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Report

*Relative Accuracy Test Audits
EUTURBINE1SC - EUTURBINE4SC
Test Dates: September 16-20, 2013*

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Renaissance Power, LLC
950 North Division Street
Carson city, MI 48811

NTH Project No. 73-130145-01
October 22, 2013

NTH Consultants, Ltd.
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1.0 INTRODUCTION

NTH Consultants, Ltd. (NTH) was retained by Renaissance Power, LLC (Renaissance) to conduct Relative Accuracy Test Audits (RATA) on the continuous emission monitoring systems (CEMS) installed to monitor emissions of nitrogen oxides (NO_x), carbon monoxide (CO), and oxygen (O₂) associated with EUTURBINE1SC through EUTURBINE4SC at the Renaissance facility located in Carson City, Michigan.

1.1 Purpose of Test

The testing was performed to satisfy the requirements found in Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) No. MI-ROP-N6873-2010 Special Conditions V.1 and VI.13 of Part D. The testing was completed in accordance with and the requirements set forth in Appendix A to 40 CFR Part 75 and Appendix B to 40 CFR Part 60; specifically, Performance Specifications (PS) 2, 3, and 4A were followed.

1.2 Test Date Requirement

The testing was performed from September 16 through September 20, 2013.

1.3 Project Contact Information

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Location	Address	Contact
Test Facility	Renaissance Power, LLC 950 North Division Street Carson City, MI 48811	Mr. Matt Kaleyta 989-584-2333 ext. 225 mkaleyta@renaissance-power.com
Company Representative	Renaissance Power, LLC 950 North Division Street Carson City, MI 48811	Mr. Harvey Brophy 989-584-2333 hbrophy@renaissance-power.com
Test Company Representative	NTH Consultants, Ltd. 1430 Monroe Avenue NW, Suite 180 Grand Rapids, MI 49505	Mr. Graziano Gozzi 616-451-6262 ggozzi@nthconsultants.com
State Representative	MDEQ 525 West Allegan Street Lansing, MI 48909-7973	Mr. David Patterson 517-241-7469 Pattersond2@michigan.gov
State Representative	MDEQ 350 Ottawa Avenue NW, Unit 10 Grand Rapids, MI 49503	Ms. April Lazzaro 616-356-0248 lazzaroa@michigan.gov



Messrs. Kyle Daneff, Tyler Hanna and Graziano Gozzi of NTH conducted the tests. Ms. April Lazzaro and Mr. David Patterson of the MDEQ observed portions of the testing. Messrs. Matt Kaleyta and Harvey Brophy of Renaissance coordinated the test events and provided assistance in collecting process data.

1.4 Summary Of Results

The Relative Accuracy results are shown in the table below. Detailed results are presented in Tables 1- 24 following this report. A detailed discussion of this data is located in Section 5.

Table 1.4. Summary of RATA Results

Emission Unit	Pollutant	RATA Results	Allowable Limit (for annual RATA frequency)	Basis for Allowable Limit
EUTURBINE1SC	NO _x	1.8%	20% @ 15% O ₂	Part 75, App. B, §2.3.1.2 Part 60, App. B, PS-2, §13.2
	CO	0 ppmv*	5 ppmv	Part 60, App. B, PS-4A, §13.2
	O ₂	.20% O ₂	0.7% O ₂ 1% O ₂	Part 75, App. B, §2.3.1.2(h) Part 60, App. B, PS-3, §13.2
EUTURBINE2SC	NO _x	12.22%	20% @ 15% O ₂	Part 75, App. B, §2.3.1.2 Part 60, App. B, PS-2, §13.2
	CO	0 ppmv	5 ppmv	Part 60, App. B, PS-4A, §13.2
	O ₂	.10 % O ₂	0.7% O ₂ 1% O ₂	Part 75, App. B, §2.3.1.2(h) Part 60, App. B, PS-3, §13.2
EUTURBINE3SC	NO _x	8.6 %	20% @ 15% O ₂	Part 75, App. B, §2.3.1.2 Part 60, App. B, PS-2, §13.2
	CO	0 ppmv*	5 ppmv	Part 60, App. B, PS-4A, §13.2
	O ₂	.10 % O ₂	0.7% O ₂ 1% O ₂	Part 75, App. B, §2.3.1.2(h) Part 60, App. B, PS-3, §13.2
EUTURBINE4SC	NO _x	8.6 %	20% @ 15% O ₂	Part 75, App. B, §2.3.1.2 Part 60, App. B, PS-2, §13.2
	CO	0 ppmv	5 ppmv	Part 60, App. B, PS-4A, §13.2
	O ₂	0.30% O ₂	0.7% O ₂ 1% O ₂	Part 75, App. B, §2.3.1.2(h) Part 60, App. B, PS-3, §13.2

*CO RATA was conducted for turbines 1, 2, 3, 4 but resulted in zeros.

NO_x: Nitrogen Oxides

CO: Carbon Monoxide

O₂: Oxygen



lb/MMBtu: Pound per Million British Thermal Unit
ppmv: Part Per Million by volume corrected to 15 percent Oxygen
RM: Reference Monitor
CEMS: Continuous Emission Monitoring System

2.0 PROCESS DESCRIPTION

The Renaissance facility is located in Carson City, Michigan and produces electricity from four (4) simple cycle natural gas-fired turbines designated as EUTURBINE1SC through EUTURBINE4SC with a total combined power output rating of approximately 680-megawatts (MW). The turbines consist of a compressor, combustion turbine, and electric generator. Energy is generated at the combustion turbine by drawing in ambient air by means of burning fuel and expanding the hot combustion gases in a four-stage turbine. The simple cycle turbines are equipped with dry low-NO_x burners.

3.0 RELATIVE ACCURACY TEST AUDIT PROCEDURES

A relative accuracy test audit (RATA) was performed on the dedicated extractive based analyzers installed by Renaissance to measure nitrogen oxides (NO_x), carbon monoxide (CO), and oxygen (O₂). A minimum of nine 21-minute test runs utilizing three (3) exhaust stack traverse points were conducted on each monitor. Data collected from the analyzers were averaged for each test run. NO_x concentrations were measured in parts per million by volume (ppmv) and corrected to 15 percent (%) O₂, and converted to pounds per million British thermal unit (lb/MMBtu) using equation 19-1 of U.S. EPA Method 19 of Appendix A to 40 CFR Part 60. CO concentrations are reported as ppmv corrected to 15 % O₂. O₂ concentrations are reported as percent (%). A diagram of the reference method system is illustrated in Figure 2.

3.1 Continuous Emissions Monitoring System (Renaissance)

The CEMS at each turbine consist of a Rosemount 951- C NO_x chemiluminescent monitor with a span range of 0 – 25/100 ppm, a Servomex CO non-dispersive infrared (NDIR) monitor with a span range of 0 – 50/1000 ppm, and a Servomex O₂ paramagnetic monitor with a span range of 0 – 25 percent. The following serial numbers (S/N) are associated with each CEMS:



Analyzer	S/N Turbine 1	S/N Turbine 2	S/N Turbine 3	S/N Turbine 4
NO _x	U1006364	U1006365	U1006438	U1006439
CO	04902/C1/3330	04902/C1/3331	04902/C1/3332	04902/C1/3333
O ₂	04902/C1/3330	04902/C1/3331	4902/C1/3332	04902/C1/3333

Each monitor is installed to comply with ROP No. MI-ROP-N6873-2010, and according to the quality assurance requirements of Appendix B to 40 CFR Part 75, and Appendix F to 40 CFR Part 60. The CEM systems include a data acquisition system (DAS) to provide data averaging.

