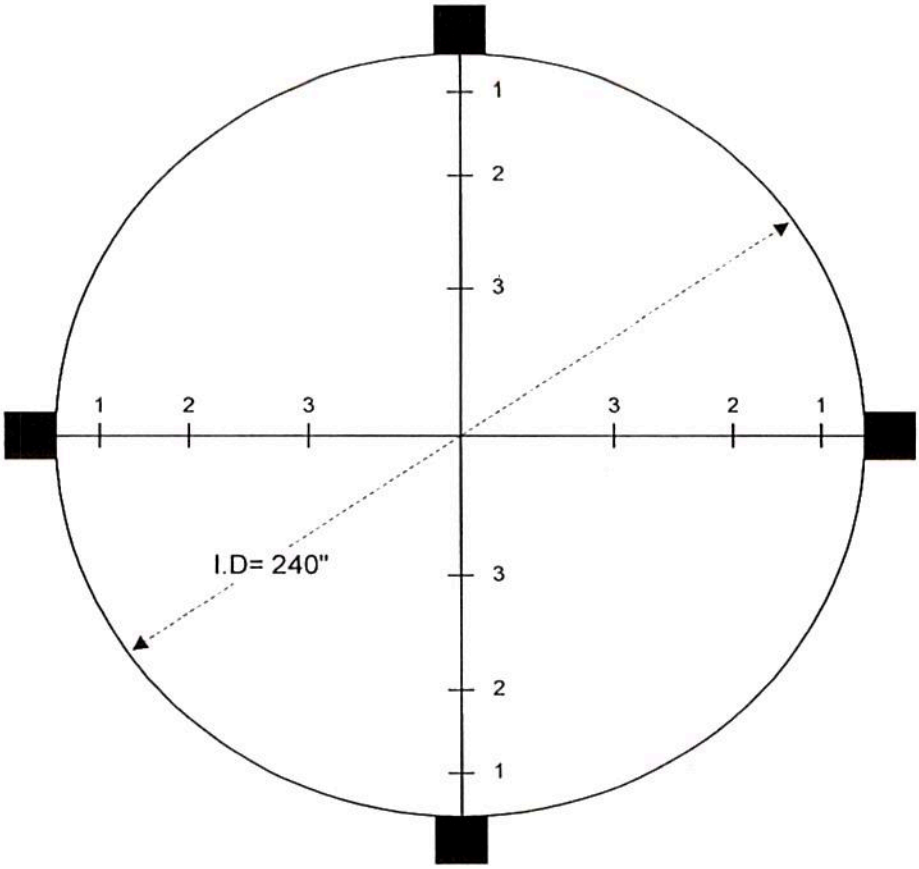

POINT	% OF I.D.	DISTANCE FROM INSIDE OF PORT (inches)
1	4.4	10.56
2	6.7	35.04
3	11.8	71.04

INSIDE DIAMETER	240.0 in.	20.0 ft.
DISTANCE UPSTREAM FROM DISTURBANCE	1620 in.	6.75 dia.
DISTANCE DOWNSTREAM FROM DISTURBANCE	446 in.	1.86 dia.

Figure 1 – Sampling and Traverse Points:
Marcus Hook Energy Combustion Gas Turbines
(Identical Units)
Marcus Hook, Pennsylvania

Daily Analyzer Calibration

Plant I.D. _____ Project No. _____

Source I.D _____ Personnel _____

Pollutant _____ Analyzer I.D. _____

Analyzer Serial No. _____ Span Value _____

Date _____ Time _____ Test Method _____

	Cylinder Value (ppm or %)	Analyzer Response (ppm or %)	Calibration Error (% of Span) +/- 2%	System Response (ppm or %)	System Bias (% of Span) +/-5%
Zero Gas					
	Cylinder ID				
Low Level Gas					
	Cylinder ID				
Mid Level Gas					
	Cylinder ID				
High Level Gas					
	Cylinder ID				

Calibration Error = $\frac{\text{(Analyzer Response - Cylinder Value)}}{\text{Span Value}} \times 100$

System Bias = $\frac{\text{(System Response - Analyzer Response)}}{\text{Span Value}} \times 100$

System Calibration Bias and Drift Data

Plant I.D. _____ Project No. _____

Source I.D. _____ Personnel _____

Pollutant _____ Analyzer I.D. _____

Analyzer Serial No. _____ Span Value _____

Date _____ Time _____ Test Method _____

Run No. _____

	Analyzer Calibration Response (ppm or %)	Initial System Response (ppm or %)	System Calibration Bias (% of Span) +/- 5%	Final System Response (ppm or %)	System Drift (% of Span) +/-3%
Zero Gas					
Span Gas					

Date _____ Time _____

Run No. _____

	Analyzer Calibration Response (ppm or %)	Initial System Response (ppm or %)	System Calibration Bias (% of Span) +/- 5%	Final System Response (ppm or %)	System Drift (% of Span) +/-3%
Zero Gas					
Span Gas					

