TECO
TAMPA ELECTRIC

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MAR 08 2013
DIVISION OF AIR
RESOURCE MANAGEMENT

March 7, 2013

Jeffery F. Koerner, Program Administrator
Florida Department of Environmental Protection
Division of Air Resource Management
Office of Air Permitting and Compliance
2600 Blair Stone Road, M.S. 5505
Tallahassee, Florida 32399-2400

FEDEX
Air Bill No. 7949-2011-7854

Re: Tampa Electric Company - Big Bend Station
Request for Additional Information
Fuel Igniter Replacements
File No. 0570039-062-AC
Facility ID No. 0570039

Dear Mr. Koerner:

Tampa Electric Company (TEC) submitted a permit application (No. 3335-1) on October 16, 2012. The request incorporates specific language into the Title V permit to close out the consent decree; modifications to allow additional transloading coal, petroleum coke, and slag in EU-046; modifications to allow EU-001 to -004 to fire natural gas during startup, shutdown, malfunctions and flame stabilization; additional permit cleanups to the Title V permit; and incorporation of several outstanding permit cleanups that were previously requested by TEC but were not incorporated into the final permit 0570030-054-AV.

On November 14, 2012, TEC and Florida Department of Environmental Protection (Department) discussed the permit scopes in the application No 3335-1. On November 15, 2012, TEC received a request for information (RAI) from Department clarifying the scope of the work on the natural gas ignition system. Pursuant to this request, TEC is providing the responses to the Department and revisions to the original permitting scope of work. The revised scope of work and TEC's responses are discussed below.

FDEP Comment 1

The application requests adding natural gas igniters. Please describe this project in further detail including a description of how these igniters will be integrated with existing igniters (will these new igniters be operated together with existing oil igniters or separately?) and the physical and operational changes associated with this project. Provide this information for each boiler along with a layout of the new igniters in each boiler so that the location and number of new igniters is shown.

TEC Response 1
The existing ignition systems on Units 1 to 3 consist of 24, 4-inch fuel oil igniters. The igniters are Hamworthy Peabody type (Model OE-HE) rated at a heat input rating of 15 mmBtu per hour. Each igniter is installed within each windbox on 4 feet 6-inch centers on the front and back walls of each boiler at 61.0 feet El. Each igniter is installed in a 4-5/8-inch guide tube that is orientated into the boiler at a fixed location of 25° below elevation. The drawings of the Units 1 to 3 ignition systems are shown attached.

Unit 4 consists of 5 coal feeding elevations (A, B, C, D, and E). The existing ignition system on Unit 4 consists of varying sizes and locations of igniters. Twelve (12) fuel oil igniters (6-inch Limelight eddy plate type) are rated at a heat input of 10 mmBtu per hour. Four (4) igniters are installed at each corner and wind box at coal feeding elevations C (97 feet 2-3/8 inches El.), D (102 feet 8-3/8 inches El.), and E (108 feet 2-3/8 inches El.) for a total of 12 igniters. Four (4) additional fuel oil igniters rated at heat input of 244 mmBtu per hour are located between coal feeding elevation A-B (88 feet 11-3/8 inches El.). These warm up igniters are designed to heat the boiler during startup. Each warm up igniter is equipped with a secondary igniter to startup each warm up igniter. Each secondary igniter is rated at 2 mmBtu per hour. The igniters are currently designed to be tilted ±30°. However, the igniters are typjcally oriented at 0° (neutral) during operation. The drawings and locations of the Unit 4 ignition system are shown attached.

The existing fuel oil ignition systems are primarily used during startup and shutdown. These systems are also used during malfunctions to stabilize combustion during times of unexpected poor coal quality or during a malfunction/equipment failure such as wet coal, coal piping pluggage or equipment that is otherwise damaged that results in an inconsistent amount of coal reaching the burners. The systems are also necessary during periods of load change to initialize and stabilize the flame until coal flow to the burners reaches steady state.

As mentioned earlier, TEC previously requested modifications to Units 1 to 4 to fire natural gas during startup, shutdown, malfunctions and flame stabilization. Based on recent evaluations, TEC has revised its earlier request to include the capability to co-fire with natural gas and fire natural gas only at low loads. The co-firing operation will generate sufficient heating load to operate the SCR system. The firing of natural gas at low loads will not generate enough heat to operate the SCR; therefore, the SCR unit will not operate during low loads.

The work involves replacing all of the existing fuel oil igniters with natural gas igniters. The work will involve the removal of the existing 24 fuel oil igniters on Units 1 to 3 and replacement with 24 new natural gas igniters. For Unit 4, the 20 existing fuel oil igniters will be removed and replaced with new natural gas igniters. The existing guide tubes on each boiler may need to be modified or replaced as necessary to install the new natural gas igniters.

A new pipe line and valve station will be installed to supply natural gas to Units 1 to 4. A new 12-inch pipe line will be installed to accommodate full pipeline pressure. At the tie-in location, a block valve (DCS controllable) and a manual pressure control valve will be used to adjust the pressure to approximately 250 psig. The new pipeline will be routed to the turbine area where a block valve and pressure control valve will used to adjust the pressure to approximately 125 psig.

The pipeline will be routed to an igniter pressure control skids on each unit to meter and regulate the pressure of natural gas from 5 to 125 psig.

The existing fuel oil igniter piping will be removed from the units and replaced in essentially the same locations with the new natural gas lines. The modifications will be made to the igniter guns to accommodate the natural gas firing. The entire burner management system will be modified and upgraded to accommodate natural gas firing as well as compliance with NFPA 2011 Code requirements for Burner Management Systems.

FDEP Comment 2
Will the existing oil igniters be removed as part of this project?

TEC Response 2
As previously mentioned, the existing fuel oil ignition systems will be removed from service and replaced with new natural gas ignition systems. In addition, TEC requests to retain the existing provision to burn fuel oil during startup, shutdown, malfunction and flame stabilization pursuant to Condition A.4.b in the Title V permit.

FDEP Comment 3
Please provide a description of any changes to the air management system in each boiler associated with these new igniters. Provide design values for natural gas heat inputs for these igniter systems in each boiler. Describe any new combustion air fans associated with the new igniters.

TEC Response 3
Units 1 to 3 will be designed up to 70 mmBtu per hour @ 24 igniters for a total design capacity of 1,680 mmBtu per hour. Unit 4 will be designed up to a total design capacity of approximately 2,000 mmBtu per hour. The existing air management systems in each boiler will not be modified. The existing air management system will be utilized with the new ignition system. The igniters will not contain new additional combustion air fans.

FDEP Comment 4
Please provide details of how these igniters will be used for flame stabilization and provide data showing how often, and at what heat input rates these igniters are needed during low load and load change modes of operation.

TEC Response 4
As previously mentioned, the new igniter system will be used for flame stabilization in the same manner as the existing fuel oil igniter system. The flame stabilization is utilized on an as needed basis during malfunctions to stabilize combustion during times of unexpected poor coal quality or during equipment malfunctions or load change to initialize and stabilize the flame until coal flow to the burners reaches steady state.

FDEP Comment 5

Describe how these new gas igniters will change how each boiler is operated (e.g. will these igniters allow boilers to operate at low loads for extended periods like overnight when gas prices are favorable?). Quantify emission changes for each boiler if overall boiler emissions are expected to change with the addition of the new igniters, or how the economic dispatch of each boiler will change.

TEC Response 5

The proposed ignition systems will be used during startup, shutdown, malfunctions and flame stabilization similar to the existing fuel oil ignition systems. In addition, the proposed ignition systems will also have the capacity to co-fire with natural gas or operate on natural gas only during low loads for distinct periods. The implementation of this project is not expected to change the economic dispatch of each boiler.

A PSD applicability analysis for the Big Bend Station (BBS) natural gas igniter project was conducted in accordance with Rule 62-212.400(2), F.A.C. The analysis evaluates the potential changes in emissions associated with the co-firing of natural gas and coal and low-load firing of natural gas in Units 1 through 4. The projected actual emission factors for natural gas when co-fired with coal were taken from AP-42, Section 1.4 with the exception of NO_X. Since the SCR controls will be in use during natural gas and coal co-firing, the average actual controlled NO_X emission factors for each unit for 2011/2012 was used to estimate NO_X emissions due to natural gas combustion. The projected actual annual emissions for natural gas and coal were then summed to obtain total projected actual emissions.

Estimates of projected actual emissions during low-load natural gas firing used the same approach as described for natural gas and coal co-firing with the exception of the use of a different projected actual NOx emission factor for natural gas combustion. During low-load natural gas operation (when coal is not combusted), the SCR controls will not be used. For this case, the AP-42, Section 1.4 NOx emission factor of 140 lb/mmft3 (equivalent to 0.137 lb/mmBtu) was used to estimate NOx emissions due to natural gas combustion.

To ensure that emissions do not increase above the PSD major modification permitting thresholds, TEC requests annual natural gas heat input caps for Units 1 - 4 for co-firing and for low-load operation as follows:

Unit ID	Natural Gas Heat Input Cap (mmBtu/yr)
Co-Firing	
1	5,397,664
2	4,622,649
3	5,412,868
4	5,956,684
Low-Load	
1-4 Combined	1,514,460

One annual natural gas heat input cap for Units 1-4 combined is appropriate for low-load natural gas operation since each natural gas pollutant emission factor is the same for all units. For co-firing, the natural gas NO_X emission factors differ for each unit. No changes to the current maximum hourly heat input rates shown in Title V Air Operation Permit No. 0570039-054-AV are requested. The details of the emission calculations are shown attached.