3.2 Reference Monitoring System (NTH)

The NTH extractive reference method (RM) monitors require that the effluent gas sample be conditioned to eliminate any possible interference, such as water vapor and/or particulate matter, before being transported and injected into each analyzer. All components of the sampling system that contact the exhaust gas are constructed of Type 316 stainless steel or Teflon. The output signal from each RM was connected to a computerized DAS. The sample was collected from the stack in a heated sample probe positioned in a secondary sample port in close proximity to the CEMS probe. The sample was then conveyed through a heated Teflon sample line and gas conditioner before distribution to a manifold board for delivery to the RM analyzers. The configuration of the sampling system allows for the injection of calibration gases directly to the analyzers or through the sampling system. All monitors in use were calibrated with U.S. EPA Protocol No. 1 calibration gases and operated to ensure that zero drift, calibration gas drift, and calibration error met the specified method requirements. A minimum of nine 21-minute test runs were conducted on each monitor, with the best nine runs used to determine the relative accuracy. A diagram of the reference monitoring system is illustrated in Figure 1. Data collected from the RM were averaged for each test run.

3.2.1 Measurement Location

The sampling location and number of traverse points were selected according to U.S. EPA Reference Method 7E. The stack exhaust had a cross section measuring 279 inches by 123.8. A diagram of the exhaust duct is shown in Figure 1.



3.2.2 Oxygen

O₂ concentrations were monitored using a paramagnetic analyzer following the guidelines of U.S. EPA Method 3A in conjunction with Performance Specification No. 3 found in Appendix B to 40 CFR Part 60. The O₂ analyzer was calibrated at a minimum of three points: zero, mid-range (40-60 percent of calibration span) and high range 90-100 percent of the span for the testing.

3.2.3 Nitrogen Oxides

A chemiluminescence analyzer was used to measure concentrations of nitrogen oxides in the dry sample gas following the guidelines of U.S. EPA Method 7E. The NO_x sampling system was calibrated at three points: zero, mid-range (40-60 percent of span), and high range 90-100 percent of the span for the testing.

3.2.4 Carbon Monoxide

The CO concentrations were measured using a non-dispersive infrared analyzer (NDIR) following the guidelines of U.S. EPA Reference Method 10. The analyzer was calibrated at a minimum of three points: zero, mid-range (40-60 percent of span), and high range 90-100 percent of the span for the testing.

3.2.5 Data Acquisition System

Information and data from each analog instrument signal output was collected with a STRATA⁺ data acquisition system (DAS). Calibration error, drift and bias corrections were calculated automatically. All gathered data was linked to spreadsheets that support dynamic data exchange (i.e. Microsoft[™] Excel) for quick data reduction and report generation.

4.0 QUALITY ASSURANCE

Each promulgated U.S. EPA reference method described above is accompanied by a statement indicating that to obtain reliable results, persons using these methods should have a thorough knowledge of the techniques associated with each. To that end, NTH attempts to minimize any factors in the field which could increase error by implementing a quality assurance program into every testing activity segment.



U.S. EPA Protocol No. 1 gas standards were used to calibrate the analyzers during the test program. These gases are certified according to the *U.S. EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997*, and are certified to have a total relative uncertainty of ± 1 percent. All calibration gases used for this emission test program were supplied by Praxair from their Toledo, Ohio center. Praxair participates in U.S. EPA's Protocol Gas Verification Program (PGVP) for stationary source monitoring and their vendor identification number is C12013.

The DAS software in use during the testing is programmed to the specifications described in the applicable U.S. EPA Method in use during the test, and operates based on each pre-programmed analyzer span value.

5.0 DISCUSSION OF RESULTS

No problems were encountered with the test equipment during this test program. The results of all testing are presented in Tables 1 through 24. Based on the data obtained during the RATA, the CEMS servicing EUTURBINE1SC-4SC meet the requirements for Relative Accuracy specifications described in 40 CFR Parts 60 and 75.

5.1 Rata Expressions and Pass/Fail Criteria

The RA for EUTURBINE1SC-4SC CEMS was calculated as specified in PS 2 of Appendix B to 40 CFR Part 60, Equation 2-6 shown below.

$$RA = \frac{|d_{\text{mean}}| + |CC|}{|RM_{\text{mean}}|} \times 100$$

Where:

RA = Relative Accuracy of the facility CEMS

$|d_{\text{mean}}|$ = Absolute value of the mean differences between the individual RM and CEMS test run results

$|CC|$ = Absolute value of the confidence coefficient

$|RM_{\text{mean}}|$ = Average $|RM_{\text{mean}}|$ value. In cases where the average emissions for the test are



less than 50 percent of the applicable standard, substitute the emission standard value in the denominator of Equation 2-6 in place of $|RM_{mean}|$. In all other cases, use $|RM_{mean}|$.

Appendix A of 40 CFR Part 75 requires that relative accuracy for the NO_x system be less than or equal to 10 percent when expressed as a percentage of the average reference method result in lb/MMBtu. Alternatively, the system may meet the relative accuracy criteria under the low-NO_x emitter provisions. A unit is considered to be a low-NO_x emitter if NO_x emissions are less than 0.2 lb/MMBtu, and the unit meets the relative accuracy criteria if the average difference between RM and CEM measurements is less than 0.02 lb/MMBtu. Additionally, if the average difference is less than 0.015 lb/MMBtu, the facility need not conduct a RATA on the system for one year.

As indicated above, a BAF was calculated using the results of each RATA. The BAF is a tool used to avoid systematic under-reporting of NO_x emissions by a facility. BAFs are calculated as follows:

The confidence coefficient of a specific RATA data set is calculated. If the mean difference between the Reference Monitors and CEMS is less than or equal to the absolute value of the confidence coefficient, the monitor passes the bias test. If the mean difference is greater than the absolute value of the confidence coefficient, the monitor fails the bias test requirement. The value obtained from the monitor is then adjusted using the following equation:

$$CEM_{i, Adjusted} = CEM_{i, Monitor} * BAF \quad \text{Eq. A-11}$$

Where:

$CEM_{i, Monitor}$ = Data (measurement) provided by the monitor at time i.

$CEM_{i, Adjusted}$ = Data value, adjusted for bias, at time i.

BAF = Bias adjustment factor, defined by:

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$$\text{BAF} = 1 + \frac{|\text{dmean}|}{\text{CEM}_{\text{avg}}} \quad \text{Eq. A-12}$$

Where:

- BAF = Bias adjustment factor, calculated to the nearest thousandth
- $|\text{d}_{\text{mean}}|$ = Arithmetic mean of the difference obtained during the failed bias test.
- CEM_{avg} = Mean of the data values provided by the monitor during the failed bias test.

After the appropriate bias adjustment factor is determined, the BAF is applied to all monitoring system data, beginning with the first clock hour following the hour in which the RATA was completed.

PS 2 of Appendix B to 40 CFR Part 60 states that the NO_x (ppmv) CEMS RA must be no greater than 20 percent using the average Reference Method (RM) value.

PS 3 for oxygen states that the RA for the CEMS must be no greater than 1.0 percent O_2 or CO_2 . 40 CFR Part 75 requires that the RA for the CEMS be no greater than 0.7 percent O_2 or CO_2 for an annual RATA frequency.

PS 4 for carbon monoxide states that the RA for the CEMS must be no greater than 5 ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.



