

ATTACHMENT 1



ALSTOM Power, Inc.
1409 Centerpoint Blvd.
Knoxville, Tennessee 37932-1962

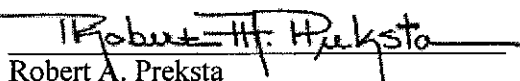
REPORT ON FGD FEEDBACK TEST PROGRAM

Performed for:
ALSTOM POWER, INC.
AT THE
UNIT 4 FGD ABSORBER INLET AND STACK
DUKE ENERGY
MARSHALL STEAM STATION

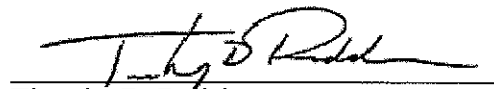
Client Reference No: 96004005
CleanAir Project No: 10171
Revision 0: May 29, 2007

To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program.

Submitted by,


Robert A. Preksta
Sr. Project Manager
(615) 773-7177
bpreksta@cleanair.com

Reviewed by,


Timothy D. Rodak
Leader, Eastern Engineering Group
(800) 632-1619 ext. 225
trodak@cleanair.com

REVISION HISTORY

REPORT ON FGD FEEDBACK TEST PROGRAM

Revision History

Revision No:	Date	Pages	Comments
R0	05/29/2007	All	Final version of original document.

CONTENTS

1	PROJECT OVERVIEW.....	1-1
	Table 1-1: Schedule of Activities	1-2
	Table 1-2: Summary of Test Results	1-3
	DISCUSSION OF TEST PROGRAM.....	1-4
2	RESULTS	2-1
	Table 2-1: Unit 4 FGD Inlet – CleanAir Method 8B – Runs 1-2	2-1
	Table 2-2: Unit 4 FGD Stack – CleanAir Method 8C – Runs 1-2.....	2-2
	Table 2-3: Unit 4 FGD Inlet – Method 29 (Hg) – Runs 1-2.....	2-3
	Table 2-4: Unit 4 FGD Inlet – Method 29 (Sb, As, Ba, Be) – Runs 1-2.....	2-4
	Table 2-5: Unit 4 FGD Inlet – Method 29 (Cd, Cr, Co, Cu) – Runs 1-2	2-5
	Table 2-6: Unit 4 FGD Inlet – Method 29 (Pb, Mn, Ni, P) – Runs 1-2.....	2-6
	Table 2-7: Unit 4 FGD Inlet – Method 29 (Se, Ag, Tl, Zn) – Runs 1-2	2-7
	Table 2-8: Unit 4 FGD Stack – Method 29 (Hg) – Runs 1-2	2-8
	Table 2-9: Unit 4 FGD Stack – Method 29 (Sb, As, Ba, Be) – Runs 1-2	2-9
	Table 2-10: Unit 4 FGD Stack – Method 29 (Cd, Cr, Co, Cu) – Runs 1-2	2-10
	Table 2-11: Unit 4 FGD Stack – Method 29 (Pb, Mn, Ni, P) – Runs 1-2.....	2-11
	Table 2-12: Unit 4 FGD Stack – Method 29 (Se, Ag, Tl, Zn) – Runs 1-2.....	2-12
	Table 2-13: Unit 4 FGD Inlet – Method 26 – Glass, Runs 1-4	2-13
	Table 2-14: Unit 4 FGD Inlet – Method 26 – Glass, Runs 5-8	2-14
	Table 2-15: Unit 4 FGD Inlet – Method 26 – Teflon, Runs 1-4	2-15
	Table 2-16: Unit 4 FGD Inlet – Method 26 – Teflon, Runs 5-8	2-16
	Table 2-17: Unit 4 FGD Stack – Method 26 – Glass, Runs 1-4	2-17
	Table 2-18: Unit 4 FGD Stack – Method 26 – Glass, Runs 5-8.....	2-18
	Table 2-19: Unit 4 FGD Stack – Method 26 – Teflon, Runs 1-4	2-19
	Table 2-20: Unit 4 FGD Stack – Method 26 – Teflon, Runs 5-8	2-20
	Table 2-21: Unit 4 FGD Inlet – FTIR – March 27, 2007	2-21
	Table 2-22: Unit 4 FGD Inlet – FTIR – March 28, 2007	2-22
	Table 2-23: Unit 4 FGD Stack – FTIR – March 29, 2007	2-23
	Table 2-24: Unit 4 FGD Stack – FTIR – March 30, 2007	2-23
3	DESCRIPTION OF INSTALLATION.....	3-1
	MARSHALL STEAM STATION.....	3-1
	Figure 3-1: Process Schematic	3-2
	DESCRIPTION OF SAMPLING LOCATIONS.....	3-3
	Table 3-1: Sampling Points	3-3
	Figure 3-2: FGD Inlet Sampling Point Determination (EPA Method 1)	3-4
	Figure 3-3: FGD Stack Sampling Point Determination (EPA Method 1).....	3-5
4	METHODOLOGY	4-1
	Table 4-1: Summary of Sampling Procedures	4-1

CleanAir

ALSTOM POWER, INC.
MARSHALL STEAM STATION

Client Reference No: 96004005
CleanAir Project No: 10171

CONTENTS

iv

5 APPENDIX.....5-1
TEST METHOD SPECIFICATIONSA
SAMPLE CALCULATIONSB
PARAMETERSC
QA/QC DATAD
FIELD DATAE
FIELD DATA PRINTOUTSF
LABORATORY DATA.....G
PLANT DATA.....H

PROJECT OVERVIEW

1-1

ALSTOM Power Inc. (ALSTOM) contracted Clean Air Engineering (CleanAir) to perform air emission testing at the Duke Energy Marshall Steam Station located in Terrell, North Carolina.

The test parameters included the following emissions measurements:

- sulfur dioxide (SO₂)
- sulfur trioxide (SO₃)
- hydrogen chloride (HCl)
- hydrogen fluoride (HF)
- mercury (Hg)
- trace metals:
 - antimony (Sb)
 - arsenic (As)
 - barium (Ba)
 - beryllium (Be)
 - cadmium (Cd)
 - chromium (Cr)
 - cobalt (Co)
 - copper (Cu)
 - lead (Pb)
 - manganese (Mn)
 - nickel (Ni)
 - phosphorus (P)
 - selenium (Se)
 - silver (Ag)
 - thallium (Tl)
 - zinc (Zn)

The testing took place at the Unit 4 Flue Gas Desulfurization (FGD) Inlet and FGD Stack locations on March 27 through March 30, 2007. Coordinating the field testing were:

- D. Laslo – ALSTOM Power Inc.
- G. English – Duke Energy
- B. Delatte – Clean Air Engineering

Table 1-1 outlines the schedule adhered to during the test program. Table 1-2 summarizes the results of the test program. A more detailed presentation of the test conditions and results of analysis are shown in Tables 2-1 through 2-24 on pages 2-1 through 2-23.

PROJECT OVERVIEW

**Table 1-1:
Schedule of Activities**

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	Unit 4 FGD Inlet	CleanAir Method 8B	SO2/SO3	03/27/07	11:48	12:48
2	Unit 4 FGD Inlet	CleanAir Method 8B	SO2/SO3	03/27/07	15:01	16:01
1	Unit 4 FGD Stack	CleanAir Method 8C	SO2/SO3	03/27/07	11:48	13:57
2	Unit 4 FGD Stack	CleanAir Method 8C	SO2/SO3	03/27/07	15:01	16:47
1	Unit 4 FGD Inlet	USEPA Method 29	Trace Metals	03/27/07	11:48	13:36
2	Unit 4 FGD Inlet	USEPA Method 29	Trace Metals	03/27/07	15:01	16:49
1	Unit 4 FGD Stack	USEPA Method 29	Trace Metals	03/27/07	11:48	13:57
2	Unit 4 FGD Stack	USEPA Method 29	Trace Metals	03/27/07	15:01	16:47
1	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/28/07	09:35	11:11
2	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/28/07	11:59	13:35
3	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/28/07	14:03	15:39
4	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/29/07	08:41	10:17
5	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/29/07	10:51	12:27
6	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/29/07	12:58	14:34
7	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/30/07	08:26	10:02
8	Unit 4 FGD Inlet	USEPA Method 26 - Glass	HCl and HF	03/30/07	11:23	12:59
1	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/28/07	09:35	11:11
2	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/28/07	11:59	13:35
3	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/28/07	14:03	15:39
4	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/29/07	08:41	10:17
5	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/29/07	10:51	12:27
6	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/29/07	12:58	14:34
7	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/30/07	08:26	10:02
8	Unit 4 FGD Inlet	USEPA Method 26 - Teflon	HCl and HF	03/30/07	11:23	12:59
1	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/28/07	09:35	11:11
2	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/28/07	11:59	13:35
3	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/28/07	14:03	15:39
4	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/29/07	08:41	10:17
5	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/29/07	10:51	12:27
6	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/29/07	12:58	14:34
7	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/30/07	08:26	10:02
8	Unit 4 FGD Stack	USEPA Method 26 - Glass	HCl and HF	03/30/07	11:23	12:59
1	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/28/07	09:35	11:11
2	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/28/07	11:59	13:35
3	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/28/07	14:03	15:39
4	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/29/07	08:41	10:17
5	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/29/07	10:51	12:27
6	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/29/07	12:58	14:34
7	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/30/07	08:26	10:02
8	Unit 4 FGD Stack	USEPA Method 26 - Teflon	HCl and HF	03/30/07	11:23	12:59

Note: FTIR samples collected at FGD Inlet on March 27 and 28 and FGD Stack on March 29 and 30, 2007.

052907 111931

PROJECT OVERVIEW

1-3

**Table 1-2:
Summary of Test Results**

<u>Source</u>			
<u>Method</u>			
	Constituent	FGD Inlet	FGD Stack
<u>Unit 4</u>			
CleanAir Method 8B/8C			
	SO ₃ (ppmdv @ 3% O ₂)	0.86	0.74
	SO ₂ (ppmdv)	753	38.1
	SO ₂ (ppmdv @ 3% O ₂)	1,063	48.2
Plant CEMS			
	SO ₂ (ppmdv)	N/A	39.0
EPA Method 320 - FTIR			
	SO ₂ (ppmdv)	878	38.6
EPA Method 29			
	Mercury (lb/hr)	1.28E-02	4.21E-03
	Antimony (lb/hr)	5.00E-03	1.95E-03
	Arsenic (lb/hr)	5.86E-02	6.30E-03
	Barium (lb/hr)	1.34E-01	4.92E-03
	Beryllium (lb/hr)	1.94E-03	<1.99E-04
	Cadium (lb/hr)	1.49E-03	<9.49E-04
	Chromium (lb/hr)	2.13E-02	3.29E-03
	Colbalt (lb/hr)	2.54E-02	<9.33E-04
	Copper (lb/hr)	2.17E-02	3.28E-03
	Lead (lb/hr)	1.46E-02	4.59E-03
	Manganese (lb/hr)	2.87E-02	6.92E-03
	Nickel (lb/hr)	2.56E-02	1.81E-02
	Phosphorus (lb/hr)	1.51E-01	<7.98E-03
	Selenium (lb/hr)	2.26E-01	8.15E-02
	Silver (lb/hr)	4.49E-03	1.64E-03
	Thallium (lb/hr)	<7.86E-04	<7.98E-04
	Zinc (lb/hr)	2.26E-01	9.47E-02
EPA Method 26 - Glass			
	HCl (ppmdv @ 3% O ₂)	70.7	0.07
	HF (ppmdv @ 3% O ₂)	9.9	<0.01
	HCl Reduction Efficiency (% Removal)		99.9
	HF Reduction Efficiency (% Removal)		99.9
EPA Method 26 - Teflon			
	HCl (ppmdv @ 3% O ₂)	68.3	0.09
	HF (ppmdv @ 3% O ₂)	8.7	<0.01
	HCl Reduction Efficiency (% Removal)		99.9
	HF Reduction Efficiency (% Removal)		99.9
EPA Method 320 - FTIR			
	HCl (ppmdv @ 3% O ₂)	69.1	0.04
	HF (ppmdv @ 3% O ₂)	9.9	0.10

PROJECT OVERVIEW

1-4

DISCUSSION OF TEST PROGRAM

Project Objectives

The objectives of the test program were as follows:

1. Determine the concentration of trace metals and SO₃ at the Flue Gas Desulphurization (FGD) Inlet and FGD Stack.
2. Collect more precise data on the HF and HCl emission rates and removal effectiveness of the various ALSTOM scrubber configurations.
3. Explore the potential reaction between HF with the glass probe liner used in the EPA Method 26 sampling train and the possible positive bias of silicon tetra fluoride, if present in the flue gas stream, on the test results.
4. Compare the results from instrumental (Fourier Transform Infrared (FTIR)) and the wet chemistry (EPA Reference Method 26) in the measurement of HCl and HF.

