July 2, 2014

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Permitting Section Administrator
Florida Department of Environmental Protection
Division of Air Resource Management
Office of Air Permitting and Compliance
2600 Blair Stone Road, M.S. 5505
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E-Mail Notification
David.Read@dep.state.fl.us

RE: Tampa Electric Company - Big Bend Station
Request for Information Response
Revise CAM Plan to authorize PM CPMS
Project No. 0570039-69-AV
Title V Permit No. 0570039-067-AV
Facility ID No. 0570039

Dear Mr. Read:

On March 11, 2014, Tampa Electric Company ("TEC") submitted a permit application to the Florida Department of Environmental Protection ("Department"). The application requests a revision to the compliance assurance monitoring ("CAM") plan to replace the existing continuous opacity monitors ("COMS") with particulate matter continuous parametric monitoring systems ("PM CPMS"). The application also requests using the PM CPMS to demonstrate compliance in lieu of the annual visible emission ("VE") testing requirement. On April 7, 2014, the Department submitted a request for additional information (RAI) for the above referenced permit application. TEC's responses to these comments are discussed below.

Comment 1
Through most of the application, the new PM monitors are referred to as continuous parameter monitoring systems (CPMS); however, in the revised CAM plan, they are referred to as continuous emissions monitoring systems (CEMS). Please clarify whether the new monitors directly read actual particulate matter emissions equivalent to a Method 5 stack test or if they establish a surrogate parameter that is in some way indicative of approximate actual emissions. Please provide specific manufacturer's details related to the these monitors, including the make, model, sensitivity, range of operation, calibration requirements, maintenance requirements, expected percentage of operating time availability and manufacturer's contact information. Also, describe the design of the monitors to fully explain whether they measure actual PM emissions or if they measure the opacity of the flue gas.

TEC Response 1

The PM CEMS (Sick Maihak, Model No. FWE200) is based on the forward light scattering principle. A laser diode directs a beam of modulated light in the visible range (wavelength approximately 650 nm) at the dust particles in the gas flow. The light scattered by the particles is recorded by a highly sensitive detector, which is positioned at an angle of approximately 15° to the beam axis. The received signal is electrically amplified and supplied to the measuring channel of a microprocessor for processing. The point of intersection between the transmitted beam and the receiver aperture defines the measuring volume in the gas duct. As a result, very small particle concentrations can be recorded due to the extremely high sensitivity of the instrument. A product catalog detailing the proposed PM CEMS is shown attached.

PM CEMS are an indirect measure of actual PM emissions. PM CEMS utilize two site specific correlations to estimate actual PM emissions: Performance Specification 11 (PS-11)/Procedure 2 and continuous parametric monitoring. PS-11 is a site-specific correlation of the PM CEMS response against manual gravimetric reference method measurements (including those made using EPA Test Methods 5, 5B, 5I, or 17). This correlation requires 15 manual gravimetric reference runs at low, medium and high load conditions to determine the PM response over the total range. This method differs from traditional, direct monitor CEMS that monitor against gaseous pollutants of known concentration.

PM CEMS can also utilize a continuous parametric monitoring correlation. Raw output (e.g. mg/scm or milliamps) from the PM CEMS is correlated to either a 1-hour PM test (e.g. MATS) or a derived threshold from a range of stack testing measurements. The raw output is continuously monitored against the established threshold to ensure compliance of the permitted PM limit. An annual PM test is conducted annually to demonstrate compliance of the permitted PM limit. This permit application proposes to use a PM CEMS as a continuous parametric monitoring system and an annual stack test to demonstrate compliance.

Comment 2
If the PM monitors do not directly measure actual PM emissions, please explain your request to remove the annual PM compliance testing requirements.

TEC Response 2
The original application requested operation of a PM CEMS using PS-11. Under this request, PS-11 would satisfy the annual stack testing requirement; thus, the application requested removal of the annual testing requirement. However, the application was subsequently modified to a continuous parametric monitoring approach, which does not utilize PS-11. The annual stack test condition was not corrected and was submitted in error. This permit application proposes to use a PM CPMS and annual stack test to demonstrate compliance with the CAM requirements.

Comment 3
Rule 62-296.405, F.A.C. does not require the installation of a COMS for emissions units using a wet scrubber, but it does provide a waiver from annual Method 9 visible emissions testing for units that have a transmissometer installed, certified, calibrated, operated and maintained in accordance with the provisions of 40 CFR Part 75. Therefore, the removal of the COMS from Units 1-3 is allowed, but annual VE testing will be required. Please clarify which method you wish to retain for demonstrating compliance with the VE limits for these units.
TEC Response 3

The facility continuously monitors NOx, SO_2 and PM. The request is to exempt the annual VE test requirement and certified transmissometer requirements. The justification for removing annual VE test requirement is discussed in Response 6.

Comment 4
Unit 4 is regulated pursuant to 40 CFR 60, Subpart Da, which requires the installation and operation of a COMS. This requirement is waived under 40 CFR 60.49Da(a)(4)(ii) for "owners or operators of affected facilities that install, calibrate, operate, and maintain a particulate matter continuous parametric monitoring system (PM CPMS) according to the requirements specified in subpart UUUUU of part 63". Please describe the requirements from 40 CFR 63, Subpart UUUUU that apply to Unit 4 for PM monitoring and explain how the selected monitoring system meets these requirements.

TEC Response 4
The application is requesting to revise the CAM plan to remove the COMS and utilize a PM CPMS. This application is not requesting the PM CPMS requirement pursuant to subpart UUUUU of part 63.

Subpart UUUUU of part 63 authorizes the use of a PM CEMS or a PM CPMS for filterable PM as a surrogate of non-mercury metals. The rule requires the PM CEMS to be certified in accordance with PS-11 and Procedure 2 of 40 CFR part 60, Appendices B and F, respectively. Under this option, the quarterly stack testing is not required.

As an alternative, the rule specifies a PM CPMS option and an associated operating limit. A Method 5 or Method 29 stack test must be conducted annually rather than quarterly, in which case the permittee is required to re-establish the operating limit during each annual performance test. A PM CPMS does not need to meet the requirements for a PM CEMS under PS-11. The 30-boiler operating day rolling average is calculated by all valid hourly PM values collected during the 30 boiler operating period.

Comment 5
Regarding your requested revision to Specific Condition A.12., please confirm that it is your desire to remove the allowable limitation for excess visible emissions resulting from boiler cleaning and load changes from your permit.

TEC Response 5
The removal of the COMS will make the Specific Condition A.12 no longer applicable. However, TEC would like retain this condition in the permit by referencing Rule 62-210.700(3), F.A.C.

Comment 6
Regarding your requested revisions to Specific Conditions A.44. and B.44. to allow the use of the PM CPMS to satisfy the annual VE test requirement, please explain how the selected PM CPMS records visible emissions readings equivalent to a COMS or a Method 9 test. Alternatives to specified test methods are granted through the approval of an Alternate Sampling Procedure (ASP) issued pursuant to the requirements of Rule 62-297.620, F.A.C. Pursuant to Rule 62-297.620(2), F.A.C., to satisfy the requirements for requesting an ASP, please provide the following information, at a minimum:

(a) Specific emissions unit and permit number, if any, for which exception is requested.

(b) The specific provision(s) of this chapter (62-296, F.A.C.) from which an exception is sought.

(c) The basis for the exception, including but not limited to any hardship which would result from compliance with the provisions of this chapter.

(d) The alternate procedure(s) or requirement(s) for which approval is sought and a demonstration that such alternate procedure(s) or requirement(s) shall be adequate to demonstrate compliance with applicable emission limiting standards contained in the rules of the department or any permit issued pursuant to those rules.

TEC Response 6(a)
The exception is requested for Common Stack CS0W1 (Units 1 &2), Unit 3 and Unit 4.

TEC Response 6(b)
The exception is to remove the annual VE testing requirement pursuant to Rule 62-297.310(7)(a)4a, F.A.C. In lieu of Method 9 testing, a certified transmissometer also may be used. The exception also removes the transmissometer requirement pursuant to Rule 62-296.405(1)(e)1., F.A.C.

TEC Response 6(c)
The EPA evaluated compliance assurance monitoring protocols for PM[1]. The study shows a good correlation between actual PM emissions and opacity at the outlet of the precipitator. The correlation was determined to be statistically significant R= 0.95. The test data showed PM emissions from the precipitator at full power are typically less than 0.03 lb/mmBtu and have less than 5 percent opacity. The opacity was shown to reach 20 percent when the actual emissions from the precipitator approached the emission limit of 0.24 lb/mmbtu. Despite the fact that opacity and mass emissions can vary significantly with the particle size distribution and the refractive index of the ash particles, EPA believes opacity can serve as a very useful indicator. However, the evaluation did not address the relationship between opacity and actual PM emissions for systems equipped with a wet stack and FGD system.

Statistical analyses of the PM CEMS test data were evaluated to determine the relationship between opacity and actual PM emissions. The Pearson Product-Moment Correlation Coefficient methodology was performed between opacity and actual PM emissions. The correlation coefficients were calculated to be R=0.36 and R= -0.23 for Unit 3 and Unit 4, respectively. Since the correlations are below critical threshold values ($p>0.05$), there is no significant statistical relationship between opacity at the outlet of the precipitator and actual PM emission at the wet stack. This poor relationship is attributed to the operation of the FGD system and wet stack.

[1] U.S. Environmental Protection Agency, *Compliance Assurance Monitoring (CAM) Protocol for an Electrostatic Precipitator (ESP) Controlling Particulate Matter (PM) Emissions from a Coal Powered Plant (Proposed)*, Office of Air Quality Planning and Standards, Research Triangle Park, NC. April 2003, < http://www.epa.gov/ttn/emc/cam/espcam.pdf>.

Therefore, opacity is a poor indicator of actual PM emissions in a wet stack and is not recommended for compliance demonstration purposes.

Statistical analyses of the PM CEMS test data were also evaluated to determine the relationship between PM CEMS response and actual PM emissions. Similarly, the Pearson Product-Moment Correlation Coefficient methodology was performed between PM CEMS response and actual PM emissions. The correlation coefficients were calculated to be R=0.67 and R= 0.82 for Unit 3 and Unit 4, respectively. Since these correlations were above the critical threshold values ($p<0.05$), there is a significant statistical relationship between PM CEMS and actual PM emission at the wet stack. These calculations are simple correlations and different in nature from the specific curve fitting correlation requirements in PS-11. Nevertheless, these correlations show a PM CEMS is an excellent indicator of actual PM emissions from a wet stack. A summary of the statistical analyses are shown in **Table 1**.

Table 1. Statistical Evaluation of the PM CEMS PS-11 Data.