TABLES



TABLE 1

Summary of Reference Method (RM) and CEMS Data
100%
September 18, 2013

Renaissance Power - Unit 1 Outlet

RUN No.	TIME		Reference Method								
	START	END	F _d dscf/MMBtu	O ₂ %	NO _x PPM, dry	NO _x PPM @ 15% O ₂	NO _x lb/MMBtu ²	CO PPM	CO @ 15% O ₂	CO lb/MMBtu ²	
1	900	921	8710	14.0	16.0	13.7	0.050	-0.3	-0.2	0.00	
2	1019	1040	8710	13.9	16.1	13.6	0.050	-0.1	-0.1	0.00	
3	1102	1123	8710	14.0	16.2	13.8	0.051	-0.8	-0.7	0.00	
4	1150	1211	8710	14.0	16.2	13.9	0.051	-0.5	-0.4	0.00	
5	1242	1303	8710	14.0	16.3	14.0	0.052	-0.4	-0.3	0.00	
6	1317	1338	8710	14.0	16.6	14.3	0.053	-0.3	-0.3	0.00	
7	1418	1439	8710	14.0	16.4	14.1	0.052	-0.3	-0.3	0.00	
8	1512	1533	8710	14.0	16.2	13.9	0.051	-0.6	-0.5	0.00	
9	1552	1613	8710	14.0	16.3	13.9	0.051	-0.5	-0.4	0.00	
10	1627	1648	8710	14.0	16.5	14.1	0.052	-0.4	-0.4	0.00	

² RM_{lb/MMBtu} is calculated using Equation 19-1 of Method 19. $RM_{lb/MMBtu} = [RM_{PPM, dry} * C1 \text{ lb/scf}] \times [Fd \text{ scf/MMBtu}] \times [20.9 / (20.9 - \%O_2 \text{ dry})]$, with default Fd = 8710cf/MMBtu.

RUN No.	TIME		CEMS								
	START	END	F _d dscf/MMBtu	O ₂ %	NO _x PPM, dry	NO _x PPM @ 15% O ₂	NO _x lb/MMBtu ²	CO PPM	CO @ 15% O ₂	CO lb/MMBtu ²	
1	900	921		13.8	16.0	13.4	0.048	0.9	0.8	0.0018	
2	1019	1040		13.8	15.9	13.4	0.048	1.0	0.8	0.0018	
3	1102	1123		13.8	16.2	13.7	0.049	0.9	0.8	0.0017	
4	1150	1211		13.8	16.4	13.9	0.049	0.8	0.7	0.0015	
5	1242	1303		13.8	16.6	14.0	0.049	0.9	0.7	0.0016	
6	1317	1338		13.8	16.5	13.9	0.050	0.8	0.7	0.0015	
7	1418	1439		13.8	16.6	14.0	0.049	0.8	0.7	0.0015	
8	1512	1533		13.8	16.5	13.9	0.049	0.8	0.6	0.0015	
9	1552	1613		13.8	16.3	13.7	0.049	0.8	0.7	0.0013	
10	1627	1648		13.9	16.3	13.6	0.050	0.7	0.6	0.0000	



TABLE 2

Summary of NOX RATA Test Results
100%
September 18, 2013

Renaissance Power
Unit 1 Outlet

NO _x @15% O ₂							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM, Dry	CEM PPM, Dry	Diff	%Diff	Use?
1	900	921	13.7	13.4	0.3	1.97%	
2	1019	1040	13.6	13.4	0.2	1.62%	
3	1102	1123	13.8	13.7	0.1	0.65%	
4	1150	1211	13.9	13.9	0.0	-0.28%	
5	1242	1303	14.0	14.0	0.0	0.02%	
6	1317	1338	14.3	13.9	0.4	2.77%	
7	1418	1439	14.1	14.0	0.1	0.38%	
8	1512	1533	13.9	13.9	0.0	0.10%	
9	1552	1613	13.9	13.7	0.2	1.53%	
10	1627	1648	14.1	13.6	0.5	3.53%	n
9-Run Mean:			13.9	13.8	0.1	0.010	
Standard Deviation: 0.1463							
Confidence Coefficient: 0.1124							
Relative Accuracy (Based on RM): 1.8%							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 12.0 ppm with $RM_{avg} \leq 250$ ppm
Semi-Annual	≤ 10.0 %	± 15.0 ppm with $RM_{avg} \leq 250$ ppm

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 20 percent when the average RM is used in the denominator of Equation 2-6 or 10 percent when the applicable emission standard is used in the denominator of Equation 2-6.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 3

Summary of NO_x RATA Test Results
100%
September 18, 2013

Renaissance Power
Unit 1 Outlet

NO _x Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM lb/MMBtu	CEMS lb/MMBtu	Diff	%Diff	Use?
1	900	921	0.050	0.048	0.002	3.80%	
2	1019	1040	0.050	0.048	0.002	3.20%	
3	1102	1123	0.051	0.049	0.002	4.71%	
4	1150	1211	0.051	0.049	0.002	4.51%	
5	1242	1303	0.052	0.049	0.003	5.00%	
6	1317	1338	0.053	0.050	0.003	5.66%	n
7	1418	1439	0.052	0.049	0.003	5.19%	
8	1512	1533	0.051	0.049	0.002	3.73%	
9	1552	1613	0.051	0.049	0.002	3.73%	
10	1627	1648	0.052	0.050	0.002	3.27%	
9-Run Mean:			0.051	0.049	0.002	4.13%	
Standard Deviation: 0.0004							
Confidence Coefficient: 0.0003							
Bias Adjustment Factor: 1.043							
Relative Accuracy (Based on RM): 4.73%							

Part 75 Performance Specifications

	Primary	Alternative
Annual	RA ≤ 7.5 %	Absolute Mean ± 0.015 lb/MMBtu w/ $RM_{avg} \leq 0.200$ lb/MMBtu
Semi-Annual	≤ 10.0 %	± 0.020 lb/MMBtu w/ $RM_{avg} \leq 0.200$ lb/MMBtu

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 4

Summary of O₂ RATA Test Results
 100%
 September 18, 2013
 Renaissance Power
 Unit 1 Outlet

O ₂ Relative Accuracy (%)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM %	CEMS %	Diff	%Diff	Run Used?
1	900	921	14.0	13.8	0.2	1.39%	
2	1019	1040	13.9	13.8	0.1	0.90%	
3	1102	1123	14.0	13.8	0.2	1.33%	
4	1150	1211	14.0	13.8	0.2	1.46%	
5	1242	1303	14.0	13.8	0.2	1.51%	
6	1317	1338	14.0	13.8	0.2	1.67%	n
7	1418	1439	14.0	13.8	0.2	1.65%	
8	1512	1533	14.0	13.8	0.2	1.53%	
9	1552	1613	14.0	13.8	0.2	1.36%	
10	1627	1648	14.0	13.9	0.1	0.77%	
9-Run Mean:			14.0	13.8	0.2	1.32%	
Standard Deviation: 0.0415							
Confidence Coefficient: 0.0319							
Relative Accuracy (Based on RM): 1.55%							
Absolute Mean (For Alternate Specification): 0.2%							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 0.7% O ₂
Semi-Annual	≤ 10.0 %	± 1.0% O ₂

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 5

Summary of CO RATA Test Results
 100%
 September 18, 2013
 Renaissance Power
 Unit 1 Outlet

CO @ 15% O ₂							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM	CEM PPM	Diff	%Diff	Run Used?
1	900	921	-0.2	0.8	-1.05	420.69%	
2	1019	1040	-0.1	0.8	-0.91	850.61%	
3	1102	1123	-0.7	0.8	-1.48	217.19%	
4	1150	1211	-0.4	0.7	-1.10	272.95%	
5	1242	1303	-0.3	0.7	-1.02	322.07%	
6	1317	1338	-0.3	0.7	-0.97	361.05%	
7	1418	1439	-0.3	0.7	-0.99	338.29%	
8	1512	1533	-0.5	0.6	-1.07	226.38%	
9	1552	1613	-0.4	0.7	-1.12	266.63%	
10	1627	1648	-0.4	0.6	-0.96	266.88%	
9-Run Mean:			-0.4	0.7	<u>-1.07</u>	3.543	
Standard Deviation: 0.1607							
Confidence Coefficient: 0.1150							
Relative Accuracy (Based on RM): -330.76%							

Absolute Mean (For Alternate Specification): 1.07 ppm

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternatively, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 6

