

# Determination of Actual Condensable and non-Condensable PM<sub>2.5</sub> Emissions from Stationary Sources

## Region 9 – Regional Applied Research Effort (RARE)

- Test 1** External Combustion Boilers - Electric Generation - Wood/Bark Waste – Fluidized bed combustion boilers
- Test 2** External Combustion Boilers - Electric Generation - Wood/Bark Waste – Fluidized bed combustion boilers
- Test 3** External Combustion Boilers - Electric Generation - Solid Waste - Refuse Derived Fuel
- Test 4** External Combustion Boilers - Electric Generation - Petroleum Coke - All Boiler Sizes
- Test 5** Internal Combustion Engines - Electric Generation - Natural Gas - Turbine
- Test 6** Internal Combustion Engines - Electric Generation - Distillate Oil (Diesel) – Reciprocating

### Summary Tables

Test	Source	Filterable PM2.5	Inorganic (Aqueous) Condensible	Organic Condensable Particulate	Total PM2.5
1	400 MMBtu/hr fluidized bed combustor; wood/bark fuel	mg: 3.63E+00 lb/hr: 1.22E+00 mg/dscm: 2.90E+00	mg: 4.37E+00 lb/hr: 1.47E+00 mg/dscm: 3.49E+00	mg: 1.00E-01 lb/hr: 3.50E-02 mg/dscm: 8.20E-02	mg: 8.10E+00 lb/hr: 2.72E+00 mg/dscm: 6.48E+00
2	317 MMBTU/hr fluidized bed combustor; wood/bark fuel	mg: 2.15E+00 lb/hr: 6.91E-01 gr/dscf: 8.56E-04 lb/MMBtu: 1.95E-03	mg: 1.13E+00 lb/hr: 3.58E-01 gr/dscf: 4.41E-04 lb/MMBtu: 1.01E-03	mg: 2.00E+00 lb/hr: 6.38E-01 gr/dscf: 7.89E-04 lb/MMBtu: 1.79E-03	mg: 5.28E+00 lb/hr: 1.69E+00 gr/dscf: 2.08E-03 lb/MMBtu: 4.74E-03
3	315 MMBtu/hr MSW combustor	mg: 1.50E+00 lb/hr: 3.32E-01 mg/dscm: 1.27E+00	mg: 1.13E+01 lb/hr: 2.52E+00 mg/dscm: 9.53E+00	mg: 1.33E+00 lb/hr: 2.98E-01 mg/dscm: 1.12E+00	mg: 1.41E+01 lb/hr: 3.15E+00 mg/dscm: 1.19E+01
4	circulating fluidized bed combustor; petroleum coke fuel	mg: 2.00E-01 lb/hr: 3.04E-02 gr/dscf: 6.67E-05 lb/MMBtu: 1.24E-04	mg: 2.27E+00 lb/hr: 3.45E-01 gr/dscf: 7.60E-04 lb/MMBtu: 1.41E-03	mg: 2.71E+00 lb/hr: 4.11E-01 gr/dscf: 9.05E-04 lb/MMBtu: 1.69E-03	mg: 5.19E+00 lb/hr: 7.87E-01 gr/dscf: 1.73E-03 lb/MMBtu: 3.23E-03
5	2,124 MMBtu/hr Siemens/Westinghouse 501F turbine engine	mg: 2.03E-01 lb/hr: 3.58E-01 gr/dscf: 4.79E-05 lb/MMBtu: 1.60E-04	mg: 1.91E+00 lb/hr: 3.36E+00 gr/dscf: 4.52E-04 lb/MMBtu: 1.50E-03	mg: 1.00E-01 lb/hr: 1.76E-01 gr/dscf: 2.35E-05 lb/MMBtu: 7.84E-05	mg: 2.22E+00 lb/hr: 3.90E+00 gr/dscf: 5.24E-04 lb/MMBtu: 1.74E-03

Test	Source	Filterable PM10 (and greater)	Filterable PM2.5 - PM10	Total PM2.5
6	Cummins; Model QSK60-G6; Rated at 2922 BHP	mg: 3.56E+01 lb/hr: 5.79E-01 gr/dscf: 1.40E-02	mg: 3.50E+00 lb/hr: 6.10E-02 gr/dscf: 1.00E-03	mg: 1.14E+02 lb/hr: 2.98E+00 gr/dscf: 7.30E-02

**Test 1**

**Facility Information:**

**SCC / 10100912:** External Combustion Boilers - Electric Generation - Wood/Bark Waste – Fluidized bed combustion boilers

**Permitted Maximum Process:** Unit 1 Boiler: 400 MMBTU/hr

**Description of the source (including control equipment).**

The Unit 1 boiler includes a fluidized bed combustor rated at 400 MMBtu/hr. Limestone is added to the bed material for control of SO<sub>2</sub> and slagging of the bed material. NO<sub>x</sub> emissions are controlled by flue gas recirculation and by injection of anhydrous ammonia into the hot exhaust gases for selective non-catalytic reduction (SNCR). PM emissions are controlled by a multiclone and baghouse, exhausting through a cylindrical stack.

**Sampling Location Information:**

<b>Location</b>	<b>Round Duct Diam.</b>	<b>Rect. Duct Length /Width</b>	<b>Equiv. Diam</b>	<b>Distance from upstream dist.</b>	<b>Distance from downstream dist.</b>	<b>Number of Traverse Ports</b>	<b>Min.Traverse Points</b>
Unit 1	84	0 0	0	180	840	4	6

**Test Parameter Information:**

<b>Location</b>	<b>Target Parameter</b>	<b>Test Method</b>	<b>Number of Test Runs</b>	<b>Test Run Duration</b>	<b>Sample Points</b>	<b>Comments</b>
Unit 1	Filterable PM2.5	OTM - 27/28			0	
Unit 1	Inorganic (Aqueous) Condensable Part.	OTM - 27/28			0	
Unit 1	Organic Condensable Particulate	OTM - 27/28			0	
Unit 1	Total PM2.5	OTM - 27/28	3	120	0	

**The following describes any modifications and/or deviations to the applicable test methods. If alternative methods were requested, see the attachments for documentation of request AND approval, including dates.**

Using standard testing procedures for OTM 27/28.

**Sampling / Stack Data Results**

Location Unit 1 - OTM - 27/28

	1	2	3	Average
Run Number	1	2	3	
Test Date	7/20/2010	7/20/2010	7/20/2010	
Run Start Time	8:08:00 AM	10:47:00 AM	1:18:00 PM	
Run Finish Time	10:30:00 AM	12:58:00 PM	3:25:00 PM	
Net Run Time, minutes	129.5	121.5	120	
Dry Gas Meter Volume Sampled, dscf	46.186	43.180	42.820	44.062
Moisture Content of Stack Gas, %	17.83	17.99	18.76	18.193
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Carbon Dioxide, %	10.8	10.9	10.9	10.867
Oxygen, %	9.8	9.8	9.8	9.800
Average Stack Gas Temperature, °F	328.92	329.92	331.42	330.087
Dry Volumetric Flow Rate, dry scfm	112,233.1	112,372.2	111,686.3	112,097.2
Actual Wet Volumetric Flue Gas Flow Rate, acfm	206,918.5	207,842.1	208,927.4	207,896.0
Percent Isokinetic of Sampling Rate, %	98.3	95.3	98.9	97.500
F-Factor, dscf/MMBtu @ %O <sub>2</sub>	9240	9240	9240	9,240
Fw				
Fc	1830	1830	1830	1,830

