stack Static Pressure	Inches Water	-0.15	-0.15	-0.15	-0.15
Barometric Pressure	Inches Mercury	29.69	29.69	29.69	29.69
Standard Orifice Pressure ΔH@	Inches Water	1.869	1.869	1.869	1.869
Meter Correction Factor	dimensionless	0.989	0.989	0.989	0.989
Oxygen Concentration	Mole Percent O2	10.0	10.0	10.0	9.5
Carbon Dioxide Concentration	Mole Percent CO2	10.0	10.0	10.0	10.5
Volume of Gas Metered	Actual Cubic Feet	39.579	39.745	39.720	39.323
Volume of Water Collected	Milliliters	125.2	127.7	132.5	132.8
Sampling Time	Minutes	60.0	60.0	60.0	60.0
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5	1.5
Average Stack Temperature	Degrees F	114	118	118	121
Average Meter Temperature	Degrees F	80	85	93	93
Final Volume of SO2 Solution	Milliliters	406.0	412.0	417.0	422.0
Final Volume of H2SO4 Solution	Milliliters	38.5	28.0	37.0	48.5
Normality of Titrant (BaCl2)	Equivalence/Liter	0.0049	0.0049	0.0049	0.0049
Volume of Aliquot (SO2)	Milliliters	5.0	5.0	5.0	5.0
Volume of Aliquot (H2SO4)	Milliliters	10.0	10.0	10.0	10.0
Volume of Titrant for SO2 Blank	Milliliters	0.00	0.00	0.00	0.00
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	2.45	2.49	3.79	4.47
Volume of Titrant For H2SO4 Aliquot	Milliliters	4.19	7.31	7.92	5.46
Mass of Sulfur Dioxide Collected	ug	30,918	31,953	49,160	58,753
Mass of Sulfuric Acid Mist Collected	ug	3,846	4,880	6,987	6,308

Calculations

		RUN 1	RUN 2	RUN 3	RUN 4
Standard Temperature (° F) =	68				
Standard Pressure (inches of Hg) =	29.92				
Volume of Gas Sampled	Standard Dry Cubic Feet	38.120	37.946	37.390	37.005
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	30.00	30.00	30.00	30.06
Water vapor in Stack Gas	Percent	9.7 Saturated	10.8 Saturated	10.9 Saturated	11.8 Saturated
Stack Gas Flow Rate	Actual Cubic Feet Per Minute	2,388,234	2,416,292	3,025,549	3,039,829
Stack Gas Flow Rate	Standard Wet Cubic Feet Per Minute	2,180,303	2,190,951	2,741,015	2,741,693
Stack Gas Flow Rate	Standard Dry Cubic Feet Per Minute	1,969,667	1,954,529	2,441,069	2,419,329
Post Test Meter Correction Check	dimensionless	1.02	1.02	1.02	1.03
Percent Difference	Allowed 5% Average	2.6	2.7	3.5	4.4

CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	Sulfur Dioxide	28,643	29,737	46,432	56,070
	Sulfuric Acid	3,563	4,542	6,599	6,020
CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	Sulfur Dioxide	10.75	11.16	17.42	21.04
	Sulfuric Acid	0.87	1.11	1.62	1.48
EMISSION RATE OF CHEMICAL (LBS/HR)	Sulfur Dioxide	211.32	217.70	424.54	508.10
	Sulfuric Acid	26.29	33.25	60.34	54.55

TABLE III. SULFURIC ACID MIST TEST RESULTS
GULF POWER COMPANY
PLANT CRIST - FGD STACK
Wednesday, August 08, 2012

		CTM-013 (Controlled Condensation) quartz filter			
Title of Run		**RUN 1**	**RUN 2**	**RUN 3**	**RUN 4**
Date	Month/Day/Year	8/8/2012	8/8/2012	8/8/2012	8/8/2012
Sampling Time -Start	Military	1045	1155	1350	1505
Sampling Time -Stop	Military	1145	1255	1450	1605
Number of Ports	dimensionless	1	1	1	1
Number of Points per Port	dimensionless	12	12	12	12
Stack Static Pressure	Inches Water	-0.15	-0.15	-0.15	-0.15
Barometric Pressure	Inches Mercury	29.73	29.73	29.73	29.73
Standard Orifice Pressure ΔH@	Inches Water	1.869	1.869	1.869	1.869
Meter Correction Factor	dimensionless	0.989	0.989	0.989	0.989
Oxygen Concentration	Mole Percent O2	9.5	9.5	10.0	10.0
Carbon Dioxide Concentration	Mole Percent CO2	10.0	10.0	10.0	10.0
Volume of Gas Metered	Actual Cubic Feet	38.844	39.134	39.165	39.635
Volume of Water Collected	Milliliters	138.1	136.5	141.2	139.1
Sampling Time	Minutes	60.0	60.0	60.0	60.0
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5	1.5
Average Stack Temperature	Degrees F	120	118	115	118
Average Meter Temperature	Degrees F	84	82	80	80
Final Volume of SO2 Solution	Milliliters	410.0	451.0	441.0	426.0
Final Volume of H2SO4 Solution	Milliliters	35.5	34.5	54.0	31.0
Normality of Titrant (BaCl2)	Equivalence/Liter	0.00480	0.00480	0.00480	0.00480
Volume of Aliquot (SO2)	Milliliters	5.0	5.0	5.0	5.0
Volume of Aliquot (H2SO4)	Milliliters	10.0	10.0	10.0	10.0
Volume of Titrant for SO2 Blank	Milliliters	0.00	0.00	0.00	0.00
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	6.45	5.16	5.11	4.97
Volume of Titrant For H2SO4 Aliquot	Milliliters	9.58	11.00	8.36	7.38
Mass of Sulfur Dioxide Collected	ug	81,184	71,428	69,167	65,048
Mass of Sulfuric Acid Mist Collected	ug	7,999	8,926	10,618	5,381

Calculations

Standard Temperature (° F) =	68	**RUN 1**	**RUN 2**	**RUN 3**	**RUN 4**
Standard Pressure (inches of Hg) =	29.92				
Volume of Gas Sampled	Standard Dry Cubic Feet	37.187	37.591	37.755	38.213
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	29.98	29.98	30.00	30.00
Water vapor in Stack Gas	Percent	11.4 Saturated	10.8 Saturated	10.0 Saturated	11.0 Saturated
Stack Gas Flow Rate	Actual Cubic Feet Per Minute	3,436,318	3,415,392	3,500,253	3,515,960
Stack Gas Flow Rate	Standard Wet Cubic Feet Per Minute	3,109,724	3,101,049	3,192,849	3,187,759
Stack Gas Flow Rate	Standard Dry Cubic Feet Per Minute	2,756,202	2,766,871	2,873,676	2,836,137
Post Test Meter Correction Check	dimensionless	1.04	1.03	1.03	1.01
Percent Difference	Allowed 5% Average	4.9	4.0	3.7	2.5
CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	**Sulfur Dioxide**	77,097	67,103	64,697	60,113
	Sulfuric Acid	7,596	8,385	9,932	4,973
CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	**Sulfur Dioxide**	28.93	25.18	24.28	22.56
	Sulfuric Acid	1.86	2.06	2.43	1.22
EMISSION RATE OF CHEMICAL (LBS/HR)	**Sulfur Dioxide**	795.93	695.43	696.38	638.59
	Sulfuric Acid	78.42	86.90	106.90	52.82

TABLE IV. SULFURIC ACID MIST TEST RESULTS
GULF POWER COMPANY
PLANT CRIST - FGD STACK
Thursday, August 09, 2012

		CTM-013 (Controlled Condensation) quartz filter			
Title of Run		**RUN 1**	**RUN 2**	**RUN 3**	**RUN 4**
Date	Month/Day/Year	8/9/2012	8/9/2012	8/9/2012	8/9/2012
Sampling Time -Start	Military	0910	1023	1240	1350
Sampling Time -Stop	Military	1010	1123	1340	1450
Number of Ports	dimensionless	1	1	1	1
Number of Points per Port	dimensionless	12	12	12	12
Stack Static Pressure	Inches Water	-0.15	-0.15	-0.15	-0.15
Barometric Pressure	Inches Mercury	29.70	29.70	29.70	29.70
Standard Orifice Pressure ΔH@	Inches Water	1.869	1.869	1.869	1.869
Meter Correction Factor	dimensionless	0.989	0.989	0.989	0.989
Oxygen Concentration	Mole Percent O2	10.0	9.5	10.0	10.0
Carbon Dioxide Concentration	Mole Percent CO2	10.0	10.0	9.5	9.5
Volume of Gas Metered	Actual Cubic Feet	40.248	40.241	39.989	40.558
Volume of Water Collected	Milliliters	132.2	131.3	134.6	137.5
Sampling Time	Minutes	60.0	60.0	60.0	60.0
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5	1.5
Average Stack Temperature	Degrees F	122	121	122	123
Average Meter Temperature	Degrees F	81	80	75	82
Final Volume of SO2 Solution	Milliliters	432.0	420.0	432.0	415.0
Final Volume of H2SO4 Solution	Milliliters	48.5	35.5	32.0	34.0
Normality of Titrant (BaCl2)	Equivalence/Liter	0.00494	0.00494	0.00494	0.00494
Volume of Aliquot (SO2)	Milliliters	5.0	5.0	5.0	5.0
Volume of Aliquot (H2SO4)	Milliliters	10.0	10.0	10.0	10.0
Volume of Titrant for SO2 Blank	Milliliters	1.08	1.08	1.08	1.08
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	9.91	7.23	5.18	5.01
Volume of Titrant For H2SO4 Aliquot	Milliliters	5.48	4.12	6.60	4.75
Mass of Sulfur Dioxide Collected	ug	120,768	81,777	56,076	51,636
Mass of Sulfuric Acid Mist Collected	ug	4,203	2,312	3,341	2,554

Calculations

Standard Temperature (° F) =	68	**RUN 1**	**RUN 2**	**RUN 3**	**RUN 4**
Standard Pressure (Inches of Hg) =	29.92				
Volume of Gas Sampled	Standard Dry Cubic Feet	38.742	38.759	38.911	38.914
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	30.00	29.98	29.92	29.92
Water vapor in Stack Gas	Percent	12.1 Saturated	11.9 Saturated	12.3 Saturated	12.5 Saturated
Stack Gas Flow Rate	Actual Cubic Feet Per Minute	2,431,419	2,434,226	3,087,590	3,098,653
Stack Gas Flow Rate	Standard Wet Cubic Feet Per Minute	2,189,292	2,194,649	2,778,526	2,784,892
Stack Gas Flow Rate	Standard Dry Cubic Feet Per Minute	1,923,547	1,933,705	2,438,152	2,436,642
Post Test Meter Correction Check	dimensionless	1.00	1.00	1.00	0.99
Percent Difference	Allowed 5% Average	1.0	1.0	1.2	0.5

CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	Sulfur Dioxide	110,086	74,511	50,894	46,860
	Sulfuric Acid	3,832	2,107	3,032	2,318
CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	Sulfur Dioxide	41.31	27.96	19.10	17.59
	Sulfuric Acid	0.94	0.52	0.74	0.57
EMISSION RATE OF CHEMICAL (LBS/HR)	Sulfur Dioxide	793.15	539.67	464.78	427.68
	Sulfuric Acid	27.61	15.26	27.69	21.15

TABLE V. SULFURIC ACID MIST TEST RESULTS
GULF POWER COMPANY
PLANT CRIST - FGD STACK
Friday, August 10, 2012

		CTM-013 (Controlled Condensation) quartz filter				
Title of Run		**RUN 1**	**RUN 2**	**RUN 3**	**RUN 4**	**RUN 5**
Date	Month/Day/Year	8/10/2012	8/10/2012	8/10/2012	8/10/2012	8/10/2012
Sampling Time -Start	Military	0855	1005	1135	1325	1435
Sampling Time -Stop	Military	0955	1105	1235	1425	1535
Number of Ports	dimensionless	1	1	1	1	1
Number of Points per Port	dimensionless	12	12	12	12	12
Stack Static Pressure	Inches Water	-0.15	-0.15	-0.15	-0.15	-0.15
Barometric Pressure	Inches Mercury	29.75	29.75	29.75	29.75	29.50
Standard Orifice Pressure ΔH@	Inches Water	1.869	1.869	1.869	1.869	1.869
Meter Correction Factor	dimensionless	0.989	0.989	0.989	0.989	0.989
Oxygen Concentration	Mole Percent O2	10.0	9.5	10.0	10.0	10.0
Carbon Dioxide Concentration	Mole Percent CO2	9.5	10.0	10.0	10.0	10.0
Volume of Gas Metered	Actual Cubic Feet	39.995	40.158	39.802	39.584	39.802
Volume of Water Collected	Milliliters	144.6	144.5	146.5	143.2	142.2
Sampling Time	Minutes	60.0	60.0	60.0	60.0	60.0
Average Orifice Pressure (ΔH)	Inches Water	1.5	1.5	1.5	1.5	1.5
Average Stack Temperature	Degrees F	124	124	124	125	125
Average Meter Temperature	Degrees F	80	76	73	76	76
Final Volume of SO2 Solution	Milliliters	437.0	428.0	426.0	421.0	433.0
Final Volume of H2SO4 Solution	Milliliters	41.5	32.5	27.0	27.5	40.5
Normality of Titrant (BaCl2)	Equivalence/Liter	0.00494	0.00494	0.00494	0.00461	0.00461
Volume of Aliquot (SO2)	Milliliters	5.0	5.0	5.0	5.0	5.0
Volume of Aliquot (H2SO4)	Milliliters	10.0	10.0	10.0	10.0	10.0
Volume of Titrant for SO2 Blank	Milliliters	1.08	1.08	1.08	1.08	1.08
Volume of Titrant for H2SO4 Blank	Milliliters	0.00	0.00	0.00	0.00	0.00
Volume of Titrant For SO2 Aliquot	Milliliters	7.34	6.40	6.63	6.64	5.88
Volume of Titrant For H2SO4 Aliquot	Milliliters	5.12	9.10	10.79	10.70	6.92
Mass of Sulfur Dioxide Collected	ug	86,540	72,088	74,853	69,138	61,421
Mass of Sulfuric Acid Mist Collected	ug	5,145	7,168	7,058	6,653	6,337

Calculations

Standard Temperature (° F) =	68	**RUN 1**	**RUN 2**	**RUN 3**	**RUN 4**	**RUN 5**
Standard Pressure (inches of Hg) =	29.92					
Volume of Gas Sampled	Standard Dry Cubic Feet	38.604	39.015	38.899	38.523	38.387
Molecular Wt. of Stack Gas (dry)	LB/LB-MOLE	29.92	29.98	30.00	30.00	30.00
Water vapor in Stack Gas	Percent	13.0 Saturated	12.9 Saturated	13.0 Saturated	13.1 Saturated	13.4 Saturated
Stack Gas Flow Rate	Actual Cubic Feet Per Minute	3,397,730	3,389,361	3,433,191	3,485,772	3,524,590
Stack Gas Flow Rate	Standard Wet Cubic Feet Per Minute	3,051,408	3,044,326	3,082,815	3,129,137	3,134,702
Stack Gas Flow Rate	Standard Dry Cubic Feet Per Minute	2,655,438	2,650,171	2,681,860	2,720,307	2,716,019
Post Test Meter Correction Check	dimensionless	1.00	1.00	1.00	1.01	1.01
Percent Difference	Allowed 5% Average	1.6	0.8	1.3	2.1	2.0
CONCENTRATION OF CHEMICAL IN STACK GAS (ug/m3)	**Sulfur Dioxide**	79,166	65,252	67,957	63,381	56,506
	Sulfuric Acid	4,706	6,488	6,407	6,099	5,830
CONCENTRATION OF CHEMICAL IN STACK GAS (PPM)	**Sulfur Dioxide**	29.71	24.49	25.50	23.79	21.20
	Sulfuric Acid	1.15	1.59	1.57	1.50	1.43
EMISSION RATE OF CHEMICAL (LBS/HR)	**Sulfur Dioxide**	787.40	647.72	682.64	645.80	574.84
	Sulfuric Acid	46.81	64.41	64.36	62.15	59.31

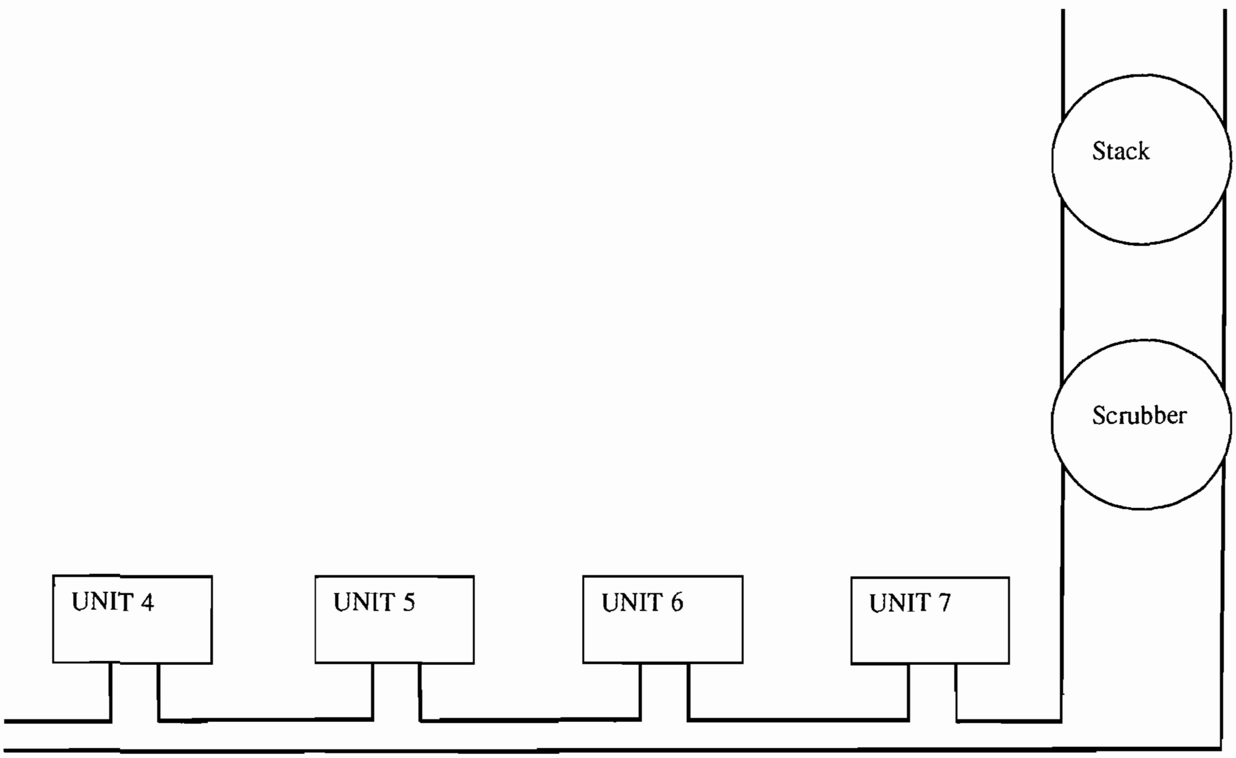
4. PROCESS DESCRIPTION

The process consists of a steam electric generating unit firing bituminous coal for the production of electric energy. The coal is received by barge, and loaded directly onto the conveyor feeding the plant or onto the stockpile and later loaded onto the conveyor belt transporting the coal to the plant. The coal from the conveyor is loaded into bunkers capable of holding between 36 to 48 hours supply of coal. The coal is then fed to pulverizing mills before being fired in the unit through the burners. Upon combustion of the coal in the fire box, approximately 20 percent of the ash falls to the bottom of the boiler and is removed by the ash removal system. The remaining 80 percent exits with the flue gases through the heat exchange and economizer sections of the furnace, and is collected by electrostatic precipitators.

4.1. Source Air Flow

The air flow schematic which depicts the passage of the flue gases exhausted from Plant Crist, Scrubber Stack, is presented in Figure 1.

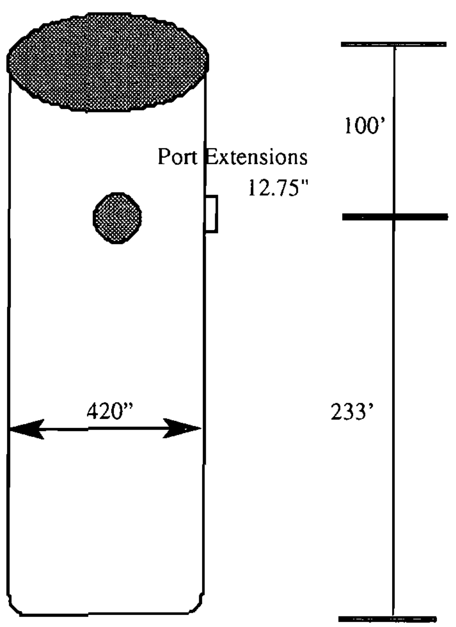
FIGURE 1. AIR FLOW SCHEMATIC

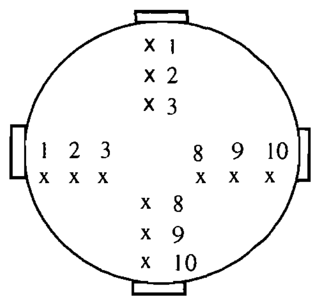


5. SAMPLE POINT LOCATION

The sample point locations and outlet duct schematic for the combined scrubber stack are presented in Figure 2.