Test	BS-004 Actual PM (mg/acm) [1]	ESP Outlet Opacity (%) [2]	BS-004 PM CEMS (mg/acm) [3]	Test	BS-003 Actual PM (mg/acm) [1]	ESP Outlet Opacity (%) [2]	BS-003 PM CEMS (mg/acm) [3]
1	2.1	2.2	0.74	1	2.4	3.0	0.014
2	4.5	2.2	0.74	2	1.2	3.0	0.0089
3	2.0	1.5	0.55	3	0.8	8.1	0.010
4	2.8	1.5	0.57	4	0.5	8.4	0.0073
5	3.9	7.7	2.6	5	1.0	9.8	0.0091
6	0.6	5.3	0.08	6	1.1	7.3	0.010
7	1.4	5.3	0.08	7	0.4	5.2	1.07
8	0.8	6.0	0.10	8	1.5	5.2	1.07
9	1.3	6.0	0.10	9	1.1	5.1	1.02
10	0.6	4.1	0.08	10	2.3	5.2	1.02
11	0.8	4.1	0.08	11	1.9	5.2	1.01
12	5.6	3.8	1.91	12	2.8	5.1	1.01
13	7.2	3.8	1.91	13	4.5	5.0	1.03
14	4.2	3.6	1.79	14	1.9	5.1	1.03
15	4.0	3.6	1.80	15	5.6	7.9	1.54
16	5.1	3.4	1.68	16	4.7	7.3	1.37
17	2.6	3.4	1.70	17	4.2	10.8	2.68
				18	2.5	10.2	2.49
				19	3.8	11.0	3.01
				20	5.1	11.3	3.01
Correlation		[1]&[2]	[1]&[3]	Correlation		[1]&[2]	[1]&[3]
No. Samples		17	17	No. Samples		20	20
Correlation Coefficient		-0.23	0.82	Correlation Coefficient		0.36	0.67
Correlation Threshold		0.48	0.48	Correlation Threshold		0.44	0.44
Correlation		NO	YES	Correlation		NO	YES

Test	BS-004 Actual PM (mg/acm) [1]	ESP Outlet Opacity (%) [2]	BS-004 PM CEMS (mg/acm) [3]	Test	BS-003 Actual PM (mg/acm) [1]	ESP Outlet Opacity (%) [2]	BS-003 PM CEMS (mg/acm) [3]
Significant?				Significant?			

Under the previous regulatory requirements, which did not contemplate PM CEMS, the only method to assess compliance continuously was routine Method 9 testing or COMS. Now that technology has developed to allow the use of PM CEMS with an annual certification (PS-11), this equipment fulfills the same purpose as an annual transmissometer test; therefore, making a visible emission unnecessary and redundant requirement.

TEC Response 6(d)
The alternative procedure utilizes a PM CPMS on CS0W1, Unit 3 and Unit 4. This procedure continuously monitors the raw output from the PM CPMS in milligrams per standard cubic meter. The output is continuously monitored against a threshold established under CAM. Within an established percentage of the threshold, the permittee would take corrective action to reduce the raw output under the threshold value. In addition, an annual PM stack test would be required to demonstrate compliance with the PM limit pursuant to Rule 62-297.310(7), F.A.C.

Comment 7
Please provide the particulate matter stack test data and corresponding raw parametric data recorded through the automated data acquisition and handling system that was used to establish the proposed surrogate indicator ranges selected to define an excursion. In addition to the raw data, please provide a graphical representation of the data showing the correlation between what is monitored by the CPMS and the actual PM emissions emitted from the stack, along with a justification for the chosen excursion levels. When providing this data and justification, keep in mind that excursion levels should be based on the results of as many different tests as possible and should be set at a level that triggers an inspection and corrective action when monitored parameters deviate from levels that are representative of normal operation, rather than at some arbitrary percentage of the permitted emissions limit. Compliance assurance monitoring requires that operators react to control device deviations from the operating parameters recorded during successful compliance tests representative of normal operation to ensure that control devices are operated to the same level of control as demonstrated during the compliance tests. CAM is not designed to be a direct measurement of compliance with the emissions limits. Because the summary table showing the stack test data for 2013 indicates a fairly low emission rate compared to the allowable limits, it is not clear that the chosen excursion levels correspond to normal operations.

TEC Response 7
The stack test data during the period 2009 to 2013 were evaluated to determine the variation between the PM CEMS response and actual PM emissions. This data does not show a good relationship due to the variations in the equipment operation during this period. Furthermore, this data does not meet the specifications of PS-11. Therefore, this data is not recommended to

establish a representative level that triggers an inspection and corrective action as requested by the Department. A summary of the stack test data is shown in **Table 2**.

Table 2 Stack Test and PM CEMS response date from 2009 to 2013.

Date	Run	Unit 3 PM CEMS (mg/scm) [1]	Unit 3 PM Emissions (mg/scm) [2]	Unit 3 PM Emissions (lb/mmBtu) [3]	Date	Run	Unit 4 PM CEMS (mg/scm) [4]	Unit 4 PM Emissions (mg/scm) [5]	Unit 4 PM Emissions (lb/mmBtu) [6]
6/3/2009	1	-	17.6	0.02	5/2/2009	1	0.86	9.70	0.01
6/3/2009	2	-	14.4	0.01	5/2/2009	2	0.88	8.11	0.01
6/3/2009	3	-	12.9	0.01	5/2/2009	3	0.70	5.55	0.01
4/8/2010	1	-	15.4	0.02	9/28/2010	1	0.23	1.84	0.002
4/8/2010	2	-	14.5	0.01	9/28/2010	2	0.23	1.96	0.002
4/8/2010	3	-	13.6	0.01	9/28/2010	3	0.22	1.81	0.002
7/13/2011	1	0.96	4.57	0.005	7/12/2001	1	0.13	1.79	0.002
7/13/2011	2	0.94	3.95	0.004	7/12/2011	2	0.13	1.92	0.002
7/13/2011	3	0.92	1.63	0.001	7/13/2011	3	0.13	1.99	0.002
5/9/2012	1	0.68	2.83	0.003	2/21/2012	1	0.99	2.74	0.003
5/9/2012	2	0.69	3.23	0.003	2/21/2012	2	1.55	3.45	0.003
5/9/2012	3	0.71	6.22	0.006	2/21/2012	3	1.06	2.83	0.003
7/10/2013	1	0.63	5.99	0.006	7/1/2013	1	1.19	2.53	0.003
7/10/2013	2	0.64	2.65	0.003	7/1/2013	2	1.17	2.05	0.002
7/10/2013	3	0.73	4.27	0.004	7/1/2013	3	1.20	1.30	0.001
Correlation		[1]&[2]			Correlation		[4]&[5]		
Correlation Coefficient		-0.21			Correlation Coefficient		0.24		

Comment 8
Appendix CP-1 of Title V Permit No. 0570039-061-AV explains that the current PM CEMS for Unit 4 was installed in Quarter 1, 2009 and certified on July 16, 2009. It also states that the current PM CEMS for Unit 3 was installed in Quarter 3, 2010 and certified on December 10, 2010. However, the permit does not make any references to PM CEMS in Units 1 or 2, as alluded to in the Application. TECO should provide the date of installation of the PM CEMS on Units 1 and 2, as well as the corresponding certification dates, as applicable. TECO should also provide the manufacturer's information for each of the four (4) PM CEMS and the location of each of the PM CEMS for Units 1-4.

TEC Response 8
PM CEMS units are currently installed on Units 3 and 4. PM CEMS on Unit 4 was installed in Quarter 1, 2009 and certified on July 16, 2009. PM CEMS on Unit 3 was installed in Quarter 3, 2010 and certified on December 10, 2010. Units 1 & 2 share a common stack, CS0W1. The PM CEMS is currently being installed on CS0W1 and should be in operation sometime in Q3, 2014. This permit application proposes to install and operate a PM CEMS as a continuous parametric

monitoring system on common stack CS0W1 (Units 1 & 2), Unit 3 and Unit 4. A summary of the manufacturer's information and location of each PM CEMS unit is shown in **Table 3**.

Table 3. PM CEMS Manufacturer Information for Units 1 to 4.

Unit ID	Location	Manufacturer/Model No.	Condition	Certification Date
Units 1 & 2	CS0W1	Sick Maihak/Model No. FWE200	Wet Stack	End Q3 2014
Unit 3	BB-003	Sick Maihak/Model No. FWE200	Wet Stack	December 10, 2010
Unit 4	BB-004	Sick Maihak/Model No. FWE200	Wet Stack	July 16, 2009

Comment 9
On Page A-3 of the Application, it appears the maximum PM concentration, maximum raw concentration, and excursion concentration (80% maximum raw concentration), in mg/m3, were derived based on the permit limits (0.03 lb/MMBtu for Units 1-3, and 0.01 lb/MMBtu for Unit 4) and not based on actual reference method stack test data. PS-11 of 40 CFR 60 Appendix B requires a minimum of 15 reference method tests conducted over the full range of PM CEMS responses that correspond to normal operating conditions and will result in the widest range of emissions concentrations. TECO should submit the calculations, with a detailed explanation, to justify the correlations between the manual (EPA) reference method data and the PM CEMS concentrations, the methods used to develop the correlations (e.g. PS-11, EPA Methods 5, 5B, 5F, or 17), and the supporting reference method data and CEMS data.

TEC Response 9
Table 4 shows the calculations of the proposed concentration threshold for CAM (see Page A-3 of the Application). The most recent 2013 stack test data was used to calculate the maximum threshold. The calculation was performed consistent with the current opacity threshold in the current Title V permit. The calculation procedure is summarized as follows:

1. Compute the maximum mass rate (lb/hr) by the product of the heat input rate by the 0.03 lb/mmBtu limit.

2. Compute the maximum concentration threshold by the ratio of the maximum emission rate (lb/hr) divided by the stack test flow rate (scfh).

3. Compute the maximum raw concentration by dividing maximum actual concentration by 2.1. This factor is the ratio of average actual concentration to raw concentration. This relationship was based on the linear relationships established in the PS-11 certification data. This approach was utilized because it provides the most consistent and representative relationship between the PM CEMS response and actual PM emissions. A copy of the PS-11 certifications reports for Unit 3 and Unit 4 are shown attached.

4. Compute a revised maximum raw concentration for corrective action by multiplying by an arbitrary factor. A value of 80% was utilized in the calculation because the PM CEMS response is less impacted by the presence of the FGD system. The revised raw maximum concentrations were determined to be 10.8, 11.3 and 3.1 mg/scm for Units 1&2, Unit 3 and Unit 4, respectively.

Table 4. A summary of Proposed Raw Emission Calculations.