Sulfur Trioxide/Sulfur Dioxide

The concentration of SO₃ and SO₂ at the FGD Inlet was determined using CleanAir Method 8B, "Determination of Sulfur Oxides Including Sulfur Dioxide, Sulfur Trioxide, and Sulfuric Acid Vapor and Mist from Stationary Sources Using a Controlled Condensation Sampling Apparatus."

The FGD Stack used CleanAir Method 8C, "Determination of Sulfur Oxides Including Sulfur Dioxide, Sulfur Trioxide, and Sulfuric Acid Vapor and Mist from Stationary Sources Using an EPA Method 8 Sampling Apparatus Modified to Mitigate the Effects of Moisture and Other Potential Interferents." This methodology was performed at the FGD Stack due to elevated moisture content of the flue gas.

Trace Metals

EPA Method 29 sampling runs were performed concurrently at the FGD Inlet and FGD Stack locations for the specified trace metals including mercury.

PROJECT OVERVIEW

1-5

DISCUSSION OF TEST PROGRAM (CONTINUED)

Hydrogen Chloride and Hydrogen Fluoride

The test program consisted of performing a series of EPA Method 26 sampling trains at the Unit 4 FGD Inlet and FGD Stack. At each location two (2) EPA Method 26 (HCl and HF) sampling trains were run concurrently. The first train designated "Method 26 – Glass" consisted of a standard EPA Method 26 sampling train including a glass probe liner and a quartz glass fiber filter. The second train designated as "Method 26 – Teflon" consisted of modifications to the standard EPA Method 26 sampling train; the probe liner and filter medium were both Teflon.

FTIR Spectroscopy

FTIR was performed at the FGD Inlet on March 27 and 28. The FTIR was then relocated to the FGD Stack and measured stack concentrations on March 29 and 30.

Data presented in results section has been edited to correspond with EPA Method 26 run times. A complete set of FTIR data is included in appendix of this report.

In order to assess the validity of the FTIR data a comparison was made between the FTIR data and data recorded by the plant CEMS, Reference Method CEMS* and results from the EPA Method 26 sampling trains. The comparison of the following parameters (SO₂, NO_x, CO₂ and Moisture) demonstrated the validity of FTIR spectra data. These comparisons are contained in the results section of this test report.

*CleanAir operated the reference method CEMS using the exhaust stream of the FTIR as a QA/QC check of the FTIR sampling system.

RESULTS

2-1

**Table 2-1:
Unit 4 FGD Inlet – CleanAir Method 8B – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		12:48	16:01	
Process Conditions				
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	
Gas Conditions				
O ₂	Oxygen (dry volume %)	8.4	8.0	8.2
CO ₂	Carbon dioxide (dry volume %)	10.6	11.2	10.9
T _s	Sample temperature (°F)	259	261	260
B _w	Actual water vapor in gas (% by volume)	7.41	6.63	7.02
Gas Flow Rate¹				
Q _a	Volumetric flow rate, actual (acfm)	2,239,913	2,203,593	2,221,753
Q _s	Volumetric flow rate, standard (scfm)	1,626,462	1,594,475	1,610,469
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,505,880	1,488,716	1,497,298
Sulfuric Acid Vapor (SO3) Results				
C _{sd}	SO3 Concentration (ppmdv)	0.50	0.72	0.61
C _{sd7}	SO3 Concentration @3% O2 (ppmdv)	0.72	1.00	0.86
C _{sd12}	SO3 Concentration @12% CO2 (ppmdv)	0.57	0.77	0.67
E _{lb/hr}	SO3 Rate (lb/hr)	9.44	13.3	11.4
E _{kg/hr}	SO3 Rate (kg/hr)	4.28	6.05	5.17
E _{Fd}	SO3 Rate - Fd-based (lb/MMBtu)	0.0017	0.0024	0.0020
E _{Fc}	SO3 Rate - Fc-based (lb/MMBtu)	0.0018	0.0024	0.0021
Sulfur Dioxide (SO2) Results				
C _{sd}	SO2 Concentration (ppmdv)	634	872	753
C _{sd7}	SO2 Concentration @3% O2 (ppmdv)	911	1215	1063
C _{sd12}	SO2 Concentration @12% CO2 (ppmdv)	721	935	828
E _{lb/hr}	SO2 Rate (lb/hr)	9,521	12,951	11,236
E _{kg/hr}	SO2 Rate (kg/hr)	4,318	5,873	5,096
E _{Fd}	SO2 Rate - Fd-based (lb/MMBtu)	1.73	2.30	2.02
E _{Fc}	SO2 Rate - Fc-based (lb/MMBtu)	1.80	2.33	2.06

¹ Volumetric flow rates obtained from EPA Method 29 sampling train.

052907 111933

RESULTS

2-2

**Table 2-2:
Unit 4 FGD Stack – CleanAir Method 8C – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:57	16:47	
Process Conditions				
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	
Gas Conditions				
O ₂	Oxygen (dry volume %)	6.7	6.9	6.8
CO ₂	Carbon dioxide (dry volume %)	12.3	12.0	12.2
T _s	Sample temperature (°F)	125	125	125
B _w	Actual water vapor in gas (% by volume)	12.82	12.89	12.86
Gas Flow Rate¹				
Q _a	Volumetric flow rate; actual (acfm)	2,181,522	2,157,786	2,169,654
Q _s	Volumetric flow rate, standard (scfm)	1,951,831	1,930,456	1,941,144
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,701,608	1,681,609	1,691,608
Sulfuric Acid Vapor (SO₃) Results				
C _{sd}	SO ₃ Concentration (ppmdv)	0.53	0.63	0.58
C _{sd7}	SO ₃ Concentration @3% O ₂ (ppmdv)	0.66	0.81	0.74
C _{sd12}	SO ₃ Concentration @12% CO ₂ (ppmdv)	0.52	0.63	0.57
E _{lb/hr}	SO ₃ Rate (lb/hr)	11.2	13.3	12.3
E _{kg/hr}	SO ₃ Rate (kg/hr)	5.09	6.03	5.56
E _{Fd}	SO ₃ Rate - Fd-based (lb/MMBtu)	0.0016	0.0019	0.0017
E _{Fc}	SO ₃ Rate - Fc-based (lb/MMBtu)	0.0016	0.0020	0.0018
RE	Reduction Efficiency (% Removal) ²	7.98%	19.2%	13.6%
Sulfur Dioxide (SO₂) Results				
C _{sd}	SO ₂ Concentration (ppmdv)	39.2	36.9	38.1
C _{sd7}	SO ₂ Concentration @3% O ₂ (ppmdv)	49.3	47.1	48.2
C _{sd12}	SO ₂ Concentration @12% CO ₂ (ppmdv)	38.3	36.9	37.6
E _{lb/hr}	SO ₂ Rate (lb/hr)	665	619	642
E _{kg/hr}	SO ₂ Rate (kg/hr)	302	281	291
E _{Fd}	SO ₂ Rate - Fd-based (lb/MMBtu)	0.094	0.089	0.091
E _{Fc}	SO ₂ Rate - Fc-based (lb/MMBtu)	0.095	0.092	0.094
RE	Reduction Efficiency (% Removal) ²	94.6%	96.1%	95.4%

¹ Volumetric flow rates obtained from EPA Method 29 sampling train.

052907 111936

² Reduction efficiency determined using ppm @ 3% O₂.

RESULTS

2-3

**Table 2-3:
Unit 4 FGD Inlet – Method 29 (Hg) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:36	16:49	
Gas Conditions				
O ₂	Oxygen (dry volume %)	8.4	8.0	8.2
CO ₂	Carbon dioxide (dry volume %)	10.6	11.2	10.9
T _s	Sample temperature (°F)	259	261	260
B _w	Actual water vapor in gas (% by volume)	7.41	6.63	7.02
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,239,913	2,203,593	2,221,753
Q _s	Volumetric flow rate, standard (scfm)	1,626,462	1,594,475	1,610,469
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,505,880	1,488,716	1,497,298
Mercury Results - Total				
C _{sd}	Concentration (lb/dscf)	1.41E-10	1.44E-10	1.42E-10
C _a	Concentration (lb/acf)	9.46E-11	9.73E-11	9.60E-11
C _{sd}	Concentration (µg/dscm)	2.25E+00	2.31E+00	2.28E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	3.24E+00	3.21E+00	3.22E+00
C _{sd}	Concentration (mg/dscm)	2.25E-03	2.31E-03	2.28E-03
C _{sd}	Concentration (µg/Nm ³ dry)	2.42E+00	2.48E+00	2.45E+00
E _{lb/hr}	Rate (lb/hr)	1.27E-02	1.29E-02	1.28E-02
E _{g/s}	Rate (g/s)	1.60E-03	1.62E-03	1.61E-03