Date _____ Time _____

Run No. _____

	Analyzer Calibration Response (ppm or %)	Initial System Response (ppm or %)	System Calibration Bias (% of Span) +/- 5%	Final System Response (ppm or %)	System Drift (% of Span) +/-3%
Zero Gas					
Span Gas					

$$\text{System Calibration Bias} = \frac{(\text{System Cal. Response} - \text{Analyzer Cal. Response}) \times 100}{\text{Analyzer Span}}$$

$$\text{Calibration Drift} = \frac{(\text{Final System Cal. Response} - \text{Initial System Cal. Response}) \times 100}{\text{Analyzer Span}}$$

CEMS Measurement Data

Plant I.D. _____ Project No. _____

Source I.D. _____ Personnel _____

Date _____

Clock Time	O2 (%)	CO2 (%)	NOx (ppm)	CO (ppm)	SO2 (ppm)	THC-1 (ppm)	THC-2 (ppm)

NO2 to NO Conversion Efficiency

Analyzer I.D. _____ Analyzer Span _____

Analyzer Serial No. _____ Mid Span Gas _____

Date _____ Time _____

Clock Time	Analyzer Response	Clock Time	Analyzer Response

Peak Value _____

Note: analyzer response at the end of test must not be less than 2 percent of peak value

Analyzer Response Time

Pollutant _____ Analyzer I.D. _____

Analyzer Serial No. _____ High Span Gas _____

Date _____ Time _____

Upscale Response		
Run 1	_____	seconds
Run 2	_____	seconds
Run 3	_____	seconds
Average	_____	seconds

Downscale Response		
Run 1	_____	seconds
Run 2	_____	seconds
Run 3	_____	seconds
Average	_____	seconds

Pollutant _____ Analyzer I.D. _____

Analyzer Serial No. _____ High Span Gas _____

Date _____ Time _____

Upscale Response		
Run 1	_____	seconds
Run 2	_____	seconds
Run 3	_____	seconds
Average	_____	seconds

Downscale Response		
Run 1	_____	seconds
Run 2	_____	seconds
Run 3	_____	seconds
Average	_____	seconds

Example Calculations

Marcus Hook Energy, LP

Marcus Hook, Pennsylvania

NOx Emission Rates

1. ***NO_x (lb/MMBtu) = Outlet emission rate of NO_x (lb/MMBtu), expressed as NO_2***

$$NO_x\ ppmvd \times Ffactor \times 1.194e^{-07} \times \frac{20.9}{(20.9\ - \%O_2)}$$

2. ***NO_x (lb/hr) = Outlet emission rate of NO_x (lb/hr), expressed as NO_2***

$$NO_x lb/MMBtu \times Heat\ Input\ MMBtu/hr$$

3. ***NO_x ppmvd @ 15% O_2 = NO_x concentration normalized to 15% O_2, expressed as NO_2***

$$NO_x\ ppmvd \times \left[\frac{(20.9\ - 15.0)}{20.9\ - \%O_2}\right]$$

CO Emission Rates

4. ***CO(lb/MMBtu) = Outlet emission rate of CO(lb/MMBtu)***

$$CO\ ppmvd \times Ffactor \times 7.274e^{-08} \times \frac{20.9}{(20.9\ - \%O_2)}$$

5. ***CO (lb/hr) = Outlet emission rate of CO(lb/hr)***

$$CO\ lb/MMBtu \times Heat\ Input\ MMBtu/hr$$

6. ***CO ppmvd @ 15% O_2 = CO concentration normalized to 15% O_2***

$$CO\ ppmvd \times \left[\frac{(20.9\ - 15.0)}{20.9\ - \%O_2}\right]$$

Marcus Hook Energy, LP

Load Level Analysis In Preparation for 2017 RATA
40 CFR 75 App A, Section 6.5.2.1

COMBUSTION TURBINE 1				
	RANGE OF OPERATION (from EDR)			
	UPPER	300	MW	
	LOWER	72	MW	
	LOAD LEVEL RANGES			
	LOAD LEVELS:	0-30%	30-60%	60-100%
	FROM, MW	72	141	210
	TO, MW	140	209	300
	SUMMARY OF RESULTS			
	07/01/16 - 06/30/17			
	LOAD LEVELS:	L	M	H
	% OF OP HRS:	0.2%	11.5%	88.3%

COMBUSTION TURBINE 2				
	RANGE OF OPERATION (from EDR)			
	UPPER	300	MW	
	LOWER	72	MW	
	LOAD LEVEL RANGES			
	LOAD LEVELS:	0-30%	30-60%	60-100%
	FROM, MW	72	141	210
	TO, MW	140	209	300
	SUMMARY OF RESULTS			
	07/01/15 - 06/30/16			
	LOAD LEVELS:	L	M	H
	% OF OP HRS:	0.2%	11.3%	88.5%

COMBUSTION TURBINE 3				
	RANGE OF OPERATION (from EDR)			
	UPPER	300	MW	
	LOWER	72	MW	
	LOAD LEVEL RANGES			
	LOAD LEVELS:	0-30%	30-60%	60-100%
	FROM, MW	72	141	210
	TO, MW	140	209	300
	SUMMARY OF RESULTS			
	07/01/15 - 06/30/16			
	LOAD LEVELS:	L	M	H
	% OF OP HRS:	0.2%	8.2%	91.6%

Summary

UNIT	NORMAL OPERATING LOAD	SECOND NORMAL OPERATING LOAD
CT1	HIGH	MID
CT2	HIGH	MID
CT3	HIGH	MID