Parameter	Unit 1 & 2	Unit 3	Unit 4
Emission Limit (lb/mmBtu)	0.03	0.03	0.01
Heat Input (mmBtu/h)	8,329	4,242	4,305
Emission Rate (lb/h)	249.9	127.3	43.1
Flow rate Q (scfh)	140,600,371	68,428,571	86,071,429
Maximum Concentration (mg/scm)	28.5	29.8	8.0
Maximum Raw Concentration (mg/scm)	13.6	14.2	3.8
80% Maximum Raw Concentration (mg/scm)	10.8	11.3	3.1

As an alternative, the aforementioned calculations were revised using the 2009 - 2013 data. The alternative procedure utilized the maximum actual PM emission data and PS-11 data to establish a representative level. The alternative raw maximum concentrations were calculated to be 5.9, 5.9, and 3.7 mg/scm for Units 1&2, Unit 3 and Unit 4 respectively. TEC believes the alternative calculation establishes the representative levels that trigger the necessary correction action as requested by the Department. A summary of the alternative emission calculations is shown in **Table 5**.

Table 5. A summary of Alternative Raw Emission Calculations.

Parameter	Unit 1 & 2	Unit 3	Unit 4
Maximum Emission Limit (lb/mmBtu)	0.02	0.02	0.01
Maximum Concentration (mg/scm)	15.4	15.4	9.7
Maximum Raw Concentration (mg/scm)	7.3	7.3	4.6
80% Maximum Raw Concentration (mg/scm)	5.9	5.9	3.7

Comment 10

Based on EPC's review of the past 5 years of PM test data in the ARMS database, below are the ranges and average emissions rates (lbs/MMBtu).

PM Stack Test Data: Big Bend Units 1-4 2009-2013						
		Test Results				
	Permit PM Limit lb/mmBtu	**Min Lbs/mmBtu**	**Max Lbs/mmBtu**	**Average Lb/mmBtu**	**Average % of Permit Limit**	**Max % of Permit Limit**
Unit 1	0.03	0.004	0.025	0.013	42%	82%
Unit 2	0.03	0.004	0.03	0.012	38%	100%
Unit 3	0.03	0.003	0.02	0.009	30%	67%
Unit 4	0.01	0.002	0.01	0.004	37%	100%

Based on the data above, and the fact that the average emissions are between 30-40% of the permit limit, TECO should consider establishing an excursion concentration lower than the

proposed 80% of the maximum to allow TECO to take prompt corrective action. In addition, TECO should also provide the minimum detection limit (MDL) of each CEMS, the measurable range, and the accuracy of the PM CEMS throughout the measurable range. Furthermore, TECO should provide an analysis of the PM CEMS data for a minimum of the last three (3) years and justification for TECO's selection of their proposed data indicator range for PM emissions.

TEC Response 10
As previously mentioned in TEC Response 7, the data shows the PM CEMS response is not consistent with the stack test data at base load conditions. Therefore, TEC does not believe this data is useful in establishing a consistent or representative threshold at the normal low emission rate levels that trigger an inspection and corrective action as requested by the Department. The data range and technical information of the PM CEMS unit is shown in **Table 6**.

Table 6. Technical data and indicator ranges for Proposed PM CEMS.

Technical Data	**FWE200 Particulate Measurement**
Measuring Data	
Measuring principle	Scattered-light intensity, proportional to the dust concentration
Measuring ranges	0...200 mg/m^3
Accuracy	±2% of full scale
Response time	0.1...600 s; freely selectable
Measuring Conditions	
Gas temperature	Maximum 248°F (120°C) for PVDF probes Maximum 392°F (200°C) for Hastelloy probes (higher on request)
Internal duct pressure	±20 hPa (8 inches water column) (±20 mbar)
Gas velocity	13...65.5 ft/sec (4...20 m/s)
Ambient Conditions	
Ambient temperature	-4...+120°F (–20...+50°C) -4...+113°F (–20...+45°C
General Information	
System components	Extraction probe Measurement- and control unit Purge air unit Blower unit
Compliance	
Methods	EPA PS-11 Parametric monitoring

Comment 11
According to Title V Permit No. 0570039-061-AV, Big Bend Unit 4 is subject to 40 CFR 60, Subpart Da Standards of Performance for Electric Utility Steam Generating Units. Pursuant to 40 CFR 60.42(b)(1) of Subpart Da, an owner or operator of an affected facility that elects to install, calibrate, maintain, and operate a CEMS for measuring PM emissions according the requirements of this subpart is exempt from the opacity standard specified in this paragraph (b) of this section.

Even if Unit 4 becomes exempt from the opacity standard in 40 CFR 60.42(b) of Subpart Da and consequently becomes exempt from the opacity standard in Rule 62-296.405(2), F.A.C., it will still be subject to the 20% opacity standard in Rule 62-296.320(4)(b)1., F.A.C. Pursuant to Chapter 1-3.52.3., Rules of the EPC, the facility is required to conduct an annual EPA Method 9 test on Unit 4 if the COMS is removed from service as proposed.

Furthermore, since the requirement to install, calibrate, operate, and maintain COMS systems on Units 1-4 was established under previous Air Construction permits and Title V permit revisions (PSD-FL-040, 0570039-016-AC, 028-AV, 039-AV, etc.), the removal of this requirement should be done through an Air Construction Permit rather than through only a Title V permit revision. TECO should submit a revised application for a concurrent Air Construction/Title V permit revision to change this requirement.

TEC Response 11
The permit indicates that Units 1 to 3 are subject to the 20 percent opacity pursuant to Rule 62-296.405(1)(a), F.A.C. The permit also indicates Unit 4 is subject to the 20 percent opacity pursuant to 40 CFR 60.42Da(b); PSD-FL-040; and, Rule 62-296.405(2)(a), F.A.C. These units are subject to unit specific requirements not the general opacity requirement in Rule 62-296.320(4)(b)1., F.A.C. Therefore, the annual EPA Method 9 requirement in Chapter 1-3.52.3., Rules of the EPC, is not applicable to Units 1 to 4. Furthermore, for reasons stated earlier in TEC Response 6c, the Method 9 Test is considered a redundant requirement in the presence of a certified PM CEMS or PM CPMS.

An evaluation shows the COMS requirement is referenced in several air construction and Title V air operating permits (See Table 7). Based on the evaluation, TEC agrees with the Department that the removal of the COMS should be completed through a concurrent Air Construction Permit/Title V Air Permit Revision rather than through only a Title V Permit Revision. The revised application for a concurrent Air Construction Permit/Title V Air Permit Revision is shown attached.

Table 7. A summary of the permits referencing the COMS requirement.

Permit Type	Permit	Reference
Air Construction Permit	PSD-FL-040	Part 1 – Condition 4
Title V operating permit	0570039-002-AV	A.23, B.16, B.19
Title V operating permit	0570039-010-AV	A.23, B.16, B.19
Title V operating permit	0570039-013-AV	A.23, B.16, B.19
Air Construction Permit	0570039-016-AC	Section III.b.19, description
Title V operating permit	0570039-017-AV	A.23, B.16, B.19
Title V operating permit	0570039-028-AV	A.23, B.16, B.19
Title V operating permit	0570039-039-AV	A.31, A.39, B.27, B.29, B.39
Title V operating permit	0570039-045-AV	A.31, A.39, B.27, B.29, B.39
Air Construction Permit	0570039-053-AC	Section 6
Title V operating permit	0570039-054-AV	A.31, A.39, B.27, B.29, B.39
Title V operating permit	0570039-061-AV	A.32, A.40, B.28, B.30, B.40

Permit Type	Permit	Reference
Air Construction Permit	0570039-066-AC	description
Title V operating permit	0570039-067-AV	A.31, A.37, B.28, B.30, B.40

Responsible Official (R.O.) Certification Statement. Rule 62-213.420, F.A.C. requires that all Title V permit applications must be certified by a responsible official. A R.O. certification statement page from the long application form, DEP Form No. 62-210.900(1) is shown attached.

Professional Engineer (P.E.) Certification Statement. Rule 62-4.050(3), F.A.C. requires that all applications for a Department permit must be certified by a professional engineer registered in the State of Florida. A P.E. certification statement page from the long application form, DEP Form No. 62-210.900(1) is shown attached.

TEC is submitting these responses in accordance with Rule 62-4.055(1), F.A.C. Please review the responses and contact me at (813) 228-4232, if you have any questions.

Sincerely,

(No Electronic Signature Available)

Robert A. Velasco, P.E., BCEE, QEP
Air Programs
Environmental, Health & Safety
Tampa Electric Company

EHS/iym/RAV238 PM CPMS RAI project 069.docx

Department of Environmental Protection

Division of Air Resource Management

APPLICATION FOR AIR PERMIT - LONG FORM

I. APPLICATION INFORMATION

Air Construction Permit – Use this form to apply for an air construction permit:

- For any required purpose at a facility operating under a federally enforceable state air operation permit (FESOP) or Title V air operation permit;
- For a proposed project subject to prevention of significant deterioration (PSD) review, nonattainment new source review, or maximum achievable control technology (MACT);
- To assume a restriction on the potential emissions of one or more pollutants to escape a requirement such as PSD review, nonattainment new source review, MACT, or Title V; or
- To establish, revise, or renew a plantwide applicability limit (PAL).

Air Operation Permit – Use this form to apply for:

- An initial federally enforceable state air operation permit (FESOP); or
- An initial, revised, or renewal Title V air operation permit.

To ensure accuracy, please see form instructions.

Identification of Facility

1. Facility Owner/Company Name: Tampa Electric Company	
2. Site Name: Big Bend Power Station	
3. Facility Identification Number: 0570039	
4. Facility Location... 13031 Wyandotte Road Street Address or Other Locator: City: Apollo Beach County: Hillsborough Zip Code: 33572-9200	
5. Relocatable Facility? ☐ Yes ☒ No	6. Existing Title V Permitted Facility? ☒ Yes ☐ No

Application Contact

1. Application Contact Name: Robert A. Velasco P.E.
2. Application Contact Mailing Address... Organization/Firm: Tampa Electric Company Street Address: 702 N. Franklin Street City: Tampa State: FL Zip Code: 33602
3. Application Contact Telephone Numbers... Telephone: (813) 228 - 4232 ext. Fax: ( ) -
4. Application Contact E-mail Address:

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	3. PSD Number (if applicable):
2. Project Number(s):	4. Siting Number (if applicable):

Purpose of Application

This application for air permit is being submitted to obtain: (Check one)

Air Construction Permit

☐ Air construction permit.

☐ Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL).

☐ Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL), and separate air construction permit to authorize construction or modification of one or more emissions units covered by the PAL.

Air Operation Permit

☐ Initial Title V air operation permit.

☐ Title V air operation permit revision.