052907 111939
NM@@_M

RESULTS

**Table 2-4:
Unit 4 FGD Inlet – Method 29 (Sb, As, Ba, Be) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:36	16:49	
Gas Conditions				
O ₂	Oxygen (dry volume %)	8.4	8.0	8.2
CO ₂	Carbon dioxide (dry volume %)	10.6	11.2	10.9
T _s	Sample temperature (°F)	259	261	260
B _w	Actual water vapor in gas (% by volume)	7.41	6.63	7.02
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,239,913	2,203,593	2,221,753
Q _s	Volumetric flow rate, standard (scfm)	1,626,462	1,594,475	1,610,469
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,505,880	1,488,716	1,497,298
Antimony Results - Total				
C _{sd}	Concentration (lb/dscf)	8.18E-11	2.91E-11	5.55E-11
C _a	Concentration (lb/acf)	5.50E-11	1.97E-11	3.73E-11
C _{sd}	Concentration (µg/dscm)	1.31E+00	4.66E-01	8.88E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.88E+00	6.49E-01	1.26E+00
C _{sd}	Concentration (mg/dscm)	1.31E-03	4.66E-04	8.88E-04
C _{sd}	Concentration (µg/Nm ³ dry)	1.41E+00	5.00E-01	9.53E-01
E _{lb/hr}	Rate (lb/hr)	7.39E-03	2.60E-03	5.00E-03
E _{g/s}	Rate (g/s)	9.31E-04	3.27E-04	6.29E-04
Arsenic Results - Total				
C _{sd}	Concentration (lb/dscf)	6.88E-10	6.16E-10	6.52E-10
C _a	Concentration (lb/acf)	4.62E-10	4.16E-10	4.39E-10
C _{sd}	Concentration (µg/dscm)	1.10E+01	9.87E+00	1.04E+01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.58E+01	1.37E+01	1.48E+01
C _{sd}	Concentration (mg/dscm)	1.10E-02	9.87E-03	1.04E-02
C _{sd}	Concentration (µg/Nm ³ dry)	1.18E+01	1.06E+01	1.12E+01
E _{lb/hr}	Rate (lb/hr)	6.21E-02	5.50E-02	5.86E-02
E _{g/s}	Rate (g/s)	7.83E-03	6.93E-03	7.38E-03
Barium Results - Total				
C _{sd}	Concentration (lb/dscf)	1.60E-09	1.38E-09	1.49E-09
C _a	Concentration (lb/acf)	1.08E-09	9.30E-10	1.00E-09
C _{sd}	Concentration (µg/dscm)	2.57E+01	2.20E+01	2.39E+01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	3.69E+01	3.07E+01	3.38E+01
C _{sd}	Concentration (mg/dscm)	2.57E-02	2.20E-02	2.39E-02
C _{sd}	Concentration (µg/Nm ³ dry)	2.76E+01	2.36E+01	2.56E+01
E _{lb/hr}	Rate (lb/hr)	1.45E-01	1.23E-01	1.34E-01
E _{g/s}	Rate (g/s)	1.83E-02	1.55E-02	1.69E-02
Beryllium Results - Total				
C _{sd}	Concentration (lb/dscf)	2.30E-11	2.02E-11	2.16E-11
C _a	Concentration (lb/acf)	1.54E-11	1.37E-11	1.46E-11
C _{sd}	Concentration (µg/dscm)	3.68E-01	3.24E-01	3.46E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	5.28E-01	4.51E-01	4.90E-01
C _{sd}	Concentration (mg/dscm)	3.68E-04	3.24E-04	3.46E-04
C _{sd}	Concentration (µg/Nm ³ dry)	3.95E-01	3.48E-01	3.71E-01
E _{lb/hr}	Rate (lb/hr)	2.08E-03	1.81E-03	1.94E-03
E _{g/s}	Rate (g/s)	2.62E-04	2.28E-04	2.45E-04

RESULTS

**Table 2-5:
Unit 4 FGD Inlet – Method 29 (Cd, Cr, Co, Cu) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:36	16:49	
Gas Conditions				
O ₂	Oxygen (dry volume %)	8.4	8.0	8.2
CO ₂	Carbon dioxide (dry volume %)	10.6	11.2	10.9
T _s	Sample temperature (°F)	259	261	260
B _w	Actual water vapor in gas (% by volume)	7.41	6.63	7.02
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,239,913	2,203,593	2,221,753
Q _s	Volumetric flow rate, standard (scfm)	1,626,462	1,594,475	1,610,469
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,505,880	1,488,716	1,497,298
Cadmium Results - Total				
C _{sd}	Concentration (lb/dscf)	1.74E-11	1.59E-11	1.66E-11
C _a	Concentration (lb/acf)	1.17E-11	1.07E-11	1.12E-11
C _{sd}	Concentration (µg/dscm)	2.78E-01	2.54E-01	2.66E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	3.99E-01	3.54E-01	3.77E-01
C _{sd}	Concentration (mg/dscm)	2.78E-04	2.54E-04	2.66E-04
C _{sd}	Concentration (µg/Nm ³ dry)	2.98E-01	2.73E-01	2.86E-01
E _{lb/hr}	Rate (lb/hr)	1.57E-03	1.42E-03	1.49E-03
E _{g/s}	Rate (g/s)	1.98E-04	1.79E-04	1.88E-04
Chromium Results - Total				
C _{sd}	Concentration (lb/dscf)	2.43E-10	2.31E-10	2.37E-10
C _a	Concentration (lb/acf)	1.63E-10	1.56E-10	1.60E-10
C _{sd}	Concentration (µg/dscm)	3.89E+00	3.70E+00	3.79E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	5.58E+00	5.15E+00	5.37E+00
C _{sd}	Concentration (mg/dscm)	3.89E-03	3.70E-03	3.79E-03
C _{sd}	Concentration (µg/Nm ³ dry)	4.17E+00	3.97E+00	4.07E+00
E _{lb/hr}	Rate (lb/hr)	2.19E-02	2.06E-02	2.13E-02
E _{g/s}	Rate (g/s)	2.76E-03	2.80E-03	2.68E-03
Cobalt Results - Total				
C _{sd}	Concentration (lb/dscf)	9.14E-11	4.75E-10	2.83E-10
C _a	Concentration (lb/acf)	6.14E-11	3.21E-10	1.91E-10
C _{sd}	Concentration (µg/dscm)	1.46E+00	7.61E+00	4.54E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	2.10E+00	1.06E+01	6.35E+00
C _{sd}	Concentration (mg/dscm)	1.46E-03	7.61E-03	4.54E-03
C _{sd}	Concentration (µg/Nm ³ dry)	1.57E+00	8.17E+00	4.87E+00
E _{lb/hr}	Rate (lb/hr)	8.26E-03	4.25E-02	2.54E-02
E _{g/s}	Rate (g/s)	1.04E-03	5.35E-03	3.19E-03
Copper Results - Total				
C _{sd}	Concentration (lb/dscf)	2.76E-10	2.06E-10	2.41E-10
C _a	Concentration (lb/acf)	1.86E-10	1.39E-10	1.62E-10
C _{sd}	Concentration (µg/dscm)	4.43E+00	3.29E+00	3.86E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	6.36E+00	4.59E+00	5.47E+00
C _{sd}	Concentration (mg/dscm)	4.43E-03	3.29E-03	3.86E-03
C _{sd}	Concentration (µg/Nm ³ dry)	4.75E+00	3.54E+00	4.14E+00
E _{lb/hr}	Rate (lb/hr)	2.50E-02	1.84E-02	2.17E-02
E _{g/s}	Rate (g/s)	3.15E-03	2.31E-03	2.73E-03

RESULTS

2-6

**Table 2-6:
Unit 4 FGD Inlet – Method 29 (Pb, Mn, Ni, P) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:36	16:49	
Gas Conditions				
O ₂	Oxygen (dry volume %)	8.4	8.0	8.2
CO ₂	Carbon dioxide (dry volume %)	10.6	11.2	10.9
T _s	Sample temperature (°F)	259	261	260
B _w	Actual water vapor in gas (% by volume)	7.41	6.63	7.02
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,239,913	2,203,593	2,221,753
Q _s	Volumetric flow rate, standard (scfm)	1,626,462	1,594,475	1,610,469
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,505,880	1,488,716	1,497,298
Lead Results - Total				
C _{sd}	Concentration (lb/dscf)	1.83E-10	1.42E-10	1.63E-10
C _a	Concentration (lb/acf)	1.23E-10	9.63E-11	1.10E-10
C _{sd}	Concentration (µg/dscm)	2.92E+00	2.28E+00	2.60E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	4.20E+00	3.18E+00	3.69E+00
C _{sd}	Concentration (mg/dscm)	2.92E-03	2.28E-03	2.60E-03
C _{sd}	Concentration (µg/Nm ³ dry)	3.14E+00	2.45E+00	2.79E+00
E _{lb/hr}	Rate (lb/hr)	1.65E-02	1.27E-02	1.46E-02
E _{g/s}	Rate (g/s)	2.08E-03	1.60E-03	1.84E-03
Manganese Results - Total				
C _{sd}	Concentration (lb/dscf)	3.38E-10	3.01E-10	3.19E-10
C _a	Concentration (lb/acf)	2.27E-10	2.04E-10	2.15E-10
C _{sd}	Concentration (µg/dscm)	5.40E+00	4.83E+00	5.12E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	7.76E+00	6.72E+00	7.24E+00
C _{sd}	Concentration (mg/dscm)	5.40E-03	4.83E-03	5.12E-03
C _{sd}	Concentration (µg/Nm ³ dry)	5.80E+00	5.18E+00	5.49E+00
E _{lb/hr}	Rate (lb/hr)	3.05E-02	2.69E-02	2.87E-02
E _{g/s}	Rate (g/s)	3.84E-03	3.39E-03	3.62E-03
Nickel Results - Total				
C _{sd}	Concentration (lb/dscf)	3.38E-10	2.30E-10	2.84E-10
C _a	Concentration (lb/acf)	2.27E-10	1.56E-10	1.91E-10
C _{sd}	Concentration (µg/dscm)	5.41E+00	3.69E+00	4.55E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	7.77E+00	5.13E+00	6.45E+00
C _{sd}	Concentration (mg/dscm)	5.41E-03	3.69E-03	4.55E-03
C _{sd}	Concentration (µg/Nm ³ dry)	5.81E+00	3.96E+00	4.88E+00
E _{lb/hr}	Rate (lb/hr)	3.05E-02	2.06E-02	2.56E-02
E _{g/s}	Rate (g/s)	3.85E-03	2.59E-03	3.22E-03
Phosphorus Results - Total				
C _{sd}	Concentration (lb/dscf)	1.73E-09	1.63E-09	1.68E-09
C _a	Concentration (lb/acf)	1.17E-09	1.10E-09	1.14E-09
C _{sd}	Concentration (µg/dscm)	2.78E+01	2.62E+01	2.70E+01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	3.99E+01	3.64E+01	3.82E+01
C _{sd}	Concentration (mg/dscm)	2.78E-02	2.62E-02	2.70E-02
C _{sd}	Concentration (µg/Nm ³ dry)	2.98E+01	2.81E+01	2.89E+01
E _{lb/hr}	Rate (lb/hr)	1.57E-01	1.46E-01	1.51E-01
E _{g/s}	Rate (g/s)	1.97E-02	1.84E-02	1.91E-02

052907 111846
NM@@@_M

RESULTS

2-7

**Table 2-7:
Unit 4 FGD Inlet – Method 29 (Se, Ag, Tl, Zn) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:36	16:49	
Gas Conditions				
O ₂	Oxygen (dry volume %)	8.4	8.0	8.2
CO ₂	Carbon dioxide (dry volume %)	10.6	11.2	10.9
T _s	Sample temperature (°F)	259	261	260
B _w	Actual water vapor in gas (% by volume)	7.41	6.63	7.02
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,239,913	2,203,593	2,221,753
Q _s	Volumetric flow rate, standard (scfm)	1,626,462	1,594,475	1,610,469
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,505,880	1,488,716	1,497,298
Selenium Results - Total				
C _{sd}	Concentration (lb/dscf)	2.56E-09	2.48E-09	2.52E-09
C _a	Concentration (lb/acf)	1.72E-09	1.67E-09	1.70E-09
C _{sd}	Concentration (µg/dscm)	4.10E+01	3.97E+01	4.04E+01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	5.89E+01	5.52E+01	5.71E+01
C _{sd}	Concentration (mg/dscm)	4.10E-02	3.97E-02	4.04E-02
C _{sd}	Concentration (µg/Nm ³ dry)	4.40E+01	4.26E+01	4.33E+01
E _{lb/hr}	Rate (lb/hr)	2.32E-01	2.21E-01	2.26E-01
E _{g/s}	Rate (g/s)	2.92E-02	2.79E-02	2.85E-02
Silver Results - Total				
C _{sd}	Concentration (lb/dscf)	5.96E-11	4.02E-11	4.99E-11
C _a	Concentration (lb/acf)	4.01E-11	2.72E-11	3.36E-11
C _{sd}	Concentration (µg/dscm)	9.55E-01	6.44E-01	7.99E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.37E+00	8.96E-01	1.13E+00
C _{sd}	Concentration (mg/dscm)	9.55E-04	6.44E-04	7.99E-04
C _{sd}	Concentration (µg/Nm ³ dry)	1.02E+00	6.91E-01	8.58E-01
E _{lb/hr}	Rate (lb/hr)	5.39E-03	3.59E-03	4.49E-03
E _{g/s}	Rate (g/s)	6.79E-04	4.52E-04	5.65E-04
Thallium Results - Total				
C _{sd}	Concentration (lb/dscf)	<8.70E-12	<8.80E-12	<8.75E-12
C _a	Concentration (lb/acf)	<5.85E-12	<5.95E-12	<5.90E-12
C _{sd}	Concentration (µg/dscm)	<1.39E-01	<1.41E-01	<1.40E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	<2.00E-01	<1.96E-01	<1.98E-01
C _{sd}	Concentration (mg/dscm)	<1.39E-04	<1.41E-04	<1.40E-04
C _{sd}	Concentration (µg/Nm ³ dry)	<1.50E-01	<1.51E-01	<1.50E-01
E _{lb/hr}	Rate (lb/hr)	<7.86E-04	<7.86E-04	<7.86E-04
E _{g/s}	Rate (g/s)	<9.91E-05	<9.91E-05	<9.91E-05
Zinc Results - Total				
C _{sd}	Concentration (lb/dscf)	2.44E-09	2.60E-09	2.52E-09
C _a	Concentration (lb/acf)	1.64E-09	1.76E-09	1.70E-09
C _{sd}	Concentration (µg/dscm)	3.91E+01	4.16E+01	4.03E+01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	5.61E+01	5.79E+01	5.70E+01
C _{sd}	Concentration (mg/dscm)	3.91E-02	4.16E-02	4.03E-02
C _{sd}	Concentration (µg/Nm ³ dry)	4.19E+01	4.47E+01	4.33E+01
E _{lb/hr}	Rate (lb/hr)	2.20E-01	2.32E-01	2.26E-01
E _{g/s}	Rate (g/s)	2.78E-02	2.92E-02	2.85E-02