FDEP Comment 6
Describe the installation features of the new igniters (e.g. will they be able to tilt for different operation modes). Describe the burner management system associated with each boiler associated with the new igniters.

TEC Response 6
The new igniters for Units 1 to 3 will be orientated into the boiler at a fixed location of 25° below elevation in the same manner as the existing fuel oil igniters. The new igniters for Unit 4 will be orientated into the boiler at a fixed location of 0° (neutral) in the same manner as the existing fuel oil igniters.

FDEP Comment 7
Describe if there are circumstances when the new igniters will be operated alone without other fuels co-fired in each boiler. Will the gas igniters be used to facilitate operating of any of the boilers more as a peaking unit and are more startups expected when the new igniters are employed?

TEC Response 7
As mentioned earlier, the proposed ignition systems will be operated to co-fire with natural gas or operate on natural gas only during low loads for economical reasons only and not as peaking units. The new igniters will be used primarily for startup and shutdowns and flame stabilization as necessary. The baseline heat input (2010-2011) for startup and shutdown is 289,657 mmBtu per year. The future actual startup and shutdown are expected to be same as the baseline heat input year (See application dated October 18, 2012).

FDEP Comment 8
Describe any other physical changes to each boiler associated with addition of the new igniters including the extent of boiler wall modifications and changes in the steam systems for each boiler associated with the new igniters.

TEC Response 8
As mentioned earlier, the windbox wall on each boiler will be modified as necessary to install the new igniters. The wall modifications will have no effect on the steam system for each boiler.

TEC is requesting an amendment to the permit application No. 3335-1 to co-fire with natural gas or operate on natural gas only during low loads for economic reasons. The requested information herein provides reasonable assurance of complying with the provisions of Chapter 62-4 F.A.C.

Please contact me at (813) 228-4232 or Byron Burrows at (813) 228-1282, if you have any questions.

Sincerely,

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

Enclosures

c/enc: Kelly Boatwright, SW DEP
Diana Lee, EPCHC

EHS/iym/RAV193

Tampa Electric Company
Big Bend Power Station
Request for Additional Information
Fuel Igniter Replacements
Permit Application No. 3335-1

Owner/Authorized Representative Statement

Complete if applying for an air construction permit or an initial FESOP.

1. Owner/Authorized Representative Name: **Byron T. Burrows**	
2. Owner/Authorized Representative Mailing Address... Organization/Firm: **Tampa Electric Company** Street Address: **P.O. Box 111** City: **Tampa** State: **FL** Zip Code: **33601-0111**	
3. Owner/Authorized Representative Telephone Numbers... Telephone: **(813) 228 - 4111** ext. Fax: ( ) -	
4. Owner/Authorized Representative E-mail Address: **btburrows@tecoenergy.com**	
5. Owner/Authorized Representative Statement: *I, the undersigned, am the owner or authorized representative of the corporation, partnership, or other legal entity submitting this air permit application. To the best of my knowledge, the statements made in this application are true, accurate and complete, and any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department.* Signature	Date 3/7/13

Professional Engineer Certification

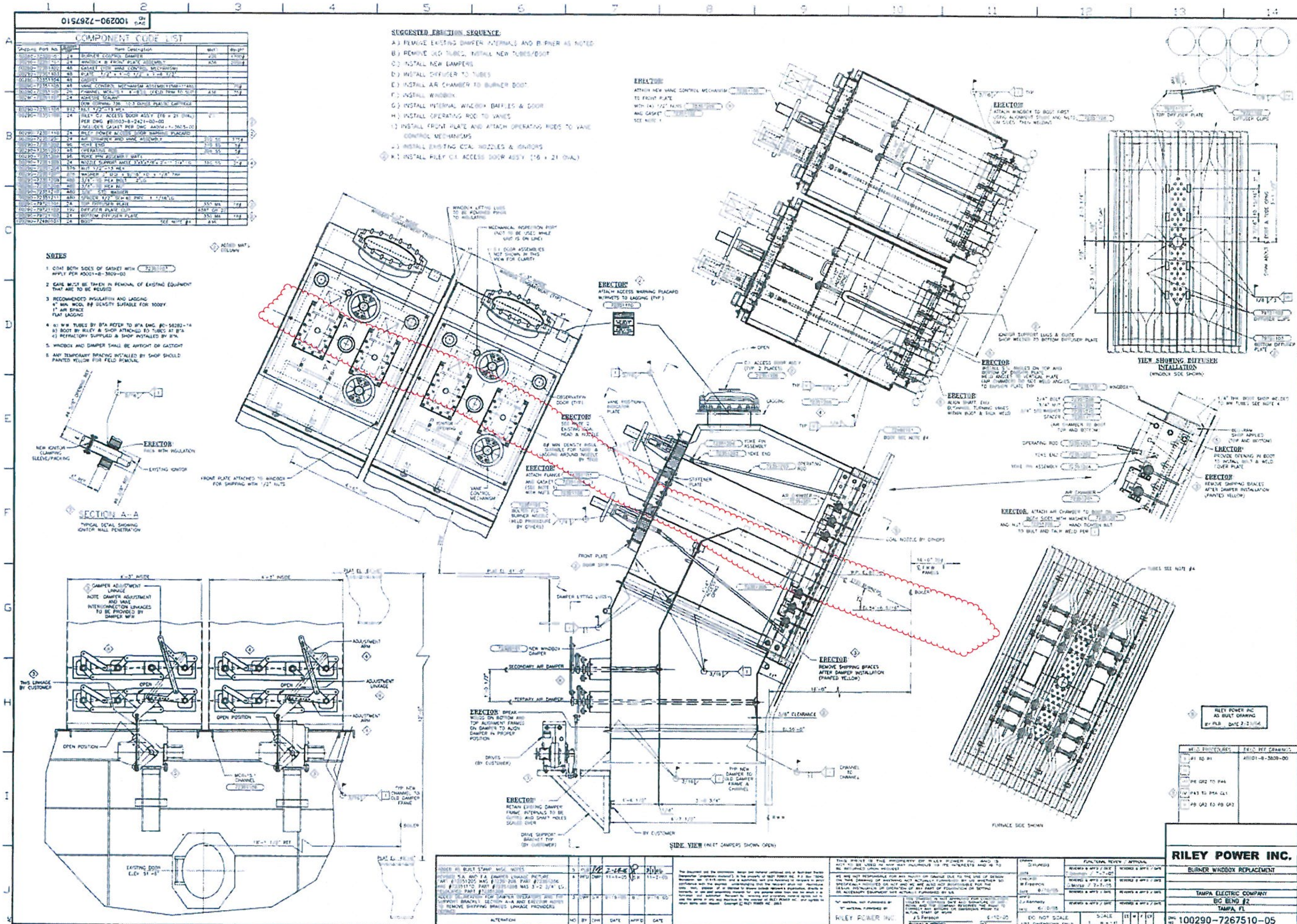
1.	Professional Engineer Name: **Robert A. Velasco** Professional Engineer Job Title: **Senior Environmental Engineer** Registration Number: **57190**
2.	Professional Engineer Mailing Address... Organization/Firm: **Tampa Electric Company** Street Address: **702 N. Franklin St** City: **Tampa** State: **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 Date 3/7/13 (seal)

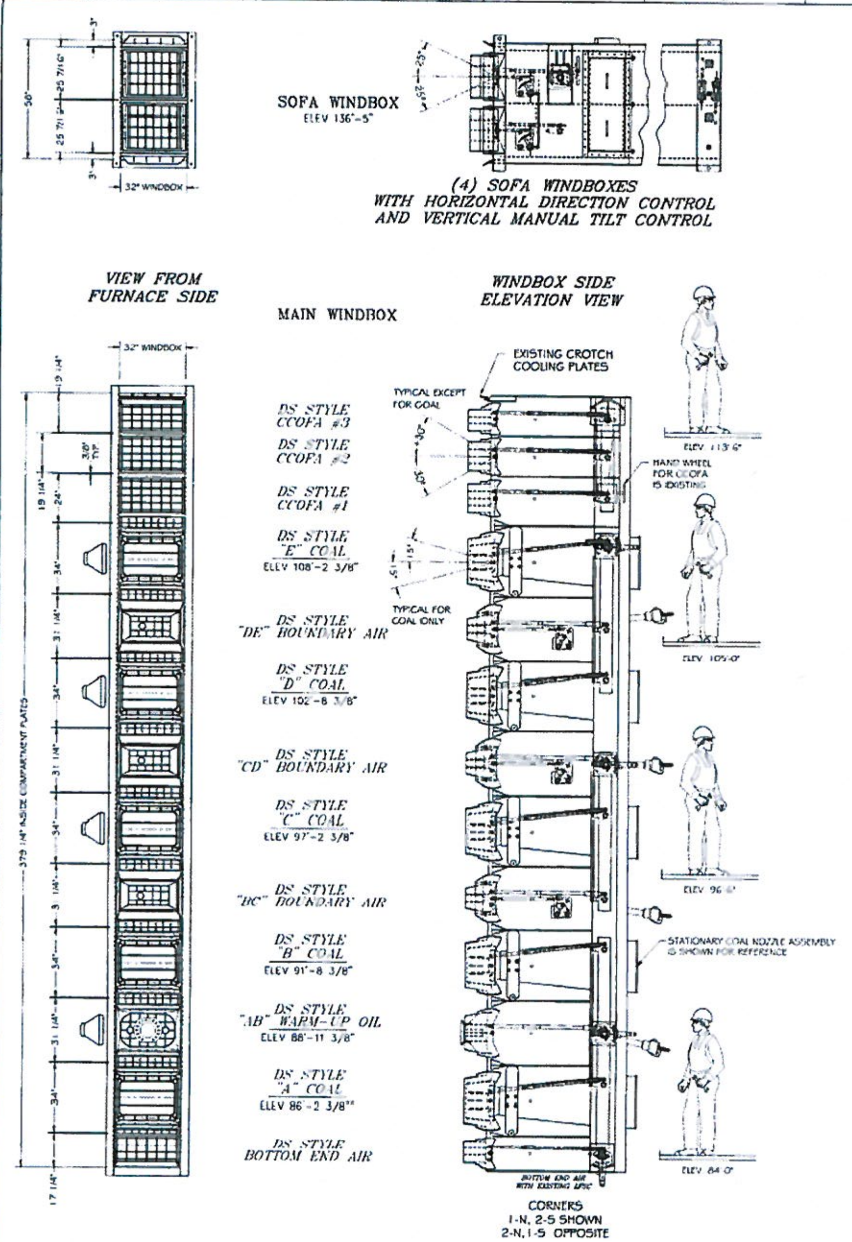
* Attach any exception to certification statement.