☐ Title V air operation permit renewal.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is required.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is not required.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit (Concurrent Processing)

☒ Air construction permit and Title V permit revision, incorporating the proposed project.

☐ Air construction permit and Title V permit renewal, incorporating the proposed project.

Note: By checking one of the above two boxes, you, the applicant, are requesting concurrent processing pursuant to Rule 62-213.405, F.A.C. In such case, you must also check the following box:

☒ I hereby request that the department waive the processing time requirements of the air construction permit to accommodate the processing time frames of the Title V air operation permit.

Application Comment

RAI requests to revise the application processing from a "Title V air operation permit revision" to a concurrent "Air construction permit/Title V permit revision." Otherwise, the original application, dated March 10, 2014, remains unchanged.

Request for Information Response
Revise CAM Plan to authorize PM CPMS
Title Permit No. 0570039-067-AV
Facility ID No. 0570039

Application Responsible Official Certification

1. Application Responsible Official Name: **Ronald D. Bishop**

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

- [X] For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C.
- [ ] For a partnership or sole proprietorship, a general partner or the proprietor, respectively.
- [ ] For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official.
- [ ] The designated representative at an Acid Rain source or CAIR source.

3. Application Responsible Official Mailing Address...
Organization/Firm: **Tampa Electric Company**
Street Address: **P.O. Box 111**
City: **Tampa** State: **FL** Zip Code: **33601-0111**

4. Application Responsible Official Telephone Numbers...
Telephone: **(813) 228 -4111** ext. Fax: ( ) -

5. Application Responsible Official E-mail Address: **RDBishop@tecoenergy.com**

6. Application Responsible Official Certification:

I, the undersigned, am a responsible official of the Title V source addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other applicable requirements identified in this application to which the Title V source is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit. Finally, I certify that the facility and each emissions unit are in compliance with all applicable requirements to which they are subject, except as identified in compliance plan(s) submitted with this application.

Signature

7/2/14
Date

Professional Engineer Certification

1. Professional Engineer Name: **Robert A. Velasco, P.E.**
   Professional Engineer Job Title: **Senior Consulting Engineer**
   Registration Number: **57190**

2. Professional Engineer Mailing Address...
   Organization/Firm: **Tampa Electric Company**
   Street Address: **702 N. Franklin St**
   City: **Tampa** State: **FL** Zip Code: **33602**

3. Professional Engineer Telephone Numbers...
   Telephone: **(813) 228 - 4232** ext. Fax: ( ) -

4. Professional Engineer E-mail Address: **RAVelasco@tecoenergy.com**

5. Professional Engineer Statement:

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

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

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

(3) If the purpose of this application is to obtain a Title V air operation permit (check here ☐, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.

(4) If the purpose of this application is to obtain an air construction permit (check here ☐, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here ☒, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here , if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

ROBERT A. VELASCO LICENSE NO. 57190 STATE OF FLORIDA PROFESSIONAL ENGINEER

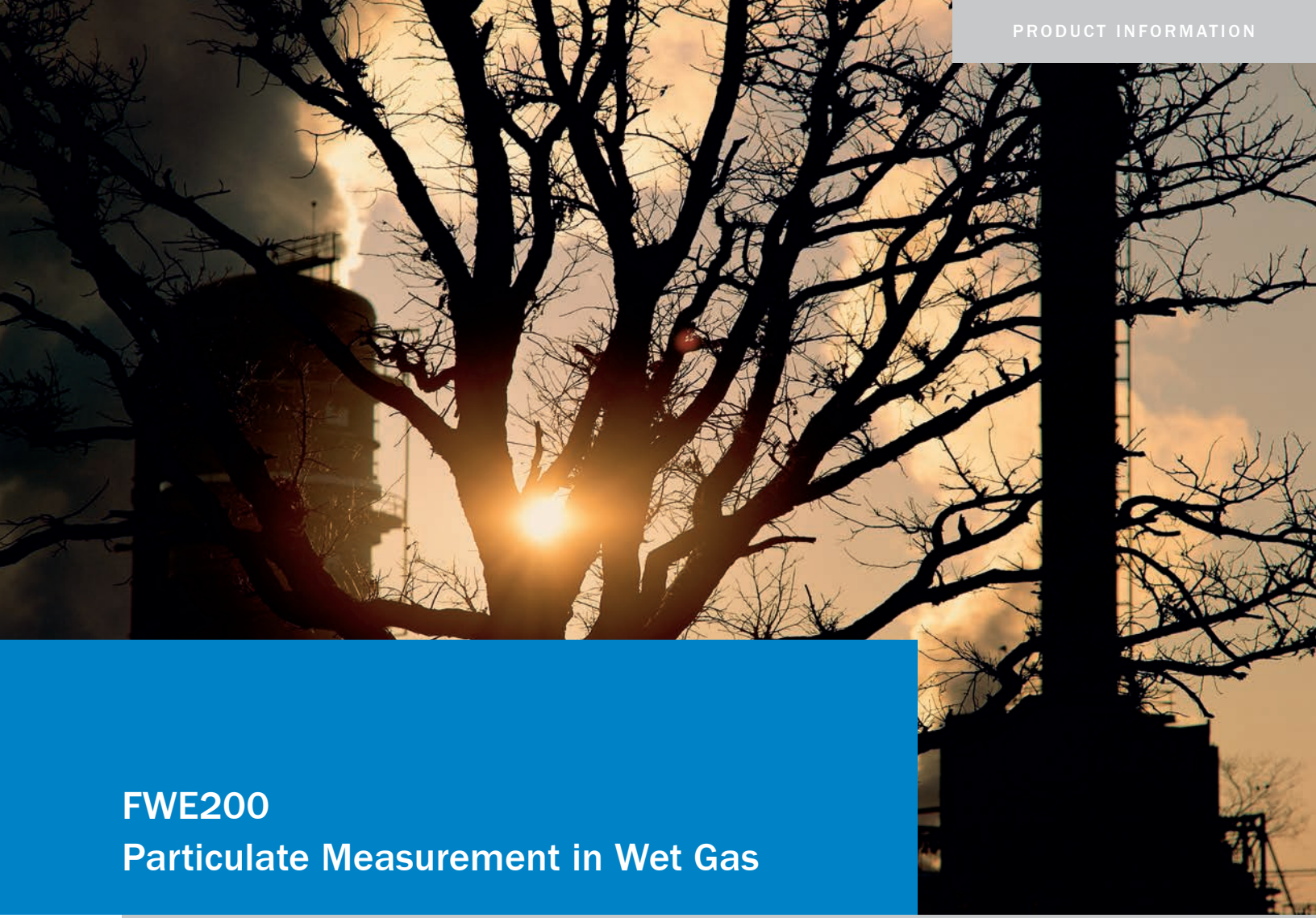
Signature

7/2/14
Date

(seal)

* Attach any exception to certification statement.

PRODUCT INFORMATION



FWE200
Particulate Measurement in Wet Gas

Measurement of Dust Concentration
in Wet Gases

SICK
Sensor Intelligence.

FWE200
Dust measuring system for highly precise particle monitoring in many different applications

AREAS OF APPLICATION

- Measurement of dust concentrations in wet flue gas
  - In saturated gas downstream of desulfurization plants
  - Downstream of wet scrubber, e.g. in waste incinerators
- Plants that are subject to EPA PS-11 requirements or as part of PC MACT, Boiler MACT or Utility MACT

RELIABLE OPERATION

- Automatic test cycle with monitor of zero point, reference and contamination value
- Simple setting of parameters and controls with user friendly software
- Integrated system monitoring for early recognition of maintenance requirements

COST BENEFITS

- Minimal consumables
- Minimal operational costs - long maintenance intervals
- Long life cycle

COMPACT DESIGN

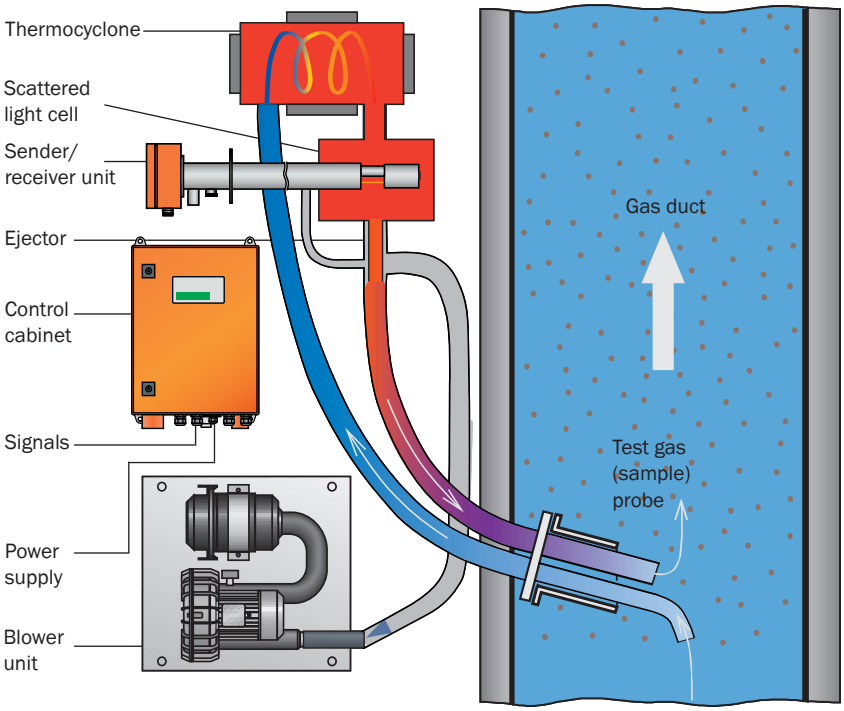
- Extraction and feedback of sample gas in one probe: only one flange required
- Measuring and control units completely on one mounting plate
- Optional: For even easier installation and mounting work, the complete system can be fitted on a frame

FEATURES

- Measures very low to medium dust concentration with scattered-light measurement using a scattered-light cell with free jet flow
- Extraction of part of the gas flow from the gas duct
- Drying and superheating of wet partial gas flow with a controllable electric heater for a constant sample gas temperature. This prevents measurement errors caused by droplets.
- Display of operational value and system status on a LCD
- Flow control with integrated differential pressure measurement
- More than 35 years experience with over 35,000 dust and opacity monitors worldwide

FWE200 SYSTEM OVERVIEW

A partial flow of gas is extracted from the flue gas duct via a probe and heated above dewpoint in a thermocyclone before it is supplied to a scattered-light cell. The FWE200 then uses the sender/receiver unit to measure the scattered-light intensity in the test cell as a measure of the dust concentration. Following this, the test gas is fed to the sample-gas probe via an ejector and returned to the duct. The sample gas is forwarded via the ejector by means of a blower unit that also supplies the sender/receiver unit with purge air for keeping the optical surfaces clean.