Summary of CO RATA Test Results
100%
September 18, 2013

Renaissance Power
Unit 1 Outlet

CO Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM lb/MMBtu	CEM lb/MMBtu	Diff	%Diff	Use?
1	900	921	-0.001	0.002	-0.003	280.00%	
2	1019	1040	0.000	0.002	-0.002	#DIV/0!	n
3	1102	1123	-0.002	0.002	-0.004	185.00%	
4	1150	1211	-0.001	0.002	-0.003	250.00%	
5	1242	1303	-0.001	0.002	-0.003	260.00%	
6	1317	1338	-0.001	0.002	-0.003	250.00%	
7	1418	1439	-0.001	0.002	-0.003	250.00%	
8	1512	1533	-0.001	0.002	-0.003	250.00%	
9	1552	1613	-0.001	0.001	-0.002	230.00%	
10	1627	1648	-0.001	0.000	-0.001	100.00%	
9-Run Mean:			0.0	0.0	-0.002	228.3%	
Standard Deviation: 0.0007							
Confidence Coefficient: 0.001							
Bias Adjustment Factor: 1.000							
Relative Accuracy (Based on RM): 0.4%							

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternatively, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 7

Summary of Reference Method (RM) and CEMS Data
100%
September 17, 2013

Renaissance Power - Unit 2 Outlet

RUN No.	TIME		Reference Method							
	START	END	F _d dscf/MMBtu	O ₂ %	NO _x PPM, dry	Nox @ 15% O2	NO _x lb/MMBtu ²	CO PPM	CO @ 15% O2	CO lb/MMBtu ²
1	1041	1102	8710	13.9	16.4	13.9	0.051	-2.3	-2.0	-0.01
2	1125	1146	8710	14.0	16.9	14.4	0.053	-3.7	-3.1	-0.02
3	1205	1226	8710	14.0	17.3	14.9	0.055	-1.4	-1.2	-0.01
4	1253	1314	8710	14.0	17.1	14.6	0.054	-1.6	-1.3	-0.01
5	1342	1403	8710	14.0	17.8	15.3	0.056	-1.4	-1.2	-0.01
6	1421	1442	8710	14.0	17.6	15.1	0.056	-1.2	-1.1	-0.01
7	1502	1523	8710	14.0	17.7	15.2	0.056	-0.2	-0.1	0.00
8	1540	1601	8710	14.0	17.7	15.1	0.056	-1.4	-1.2	-0.01
9	1619	1640	8710	14.0	17.5	15.0	0.055	-1.4	-1.2	-0.01
10	1657	1718	8710	14.0	26.9	23.0	0.085	23.8	20.4	0.11

² RM_{lb/MMBtu} is calculated using Equation 19-1 of Method 19. $RM_{lb/MMBtu} = [RM_{PPM, dry} * C1 \text{ lb/scf}] \times [Fd \text{ scf/MMBtu}] \times [20.9 / (20.9 - \%O2 \text{ dry})]$, with default Fd = 8710cf/MMBtu.

RUN No.	TIME		CEMS							
	START	END	F _d dscf/MMBtu	O ₂ %	NO _x PPM, dry	Nox @ 15% O2	NO _x lb/MMBtu ²	CO PPM	CO @ 15% O2	CO lb/MMBtu ²
1	1041	1102		13.9	16.0	13.1	0.045	0.000	0.000	0.000
2	1125	1146		13.9	15.9	13.1	0.049	0.000	0.000	0.000
3	1205	1226		13.9	16.2	13.2	0.050	0.000	0.000	0.000
4	1253	1314		13.9	16.4	13.2	0.051	0.000	0.000	0.000
5	1342	1403		13.9	16.6	13.4	0.052	0.000	0.000	0.000
6	1421	1442		13.9	16.5	13.6	0.051	0.000	0.000	0.000
7	1502	1523		13.9	16.6	13.4	0.051	0.000	0.000	0.000
8	1540	1601		13.9	16.5	13.3	0.051	0.000	0.000	0.000
9	1619	1640		13.9	16.3	13.3	0.051	0.000	0.000	0.000
10	1657	1718		13.9	16.3	13.3	0.050	0.000	0.000	0.000



TABLE 8

Summary of NOx RATA Test Results

100%

September 17, 2013

Renaissance Power
Unit 2 Outlet

NO _x @ 15% O ₂							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM, Dry	CEMS PPM, Dry	Diff	%Diff	Run Used?
1	1041	1102	13.9	13.1	0.8	5.58%	
2	1125	1146	14.4	13.1	1.3	9.16%	
3	1205	1226	14.9	13.2	1.7	11.16%	
4	1253	1314	14.6	13.2	1.4	9.57%	
5	1342	1403	15.3	13.4	1.9	12.27%	
6	1421	1442	15.1	13.6	1.5	10.15%	
7	1502	1523	15.2	13.4	1.8	11.92%	
8	1540	1601	15.1	13.3	1.8	12.18%	
9	1619	1640	15.0	13.3	1.7	11.27%	
10	1657	1718	23.0	13.3	9.7	42.18%	n
9-Run Mean:			14.8	13.3	1.5	10.36%	
Standard Deviation: 0.348							
Confidence Coefficient: 0.268							
Bias Adjustment Factor: 1.116							
Relative Accuracy (Based on RM): 12.22%							
Absolute Mean (For Alternate Specification): 1.5 ppm							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 12.0 ppm with $RM_{avg} \leq 250$ ppm
Semi-Annual	≤ 10.0 %	± 15.0 ppm with $RM_{avg} \leq 250$ ppm

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 20 percent when the average RM is used in the denominator of Equation 2-6 or 10 percent when the applicable emission standard is used in the denominator of Equation 2-6.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 9

Summary of NO_x RATA Test Results
100%
September 17, 2013

Renaissance Power
Unit 2 Outlet

NO _x Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM lb/MMBtu	CEMS lb/MMBtu	Diff	%Diff	Use?
1	1041	1102	0.051	0.045	0.006	11.88%	
2	1125	1146	0.053	0.049	0.004	6.98%	
3	1205	1226	0.055	0.050	0.005	8.36%	
4	1253	1314	0.054	0.051	0.003	5.37%	
5	1342	1403	0.056	0.052	0.005	8.04%	
6	1421	1442	0.056	0.051	0.005	8.21%	
7	1502	1523	0.056	0.051	0.005	8.21%	
8	1540	1601	0.056	0.051	0.005	8.75%	
9	1619	1640	0.055	0.051	0.005	8.18%	
10	1657	1718	0.085	0.050	0.035	40.82%	n
9-Run Mean:			0.055	0.050	0.005	8.25%	
Standard Deviation: 0.0008							
Confidence Coefficient: 0.0006							
Bias Adjustment Factor: 1.090							
Relative Accuracy (Based on RM): 9.29%							
Absolute Mean (For Alternate Specification): 0.005 lb/mmbtu							

Part 75 Performance Specifications

	Primary	Alternative
	RA	Absolute Mean
Annual	≤ 7.5 %	± 0.015 lb/MMBtu w/ $RM_{avg} \leq 0.200$ lb/MMBtu
Semi-Annual	≤ 10.0 %	± 0.020 lb/MMBtu w/ $RM_{avg} \leq 0.200$ lb/MMBtu

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 10

Summary of O₂ RATA Test Results
 100%
 September 17, 2013
 Renaissance Power
 Unit 2 Outlet

O ₂ Relative Accuracy (%)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM %	CEMS %	Diff	%Diff	Run Used?
1	1041	1102	13.9	13.9	0.0	0.29%	n
2	1125	1146	14.0	13.9	0.1	0.55%	
3	1205	1226	14.0	13.9	0.1	0.79%	
4	1253	1314	14.0	13.9	0.1	0.76%	
5	1342	1403	14.0	13.9	0.1	0.98%	
6	1421	1442	14.0	13.9	0.1	1.00%	
7	1502	1523	14.0	13.9	0.1	0.98%	
8	1540	1601	14.0	13.9	0.1	0.82%	
9	1619	1640	14.0	13.9	0.1	0.72%	
10	1657	1718	14.0	13.9	0.1	0.71%	
9-Run Mean:			14.0	13.9	0.1	0.80%	
Standard Deviation: 0.0206							
Confidence Coefficient: 0.0147							
Relative Accuracy (Based on RM): 0.91%							
Absolute Mean (For Alternate Specification): 0.1%							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 0.7% O ₂
Semi-Annual	≤ 10.0 %	± 1.0% O ₂