## Emissions Summary

Location: Unit 1 - OTM - 27/28

Compound: Filterable PM2.5

	1	2	3	Average
RunNumber	1	2	3	
Mass_mg	4.3	3.8	2.8	3.63E+00
lb/hr	1.38E+00	1.31E+00	9.66E-01	1.22E+00
mg/dscm	3.29E+00	3.11E+00	2.31E+00	2.90E+00

Compound: Inorganic (Aqueous) Condensibles

	1	2	3	Average
RunNumber	1	2	3	
Mass_mg	4.9	4.4	3.8	4.37E+00
lb/hr	1.58E+00	1.51E+00	1.31E+00	1.47E+00
mg/dscm	3.75E+00	3.60E+00	3.13E+00	3.49E+00

Compound: Organic Condensibles Particulate

	1	2	3	Average
RunNumber	1	2	3	
Mass_mg	0	0	0.3	1.00E-01
lb/hr	0.00E+00	0.00E+00	1.04E-01	3.50E-02
mg/dscm	0.00E+00	0.00E+00	2.47E-01	8.20E-02

Compound: Total PM2.5

	1	2	3	Average
RunNumber	1	2	3	
Mass_mg	9.2	8.2	6.9	8.10E+00
lb/hr	2.96E+00	2.82E+00	2.38E+00	2.72E+00
mg/dscm	7.04E+00	6.71E+00	5.69E+00	6.48E+00

**Process Run Data**

Run	Name	Value	UOM	Target Value	Comments
1	Wood/Bark Burned	30	Tons/hr	0	
1	Average Heat Input	234.9	mmBtu/hr	0	
1	Average Lime Usage for July	50	lbs/hr	0	
1	Ammonia Injection rate	125	lbs/hr	0	
1	Bicarb Injection rate	83.3	lbs/hr	0	
2	Wood/Bark Burned	30	Tons/hr	0	
2	Average Heat Input	235	mmBtu/hr	0	
2	Average Lime Usage for July	50	lbs/hr	0	
2	Ammonia Injection rate	125	lbs/hr	0	
2	Bicarb Injection rate	83.3	lbs/hr	0	
3	Wood/Bark Burned	30	Tons/hr	0	
3	Average Heat Input	235.2	mmBtu/hr	0	
3	Average Lime Usage for July	50	lbs/hr	0	
3	Ammonia Injection rate	125	lbs/hr	0	
3	Bicarb Injection rate	83.3	lbs/hr	0	

**APCD Run Data**

Run	Name	Value	UOM	Target Value	Comments
1	BAGHOUSE	0		0	
1	SELECTIVE NONCATALYTIC REDUCTION FOR NOX	0		0	
1	DRY LIMESTONE INJECTION	0		0	

**Process Lab Run Data**

## Sampling / Stack Data Results Detail

Location Unit 1 - OTM - 27/28

				Average
Run Number	1	2	3	
Test Date	7/20/2010	7/20/2010	7/20/2010	
Run Start Time	8:08:00 AM	10:47:00 AM	1:18:00 PM	
Run Finish Time	10:30:00 AM	12:58:00 PM	3:25:00 PM	
Net Traversing Points	12	12	12	
Net Run Time, minutes	129.5	121.5	120	
Nozzle Diameter, inches	0.151	0.153	0.151	0.152
Pitot Tube Coefficient	0.84	0.84	0.84	0.840
Dry Gas Meter Calibration Factor	1	1	1	1.000
Barometric Pressure, inches of Mercury	29.4	29.4	29.4	29.400
Average Orifice Meter Differential, inches H2O	0.46	0.46	0.46	0.460
Dry Gas Meter Volume Sampled, cubic feet	49.628	46.796	46.392	47.605
Average Dry Gas Meter Temperature, °F	98.13	102.92	102.75	101.267
Dry Gas Meter Volume Sampled, dscf	46.186	43.180	42.820	44.062
Total Moisture Liquid collected, g	212.9	201.1	210.1	208.033
Volume of Water Vapor, standard cubic feet	10.02	9.47	9.89	9.793
Moisture Content of Stack Gas, %	17.83	17.99	18.76	18.193
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Dry Mole Fraction	0.8217	0.8201	0.8124	0.818
Carbon Dioxide, %	10.8	10.9	10.9	10.867
Oxygen, %	9.8	9.8	9.8	9.800
Carbon Monoxide & Nitrogen, %	79.4	79.3	79.3	79.333
Fuel Factor	1.03	1.02	1.02	
Dry Molecular Weight, lb/lb-Mole	30.12	30.14	30.14	30.133
Wet Molecular weight, lb/lb-Mole	27.96	27.96	27.86	27.927
Flue Gas Static Pressure, inches of H2O	1.45	1.45	1.45	1.450
Absolute Flue Gas Pressure, inches of Mercury	29.51	29.51	29.51	29.510
Average Stack Gas Temperature, °F	328.92	329.92	331.42	330.087
Average Velocity Head, inches of H2O	1.628373458	1.64091703	1.649298783	1.640
Average Stack Gas Velocity, feet/second	89.61	90.01	90.48	90.033
Stack Cross-Sectional Area, square feet	38.485	38.485	38.485	38.485
Dry Volumetric Flow Rate, dry scfm	112,233.1	112,372.2	111,686.3	112,097.2
Actual Wet Volumetric Flue Gas Flow Rate, acfm	206,918.5	207,842.1	208,927.4	207,896.0
Percent Isokinetic of Sampling Rate, %	98.3	95.3	98.9	97.500
Percent Excess Air, %	87.8	88.0	88.0	87.933
F-Factor, dscfm/MMBtu @ %O2	9240	9240	9240	9,240
Round Duct Diameter, inches	84	84	84	
Rectangular Duct Width, inches	0	0	0	
Rectangular Duct Length, inches	0	0	0	
Fw				
Fc	1830	1830	1830	1,830

**Test 2**

**Facility Information:**

**SCC / 10100912:** External Combustion Boilers - Electric Generation - Wood/Bark Waste – Fluidized bed combustion boilers

**Permitted Maximum Process:** 317 MMBtu/hr

**Max. Normal Operation Process:** Normal conditions

**Description of the source (including control equipment).**

The plant burns biomass materials and produces electrical power. The cogeneration unit is a circulating fluidized bed combustor rated at 317 MMBTU/hr. The unit burns biomass material to produce steam to drive an electrical generator. Limestone is added to the bed material for control of SO<sub>2</sub> emissions, and ammonia is injected into the hot exhaust gases for selective non-catalytic reduction (SNCR) of NO<sub>x</sub> emissions. The emissions of particulate matter are controlled by a baghouse, which exhausts through a vertical, cylindrical stack.