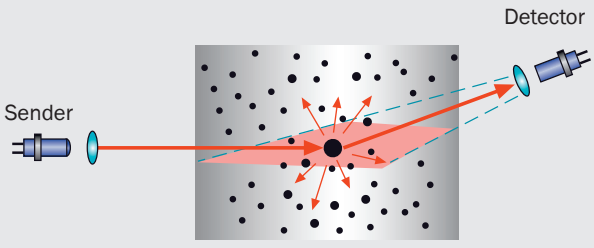


SCATTERED LIGHT PRINCIPLE

The FWE200 is based on the scattered light principle (forward scattering). Smallest particle concentrations can be recorded due to the extremely high sensitivity of this principle.

A laser diode directs a beam of modulated light in the visible range (wavelength approximately 650 nm) at the dust particles in the gas flow. The light scattered by the particles is recorded by a highly sensitive detector which is positioned at an angle of approximately 15° to the beam axis.

The received signal is electrically amplified and supplied to the measuring channel of a microprocessor as the central part of the measuring, control and evaluation electronics. The point of intersection between the transmitted beam and the receiver aperture defines the measuring volume in the gas duct.



FWE200 PI/2011-08 · DIV03 · Printed in USA · Subject to change without prior notice

Technical data	FWE200 Particulate Measurement
Measuring data	
Measuring principle	Scattered-light intensity, proportional to the dust concentration
Measuring ranges	• 0...5 mg/m³ • 0...200 mg/m³ • Higher on request, in-between values freely configurable
Accuracy	±2% of full scale
Response time (t_{90})	0.1...600 s; freely selectable
Measuring conditions	
Gas temperature	• Maximum 248°F (120°C) for PVDF probes • Maximum 392°F (200°C) for Hastelloy probes (higher on request)
Internal duct pressure	±20 hPa (8 inces water column) (±20 mbar)
Gas velocity	13...65.5 ft/sec (4...20 m/s), higher on request
Ambient Conditions	
Ambient temperature	-4...+120°F (–20...+50°C) (housing required for other temperature limits) -4...+113°F (–20...+45°C) intake temperature for fan
Inputs, outputs, interfaces	
Analog outputs	Electrically isolated, 0/2/4...20 mA, max. load 750 Ω; 10 bit, resolution ± 1 % Optional second analog output, electrically isolated, 0/2/4...20 mA, max. load 750 Ω, can be set separately
Relay outputs	4 outputs: status signals operation/malfunction, warning, limit value, maintenance Load carrying capacity: 48 V DC 0.5 A / 250 V, 1 A; floating
Interfaces	RS232 for laptop/PC
Digital input	Digital Input 1 = connection for maintenance switch with floating contact
General Information	
System components	• Extraction probe • Measurement- and control unit • Purge air unit • Blower unit (weather proof cover required for outdoor installation)
Function check	• Automatic control for zero and reference point • Contamination measurement
Approvals	
Compliances	EPA PS-11 Electrical safety according to EN 61010-1 • Measuring and control unit and blower unit protection class I • Sender/receiver unit protection class III
Protection class	• System: IP 54 • Electronic housing: IP 65

SICK Process Automation Division
United States - Minneapolis, Minnesota | Houston, Texas | 281-436-5100
Canada - Calgary, Alberta | Toronto, Ontario | 905-771-1444 | 855-742-5583
e-mail: information@sick.com | www.sicknorthamerica.com

SICK
Sensor Intelligence.

TAMPA ELECTRIC COMPANY

CERTIFICATION AND CORRELATION REPORT
BIG BEND UNIT 3
PARTICULATE MATTER
CONTINUOUS EMISSIONS MONITORING SYSTEM

BIG BEND POWER STATION

1.0 INTRODUCTION

Beginning on December 1, 2010, the Environmental, Health, & Safety Air Services Group of Tampa Electric Company (TEC), performed certification and correlation testing at Big Bend Power Station (Facility ID No.: 0570039), Boiler No. 3, (E.U. ID No.: -003). Testing was conducted according to procedures stipulated by the Performance Specification 11 for Particulate Matter Continuous Monitors (PM CEMS) certification and correlation. The certification and correlation testing was performed as designated in the Second Amendment to the Consent Decree, Civil Action No. 99-2524-T-23F. Subparagraph 32.E. states that Tampa Electric "must install, calibrate, and commence continuous operation of the replacement PM CEM". Tampa Electric must be "in compliance with all applicable EPA regulation and guidance, including achievement of the acceptance criteria during the process undertaken for the initial correlation testing, which must be done in compliance with the EPA standard PS-11".

2.0 SOURCE DESCRIPTION/TEST PROCEDURES

Big Bend Station is located on Big Bend Road, Ruskin, Florida at UTM coordinates East 361.9 North 3075.0. The stack serves Big Bend Unit 3 (BB03) source sampling location consists of a circular stack 28.83 feet in diameter with four sample ports located 90 degrees apart on the stack circumference. Upstream and downstream gas flow disturbances were determined to be 8.51 and 2.99 stack diameters from the test ports, respectively. Using these criteria, a total of 24 sampling points were chosen for particulate sampling, as stipulated in USEPA Method 1 – "Sample and Velocity Traverses for Stationary Sources". A diagram of the stack sampling location is included in Figure 1 along with other pertinent information on the test site.

Boiler No. 3 is serviced by an electrostatic precipitator for the control of fly ash emissions, low NOX burners and a Selective Catalytic Reduction (SCR) system for control of nitrogen oxide emissions, and a flue gas desulfurization (FGD) system for control of sulfur dioxide emissions.

Particulate matter sampling was performed according to USEPA Method 5B "Determination of Nonsulfuric Acid Particulate Matter from Stationary Sources". Particulate matter was collected on a high purity, borosilicate microfiber filter measuring 82mm in diameter.

Diluent gas sampling and analysis was performed according to USEPA Method 3 "Gas Analysis for Determination of Emission Rate Correction Factor, or Excess Air". Gas analysis was performed on-site using an Orsat analyzer.

3.0 TESTING DETAILS

On September 9, 2010, the PM CEMS data collection plan was submitted to EPA as stipulated by the 2nd Amendment of the Consent Decree. Correlation testing began on December 1st, 2010 and was completed on December 10th, 2010. The twenty performed runs were performed at various levels of particulate loading to qualify in three ranges of particulate matter loading. Prior to testing, operations were adjusted (generation, opacity, etc.) to realize the desired ranges for testing.

As stated in the data collection plan submitted to EPA the low range for the correlation testing would be performed according to Section 8.6(5) of Performance Specification 11. Section 8.6(5) states that if you can not obtain three distinct PM concentrations, then you should "perform correlation testing over the maximum range of PM concentrations that is practical." Then, to ensure the range of data for the correlation is maximized, zero point data can be obtained by sampling ambient air with both the reference method and the PM CEMS. TEC had very limited success in varying process operating conditions and varying PM control device operating conditions with respect to obtaining three different PM levels, when attempting to certify its first PM CEMS at Big Bend. TEC acknowledged that PM spiking might be feasible for a small source but is not a realistic option for coal-fired utility boilers. Therefore, TEC utilized the approach provided for in section 8.6(5) of PS-11.

The PM CEMS instrument was installed on Big Bend Power Station stack BB03 serving Unit 3 (E.U. I.D. #003). The seven day drift test was performed beginning November 8, 2010, and ending November 14, 2010, showing a drift less than 2 percent of the upscale check value. The seven day drift was performed

and met the acceptance criteria for allowable drift in accordance with section 8.5 of PS-11. Detailed results of the seven day drift test can be found in Table 1.0 of this report.

Following the method 5B testing five runs were excluded from the data for the purposes of correlation, runs one, seven, thirteen, fifteen and sixteen were identified as the runs to be excluded. Table 2.0 contains operational details for the twenty performed runs.

4.0 CORRELATION RESULTS

Results from each run using Method 5b were compared against each set of data taken from the PM CEM as shown in Table 3.0. A correlation was done using the PS-11 Correlation Test Calculation Spreadsheet (Version 2-6) that was formulated by the EPA on 10/24/2004.

After consideration of the range of results and the results of the correlation Tampa Electric deems the Linear Model to best represent the operation of Big Bend Power Station's Unit 3. The results of the correlation tests that met the correlation criteria are included in Table 5.0 of this report. All criterions were met for the Linear Model and all the criteria demonstrated within the allowable interval. Details of the Linear Correlation are contained in Table 4.0 of this report.