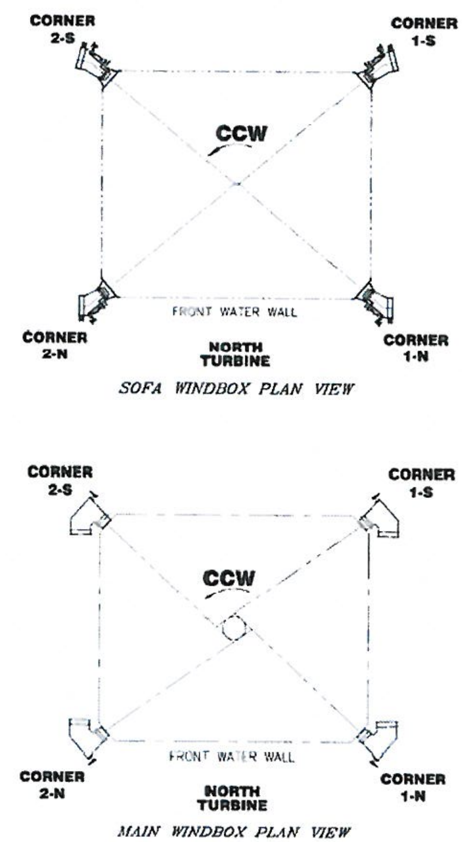
Tampa Electric Company
Big Bend Power Station
Request for Additional Information
Fuel Igniter Replacements
Permit Application No. 3335-1

Professional Engineer Exceptions Statement

1. Professional Engineer Name: **Robert A. Velasco, P.E.**
   Registration Number: **57190**
2. Professional Engineer Address...
   Organization/Firm: **Tampa Electric Company**
   Street Address: **P.O. Box 111**
   City: **Tampa** State: **FL** Zip Code: **33601**
3. Professional Engineer Telephone Numbers...
   Telephone: **(813) 228 - 4232** Fax: **(813) 228 - 1308**
4. Professional Engineer E-mail Address: **ravelasco@tecoenergy.com**
5. Professional Engineer Statement:
   (1) Engineering opinions and information included herein provides reasonable assurance of meeting the requirements of Chapter 62-210.300 F.A.C.;
   (2) Engineering information included herein is believed to be correct to the best of the Engineer's knowledge;
   (3) Emission calculations information was based on acceptable techniques available for calculating emissions or estimating emissions from designated emission sources;
   (4) Emission calculations were prepared by others who qualified to perform such services. This seal does not certify or attest to the accuracy of work or information prepared by others. This includes, but not limited to emission calculations, drawings, vendor information, engineering test data, laboratory data, correspondences, personnel communication etc.; and
   (5) The Engineer is not responsible for subsequent deviations made by others without the written consent of the Engineer.


100290-7267510
COMPONENT CODE LIST
SUGGESTED ERECTION SEQUENCE:
A.) REMOVE EXISTING DAMPER INTERNALS AND BURNER AS NOTED
B.) REMOVE OLD TUBES, INSTALL NEW TUBES/BOOT
C.) INSTALL NEW DAMPERS
D.) INSTALL DIFFUSER TO TUBES
E.) INSTALL AIR CHAMBER TO BURNER BOOT
F.) INSTALL WINDBOX
G.) INSTALL INTERNAL WINDBOX BAFFLES & DOOR
H.) INSTALL OPERATING ROD TO VANES
I.) INSTALL FRONT PLATE AND ATTACH OPERATING RODS TO VANE CONTROL MECHANISMS
J.) INSTALL EXISTING COAL NOZZLES & IGNITORS
K.) INSTALL RILEY C.I. ACCESS DOOR ASSY (16 x 21 OVAL)
NOTES
1. COAT BOTH SIDES OF GASKET WITH APPLY PER A5001-8-3809-00
2. CARE MUST BE TAKEN IN REMOVAL OF EXISTING EQUIPMENT THAT ARE TO BE REUSED
3. RECOMMENDED INSULATION AND LAGGING 4" MIN. WOOL #8 DENSITY SUITABLE FOR 1000°F 1" AIR SPACE FLAT LAGGING
4. a) W.W. TUBES BY B&A REFER TO B&A DWG. #C-58282-14 b) BOOT BY RILEY & SHOP ATTACHED TO TUBES AT B&A c) REFRACTORY SUPPLIED & SHOP INSTALLED BY B&A
5. WINDBOX AND DAMPER SHALL BE AIRTIGHT OR GASTIGHT
6. ANY TEMPORARY BRACING INSTALLED BY SHOP SHOULD PAINTED YELLOW FOR FIELD REMOVAL
SECTION A-A
TYPICAL DETAIL SHOWING IGNITOR WALL PENETRATION
ERECTOR
ATTACH ACCESS WARNING PLACARD W/RIVETS TO LAGGING (TYP.)
VIEW SHOWING DIFFUSER INSTALLATION
(WINDBOX SIDE SHOWN)
FURNACE SIDE SHOWN
SIDE VIEW (INLET DAMPERS SHOWN OPEN)
ERECTOR
REMOVE SHIPPING BRACES AFTER DAMPER INSTALLATION (PAINTED YELLOW)
FRONT PLATE ATTACHED TO WINDBOX FOR SHIPPING WITH 1/2" NUTS
OPEN POSITION
EXISTING DOOR
THIS LINKAGE BY CUSTOMER
RILEY POWER INC.
BURNER WINDBOX REPLACEMENT
TAMPA ELECTRIC COMPANY
BIG BEND #2
TAMPA, FL
100290-7267510-05





NOTES.

1. ALL DIMENSIONS ARE IN INCHES
2. DIMENSIONAL TOLERANCES SHOULD BE ± 1/8" UNLESS OTHERWISE SPECIFIED
3. COMPARTMENT PLATE SPACING SHOULD BE ± 1/8" ON ORIGINAL EQUIPMENT.
4. ALL EQUIPMENT INSTALLED SHOULD BE HELD TO ± 1/8" EXCEPT ALL ADJUSTABLE NOZZLE TIP SOCKETS WHICH SHOULD BE HELD TO ± 1/16". ALIGNMENT TOOLS ARE PROVIDED.

REFERENCE DRAWINGS:

30-107569-3-661	MAIN WINDBOX NEW EQUIPMENT ARRANGEMENT
30-107569-3-662	MAIN WINDBOX AND SOFA WINDBOX BILL OF MATERIAL
30-107569-3-663	MAIN WINDBOX DEMOLITION
30-107569-3-664	MAIN WINDBOX MODIFICATIONS
30-107569-2-665	MAIN WINDBOX INSTALLATION
30-107569-3-666	DAMPER BOX DEMOLITION, MODIFICATIONS & BEARING INSTALLATION
30-107569-2-667	CCOFA #1, #2, & #3 DAMPER BLADE & VENTURI INSTALLATION
30-107569-2-668	COAL & BOUNDARY AIR COMPARTMENT DAMPER BLADE & VENTURI INSTALLATION
30-107569-2-669	WARM UP OIL & BOTTOM END AIR COMPARTMENT DAMPER BLADE & VENTURI INSTALLATION
30-107569-2-670	MAIN WINDBOX BOUNDARY AIR COMPARTMENT - 31 1/4" COMPARTMENT
30-107569-2-671	MAIN WINDBOX OIL COMPARTMENT - 31 1/4" COMPARTMENT
30-107569-2-672	MAIN WINDBOX HORIZONTAL ADJUSTMENT MODULE ASSEMBLY - 31 1/4" COMPARTMENT
30-107569-3-673	SOFA WINDBOX EQUIPMENT ARRANGEMENT CORNERS #2-N & #1-N
30-107569-3-674	SOFA WINDBOX EQUIPMENT ARRANGEMENT CORNERS #2-S & #1-S
30-107569-3-675	SOFA WINDBOX ASSEMBLY CORNERS #1-N AND #2-N
30-107569-3-676	SOFA WINDBOX ASSEMBLY CORNERS #1-N AND #2-N DETAILS
30-107569-3-677	SOFA WINDBOX ASSEMBLY CORNERS #1-S AND #2-S
30-107569-3-678	SOFA WINDBOX ASSEMBLY CORNERS #1-S AND #2-S DETAILS
30-107569-2-679	SOFA WINDBOX DAMPER BLADE ASSEMBLY