**Sampling Location Information:**

	Round							
Location	Duct	Rect. Duct	Equiv.	Distance from	Distance from	Number of	Min.Traverse	
Stack	Diam.	Length /Width	Diam	upstream dist.	downstream dist.	Traverse Ports	Points	
	90	0	0	0	0	2	12	



**Test Parameter Information:**

<b>Location</b>	<b>Target Parameter</b>	<b>Test Method</b>	<b>Number of Test Runs</b>	<b>Test Run Duration</b>	<b>Sample Points</b>	<b>Comments</b>
Stack	Inorganic (Aqueous) Condensible Part.	OTM - 27/28	3	120	0	
Stack	Organic Condensible Particulate	OTM - 27/28	3	120	0	
Stack	Filterable PM2.5	OTM - 27/28	3	120	0	
Stack	Total PM2.5	OTM - 27/28	3	120	0	

**The following describes any modifications and/or deviations to the applicable test methods. If alternative methods were requested, see the attachments for documentation of request AND approval, including dates.**

**Sampling / Stack Data Results**

Location Stack - OTM - 27/28

	1-OTM	2-OTM	3-OTM	Average
Run Number	1-OTM	2-OTM	3-OTM	
Test Date	6/17/2010	6/17/2010	6/17/2010	
Run Start Time	9:16 AM	12:02 PM	3:31 PM	
Run Finish Time	11:14 AM	1:58 PM	5:34:45 PM	
Net Run Time, minutes	115	112	120	
Dry Gas Meter Volume Sampled, dscf	39.081	38.140	40.954	39.392
Moisture Content of Stack Gas, %	13.62	13.63	12.07	13.107
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Carbon Dioxide, %	12.399	12.38	12.263	12.347
Oxygen, %	8.311	8.341	8.382	8.345
Average Stack Gas Temperature, °F	314.42	318.50	323.83	318.9
Dry Volumetric Flow Rate, dry scfm	94,397.4	93,583.4	95,421.6	94,467.467
Actual Wet Volumetric Flue Gas Flow Rate, acfm	160,767.4	160,078.2	161,695.1	160,846.9
Percent Isokinetic of Sampling Rate, %	95.2	96.2	94.6	95.333
F-Factor, dscf/MMBtu @ %O <sub>2</sub>	9513	9604	9592	9,569.667
Fw	0	0	0	0.000
Fc	0	0	0	0.000

**Emissions Summary**

**Location: Stack - OTM - 27/28**

**Compound: Filterable PM2.5**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
RunNumber	1-OTM	2-OTM	3-OTM	
Mass_mg	2.78	3.05	0.63	2.15E+00
lb/hr	8.88E-01	9.90E-01	1.94E-01	6.91E-01
gr/dscf	1.10E-03	1.23E-03	2.37E-04	8.56E-04
lb/mmBtu	2.48E-03	2.82E-03	5.43E-04	1.95E-03

**Compound: Inorganic (Aqueous) Condensable**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
RunNumber	1-OTM	2-OTM	3-OTM	
Mass_mg	0.44	1.23	1.73	1.13E+00
lb/hr	1.41E-01	3.99E-01	5.33E-01	3.58E-01
gr/dscf	1.74E-04	4.98E-04	6.52E-04	4.41E-04
lb/mmBtu	3.92E-04	1.14E-03	1.49E-03	1.01E-03

**Compound: Organic Condensable Particulate**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
RunNumber	1-OTM	2-OTM	3-OTM	
Mass_mg	3.34	1.71	0.94	2.00E+00
lb/hr	1.07E+00	5.55E-01	2.90E-01	6.38E-01
gr/dscf	1.32E-03	6.92E-04	3.54E-04	7.89E-04
lb/mmBtu	2.98E-03	1.58E-03	8.10E-04	1.79E-03

**Compound: Total PM2.5**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
RunNumber	1-OTM	2-OTM	3-OTM	
Mass_mg	6.56	5.99	3.3	5.28E+00
lb/hr	2.10E+00	1.94E+00	1.02E+00	1.69E+00
gr/dscf	2.59E-03	2.42E-03	1.24E-03	2.08E-03
lb/mmBtu	5.84E-03	5.53E-03	2.84E-03	4.74E-03

**Process Run Data**

Run	Name	Value	UOM	Target Value	Comments
1	Wood/Bark Burned	26.46	Tons/hr	0	
1	Heat input	318.1	mmBtu/hr	0	
1	sorbent injection	500	lb/hr	0	
2	Wood/Bark Burned	26.46	Tons/hr	0	
2	Heat Input	318.1	mmBtu/hr	0	
2	sorbent injection	500	lb/hr	0	
3	Wood/Bark Burned	26.46	Tons/hr	0	
3	Heat Input	318.1	mmBtu/hr	0	
3	sorbent injection	500	lb/hr	0	

**APCD Run Data**

Run	Name	Value	UOM	Target Value	Comments
1	BAGHOUSE	0		0	
1	thermal de-NOx system with cyclone, superheater, steam drum, economizer	0		0	
1	sand silo and limestone silo controlled by bin vent filter	0		0	
1	ash silo	0		0	
1	bottom sand discharge units	0		0	

**Process Lab Run Data**

## Sampling / Stack Data Results Detail

Location Stack - OTM - 27/28

	1-OTM	2-OTM	3-OTM	Average
Run Number	1-OTM	2-OTM	3-OTM	
Test Date	6/17/2010	6/17/2010	6/17/2010	
Run Start Time	9:16:00 AM	12:02:00 PM	3:31:00 PM	
Run Finish Time	11:14:00 AM	1:58:00 PM	5:34:45 PM	
Net Traversing Points	12	12	12	
Net Run Time, minutes	115	112	120	
Nozzle Diameter, inches	0.175	0.175	0.175	0.175
Pitot Tube Coefficient	0.8136	0.8136	0.8136	0.814
Dry Gas Meter Calibration Factor	0.986	0.98	0.986	0.984
Barometric Pressure, inches of Mercury	29.86	29.89	29.84	29.863
Average Orifice Meter Differential, inches H <sub>2</sub> O	0.47	0.47	0.47	0.470
Dry Gas Meter Volume Sampled, cubic feet	41.955	40.970	43.463	42.129
Average Dry Gas Meter Temperature, °F	98.42	95.92	91.67	95.337
Dry Gas Meter Volume Sampled, dscf	39.081	38.140	40.954	39.392
Total Moisture Liquid collected, g	130.9	127.8	119.3	126.000
Volume of Water Vapor, standard cubic feet	6.16	6.02	5.62	5.933
Moisture Content of Stack Gas, %	13.62	13.63	12.07	13.107
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Dry Mole Fraction	0.8638	0.8637	0.8793	0.869
Carbon Dioxide, %	12.399	12.38	12.263	12.347
Oxygen, %	8.311	8.341	8.382	8.345
Carbon Monoxide & Nitrogen, %	79.29	79.279	79.355	79.308
Fuel Factor	1.02	1.01	1.02	
Dry Molecular Weight, lb/lb-Mole	30.32	30.31	30.30	30.310
Wet Molecular weight, lb/lb-Mole	28.64	28.63	28.82	28.697
Flue Gas Static Pressure, inches of H <sub>2</sub> O	-0.42	-0.44	-0.44	-0.433
Absolute Flue Gas Pressure, inches of Mercury	29.83	29.86	29.81	29.833
Average Stack Gas Temperature, °F	314.42	318.50	323.83	318.917
Average Velocity Head, inches of H <sub>2</sub> O	0.838678131	0.82789562	0.842965797	0.837
Average Stack Gas Velocity, feet/second	60.65	60.39	61.00	60.680
Stack Cross-Sectional Area, square feet	44.179	44.179	44.179	44.179
Dry Volumetric Flow Rate, dry scfm	94,397.4	93,583.4	95,421.6	94,467.467
Actual Wet Volumetric Flue Gas Flow Rate, acfm	160,767.4	160,078.2	161,695.1	160,846.900
Percent Isokinetic of Sampling Rate, %	95.2	96.2	94.6	95.333
Percent Excess Air, %	65.8	66.3	66.7	66.267
F-Factor, dscfm/MMBtu @ %O <sub>2</sub>	9513	9604	9592	9,569.667
Round Duct Diameter, inches	90	90	90	
Rectangular Duct Width, inches	0	0	0	
Rectangular Duct Length, inches	0	0	0	
Fw	0	0	0	0.000
Fc	0	0	0	0.000

**Test 3**

**Facility Information:**

**SCC / 10101202:**External Combustion Boilers - Electric Generation - Solid Waste - Refuse Derived Fuel

**Permitted Maximum Process:** 315 MMBTU/hr

**Description of the source (including control equipment).**

Mass-fired refuse boilers rated at 315 MMBtu/hr. Each boiler has a capacity to process 400 tons of municipal solid waste per day and to provide steam for the generation of electricity. Each boiler train is equipped with a spray dryer absorber (SDA) using lime for acid gas removal followed by a carbon injection system for mercury removal. The SDA and carbon injection system are followed by a Fabric Filter Baghouse (FF) for the control of suspended particulate emissions. Each FF is followed by an induced draft fan which directs the flue gas to a dual flue, common stack.