Figure 2. Stack Outlet Sample Point Location





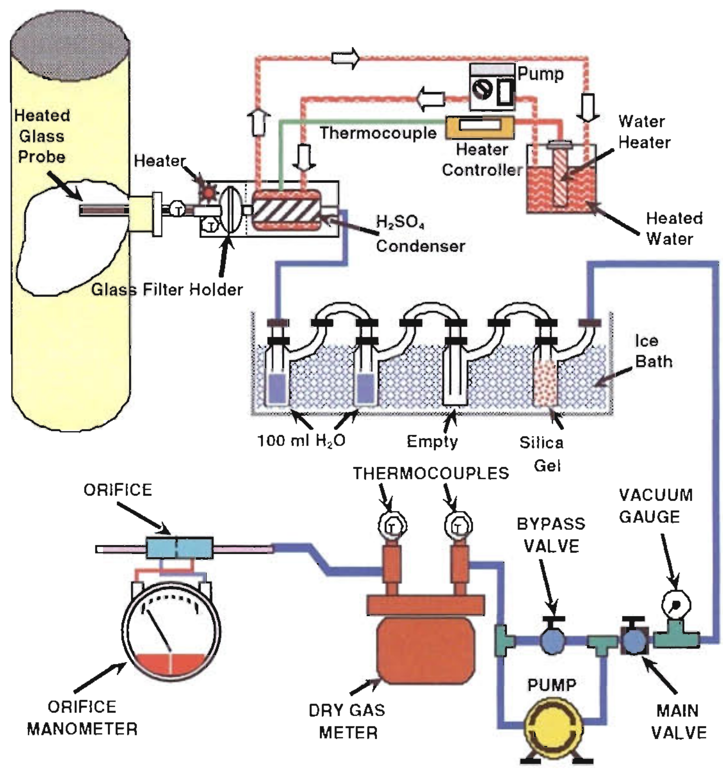
Point Number	Distance From Stack Wall (Inches)
1	143.64
2	94.92
3	61.32
4	34.44
5	10.92

Stack Area = 962.113 $ft.^2$

6. SULFUR DIOXIDE AND SULFURIC ACID MIST SAMPLE PROCEDURE (CTM-013)

The sampling procedure utilized is that approved by the United States Environmental Protection Agency for sampling and analysis of sulfuric acid mist for certain sources at kraft pulp mills. A brief description of the procedure is as follows:

Figure 3. CTM-013 Sampling Train



The glass sample probe and quartz filter and filter holder are heated to 500 degrees Fahrenheit or greater to prevent condensation of sulfuric acid mist. The filter was used to collect any particulate which may contain sulfates (sodium sulfate, calcium sulfate, etc). If any sulfuric acid mist was collected on the filter it was evaporated to the gaseous state and passed through the train to be collected in the condenser portion.

The condenser was maintained between 167 and 187 degrees Fahrenheit to allow condensation of the sulfuric acid mist without collecting other sulfur compounds particularly sulfur dioxide. The temperature was maintained by circulating heated water through the shell of the condenser. The temperature of the circulating water was controlled by a thermocouple inserted in the condenser.

Upon leaving the condenser, the gas enters a series of impingers. The first two impingers were partially filled with 100 milliliters of three percent hydrogen peroxide. The next impinger was left empty. Preweighed 6 to 16-mesh indication

silica gel was added to the last impinger. The sampling equipment, manufactured by Lear Siegler (Model 100) or Sanders Engineering (Model 200), was assembled as shown in the attached drawing. The system was leak checked by plugging the inlet to the nozzle and pulling a 15-inch mercury vacuum. A leakage rate not in excess of 0.02 cubic feet per minute was considered acceptable.

Crushed ice was placed around the impingers. The probe and hot box were preheated to 500 degrees Fahrenheit and the condenser water was heated to between 167 and 187 degrees Fahrenheit and circulated through the condenser. When the equipment reached the desired temperature, the flow was adjusted to one-half cubic foot per minute. Readings of the dry gas meter volume, temperature, and flow rate were recorded on the field data sheet every five minutes. At the conclusion of each run, the pump was turned off, final readings were recorded, and final system leak checks were performed. The sample train was purged by drawing clean ambient air through the system for five minutes at the average flow rate used for sampling.

6.1. Sample Recovery

The impingers were disconnected after purging. The nozzle, probe, and filter were rinsed with deionized water using multiple rinses for good washing, and the rinse was then discarded. The sulfuric acid mist condenser was rinsed with deionized water and the wash solution was collected in Container 1. The volume of liquids in the first two impingers were recorded to determine stack gas moisture content and then placed in container 2 and rinsed with deionized water.

6.2. Sample Analysis Procedures

The volume of sample for the container was recorded on the data sheet. If a noticeable amount of liquid was lost, the sample was either voided or methods, subject to the approval of the test administrator, were used to correct the final results. The entire contents of Container 1 were transferred into a 250 milliliter Erlenmeyer flask and 100% isopropyl alcohol was added to give an 80 percent isopropyl alcohol solution. An aliquot of this solution was pipetted into a 250

milliliter Erlenmeyer flask; two to four drops of thorin indicator were added and titrated to a pink endpoint barium chloride. The titration was repeated with a second aliquot of sample and the values were averaged. Replicate titrations must agree within one percent or 0.2 milliliters, whichever is greater.

For container 2, an aliquot of the solution was pipetted into a 250 ml Erlenmeyer flask and a volume of 100% Isopropanol equal to four times the sample aliquot was added to the sample. The sample was titrated in the same procedure as container 1.

7. QUALITY ASSURANCE

In order to ensure the accuracy of all the data collected in the field and at the laboratory, SEAS has instituted a comprehensive quality assurance and quality control program. New or repaired items requiring calibration are calibrated before their initial use in the field. Equipment with calibration that may change with use is calibrated before and after each use. When an item is found to be out of calibration, the unit is either discarded or repaired, and then recalibrated before being returned to service. All equipment is periodically recalibrated in full regardless of the results of the regular inspections or its present calibration status. Calibrations are performed in a manner consistent with the EPA reference methods recommended in the "Quality Assurance Handbook for Air Pollution Measurement Systems" published by the US Environmental Protection Agency. To the maximum degree possible all calibrations are traceable to the National Institute of Standards & Technology (NIST).

In order to ensure that the test will be performed in a timely manner without undue delays, SEAS sampling vans are equipped with duplicate sampling devices for almost every device needed to perform the test. If a particular device is broken or does not pass inspection, a second device is available immediately at the site for use. Any device which appears to be outside calibration, or in need of repair is tagged in the field and repaired, calibrated, or discarded immediately upon return to the laboratory.

7.1. Calibrations

Certain pieces of equipment need to be calibrated before and after each test. Those items include the pitot tubes, the differential pressure gauges, the dry gas meter, and the nozzles used for the particulate testing. The following is a brief description of the calibration procedures for each of these important devices.

7.1.1. *Pitot Tubes*

All pitot tubes are the S-type as required by EPA Reference Method 2 (40 CFR, Part 60, Appendix A, Method 2). This method contains certain geometric standards for the construction of S-type pitot tubes. All of SEAS pitot tubes are constructed according to these standards. According to the EPA any pitot tube constructed to these standards will have a coefficient of 0.84 $\pm$ 0.02. To ensure the exact value of SEAS pitot tubes, all pitot tubes are initially calibrated in SEAS wind tunnel to determine the exact pitot coefficient. This coefficient should not change unless the pitot is physically damaged. Each pitot tube is checked before going to the field to make sure it meets the geometry as specified. Any pitot tube which does not meet the specifications is not used in the test.

7.1.2. *Differential Pressure Gauges*

SEAS uses several different types of pressure gauges including oil tube manometers, water tube manometers, magnehelics, and current output electronic load cells. Each of these devices are inspected before taken to the field and are inspected for leaks during each test. The magnehelics and load cells are tested against an incline manometer water gauge to ensure accuracy.

7.1.3. *Temperature Sensors*

All temperature sensors used in SEAS sampling program are either mercury in-glass thermometers or type K thermocouples. These thermocouples are physical devices which produce a voltage proportional to the temperature. The thermocouple reading device is calibrated before and after each series of tests to ensure accuracy of $\pm$ 2 percent. The calibration of the thermocouple is accomplished by NIST traceable calibrated reference thermocouple potentiometer system.

7.1.4. *Nozzles*

The inside diameter of each nozzle is measured to the nearest 0.001 inches prior to its initial use. Upon arriving in the field each nozzle is again measured

with a micrometer on three different points on the diameter to ensure its original measurement and that the nozzle is perfectly round. If the difference between the maximum and minimum diameters measured does not exceed 0.003 inches, the nozzle is acceptable; otherwise, this nozzle is discarded and another is selected. At the end of each test the nozzles are again remeasured on three different points on the diameter to ensure that during the test the nozzle has not become dented or deformed.

7.1.5. *Dry Gas Meter*

The dry gas meter is initially calibrated against a spirometer transfer standard. During the initial calibration, a five point calibration curve is made at a minimum of one-half inch water column orifice pressure up to four inches water column orifice pressure. After each test, the dry gas meter calibration factor is checked by performing three repetitions at a representative flow rate experienced during the test. If the final calibration does not agree with the initial calibration within five percent the calibration which yields the lowest volume of sample pulled is used in the calculations. The dry gas meter is repaired and a new five initial five point calibration is performed.

7.1.6. *Orifice*

The flow meter orifice is used to establish isokinetic sampling rates during the test. The orifice is calibrated with the dry gas meter at the same time under the same conditions. The orifice is calibrated over a wide range of flow rates and the arithmetic mean of the orifice calibration is used for sampling purposes. The orifice is recalibrated every time the gas meter is recertified.