RESULTS

2-8

**Table 2-8:
Unit 4 FGD Stack – Method 29 (Hg) -- Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:57	16:47	
Gas Conditions				
O ₂	Oxygen (dry volume %)	7.4	8.2	7.8
CO ₂	Carbon dioxide (dry volume %)	11.7	11.0	11.3
T _s	Sample temperature (°F)	125	125	125
B _w	Actual water vapor in gas (% by volume)	12.82	12.89	12.86
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,181,522	2,157,786	2,169,654
Q _s	Volumetric flow rate, standard (scfm)	1,951,831	1,930,456	1,941,144
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,701,608	1,681,609	1,691,608
Mercury Results - Total				
C _{sd}	Concentration (lb/dscf)	3.97E-11	4.32E-11	4.15E-11
C _a	Concentration (lb/acf)	3.10E-11	3.37E-11	3.23E-11
C _{sd}	Concentration (µg/dscm)	6.36E-01	6.92E-01	6.64E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	8.42E-01	9.73E-01	9.08E-01
C _{sd}	Concentration (mg/dscm)	6.36E-04	6.92E-04	6.64E-04
C _{sd}	Concentration (µg/Nm ³ dry)	6.83E-01	7.42E-01	7.13E-01
E _{lb/hr}	Rate (lb/hr)	4.06E-03	4.36E-03	4.21E-03
E _{g/s}	Rate (g/s)	5.11E-04	5.49E-04	5.30E-04

052907 111950
Q Q @ @ _ K

RESULTS

**Table 2-9:
Unit 4 FGD Stack – Method 29 (Sb, As, Ba, Be) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:57	16:47	
Gas Conditions				
O ₂	Oxygen (dry volume %)	7.4	8.2	7.8
CO ₂	Carbon dioxide (dry volume %)	11.7	11.0	11.3
T _s	Sample temperature (°F)	125	125	125
B _w	Actual water vapor in gas (% by volume)	12.82	12.89	12.86
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,181,522	2,157,786	2,169,654
Q _s	Volumetric flow rate, standard (scfm)	1,951,831	1,930,456	1,941,144
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,701,608	1,681,609	1,691,608
Antimony Results - Total				
C _{sd}	Concentration (lb/dscf)	2.31E-11	1.53E-11	1.92E-11
C _a	Concentration (lb/acf)	1.80E-11	1.19E-11	1.49E-11
C _{sd}	Concentration (µg/dscm)	3.69E-01	2.44E-01	3.07E-01
C _{sd7}	Concentration @7% O ₂ (µg/dscm)	3.80E-01	2.67E-01	3.23E-01
C _{sd}	Concentration (mg/dscm)	3.69E-04	2.44E-04	3.07E-04
C _{sd}	Concentration (µg/Nm ³ dry)	3.96E-01	2.62E-01	3.29E-01
E _{lb/hr}	Rate (lb/hr)	2.35E-03	1.54E-03	1.95E-03
E _{g/s}	Rate (g/s)	2.97E-04	1.94E-04	2.45E-04
Arsenic Results - Total				
C _{sd}	Concentration (lb/dscf)	6.08E-11	6.34E-11	6.21E-11
C _a	Concentration (lb/acf)	4.74E-11	4.94E-11	4.84E-11
C _{sd}	Concentration (µg/dscm)	9.73E-01	1.02E+00	9.94E-01
C _{sd7}	Concentration @7% O ₂ (µg/dscm)	1.00E+00	1.11E+00	1.05E+00
C _{sd}	Concentration (mg/dscm)	9.73E-04	1.02E-03	9.94E-04
C _{sd}	Concentration (µg/Nm ³ dry)	1.04E+00	1.09E+00	1.07E+00
E _{lb/hr}	Rate (lb/hr)	6.21E-03	6.40E-03	6.30E-03
E _{g/s}	Rate (g/s)	7.82E-04	8.06E-04	7.94E-04
Barium Results - Total				
C _{sd}	Concentration (lb/dscf)	5.42E-11	4.28E-11	4.85E-11
C _a	Concentration (lb/acf)	4.22E-11	3.34E-11	3.78E-11
C _{sd}	Concentration (µg/dscm)	8.67E-01	6.85E-01	7.76E-01
C _{sd7}	Concentration @7% O ₂ (µg/dscm)	8.92E-01	7.48E-01	8.20E-01
C _{sd}	Concentration (mg/dscm)	8.67E-04	6.85E-04	7.76E-04
C _{sd}	Concentration (µg/Nm ³ dry)	9.31E-01	7.36E-01	8.33E-01
E _{lb/hr}	Rate (lb/hr)	5.53E-03	4.32E-03	4.92E-03
E _{g/s}	Rate (g/s)	6.97E-04	5.44E-04	6.20E-04
Beryllium Results - Total				
C _{sd}	Concentration (lb/dscf)	<1.95E-12	<1.98E-12	<1.96E-12
C _a	Concentration (lb/acf)	<1.52E-12	<1.54E-12	<1.53E-12
C _{sd}	Concentration (µg/dscm)	<3.12E-02	<3.17E-02	<3.15E-02
C _{sd7}	Concentration @7% O ₂ (µg/dscm)	<3.21E-02	<3.46E-02	<3.34E-02
C _{sd}	Concentration (mg/dscm)	<3.12E-05	<3.17E-05	<3.15E-05
C _{sd}	Concentration (µg/Nm ³ dry)	<3.35E-02	<3.41E-02	<3.38E-02
E _{lb/hr}	Rate (lb/hr)	<1.99E-04	<2.00E-04	<1.99E-04
E _{g/s}	Rate (g/s)	<2.51E-05	<2.52E-05	<2.51E-05

052907 111951
Q Q @ @ _ Q

RESULTS

2-10

**Table 2-10:
Unit 4 FGD Stack – Method 29 (Cd, Cr, Co, Cu) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:57	16:47	
Gas Conditions				
O ₂	Oxygen (dry volume %)	7.4	8.2	7.8
CO ₂	Carbon dioxide (dry volume %)	11.7	11.0	11.3
T _s	Sample temperature (°F)	125	125	125
B _w	Actual water vapor in gas (% by volume)	12.82	12.89	12.86
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,181,522	2,157,786	2,169,654
Q _s	Volumetric flow rate, standard (scfm)	1,951,831	1,930,456	1,941,144
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,701,608	1,681,609	1,691,608
Cadmium Results - Total				
C _{sd}	Concentration (lb/dscf)	1.08E-11	<7.93E-12	<9.34E-12
C _a	Concentration (lb/acf)	8.39E-12	<6.18E-12	<7.28E-12
C _{sd}	Concentration (µg/dscm)	1.72E-01	<1.27E-01	<1.50E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.77E-01	<1.39E-01	<1.58E-01
C _{sd}	Concentration (mg/dscm)	1.72E-04	<1.27E-04	<1.50E-04
C _{sd}	Concentration (µg/Nm ³ dry)	1.85E-01	<1.36E-01	<1.61E-01
E _{lb/hr}	Rate (lb/hr)	1.10E-03	<8.00E-04	<9.49E-04
E _{g/s}	Rate (g/s)	1.38E-04	<1.01E-04	<1.20E-04
Chromium Results - Total				
C _{sd}	Concentration (lb/dscf)	3.19E-11	3.29E-11	3.24E-11
C _a	Concentration (lb/acf)	2.49E-11	2.56E-11	2.53E-11
C _{sd}	Concentration (µg/dscm)	5.12E-01	5.27E-01	5.19E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	5.26E-01	5.75E-01	5.51E-01
C _{sd}	Concentration (mg/dscm)	5.12E-04	5.27E-04	5.19E-04
C _{sd}	Concentration (µg/Nm ³ dry)	5.49E-01	5.65E-01	5.67E-01
E _{lb/hr}	Rate (lb/hr)	3.26E-03	3.32E-03	3.29E-03
E _{g/s}	Rate (g/s)	4.11E-04	4.18E-04	4.15E-04
Cobalt Results - Total				
C _{sd}	Concentration (lb/dscf)	1.04E-11	<7.93E-12	<9.18E-12
C _a	Concentration (lb/acf)	8.14E-12	<6.18E-12	<7.16E-12
C _{sd}	Concentration (µg/dscm)	1.67E-01	<1.27E-01	<1.47E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.72E-01	<1.39E-01	<1.55E-01
C _{sd}	Concentration (mg/dscm)	1.67E-04	<1.27E-04	<1.47E-04
C _{sd}	Concentration (µg/Nm ³ dry)	1.79E-01	<1.36E-01	<1.58E-01
E _{lb/hr}	Rate (lb/hr)	1.07E-03	<8.00E-04	<9.33E-04
E _{g/s}	Rate (g/s)	1.34E-04	<1.01E-04	<1.18E-04
Copper Results - Total				
C _{sd}	Concentration (lb/dscf)	4.10E-11	2.35E-11	3.23E-11
C _a	Concentration (lb/acf)	3.20E-11	1.83E-11	2.52E-11
C _{sd}	Concentration (µg/dscm)	6.57E-01	3.76E-01	5.17E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	6.75E-01	4.11E-01	5.43E-01
C _{sd}	Concentration (mg/dscm)	6.57E-04	3.76E-04	5.17E-04
C _{sd}	Concentration (µg/Nm ³ dry)	7.05E-01	4.04E-01	5.54E-01
E _{lb/hr}	Rate (lb/hr)	4.19E-03	2.37E-03	3.28E-03
E _{g/s}	Rate (g/s)	5.28E-04	2.99E-04	4.13E-04