**Sampling Location Information:**

Location	Round			Distance from upstream dist.	Distance from downstream dist.	Number of Traverse Ports	Min.Traverse Points
	Duct Diam.	Rect. Duct Length /Width	Equiv. Diam				
Unit 2	63	0 0	0	480	960	2	6

**Test Parameter Information:**

<b>Location</b>	<b>Target Parameter</b>	<b>Test Method</b>	<b>Number of Test Runs</b>	<b>Test Run Duration</b>	<b>Sample Points</b>	<b>Comments</b>
Unit 1	Filterable PM2.5	OTM - 27/28			0	
Unit 1	Inorganic (Aqueous) Condensable Part.	OTM - 27/28			0	
Unit 1	Organic Condensable Particulate	OTM - 27/28			0	
Unit 1	Total PM2.5	OTM - 27/28	3	120	0	
Unit 2	Organic Condensable Particulate	OTM - 27/28			0	
Unit 2	Inorganic (Aqueous) Condensable Part.	OTM - 27/28			0	
Unit 2	Filterable PM2.5	OTM - 27/28			0	
Unit 2	Total PM2.5	OTM - 27/28	3	120	0	

**The following describes any modifications and/or deviations to the applicable test methods. If alternative methods were requested, see the attachments for documentation of request AND approval, including dates.**  
Using standard testing procedures for OTM 27/28.

**Sampling / Stack Data Results**

**Location** Unit 2 - OTM - 27/28

				<b>Average</b>
Run Number	2	3	4	
Test Date	5/25/2010	5/25/2010	5/27/2010	
Run Start Time	1:20:00 PM	4:23:00 PM	9:57:00 AM	
Run Finish Time	3:30:00 PM	6:36:00 PM	12:34:00 PM	
Net Run Time, minutes	114.25	125	123.25	
Dry Gas Meter Volume Sampled, dscf	39.763	42.847	42.323	41.644
Moisture Content of Stack Gas, %	15.02	14.44	15.27	14.910
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Carbon Dioxide, %	7.4	7.5	7.9	7.600
Oxygen, %	12.6	12.5	12	12.367
Average Stack Gas Temperature, °F	287.50	285.08	290.83	287.803
Dry Volumetric Flow Rate, dry scfm	68,562.7	73,088.3	70,005.6	70,552.200
Actual Wet Volumetric Flue Gas Flow Rate, acfm	115,730.2	122,094.7	119,042.4	118,955.767
Percent Isokinetic of Sampling Rate, %	86.1	80.6	84.3	83.667
F-Factor, dscf/MMBtu @ %O2	9240	9240	9240	9,240
Fw				
Fc	1830	1830	1830	1,830



**Emissions Summary**

**Location: Unit 2 - OTM - 27/28**

**Compound: Filterable PM2.5**

	2	3	4	<b>Average</b>
Run Number	2	3	4	
Mass_mg	1	0.5	3	1.50E+00
lb/hr	2.28E-01	1.13E-01	6.56E-01	3.32E-01
mg/dscm	8.88E-01	4.12E-01	2.50E+00	1.27E+00

**Compound: Inorganic (Aqueous) Condensable**

	2	3	4	<b>Average</b>
Run Number	2	3	4	
Mass_mg	9.7	11.6	12.5	1.13E+01
lb/hr	2.21E+00	2.62E+00	2.73E+00	2.52E+00
mg/dscm	8.62E+00	9.56E+00	1.04E+01	9.53E+00

**Compound: Organic Condensable Particulate**

	2	3	4	<b>Average</b>
Run Number	2	3	4	
Mass_mg	0.7	1.6	1.7	1.33E+00
lb/hr	1.60E-01	3.61E-01	3.72E-01	2.98E-01
mg/dscm	6.22E-01	1.32E+00	1.42E+00	1.12E+00

**Compound: Total PM2.5**

	2	3	4	<b>Average</b>
Run Number	2	3	4	
Mass_mg	11.4	13.7	17.2	1.41E+01
lb/hr	2.60E+00	3.09E+00	3.76E+00	3.15E+00
mg/dscm	1.01E+01	1.13E+01	1.44E+01	1.19E+01

**Process Run Data**

<b>Run</b>	<b>Name</b>	<b>Value</b>	<b>UOM</b>	<b>Target Value</b>	<b>Comments</b>
1	Refuse Derived Fuel Burned	17.21	Tons/hr	0	
2	Refuse Derived Fuel Burned	17.21	Tons/hr	0	
3	Refuse Derived Fuel Burned	17.42	Tons/hr	0	
1	HHV	4686	btu/lb	0	
2	HHV	4686	btu/lb	0	
3	HHV	4686	btu/lb	0	
1	Heat Input	175.4	mmBtu/hr	0	
2	Heat Input	177.8	mmBtu/hr	0	
3	Heat Input	173.5	mmBtu/hr	0	
1	Carbon injection	33	lb/hr	0	
2	Carbon injection	34.4	lb/hr	0	
3	Carbon injection	17.4	lb/hr	0	
1	Lime injection	2.8	gal/min	0	
2	Lime injection	2.8	gal/min	0	
3	Lime injection	2.6	gal/min	0	

**APCD Run Data**

<b>Run</b>	<b>Name</b>	<b>Value</b>	<b>UOM</b>	<b>Target Value</b>	<b>Comments</b>
1	FABRIC FILTER	0		0	
1	SPRAY DRYER	0		0	