APPENDIX A QUALITY CONTROL OF TESTING EQUIPMENT

INITIAL METER BOX CALIBRATION

Calibrated By: DM **BOX #:** SEAS-201 **Date:** 3/13/2012

	Unit	Orifice #: 1 RUN 1	Orifice #: 1 RUN 2	Orifice #: 3 RUN 1	Orifice #: 3 RUN 2	Orifice #: 8 RUN 1	Orifice #: 8 RUN 2
Meter DH	In. H_2O	0.75	0.75	1.15	1.15	1.65	1.65
Initial Gas Volume	$Ft.^3$	0.000	0.000	0.000	0.000	0.000	0.000
Final Gas Volume	$Ft.^3$	6.971	5.579	5.323	5.921	6.435	9.333
Initial Temp. Out	°F	67	68	68	68	69	76
Final Temp. Out	°F	68	68	68	69	69	76
Vacuum	In. Hg	21.0	21.0	21.0	21.0	20.0	20.0
Ambient Temp.	°F	68	68	68	68	68	76
Barometric Pressure	In. Hg	30.24	30.24	30.24	30.24	30.24	30.24
Time	sec	900	720	540	600	540	780
K'		0.3506	0.3506	0.4476	0.4476	0.5423	0.5423
CALCULATIONS							
Total Meter Gas Volume	Actual $Ft.^3$	6.971	5.579	5.323	5.921	6.435	9.333
Time	Minutes	15.000	12.000	9.000	10.000	9.000	13.000
Volume through the Meter	*SDCF without Y*	7.062	5.647	5.393	5.993	6.515	9.326
Volume through the Orifice	*SDCF*	6.921	5.537	5.301	5.891	6.423	9.208
Calculated Y	*Dimensionless*	**0.980**	**0.981**	**0.983**	**0.983**	**0.986**	**0.987**
Difference	*Allowable 0.02*	-0.009	-0.009	-0.006	-0.006	-0.003	-0.002
Calculated DH@		**2.012**	**2.010**	**1.895**	**1.893**	**1.853**	**1.856**
Difference	*Allowable 0.2*	0.143	0.141	0.026	0.024	-0.016	-0.012

Reference 33103	Unit	RUN 4	RUN 5	
Field Meter DH	In. H_2O	2.50	3.50	
Initial Gas Volume	$Ft.^3$	0.000	0.000	
Final Gas Volume	$Ft.^3$	10.770	12.807	
Initial Temp. Out	°F	70	76	
Final Temp. Out	°F	71	76	
Reference Meter Y	*Dimensionless*	0.952	0.952	
Initial Gas Volume	$Ft.^3$	133.740	159.202	
Final Gas Volume	$Ft.^3$	144.638	172.208	
Initial Temp.	°F	70	76	
Final Temp.	°F	71	76	
Barometric Pressure	In. Hg	30.24	30.24	
Time	sec	720	720	
Volume Field Meter	ACF	10.77	12.807	
Volume Field Meter	SDCF	10.895	12.854	
Volume Reference Meter	ACF	10.90	13.006	
Volume Reference Meter	SDCF	10.958	12.944	
		1.006	1.007	**0.989**
		0.017	0.018	
		1.717	1.713	**1.869**
		-0.152	-0.155	

Magnehelic Calibrations

Device	Calibration	Delta P	
	Standard	Magnehelic	
Units	inches water	inches water	*Percent*
Reading	Reference	Sample	*Error*
1	1.32	1.31	*0.0*
2	0.72	0.71	*-1.4*
3	0.48	0.49	*2.1*

Allowed Error = 5% of Reading

Thermocouple Calibrations

Device	Calibration	Thermocouple	
	Standard	Detector	
Units	Degrees F.	Degrees F.	*Percent*
Reading	Reference	Sample	*Error*
1	150	150	*0.0*
2	212	213	*0.1*
3	400	400	*0.0*

Allowed Error = 1.5% of Absolute Temperature (Degrees Rankin);
Absolute Temperature = Temperature in Degrees Fahrenheit. + 460

Magnehelic Calibration

serial number	101			102A			102C			103A		
Span (in H2O)	**0.25**	**2**	**25**	**0.25**	**2**	**25**	**0.25**	**2**	**25**	**0.25**	**2**	**10**
Reference Reading @ 0% Span (in H2O)	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Device Reading (in H2O)	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Difference (Allowed = 0.05)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.120	0.95	4.73	0.125	1.00	9.64	0.131	0.90	9.30	0.12	0.95	5.15
Device Reading (in H2O)	0.122	0.96	4.90	0.126	0.98	9.75	0.129	0.88	9.00	0.12	0.92	5.20
% Difference (Allowed = 0.05)	1.67	1.05	3.59	0.80	2.00	1.14	1.53	2.22	3.23	2.56	3.16	0.97
Reference Reading @ 90% Span (in H2O)	0.220	1.88	23.50	2.32	1.85	23.30	0.250	2.00	22.80	0.248	1.91	9.50
Device Reading (in H2O)	0.222	1.83	24.20	2.300	1.90	24.00	0.243	1.97	23.30	0.240	1.95	9.20
% Difference (Allowed = 0.05)	0.91	2.66	2.98	0.86	2.70	3.00	2.80	1.50	2.19	3.23	2.09	3.16

serial number	103B						104		
Span (in H2O)	**0.25**	**0.5**	**1**	**2**	**5**	**25**	**0.25**	**2**	**10**
Reference Reading @ 0% Span (in H2O)	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00
Device Reading (in H2O)	0.000	0.000	0.000	0.00	0.00	0.00	0.000	0.00	0.00
% Difference (Allowed = 0.05)	0.000	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.130	0.260	0.50	9.40	2.43	9.70	0.120	0.99	4.73
Device Reading (in H2O)	0.124	0.260	0.48	9.40	2.54	9.50	0.120	0.98	4.90
% Difference (Allowed = 0.05)	4.615	0.00	4.00	0.00	4.53	2.06	0.000	1.02	3.47
Reference Reading @ 90% Span (in H2O)	0.261	0.500	0.85	1.89	4.52	24.5	0.248	1.67	8.20
Device Reading (in H2O)	0.249	0.495	0.81	1.88	4.64	25.0	0.240	1.74	8.60
% Difference (Allowed = 0.05)	4.598	1.00	4.71	0.53	2.65	2.04	3.333	4.02	4.65

serial number	105			106		
Span (in H2O)	**0.25**	**2**	**25**	**0.5**	**4**	**15**
Reference Reading @ 0% Span (in H2O)	0.000	0.00	0.00	0.000	0.00	0.00
Device Reading (in H2O)	0.000	0.00	0.00	0.000	0.00	0.00
% Difference (Allowed = 0.05)	0.000	0.00	0.00	0.000	0.00	0.00
Reference Reading @ 50% Span (in H2O)	0.122	0.97	8.90	0.233	1.86	8.00
Device Reading (in H2O)	0.123	0.95	9.30	0.232	1.95	7.90
% Difference (Allowed = 0.05)	0.820	2.11	4.30	0.431	4.62	1.27
Reference Reading @ 90% Span (in H2O)	0.239	1.92	24.5	0.470	3.60	14.4
Device Reading (in H2O)	0.235	1.98	23.7	0.461	3.60	14.8
% Difference (Allowed = 0.05)	1.702	3.03	3.38	1.952	0.00	2.70
Calibration Date 12/30/2008 By MC						

APPENDIX B FIELD DATA

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-6-12 OPERATOR MC/BH

PLANT Crist BOX No. S-201 DHa 1.869 Y 0.989

UNIT FGD Stack Outlet METHOD CTM-13 PROBE #

BALANCE No. 101 A STD. WT. (gm) 2000.0 BALANCE RESPONCE (gm) 1997.9

	Run 1	Run 2	Run 3
Nozzle Calibration (inches)	NA	NA	NA
Filter Number	NA	NA	NA
METER READING Final	40.110	40.461	39.858
Initial	0.000	0.000	0.000
Net	40.110	40.461	39.858
LEAK CHECK System Pre (in. Hg)	10	11	10
System Post (in. Hg)	11	11	12
System Pre (cfm)	.004	.008	.003
System Post (cfm)	.008	.004	.005
Pitot Pre/Post (Impact / Static)	NA	NA	NA
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final	187	217	217
Imp 1 Initial	100	100	100
Imp 1 Net	87	117	117
Imp 2 Final	128	117	116
Imp 2 Initial	100	100	100
Imp 2 Net	28	17	16
Imp 3 Final / Initial / Net	/	/	/
Imp 4 Final	1762.4	1774.8	1784.4
Imp 4 Initial	1741.6	1762.4	1774.8
Imp 4 Net	20.8	12.4	9.6
Total	135.8	146.4	142.6
GAS ANALYSIS O_2	11%	11%	10%
CO_2	10.5%	10.5%	11%
CO	/	/	/
STATIC (in. H_2O)	-0.1	-0.1	-0.1
BAROMETRIC (in. Hg)	29.77	29.77	29.77

Form Revised 10/10/06

Page 1 of

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-6-12 OPERATOR MC / TBH
PLANT Crist BOX No. S-201 DHa 1.869 Y .989
UNIT FGD Stack METHOD ctm-013 PROBE #
BALANCE No. 101 A STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 1997.9

	Run 4	Run 5	Run 6
Nozzle Calibration (Inches)	NA	NA	NA
Filter Number	NA	NA	NA
METER READING Final	39.761	39.660	39.416
Initial	0.000	0.000	0.000
Net	39.761	39.660	39.416
LEAK CHECK System Pre (In. Hg)	10	11	12
System Post (In. Hg)	9	11	10
System Pre (cfm)	.002	.005	.002
System Post (cfm)	.002	.008	.003
Pitot Pre/Post (Impact / Static)	NA	NA	NA
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final	219	219	216
Imp 1 Initial	100	100	100
Imp 1 Net	119	119	116
Imp 2 Final	117	115	114
Imp 2 Initial	100	100	100
Imp 2 Net	17	15	14
Imp 3 Final / Initial / Net	/	/	/
Imp 4 Final	1792.6	1800.6	1806.8
Imp 4 Initial	1784.4	1792.6	1800.6
Imp 4 Net	8.2	8.0	6.2
Total	144.2	142.0	136.2
GAS ANALYSIS O_2	10%	10%	10%
CO_2	11%	10%	10%
CO	/	/	/
STATIC (In. H_2O)	-0.1	-0.1	-0.1
BAROMETRIC (In. Hg)	29.77	29.77	29.77

Form Revised 10/10/06

Page 1 of

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Condenser	Imp.	Gas Meter	Vac. (In. Hg)
1-1	9:45	0.00		1.5	119	502	167	43	74	7
	9:50	3.3		1.5	118	503	170	43	76	7
	9:55	6.7		1.5	119	502	171	43	80	7
	10:00	10.1		1.5	118	501	172	43	80	6
	10:05	13.4		1.5	119	502	173	43	80	6
	10:10	16.8		1.5	119	504	173	43	81	6
	10:15	20.1		1.5	118	506	171	44	81	6
	10:20	23.4		1.5	120	503	174	44	83	6
	10:25	26.8		1.5	119	500	170	45	85	6
	10:30	30.0		1.5	120	501	169	45	84	6
	10:35	33.5		1.5	120	502	170	46	84	6
	10:40	36.8		1.5	119	500	165	46	86	6
	10:45	40.110								
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Company: Gulf Power Date: 8-6-12 Page ______