5.0 FIGURES & TABLES

Figure 1 Big Bend BB03 Test Location

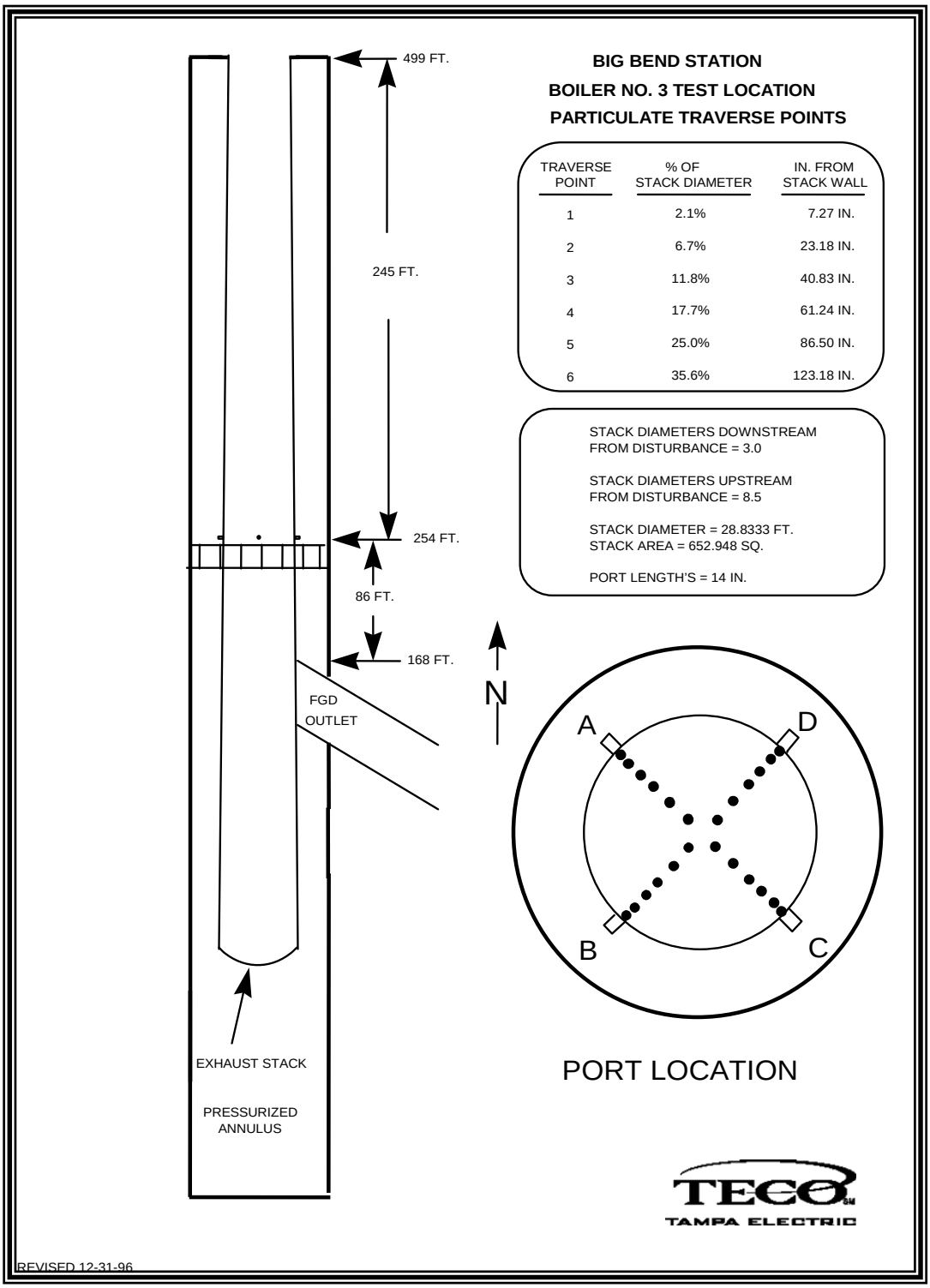


Table 1.0 Seven Day Drift Test Data Table

Unit 3 PM CEM
7 Day Drift Test

Zero Drift Day #	Date & Time	Zero Check Value (R_L)	PM CEMS Reponse (R_{CEMS})	Difference (R_{CEMS}-R_L)	Zero Drift ((R_{CEMS}-R_L)/R_U)x100%
1	11/08/2010 7:13	0	0.047	0.047	0.7%
2	11/09/2010 7:13	0	0.089	0.089	1.3%
3	11/10/2010 7:13	0	-0.012	0.012	0.2%
4	11/11/2010 7:13	0	0.008	0.008	0.1%
5	11/12/2010 7:13	0	0.089	0.089	1.3%
6	11/13/2010 7:13	0	0.051	0.051	0.7%
7	11/14/2010 7:13	0	-0.025	0.025	0.4%

Upscale Drift Day #	Date & Time	Upscale Check Value (R_U)	PM CEMS Reponse (R_{CEMS})	Difference (R_{CEMS}-R_U)	Zero Drift ((R_{CEMS}-R_U)/R_U)x100%
1	11/08/2010 7:12	7.00	7.030	0.030	0.4%
2	11/09/2010 7:12	7.00	7.013	0.013	0.2%
3	11/10/2010 7:12	7.00	6.952	0.048	0.7%
4	11/11/2010 7:12	7.00	6.956	0.044	0.6%
5	11/12/2010 7:12	7.00	7.052	0.052	0.7%
6	11/13/2010 7:12	7.00	6.977	0.023	0.3%
7	11/14/2010 7:12	7.00	7.061	0.061	0.9%

0.14	7 Day Drift Performance Specification

Table 2.0 FWE200 PM CEM Certification Data – December 2010

Date	Run #	Range	CEM Start Time	CEM End Time	Megawatts	Comments
December 1, 2010	1	**Out**	12:00	12:42	395 mw	395 mw, On the deck testing
December 1, 2010	2	**Low**	12:15	12:59	395 mw	395 mw, On the deck testing
December 1, 2010	3	**Low**	13:12	13:53	395 mw	395 mw, On the deck testing
December 1, 2010	4	**Low**	13:27	14:07	395 mw	395 mw, On the deck testing
December 1, 2010	5	**Low**	14:18	15:01	395 mw	395 mw, On the deck testing
December 1, 2010	6	**Low**	14:33	15:14	395 mw	395 mw, On the deck testing
December 6, 2010	7	**Out**	10:28	11:43	395 mw	395 mw, Base load with no operational change
December 6, 2010	8	**Mid**	10:12	11:25	395 mw	395 mw, Base load with no operational change
December 6, 2010	9	**Mid**	12:10	13:24	395 mw	395 mw, Base load with no operational change
December 6, 2010	10	**Mid**	11:46	12:57	395 mw	395 mw, Base load with no operational change
December 7, 2010	11	**Mid**	10:00	11:16	395 mw	395 mw, Base load with no operational change
December 7, 2010	12	**Mid**	9:45	10:59	395 mw	395 mw, Base load with no operational change
December 7, 2010	13	**Out**	11:36	12:50	395 mw	395 mw, Base load with no operational change
December 7, 2010	14	**High**	11:16	12:29	395 mw	395 mw, Base load with no operational change
December 10, 2010	15	**Out**	9:16	10:31	395 mw	395 mw, Initiated shut down of SO3 mitigation equipment
December 10, 2010	16	**Out**	9:00	10:13	395 mw	395 mw, Initiated shut down of SO3 mitigation equipment
December 10, 2010	17	**High**	10:54	12:05	395 mw	395 mw, Initiated shut down of SO3 mitigation equipment
December 10, 2010	18	**High**	10:30	11:43	395 mw	395 mw, Initiated shut down of SO3 mitigation equipment
December 10, 2010	19	**High**	12:23	13:36	395 mw	395 mw, Initiated shut down of SO3 mitigation equipment
December 10, 2010	20	**High**	11:58	13:11	395 mw	395 mw, Initiated shut down of SO3 mitigation equipment

Table 3.0 Correlation Testing Raw Data

	Method 5B Results				***Instrument Results***
	Particulate Captured	**Sampled Volume**	**Concentration**		**PM CEM Run Average**
	milligrams	**dscm**	**mg/dscm**		**mg/m3**
Run 1	3.2	0.91	3.51	**Run 1**	0.01
Run 2	1.7	0.94	1.81	**Run 2**	0.01
Run 3	1.2	0.93	1.24	**Run 3**	0.01
Run 4	0.7	0.89	0.73	**Run 4**	0.01
Run 5	1.5	0.95	1.52	**Run 5**	0.01
Run 6	1.4	0.89	1.57	**Run 6**	0.01
Run 7	0.7	1.04	0.68	**Run 7**	1.07
Run 8	2.7	1.05	2.52	**Run 8**	1.07
Run 9	1.9	1.03	1.84	**Run 9**	1.02
Run 10	4.1	1.06	3.81	**Run 10**	1.02
Run 11	3.3	1.02	3.18	**Run 11**	1.01
Run 12	5.1	1.07	4.77	**Run 12**	1.01
Run 13	7.9	1.03	7.69	**Run 13**	1.03
Run 14	3.5	1.05	3.28	**Run 14**	1.03
Run 15	9.8	1.02	9.62	**Run 15**	1.54
Run 16	8.9	1.08	8.22	**Run 16**	1.37
Run 17	7.4	1.02	7.26	**Run 17**	2.68
Run 18	4.6	1.07	4.28	**Run 18**	2.49
Run 19	6.8	1.03	6.57	**Run 19**	3.01
Run 20	9.5	1.08	8.77	**Run 20**	3.01

Table 4.0 Linear Correlation Results

RESULTS OF LINEAR CORRELATION

Facility: Big Bend Power Station — **Emission Unit:** Unit 3
Location: Apollo Beach, FL — **Test Dates:** Dec 1 - Dec 10

Variable	Equation	Value
n	Number of data points =	15
$\tilde{x}$	$\tilde{x}$ = 1/n*(Sum of (x_i)) =	1.16
S_{xx}	S_{xx} = Sum((x_i-$\tilde{x}$)^2) =	18
$\tilde{y}$	$\tilde{y}$ = 1/n*(Sum of (y_i)) =	2.11
S_{yy}	S_{yy} = Sum((y_i-$\tilde{y}$)^2) =	26
S_{xy}	S_{xy} = Sum((x_i-$\tilde{x}$)(y_i-$\tilde{y}$)) =	19.4
b_0	b_0 = $\tilde{y}$-$b_1\tilde{x}$ =	0.842
b_1	b_1 = S_{xy}/S_{xx} =	1.097
S_L	S_L = SQRT(1/(n-2)(Sum(y_i^-y_i)^2)) =	0.601
$y^{\wedge}_{mean}$	y^ at mean x value =	2.114
t_f	t_f from table =	2.160
CI	CI = t_f*S_L*SQRT(1/n) =	0.335
EL	Emission Limit =	7.0
CI%	CI% =CI/EL*100% =	4.79%
n'	n' = n =	15
v_f	v_f from table =	1.485
$u_{n'}$	$u_{n'}$ from table =	1.184
k_T	k_t = $u_{n'}$*v_f =	1.759
TI	TI = k_t*S_L =	1.058
TI%	TI% = TI/EL*100% =	15.1%
S_y	S_y = SQRT(S_{yy}/(n-1)) =	1.362
r^2	r^2 = 1-(S_L^2/S_y^2) =	0.805
r	r = SQRT((1-S_L^2/S_y^2)) =	0.897

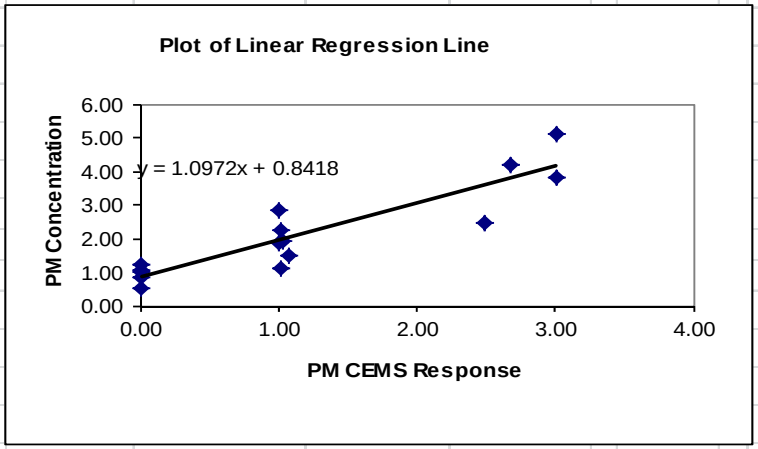
* Indicates correlation coefficient is undefined.