REV	DATE	BY	DESCRIPTION
2	1-21-04		AS BUILT
1	6/16/03		RELEASED FOR FABRICATION
0	6/5/03		FOR CONSTRUCTION
A	5/15/03		RELEASED FOR APPROVAL
P	5/9/03		INITIAL RELEASE FOR DISCUSSION

REVISIONS

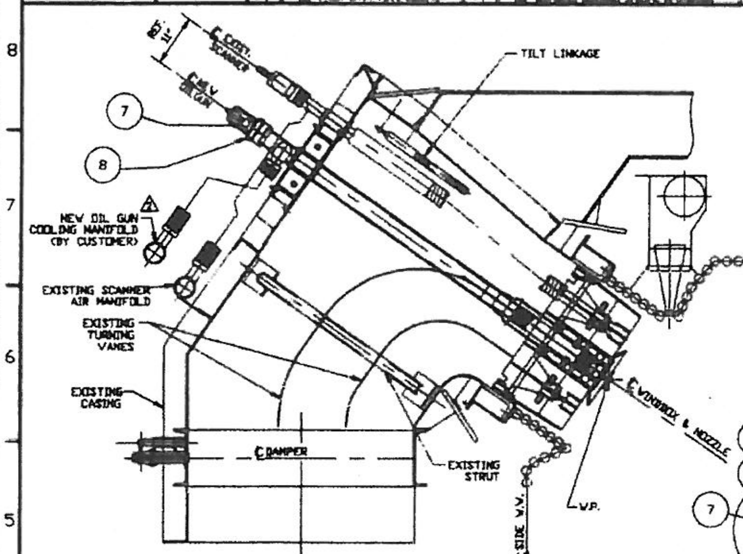
LOW NOx MODIFICATIONS
GENERAL EQUIPMENT ARRANGEMENT
MAIN WINDBOX
SOFA WINDBOX

FOR TAMPA ELECTRIC COMPANY
BIG BEND STATION UNIT #4

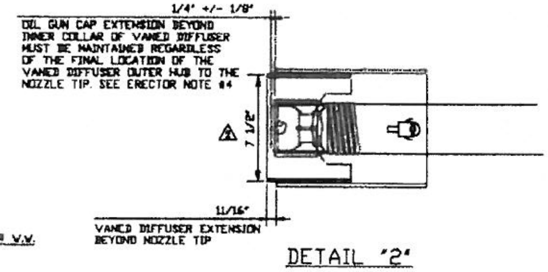
DRAWING NUMBER: 30-107569-3-660
SCALE: N/A
REVISION: 2

THIS DRAWING IS THE PROPERTY OF THE FOSTER WHEELER POWER GROUP, INC.
PERRYVILLE, N.J.

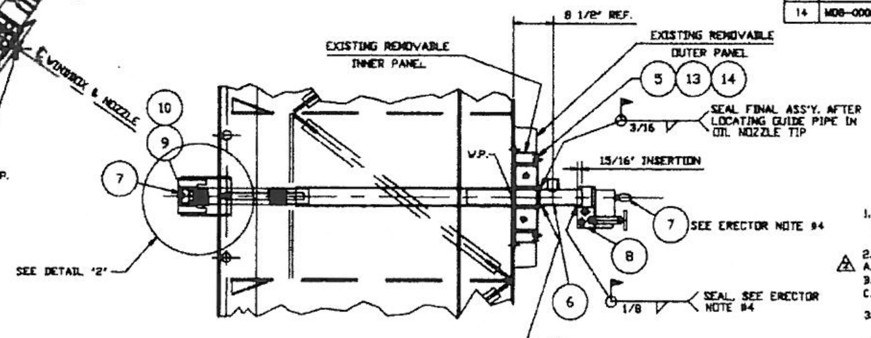
03175-1D9254 REVISIONS



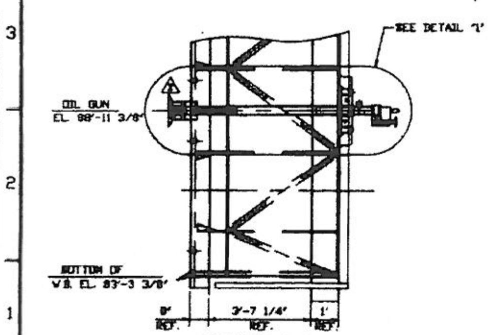
SECTION 'B-B'
WINDBOX NO. 2 & 4 AS SHOWN
WINDBOX NO. 1 & 3 OPP. HAND



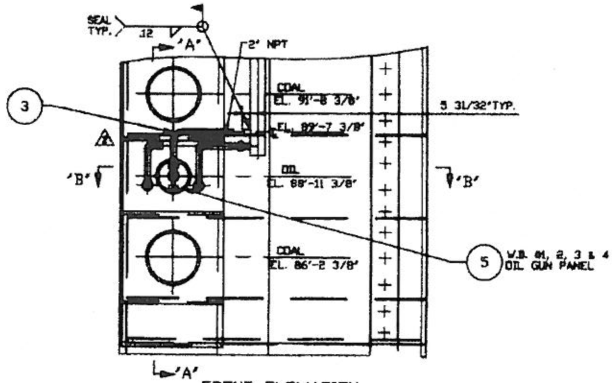
DETAIL '2'



DETAIL '1'



SECTION A-A
SIDE ELEVATION



FRONT ELEVATION
BURNER NO. 2 & 4 AS SHOWN & NOTED
BURNER NO. 1 & 3 OPP. HAND

BILL OF MATERIAL (QUANTITIES LISTED ARE FOR (1) UNIT ONE UNIT ON CONTRACT)

ITEM NO.	PART NO.	NO. REQ'D	DRAWING NO.	DESCRIPTION	MAT'L ITEM
1					---
2					---
3	849-738-A	4	B-849-738	EXT. COOLING AIR HOSE ASSEMBLY DIM. "A"= 4'	---
4					---
5	03175-8253	4	03175-1D9253	REMOVABLE OIL GUN PANEL	---
6	902-3949-4	4	03175-1D9258	GUIDE PIPE SEAL TUBE ASSY ARRG'T 4	---
7	10-8094	4	D-902-2136	EVERKOOL OIL GUN ASSY "XP" DIM = 7'-7 9/16"	---
8	10-8089	4	C-902-2028	STATIONARY UNION COMPLETE ARRG'T NO. 3	---
9	1G-8938-J-28	4	B-902-0881	SPRAY PLATE (TYPE J)	---
10	10-4749-J	4	B-832-033	BACK PLATE	---
* 11	902-1870-AA	1	B-902-1870	OIL GUN VISE ASSY. "XP" DIM = 7'-7 9/16"	---
* 12	902-0878-3	4	B-902-0878	OIL GUN FLEX HOSE ARRGT NO. 3	---
13	15-2002	48	M080-1C0028	LOCKWASHER SPRING 3/8" STL.	---
14	M08-00056-AC	48	M080-1C0056	NUT HEX 3/8-16UNC-2B STL.	---

* NOT SHOWN ON THIS DRAWING

ALSTOM MATERIAL SPECIFICATION CHART

FOR INDEX TO MATERIAL SPECIFICATION REFER TO STANDARD NO. 17-64, INDEX NO. 142

ITEM	SPEC. NO.	NOMINAL COMPOSITION	PURCH. DISTR.
153	A-53	C-Mn P-1, Gr. No. 1	None

ERECTOR NOTES:

1. ERECTOR TO ESTABLISH SEQUENCE OF OPERATIONS FOR REMOVAL AND ALTERATION OF EXISTING MATERIAL AND INSTALLATION OF NEW MATERIAL AND EQUIPMENT.
2. REMOVE COMPLETE OIL GUN ASSEMBLY INCLUDING:
   A. ADVANCED RETRACT MECHANISM
   B. GUIDE PIPE
   C. DIFFUSER
   REFERENCE DRAWING E-902-2287
3. INSTALL NEW REMOVABLE OIL GUN PANELS AND ALL NEW COMPONENTS AS SHOWN.
4. TACK WELDED IN SHOP. AFTER WELDING STATIONARY UNION W/ REMOVABLE OIL GUN CLAMPED IN PLACE, BREAK SHOP TACK WELD, IF NECESSARY, AND ADJUST CONNECTING TUBE TO OBTAIN THE 1/4"±.12 OIL GUN TIP DIMENSION.

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN FEET AND INCHES OR INCHES.
2. ALL WELDS PER A.W.S. D1.1 LATEST EDITION. USE E-7018 ELECTRODE UNLESS OTHERWISE SPECIFIED.
3. SHOP PAINT IN ACCORDANCE WITH ABB INC. DWG. #C-985-0671 ITEM #9.5.

REFERENCE DRAWINGS:

1. 03175-1E4100 WINDBOX ARRANGEMENT (ORIGINAL).