Site: Plant Crist FGD Stack outlet Run #: 1 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Condenser	Imp.	Gas Meter	Vac. (In. Hg)
1-1	11:00	0.000		1.5	121	509	166	43	89	6
	:05	3.3		1.5	121	510	167	43	89	6
	:10	6.5		1.5	120	505	167	44	89	6
	:15	10.1		1.5	119	506	167	44	89	6
	:20	13.3		1.5	120	503	168	44	89	6
	:25	17.0		1.5	120	505	166	45	89	6
	:30	20.4		1.5	121	507	167	45	90	6
	:35	23.6		1.5	119	508	166	44	90	6
	:40	27.0		1.5	122	506	167	45	90	6
	:45	30.5		1.5	121	503	167	44	91	6
	:50	33.7		1.5	121	504	168	45	92	6
	:55	36.9		1.5	119	506	166	45	92	6
Stop	12:00	40.461								
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Company: Gulf Power - FGD Stack Date: 8-6-12 Page ____

Site: ctm-013 Crist Run #: 2 Of ____

Port # Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Condenser	Imp.	Gas Meter	Vac. (In. Hg)
1-1	12:20	0.000		1.5	124	504	169	42	88	6
	:25	3.2		1.5	124	503	169	42	87	6
	:30	6.7		1.5	123	506	171	43	86	6
	:35	10.1		1.5	122	508	170	43	85	6
	:40	13.5		1.5	124	507	169	43	84	6
	:45	16.8		1.5	123	510	169	43	83	6
	:50	19.9		1.5	125	509	170	44	82	6
	:55	23.2		1.5	122	511	171	45	80	6
	13:00	26.7		1.5	124	506	168	45	80	6
	:05	29.9		1.5	123	507	169	45	80	6
	:10	33.8		1.5	124	505	170	46	80	6
	:15	37.1		1.5	123	504	168	46	79	6
stop	13:20	39.858								
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Company: Gulf Power - FGD Stack Date: 8-6-12 Page ____

Site: ctm-013 Crist Run #: 3 Of ____

Port # Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Condenser	Imp.	Gas Meter	Vac. (In. Hg)
1-1	13:30	0.000		1.5	124	510	167	41	77	6
	:35	3.6		1.5	123	512	166	41	77	6
	:40	9.7		1.5	123	509	166	42	78	6
	:45	11.4		1.5	122	508	167	41	78	6
	:50	14.2		1.5	124	506	168	42	78	6
	:55	16.5		1.5	122	508	167	43	78	6
	14:00	19.4		1.5	123	509	167	43	78	6
	:05	22.1		1.5	123	510	167	44	78	6
	:10	24.8		1.5	124	507	168	44	77	6
	:15	28.9		1.5	123	506	168	44	77	6
	:20	33.0		1.5	122	508	169	44	77	6
	:25	36.6		1.5	123	510	168	45	77	6
Stop	14:30	39.761								
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Company: Gulf Power - FGD Stack Date: 8-6-12 Page ____

Site: ctm-013 Crist Run #: 4 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Condenser	Imp.	Gas Meter	Vac. (In. Hg)
1-1	14:40	0.000		1.5	123	509	171	44	79	6
	:45	3.4		1.5	122	508	170	45	79	6
	:50	6.3		1.5	120	510	170	45	79	6
	:55	9.9		1.5	120	511	171	45	79	6
	15:00	13.1		1.5	119	508	172	45	80	6
	:05	16.3		1.5	120	507	171	46	80	6
	:10	19.5		1.5	118	510	172	46	80	6
	:15	22.3		1.5	119	512	172	47	80	6
	:20	25.8		1.5	119	509	172	48	80	6
	:25	29.7		1.5	118	506	171	48	81	6
	:30	32.7		1.5	117	508	171	49	81	6
	:35	36.1		1.5	118	503	170	49	81	6
Stop	15:40	39.660								
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Company: Gulf Power – FGD Stack Date: 8-6-12 Page ______

Site: ctm-013 Crist Run #: 5 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond.	Gas Meter	Vac. (In. Hg)
1-1	15:50	0.000		1.5	122	510	172	80	6
	:55	3.5		1.5	120	513	171	80	6
	16:00	6.2		1.5	119	511	171	80	6
	:05	10.0		1.5	120	516	171	81	6
	:10	13.2		1.5	118	512	170	81	6
	:15	17.0		1.5	119	509	171	82	6
	:20	20.8		1.5	119	508	171	82	6
	:25	22.6		1.5	118	510	172	82	6
	:30	26.2		1.5	117	511	172	82	6
	:35	29.9		1.5	118	507	171	82	6
	:40	33.1		1.5	116	506	169	83	6
	:45	35.8		1.5	116	502	170	83	6
Stop	16:50	39.416							
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Company: Gulf Power - FGD Stack Date: 8-6-12 Page ______

Site: ctm-013 Crist Run #: 6 Of ______

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-7-17 OPERATOR TBH/MC

PLANT Crist BOX No. S-201 DHa 1.869 Y .989

UNIT FGD Stack METHOD ctm-013 PROBE # ____

BALANCE No. 101 A STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 2000.5

	Run 1	Run 2	Run 3
Nozzle Calibration (Inches)	NA	NA	NA
Filter Number	NA	NA	NA
METER READING Final	39.579	39.745	39.720
Initial	0.000	0.000	0.000
Net	39.579	39.745	39.720
LEAK CHECK System Pre (in. Hg)	10	11	10
System Post (in. Hg)	8	9	10
System Pre (cfm)	.003	.002	.008
System Post (cfm)	.002	.002	.004
Pitot Pre/Post (Impact/Static)	NA	NA	NA
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final	200	204	208
Imp 1 Initial	100	100	100
Imp 1 Net	100	104	108
Imp 2 Final	116	110	114
Imp 2 Initial	100	100	100
Imp 2 Net	16	10	14
Imp 3 Final	/	/	/
Imp 3 Initial	/	Ø	/
Imp 3 Net	/	/	/
Imp 4 Final	1810.8	1811.2	1821.7
Imp 4 Initial	1801.6	1797.5	1811.2
Imp 4 Net	9.2	13.7	10.5
Total	125.2	127.7	132.5
GAS ANALYSIS O_2	10%	10%	12.0
CO_2	10%	10%	12.0
CO	/	/	/
STATIC (in. H_2O)	-0.15	-0.15	-0.15
BAROMETRIC (in. Hg)	29.69	29.69	29.69

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Page 1 of ____

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-7-12 OPERATOR TBH/[illegible]

PLANT Crist BOX No. 5-201 DHa 1.869 Y .989

UNIT FGD Stack METHOD ctm-013 PROBE # ______

BALANCE No. 101A STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 2000.5

	Run 4	Run ____	Run ____
Nozzle Calibration (inches)	NA		
Filter Number	NA		

METER READING

	Run 4		Run		Run	
Final	39.323					
Initial	0.000					
Net	39.323					

LEAK CHECK

	System Pre	System Post	Pitot Pre	Pitot Post
Run 4 in. Hg	11	9	NA	NA
Run 4 cfm	.001	.001		
Run ____				
Run ____				

VOLUME OF LIQUID WATER COLLECTED

Run 4	Imp 1	Imp 2	Imp 3	Imp 4
Final	210	112	/	1832.5
Initial	100	100	/	1821.7
Net	110	12		10.8

Total 132.8

GAS ANALYSIS

O_2 9.5

CO_2 10.5

CO /

STATIC -0.15 in. H_2O

BAROMETRIC 29.69 in. Hg

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Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	~~Imp.~~ Cond.	Gas Meter	Vac. (In. Hg)
1-1	9:30	0.000		1.5	113	501	165	80	6
	:35	3.3		1.5	114	502	165	80	6
	:40	6.7		1.5	112	504	165	80	6
	:45	9.9		1.5	111	507	166	80	6
	:50	13.0		1.5	115	508	167	80	6
	:55	16.1		1.5	114	505	167	80	6
	10:00	19.4		1.5	115	509	167	80	6
	:05	22.9		1.5	115	511	168	80	6
	:10	26.3		1.5	115	512	167	80	6
	:15	29.7		1.5	114	509	168	80	6
	:20	32.9		1.5	112	508	169	80	6
	:25	36.0		1.5	114	510	169	80	6
Stop	10:30	39.579							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-7-12 Page ______

Site: ctm-013 Crist Run #: 1 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. ~~Imp.~~	Gas Meter	Vac. (In. Hg)
1-1	10:40	0.000		1.5	118	511	170	84	6
	:45	3.2		1.5	119	511	170	84	6
	:50	6.3		1.5	118	507	171	84	6
	:55	9.8		1.5	119	508	171	85	6
	11:00	13.4		1.5	119	506	176	85	6
	:05	16.7		1.5	120	509	170	85	6
	:10	19.9		1.5	119	504	169	85	6
	:15	22.6		1.5	118	507	169	85	6
	:20	25.0		1.5	118	508	168	85	6
	:25	28.7		1.5	116	510	169	85	6
	:30	33.1		1.5	113	511	170	85	6
	:35	36.5		1.5	114	512	170	85	6
Stop	11:40	39.745							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-7-12 Page ____

Site: ctm-013 Crist Run #: 2 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. ~~Imp.~~	Gas Meter	Vac. (In. Hg)
1-1	12:45	0.000		1.5	116	513	172	90	6
	:50	3.4		1.5	117	512	171	91	6
	:55	6.7		1.5	118	515	171	91	6
	13:00	10.0		1.5	118	511	171	92	6
	:05	13.2		1.5	117	509	171	92	6
	:10	16.5		1.5	118	510	172	93	6
	:15	20.0		1.5	118	509	171	93	6
	:20	23.6		1.5	118	508	170	93	6
	:25	27.1		1.5	119	506	171	93	6
	:30	29.5		1.5	118	507	170	94	6
	:35	32.8		1.5	120	507	172	94	6
	:40	36.4		1.5	120	509	172	94	6
Stop	13:45	39.720							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-7-12 Page ______