Correlation equation: y = 0.842 + 1.097 x

Summary of Acceptance Criteria for PS-11

Criterion	Actual	Allowable	Acceptable?
Correlation coefficient	0.897	≥ 0.85	yes
Confidence interval	4.79%	≤ 10%	yes
Tolerance interval	15.1%	≤ 25%	yes

* Indicates correlation coefficient is undefined.



PS-11 Correlation Test
Calculation Spreadsheet
Version 2-6 10/25/04

Table 5.0 Summary of Model Correlation Statistics

Linear Model		**Polynomial Model**		**Exponential Model**	
Correlation coefficient	*≥ 0.85*	*Correlation coefficient*	*≥ 0.85*	*Correlation coefficient*	*≥ 0.85*
0.897	**Yes**	**0.894**	**Yes**	**0.871**	**Yes**
Confidence interval half range percentage	*≤ 10%*	*Confidence interval half range percentage*	*≤10%*	*Confidence interval half range percentage*	*≤10%*
4.79%	**Yes**	**7.44%**	**Yes**	**4.52%**	**Yes**
Tolerance interval half range percentage	*< 25%*	*Tolerance interval half range percentage*	*< 25%*	*Tolerance interval half range percentage*	*< 25%*
15.1%	**Yes**	**16.0%**	**Yes**	**14.9%**	**Yes**
Does model meet all criteria?		*Does model meet all criteria?*		*Does model meet all criteria?*	
Yes		**Yes**		**Yes**	
Best Model: Linear					

Note: The Logarithmic and Power model did not meet the specified criteria.

TAMPA ELECTRIC COMPANY

CERTIFICATION AND CORRELATION REPORT
BIG BEND UNIT 4
PARTICULATE MATTER
CONTINUOUS EMISSIONS MONITORING SYSTEM

BIG BEND POWER STATION

1.0 INTRODUCTION

Beginning on June 16th, 2009, the Environmental, Health, & Safety Air Services Group of Tampa Electric Company, performed certification and correlation testing at Big Bend Power Station (Facility ID No.: 0570039), Boiler No. 4, (E.U. ID No.: -004). Testing was conducted according to procedures stipulated by the Performance Specification 11 for Particulate Matter Continuous Monitors (PM CEMS) certification and correlation. The certification and correlation testing was performed as designated in the Second Amendment to the Consent Decree, Civil Action No. 99-2524-T-23F. Subparagraph 32.G. states that Tampa Electric "must install, calibrate, and commence continuous operation of a second PM CEM". Tampa Electric must be "in compliance with all applicable EPA regulation and guidance, including achievement of the acceptance criteria during the process undertaken for the initial correlation testing, which must be done in compliance with the EPA standard PS-11".

2.0 SOURCE DESCRIPTION/TEST PROCEDURES

Big Bend Station is located on Big Bend Road, Ruskin, Florida at UTM coordinates East 361.9 North 3075.0. The stack serve Big Bend Unit 4 (BB04) source sampling location consists of a circular stack 28.83 feet in diameter with four sample ports located 90 degrees apart on the stack circumference. Upstream and downstream gas flow disturbances were determined to be 8.51 and 2.99 stack diameters from the test ports, respectively. Using these criteria, a total of 24 sampling points were chosen for particulate sampling, as stipulated in USEPA Method 1 – "Sample and Velocity Traverses for Stationary Sources". A diagram of the stack sampling location is included in Figure 1 along with other pertinent information on the test site.

Boiler No. 4 is serviced by an electrostatic precipitator for the control of fly ash emissions, low NOX burners and a Selective Catalytic Reduction (SCR) system for control of nitrogen oxide emissions, and a flue gas desulfurization (FGD) system for control of sulfur dioxide emissions.

Particulate matter sampling was performed according to USEPA Method 5B "Determination of Nonsulfuric Acid Particulate Matter from Stationary Sources". Particulate matter was collected on a high purity, borosilicate microfiber filter measuring 82mm in diameter.

Diluent gas sampling and analysis was performed according to USEPA Method 3 "Gas Analysis for Determination of Emission Rate Correction Factor, or Excess Air". Gas analysis was performed on-site using an Orsat analyzer.

3.0 TESTING DETAILS

On March 23rd, 2009, a PM CEMS data collection plan was submitted to EPA as stipulated by the 2nd Amendment of the Consent Decree. Testing began on June 16th and was completed on July 16th, 2009. The seventeen performed runs were performed at various levels of particulate loading to qualify in three ranges of particulate matter loading. Prior to testing, operations were adjusted (generation, opacity, etc.) to realize the desired ranges for testing.

As stated in the data collection plan submitted to EPA the low range for the correlation testing would be performed according to Section 8.6(5) of Performance Specification 11. Section 8.6(5) states that if you can not obtain three distinct PM concentrations, then you should "perform correlation testing over the maximum range of PM concentrations that is practical." Then, to ensure the range of data for the correlation is maximized, zero point data can be obtained by sampling ambient air with both the reference method and the PM CEMS. TEC had very limited success in varying process operating conditions and varying PM control device operating conditions with respect to obtaining three different PM levels, when attempting to certify its first PM CEMS at Big Bend. TEC acknowledged that PM spiking might be feasible for a small source but is not a realistic option for coal-fired utility boilers. Therefore, TEC proposed to utilize the approach provided for in section 8.6(5) of PS-11.

The PM CEMS instrument was installed on Big Bend Power Station stack BB04 serving Unit 4 (E.U. I.D. #004). The seven day drift test was performed beginning May 2, 2009, and ending May 8, 2009, showing

a drift less than 2 percent of the upscale check value. Detailed results of the seven day drift test can be found in Table 1.0 of this report. Following the method 5B testing two runs were excluded from the data for the purposes of correlation, run two and run five were identified as the runs to be excluded. Table 2.0 contains operational details for the seventeen performed runs.

4.0 CORRELATION RESULTS

Results from each run using Method 5b were compared against each set of data taken from the PM CEM. A correlation was done using the PS-11 Correlation Test Calculation Spreadsheet (Version 2-6) that was formulated by the EPA on 10/24/2004. The results of the correlation tests are included in Table 5.0 of this report. After consideration of the range of results and the results of the correlation Tampa Electric deems the Linear Model to best represent the operation of Big Bend Power Station's Unit 4. All criterions were met for the Linear Model and all the criteria demonstrated within the allowable interval. Details of the Linear Correlation are contained in Table 4.0 of this report.

5.0 FIGURES & TABLES

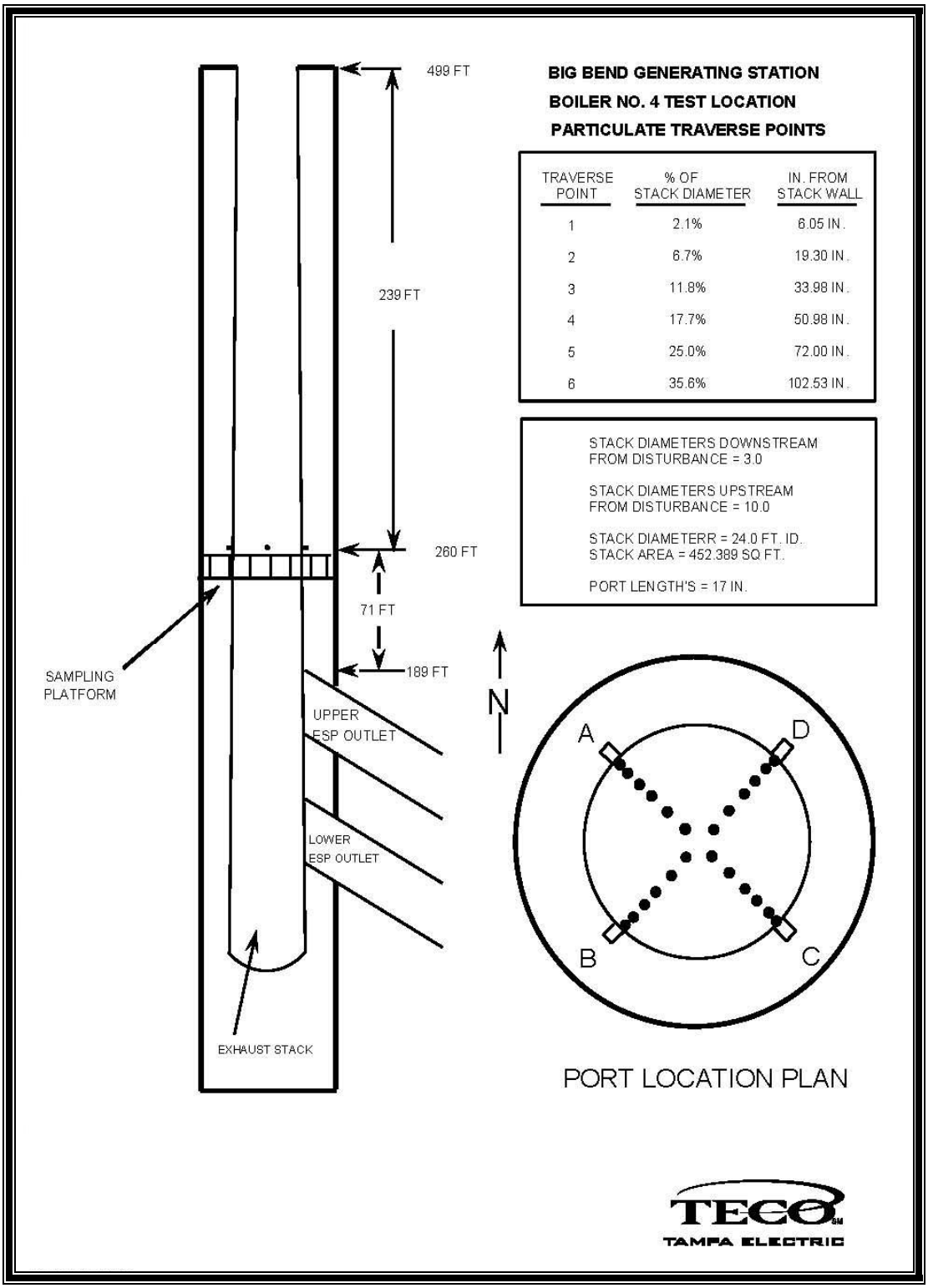

499 FT
239 FT
260 FT
71 FT
189 FT
SAMPLING PLATFORM
UPPER ESP OUTLET
LOWER ESP OUTLET
EXHAUST STACK
BIG BEND GENERATING STATION
BOILER NO. 4 TEST LOCATION
PARTICULATE TRAVERSE POINTS
TRAVERSE POINT | % OF STACK DIAMETER | IN. FROM STACK WALL
1 | 2.1% | 6.05 IN.
2 | 6.7% | 19.30 IN.
3 | 11.8% | 33.98 IN.
4 | 17.7% | 50.98 IN.
5 | 25.0% | 72.00 IN.
6 | 35.6% | 102.53 IN.
STACK DIAMETERS DOWNSTREAM FROM DISTURBANCE = 3.0
STACK DIAMETERS UPSTREAM FROM DISTURBANCE = 10.0
STACK DIAMETERR = 24.0 FT. ID.
STACK AREA = 452.389 SQ FT.
PORT LENGTH'S = 17 IN.
N
A
B
C
D
PORT LOCATION PLAN
TECO
TAMPA ELECTRIC