RESULTS

2-11

**Table 2-11:
Unit 4 FGD Stack – Method 29 (Pb, Mn, Ni, P) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:57	16:47	
Gas Conditions				
O ₂	Oxygen (dry volume %)	7.4	8.2	7.8
CO ₂	Carbon dioxide (dry volume %)	11.7	11.0	11.3
T _s	Sample temperature (°F)	125	125	125
B _w	Actual water vapor in gas (% by volume)	12.82	12.89	12.86
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,181,522	2,157,786	2,169,654
Q _s	Volumetric flow rate, standard (scfm)	1,951,831	1,930,456	1,941,144
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,701,608	1,681,609	1,691,608
Lead Results - Total				
C _{sd}	Concentration (lb/dscf)	4.90E-11	4.15E-11	4.52E-11
C _a	Concentration (lb/acf)	3.82E-11	3.23E-11	3.53E-11
C _{sd}	Concentration (µg/dscm)	7.84E-01	6.65E-01	7.24E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	8.06E-01	7.25E-01	7.66E-01
C _{sd}	Concentration (mg/dscm)	7.84E-04	6.65E-04	7.24E-04
C _{sd}	Concentration (µg/Nm ³ dry)	8.42E-01	7.13E-01	7.77E-01
E _{lb/hr}	Rate (lb/hr)	5.00E-03	4.19E-03	4.59E-03
E _{g/s}	Rate (g/s)	6.30E-04	5.27E-04	5.79E-04
Manganese Results - Total				
C _{sd}	Concentration (lb/dscf)	9.76E-11	3.83E-11	6.80E-11
C _a	Concentration (lb/acf)	7.62E-11	2.98E-11	5.30E-11
C _{sd}	Concentration (µg/dscm)	1.56E+00	6.13E-01	1.09E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.61E+00	6.69E-01	1.14E+00
C _{sd}	Concentration (mg/dscm)	1.56E-03	6.13E-04	1.09E-03
C _{sd}	Concentration (µg/Nm ³ dry)	1.68E+00	6.58E-01	1.17E+00
E _{lb/hr}	Rate (lb/hr)	9.97E-03	3.86E-03	6.92E-03
E _{g/s}	Rate (g/s)	1.26E-03	4.87E-04	8.71E-04
Nickel Results - Total				
C _{sd}	Concentration (lb/dscf)	2.47E-10	1.10E-10	1.78E-10
C _a	Concentration (lb/acf)	1.93E-10	8.55E-11	1.39E-10
C _{sd}	Concentration (µg/dscm)	3.96E+00	1.76E+00	2.86E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	4.07E+00	1.92E+00	2.99E+00
C _{sd}	Concentration (mg/dscm)	3.96E-03	1.76E-03	2.86E-03
C _{sd}	Concentration (µg/Nm ³ dry)	4.24E+00	1.89E+00	3.07E+00
E _{lb/hr}	Rate (lb/hr)	2.52E-02	1.11E-02	1.81E-02
E _{g/s}	Rate (g/s)	3.18E-03	1.39E-03	2.29E-03
Phosphorus Results - Total				
C _{sd}	Concentration (lb/dscf)	<7.79E-11	<7.93E-11	<7.86E-11
C _a	Concentration (lb/acf)	<6.08E-11	<6.16E-11	<6.13E-11
C _{sd}	Concentration (µg/dscm)	<1.25E+00	<1.27E+00	<1.26E+00
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	<1.28E+00	<1.39E+00	<1.33E+00
C _{sd}	Concentration (mg/dscm)	<1.25E-03	<1.27E-03	<1.26E-03
C _{sd}	Concentration (µg/Nm ³ dry)	<1.34E+00	<1.36E+00	<1.35E+00
E _{lb/hr}	Rate (lb/hr)	<7.98E-03	<8.00E-03	<7.98E-03
E _{g/s}	Rate (g/s)	<1.00E-03	<1.01E-03	<1.00E-03

052907 111956
Q Q @ @ _ Q

RESULTS

2-12

**Table 2-12:
Unit 4 FGD Stack – Method 29 (Se, Ag, Tl, Zn) – Runs 1-2**

Run No.		1	2	Average
Date (2007)		Mar 27	Mar 27	
Start Time (approx.)		11:48	15:01	
Stop Time (approx.)		13:57	16:47	
Gas Conditions				
O ₂	Oxygen (dry volume %)	7.4	8.2	7.8
CO ₂	Carbon dioxide (dry volume %)	11.7	11.0	11.3
T _s	Sample temperature (°F)	125	125	125
B _w	Actual water vapor in gas (% by volume)	12.82	12.89	12.86
Gas Flow Rate				
Q _a	Volumetric flow rate, actual (acfm)	2,181,522	2,157,786	2,169,654
Q _{std}	Volumetric flow rate, dry standard (dscfm)	1,701,608	1,681,609	1,691,608
Selenium Results - Total				
C _{sd}	Concentration (lb/dscf)	8.65E-10	7.41E-10	8.03E-10
C _a	Concentration (lb/acf)	6.75E-10	5.78E-10	6.26E-10
C _{sd}	Concentration (µg/dscm)	1.39E+01	1.19E+01	1.29E+01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.42E+01	1.30E+01	1.36E+01
C _{sd}	Concentration (mg/dscm)	1.39E-02	1.19E-02	1.29E-02
C _{sd}	Concentration (µg/Nm ³ dry)	1.49E+01	1.27E+01	1.38E+01
E _{lb/hr}	Rate (lb/hr)	8.83E-02	7.48E-02	8.15E-02
E _{g/s}	Rate (g/s)	1.11E-02	9.42E-03	1.03E-02
Silver Results - Total				
C _{sd}	Concentration (lb/dscf)	1.96E-11	1.26E-11	1.61E-11
C _a	Concentration (lb/acf)	1.53E-11	9.85E-12	1.26E-11
C _{sd}	Concentration (µg/dscm)	3.14E-01	2.02E-01	2.58E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	3.23E-01	2.21E-01	2.72E-01
C _{sd}	Concentration (mg/dscm)	3.14E-04	2.02E-04	2.58E-04
C _{sd}	Concentration (µg/Nm ³ dry)	3.37E-01	2.17E-01	2.77E-01
E _{lb/hr}	Rate (lb/hr)	2.00E-03	1.28E-03	1.64E-03
E _{g/s}	Rate (g/s)	2.53E-04	1.61E-04	2.07E-04
Thallium Results - Total				
C _{sd}	Concentration (lb/dscf)	<7.79E-12	<7.93E-12	<7.86E-12
C _a	Concentration (lb/acf)	<6.08E-12	<6.18E-12	<6.13E-12
C _{sd}	Concentration (µg/dscm)	<1.25E-01	<1.27E-01	<1.26E-01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	<1.28E-01	<1.39E-01	<1.33E-01
C _{sd}	Concentration (mg/dscm)	<1.25E-04	<1.27E-04	<1.26E-04
C _{sd}	Concentration (µg/Nm ³ dry)	<1.34E-01	<1.36E-01	<1.35E-01
E _{lb/hr}	Rate (lb/hr)	<7.96E-04	<8.00E-04	<7.98E-04
E _{g/s}	Rate (g/s)	<1.00E-04	<1.01E-04	<1.00E-04
Zinc Results - Total				
C _{sd}	Concentration (lb/dscf)	1.12E-09	7.47E-10	9.32E-10
C _a	Concentration (lb/acf)	8.71E-10	5.82E-10	7.26E-10
C _{sd}	Concentration (µg/dscm)	1.79E+01	1.20E+01	1.49E+01
C _{sd7}	Concentration @3% O ₂ (µg/dscm)	1.84E+01	1.31E+01	1.57E+01
C _{sd}	Concentration (mg/dscm)	1.79E-02	1.20E-02	1.49E-02
C _{sd}	Concentration (µg/Nm ³ dry)	1.92E+01	1.28E+01	1.60E+01
E _{lb/hr}	Rate (lb/hr)	1.14E-01	7.54E-02	9.47E-02
E _{g/s}	Rate (g/s)	1.44E-02	9.50E-03	1.19E-02

052907 111957
QQ@_@_Q

RESULTS

2-13

**Table 2-13:
Unit 4 FGD Inlet – Method 26 – Glass, Runs 1-4**

Run No.		1	2	3	4	Average
Date (2007)		Mar 28	Mar 28	Mar 28	Mar 29	
Start Time (approx.)		09:35	11:59	14:03	08:41	
Stop Time (approx.)		11:11	13:35	15:39	10:17	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	8.8	8.7	7.5	8.0	8.2
CO ₂	Carbon dioxide (dry volume %)	10.6	9.9	11.8	11.2	10.9
T _s	Sample temperature (°F)	255	259	262	250	257
B _w	Actual water vapor in gas (% by volume)	10.50	10.61	9.84	9.69	10.16
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppmdv)	58.7	49.8	54.0	45.0	51.9
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	86.6	73.1	72.1	62.5	73.6
E _{Fd}	HCl Rate - Fd-based (lb/MMBtu)	9.35E-02	7.89E-02	7.79E-02	6.75E-02	7.95E-02
E _{Fc}	HCl Rate - Fc-based (lb/MMBtu)	9.44E-02	8.57E-02	7.79E-02	6.85E-02	8.16E-02
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppmdv)	11.7	7.40	5.58	6.71	7.84
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	17.2	10.9	7.46	9.31	11.2
E _{Fd}	HF Rate - Fd-based (lb/MMBtu)	1.02E-02	6.43E-03	4.42E-03	5.52E-03	6.64E-03
E _{Fc}	HF Rate - Fc-based (lb/MMBtu)	1.03E-02	6.98E-03	4.42E-03	5.60E-03	6.82E-03

052007 111959

RESULTS

2-14

**Table 2-14:
Unit 4 FGD Inlet – Method 26 – Glass, Runs 5-8**

Run No.		5	6	7	8	Average
Date (2007)		Mar 29	Mar 29	Mar 30	Mar 30	
Start Time (approx.)		10:51	12:58	08:26	11:23	
Stop Time (approx.)		12:27	14:34	10:02	12:59	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	9.5	7.6	8.2	8.1	8.4
CO ₂	Carbon dioxide (dry volume %)	9.9	11.6	11.0	11.1	10.9
T _s	Sample temperature (°F)	246	244	241	244	244
B _w	Actual water vapor in gas (% by volume)	10.13	10.01	9.58	9.67	9.85
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppm dv)	42.42	42.17	50.02	55.43	47.51
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	66.61	56.75	70.50	77.52	67.85
E _{Fd}	HCl Rate - Fd-based (lb/MM Btu)	7.19E-02	6.13E-02	7.61E-02	8.37E-02	7.33E-02
E _{Fc}	HCl Rate - Fc-based (lb/MM Btu)	7.30E-02	6.19E-02	7.74E-02	8.50E-02	7.43E-02
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppm dv)	5.42	6.25	5.61	6.71	6.00
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	8.51	8.41	7.90	9.38	8.55
E _{Fd}	HF Rate - Fd-based (lb/MM Btu)	5.04E-03	4.99E-03	4.68E-03	5.56E-03	5.07E-03
E _{Fc}	HF Rate - Fc-based (lb/MM Btu)	5.11E-03	5.03E-03	4.76E-03	5.64E-03	5.14E-03

052807 112004

RESULTS

2-15

**Table 2-15:
Unit 4 FGD Inlet – Method 26 – Teflon, Runs 1-4**

Run No.		1	2	3	4	Average
Date (2007)		Mar 28	Mar 28	Mar 28	Mar 29	
Start Time (approx.)		09:35	11:59	14:03	08:41	
Stop Time (approx.)		11:11	13:35	15:39	10:17	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	8.1	8.5	9.5	8.0	8.5
CO ₂	Carbon dioxide (dry volume %)	11.2	10.6	9.9	11.2	10.7
T _s	Sample temperature (°F)	255	257	257	247	254
B _w	Actual water vapor in gas (% by volume)	11.18	10.68	10.47	10.27	10.65
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppmdv)	43.82	51.03	56.60	42.69	48.54
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	61.28	73.67	88.87	59.24	70.76
E _{Fd}	HCl Rate - Fd-based (lb/MMBtu)	6.62E-02	7.96E-02	9.60E-02	6.40E-02	7.64E-02
E _{Fc}	HCl Rate - Fc-based (lb/MMBtu)	6.66E-02	8.20E-02	9.73E-02	6.49E-02	7.77E-02
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppmdv)	6.34	6.53	5.31	5.50	5.92
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	8.86	9.43	8.33	7.63	8.56
E _{Fd}	HF Rate - Fd-based (lb/MMBtu)	5.25E-03	5.59E-03	4.94E-03	4.52E-03	5.07E-03
E _{Fc}	HF Rate - Fc-based (lb/MMBtu)	5.29E-03	5.75E-03	5.01E-03	4.58E-03	5.16E-03