Tampa Electric Company
Big Bend Unit 4 Stationary Burner Nozzles and Oil Guns Replacement
Project No. B1924
Purchase Order No.
ATTN:

UNIT: 4

EVERKOOL OIL GUN FIELD INSTALLATION
TAMPA ELECTRIC COMPANY
BIG BEND STATION
APOLLO BEACH, FLORIDA

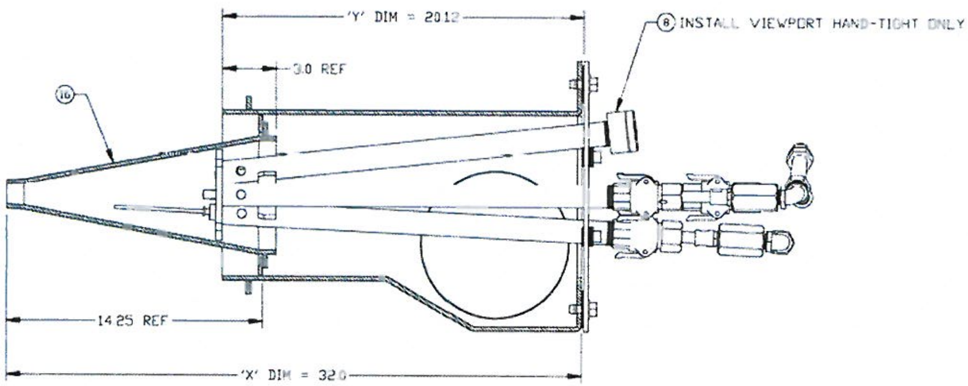
ALSTOM

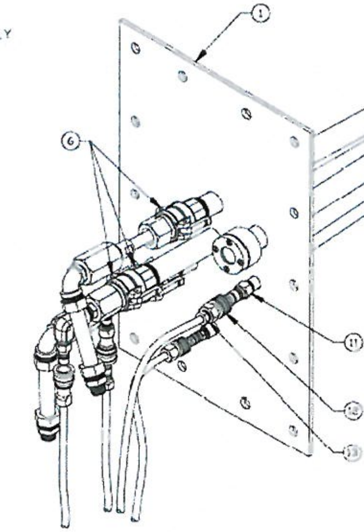
ORIGINAL

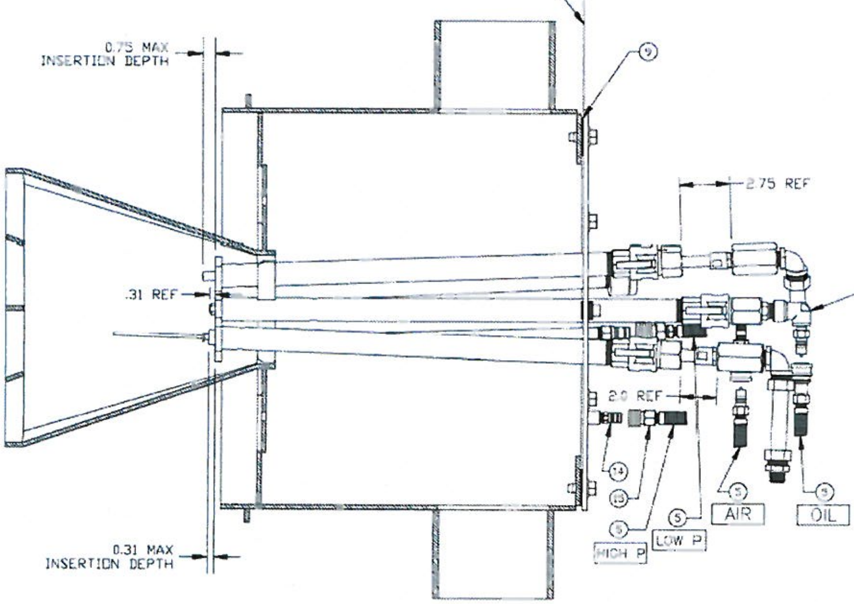
03175-1D9254 | REV 02

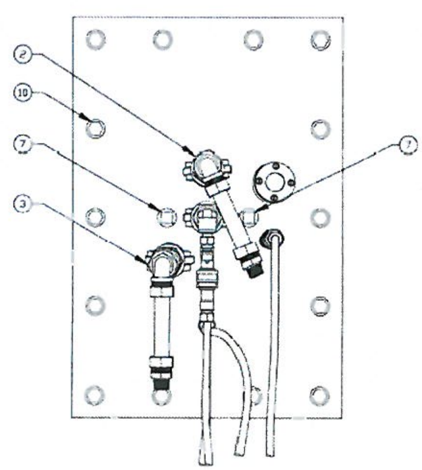
RELEASED

03175-1E9250	REVISIONS	1	CDE 1/26/06	ADDED REF. DWGS. MODIFIED FLEX HOSE VIEWS









BILL OF MATERIAL (QUANTITIES LISTED ARE FOR (1) ASSEMBLY 4 ASSEMBLIES IN CONTRACT)

ITEM NO	PART NO	NO REQ'D	DRAWING NO	DESCRIPTION	MAT'L ITEM
1	EPSE-0010	1	E-EPSE-[illegible]	6" EDDY PLATE OIL SIDE IGNITOR FACEPLATE FABRICATION 'Y' DIM=20.12"	---
2	75-HEI-24	1	D-99-6062	HEI ROD ASSEMBLY - 'A' DIM=22"	---
3	75-DFI-24	1	D-99-6041	DFI ROD ASSEMBLY - 'A' DIM=22"	
4	75-IM[illegible]C-26	1	03175-1D925[illegible]	ATOMIZING NOZZLE ASSEMBLY - 'A' DIM=26"	---
5	V00-2847	4	---	FLEX METAL HOSE 1/4" ID X 48" LG	ST STEEL
6	10-5109	3	---	1" KAMLOK QUICK DISCONNECT	BRASS
7	17-6004	2	M000-1C[illegible]05	3/4" NPT PIPE PLUG	213
8	EPSE-0[illegible]	1	C-EPSE-[illegible]	1" OBSERVATION PORT	---
9	R00-9333	6'	---	[illegible] TAPE GASKET CLAMETEX CO. - STYLE 191-125 PSA	---
10	M00-[illegible]204-BC	14	M000-1C0204	1/2"-13 X 1/2" LG HEX HEAD CAD PLATED TYPE T - SELF TAPPING SCREW	662
11	V00-2933	1	---	QD COUPLING PLUG - HANSEN SERIES ST P/N 3J-T21 - FEMALE 3/8" NPT	BRASS
12	V00-293[illegible]	1	---	QD COUPLING SOCKET - HANSEN SERIES ST P/N 3-[illegible] - FEMALE 3/8" NPT	BRASS
13	M00-[illegible]-AA	1	M000-1C0125	3/8" X 1/4" HEX HEAD REDUCING BUSHING STAINLESS STEEL	454
14	V00-2930	1	---	QD COUPLING PLUG - HANSEN SERIES ST P/N B2-T15 - MALE 1/4" NPT	BRASS
15	V00-2931	1	---	QD COUPLING SOCKET - HANSEN SERIES ST P/N 2-S16 - FEMALE 1/4" NPT	BRASS
16	997-872-AA	N/A	D-997-872	EXISTING IGNITOR NOZZLE ASSEMBLY 49' ELEVATION	---
N/S	99[illegible]9-01	1	C-99-6092	AIR AND OIL TEST EQUIPMENT	---

GENERAL NOTES:
1) FOR INDEX TO MATERIAL SPECIFICATION REFER TO C.E. STANDARD NO. 17-64 INDEX 142
2) ALL DIMENSIONS ARE IN INCHES

ERECTORS NOTES:
1) DFI ROD AND HEI ROD (ITEMS 2,3) ARE SUPPLIED WITH 30' OF SIGNAL WIRE AND 30' OF GROUND WIRE. ALSO INCLUDED IS 10' OF 1/2" FLEXIBLE CONDUIT WITH A 1/2" MALE NPT CONDUIT FITTING ON THE LOOSE END.
2) DFI AND HEI WIRE TRAIN ASSEMBLIES ARE NOT INTERCHANGEABLE THE TYPE IS INDICATED AT THE CONNECTOR END
3) FOR WIRING TERMINATIONS SEE IGNITOR CABINET SCHEMATIC
4) 1/4" QUICK DISCONNECTS SUPPLIED WITH THE OIL ATOMIZER ASSEMBLY (ITEM 4) HAVE VITON SEALS FOR OIL RESISTANCE
5) 1/4" METAL FLEX HOSES FOR THE OIL ATOMIZER HAVE 1/4" MALE NPT ENDS FOR CONNECTION TO THE SUPPLY
6) 1/4" METAL FLEX HOSES FOR THE HIGH AND LOW PRESSURE TAPS HAVE 1/4" MALE NPT ENDS FOR CONNECTION TO THE SUPPLY
7) APPLY PERMATEX NO. 51D PIPE JOINT COMPOUND OR EQUIVALENT TO ALL OIL AND AIR PIPE THREADS AT ASSEMBLY

REFERENCE DRAWINGS:
1) ORIGINAL WINDBOX ARRANGEMENT - 03175-1E4[illegible]0
2) IGNITOR CONTROL CABINET LAYOUT - D-EPSD-03[illegible]7
3) IGNITOR CONTROL CABINET SCHEMATIC - D-EPSD-03[illegible]
4) IGNITOR VALVE TRAIN (2 MMBTU/HR) - D-EPSD-0328