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 11

Summary of CO RATA Test Results
100%
September 17, 2013

Renaissance Power
Unit 2 Outlet

CO @ 15% O2							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM, Dry	CEM PPM, Dry	Diff	%Diff	Use?
1	1041	1102	-2.0	0.0	-2.0	100.00%	
2	1125	1146	-3.1	0.0	-3.1	100.00%	
3	1205	1226	-1.2	0.0	-1.2	100.00%	
4	1253	1314	-1.3	0.0	-1.3	100.00%	
5	1342	1403	-1.2	0.0	-1.2	100.00%	
6	1421	1442	-1.1	0.0	-1.1	100.00%	
7	1502	1523	-0.1	0.0	-0.1	100.00%	
8	1540	1601	-1.2	0.0	-1.2	100.00%	
9	1619	1640	-1.2	0.0	-1.2	100.00%	
10	1657	1718	20.4	0.0	20.4	100.00%	n
9-Run Mean:			-1.4	0.0	-1.4	1.000	
Standard Deviation: 0.7997							
Confidence Coefficient: 0.6147							
Relative Accuracy (Based on RM): 0.0%							

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternately, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.

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TABLE 12

Summary of CO RATA Test Results

100%

September 17, 2013

Renaissance Power

Unit 2 Outlet

CO Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM lb/MMBtu	CEM lb/MMBtu	Diff	%Diff	Use?
1	1041	1102	-0.010	0.000	-0.010	100.00%	
2	1125	1146	-0.017	0.000	-0.017	100.00%	
3	1205	1226	-0.006	0.000	-0.006	100.00%	
4	1253	1314	-0.007	0.000	-0.007	100.00%	
5	1342	1403	-0.006	0.000	-0.006	100.00%	
6	1421	1442	-0.006	0.000	-0.006	100.00%	
7	1502	1523	-0.001	0.000	-0.001	100.00%	
8	1540	1601	-0.006	0.000	-0.006	100.00%	
9	1619	1640	-0.006	0.000	-0.006	100.00%	
10	1657	1718	0.108	0.000	0.108	100.00%	n
9-Run Mean:			0.0	0.0	-0.007	100.0%	
Standard Deviation: 0.0043							
Confidence Coefficient: 0.003							
Bias Adjustment Factor: 1.000							
Relative Accuracy (Based on RM): 1.3%							

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternatively, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 13

Summary of Reference Method (RM) and CEMS Data

100%

September 18, 2013

Renaissance Power LLC - Unit 3 Outlet

RUN No.	TIME		Reference Method								
	START	END	F _d	O ₂	NO _x	NO _x	Nox @	NO _x	CO	CO @	CO
			dscf/MMBtu	%	PPM, dry	PPM, wet ¹	15% O2	lb/MMBtu ²	PPM	15% O2	lb/MMBtu ²
1	0826	0847	8710	13.9	15.7	15.7	13.3	0.049	-0.6	-0.5	0.00
2	0940	1001	8710	13.8	15.4	15.4	12.8	0.047	-0.8	-0.6	0.00
3	0940	1001	8710	13.9	15.3	15.3	12.9	0.048	-1.0	-0.8	0.00
4	1017	1038	8710	13.8	15.1	15.1	12.5	0.046	-0.9	-0.7	0.00
5	1051	1112	8710	14.0	15.2	15.2	12.9	0.047	-1.1	-1.0	0.00
6	1127	1148	8710	14.0	15.1	15.1	12.9	0.047	-1.2	-1.0	0.00
7	1206	1227	8710	13.9	15.1	15.1	12.8	0.047	-1.1	-1.0	0.00
8	1300	1321	8710	13.9	15.2	15.2	12.9	0.047	-1.1	-1.0	0.00
9	1349	1410	8710	13.9	15.1	15.1	12.7	0.047	-1.1	-0.9	0.00
10	1429	1450	8710	14.0	15.3	15.3	13.0	0.048	-1.1	-0.9	0.00

² RM lb/MMBtu is calculated using Equation 19-1 of Method 19. $RM_{lb/MMBtu} = [RM_{PPM, dry} * C1 \text{ lb/scf}] \times [Fd \text{ scf/MMBtu}] \times [20.9 / (20.9 - \%O2 \text{ dry})]$, with default Fd = 8710cf/MMBtu.

RUN No.	TIME		CEMS								
	START	END	F _d	O ₂	NO _x	NO _x	Nox @	NO _x	CO	CO @	CO
			dscf/MMBtu	%	PPM, dry	PPM, wet	15% O2	lb/MMBtu ²	PPM	15% O2	lb/MMBtu ²
1	0826	0847		13.8	14.8	14.8	12.3	0.045	0.0	0.0	0.00
2	0940	1001		13.8	14.5	14.5	12.1	0.045	0.0	0.0	0.00
3	0940	1001		13.8	14.3	14.3	11.9	0.044	0.0	0.0	0.00
4	1017	1038		13.8	14.1	14.1	11.8	0.043	0.0	0.0	0.00
5	1051	1112		13.8	14.1	14.1	11.8	0.043	0.0	0.0	0.00
6	1127	1148		13.8	14.1	14.1	11.7	0.043	0.0	0.0	0.00
7	1206	1227		13.8	14.0	14.0	11.7	0.043	0.0	0.0	0.00
8	1300	1321		13.8	14.1	14.1	11.8	0.043	0.0	0.0	0.00
9	1349	1410		13.8	14.2	14.2	11.8	0.044	0.0	0.0	0.00
10	1429	1450		13.8	14.2	14.2	11.9	0.044	0.0	0.0	0.00



TABLE 14

Summary of NOX RATA Test Results
100%
September 18, 2013

Renaissance Power LLC
Unit 3 Outlet

NO _x @ 15% O ₂							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM, Dry	CEM PPM, Dry	Diff	%Diff	Use?
1	0826	0847	13.3	12.3	1.0	7.58%	
2	0940	1001	12.8	12.1	0.7	5.18%	
3	0940	1001	12.9	11.9	1.0	8.06%	
4	1017	1038	12.5	11.8	0.7	5.58%	
5	1051	1112	12.9	11.8	1.1	8.48%	
6	1127	1148	12.9	11.7	1.2	9.09%	n
7	1206	1227	12.8	11.7	1.1	8.50%	
8	1300	1321	12.9	11.8	1.1	8.37%	
9	1349	1410	12.7	11.8	0.9	6.97%	
10	1429	1450	13.0	11.9	1.1	8.72%	
9-Run Mean:			12.9	11.9	1.0	0.075	
Standard Deviation: 0.1776							
Confidence Coefficient: 0.1365							
Relative Accuracy (Based on RM): 8.6%							
Absolute Mean (For Alternate Specification) : 1.0 ppm							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 12.0 ppm with $RM_{avg} \leq 250$ ppm
Semi-Annual	≤ 10.0 %	± 15.0 ppm with $RM_{avg} \leq 250$ ppm

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 20 percent when the average RM is used in the denominator of Equation 2-6 or 10 percent when the applicable emission standard is used in the denominator of Equation 2-6.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 15