Removal efficiency based on ppmdv @ 3% O₂

052807 112007

RESULTS

2-16

**Table 2-16:
Unit 4 FGD Inlet – Method 26 – Teflon, Runs 5-8**

Run No.		5	6	7	8	Average
Date (2007)		Mar 29	Mar 29	Mar 30	Mar 30	
Start Time (approx.)		10:51	12:58	08:26	11:23	
Stop Time (approx.)		12:27	14:34	10:02	12:59	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	8.0	7.7	8.5	7.9	8.0
CO ₂	Carbon dioxide (dry volume %)	11.6	11.6	10.6	11.4	11.3
T _s	Sample temperature (°F)	243	242	239	242	242
B _w	Actual water vapor in gas (% by volume)	11.13	9.97	10.01	9.98	10.27
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppmdv)	44.61	43.45	47.85	53.22	47.28
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	61.90	58.92	69.08	73.28	65.79
E _{Fd}	HCl Rate - Fd-based (lb/MMBtu)	6.69E-02	6.36E-02	7.46E-02	7.91E-02	7.11E-02
E _{Fc}	HCl Rate - Fc-based (lb/MMBtu)	6.55E-02	6.38E-02	7.69E-02	7.95E-02	7.14E-02
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppmdv)	7.53	6.17	5.71	5.74	6.29
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	10.45	8.37	8.24	7.90	8.74
E _{Fd}	HF Rate - Fd-based (lb/MMBtu)	6.19E-03	4.96E-03	4.88E-03	4.68E-03	5.18E-03
E _{Fc}	HF Rate - Fc-based (lb/MMBtu)	6.06E-03	4.97E-03	5.03E-03	4.70E-03	5.19E-03

Removal efficiency based on ppmdv @ 3% O₂

052907 112010

RESULTS

2-17

**Table 2-17:
Unit 4 FGD Stack – Method 26 – Glass, Runs 1-4**

Run No.		1	2	3	4	Average
Date (2007)		Mar 28	Mar 28	Mar 28	Mar 29	
Start Time (approx.)		09:35	11:59	14:03	08:41	
Stop Time (approx.)		11:11	13:35	15:39	10:17	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	7.9	8.2	7.3	7.0	7.6
CO ₂	Carbon dioxide (dry volume %)	11.4	11.0	11.9	12.1	11.6
T _s	Sample temperature (°F)	124	124	125	125	125
B _w	Actual water vapor in gas (% by volume)	12.80	11.74	13.24	12.43	12.55
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppmdv)	0.052	0.102	0.061	0.052	0.067
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	0.072	0.144	0.080	0.067	0.091
E _{Fd}	HCl Rate - Fd-based (lb/MMBtu)	7.76E-05	1.56E-04	8.69E-05	7.24E-05	9.81E-05
E _{Fc}	HCl Rate - Fc-based (lb/MMBtu)	7.79E-05	1.58E-04	8.74E-05	7.32E-05	9.92E-05
RE	Reduction Efficiency (% Removal) ¹	99.9%	99.8%	99.9%	99.9%	99.9%
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppmdv)	<0.0077	<0.011	<0.011	<0.011	<0.010
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	<0.011	<0.015	<0.014	<0.015	<0.014
E _{Fd}	HF Rate - Fd-based (lb/MMBtu)	<8.26E-06	<9.02E-06	<8.57E-06	<8.76E-06	<8.15E-06
E _{Fc}	HF Rate - Fc-based (lb/MMBtu)	<8.29E-06	<9.17E-06	<8.62E-06	<8.86E-06	<8.24E-06
RE	Reduction Efficiency (% Removal) ¹	99.9%	99.9%	99.9%	99.9%	99.9%

¹ Reduction efficiency determined using ppmdv @ 3% O₂.

052907 112016

RESULTS

2-18

**Table 2-18:
Unit 4 FGD Stack – Method 26 – Glass, Runs 5-8**

Run No.		5	6	7	8	Average
Date (2007)		Mar 29	Mar 29	Mar 30	Mar 30	
Start Time (approx.)		10:51	12:58	08:26	11:23	
Stop Time (approx.)		12:27	14:34	10:02	12:59	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	7.0	7.1	6.9	7.0	7.0
CO ₂	Carbon dioxide (dry volume %)	12.2	12.2	12.1	12.2	12.2
T _s	Sample temperature (°F)	123	123	123	122	123
B _w	Actual water vapor in gas (% by volume)	11.68	11.65	11.78	11.81	11.73
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppmdv)	0.033	0.050	0.033	0.036	0.038
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	0.043	0.065	0.043	0.046	0.049
E _{Fd}	HCl Rate - Fd-based (lb/MMBtu)	4.61E-05	7.07E-05	4.60E-05	5.01E-05	5.32E-05
E _{Fc}	HCl Rate - Fc-based (lb/MMBtu)	4.62E-05	7.04E-05	4.69E-05	5.03E-05	5.35E-05
RE	Reduction Efficiency (% Removal) ¹	99.9%	99.9%	100.0%	100.0%	99.9%
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppmdv)	<0.011	<0.011	<0.012	<0.012	<0.011
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	<0.015	<0.014	<0.015	<0.015	<0.015
E _{Fd}	HF Rate - Fd-based (lb/MMBtu)	<8.77E-06	<8.55E-06	<8.76E-06	<8.90E-06	<8.75E-06
E _{Fc}	HF Rate - Fc-based (lb/MMBtu)	<8.80E-06	<8.52E-06	<8.93E-06	<8.93E-06	<8.79E-06
RE	Reduction Efficiency (% Removal) ¹	99.8%	99.9%	99.9%	99.9%	99.9%

¹ Reduction efficiency determined using ppmdv @ 3% O₂.

052907 114143

RESULTS

2-19

**Table 2-19:
Unit 4 FGD Stack – Method 26 – Teflon, Runs 1-4**

Run No.		1	2	3	4	Average
Date (2007)		Mar 28	Mar 28	Mar 28	Mar 29	
Start Time (approx.)		09:35	11:59	14:03	08:41	
Stop Time (approx.)		11:11	13:35	15:39	10:17	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	7.0	6.9	6.9	7.1	7.0
CO ₂	Carbon dioxide (dry volume %)	12.3	12.3	12.1	12.2	12.2
T _s	Sample temperature (°F)	126	126	126	126	126
B _w	Actual water vapor in gas (% by volume)	12.45	12.98	12.22	12.07	12.43
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppmdv)	0.045	0.089	0.036	0.080	0.062
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	0.058	0.113	0.046	0.103	0.080
E _{Fd}	HCl Rate - Fd-based (lb/MMBtu)	6.23E-05	1.22E-04	5.01E-05	1.11E-04	8.66E-05
E _{Fc}	HCl Rate - Fc-based (lb/MMBtu)	6.20E-05	1.23E-04	5.10E-05	1.11E-04	8.67E-05
RE	Reduction Efficiency (% Removal) ¹	99.9%	99.8%	99.9%	99.8%	99.9%
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppmdv)	<7.49E-03	<7.55E-03	<9.27E-03	<1.10E-02	<8.84E-03
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	<0.010	<0.010	<0.012	<0.014	<0.011
E _{Fd}	HF Rate - Fd-based (lb/MMBtu)	<5.72E-06	<5.72E-06	<7.02E-06	<8.48E-06	<6.74E-06
E _{Fc}	HF Rate - Fc-based (lb/MMBtu)	<5.69E-06	<5.74E-06	<7.15E-06	<8.45E-06	<6.76E-06
RE	Reduction Efficiency (% Removal) ¹	99.9%	99.9%	99.9%	99.8%	99.9%

¹ Reduction efficiency determined using pp mdv @ 3% O₂.

RESULTS

2-20

**Table 2-20:
Unit 4 FGD Stack – Method 26 – Teflon, Runs 5-8**

Run No.		5	6	7	8	Average
Date (2007)		Mar 29	Mar 29	Mar 30	Mar 30	
Start Time (approx.)		10:51	12:58	08:26	11:23	
Stop Time (approx.)		12:27	14:34	10:02	12:59	
Process Conditions						
F _d	Oxygen-based F-factor (dscf/MMBtu)	9,780	9,780	9,780	9,780	
F _c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,800	1,800	1,800	1,800	
Gas Conditions						
O ₂	Oxygen (dry volume %)	6.8	6.8	6.8	6.8	6.8
CO ₂	Carbon dioxide (dry volume %)	12.3	12.5	12.2	12.3	12.3
T _s	Sample temperature (°F)	124	124	124	123	124
B _w	Actual water vapor in gas (% by volume)	11.75	11.30	11.49	11.87	11.60
Hydrogen Chloride (HCl) Results						
C _{sd}	HCl Concentration (ppmdv)	0.058	0.053	0.027	0.13	0.068
C _{sd7}	HCl Concentration @3% O ₂ (ppmdv)	0.074	0.067	0.034	0.17	0.086
E _{Fd}	HCl Rate - Fd-based (lb/MMBtu)	7.97E-05	7.20E-05	3.71E-05	1.82E-04	9.27E-05
E _{Fc}	HCl Rate - Fc-based (lb/MMBtu)	8.05E-05	7.15E-05	3.78E-05	1.84E-04	9.34E-05
RE	Reduction Efficiency (% Removal) ¹	99.9%	99.9%	100.0%	99.8%	99.9%
Hydrogen Fluoride (HF) Results						
C _{sd}	HF Concentration (ppmdv)	<0.011	<0.011	<0.010	<0.011	<0.011
C _{sd7}	HF Concentration @3% O ₂ (ppmdv)	<0.014	<0.014	<0.013	<0.014	<0.014
E _{Fd}	HF Rate - Fd-based (lb/MMBtu)	<8.50E-06	<8.34E-06	<7.61E-06	<8.07E-06	<8.13E-06
E _{Fc}	HF Rate - Fc-based (lb/MMBtu)	<8.58E-06	<8.28E-06	<7.74E-06	<8.15E-06	<8.19E-06
RE	Reduction Efficiency (% Removal) ¹	99.9%	99.9%	99.9%	99.9%	99.9%

¹ Reduction efficiency determined using pp mdv @ 3% O₂.