**Process Lab Run Data**

## Sampling / Stack Data Results Detail

Location Unit 2 - OTM - 27/28

				Average
Run Number	2	3	4	
Test Date	5/25/2010	5/25/2010	5/27/2010	
Run Start Time	1:20:00 PM	4:23:00 PM	9:57:00 AM	
Run Finish Time	3:30:00 PM	6:36:00 PM	12:34:00 PM	
Net Traversing Points	12	12	12	
Net Run Time, minutes	114.25	125	123.25	
Nozzle Diameter, inches	0.153	0.152	0.152	0.152
Pitot Tube Coefficient	0.84	0.84	0.84	0.840
Dry Gas Meter Calibration Factor	0.99	0.99	0.96	0.980
Barometric Pressure, inches of Mercury	29.6	29.6	29.6	29.600
Average Orifice Meter Differential, inches H2O	0.38	0.43	0.47	0.427
Dry Gas Meter Volume Sampled, cubic feet	40.890	44.080	44.585	43.185
Average Dry Gas Meter Temperature, °F	72.29	72.58	68.88	71.250
Dry Gas Meter Volume Sampled, dscf	39.763	42.847	42.323	41.644
Total Moisture Liquid collected, g	149.4	153.6	162.2	155.067
Volume of Water Vapor, standard cubic feet	7.03	7.23	7.63	7.297
Moisture Content of Stack Gas, %	15.02	14.44	15.27	14.910
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Dry Mole Fraction	0.8498	0.8556	0.8473	0.851
Carbon Dioxide, %	7.4	7.5	7.9	7.600
Oxygen, %	12.6	12.5	12	12.367
Carbon Monoxide & Nitrogen, %	80	80	80.1	80.033
Fuel Factor	1.12	1.12	1.13	
Dry Molecular Weight, lb/lb-Mole	29.69	29.70	29.74	29.710
Wet Molecular weight, lb/lb-Mole	27.93	28.01	27.95	27.963
Flue Gas Static Pressure, inches of H2O	-0.9	-0.88	-0.98	-0.920
Absolute Flue Gas Pressure, inches of Mercury	29.53	29.54	29.53	29.533
Average Stack Gas Temperature, °F	287.50	285.08	290.83	287.803
Average Velocity Head, inches of H2O	1.698605113	1.90263723	1.790530380	1.797
Average Stack Gas Velocity, feet/second	89.10	94.00	91.65	91.583
Stack Cross-Sectional Area, square feet	21.648	21.648	21.648	21.648
Dry Volumetric Flow Rate, dry scfm	68,562.7	73,088.3	70,005.6	70,552.200
Actual Wet Volumetric Flue Gas Flow Rate, acfm	115,730.2	122,094.7	119,042.4	118,955.767
Percent Isokinetic of Sampling Rate, %	86.1	80.6	84.3	83.667
Percent Excess Air, %	147.9	145.0	131.2	141.367
F-Factor, dscfm/MMBtu @ %O2	9240	9240	9240	9,240
Round Duct Diameter, inches	63	63	63	
Rectangular Duct Width, inches	0	0	0	
Rectangular Duct Length, inches	0	0	0	
Fw				
Fc	1830	1830	1830	1,830

## Test 4

### Facility Information:

SCC / 10100801: External Combustion Boilers - Electric Generation - Petroleum Coke - All Boiler Sizes

Permitted Maximum Process: 223 MMBtu/hr

### Description of the source (including control equipment).

Facilities uses a Rankine Cycle Power generation system that fires petroleum coke as a primary fuel in a circulating fluidized bed combustor (CFBC). The systems also burn fuel oil during plant start-up and under certain, infrequent transitional operating modes. Each facility generates 20.5 megawatts of power and is comprised of the following systems:

- Circulating Fluidized Bed Combustor
- Solid Fuel Receiving and Storage
- Sorbent Receiving and Storage
- Cooling Tower and Condenser
- Fly Ash Handling System

Each CFBC burns approximately 13,780 lb/hr of petroleum coke generating a heat input of 202 MMBtu/hr. Flue gas exits the fluidized bed at 1700 °F and passes through the superheater and economizer. The gas exits the economizer at 325 °F.

Sorbent in the form of limestone is added along with the solid fuel in the fluidized bed to suppress SO<sub>2</sub> emissions. Emissions of NO<sub>x</sub> from the CFBC are controlled by injection of ammonia for selective non-catalytic reduction. The ammonia is introduced at the inlet to each of seven recycle cyclones and is injected at a rate of approximately 100-150 lb/hr. Particulate emissions are controlled by a high temperature pulse-jet baghouse.

Petroleum coke fuel is unloaded into a silo system equipped with a baghouse. The sorbent material for the fluidized bed is loaded into the system with a bin vent. Ammonia is loaded into a storage tank, from which it is piped to the NO<sub>x</sub> control devices. The ash, excess bed material, and the particulate matter collected in the CFBC baghouse are piped to a silo to await collection. A cooling tower is used to cool the process water from the steam power cycle.

A continuous emissions monitoring system (CEMS) serves each boiler unit. The CEMS incorporates analyzers for reporting concentrations and mass emission rates of O<sub>2</sub>, CO, NO<sub>x</sub> and SO<sub>2</sub>.

**Sampling Location Information:**

Location	Round Duct Diam.	Rect. Duct Length /Width	Equiv. Diam	Distance from upstream dist.	Distance from downstream dist.	Number of Traverse Ports	Min.Traverse Points
Stack	54	0 0	0	0	0	2	12

**Test Parameter Information:**

Location	Target Parameter	Test Method	Number of Test Runs	Test Run Duration	Sample Points	Comments
Stack	Filterable PM2.5	OTM - 27/28	3	120	0	
Stack	Inorganic (Aqueous) Condensable Part.	OTM - 27/28	3	120	0	
Stack	Organic Condensable Particulate	OTM - 27/28	3	120	0	
Stack	Total PM2.5	OTM - 27/28	3	120	0	

**The following describes any modifications and/or deviations to the applicable test methods. If alternative methods were requested, see the attachments for documentation of request AND approval, including dates.**

No modifications were made.

**Sampling / Stack Data Results**

Location Stack - OTM - 27/28

	1-OTM	2-OTM	3-OTM	Average
Run Number	1-OTM	2-OTM	3-OTM	
Test Date	9/15/2010	9/15/2010	9/15/2010	
Run Start Time	12:22:00 PM	3:55:00 PM	6:32:00 PM	
Run Finish Time	3:02:45 PM	6:00:45 PM	8:26:45 PM	
Net Run Time, minutes	144	121	121.25	
Dry Gas Meter Volume Sampled, dscf	45.969	46.420	46.328	46.239
Moisture Content of Stack Gas, %	2.75	1.40	2.71	2.287
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Carbon Dioxide, %	15.694	15.628	15.63	15.651
Oxygen, %	4.54	4.572	4.57	4.561
Average Stack Gas Temperature, °F	327.00	326.75	327.42	327.057
Dry Volumetric Flow Rate, dry scfm	52,398.4	53,941.3	53,012.0	53,117.233
Actual Wet Volumetric Flue Gas Flow Rate, acfm	80,633.3	81,845.2	81,587.5	81,355.333
Percent Isokinetic of Sampling Rate, %	84.5	98.6	100.0	94.367
F-Factor, dscf/MMBtu @ %O <sub>2</sub>	10200	10200	10200	10,200
Fw	0	0	0	0.000
Fc	0	0	0	0.000

**Emissions Summary**

**Location: Stack - OTM - 27/28**

**Compound: Filterable PM2.5**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
Run Number	1-OTM	2-OTM	3-OTM	
Mass_mg	0.2	0.2	0.2	2.00E-01
lb/hr	3.02E-02	3.07E-02	3.03E-02	3.04E-02
gr/dscf	6.71E-05	6.65E-05	6.66E-05	6.67E-05
lb/mmBtu	1.25E-04	1.24E-04	1.24E-04	1.24E-04

**Compound: Inorganic (Aqueous) Condensable**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
Run Number	1-OTM	2-OTM	3-OTM	
Mass_mg	3.12	2.36	1.34	2.27E+00
lb/hr	4.70E-01	3.63E-01	2.03E-01	3.45E-01
gr/dscf	1.05E-03	7.85E-04	4.46E-04	7.60E-04
lb/mmBtu	1.95E-03	1.46E-03	8.32E-04	1.41E-03

**Compound: Organic Condensable Particulate**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
Run Number	1-OTM	2-OTM	3-OTM	
Mass_mg	2.49	1.17	4.48	2.71E+00
lb/hr	3.75E-01	1.80E-01	6.78E-01	4.11E-01
gr/dscf	8.36E-04	3.89E-04	1.49E-03	9.05E-04
lb/mmBtu	1.56E-03	7.25E-04	2.78E-03	1.69E-03

**Compound: Total PM2.5**

	1-OTM	2-OTM	3-OTM	<b>Average</b>
Run Number	1-OTM	2-OTM	3-OTM	
Mass_mg	5.81	3.73	6.02	5.19E+00
lb/hr	8.76E-01	5.73E-01	9.11E-01	7.87E-01
gr/dscf	1.95E-03	1.24E-03	2.01E-03	1.73E-03
lb/mmBtu	3.63E-03	2.31E-03	3.74E-03	3.23E-03