Summary of NO_x RATA Test Results
100%
September 18, 2013

Renaissance Power LLC
Unit 3 Outlet

NO _x Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM lb/MMBtu	CEMS lb/MMBtu	Diff	%Diff	Use?
1	0826	0847	0.049	0.045	0.004	7.35%	
2	0940	1001	0.047	0.045	0.003	5.32%	
3	0940	1001	0.048	0.044	0.004	8.75%	n
4	1017	1038	0.046	0.043	0.003	5.87%	
5	1051	1112	0.047	0.043	0.004	7.87%	
6	1127	1148	0.047	0.043	0.004	7.87%	
7	1206	1227	0.047	0.043	0.004	8.09%	
8	1300	1321	0.047	0.043	0.004	7.66%	
9	1349	1410	0.047	0.044	0.004	7.45%	
10	1429	1450	0.048	0.044	0.004	8.96%	
9-Run Mean:			0.047	0.044	0.003	7.38%	
Standard Deviation: 0.0006							
Confidence Coefficient: 0.0004							
Bias Adjustment Factor: 1.080							
Relative Accuracy (Based on RM): 8.29%							
Absolute Mean (For Alternate Specification) : 0.003 lb/mmbtu							

Part 75 Performance Specifications

	Primary	Alternative
	RA	Absolute Mean
Annual	≤ 7.5 %	± 0.015 lb/MMBtu w/ $RM_{avg} \leq 0.200$ lb/MMBtu
Semi-Annual	≤ 10.0 %	± 0.020 lb/MMBtu w/ $RM_{avg} \leq 0.200$ lb/MMBtu

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, three sets of test runs may be rejected, these rejected test runs are noted in the table.



TABLE 16

Summary of O₂ RATA Test Results
100%
September 18, 2013

Renaissance Power LLC
Unit 3 Outlet

O ₂ Relative Accuracy (%)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM, Wet	CEM PPM, Wet	Diff	%Diff	Use?
1	0826	0847	13.9	13.8	0.1	0.87%	
2	0940	1001	13.8	13.8	0.0	-0.01%	
3	0940	1001	13.9	13.8	0.1	0.90%	
4	1017	1038	13.8	13.8	0.0	-0.07%	
5	1051	1112	14.0	13.8	0.2	1.08%	
6	1127	1148	14.0	13.8	0.2	1.12%	
7	1206	1227	13.9	13.8	0.1	1.05%	
8	1300	1321	13.9	13.8	0.1	1.04%	
9	1349	1410	13.9	13.8	0.1	0.39%	
10	1429	1450	14.0	13.8	0.2	1.29%	n
9-Run Mean:			13.9	13.8	0.1	0.007	
Standard Deviation: 0.0667							
Confidence Coefficient: 0.0512							
Relative Accuracy (Based on RM): 1.1%							
Absolute Mean (For Alternate Specification) : 0.1 ppm							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 0.7% O ₂
Semi-Annual	≤ 10.0 %	± 1.0% O ₂

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 17

Summary of CO RATA Test Results
100%
September 18, 2013

Renaissance Power LLC
Unit 3 Outlet

CO @ 15% O2							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM %	CEMS %	Diff	%Diff	Run Used?
1	0826	0847	-0.5	0.0	-0.5	100.00%	
2	0940	1001	-0.6	0.0	-0.6	100.00%	
3	0940	1001	-0.8	0.0	-0.8	100.00%	
4	1017	1038	-0.7	0.0	-0.7	100.00%	
5	1051	1112	-1.0	0.0	-1.0	100.00%	
6	1127	1148	-1.0	0.0	-1.0	100.00%	
7	1206	1227	-1.0	0.0	-1.0	100.00%	
8	1300	1321	-1.0	0.0	-1.0	100.00%	
9	1349	1410	-0.9	0.0	-0.9	100.00%	
10	1429	1450	-0.9	0.0	-0.9	100.00%	n
9-Run Mean:			-0.8	0.0	-0.8	100.00%	
Standard Deviation: 0.1785							
Confidence Coefficient: 0.1372							
Relative Accuracy (Based on RM): -116.47%							
Absolute Mean (For Alternate Specification): -0.80%							

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternately, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 18

Summary of CO RATA Test Results
100%
September 18, 2013

Renaissance Power LLC
Unit 3 Outlet

CO Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM	CEM PPM	Diff	%Diff	Run Used?
1	0826	0847	0.0	0.0	0.00	100.00%	
2	0940	1001	0.0	0.0	0.00	100.00%	
3	0940	1001	0.0	0.0	0.00	100.00%	
4	1017	1038	0.0	0.0	0.00	100.00%	
5	1051	1112	0.0	0.0	0.00	100.00%	
6	1127	1148	0.0	0.0	0.00	100.00%	n
7	1206	1227	0.0	0.0	0.00	100.00%	
8	1300	1321	0.0	0.0	0.00	100.00%	
9	1349	1410	0.0	0.0	0.00	100.00%	
10	1429	1450	0.0	0.0	0.00	100.00%	
9-Run Mean:			0.0	0.0	0.00	1.000	
Standard Deviation: 0.0004							
Confidence Coefficient: 0.0003							
Relative Accuracy (Based on RM): 0.00%							

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternately, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 19

Summary of Reference Method (RM) and CEMS Data
100%
September 19, 2013

Renaissance Power LLC - CT Unit # 4

RUN No.	TIME		Reference Method							
	START	END	F _d dscf/MMBtu	O ₂ %	NO _x PPM, dry	Nox @ 15% O2	NO _x lb/MMBtu ²	CO PPM	CO @ 15% O2	CO lb/MMBtu ²
1	0831	0852	8710	14.1	14.3	12.4	0.046	-1.6	-1.4	0.00
2	0946	1007	8710	14.1	14.5	12.5	0.046	-1.1	-1.0	0.00
3	1028	1049	8710	14.1	14.4	12.4	0.046	-1.0	-0.9	0.00
4	1108	1129	8710	14.1	14.3	12.3	0.045	-1.0	-0.9	0.00
5	1147	1208	8710	14.1	14.2	12.3	0.045	-1.0	-0.8	0.00
6	1227	1248	8710	14.0	14.2	12.2	0.045	-1.0	-0.9	0.00
7	1305	1326	8710	14.0	14.2	12.2	0.045	-1.0	-0.9	0.00
8	1343	1404	8710	14.1	14.1	12.2	0.045	-1.0	-0.9	0.00
9	1420	1441	8710	14.1	14.1	12.2	0.045	-1.0	-0.9	0.00
10	1456	1517	8710	14.1	14.1	12.1	0.045	-1.0	-0.8	0.00

² RM lb/MMBtu is calculated using Equation 19-1 of Method 19. $RM_{lb/MMBtu} = [RM_{PPM, dry} * C1 \text{ lb/scf}] \times [Fd \text{ scf/MMBtu}] \times [20.9 / (20.9\%O2 \text{ dry})]$, with default Fd = 8710cf/MMBtu.

RUN No.	TIME		CEMS							
	START	END	F _d dscf/MMBtu	O ₂ %	NO _x PPM, dry	Nox @ 15% O2	NO _x lb/MMBtu ²	CO PPM	CO @ 15% O2	CO lb/MMBtu ²
1	0831	0852		13.8	14.4	12.0	0.044	0.0	0.0	0.00
2	0946	1007		13.9	13.9	11.7	0.043	0.0	0.0	0.00
3	1028	1049		13.9	13.8	11.6	0.043	0.0	0.0	0.00
4	1108	1129		13.9	13.6	11.4	0.042	0.0	0.0	0.00
5	1147	1208		13.9	13.5	11.4	0.042	0.0	0.0	0.00
6	1227	1248		13.8	13.5	11.3	0.041	0.0	0.0	0.00
7	1305	1326		13.7	13.4	11.1	0.041	0.0	0.0	0.00
8	1343	1404		13.7	13.4	11.1	0.041	0.0	0.0	0.00
9	1420	1441		13.7	13.4	11.1	0.041	0.0	0.0	0.00
10	1456	1517		13.7	13.4	11.0	0.041	0.0	0.0	0.00



