

**Golder Associates Inc.**

6241 NW 23rd Street, Suite 500  
Gainesville, FL 32653-1500  
Telephone (352) 336-5600  
Fax (352) 336-6603



September 24, 2007

0738-7523

Florida Department of Environmental Protection  
Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32399-2400

Attention: Mr. Tom Casio, P.E.

**RE: FT. PIERCE UTILITIES AUTHORITY  
TITLE V PERMIT RENEWAL – CAM PLAN**

Dear Mr. Casio:

In response to your request, a Compliance Assurance Monitoring (CAM) Plan has been prepared for the combined cycle gas turbine unit No. 9 (EU ID 003) at the Ft. Pierce Utilities Authority's (FPUA) H.D. King Power Plant and is attached with this letter.

The gas turbine unit No. 9 is a 23.4-megawatt (MW) natural gas or No. 2 oil-fired combined-cycle unit and uses steam injection for nitrogen oxides (NO<sub>x</sub>) emissions control. The unit is subject to 40 CFR 60 Subpart GG and has a continuous emissions monitoring system to monitor and record the fuel consumption and the ratio of steam to fuel being fired in the turbine. FPUA proposes to use the continuous monitoring of steam-to-fuel ratio as the CAM for NO<sub>x</sub> emissions. The unit is subject to a NO<sub>x</sub> emissions limit of 84 parts per million by volume (ppmv) at 15 percent oxygen on a dry basis.

FPUA operates a General Electric (GE) Mark IV continuous monitoring system, which records fuel flow, steam flow, actual steam-to-fuel ratio, and steam-to-fuel ratio required to meet the emissions limit. Based on the 1989 stack test report and current actual observations, a steam-to-fuel ratio versus load curve was generated, which is shown in the attachments. Also based on the actual observations, the required steam-to-fuel ratio at approximately 20 MW operating load is 0.15. A second steam-to-fuel ratio versus load curve was generated from the required ratio of 0.15 and the slope of the actual observations curve. This new curve shows the level of required steam-to-fuel ratio at any operating load. It is to be noted that steam injection is used only at operating loads of 75-percent or higher.

Thank you for consideration of this information. If you have any questions, please do not hesitate to call me at (352) 336-5600.

Sincerely,

**GOLDER ASSOCIATES INC.**

Kennard Kosky, P.E.  
Principal Engineer

SKM/tz

Enclosures

cc: John Tompeck, FPUA

Salahuddin Mohammad  
Staff Engineer

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### MONITORING APPROACH

	<b>Compliance Indicator</b>
Indicator	Steam-to-fuel ratio.
Measurement Approach	Continuous monitoring system measuring steam injection rate, fuel consumption, and steam-to-fuel ratio.
Indicator Range	An excursion is defined as a rolling average of any 60 consecutive 1-minute averages that the steam-to-fuel ratio falls below required steam-to-flow ratio. This is calculated based on actual operating load plot (shown in Figure 1, data in Table 1) prepared from stack test data and actual observations of the GE required steam-to-flow ratio to meet the emission limit. If there is a problem with the fuel or steam flow that causes the steam-to-fuel ratio to fall below the required ratio during any rolling hourly average, an alarm alerts the control room of the problem. Since the data is monitored as a rolling hourly average and the compliance standard is based on block 1-hour averages, an alarm allows the operator to investigate the case and prevent a non-compliance situation from occurring.
Data Representativeness	The GE Mark IV Speedtronic continuous monitoring system continuously monitors the fuel flow rate and sends a signal to the steam flow control valve to adjust the flow to meet the required ratio. The required ratio is calculated by the Mark IV Speedtronic based on algorithms programmed into the system to account for varying ambient conditions (temperature and relative humidity).
Verification of Operational Status	(1) Annual compliance testing (2) Confirming the actual versus required steam-to-fuel ratios.
QA/QC Practices and Criteria	Operate and maintain the GE Mark IV Speedtronic continuous monitor according to manufacturer's specifications. All metering equipment, including transmitters, are calibrated annually and meet manufacturer requirements.
Monitoring Frequency	Continuous.
Data Collection Procedures	The GE Mark IV Speedtronic continuous monitoring system monitors the steam flow and fuel flow every second and at the end of each minute, the sixty one-second data entries are averaged and recorded as the one-minute averages. The data collection system calculates the steam-to-fuel ratio.
Averaging Period	The averaging period for steam-to-fuel ratio is 1 minute.

**TABLE 1.**  
**STEAM-TO-FUEL RATIO AND OPERATING LOAD DATA FOR UNIT NO. 9**  
**FT. PIERCE UTILITIES AUTHORITY**

Date	Time	Run No.	Operating Load (%)	(MW)	Steam Injection (lb/sec)	Fuel Flow (lb/sec)	Steam-to Fuel Ratio
8/14/2007	17:00	--	--	20.17	--		0.182
	16:00	--	--	20.52	--		0.182
	15:00	--	--	20.49	--		0.181
8/13/2007	16:41	--	--	20.64	--		0.184
	15:41	--	--	20.54	--		0.186
	14:41	--	--	20.44	--		0.184
8/12/2007	17:34	--	--	20.42	--		0.186
	16:34	--	--	20.22	--		0.18
	15:34	--	--	20.49	--		0.185
9/13/1989	16:45	1	100	23	0.82	3.71	0.221
	17:19	2	100	23	0.83	3.72	0.223
	17:54	3	100	23.1	0.83	3.72	0.223
	19:24	4	100	23.9	0.91	3.79	0.240
	19:54	5	100	23.9	0.9	3.8	0.237
	20:22	6	100	23.9	0.9	3.8	0.237
	16:45	7	75	17.9	0	3.1	0.000
	17:19	8	75	17.8	0	3.09	0.000
	17:54	9	75	17.8	0	3.09	0.000
	16:45	10	30	7.6	0	2.02	0.000
	17:19	11	30	7.6	0	2.03	0.000
	17:54	12	30	7.5	0	2.02	0.000

Note: Steam injection is used only for loads 75-percent or higher. Data from 9/13/1989 are stack test data. Data from 8/12/2007 to 8/14/2007 are actual observations.

**Figure 1. Load vs. Steam-to-Fuel Ratio  
CC Gas Turbine Unit #9 - NG Firing**