Site: ctm-013 Crist Run #: 3 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	~~Imp.~~ Cond.	Gas Meter	Vac. (In. Hg)
1-1	13:55	0.000		1.5	120	515	173	95	6
	14:00	3.2		1.5	121	513	174	95	6
	:05	6.1		1.5	121	510	174	95	6
	:10	9.8		1.5	121	511	174	94	6
	:15	12.5		1.5	120	514	174	94	6
	:20	16.0		1.5	126	513	173	93	6
	:25	19.3		1.5	121	514	173	92	6
	:30	22.4		1.5	119	511	172	92	6
	:35	25.7		1.5	121	509	174	91	6
	:40	28.8		1.5	122	508	173	91	6
	:45	32.9		1.5	121	506	174	90	6
	:50	36.1		1.5	121	505	174	90	6
Stop	14:55	39.323							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-7-12 Page ____

Site: ctm-013 Crist Run #: 4 Of ____

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-8-12 OPERATOR TBH/MC

PLANT Crist BOX No. S-201 DHa 1.869 Y .989

UNIT FGD Stack METHOD ctm-013 PROBE #

BALANCE No. 101A STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 2000.2

	Run 1	Run 2	Run 3
Nozzle Calibration (inches)	NA	NA	NA
Filter Number	NA	NA	NA
METER READING Final	38.844	39.134	39.165
Initial	0.000	0.000	0.000
Net	38.844	39.134	39.165
LEAK CHECK System Pre (in. Hg)	11	10	11
System Post (in. Hg)	10	9	9
System Pre (cfm)	.002	.008	.010
System Post (cfm)	.002	.002	.008
Pitot Pre/Post (Impact/Static)	NA	NA	NA
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final	207	214	217
Imp 1 Initial	100	100	100
Imp 1 Net	107	114	117
Imp 2 Final	116	113	116
Imp 2 Initial	100	100	100
Imp 2 Net	16	13	16
Imp 3 Final / Initial / Net	/	/	/
Imp 4 Final	1841.4	1850.9	1860.1
Imp 4 Initial	1826.3	1841.4	1850.9
Imp 4 Net	15.1	9.5	9.2
Total	138.1	136.5	141.2
GAS ANALYSIS O_2	9.5%	9.5%	10%
CO_2	10%	10%	10%
CO	/	/	/
STATIC (in. H_2O)	-0.15	-0.15	-0.15
BAROMETRIC (in. Hg)	29.73	29.73	29.73

Form Revised 10/10/06

Page 1 of

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-8-12 OPERATOR JBH/MC

PLANT Crist BOX No. S-201 DHa 1.869 Y .989

UNIT FGD Stack METHOD ctm-013 PROBE # ____

BALANCE No. 101A STD. WT. (gm) 2000 BALANCE RESPONCE (gm) 2000.2

	Run 4	Run ____	Run ____
Nozzle Calibration (inches)	NA		
Filter Number	NA		
METER READING Final	39.635		
Initial	0.000		
Net	39.635		
LEAK CHECK System Pre (in. Hg)	10		
System Pre (cfm)	.002		
System Post (in. Hg)	10		
System Post (cfm)	.003		
Pitot Pre/Post (Impact / Static)	NA		

VOLUME OF LIQUID WATER COLLECTED (Run 4)

	Imp 1	Imp 2	Imp 3	Imp 4
Final	216	115	/	1868.2
Initial	100	100	/	1860.1
Net	116	15	/	8.1

Total 139.1

	Run 4	Run ____	Run ____
GAS ANALYSIS O_2	10%		
CO_2	10%		
CO	/		
STATIC (in. H_2O)	-0.15		
BAROMETRIC (in. Hg)	29.73		

Form Revised 10/10/08

Page 1 of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. Imp.	Gas Meter	Vac. (In. Hg)
1-1	10:45	0.000		1.5	119	508	170	84	6
	:50	3.1		1.5	119	508	171	84	6
	:55	6.2		1.5	118	507	169	84	6
	11:00	9.3		1.5	118	509	170	84	6
	:05	12.6		1.5	119	510	171	84	6
	:10	15.8		1.5	118	512	171	84	6
	:15	18.4		1.5	120	510	170	84	6
	:20	21.6		1.5	120	511	171	84	6
	:25	25.7		1.5	119	508	172	84	6
	:30	29.2		1.5	122	509	170	84	6
	:35	32.4		1.5	121	510	171	84	6
	:40	35.5		1.5	121	509	171	84	6
Stop	11:45	38.844							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-8-12 Page ____

Site: ctm-013 Crist Run #: 1 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond.	Gas Meter	Vac. (In. Hg)
1-1	11:55	0.000		1.5	118	506	173	83	6
	12:00	3.3		1.5	118	509	173	83	6
	:05	6.7		1.5	116	508	172	82	6
	:10	9.5		1.5	117	508	171	82	6
	:15	12.8		1.5	117	511	170	82	6
	:20	16.0		1.5	118	510	170	82	6
	:25	19.2		1.5	119	510	170	82	6
	:30	23.1		1.5	118	512	171	82	6
	:35	27.7		1.5	117	513	170	82	6
	:40	29.8		1.5	117	510	170	82	6
	:45	32.3		1.5	118	507	171	82	6
	:50	35.6		1.5	118	506	172	82	6
Stop	12:55	39.134							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-8-12 Page ____

Site: ctm-013 Crist Run #: 2 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. ~~Imp.~~	Gas Meter	Vac. (In. Hg)
1-1	13:50	0.000		1.5	114	503	177	81	6
	:55	3.2		1.5	115	507	178	81	6
	14:00	6.3		1.5	114	510	180	81	6
	:05	9.7		1.5	116	511	173	80	6
	:10	12.9		1.5	115	513	168	80	6
	:15	16.1		1.5	115	509	170	80	6
	:20	19.2		1.5	116	508	171	80	6
	:25	22.7		1.5	115	506	169	80	6
	:30	25.8		1.5	115	505	168	80	6
	:35	29.5		1.5	116	507	169	80	6
	:40	32.7		1.5	115	503	170	80	6
	:45	36.2		1.5	113	502	167	80	6
Stop	14:50	39.165							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-8-12 Page ____

Site: ctm-013 Crist Run #: 3 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Cond. Imp.	Gas Meter	Vac. (In. Hg)
1-1	15:05	0.000		1.5	117	501	165.	80	6
	:10	3.3		1.5	117	505	168	80	6
	:15	6.5		1.5	118	507	168	80	6
	:20	9.8		1.5	119	506	172	80	6
	:25	12.7		1.5	121	510	175	80	6
	:30	15.6		1.5	120	508	173	80	6
	:35	19.5		1.5	121	507	170	80	6
	:40	22.9		1.5	118	511	170	80	6
	:45	25.8		1.5	119	512	170	81	6
	:50	29.4		1.5	118	509	170	81	6
	:55	33.3		1.5	116	508	169	80	6
	16:00	36.5		1.5	117	504	170	80	6
Stop	16:05	39.635							
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Form Revised 8/24/02

Company: Gulf Power - FGD Stack Date: 8-8-12 Page ____

Site: ctm-013 Crist Run #: 4 Of ____

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-9-12 OPERATOR MC/BJ

PLANT Crist BOX No. S-201 DHa ______ Y ______

UNIT FGD outlet METHOD CTM-13 PROBE # NA

BALANCE No. ______ STD. WT. (gm) 2000.0 BALANCE RESPONCE (gm) ______

	Run 1	Run 2	Run
Nozzle Calibration (inches)	NA	NA	
Filter Number	NA	NA	

METER READING

	Run 1		Run 2		Run	
Final	40.248		40.241			
Initial	0.000		0.000			
Net	40.248		40.241			

LEAK CHECK

	Run 1	Run 2	Run
System Pre (in. Hg)	10	10	
System Post (in. Hg)	12	10	
System Pre (cfm)	.005	0.002	
System Post (cfm)	.005	0.003	
Pitot Pre Impact / Static	NA	NA	
Pitot Post Impact / Static	NA	NA	

VOLUME OF LIQUID WATER COLLECTED

	Run 1 Imp 1	Imp 2	Imp 3	Imp 4	Run 2 Imp 1	Imp 2	Imp 3	Imp 4	Run Imp 1	Imp 2	Imp 3	Imp 4
Final	204	116		1834.8	207	113		1846.1				
Initial	100	100		1822.6	100	100		1834.8				
Net	104	16		12.2	107	13		11.3				
Total	132.2				131.3							

	Run 1	Run 2	Run
GAS ANALYSIS O_2	10.0%	9.5%	
CO_2	10.0%	10.0%	
CO	—	—	
STATIC (in. H_2O)	-.15	-0.15	
BAROMETRIC (in. Hg)	29.70	29.70	

Form Revised 10/10/06

Page 1 of ______

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-9-12 OPERATOR mc/BH

PLANT Crist BOX No. S-201 DHa ____ Y ____

UNIT FGD Outlet METHOD CTM-13 PROBE # ____

BALANCE No. ____ STD. WT. (gm) ____ BALANCE RESPONCE (gm) ____

	Run 3	Run 4	Run ____
Nozzle Calibration (inches)	NA	NA	
Filter Number	NA	NA	
METER READING Final	39.989	40.558	
Initial	0.000	0.000	
Net	39.989	40.558	
LEAK CHECK System Pre (in. Hg)	10	11	
System Post (in. Hg)	10	12	
System Pre (cfm)	0.002	0.000	
System Post (cfm)	0.000	0.007	
Pitot Pre/Post (Impact/Static)	NA	NA	
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final / Initial / Net	211 / 100 / 111	213 / 100 / 113	
Imp 2 Final / Initial / Net	113 / 100 / 13	110 / 100 / 10	
Imp 3 Final / Initial / Net	—	—	
Imp 4 Final / Initial / Net	1856.7 / 1846.1 / 10.6	1871.2 / 1856.7 / 14.5	
Total	134.6 (~~0.156~~)	137.5 (~~0.175~~)	
GAS ANALYSIS O_2	10.0%	10.0%	
CO_2	9.5%	9.5%	
CO	—	—	
STATIC (in. H_2O)	-0.15	-0.15	
BAROMETRIC (in. Hg)	29.70	29.70	

Form Revised 10/10/06

Page 1 of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity ~~Head~~ Cond ΔP ~~(In. H_2O)~~	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
	9:10	0.000	170	1.5	121	504	~~170~~45	79	6
	9:15	3.3	170	1.5	121	501	45	79	6
	9:20	6.7	170	1.5	122	503	44	79	6
	9:25	10.1	171	1.5	122	503	44	~~7~~80	6
	9:30	13.4	170	1.5	122	504	44	80	6
	9:35	16.9	170	1.5	122	505	44	80	6
	9:40	20.6	170	1.5	122	503	44	81	6
	9:45	23.5	170	1.5	122	502	45	81	6
	9:50	27.0	171	1.5	122	505	46	83	6
	9:55	30.5	170	1.5	122	504	46	83	6
	10:00	33.6	170	1.5	122	506	46	80	6
	10:05	36.9	170	1.5	122	502	46	81	6
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Form Revised 8/24/02