062907 112027

RESULTS

2-21

**Table 2-21:
Unit 4 FGD Inlet – FTIR – March 27, 2007**

Time (HH:MM)	MKS (FTIR)									Servomex (Paramagnetic/UV)	
	HCl (ppmdv)	HF (ppmdv)	CO (ppmdv)	NO (ppmdv)	NO ₂ (ppmdv)	SO ₂ (ppmdv)	NH ₃ (ppmdv)	H ₂ O (%v)	CO ₂ (%dv)	O ₂ (%dv)	CO ₂ (%dv)
12:30	48.1	0.16	389.5	106.0	0.10	861.0	0.41	7.28	11.6	8.1	11.4
12:45	54.7	0.54	414.5	103.0	0.13	868.3	0.31	7.35	11.7	6.5	11.2
13:00	55.4	3.38	212.0	108.9	0.11	868.7	0.18	7.29	11.8	8.0	11.5
13:15	56.2	5.38	220.5	108.3	0.11	866.4	0.09	7.35	11.9	8.0	11.6
13:30	56.3	6.43	161.6	103.9	0.08	861.9	0.10	7.30	11.8	7.9	11.6
13:45	56.4	7.15	162.7	104.4	0.05	852.3	0.03	7.27	11.7	7.8	11.7
14:00	56.6	7.49	269.6	104.9	0.08	855.5	0.06	7.11	11.6	8.0	11.5
14:15	57.4	8.01	202.6	105.8	0.13	869.8	0.03	7.24	11.8	7.9	11.6
14:30	56.2	8.01	155.4	102.4	0.21	849.8	0.03	7.06	11.6	8.2	11.3
14:45	57.1	8.32	157.2	109.2	0.12	865.9	0.02	7.11	11.7	8.0	11.5
15:00	57.4	8.30	431.4	101.8	0.20	870.4	0.01	7.04	11.5	8.0	11.5
15:15	56.4	8.45	171.9	102.9	0.21	863.7	0.00	7.06	11.6	8.2	11.3
15:30	56.9	8.58	296.6	102.5	0.22	866.7	0.01	7.07	11.6	8.0	11.5
15:45	55.6	8.55	75.4	107.3	0.21	859.4	0.00	7.19	11.9	8.1	11.3
16:00	56.5	8.58	246.0	100.4	0.21	876.5	-0.03	7.09	11.6	8.0	11.4
16:15	54.2	7.98	238.2	95.0	0.29	843.0	-0.05	6.78	11.0	9.0	10.6
16:30	54.2	8.05	30.4	99.6	0.39	834.7	0.05	6.83	10.9	8.6	10.9
Average	55.9	6.86	209.1	104.5	0.17	859.0	0.07	7.14	11.6	8.0	11.4
(+/-)	0.4	0.22	1.0	0.4	0.03	0.7	0.09				

RESULTS

2-22

**Table 2-22:
Unit 4 FGD Inlet – FTIR – March 28, 2007**

Time (HH:MM)	MKS (FTIR)									Servomex (Paramagnetic/UV)	
	HCl (ppmdv)	HF (ppmdv)	CO (ppmdv)	NO (ppmdv)	NO ₂ (ppmdv)	SO ₂ (ppmdv)	NH ₃ (ppmdv)	H ₂ O (%v)	CO ₂ (%dv)	O ₂ (%dv)	CO ₂ (%dv)
9:30	47.6	7.51	462.2	104.8	1.23	895.8	-0.13	7.61	12.3	6.7	12.6
9:45	47.9	8.15	126.5	116.3	1.24	895.7	-0.11	7.64	12.5	6.6	12.7
10:00	47.7	8.11	219.0	109.4	1.18	894.3	-0.15	7.59	12.4	6.8	12.6
10:15	48.1	8.13	322.5	106.9	1.21	899.3	-0.16	7.63	12.4	6.7	12.6
10:30	47.2	8.01	81.7	117.1	1.22	881.6	-0.15	7.48	12.3	6.8	12.5
10:45	47.9	8.12	306.0	105.5	1.18	899.2	-0.22	7.74	12.3	6.4	12.1
11:00	48.1	8.31	260.0	106.8	1.23	899.1	-0.16	7.79	12.4	6.8	12.5
11:15	49.2	8.29	243.1	110.6	1.18	894.1	-0.17	7.80	12.4	6.8	12.5
11:30	51.6	8.51	594.1	108.2	1.23	922.7	-0.20	7.93	12.7	6.4	12.9
11:45	50.8	8.40	213.7	109.4	1.16	898.6	-0.18	7.78	12.5	6.6	12.7
12:00	51.5	8.53	124.1	120.4	1.28	903.8	-0.17	7.83	12.7	6.6	12.7
12:15	52.5	8.59	159.2	112.8	1.20	886.8	-0.16	7.77	12.6	6.7	12.6
Average	49.1	8.19	249.6	110.3	1.23	896.34	-0.16	7.70	12.4	6.6	12.3
(+/-)	0.15	0.33	1.30	0.30	0.03	0.70	0.09	0.04	0.03		

RESULTS

2-23

**Table 2-23:
Unit 4 FGD Stack – FTIR – March 29, 2007**

Time (HH:MM)	MKS (FTIR)										Servomex (Paramagnetic/UV)		Plant CEMS	
	HCl	HF	CO	NO	NO ₂	SO ₂	NH ₃	H ₂ O	CO ₂	O ₂	CO ₂	SO ₂	CO ₂	
	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(%v)	(%dv)	(%dv)	(%dv)	(ppmdv)	(%dv)	
12:15	0.07	0.17	311.5	112.1	1.49	36.4	0.78	11.60	12.7	6.6	12.7			
12:30	0.05	0.10	294.3	116.0	1.65	35.4	0.72	11.19	12.7	6.4	12.9	35.1	12.6	
12:45	0.16	0.18	235.1	115.0	1.54	35.1	0.73	11.49	12.7	6.4	12.9			
13:00	-0.05	0.15	638.0	111.5	1.55	36.3	0.74	11.42	12.8	6.3	12.9	33.9	12.6	
13:15	0.02	0.06	204.1	115.3	1.59	34.6	0.67	11.40	12.7	6.7	12.7			
13:30	0.11	0.11	480.8	113.6	1.54	37.0	0.70	11.47	12.8	6.4	12.9	35.8	12.6	
13:45	-0.03	0.13	319.4	114.6	1.54	36.1	0.77	11.05	12.7	0.0	0.0			
14:00	-0.04	0.16	458.8	115.5	1.60	38.1	0.76	11.54	12.8	6.4	12.9	36.2	12.5	
14:16	0.15	0.09	488.6	113.1	1.53	34.9	0.83	11.45	12.7	0.0	0.0			
14:30	0.14	0.11	584.9	112.8	1.59	35.8	0.81	11.56	12.8	6.3	13.0	33.3	12.5	
14:45	0.21	0.11	233.1	115.3	1.62	32.9	0.82	11.61	12.6	6.6	12.7			
Average	0.07	0.12	335.1	114.6	1.56	35.3	0.74	11.32	12.7	6.5	12.8	34.9	12.6	
(+/-)	0.07	0.08	1.50	0.90	0.09	0.34	0.17	0.08	0.05					

Plant CEMS corrected to ppmdv using measured moisture content of flue gas.

**Table 2-24:
Unit 4 FGD Stack – FTIR – March 30, 2007**

Time (HH:MM)	MKS (FTIR)										Servomex (Paramagnetic/UV)		Plant CEMS	
	HCl	HF	CO	NO	NO ₂	SO ₂	NH ₃	H ₂ O	CO ₂	O ₂	CO ₂	SO ₂	CO ₂	
	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(ppmdv)	(%v)	(%dv)	(%dv)	(%dv)	(ppmdv)	(%dv)	
8:15	0.00	-0.01	624.3	108.8	1.56	38.8	0.75	11.37	12.3					
8:30	-0.03	-0.01	406.3	112.5	1.46	39.0	0.72	11.20	12.5	6.6	12.7	39.5	12.5	
8:45	-0.14	0.02	225.6	113.1	1.63	40.1	0.76	11.74	12.5	6.6	12.7			
9:00	0.03	0.00	572.9	111.6	1.60	44.5	0.74	11.71	12.6	6.5	12.7	43.2	12.4	
9:15	-0.05	0.03	400.7	114.4	1.60	42.7	0.73	11.63	12.6	6.5	12.7			
9:30	0.09	0.04	459.7	113.7	1.62	43.3	0.72	11.48	12.6	6.5	12.7	44.3	12.4	
9:45	0.11	0.07	500.0	113.0	1.60	41.3	0.74	10.83	12.5	6.6	12.7			
10:00	-0.06	0.00	385.8	114.5	1.58	45.7	0.72	11.25	12.6	6.5	12.7	44.3	12.5	
10:15	0.03	0.05	390.1	116.0	1.54	45.4	0.79	11.19	12.6	6.6	12.6			
10:30	0.08	0.07	143.2	116.5	1.53	39.9	0.79	10.85	12.5	6.6	12.7	43.9	12.7	
10:45	0.05	0.06	322.2	115.3	1.57	40.3	0.73	11.28	12.6	6.6	12.6			
11:00	-0.14	0.02	643.8	115.5	1.65	45.3	0.76	11.33	12.7	6.5	12.7	42.6	12.4	
11:15	-0.06	-0.04	220.4	116.5	1.67	45.2	0.72	11.23	12.6	6.6	12.7			
11:30	-0.03	0.06	219.9	115.9	1.67	42.0	0.77	11.24	12.6	6.6	12.7	42.6	12.5	
11:45	-0.01	0.00	371.0	113.9	1.45	39.7	0.73	10.81	12.6	6.6	12.6			
12:00	0.06	0.08	220.6	115.7	1.54	38.8	0.79	11.41	12.6	6.7	12.6	40.6	12.5	
12:15	0.03	0.04	217.0	118.1	1.60	38.3	0.74	11.48	12.6	6.6	12.7			
12:30	0.05	0.11	243.0	117.5	1.58	39.5	0.79	11.51	12.6	6.5	12.7	38.2	12.6	
12:45	-0.07	0.00	370.8	116.3	1.47	39.3	0.74	11.55	12.7	6.3	12.9			
13:00	-0.08	0.01	463.6	114.8	1.64	39.9	0.81	11.14	12.6	6.4	12.8	39.7	12.4	
Average	0.00	0.04	382.7	114.8	1.58	41.8	0.76	11.33	12.6	6.6	12.7	43.0	12.5	
(+/-)	0.07	0.08	0.90	0.90	0.08	0.34	0.15	0.08	0.04					

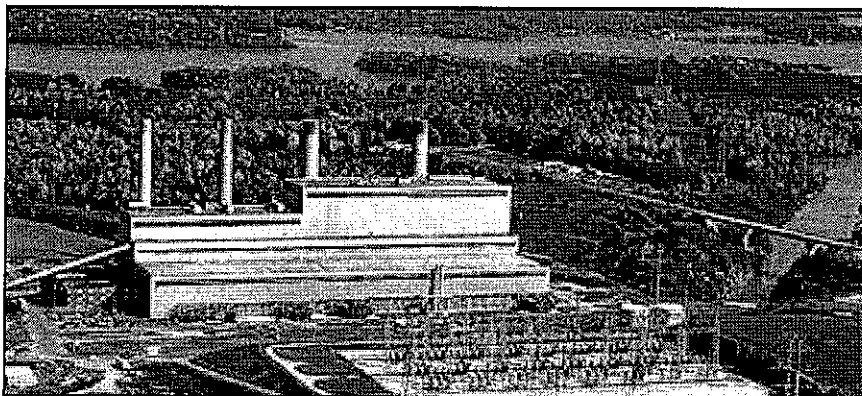
Plant CEMS corrected to ppmdv using measured moisture content of flue gas.

DESCRIPTION OF INSTALLATION

3-1

MARSHALL STEAM STATION

Capacity: 2,090 megawatts
Location: Catawba County, North Carolina
Commercial Date: 1965



Marshall Steam Station is a four-unit, coal-fired generating facility located in Catawba County, North Carolina. Named for former Duke Power president E.C. Marshall, the station is located on Lake Norman.

The second largest coal facility owned by Duke Energy in the Carolinas, Marshall generates enough electricity to power approximately two million homes. Since it began commercial operation in 1965, Marshall Steam Station has been among the most efficient power plants in the nation.

Duke Energy has made significant improvements to reduce emissions from the company's coal-fired plants. A unique type of burner arrangement in the boilers keeps the nitrogen oxide emissions from the Marshall facility well below regulatory limits.

