Walker, Elizabeth (AIR)

From: Osbourn, Scott [Scott_Osbourn@golder.com]
Sent: Friday, July 11, 2008 11:12 AM
To: Read, David; Linero, Alvaro
Subject: BG&E Draft Documents
Attachments: Emissions Standards rev2.doc; RAI Emission Calcs rev2.xls

These are the remaining attachments referred to in the draft RAI response package. We can also touch on these during our 2 PM call, if you've had time to review.

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BG&E TALLAHASSEE RENEWABLE ENERGY CENTER

ESTIMATED EMISSIONS

Pollutant	*Fuel*	*Method of Operation* [a]	*Stack Test* [b] *(3-Run Average)*		*CEMS* [c] *Compliance*	*Estimated Emissions (Informational purposes only)*
			ppmvd @ 15% O_2	*lb/hr* [d]	*ppmvd @ 15% O_2*	*lb/hr* [d]
NO_X	Product Gas	CT	32.5	--	32.5	18.4
		CT/DB	32.5	--	32.5	19.2
	Natural Gas [e]	CT	25.0	--	25.0	8.8
		CT/DB	--	--	--	--
CO	Product Gas	CT	50.0	--	50.0	17.2
		CT/DB	50.0	--	50.0	21.4
	Natural Gas [e]	CT	--	--	--	12.1
		CT/DB	--	--	--	--
VOC	Product Gas	CT	--	--	--	4.9
		CT/DB	--	--	--	6.5
	Natural Gas [e]	CT	--	--	--	0.4
		CT/DB	--	--	--	--
PM	Product Gas	CT	--	--	--	6.7
		CT/DB	--	--	--	7.2
	Natural Gas [e]	CT	--	--	--	1.0
		CT/DB	--	--	--	--
SO_2 (lb/MMBtu)	Product Gas	CT	0.06	--	--	8.8
		CT/DB	0.06	--	--	11.3
	Natural Gas [e]	CT	0.06	--	--	8.8
		CT/DB	0.06	--	--	11.3

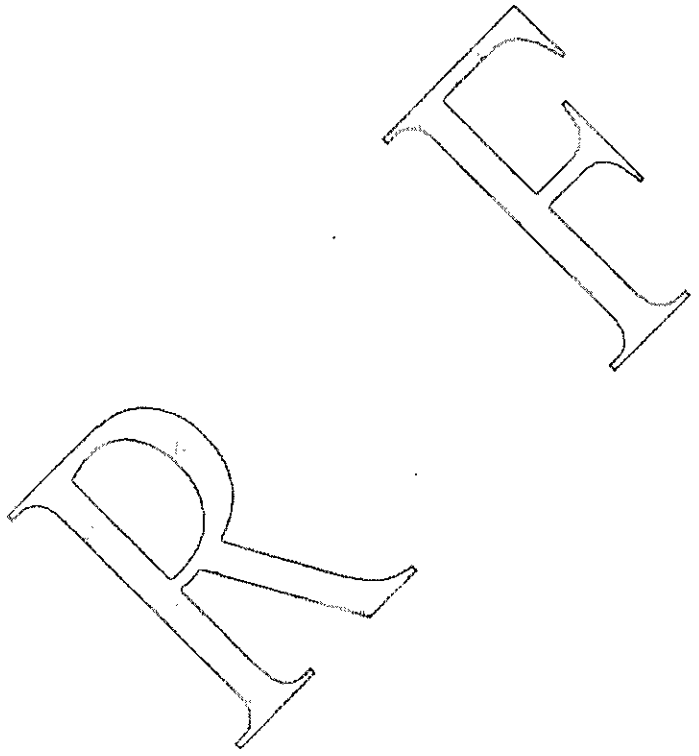
a. CT means operation of CT in combined cycle mode without use of the DB. CT & DB means operation in combined cycle mode and using the DB.

b. The initial and annual U.S. EPA Reference Method tests associated with the certification of the NOx and CO CEMS instruments may also be used to demonstrate compliance with the individual standards for product gas and natural gas. Compliance with the NOx standards will be demonstrated by conducting tests in accordance with EPA Method 7E. Compliance with the CO standards will be demonstrated by conducting tests in accordance with EPA Method 10.