Company: Gulf Power Date: 8-9-12 Page ____

Site: FGD Outlet Run #: 1 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O) cond	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
	10:23	0.000	170	1.5	121	506	43	80	6
	10:28	3.4	170	1.5	121	507	43	80	6
	10:33	6.8	170	1.5	121	502	43	80	6
	10:38	~~9~~10.0	170	1.5	121	501	43	80	6
	10:43	13.3	170	1.5	121	503	43	80	6
	10:48	16.8	170	1.5	121	502	43	79	6
	10:53	20.2	170	1.5	121	502	43	79	6
	10:58	23.5	170	1.5	122	503	42	80	6
	11:03	27.0	170	1.5	121	504	42	81	6
	11:08	30.1	170	1.5	121	503	42	81	6
	11:13	33.5	170	1.5	121	505	42	81	6
	11:18	37.0	170	1.5	121	504	42	81	6
	11:23	40.241	~~171~~	~~1.5~~	~~122~~	~~505~~	~~43~~	~~81~~	~~6~~
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Form Revised 8/24/02

Company: Gulf Power Crist Date: 8-9-12 Page ______

Site: FGD Outlet Run #: 2 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP cond (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
start	12:40	0.000	170	1.5	122	506	45	73	6
	12:45	3.2	172	1.5	122	505	44	72	6
	12:50	6.6	173	1.5	122	502	44	72	6
	12:55	10.1	172	1.5	122	501	43	72	6
	13:00	13.6	173	1.5	123	503	43	72	6
	13:05	16.6	171	1.5	122	507	43	73	6
	13:10	19.9	170	1.5	123	504	43	74	6
	13:15	23.4	172	1.5	122	502	43	75	6
	13:20	26.7	171	1.5	122	503	43	75	6
	13:25	30.0	171	1.5	122	502	44	77	6
	13:30	33.3	170	1.5	122	501	44	78	6
	13:35	36.6	170	1.5	122	503	44	79	6
end	13:40	39.4	169	1.5	122	502	45	79	6
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~~end~~	~~13:40~~								
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Form Revised 8/24/02

Company: Gulf Power Plant Crist Date: 8-9-12 Page ____

Site: FGD Outlet Run #: 3 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In/H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
start	13:50	0.000	172	1.5	124	508	42	81	5
	13:55	3.4	175	1.5	122	507	42	83	6
	14:00	6.8	178	1.5	123	503	40	82	6
	14:05	10.1	175	1.5	123	502	40	84	6
	14:10	13.3	172	1.5	124	500	41	83	6
	14:15	16.9	171	1.5	123	501	40	84	6
	14:20	18.9	170	1.5	123	507	41	84	6
	14:25	23.8	170	1.5	123	508	40	84	6
	14:30	27.5	170	1.5	123	506	40	83	6
	14:35	30.8	170	1.5	122	506	40	81	6
	14:40	34.1	170	1.5	123	502	41	80	6
	14:45	37.4	170	1.5	122	501	41	79	6
end	14:50	40.558							
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Form Revised 8/24/02

Company: Gulf Power Plant Crist Date: 8-9-12 Page ____

Site: FGD Outlet Run #: 4 Of ____

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-10-12 OPERATOR MC/BH
PLANT Crist BOX No. S-201 DHa ___ Y ___
UNIT FGD Outlet METHOD CTM-13 PROBE # NA
BALANCE No. ___ STD. WT. (gm) ___ BALANCE RESPONCE (gm) ___

	Run 3	Run 4	Run 5
Nozzle Calibration (inches)	NA	NA	NA
Filter Number	NA	NA	NA
METER READING Final	39.802	39.584	39.802
Initial	0.000	0.000	0.000
Net	39.802	39.584	39.802
LEAK CHECK System Pre (in. Hg)	10	10	10
System Post (in. Hg)	10	10	
System Pre (cfm)	0.00	0.00	0.00
System Post (cfm)	0.00	0.000	
Pitot Pre/Post (Impact/Static)	NA	NA	NA
VOLUME OF LIQUID WATER COLLECTED Imp 1 Final	219	217	215
Imp 1 Initial	100	100	100
Imp 1 Net	119	117	115
Imp 2 Final	114	115	116
Imp 2 Initial	100	100	100
Imp 2 Net	14	15	16
Imp 3	—	—	—
Imp 4 Final	1835.2	1846.4	1857.6
Imp 4 Initial	1821.7	1835.2	1846.4
Imp 4 Net	13.5	11.2	11.2
Total	146.5	143.2	142.2
GAS ANALYSIS O_2	10.0%	10.0%	10.0%
CO_2	10.0%	10.0%	10%
CO	—	—	—
STATIC (in. H_2O)	-0.15	-0.15	-0.15
BAROMETRIC (in. Hg)	29.75	29.75	29.75

Form Revised 10/10/06

Page 1 of ___

Sanders Engineering & Analytical Services, Inc.

2255 Schillinger Rd. N.
Semmes, Al. 36575

Office: (251) 633-4120
Fax: (251) 633-2285

COMPANY Gulf Power DATE 8-10-12 OPERATOR MC/BH
PLANT Crist BOX No. S-201 DHa ____ Y ____
UNIT FGD Outlet METHOD CTM-13 PROBE # NA
BALANCE No. ____ STD. WT. (gm) ____ BALANCE RESPONCE (gm) ____

	Run 1	Run 2	Run
Nozzle Calibration (inches)	NA	NA	
Filter Number	NA	NA	
Meter Reading Final	39.955	40.158	
Meter Reading Initial	0.000	0.000	
Meter Reading Net	39.955	40.158	
Leak Check System Pre (in. Hg)	11	10	
Leak Check System Post (in. Hg)	10	8	
Leak Check System Pre (cfm)	0.00	0.002	
Leak Check System Post (cfm)	0.00	0.00	
Leak Check Pitot (Impact / Static)	NA	NA	
Imp 1 Final / Initial / Net	211 / 100 / 111	214 / 100 / 114	
Imp 2 Final / Initial / Net	112 / 100 / 12	117 / 100 / 17	
Imp 3 Final / Initial / Net	—	—	
Imp 4 Final / Initial / Net	1807.7 / 1786.1 / 21.6	1821.2 / 1807.7 / 13.5	
Total	144.6	144.5	
O_2	10.0%	9.5%	
CO_2	9.5%	10.0%	
CO	—		
Static (in. H_2O)	-0.15	-0.15	
Barometric (in. Hg)	29.76	29.76	

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Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head ΔP (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
start	8:55	0.000	170	1.5	124	503	42	82	5
	9:00	.34	170	1.5	125	505	42	79	5
	9:05	.6.8	170	1.5	124	504	43	80	5
	9:10	.10.2	170	1.5	125	503	43	81	5
	9:15	.13.5	170	1.5	124	502	42	83	5
	9:20	16.5	170	1.5	125	505	42	84	5
	9:25	19.8	170	1.5	124	502	43	80	5
	9:30	23.2	170	1.5	124	505	44	80	5
	9:35	26.5	170	1.5	124	506	44	80	5
	9:40	29.7	170	1.5	124	505	45	78	5
	9:45	32.9	170	1.5	125	507	45	77	5
	9:50	36.5	1.70	1.5	124	506	45	75	5
end	9:55	39.955							
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Company: Gulf Power Plant Crist Date: 8-10-12 Page ______

Site: FGD outlet Run #: 1 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head Δp (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Temperature °F Filter	Temperature °F Imp.	Temperature °F Gas Meter	Vac. (In. Hg)
start	10:05	0.00	170	1.5	124	501	47	73	6
	10:10	3.4	170	1.5	124	502	47	72	6
	10:15	6.8	170	1.5	124	501	48	72	6
	10:20	10.2	170	1.5	125	504	48	72	6
	10:25	13.5	170	1.5	124	505	46	74	6
	10:30	16.7	170	1.5	124	506	46	75	6
	10:35	20.2	170	1.5	124	505	47	76	6
	10:40	23.5	170	1.5	125	506	47	79	6
	10:45	26.8	170	1.5	124	507	47	79	6
	10:50	30.3	170	1.5	124	508	46	81	6
	10:55	33.3	170	1.5	125	504	46	82	6
	11:00	36.9	170	1.5	124	502	47	82	6
end	11:05	40.158		[illegible]					
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Company: Gulf Power Plant Crist Date: 8-10-12 Page ____

Site: FGD Outlet Run #: 2 Of ____

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity ~~Head~~ ΔP cold (In. H_2O)	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Temperature °F Filter	Temperature °F Imp.	Temperature °F Gas Meter	Vac. (In. Hg)
start	11:35	0.000	170	1.5	125	~~48~~ 507	45	76	6
	11:40	3.3	170	1.5	125	509	46	81	6
	11:45	6.6	170	1.5	124	506	47	80	6
	11:50	10.0	170	1.5	125	503	45	76	6
	11:55	13.3	170	1.5	125	504	46	73	6
	12:00	16.7	170	1.5	124	502	46	72	6
	12:05	19.9	170	1.5	124	503	47	70	6
	12:10	23.5	170	1.5	124	506	48	68	6
	12:15	26.6	170	1.5	124	507	47	68	6
	12:20	30.0	170	1.5	125	511	47	69	6
	12:25	33.3	170	1.5	124	509	46	72	6
	12:30	36.6	170	1.5	124	504	46	74	6
end	12:35	39.802							
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Company: Gulf Power Plant Crist Date: 8-10-12 Page ____

Site: FGD Outlet Run #: 3 Of ____

Port # Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity Head Corr ~~ΔP (In. H_2O)~~	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Filter	Imp.	Gas Meter	Vac. (In. Hg)
start	13:25	0.000	170	1.5	~~8~~ 125	510	45	74	6
	13:30	3.6	170	1.5	124	508	46	74	6
	13:35	26.6	170	1.5	124	510	45	74	6
	13:40	9.9	170	1.5	125	507	45	75	6
	13:45	13.3	170	1.5	125	505	46	76	6
	13:50	16.6	170	1.5	124	501	47	75	6
	13:55	18.9	170	1.5	124	504	45	74	6
	14:00	22.2	170	1.5	125	504	44	75	6
	14:05	25.6	170	1.5	125	505	45	76	6
	14:10	27.9	170	1.5	125	507	48	77	6
	14:15	31.2	170	1.5	124	506	49	78	6
	14:20	34.5	170	1.5	125	507	50	78	6
end	14:25	39.584	~~120~~	~~1.5~~	~~125~~	~~5~~			
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Site: FGD Outlet Run #: 3 Of ______