**Process Run Data**

<b>Run</b>	<b>Name</b>	<b>Value</b>	<b>UOM</b>	<b>Target Value</b>	<b>Comments</b>
1	Coke Burned	7.30	Tons/hr	0	
1	ammonia injection	0.99	gal/min	0	
1	sorbent injection	3.52	klb/hr	0	
1	Heat Input	196.85	mmBtu/hr	0	
2	Coke Burned	7.39	Tons/hr	0	
2	ammonia injection	1.09	gal/min	0	
2	sorbent injection	4.09	klb/hr	0	
2	Heat Input	199.18	mmBtu/hr	0	
3	Coke Burned	7.465	Tons/hr	0	
3	ammonia injection	1.16	gal/min	0	
3	sorbent injection	4.07	klb/hr	0	
3	Heat Input	201.47	mmBtu/hr	0	

**APCD Run Data**

<b>Run</b>	<b>Name</b>	<b>Value</b>	<b>UOM</b>	<b>Target Value</b>	<b>Comments</b>
1	Integral Cyclones	0		0	
1	Ammonia Injection	0		0	
1	Sorbent Injection	0		0	
1	BAGHOUSE (pulse-jet)	0		0	

**Process Lab Run Data**



### Sampling / Stack Data Results Detail

Location Stack - OTM - 27/28

	1-OTM	2-OTM	3-OTM	Average
Run Number	1-OTM	2-OTM	3-OTM	
Test Date	9/15/2010	9/15/2010	9/15/2010	
Run Start Time	12:22:00 PM	3:55:00 PM	6:32:00 PM	
Run Finish Time	3:02:45 PM	6:00:45 PM	8:26:45 PM	
Net Traversing Points	12	12	12	
Net Run Time, minutes	144	121	121.25	
Nozzle Diameter, inches	0.145	0.145	0.145	0.145
Pitot Tube Coefficient	0.817	0.817	0.817	0.817
Dry Gas Meter Calibration Factor	1.002	1.002	1.002	1.002
Barometric Pressure, inches of Mercury	29.82	29.82	29.82	29.820
Average Orifice Meter Differential, inches H <sub>2</sub> O	0.60	0.60	0.60	0.600
Dry Gas Meter Volume Sampled, cubic feet	48.764	50.025	49.451	49.413
Average Dry Gas Meter Temperature, °F	100.17	109.08	103.67	104.307
Dry Gas Meter Volume Sampled, dscf	45.969	46.420	46.328	46.239
Total Moisture Liquid collected, g	27.7	14.1	27.3	23.033
Volume of Water Vapor, standard cubic feet	1.30	0.66	1.29	1.083
Moisture Content of Stack Gas, %	2.75	1.40	2.71	2.287
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Dry Mole Fraction	0.9725	0.986	0.9729	0.977
Carbon Dioxide, %	15.694	15.628	15.63	15.651
Oxygen, %	4.54	4.572	4.57	4.561
Carbon Monoxide & Nitrogen, %	79.766	79.8	79.8	79.789
Fuel Factor	1.04	1.04	1.04	
Dry Molecular Weight, lb/lb-Mole	30.69	30.68	30.68	30.683
Wet Molecular weight, lb/lb-Mole	30.34	30.50	30.34	30.393
Flue Gas Static Pressure, inches of H <sub>2</sub> O	-0.24	-0.23	-0.24	-0.237
Absolute Flue Gas Pressure, inches of Mercury	29.80	29.80	29.80	29.800
Average Stack Gas Temperature, °F	327.00	326.75	327.42	327.057
Average Velocity Head, inches of H <sub>2</sub> O	1.681323373	1.74209043	1.720595869	1.715
Average Stack Gas Velocity, feet/second	84.50	85.77	85.50	85.257
Stack Cross-Sectional Area, square feet	15.904	15.904	15.904	15.904
Dry Volumetric Flow Rate, dry scfm	52,398.4	53,941.3	53,012.0	53,117.2
Actual Wet Volumetric Flue Gas Flow Rate, acfm	80,633.3	81,845.2	81,587.5	81,355.3
Percent Isokinetic of Sampling Rate, %	84.5	98.6	100.0	94.367
Percent Excess Air, %	27.5	27.7	27.7	27.633
F-Factor, dscfm/MMBtu @ %O <sub>2</sub>	10200	10200	10200	10,200
Round Duct Diameter, inches	54	54	54	
Rectangular Duct Width, inches	0	0	0	
Rectangular Duct Length, inches	0	0	0	
Fw	0	0	0	0.000
Fc	0	0	0	0.000

**Test 5**

**Facility Information:**

**SCC / 20100201:** Internal Combustion Engines - Electric Generation - Natural Gas - Turbine

**Permitted Maximum Process:** 2,124 MMBtu/hr

**Target Process Test:** normal conditions

**Description of the source (including control equipment).**

The facility includes two Siemens/Westinghouse 501F turbine engines, each with a Nooter-Eriksen heat recovery steam generator (HSRG) with duct burners. The units operate in combined cycle mode and are equipped with selective catalytic reduction (SCR) systems and oxidation catalysts for emissions control. A dry extractive continuous emissions monitoring system (CEMS) measures O<sub>2</sub>, CO and NO<sub>x</sub> emissions at the stack of each unit. The NO<sub>x</sub> concentrations are also measured at the SCR inlet to provide process data.

Samples were collected from the exhaust stacks, from sampling ports that meet both EPA and CARB Method 1 criteria. Sampling traverse points were located according to the applicable reference methods.

**Sampling Location Information:**

<b>Location</b>	<b>Round Duct Diam.</b>	<b>Rect. Duct Length /Width</b>	<b>Equiv. Diam</b>	<b>Distance from upstream dist.</b>	<b>Distance from downstream dist.</b>	<b>Number of Traverse Ports</b>	<b>Min.Traverse Points</b>
Turbine Stack	215.6	0 0	0	0	0	4	12

**Test Parameter Information:**

<b>Location</b>	<b>Target Parameter</b>	<b>Test Method</b>	<b>Number of Test Runs</b>	<b>Test Run Duration</b>	<b>Sample Points</b>	<b>Comments</b>
Turbine Stack	Inorganic (Aqueous) Condensable Part.	OTM - 27/28	3	180	0	
Turbine Stack	Organic Condensible Particulate	OTM - 27/28	3	180	0	
Turbine Stack	Filterable PM2.5	OTM - 27/28	3	180	0	
Turbine Stack	Total PM2.5	OTM - 27/28	3	180	0	

**The following describes any modifications and/or deviations to the applicable test methods. If alternative methods were requested, see the attachments for documentation of request AND approval, including dates.**