c. CEMS for NO_X and CO will be installed on the HRSG stacks. Correction to 15% O_2 is required for NOx, consistent with the provisions of 40 CFR 60, Subpart KKKK. Compliance with the continuous NO_X and CO standards will be demonstrated based on data collected by the required CEMS. NOx compliance will be based on a 4- hour rolling average for natural gas firing and a 30-day rolling average for product gas firing. CO compliance will be based on a 30-day rolling average. Compliance will be based on all periods, except startup, shutdown, fuel switching or documented malfunction. The CTs will operate above 80% load, or the lowest load at which compliance is demonstrated during initial testing.

d. The mass emission rate estimates are based on a turbine inlet condition of 59° F and may be adjusted to actual test conditions in accordance with the performance curves and/or equations on file with the Department.

e. Limits for natural gas firing are imposed for NOx and SO_2 only, as required by the New Source Performance Standards pursuant to 40 CFR 60, Subpart KKKK. The natural gas fired values provided for other pollutants are for informational purposes only.



Calculate SO2 for the CT firing on natural gas (which would only be used for SU). Assume:

- 2 gr/100 scf and heat input of 147 MMBtu/hr for the CT —need SO2 rate in lb/hr

Calculate SO2 for the CT/DB based on use of product gas. Calculate based on H2S content of 5 ppm (mass basis) in product gas. Assume:

- Stack exhaust flow rate of 410,210 lb/hr for CT/DB combined and temp of 364 F
- Assume 100% conversion of H2S to SO2
- The heating value of the product gas is 435 Btu/cf (LHV)
- The gas will be flared if not used in the CT/DB—for the flare emissions, assume flaring of all product gas generated (~ 378 MMBtu/hr—LHV)

Calculate SO2 emissions, given the product gas H2S content. The product gas will either be fired in combustion turbines or in a flare. Issues:

- Would the calculation be the same for both the CT and for the flare?

The calculation would be the same, except for conversion efficiency, if there is known difference in conversion efficiency between a CT and a flare.

Natural Gas Firing (CT Only)

Sulfur Content		**2**	**gr/100 scf**	
Heat Input	CT	147	MMBtu/hr	
	DB	--	MMBtu/hr	
	Total	147	MMBtu/hr	
Heating value		1040	btu/cf	
Fuel use		141,346 15	cf/hr	
		1,413.46	100 cf/hr	
S		0 40	lb/hr	
SO2		**0.81**	**lb/hr**	
Emission Factors	CO	8 2E-02	lb/MMBtu	AP-42 Table 3 1-1
	VOC	2.1E-03	lb/MMBtu	AP-42 Table 3 1-2a
	PMtot	6 6E-03	lb/MMBtu	AP-42 Table 3.1-2a
CO		**12.05**	**lb/hr**	
VOC		**0.31**	**lb/hr**	
PMtot		**0.97**	**lb/hr**	
NOx Conc		25	ppm	
Volumetric flowrate		142,444.90	acfm	
Stack Temperature		1,074	F	assumed
MW		46		
NOx		**8.78**	**lb/hr**	

Product Gas Firing (CT Only) SO2

Based on 5ppm concentration

Conc.	5	ppm	
stack flow rate	403,569	lb/hr	@ 364 deg. F
Heating Value of product gas	435	btu/cf	
Temperature	823.67	deg. R	
Heat Input	3.78E+08	Btu/hr	
Volumetric flowrate	142,444 88	acfm	@ 364 deg. F
			Assumed MW gas 28.4
SO2	**4.55**	**lb/hr**	
	0.03	**lb/MMBtu**	

lb/hr =(ppm/10^6) x 2,116 8 x (60xV) x (MW/1545 6) x (1/T)

ppm =	parts per million by volume		
V =	volumetric flowrate in acfm or dscfm		
MW =	molecular weight =	64	SO2
T =	temperature of gas in (R)	R= F +459 67	

Product Gas Firing (CT/DB, HI= 189 MMBtu/hr) SO2

Based on 5ppm concentration

Conc.	5	ppm	
stack flow rate	410,210	lb/hr	@ 364 deg. F
Heating Value of product gas	435	btu/cf	
Temperature	823.67	deg. R	
Heat Input	3.78E+08	Btu/hr	
Volumetric flowrate	144,788 90	acfm	@ 364 deg. F
			Assumed MW gas 28.4
SO2	**4.62**	**lb/hr**	
	0.02	**lb/MMBtu**	

lb/hr =(ppm/10^6) x 2,116 8 x (60xV) x (MW/1545 6) x (1/T)

ppm =	parts per million by volume		
V =	volumetric flowrate in acfm or dscfm		
MW =	molecular weight =	64	SO2
T =	temperature of gas in (R)	R= F +459.67	