Port # / Point#	Time	Gas Meter Volume (Cubic Feet)	Velocity ~~Head~~ ΔP Can ~~(In. H_2O)~~	Orifice Head ΔH (In. H_2O)	Temperature °F Stack	Temperature °F Filter	Temperature °F Imp.	Temperature °F Gas Meter	Vac. (In. Hg)
start	14:35	0.000	170	1.5	125	509	49	81	6
	14:40	3.7	170	1.5	125	510	50	81	6
	14:45	6.9	170	1.5	125	509	51	78	6
	14:50	10.0	170	1.5	125	505	51	75	6
	14:55	13.3	170	1.5	125	510	50	73	6
	15:00	16.6	170	1.5	125	508	52	72	6
	15:05	20.1	170	1.5	126	505	52	70	6
	15:10	23.4	170	1.5	125	504	53	74	6
	15:15	26.7	170	1.5	125	506	52	75	6
	15:20	~~30.4~~ 29.8	170	1.5	125	508	53	76	6
	15:25	33.1	170	1.5	125	511	53	78	6
	15:30	36.3	170	1.6	125	505	53	77	6
end	15:35	39.700							
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Site: FGD Outlet Run #: 5 Of ______

TITLE **PROJECT**

Continued From Page

Gulf Power CTM-13
FGD Outlet August 9 & 10 2012

Standardization of $BaCl_2$ (Fluka 0.1005N H_2SO_4 in H_2O) batch # 1069614M

$\frac{9.5}{.5}$ $\frac{9.5}{.5}$ $\frac{2.75}{.5}$ $\frac{9.5}{.5}$ $\frac{9.5}{.5}$ $\frac{2.92}{.5}$

9.0 + 9.0 + 2.25 = 20.25   9 + 9 + 2.42 = 20.42

$\bar{x} = 20.335$

$N_1V_1 = N_2V_2 \longrightarrow (0.1005)(1) = x(20.335) \longrightarrow x = 0.00494$

8-9-11 R1
condensor catch sample volume = 48.5 mL H_2O_2 catch volume = 432 mL
aliquot volume = 10 mL   aliquot volume = 5 mL

5.95	6.00		9.68	9.70	
0.5	0.5		0.5	0.5	
5.45	5.50	$\bar{x}$ = 5.475	9.18	9.20	$\bar{x}$ = 9.19

8-9-11 R2
condensor wash sample volume = 35.5 H_2O_2 catch sample volume = 420 mL
aliquot volume = 10 mL   aliquot volume = 5 mL

4.58	4.65		7.75	7.71	
0.5	0.5		0.5	0.5	
4.08	4.15	$\bar{x}$ = 4.115	7.25	7.21	$\bar{x}$ = 7.23

8-9-11 R3
condensor wash sample volume = 32.0 H_2O_2 catch sample volume = 433
aliquot volume = 10 mL   aliquot volume = 5 mL

7.19	7.00		5.74	5.62	
0.5	0.5		0.50	0.50	
6.69	6.5	$\bar{x}$ = 6.595	5.24	5.12	$\bar{x}$ = 5.18

8-9-11 R4
condensor wash sample volume = 34.0 H_2O_2 catch sample volume = 415
aliquot volume = 10 mL   aliquot volume = 5 mL

5.27	5.22		5.50	5.52	
0.50	0.50		0.50	0.50	
4.77	4.72	$\bar{x}$ = 4.745	5.00	5.02	$\bar{x}$ = 5.01

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8-10-12 R1

condenser rinse sample volume = 41.5 H_2O_2 catch sample volume = 437
aliquot volume = 10 mL aliquot volume = 5 mL

5.53 5.70 7.85 7.82
0.50 0.50 0.50 0.50
5.03 5.20 x̄ = 5.115 7.35 7.32 x̄ = 7.335

8-10-12 R2

condenser rinse sample volume = 32.5 mL H_2O_2 catch sample volume = 428 mL
aliquot volume = 10 mL aliquot volume = 5 mL

9.58 9.62 7.00 6.80
0.50 0.50 0.50 0.50
9.08 9.12 x̄ = 9.10 6.50 6.30 x̄ = 6.40

8-10-12 R3

cond. rinse sample volume = 27.0 mL H_2O_2 catch sample volume = 426
aliquot volume = 10 mL aliquot volume = 5 mL

10.0 ~~9.5~~ 1.70 9.5 2.37 7.16 7.10
0.5 ~~0.5~~ 0.5 0.5 0.50 0.50 0.50
9.5 + 1.2 = 10.7 9.0 + 1.87 = 10.87 6.66 6.60
x̄ = 10.785 x̄ = 6.63

Standardization of $BaCl_2$
1 mL 0.1004 N H_2SO_4
9.5 9.5 3.70 9.5 9.5 3.85
0.5 0.5 0.50 0.5 0.5 0.50
9.0 + 9.0 + 3.20 = 21.70 9 + 9 + 3.35 = 21.85 x̄ = 21.775
$V_1 N_1 = V_2 N_2$
$\frac{(1)(0.1004)}{21.775} = N_2 = 0.00462\ N$

8-10-12 R4

cond rinse sample volume = 27.5 H_2O_2 catch sample volume = 421 mL
aliquot volume = 10 mL aliquot volume = 5 mL

9.5 10.0 1.55 | 10.0 1.7
0.5 0.5 0.5 | .5 .5 6.72 6.65
9.0 9.5 1.5 = 11.0 | 9.5 1.2 .5 .5
= 10.7 6.67 6.60 = 6.64 avg
= 10.85 avg

8-10-12 R-5

Cond rinse V_s = 40.5 V_a 10 ml H_2O_2 catch V_s = 433 V_a = 10 ml

7.48 7.40 10.0 2.75 10.0 2.78
.55 .50 .5 .5 0.5 0.5
6.93 6.90 avg = 6.92 9.5 2.25 9.5 2.28 avg = 11.77
11.75 11.78

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Isopropanol blank H_2O_2 8-6 to 8-8 5 ml aliquot

0.5	0.5	10 mL	0.5	0.5	
0.5	0.5	aliquot	0.5	0.5	$\bar{x}$ = 0
0	0		0	0	

$\bar{x}$ = 0

H_2O_2 blank 8-9 & 8-10 5 mL aliquot

1.55	1.61	
0.5	0.5	
1.05	1.11	$\bar{x}$ = 1.08

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SIGNATURE DATE

DISCLOSED TO AND UNDERSTOOD BY DATE

PROPRIETARY INFORMATION

APPENDIX C SAMPLE CALCULATIONS

SAMPLE CALCULATIONS, RUN 1
GULF POWER COMPANY
PLANT CRIST - FGD STACK
Monday, August 06, 2012

Absolute Stack Pressure (inches Mercury)

$$P_S = P_{bar} + \frac{\overline{P_g}}{13.6}$$

P_g = Stack Static Pressure (inches Water) = -0.10

P_{bar} = Barometric Pressure (inches Mercury) = 29.77

P_s = 29.76

Absolute Pressure at the Dry Gas Meter (inches Mercury)

$$P_m = P_{bar} + \frac{\overline{\Delta H}}{13.6}$$

P_{bar} = Barometric Pressure (inches Mercury) = 29.77

ΔH = Average pressure difference of orifice (inches Water) = 1.50

P_m = 29.88

Volume of Gas Sampled Measured by Dry Gas Meter

(corrected to standard conditions, SDCF)

$$Vm(Std) = K_1 V_m Y \left[\frac{P_{bar} + \frac{\overline{\Delta H}}{13.6}}{\overline{T_m}} \right]$$

K_1 = Degrees R/inches Mercury = 17.64

V_m = Volume of gas sample as measured by dry gas meter (actual cubic feet) = 40.11

Y = Dry gas meter calibration factor (dimensionless) = 0.9890

P_{bar} = Barometric Pressure (inches Mercury) = 29.77

ΔH = Average pressure difference of orifice (inches H2O) = 1.50

T_m = Average absolute temperature of the dry gas, degrees Rankin = 540.8

$V_{m\,(Std)}$ = 38.652

Volume of Water Vapor in Gas Sample

$$V_{w\,(Std)} = 0.04707\ V_{lc}$$

V_{lc} = Total volume of liquid collected in impingers and silica gel $_{(milliliters)}$ =	103.5
$V_{w\,(Std)}$ =	4.872

Water Vapor in the Gas Stream proportion by volume (dimensionless)

$$B_{ws} = \frac{V_{w(Std)}}{V_{m(Std)} + V_{w(Std)}}$$

$V_{w\,(std)}$ = Volume of water in gas sample $_{(corrected\ to\ standard\ conditions)}$ =	4.872
$V_{m(std)}$ = Volume of sample measured by dry gas meter $_{(standard\ conditions)}$ =	38.652
B_{ws} =	0.112

Molecular Weight of Stack Gas (dry basis, lb/lb mole)

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$$

$\%CO_2$ = Number percent by volume $_{(dry\ basis\ from\ gas\ analysis)}$ =	10.5
$\%O_2$ = Number percent by volume $_{(dry\ basis\ from\ gas\ analysis)}$ =	11.0
$\%N_2+\%CO$ = Number percent by volume $_{(dry\ basis\ from\ gas\ analysis)}$ =	78.5
M_d =	30.12

Molecular Weight of Stack Gas (wet basis, lb/lb mole)

$$M_s = M_d(1 - B_{ws}) + 18(B_{ws})$$

M_d = Molecular weight of stack gas $_{(dry\ basis,\ lb/lb\ mole)}$ =	30.12
B_{ws} = Water vapor in the gas stream $_{(proportion\ by\ volume,\ dimensionless)}$ =	0.112
M_s =	28.76

Volume of Gas Sampled Through Nozzle **(actual cubic feet)**

$$V_n = \left[(0.002669)(V_{lc}) + Y \frac{\overline{V_m}}{\overline{T_m}} \left(P_{bar} + \frac{\overline{\Delta H}}{13.6} \right) \right] \frac{\overline{T_s}}{P_s}$$

V_{lc} = Total volume of liquid collected in impingers and silica gel (milliliters) =	103.5
Y = Dry gas meter calibration factor (dimensionless) =	0.9890
V_m = Volume of gas sample as measured by dry gas meter (actual cubic feet) =	40.110
Tm = Average absolute temperature of dry gas meter, degrees Rankin =	540.8
P_{bar} = Barometric Pressure (inches Mercury) =	29.77
ΔH = Average pressure difference of orifice (inches Water) =	1.50
Ts = Average absolute temperature of stack, degrees Rankin =	578.7
P_s = Absolute stack pressure (inches Mercury) =	29.76
V_n =	47.984