## Sampling / Stack Data Results

Location Turbine Stack - OTM - 27/28

	1-PM2.5	2-PM2.5	3-PM2.5	Average
Run Number	1-PM2.5	2-PM2.5	3-PM2.5	
Test Date	3/9/2010	3/9/2010	3/10/2010	
Run Start Time	11:00:00 AM	3:08:00 PM	8:12:00 AM	
Run Finish Time	2:04:00 PM	6:14:45 PM	11:19:00 AM	
Net Run Time, minutes	178.75	180	180.25	
Dry Gas Meter Volume Sampled, dscf	64.442	66.707	65.525	65.558
Moisture Content of Stack Gas, %	10.88	9.37	7.73	9.327
Moisture Saturation at Stack Gas Temperature, %	98.79	97.81	97.32	97.973
Carbon Dioxide, %	4.515	4.523	4.516	4.518
Oxygen, %	13.065	13.053	13.056	13.058
Average Stack Gas Temperature, °F	210.75	210.25	210.00	210.333
Dry Volumetric Flow Rate, dry scfm	852,883.4	877,738.6	887,293.7	872,638.6
Actual Wet Volumetric Flue Gas Flow Rate, acfm	1,231,380.6	1,245,223.2	1,235,944.1	1,237,515.9
Percent Isokinetic of Sampling Rate, %	88.5	88.4	85.8	87.567
F-Factor, dscf/MMBtu @ %O2	8743	8743	8743	8,743
Fw	0	0	0	0.000
Fc	0	0	0	0.000

**Emissions Summary**

**Location: Turbine Stack - OTM - 27/28**

**Compound: Filterable PM2.5**

	1-PM2.5	2-PM2.5	3-PM2.5	<b>Average</b>
RunNumber	1-PM2.5	2-PM2.5	3-PM2.5	
Mass_mg	0.2	0.2	0.21	2.03E-01
lb/hr	3.50E-01	3.48E-01	3.76E-01	3.58E-01
gr/dscf	4.79E-05	4.63E-05	4.95E-05	4.79E-05
lb/mmBtu	1.60E-04	1.54E-04	1.65E-04	1.60E-04

**Compound: Inorganic (Aqueous) Condensable**

	1-PM2.5	2-PM2.5	3-PM2.5	<b>Average</b>
RunNumber	1-PM2.5	2-PM2.5	3-PM2.5	
Mass_mg	2.9	1.46	1.38	1.91E+00
lb/hr	5.08E+00	2.54E+00	2.47E+00	3.36E+00
gr/dscf	6.94E-04	3.38E-04	3.25E-04	4.52E-04
lb/mmBtu	2.31E-03	1.12E-03	1.08E-03	1.50E-03

**Compound: Organic Condensable Particulate**

	1-PM2.5	2-PM2.5	3-PM2.5	<b>Average</b>
RunNumber	1-PM2.5	2-PM2.5	3-PM2.5	
Mass_mg	0.1	0.1	0.1	1.00E-01
lb/hr	1.75E-01	1.74E-01	1.79E-01	1.76E-01
gr/dscf	2.39E-05	2.31E-05	2.36E-05	2.35E-05
lb/mmBtu	7.98E-05	7.70E-05	7.84E-05	7.84E-05

**Compound: Total PM2.5**

	1-PM2.5	2-PM2.5	3-PM2.5	<b>Average</b>
RunNumber	1-PM2.5	2-PM2.5	3-PM2.5	
Mass_mg	3.2	1.76	1.69	2.22E+00
lb/hr	5.60E+00	3.06E+00	3.03E+00	3.90E+00
gr/dscf	7.66E-04	4.07E-04	3.98E-04	5.24E-04
lb/mmBtu	2.55E-03	1.35E-03	1.32E-03	1.74E-03

**Process Run Data**

Run	Name	Value	UOM	Target Value	Comments
1	Heat Input	2,105	MMBtu/hr	0	
1	ammonia injection	332.616	lb/hr	0	
2	Heat Input	2,100	MMBtu/hr	0	
2	ammonia injection	328.301	lb/hr	0	
3	Heat Input	2,116	MMBtu/hr	0	
3	ammonia injection	335.44	lb/hr	0	

**APCD Run Data**

Run	Name	Value	UOM	Target Value	Comments
1	Oxidation Catalyst	0		0	
1	Selective catalytic reductions (SCR)	0		0	

**Process Lab Run Data**

## Sampling / Stack Data Results Detail

Location Turbine Stack - OTM - 27/28

	1-PM2.5	2-PM2.5	3-PM2.5	Average
Run Number	1-PM2.5	2-PM2.5	3-PM2.5	
Test Date	3/9/2010	3/9/2010	3/10/2010	
Run Start Time	11:00:00 AM	3:08:00 PM	8:12:00 AM	
Run Finish Time	2:04:00 PM	6:14:45 PM	11:19:00 AM	
Net Traversing Points	12	12	12	
Net Run Time, minutes	178.75	180	180.25	
Nozzle Diameter, inches	0.149	0.149	0.149	0.149
Pitot Tube Coefficient	0.8136	0.8136	0.8136	0.814
Dry Gas Meter Calibration Factor	0.977	0.977	0.977	0.977
Barometric Pressure, inches of Mercury	29.6	29.6	29.6	29.600
Average Orifice Meter Differential, inches H <sub>2</sub> O	0.46	0.46	0.44	0.453
Dry Gas Meter Volume Sampled, cubic feet	65.140	67.360	67.238	66.579
Average Dry Gas Meter Temperature, °F	56.46	55.92	64.25	58.877
Dry Gas Meter Volume Sampled, dscf	64.442	66.707	65.525	65.558
Total Moisture Liquid collected, g	167.2	146.5	116.6	143.433
Volume of Water Vapor, standard cubic feet	7.87	6.90	5.49	6.753
Moisture Content of Stack Gas, %	10.88	9.37	7.73	9.327
Moisture Saturation at Stack Gas Temperature, %	98.79	97.81	97.32	97.973
Dry Mole Fraction	0.8912	0.9063	0.9227	0.907
Carbon Dioxide, %	4.515	4.523	4.516	4.518
Oxygen, %	13.065	13.053	13.056	13.058
Carbon Monoxide & Nitrogen, %	82.42	82.424	82.428	82.424
Fuel Factor	1.74	1.73	1.74	
Dry Molecular Weight, lb/lb-Mole	29.25	29.25	29.24	29.247
Wet Molecular weight, lb/lb-Mole	28.03	28.20	28.37	28.200
Flue Gas Static Pressure, inches of H <sub>2</sub> O	-0.76	-0.76	-0.76	-0.760
Absolute Flue Gas Pressure, inches of Mercury	29.54	29.54	29.54	29.540
Average Stack Gas Temperature, °F	210.75	210.25	210.00	210.333
Average Velocity Head, inches of H <sub>2</sub> O	1.671980650	1.72135801	1.706725908	1.700
Average Stack Gas Velocity, feet/second	80.95	81.86	81.25	81.353
Stack Cross-Sectional Area, square feet	253.527	253.527	253.527	253.527
Dry Volumetric Flow Rate, dry scfm	852,883.4	877,738.6	887,293.7	872,638.6
Actual Wet Volumetric Flue Gas Flow Rate, acfm	1,231,380.6	1,245,223.2	1,235,944.11	1,237,515.9
Percent Isokinetic of Sampling Rate, %	88.5	88.4	85.8	87.567
Percent Excess Air, %	150.3	149.9	150.0	150.067
F-Factor, dscfm/MMBtu @ %O <sub>2</sub>	8743	8743	8743	8,743
Round Duct Diameter, inches	215.6	215.6	215.6	
Rectangular Duct Width, inches	0	0	0	
Rectangular Duct Length, inches	0	0	0	
Fw	0	0	0	0.000
Fc	0	0	0	0.000

**Test 6****Facility Information:**

**SCC / 20100102:** Internal Combustion Engines - Electric Generation - Distillate Oil (Diesel) - Reciprocating

**Permitted Maximum Process:** Rated at 2922 BHP

**Description of the source (including control equipment).**

Engine #1; Cummins; Model QSK60-G6; Rated at 2922 BHP; equipped with a Siemens SINOX 2000 selective catalytic reduction (SCR) system which uses urea as the reducing agent. The unit is used to drive an electrical generator to supply backup power.