TABLE 20

Summary of NOX RATA Test Results
100%
September 19, 2013

Renaissance Power LLC
CT Unit # 4

NO _x @ 15% O ₂							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM, Dry	CEM PPM, Dry	Diff	%Diff	Use?
1	0831	0852	12.4	12.0	0.4	3.25%	
2	0946	1007	12.5	11.7	0.8	6.40%	
3	1028	1049	12.4	11.6	0.8	6.70%	
4	1108	1129	12.3	11.4	0.9	7.40%	
5	1147	1208	12.3	11.4	0.9	7.07%	
6	1227	1248	12.2	11.3	0.9	7.54%	
7	1305	1326	12.2	11.1	1.1	8.98%	
8	1343	1404	12.2	11.1	1.1	9.04%	
9	1420	1441	12.2	11.1	1.1	8.94%	
10	1456	1517	12.1	11.0	1.1	9.35%	n
9-Run Mean:			12.3	11.4	0.9	0.073	
Standard Deviation: 0.2171							
Confidence Coefficient: 0.1669							
Relative Accuracy (Based on RM): 8.6%							
Absolute Mean (For Alternate Specification): 0.9 ppm							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 12.0 ppm with $RM_{avg} \leq 250$ ppm
Semi-Annual	≤ 10.0 %	± 15.0 ppm with $RM_{avg} \leq 250$ ppm

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 20 percent when the average RM is used in the denominator of Equation 2-6 or 10 percent when the applicable emission standard is used in the denominator of Equation 2-6.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 21

Summary of NO_x RATA Test Results
100%
September 19, 2013

Renaissance Power LLC
CT Unit # 4

NO _x Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM lb/MMBtu	CEMS lb/MMBtu	Diff	%Diff	Use?
1	0831	0852	0.046	0.044	0.002	3.91%	
2	0946	1007	0.046	0.043	0.003	6.09%	
3	1028	1049	0.046	0.043	0.003	7.17%	
4	1108	1129	0.045	0.042	0.003	6.22%	
5	1147	1208	0.045	0.042	0.003	7.11%	
6	1227	1248	0.045	0.041	0.004	8.89%	
7	1305	1326	0.045	0.041	0.004	9.33%	
8	1343	1404	0.045	0.041	0.004	9.56%	
9	1420	1441	0.045	0.041	0.004	9.33%	
10	1456	1517	0.045	0.041	0.005	10.00%	n
9-Run Mean:			0.045	0.042	0.003	7.51%	
Standard Deviation: 0.0009							
Confidence Coefficient: 0.0007							
Bias Adjustment Factor: 1.081							
Relative Accuracy (Based on RM): 8.94%							
Absolute Mean (For Alternate Specification): 0.003 lb/mmbtu							

Part 75 Performance Specifications

	Primary	Alternative
Annual	RA ≤ 7.5 %	Absolute Mean ± 0.015 lb/MMBtu w/ RM _{avg} ≤ 0.200 lb/MMBtu
Semi-Annual	≤ 10.0 %	± 0.020 lb/MMBtu w/ RM _{avg} ≤ 0.200 lb/MMBtu

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, three sets of test runs may be rejected, these rejected test runs are noted in the table.



TABLE 22

Summary of O₂ RATA Test Results
 100%
 September 19, 2013

Renaissance Power LLC
 CT Unit # 4

O ₂ Relative Accuracy (%)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM %	CEMS %	Diff	%Diff	Run Used?
1	0831	0852	14.1	13.8	0.3	2.18%	
2	0946	1007	14.1	13.9	0.2	1.19%	
3	1028	1049	14.1	13.9	0.2	1.17%	
4	1108	1129	14.1	13.9	0.2	1.14%	
5	1147	1208	14.1	13.9	0.2	1.10%	
6	1227	1248	14.0	13.8	0.2	1.74%	
7	1305	1326	14.0	13.7	0.3	2.44%	
8	1343	1404	14.1	13.7	0.4	2.57%	
9	1420	1441	14.1	13.7	0.4	2.51%	
10	1456	1517	14.1	13.7	0.4	2.59%	n
9-Run Mean:			14.1	13.8	0.3	1.78%	
Standard Deviation: 0.0908							
Confidence Coefficient: 0.0698							
Relative Accuracy (Based on RM): 2.28%							
Absolute Mean (For Alternate Specification): 0.3%							

Part 75 Performance Specifications

	Primary RA	Alternative Absolute Mean
Annual	≤ 7.5 %	± 0.7% O ₂
Semi-Annual	≤ 10.0 %	± 1.0% O ₂

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, three sets of test runs may be rejected, these rejected test runs are noted in the table.



TABLE 23

Summary of CO RATA Test Results
100%
September 19, 2013

Renaissance Power LLC
CT Unit # 4

CO @ 15% O2							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM PPM	CEM PPM	Diff	%Diff	Run Used?
1	0831	0852	-1.4	0.0	-1.36	100.01%	
2	0946	1007	-1.0	0.0	-0.97	100.00%	
3	1028	1049	-0.9	0.0	-0.88	100.00%	
4	1108	1129	-0.9	0.0	-0.90	100.00%	
5	1147	1208	-0.8	0.0	-0.84	100.00%	
6	1227	1248	-0.9	0.0	-0.89	100.00%	n
7	1305	1326	-0.9	0.0	-0.86	100.00%	
8	1343	1404	-0.9	0.0	-0.87	100.00%	
9	1420	1441	-0.9	0.0	-0.85	100.00%	
10	1456	1517	-0.8	0.0	-0.84	100.00%	
9-Run Mean:			-0.9	0.0	-0.93	1.000	
Standard Deviation: 0.1669							
Confidence Coefficient: 0.1283							
Relative Accuracy (Based on RM): -117.91%							

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternately, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



TABLE 24

Summary of CO RATA Test Results
 100%
 September 19, 2013

Renaissance Power LLC
 CT Unit # 4

CO Relative Accuracy (LB/MMBTU)							
Run #	Start Time (CEMS Time)	End Time (CEMS Time)	RM lb/MMBtu	CEM lb/MMBtu	Diff	%Diff	Use?
1	0831	0852	-0.001	0.000	-0.001	110.00%	
2	0946	1007	-0.001	0.000	-0.001	100.00%	
3	1028	1049	-0.001	0.000	-0.001	100.00%	
4	1108	1129	-0.001	0.000	-0.001	110.00%	
5	1147	1208	-0.001	0.000	-0.001	110.00%	
6	1227	1248	-0.001	0.000	-0.001	100.00%	
7	1305	1326	-0.001	0.000	-0.001	100.00%	
8	1343	1404	-0.001	0.000	-0.001	100.00%	
9	1420	1441	-0.001	0.000	-0.001	100.00%	
10	1456	1517	-0.001	0.000	-0.001	100.00%	n
9-Run Mean:			0.0	0.0	-0.001	103.3%	
Standard Deviation: 0.0001							
Confidence Coefficient: 0.000							
Bias Adjustment Factor: 1.000							
Relative Accuracy (Based on RM): 0.1%							

Part 60 Performance Specifications

The RA of the CEMS must be no greater than 10 percent when the average RM value is used to calculate RA, 5 percent when the applicable emission standard is used to calculate RA, or within 5ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

Alternately, where the average CO emissions are less than 10 percent of the standard and this is verified by Method 10, a cylinder gas audit may be performed in place of the RA test to determine compliance with these limits. In this case, the cylinder gas shall contain CO in 12 percent CO₂ as an interference check. If this option is exercised, Method 10 must be used to verify that emission levels are less than 10 percent of the standard.