PROJECT: 15008[illegible] ORIGINAL CONTRACT: [illegible] UNIT: 4

6" EDDY PLATE OIL SIDE IGNITOR ARRANGEMENT - 2 MMBTU/HR
TAMPA ELECTRIC COMPANY
BIG BEND STATION
NORTH RUSKIN, FLORIDA

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SCALE: N/A
DRAWN BY: C. Cabrera DATE: 12/[illegible]/05
CHECKED BY: C. Cabrera DATE: [illegible]
APPROVED BY: D. Swiss DATE: [illegible]
WBS CODE:

ORIGINAL

ALSTOM

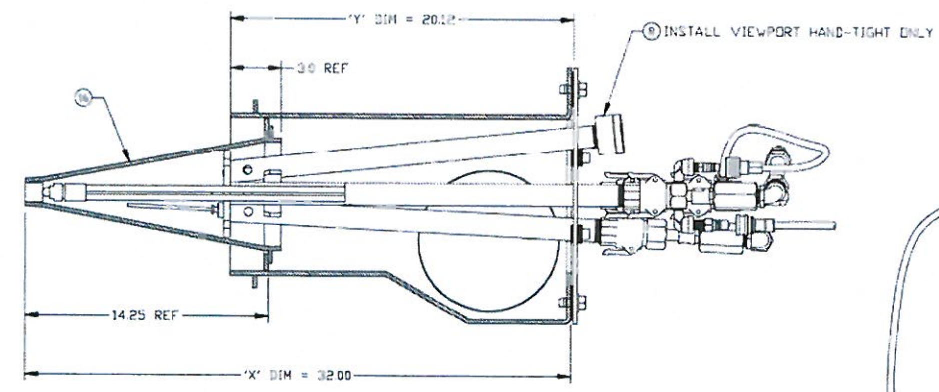
ALSTOM POWER INC.
2000 DAY HILL RD.
WINDSOR, CONNECTICUT

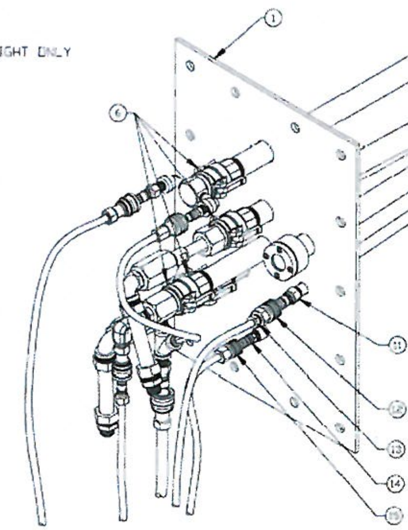
DRAWING NO. 03175-1E9250 REV 01 E

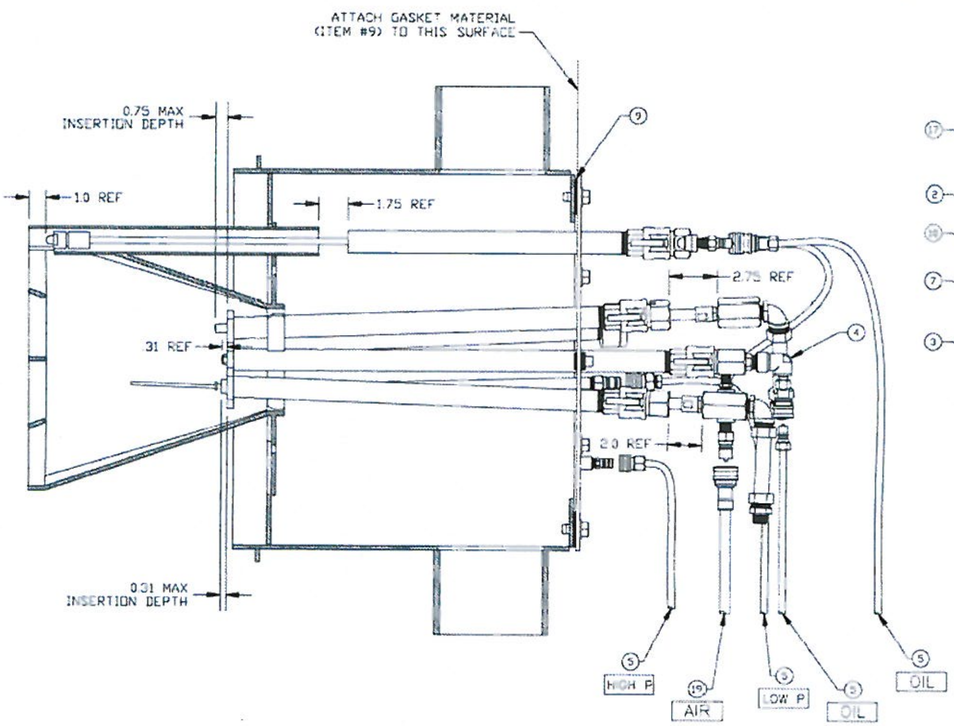
RELEASED

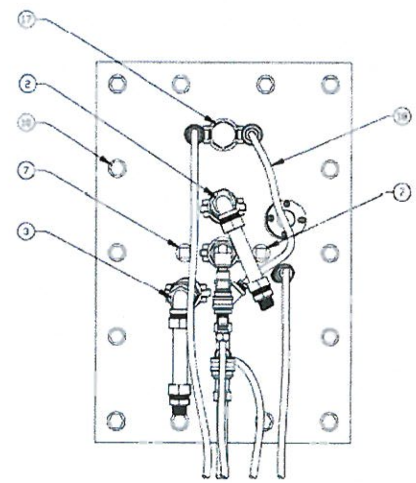
03175-1E9251 | REVISIONS | 1 | REVISED ITEM NO 23 P/N 80-4Z1-143 WAS 80-4Z1-143 IN DESCRIPTION. ALSO ITEM N/S DRAWING NO C-EPSC-0052 WAS C-99-6050

BILL OF MATERIAL				(QUANTITIES LISTED ARE FOR (1) ASSEMBLY 10 ASSEMBLIES ON CONTRACT)	
ITEM NO	PART NO	NO REQ'D	DRAWING NO	DESCRIPTION	MAT'L ITEM
1	EPSC-0009	1	C-EPSC-0009	6" EDDY PLATE OIL SIDE IGNITOR FACEPLATE FABRICATION 'Y' DIM=20"	---
2	75-HEI-24	1	D-99-6042	HEI ROD ASSEMBLY - 'A' DIM=22"	---
3	75-DFI-24	1	D-99-6041	DFI ROD ASSEMBLY - 'A' DIM=22"	
4	75-IMZK-C-26	1	03175-1D9252	ATOMIZING NOZZLE ASSEMBLY - 'A' DIM=26"	---
5	V00-2847	4	---	FLEX METAL HOSE ASSEMBLY - 40" LONG 1/4" ID - 1/4" NPT MALE ENDS WITH HEX	ST STEEL
6	15-9109	4	---	1" KAMLOK QUICK DISCONNECT	BRASS
7	12-6004	2	MD80-1C0005	3/4" NPT PIPE PLUG	212
8	EPSC-0020	1	C-EPSC-0020	1" OBSERVATION PORT	---
9	R00-9333	6'	---	2.0" X 1/8" THICK TAPE GASKET CLARETEX CO - STYLE 197-100 PSA	---
10	MD0-00204-BC	14	MD80-1C0204	1/2"-13 X 1.0" LG HEX HEAD CAD PLATED TYPE T - SELF TAPPING SCREW	662
11	V00-2933	1	---	QD COUPLING PLUG - HANSEN SERIES ST P/N B3-T21 - FEMALE 3/8" NPT	BRASS
12	V00-2932	1	---	QD COUPLING SOCKET - HANSEN SERIES ST P/N 3-S21 - FEMALE 3/8" NPT	BRASS
13	MD0-00125-KA	3	MD80-1C0125	3/8" X 1/4" HEX HEAD REDUCING BUSHING STAINLESS STEEL	454
14	V00-2930	1	---	QD COUPLING PLUG - HANSEN SERIES ST P/N B2-T15 - MALE 1/4" NPT	BRASS
15	V00-2931	1	---	QD COUPLING SOCKET - HANSEN SERIES ST P/N 2-S16 - FEMALE 1/4" NPT	BRASS
16	997-956-AA	N/A	D-997-956	EXISTING IGNITOR NOZZLE ASSEMBLY ELEVATIONS 'C', 'D', 'E'	---
17	1G-3742	N/A	C-987-236	EXISTING UPPER ATOMIZER ASSY	---
18	V00-2941	1	---	FLEX METAL HOSE ASSEMBLY - 30" LONG 1/4" ID - 1/4" NPT MALE ENDS WITH HEX	ST STEEL
19	V00-2940	1	---	FLEX METAL HOSE ASSEMBLY - 40" LONG 3/8" ID - 3/8" NPT MALE ENDS WITH HEX	ST STEEL
20	V00-2852	2	---	QD COUPLING SOCKET - HANSEN SERIES HK P/N B2-HK-143 - FEMALE 1/4" NPT	BRASS
21	V00-2853	1	---	QD COUPLING PLUG - HANSEN SERIES HK P/N B2-HK-143 - FEMALE 1/4" NPT	BRASS
22	V00-2935	1	---	QD COUPLING SOCKET - HANSEN SERIES HK P/N B3-HZ1-143 - FEMALE 3/8" NPT	BRASS
23	V00-2934	1	---	QD COUPLING PLUG - HANSEN SERIES HK P/N B3-4Z1-143 - FEMALE 3/8" NPT	BRASS
24	V00-2936	1	---	QD COUPLING SOCKET - HANSEN SERIES 3000 P/N 3000-143 - FEMALE 1/4" NPT	BRASS
25	V00-2942	1	---	3/8" WYE - NPT X NPT - GALVANIZED	MI
26	-4138	2	---	1/4" SCH 40 CLOSE NIPPLE-TBE	453
N/S	956009-03	2	C-EPSC-0052	AIR AND OIL TEST EQUIP. - KIT #3	---