**Sampling Location Information:**

Location	Round	Rect. Duct Length /Width	Equiv. Diam	Distance from upstream dist.	Distance from downstream dist.	Number of Traverse Ports	Min.Traverse Points
	Duct Diam.						
Unit 1	16.967	0	0	12	48	2	12

**Test Parameter Information:**

Location	Target Parameter	Test Method	Number of Test Runs	Test Run Duration	Sample Points	Comments
Unit 1	Filterable PM10	OTM - 27/28	3	120	0	
Unit 1	Filterable PM2.5 - PM10	OTM - 27/28	3	120	0	
Unit 1	Total PM2.5	OTM - 27/28	3	120	0	



**Sampling / Stack Data Results**

Location Unit 1 - OTM - 27/28

				<b>Average</b>
Run Number	1	2	3	
Test Date	10/16/2010	10/16/2010	10/16/2010	
Run Start Time	9:40:00 AM	12:29:00 PM	2:00:00 PM	
Run Finish Time	11:40:00 AM	1:29:00 PM	3:00:00 PM	
Net Run Time, minutes	119.78	59.94	60.06	
Dry Gas Meter Volume Sampled, dscf	46.246	22.857	23.664	30.922
Moisture Content of Stack Gas, %	5.11	9.00	9.03	7.713
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Carbon Dioxide, %	6.8	6.8	6.8	6.800
Oxygen, %	10.7	10.6	10.6	10.633
Average Stack Gas Temperature, °F	644.08	644.08	644.08	644.080
Dry Volumetric Flow Rate, dry scfm	4,914.8	4,746.5	4,749.4	4,803.567
Actual Wet Volumetric Flue Gas Flow Rate, acfm	10,841.5	10,917.8	10,928.1	10,895.800
Percent Isokinetic of Sampling Rate, %	97.9	100.1	103.4	100.467
F-Factor, dscf/MMBtu @ %O2	9190	9190	9190	9,190
Fw	10320	10320	10320	10,320
Fc	1420	1420	1420	1,420

**Emissions Summary**

**Location: Unit 1 - OTM - 27/28**

**Compound: Filterable PM10 (and greater)**

	1	2	3	<b>Average</b>
RunNumber	1	2	3	
Mass_mg	89.3	12.2	5.4	3.56E+01
lb/hr	1.26E+00	3.35E-01	1.43E-01	5.79E-01
gr/dscf	2.98E-02	8.24E-03	3.52E-03	1.40E-02

**Compound: Filterable PM2.5 - PM10**

	1	2	3	<b>Average</b>
RunNumber	1	2	3	
Mass_mg	7.7	1.8	1	3.50E+00
lb/hr	1.08E-01	4.94E-02	2.65E-02	6.10E-02
gr/dscf	2.57E-03	1.22E-03	6.52E-04	1.00E-03

**Compound: Total PM2.5**

	1	2	3	<b>Average</b>
RunNumber	1	2	3	
Mass_mg	23	209.2	108.6	1.14E+02
lb/hr	3.23E-01	5.75E+00	2.88E+00	2.98E+00
gr/dscf	7.68E-03	1.41E-01	7.08E-02	7.30E-02

**Process Run Data**

<b>Run</b>	<b>Name</b>	<b>Value</b>	<b>UOM</b>	<b>Target Value</b>	<b>Comments</b>
1	Distillate Oil (Diesel) Burned	0.114	1000 gal/hr	0	
2	Distillate Oil (Diesel) Burned	0.114	1000 gal/hr	0	
3	Distillate Oil (Diesel) Burned	0.114	1000 gal/hr	0	
1	Engine Load	2922	BHP/hr	0	
2	Engine Load	2922	BHP/hr	0	
3	Engine Load	2922	BHP/hr	0	
1	Urea Injection	7.6	gal/hr	0	
2	Urea Injection	7.6	gal/hr	0	
3	Urea Injection	7.6	gal/hr	0	

**APCD Run Data**

<b>Run</b>	<b>Name</b>	<b>Value</b>	<b>UOM</b>	<b>Target Value</b>	<b>Comments</b>
1	BAGHOUSE	0		0	
1	SELECTIVE NONCATALYTIC REDUCTION FOR NOX	0		0	
1	DRY LIMESTONE INJECTION	0		0	

**Process Lab Run Data**

## Sampling / Stack Data Results Detail

Location Unit 1 - OTM - 27/28

				Average
Run Number	1	2	3	
Test Date	10/16/2010	10/16/2010	10/16/2010	
Run Start Time	9:40:00 AM	12:29:00 PM	2:00:00 PM	
Run Finish Time	11:40:00 AM	1:29:00 PM	3:00:00 PM	
Net Traversing Points	24	24	24	
Net Run Time, minutes	119.78	59.94	60.06	
Nozzle Diameter, inches	0.152	0.152	0.152	0.152
Pitot Tube Coefficient	0.802	0.802	0.802	0.802
Dry Gas Meter Calibration Factor	0.9988	0.9988	0.9988	0.999
Barometric Pressure, inches of Mercury	30	30	30	30.000
Average Orifice Meter Differential, inches H2O	0.44	0.50	0.46	0.467
Dry Gas Meter Volume Sampled, cubic feet	46.653	23.153	23.950	31.252
Average Dry Gas Meter Temperature, °F	74.00	76.27	75.77	75.347
Dry Gas Meter Volume Sampled, dscf	46.246	22.857	23.664	30.922
Total Moisture Liquid collected, g	52.9	48.1	50	50.333
Volume of Water Vapor, standard cubic feet	2.49	2.26	2.35	2.367
Moisture Content of Stack Gas, %	5.11	9.00	9.03	7.713
Moisture Saturation at Stack Gas Temperature, %	100.00	100.00	100.00	100.000
Dry Mole Fraction	0.9489	0.91	0.9097	0.923
Carbon Dioxide, %	6.8	6.8	6.8	6.800
Oxygen, %	10.7	10.6	10.6	10.633
Carbon Monoxide & Nitrogen, %	82.5	82.6	82.6	82.567
Fuel Factor	1.50	1.51	1.51	
Dry Molecular Weight, lb/lb-Mole	29.52	29.51	29.51	29.513
Wet Molecular weight, lb/lb-Mole	28.93	28.47	28.47	28.623
Flue Gas Static Pressure, inches of H2O	-1.5	-1.5	-1.5	-1.500
Absolute Flue Gas Pressure, inches of Mercury	29.89	29.89	29.89	29.890
Average Stack Gas Temperature, °F	644.08	644.08	644.08	644.080
Average Velocity Head, inches of H2O	2.206771990	2.20255240	2.206771990	2.205
Average Stack Gas Velocity, feet/second	115.09	115.90	116.01	115.667
Stack Cross-Sectional Area, square feet	1.570	1.570	1.570	1.570
Dry Volumetric Flow Rate, dry scfm	4,914.8	4,746.5	4,749.4	4,803.567
Actual Wet Volumetric Flue Gas Flow Rate, acfm	10,841.5	10,917.8	10,928.1	10,895.800
Percent Isokinetic of Sampling Rate, %	97.9	100.1	103.4	100.467
Percent Excess Air, %	96.6	94.6	94.6	95.267
F-Factor, dscfm/MMBtu @ %O2	9190	9190	9190	9,190
Round Duct Diameter, inches	16.967	16.967	16.967	
Rectangular Duct Width, inches	0	0	0	
Rectangular Duct Length, inches	0	0	0	
Fw	10320	10320	10320	10,320
Fc	1420	1420	1420	1,420