In 2004, the company began installing flue gas desulfurization equipment – commonly known as scrubbers. This equipment will lower the station's sulfur dioxide emissions by approximately 95 percent. The project is scheduled for completion in 2007

A schematic of the process indicating sampling locations is shown in Figure 3-1.

DESCRIPTION OF INSTALLATION
MARSHALL STEAM STATION (CONTINUED)

3-2

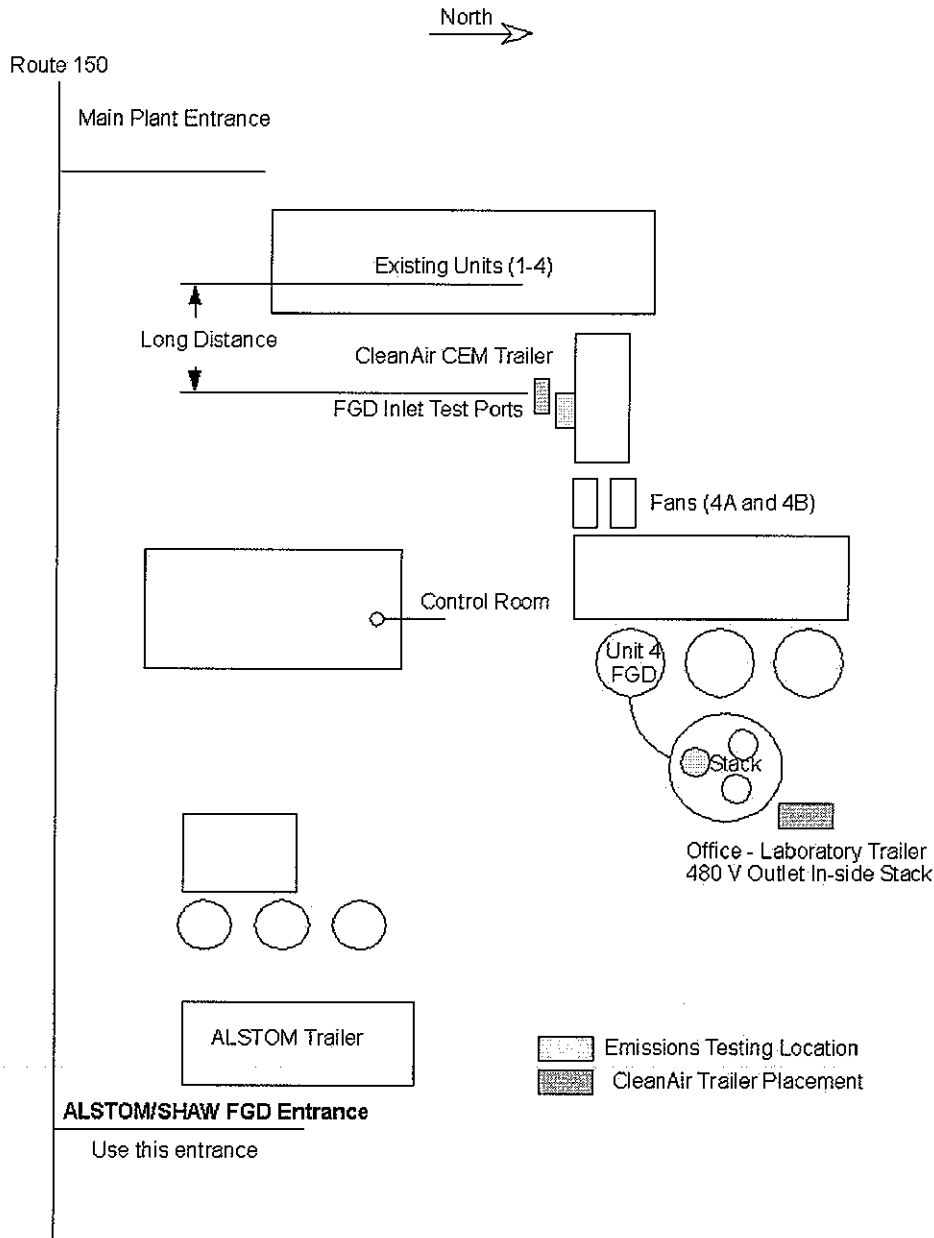


Figure 3-1: Process Schematic

DESCRIPTION OF INSTALLATION

3-3

DESCRIPTION OF SAMPLING LOCATIONS

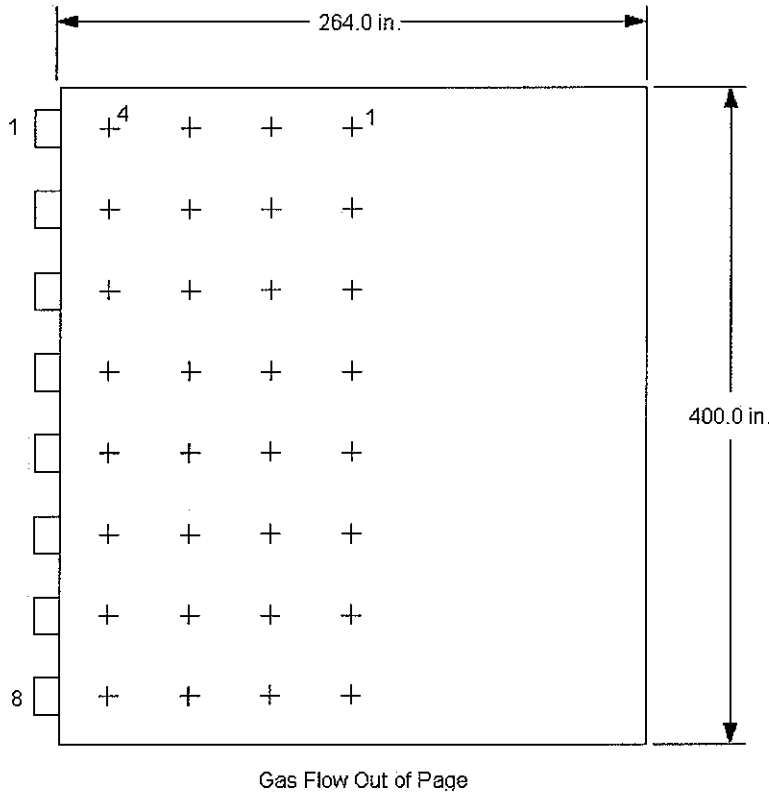
Table 3-1 outlines the sampling point configurations. Figure 3-2 through Figure 3-3 illustrates the sampling points and orientation of sampling ports for each of the sources tested in the program.

**Table 3-1:
Sampling Points**

<u>Location</u>	<u>Constituent</u>	<u>Method</u>	<u>Run No.</u>	<u>Ports</u>	<u>Points per Port</u>	<u>Minutes per Point</u>	<u>Total Minutes</u>	<u>Figure</u>
FGD Inlet	SO ₃ /SO ₂	8B	1-2	1	1	60	60	N/A
FGD Inlet	Trace Metals	29	1-2	8	4	3	96	3-2
FGD Inlet	HCl/HF	26	1-8	1	1	96	96	N/A
FGD Stack	SO ₃ /SO ₂	8C	1-2	1	1	60	90	N/A
FGD Stack	Trace Metals	29	1-2	3	4	18	96	3-3
FGD Stack	HCl/HF	26	1-8	1	1	96	96	N/A

DESCRIPTION OF INSTALLATION
DESCRIPTION OF SAMPLING LOCATIONS (CONTINUED)

3-4

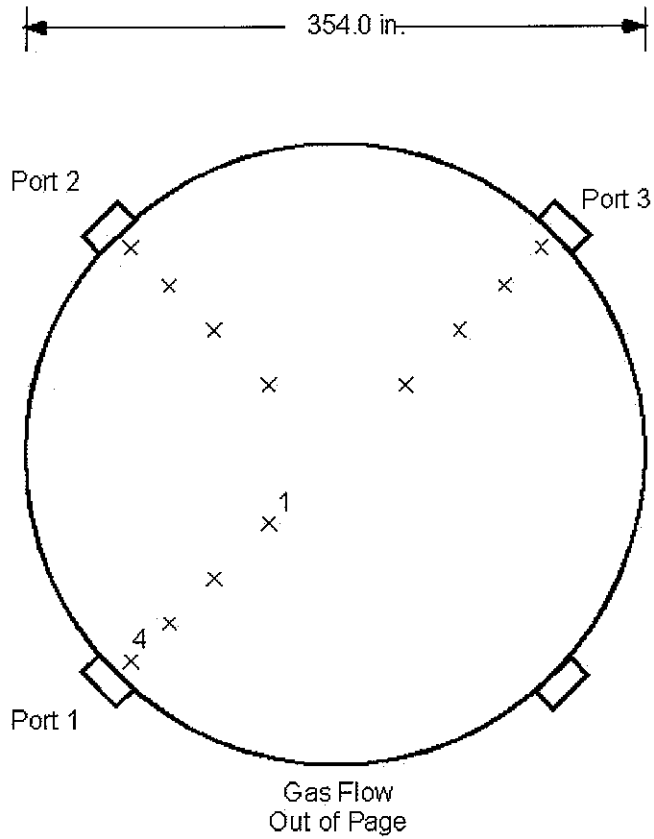


<u>Sampling Point</u>	<u>Port to Point Distance (in.)</u>
1	92.4
2	66.0
3	39.6
4	13.2

Figure 3-2: FGD Inlet Sampling Point Determination (EPA Method 1)

DESCRIPTION OF INSTALLATION
DESCRIPTION OF SAMPLING LOCATIONS (CONTINUED)

3-5



<u>Sampling Point</u>	<u>Port to Point Distance (in.)</u>
1	114.3
2	68.7
3	37.2
4	11.3

Figure 3-3: FGD Stack Sampling Point Determination (EPA Method 1)

METHODOLOGY

4-1

Clean Air Engineering followed procedures as detailed in U.S. Environmental Protection Agency (USEPA) Methods 1, 2, 3A, 26, 29 320 and CleanAir Methods 8B and 8C. The following table summarizes the methods and their respective sources.

**Table 4-1:
Summary of Sampling Procedures**

Title 40 CFR Part 60 Appendix A

Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 26	"Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Non-Isokinetic Method"
Method 29	"Determination of Metals Emissions from Stationary Sources"

Miscellaneous Methods

CleanAir Method 8B	"Determination Of Sulfur Oxides Including Sulfur Dioxide, Sulfur Trioxide, And Sulfuric Acid Vapor And Mist From Stationary Sources Using A Controlled Condensation Sampling Apparatus"
CleanAir Method 8C	"Determination Of Sulfur Oxides Including Sulfur Dioxide, Sulfur Trioxide, And Sulfuric Acid Vapor And Mist From Stationary Sources Using An EPA Method 8 Sampling Apparatus Modified To Mitigate The Effects Of Moisture And Other Potential Interferents"

Title 40 CFR Part 63 Appendix A

Method 320	"Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy"
------------	---

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and on the World Wide Web at <http://www.cleanair.com>.

Diagrams of the sampling apparatus and major specifications of the sampling, recovery and analytical procedures are summarized for each method in Appendix A.

CleanAir followed specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and in USEPA "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III Stationary Source-Specific Methods", EPA/600/R-94/038C. Additional QA/QC methods as prescribed in CleanAir's internal Quality Manual were also followed. Results of all QA/QC activities performed by CleanAir are summarized in Appendix D.

CleanAir

ALSTOM POWER, INC.
MARSHALL STEAM STATION

Client Reference No: 96004005
CleanAir Project No: 10171

APPENDIX

5-1

TEST METHOD SPECIFICATIONS	A
SAMPLE CALCULATIONS	B
PARAMETERS	C
QA/QC DATA	D
FIELD DATA	E
FIELD DATA PRINTOUTS	F
LABORATORY DATA	G
PLANT DATA	H