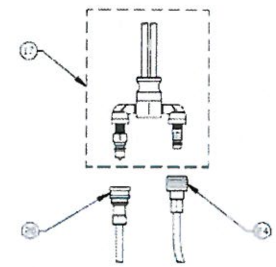




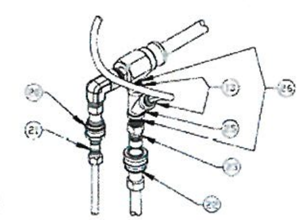




UPPER ATOMIZER



CENTER ATOMIZER



GENERAL NOTES:
1) FOR INDEX TO MATERIAL SPECIFICATION REFER TO CE STANDARD NO 17-64 INDEX 142
2) ALL DIMENSIONS ARE IN INCHES

ERECTORS NOTES:
1) DFI ROD AND HEI ROD (ITEMS 2,3) ARE SUPPLIED WITH 30' OF SIGNAL WIRE AND 30' OF GROUND WIRE. ALSO INCLUDED IS 10' OF 1/2" FLEXIBLE CONDUIT WITH A 1/2" MALE NPT CONDUIT FITTING ON THE LOOSE END.
2) DFI AND HEI WIRE TRAIN ASSEMBLIES ARE NOT INTERCHANGEABLE THE TYPE IS INDICATED AT THE CONNECTOR END
3) FOR WIRING TERMINATIONS SEE IGNITOR CABINET SCHEMATIC
4) 1/4" AND 3/8" QUICK DISCONNECTS SUPPLIED WITH THE OIL ATOMIZER ASSEMBLIES (ITEM 4, 17) HAVE VITON SEALS FOR OIL RESISTANCE
5) 1/4" METAL FLEX HOSES FOR THE OIL ATOMIZERS HAVE 1/4" MALE NPT ENDS FOR CONNECTION TO THE SUPPLY
6) 3/8" METAL FLEX HOSE TO THE CENTER ATOMIZER HAS 3/8" MALE NPT ENDS FOR CONNECTION TO THE SUPPLY
7) 1/4" METAL FLEX HOSES FOR THE HIGH AND LOW PRESSURE TAPS HAVE 1/4" MALE NPT ENDS FOR CONNECTION TO THE SUPPLY
8) APPLY PERMATEX NO. 51D PIPE JOINT COMPOUND OR EQUIVALENT TO ALL OIL AND AIR PIPE THREADS AT ASSEMBLY

REFERENCE DRAWINGS:
1) ORIGINAL WINDBOX ARRANGEMENT - 03175-1E4130
2) IGNITOR CONTROL CABINET LAYOUT - D-EPSD-0327
3) IGNITOR CONTROL CABINET SCHEMATIC - D-EPSD-0325
4) IGNITOR VALVE TRAIN (10 MMBTU/HR) - D-EPSD-0329

PROJECT: 150086525 ORIGINAL CONTRACT: 03175 UNIT: 4

6" EDDY PLATE OIL SIDE IGNITOR ARRANGEMENT - 10 MMBTU/HR
TAMPA ELECTRIC COMPANY
BIG BEND STATION
NORTH RUSKIN, FLORIDA

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SCALE: N/A
DRAWN BY: C. Edberg DATE:
CHECKED BY: C. Edberg DATE:
APPROVED BY: DATE:
WBS CODE:

ORIGINAL

ALSTOM
ALSTOM POWER INC
2000 DAY HILL RD
WINDSOR, CONNECTICUT

DRAWING NO. 03175-1E9251 REV 01 E

RELEASED

TAMPA ELECTRIC COMPANY
BIG BEND STATION NATURAL GAS IGNITOR PROJECT
PSD APPLICABILITY ANALYSIS

An analysis of PSD applicability for the Big Bend Station (BBS) natural gas ignitor project was conducted in accordance with Rule 62-212.400(2), F.A.C. The analysis evaluates the potential changes in emissions associated with the co-firing of natural gas and coal and low-load firing of natural gas in Units 1 through 4.

The BBS is classified as an existing major facility. A modification to an existing major facility that results in an emission increase equal to or exceeding the significant emission rates (SERs) defined by Rule 62-210.200(282), F.A.C., is classified as a *major* modification and will be subject to the Prevention of Significant Deterioration (PSD) preconstruction permitting program for those pollutants that exceed the PSD SERs.

The procedures for determining applicability of the PSD permitting program to modifications planned at existing major facilities are specified in Rule 62-212.400(2), F.A.C. For modifications to existing emission units, the baseline actual-to-projected actual applicability test of Rule 62-212.400(2)(a)1., F.A.C. is required. A significant emissions increase of a PSD pollutant will occur if the difference, or the sum of the differences if more than one emissions unit is involved, between the projected actual emissions and the baseline actual emissions equals or exceeds the significant emissions rate for that pollutant.

Baseline actual emissions is defined by Rule 62-210.200(36)(b), F.A.C. as:

> "The rate of emissions, in tons per year, of a PSD pollutant. For existing emission units (other than an electric utility steam generating unit), baseline actual emissions means the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 10-year period immediately preceding the date a complete permit application is received by the Department, except that the 10-year period shall not include any period earlier than November 15, 1990."

Actual annual emission rates for 2008 through 2012 for Units 1 through 4 are summarized on Table 1. These actual annual emission rates were obtained from the EPA Clean Air Markets website (for NO_x and SO_2), and from previously submitted Annual Operating Reports (AORs) for the remaining pollutants. The consecutive 24-month period selected for determining baseline actual emissions for Units 1 through 4 is calendar years 2011 and 2012. Actual average annual emissions during this 24-month baseline period were used to determine baseline actual emissions.

Projected actual emissions is defined by Rule 62-210.200(249), F.A.C. as:

> "The maximum annual rate, in tons per year, at which an existing emissions unit is projected to emit a PSD pollutant in any one of the 5 years following the date the unit resumes regular operation after the project, or in any one of the 10 years following that date, if the project involves increasing the emissions unit's design capacity or its potential to emit that PSD pollutant and full utilization of the unit would result in a significant emissions increase or a significant net emissions increase at the major stationary source. One year is one 12-month period."

The natural gas ignitor project will not increase the design capacity or potential emissions of Units 1 through 4. Projected actual emissions for co-firing natural gas and coal for the 5 year period following installation of the natural gas ignitors were estimated by multiplying the projected actual natural gas and coal emission factors (in units of lb/MMBtu) for each pollutant by the projected Units 1 through 4 actual annual heat input rates (in units of MMBtu/yr) for natural gas and coal. Since increased use of natural gas and lower coal use will not change the future utilization of Units 1-4, projected actual annual heat input rates for Units 1-4 were assumed to be equal to the actual 2011/2012 average heat input rates for each unit.

The projected actual emission factors for natural gas when co-fired with coal were taken from AP-42, Section 1.4 with the exception of NO_x. Since the SCR controls will be in use during natural gas and coal co-firing, the average actual controlled NO_x emission factors for each unit for 2011/ 2012 was used to estimate NO_x emissions due to natural gas combustion. The projected actual annual emissions for natural gas and coal were then summed to obtain total projected actual emissions.

TAMPA ELECTRIC COMPANY
BIG BEND STATION NATURAL GAS IGNITOR PROJECT
PSD APPLICABILITY ANALYSIS

Estimates of projected actual emissions during low-load natural gas firing used the same approach as described for natural gas and coal co-firing with the exception of the use of a different projected actual NO_x emission factor for natural gas combustion. During low-load natural gas operation (when coal is not combusted), the SCR controls will not be used. For this case, the AP-42, Section 1.4 NO_x emission factor of 140 lb/MMft^3 (equivalent to 0.137 lb/MMBtu) was used to estimate NO_x emissions due to natural gas combustion.

To ensure that emissions do not increase above the PSD major modification permitting thresholds, TEC requests annual natural gas heat input caps for Units 1 through 4 for co-firing and for low-load operation as follows:

A. Co-Firing

Unit ID	Natural Gas Heat Input Cap (MMBtu/yr)
1	5,397,664
2	4,622,649
3	5,412,868
4	5,956,684

B. Low-Load

Unit ID	Natural Gas Heat Input Cap (MMBtu/yr)
1-4 Combined	1,514,460

One annual natural gas heat input cap for Units 1-4 combined is appropriate for low-load natural gas operation since each natural gas pollutant emission factor is the same for all units. For co-firing, the natural gas NO_x emission factors differ for each unit. No changes to the current maximum hourly heat input rates shown in Title V Air Operation Permit No. 0570039-054-AV are requested.

Projected actual heat input rates, baseline 2011/2012 actual emission rates, projected actual emission rates, and the change in emissions for natural gas and coal co-firing are provided in Table 2. The same information for low-load natural gas firing is provided in Table 3.