Figure 1

Table 1.0 Seven Day Drift Test Data Table

7 Day Drift Test

Zero Drift Day #	Date & Time	Zero Check Value (R_L)	PM CEMS Response (R_{CEMS})	Difference (R_{CEMS}-R_L)	Zero Drift ((R_{CEMS}-R_L)/R_U)x100%
1	05/02/2009 7:03	0	0.006	0.006	0.004
2	05/03/2009 7:03	0	0.005	0.005	0.004
3	05/04/2009 7:03	0	0.006	0.006	0.004
4	05/05/2009 7:03	0	0.008	0.008	0.006
5	05/06/2009 7:03	0	0.007	0.007	0.005
6	05/07/2009 7:03	0	0.007	0.007	0.005
7	05/08/2009 7:03	0	0.005	0.005	0.004

Upscale Drift Day #	Date & Time	Upscale Check Value (R_U)	PM CEMS Response (R_{CEMS})	Difference (R_{CEMS}-R_U)	Zero Drift ((R_{CEMS}-R_U)/R_U)x100%
1	05/02/2009 7:05	1.40	1.423	0.023	0.016
2	05/03/2009 7:05	1.40	1.406	0.006	0.004
3	05/04/2009 7:05	1.40	1.389	-0.011	-0.008
4	05/05/2009 7:05	1.40	1.390	-0.010	-0.007
5	05/06/2009 7:05	1.40	1.389	-0.011	-0.008
6	05/07/2009 7:05	1.40	1.412	0.012	0.009
7	05/08/2009 7:05	1.40	1.412	0.012	0.009

Drift Allowance = 0.028

Table 2.0 FWE200 PM CEM Certification Data - June/July 2009

	Run #		CEM Start Time	CEM End Time	Megawatts	Comments
17-Jun	1	**Mid**	23:42	1:52	200	200 MW - 2-3% Opacity
17-Jun	2	**Out**	23:41	1:52	200	200 MW - 2-3% Opacity
17-Jun	3	**Mid**	2:55	5:05	200	200 MW - 2-3% Opacity
17-Jun	4	**Mid**	2:36	4:46	200	200 MW - 2-3% Opacity
19-Jun	5	**Out**	9:18	11:30	449	449 mw - 7-8% Opacity
22-Jun	6	**Low**	10:21	12:20	449	449mw,7-8% opacity, Zero on Deck
22-Jun	7	**Mid**	10:19	12:19	449	449mw,7-8%opacity, Zero on Deck
22-Jun	8	**Low**	12:47	14:47	449	449mw,7-8%opacity, Zero on Deck
22-Jun	9	**Low**	12:47	14:47	449	449mw,7-8%opacity, Zero on Deck
23-Jun	10	**Low**	9:20	11:20	440	440 mw - 4.5% Opacity
23-Jun	11	**Low**	9:20	11:20	440	440 mw - 4.5% Opacity
9-Jul	12	**High**	8:12	9:23	454	454 mw, 5.4% Opacity
9-Jul	13	**High**	8:12	9:23	454	454 mw, 5.4% Opacity
16-Jul	14	**High**	9:28	10:38	453	453, 3.5% Opacity
16-Jul	15	**High**	9:26	10:33	453	453, 3.5% Opacity
16-Jul	16	**High**	11:22	12:30	453	453, 3.5% Opacity
16-Jul	17	**Mid**	11:38	12:45	453	453, 3.5% Opacity

Table 3.0 Correlation Testing Raw Data

	Method 5B Results					Instrument Results
	Particulate Captured	**Sampled Volume**	**Concentration**	**Emission Rate**		PM CEM Run Average
	milligrams	**dscm**	**mg/dscm**	**lbs/mmBtu**		mg/m3
Run 1	5.4	1.01	5.3	0.00	Run 1	0.7
Run 2	10.8	1.02	10.7	0.01	Run 2	0.7
Run 3	5.2	1.02	5.1	0.00	Run 3	0.5
Run 4	6.8	1.02	6.7	0.01	Run 4	0.6
Run 5	10.5	2.16	4.9	0.00	Run 5	2.6
Run 6	1.6	2.11	0.7	0.00	Run 6	0.1
Run 7	4.4	2.26	2.0	0.00	Run 7	0.1
Run 8	2.3	2.14	1.1	0.00	Run 8	0.1
Run 9	4.0	2.24	1.8	0.00	Run 9	0.1
Run 10	1.8	2.15	0.8	0.00	Run 10	0.1
Run 11	2.5	2.18	1.1	0.00	Run 11	0.1
Run 12	7.2	1.02	7.0	0.01	Run 12	1.9
Run 13	9.2	1.02	9.0	0.01	Run 13	1.9
Run 14	5.4	1.01	5.3	0.00	Run 14	1.8
Run 15	5.1	1.02	5.0	0.00	Run 15	1.8
Run 16	6.5	1.02	6.4	0.01	Run 16	1.7
Run 17	3.3	1.02	3.2	0.00	Run 17	1.7

Table 4.0 Linear Correlation Results

RESULTS OF LINEAR CORRELATION

Facility:	**Big Bend Power Station**		**Emission Unit:**	**Unit 4**					
Location:	**Apollo Beach, FL**		**Test Dates:**	**June 16- July 16**					
Variable	**Equation**	**Value**	**Correlation equation:**		**y =**	**0.658**	**+**	**1.567**	**x**
n	Number of data points =	15							
$x\sim$	$x\sim = 1/n*(\text{Sum of } (x_i)) =$	0.88	**Summary of Acceptance Criteria for PS-11**						
S_{xx}	$S_{xx} = \text{Sum}((x_i-x\sim)^2) =$	9	**Criterion**		**Actual**	**Allowable**	**Acceptable?**		
$y\sim$	$y\sim = 1/n*(\text{Sum of } (y_i)) =$	2.03	Correlation coefficient		0.875	$\geq$ 0.85	yes		
S_{yy}	$S_{yy} = \text{Sum}((y_i-y\sim)^2) =$	29	Confidence interval		5.53%	$\leq$ 10%	yes		
S_{xy}	$S_{xy} = \text{Sum}((x_i-x\sim)(y_i-y\sim)) =$	14.3	Tolerance interval		17.4%	$\leq$ 25%	yes		
b_0	$b_0 = y\sim-b_1x\sim =$	0.658	* Indicates correlation coefficient is undefined.						
b_1	$b_1 = S_{xy}/S_{xx} =$	1.567							
S_L	$S_L = \text{SQRT}(1/(n-2)(\text{Sum}(y_i\hat{}-y_i)\hat{}2)) =$	0.694							
$y\hat{}_{mean}$	$y\hat{}$ at mean x value =	2.032							
t_f	t_f from table =	2.160							
CI	$CI = t_f*S_L*\text{SQRT}(1/n) =$	0.387							
EL	Emission Limit =	7.0							
CI%	CI% =CI/EL*100% =	5.53%							
n'	n' = n =	15							
v_f	v_f from table =	1.485							
$u_{n'}$	$u_{n'}$ from table =	1.184							
k_T	$k_t = u_n'*v_f =$	1.759							
TI	$TI = k_t*S_L =$	1.221							
TI%	TI% = TI/EL*100% =	17.4%							
S_y	$S_y = \text{SQRT}(S_{yy}/(n-1)) =$	1.432							
r^2	$r^2 = 1-(S_L\hat{}2/S_y\hat{}2) =$	0.765				**PS-11 Correlation Test**			
r	$r = \text{SQRT}((1-S_L\hat{}2/S_y\hat{}2)) =$	0.875				**Calculation Spreadsheet**			
* Indicates correlation coefficient is undefined.						**Version**	**2-6**	**10/25/04**	

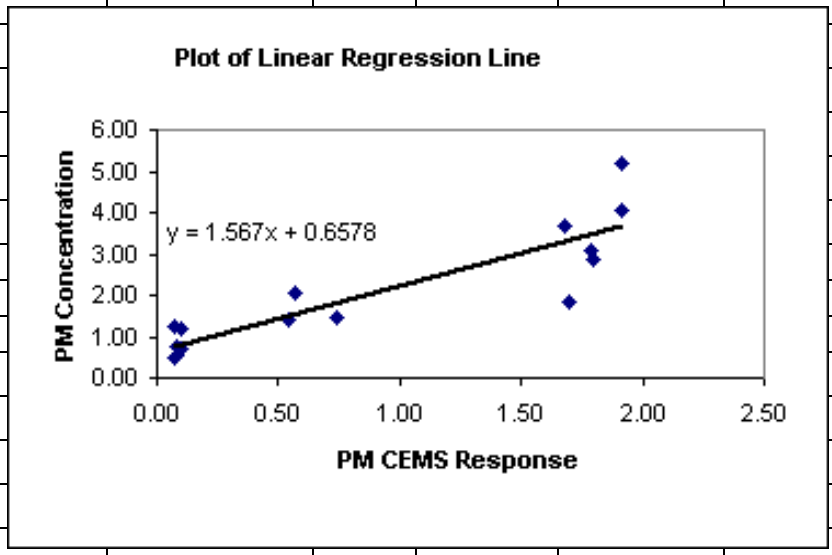


Table 5.0 Summary of Model Correlation Statistics

Linear Model		Polynomial Model		Exponential Model		Power Model	
Correlation coefficient	≥ 0.85	Correlation coefficient	≥ 0.85	Correlation coefficient	≥ 0.85	Correlation coefficient	≥ 0.85
0.875	Yes	0.871	Yes	0.888	Yes	0.891	Yes
Confidence interval half range percentage	≤ 10%	Confidence interval half range percentage	≤10%	Confidence interval half range percentage	≤10%	Confidence interval half range percentage	≤ 10%
5.53%	Yes	8.45%	Yes	4.39%	Yes	4.33%	Yes
Tolerance interval half range percentage	< 25%	Tolerance interval half range percentage	< 25%	Tolerance interval half range percentage	< 25%	Tolerance interval half range percentage	< 25%
17.4%	Yes	18.5%	Yes	14.6%	Yes	14.4%	Yes
Does model meet all criteria?		Does model meet all criteria?		Does model meet all criteria?		Does model meet all criteria?	
Yes		Yes		Yes		Yes	