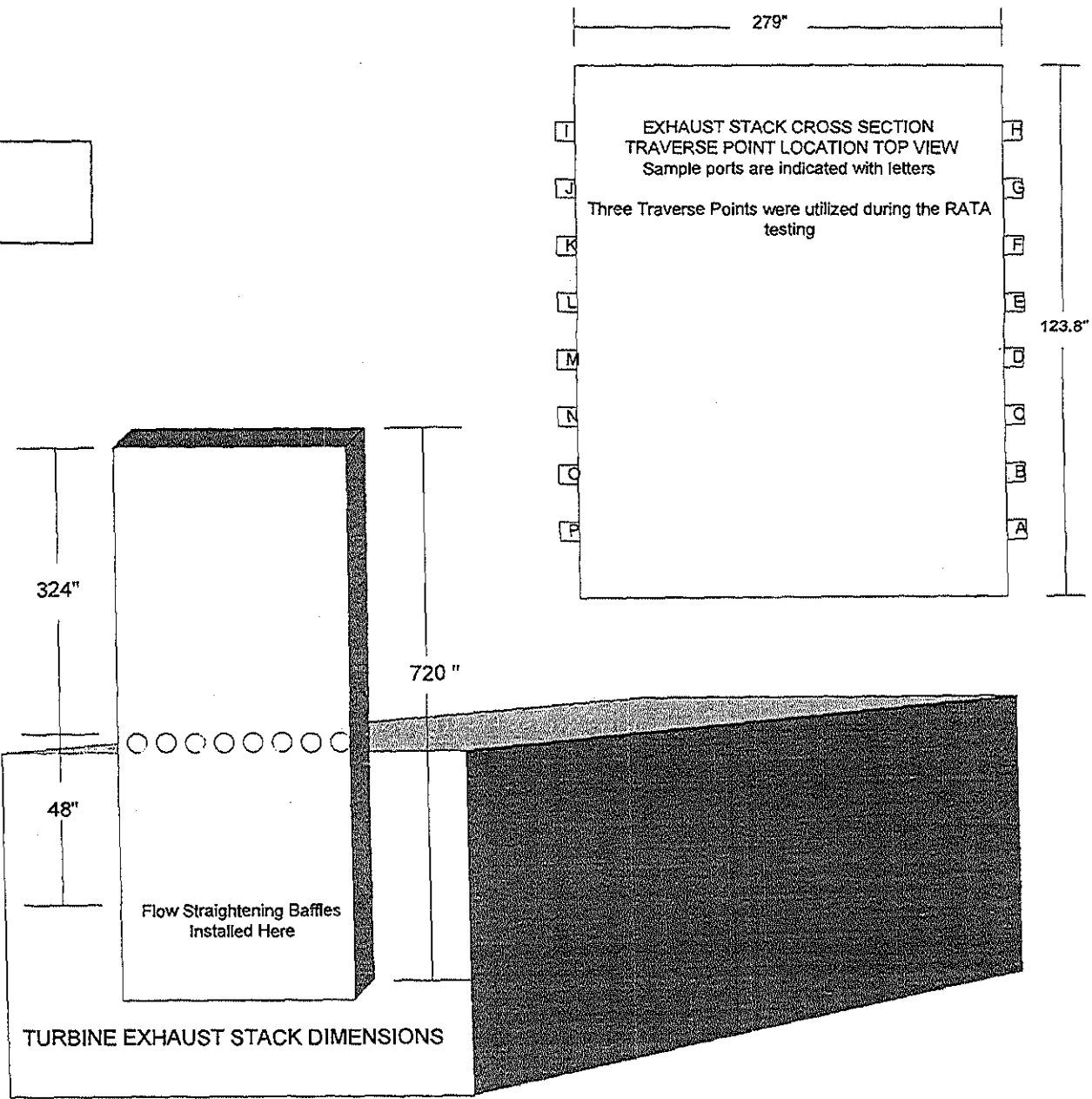
RA calculated as specified in Performance Specification 2, Appendix B, 40 CFR 60 - Equation 2-4

As specified in Performance Specification 2, subsection 8.4.4, a minimum of nine sets of test runs must be conducted. Rejected test runs are noted in the table.



FIGURES

FIGURE 1
Renaissance Power, LLC
Turbine Units
Diagram and Dimensions



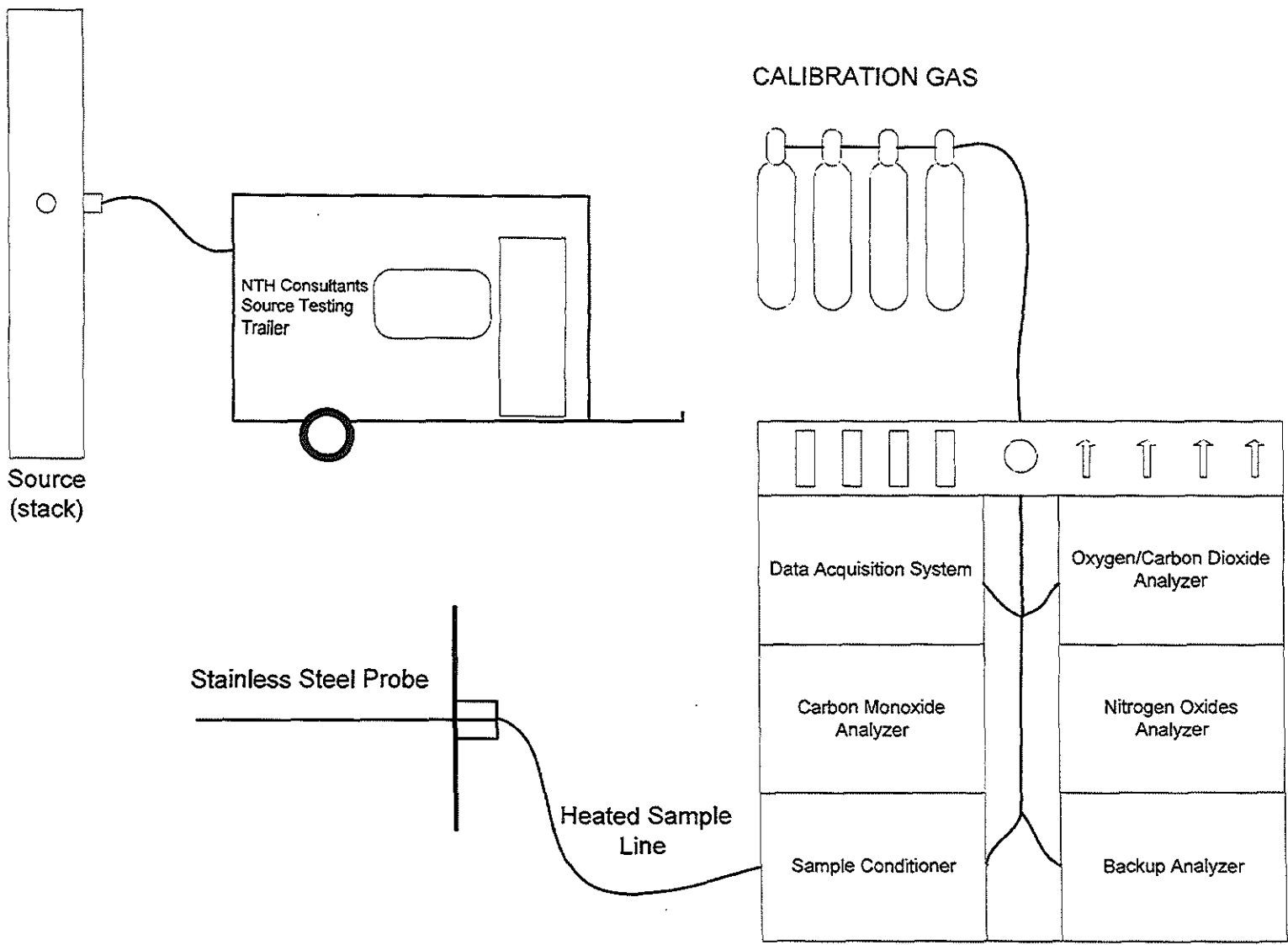


FIGURE 2
 NTH Consultants, Ltd.
 NTH CEMS/Reference Method
 Analyzers