As expected due to the increased use of natural gas and lower coal use, Table 2 shows that emissions during natural gas co-firing are projected to remain the same or decrease for all pollutants with the exception of VOCs. The increase in VOC emissions is due to the higher AP-42 VOC emission factor for natural gas compared to coal on a lb/MMBtu basis. During low-load natural gas combustion when the SCRs are not in service, the constraining air pollutant is NO_x due to the higher NO_x emission factor for natural gas without SCR compared to that of coal with SCR.

Table 1. Tampa Electric Company - Big Bend Station Natural Gas Ignitor Project
Units 1-4 Actual Emission Rates

A. Actual Emission Rates[1]

Unit	Year	Heat Input (10^6 Btu/yr)	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)
1	2012	24,493,337	1,077.4	2,053.3	237.9	19.0	192.1
	2011	30,836,521	1,292.3	2,489.0	2,773.5	23.1	277.5
	2010	22,512,131	969.0	1,989.0	1,981.7	16.6	218.1
	2009	20,504,228	5,134.5	1,524.0	1,910.1	16.0	232.3
	2008	26,751,441	7,926.6	2,097.3	2,640.9	22.4	281.2
	2011/2012 Average	**27,664,929**	**1,184.8**	**2,271.2**	**1,505.7**	**21.1**	**234.8**
2	2012	27,907,028	1,254.9	2,182.2	276.2	22.0	222.8
	2011	19,478,379	814.8	1,628.8	1,932.8	16.0	212.7
	2010	25,888,670	1,205.2	2,215.3	2,194.6	18.1	263.5
	2009	12,866,303	1,580.2	878.2	1,198.0	10.0	167.8
	2008	25,306,499	7,479.8	1,915.8	2,444.6	20.7	306.5
	2011/2012 Average	**23,692,704**	**1,034.8**	**1,905.5**	**1,104.5**	**19.0**	**217.7**
3	2012	27,912,806	1,250.7	1,684.7	250.1	20.0	134.9
	2011	27,572,898	1,317.3	1,965.6	2,376.4	20.2	173.6
	2010	30,199,343	1,462.3	1,570.2	2,566.4	21.8	231.1
	2009	31,424,714	1,557.0	2,034.6	2,669.9	22.9	228.8
	2008	17,695,716	795.3	1,080.4	1,535.5	13.1	140.6
	2011/2012 Average	**27,742,852**	**1,284.0**	**1,825.1**	**1,313.2**	**20.1**	**154.2**
4	2012	30,281,339	1,191.3	3,237.6	2,738.2	35.3	74.2
	2011	30,778,869	1,202.2	3,022.3	2,727.6	35.8	93.1
	2010	28,530,360	1,145.9	3,842.8	2,414.6	30.7	101.7
	2009	31,965,301	1,375.8	4,551.4	2,989.0	38.9	139.6
	2008	29,665,131	1,073.2	4,521.0	2,807.7	37.2	115.1
	2011/2012 Average	**30,530,104**	**1,196.8**	**3,129.9**	**2,732.9**	**35.5**	**83.6**

[1] NO_x and SO_2 emissions from EPA Clean Air Markets website, remaining pollutants from TEC AORs.

Sources: ECT, 2013.
EPA, 2013.
TEC, 2013.

Table 3. Tampa Electric Company - Big Bend Station Natural Gas Ignitor Project
Low-Load Natural Gas and Coal - Actual and Projected Actual Emission Rates

Natural Gas Heat Content	1,020	Btu/ft^3, HHV
Coal Heat Content	23.6	10^6 Btu/ton, HHV

A. Projected Actual Emission Factors[1]

Fuel Type	NO_x (lb/10^6 Btu, HHV)	SO_2 (lb/10^6 Btu, HHV)	CO (lb/10^6 Btu, HHV)	VOC (lb/10^6 Btu, HHV)	$PM_{10}/PM_{2.5}$ (lb/10^6 Btu, HHV)
Natural Gas (Without SCR)					
Unit 1	0.137	0.006	0.082	0.0054	0.0075
Unit 2	0.137	0.006	0.082	0.0054	0.0075
Unit 3	0.137	0.006	0.082	0.0054	0.0075
Unit 4	0.137	0.006	0.082	0.0054	0.0075
Coal					
Unit 1	0.086	0.164	0.109	0.0015	0.017
Unit 2	0.087	0.161	0.093	0.0016	0.018
Unit 3	0.093	0.132	0.095	0.0014	0.011
Unit 4	0.078	0.205	0.179	0.0023	0.0055

[1] AP-42 emission factors for natural gas, actual 2011/2012 annual average emission factors for coal.

B. Boiler Projected Actual HeatInput Rates

Unit	Heat Input (10^6 Btu/yr, HHV)		
	Coal	Natural Gas	Total[2]
1	27,282,759	382,169	27,664,929
2	23,365,408	327,296	23,692,704
3	27,359,607	383,246	27,742,852
4	30,108,355	421,749	30,530,104
Totals	**108,116,128**	**1,514,460**	**109,630,588**

[2] 2011/2012 average.

C. Baseline (2011/2012) Actual Emission Rates

Unit	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)
1	1,184.8	2,271.2	1,505.7	21.1	234.8
2	1,034.8	1,905.5	1,104.5	19.0	217.7
3	1,284.0	1,825.1	1,313.2	20.1	154.2
4	1,196.8	3,129.9	2,732.9	35.5	83.6

D. Low-Load Natural Gas and Coal Projected Actual Emission Rates

Unit	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)
1	1,194.7	2,240.9	1,500.6	21.8	232.9
2	1,043.0	1,880.1	1,102.7	19.6	215.9
3	1,292.6	1,801.1	1,310.9	20.9	153.5
4	1,209.2	3,087.9	2,712.5	36.2	84.1

E. Low-Load Natural Gas and Coal Projected Actual Emission Rates - Actual (2011/2012) Emission Rates (D - C)

Unit	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)
1	9.9	-30.3	-5.1	0.7	-1.8
2	8.2	-25.4	-1.8	0.6	-1.8
3	8.6	-24.1	-2.4	0.8	-0.7
4	12.4	-42.0	-20.4	0.6	0.4
Totals	**39.0**	**-121.7**	**-29.6**	**2.8**	**-3.9**

Sources: ECT, 2013.
EPA, 2013.
TEC, 2013.

Table 3. Tampa Electric Company - Big Bend Station Natural Gas Ignitor Project
Low-Load Natural Gas and Coal - Actual and Projected Actual Emission Rates

Natural Gas Heat Content	1,020	Btu/ft^3, HHV
Coal Heat Content	23.6	10^6 Btu/ton, HHV

A. Projected Actual Emission Factors[1]

Fuel Type	NO_x (lb/10^6 Btu, HHV)	SO_2 (lb/10^6 Btu, HHV)	CO (lb/10^6 Btu, HHV)	VOC (lb/10^6 Btu, HHV)	$PM_{10}/PM_{2.5}$ (lb/10^6 Btu, HHV)
Natural Gas (Without SCR)					
Unit 1	0.137	0.006	0.082	0.0054	0.0075
Unit 2	0.137	0.006	0.082	0.0054	0.0075
Unit 3	0.137	0.006	0.082	0.0054	0.0075
Unit 4	0.137	0.006	0.082	0.0054	0.0075
Coal					
Unit 1	0.086	0.164	0.109	0.0015	0.017
Unit 2	0.087	0.161	0.093	0.0016	0.018
Unit 3	0.093	0.132	0.095	0.0014	0.011
Unit 4	0.078	0.205	0.179	0.0023	0.0055

[1] AP-42 emission factors for natural gas, actual 2011/2012 annual average emission factors for coal.

B. Boiler Projected Actual Heat Input Rates

Unit	Heat Input (10^6 Btu/yr, HHV)		
	Coal	Natural Gas	Total[2]
1	27,282,759	382,169	27,664,929
2	23,365,408	327,296	23,692,704
3	27,359,607	383,246	27,742,852
4	30,108,355	421,749	30,530,104
Totals	**108,116,128**	**1,514,460**	**109,630,588**

[2] 2011/2012 average.

C. Baseline (2011/2012) Actual Emission Rates

Unit	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)
1	1,184.8	2,271.2	1,505.7	21.1	234.8
2	1,034.8	1,905.5	1,104.5	19.0	217.7
3	1,284.0	1,825.1	1,313.2	20.1	154.2
4	1,196.8	3,129.9	2,732.9	35.5	83.6

D. Low-Load Natural Gas and Coal Projected Actual Emission Rates

Unit	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)
1	1,194.7	2,240.9	1,500.6	21.8	232.9
2	1,043.0	1,880.1	1,102.7	19.6	215.9
3	1,292.6	1,801.1	1,310.9	20.9	153.5
4	1,209.2	3,087.9	2,712.5	36.2	84.1

E. Low-Load Natural Gas and Coal Projected Actual Emission Rates - Actual (2011/2012) Emission Rates (D - C)

Unit	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	$PM_{10}/PM_{2.5}$ (tpy)
1	9.9	-30.3	-5.1	0.7	-1.8
2	8.2	-25.4	-1.8	0.6	-1.8
3	8.6	-24.1	-2.4	0.8	-0.7
4	12.4	-42.0	-20.4	0.6	0.4
Totals	**39.0**	**-121.7**	**-29.6**	**2.8**	**-3.9**

Sources: ECT, 2013.
EPA, 2013.
TEC, 2013.