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COMPLIANCE TEST REPORT

for

RELATIVE ACCURACY TEST AUDIT (RATA)

CONTINUOUS EMISSIONS MONITORING SYSTEM (CEMS)

FG-TURBINE CT11 and CT12

Blue Water Energy Center
China Township, Michigan

June 26-27, 2024

Prepared By
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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Safety Environmental Field Services Group (DTE) conducted a Relative Accuracy Test Audit (RATA) at the Blue Water Energy Center (BWEC), located at 4505 King Road in China Township, Michigan. The fieldwork, performed on June 26-27, 2024, was conducted to satisfy requirements of MI-ROP-B2796-2024.

The results of the RATA testing are highlighted below:

O_2, NO_x and CO RATA Results
Units CT11 & CT12 – Blue Water Energy Center
June 26-27, 2024

Parameter	Unit	Date	CEMS	RM	Relative Accuracy	Limit
CO (ppm)	11	6-26	0.6	0.1	0.6	5(1)
CO (ppm@15%O2)	11	6-26	0.4	0.1	0.3	5(1)
NO_x (ppm@15%O_2)	11	6-26	1.8	1.9	8.2	20(1)
NOx (lb/MMBtu)	11	6-26	0.006	0.007	0.001*	<0.015(2)
O2 (%)	11	6-26	11.5	11.5	0.6	1.0(3)
CO (ppm)	12	6-27	0.8	0.1	0.7	5(1)
CO (ppm@15%O2)	12	6-27	0.5	0.1	0.4	5(1)
NO_x (ppm@15%O_2)	12	6-27	1.8	1.8	3.7	20(1)
NOx (lb/MMBtu)	12	6-27	0.006	0.007	0.001**	<0.015(2)
O2 (%)	12	6-27	11.6	11.5	1.4	20(3)

(1) Part 60 (using PS2 and 4A alt. criteria of mean diff. plus confidence coefficient) Allowable Limit
(2) Part 75 Low Emitter Criteria (mean diff. + or – 0.015 lb/MMBtu) Allowable Limit
* A Bias Adjustment Factor (BAF) of 1.111 must be applied to DAHS per Part 75 criteria
** A Bias Adjustment Factor (BAF) of 1.107 must be applied to DAHS per Part 75 criteria
(3) Part 60 (<1.0% mean difference or <20% RA) Allowable Limit

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1. 0 INTRODUCTION

DTE Energy's Environmental Management and Safety Environmental Field Services Group (DTE) conducted a Relative Accuracy Test Audit (RATA) at the Blue Water Energy Center (BWEC), located at 4505 King Road in China Township, Michigan. The fieldwork, performed on June 26-27, 2024, was conducted to satisfy requirements of MI-ROP-B2796-2024.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 3A, 7E, 10, 19, Part 75 Appendices A & B, and Part 60 Appendix B Performance Specifications 2, 3 and 4A.

The following DTE personnel participated in the testing program: Mark D. Westerberg, Senior Specialist - Environmental, Fred Meinecke, Environmental Specialist, and Steven Grigereit, Summer Intern. Mr. Westerberg was the project leader. Ms. Jamie Stanislawski, NonEE Contractor at BRPP, provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The BWEC Plant is a DTE Energy facility located at 4505 King Road in China Township, Michigan. The plant has two (2) combined cycle stationary combustion turbines, referred to as Units CT11, and CT12. The turbines are General Electric (GE) Model 7HA.02 combustion turbine units.

Each combustion turbine includes a compressor, combustor, turbine and electric generator with a combined nominally rated load capacity of 1,150 megawatts (MW) at perfect conditions in combined cycle operation.

NO_x emissions for each unit are controlled by dry low-NO_x burners. CO emissions are controlled by good combustion practices and SO_2 emissions are controlled by utilizing low sulfur natural gas.

The RATA testing was performed while each Unit operated at full load conditions.

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The exhaust stacks for Units CT11 and CT12 are circular stacks, approximately 200 feet tall with an internal diameter of approximately 23 feet. See Figure 1 for a diagram of Units CT11 and CT12 sampling locations and stack dimensions.

BWEC utilizes Teledyne API Continuous Emissions Monitoring Systems (CEMS) to record emissions during unit operations. The following Units were audited:

Unit	Analyzer	Manufacturer / Model	Serial Number
CT11	NO_x, O_2, CO	Teledyne API	1174
CT12	NO_x, O_2, CO	Teledyne API	1175

3.0 SAMPLING AND ANALYTICAL PROCEDURES

Emissions measurements were obtained in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources*. The sampling and analytical methods used in the testing program are indicated in the table below

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Sampling Method	Parameter	Analysis
USEPA Method 3A	Oxygen	Instrumental Analyzer Method
USEPA Method 7E	Oxides of Nitrogen	Chemiluminescent Analyzer
USEPA Method 10	Carbon Monoxide	NDIR Instrumental Analyzer Method

3.1 OXYGEN, OXIDES OF NITROGEN AND CARBON MONOXIDE (USEPA METHODS 3A, 7E AND 10)

3.1.1 Sampling Method

Oxygen (O_2) emissions were evaluated according to Performance Specification (PS) 3 "Specifications and Test Procedures for O_2 and CO_2 Continuous Emission Monitoring Systems in Stationary Sources" utilizing USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O_2 analyzer utilizes a paramagnetic sensor.

Oxides of Nitrogen (NO_x) emissions were evaluated according to Performance Specification (PS) 2 "Specifications and Test Procedures for SO_2 and NO_x Continuous Emission Monitoring Systems in Stationary Sources" utilizing USEPA Method 7E, "Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)". The NO_x analyzer utilizes a Chemiluminescent detector.

Carbon monoxide (CO) emissions were evaluated following the Performance Specification (PS) 4 and 4A "Specifications and Test Procedures for Carbon Monoxide Continuous Emissions Monitoring Systems in Stationary Sources" utilizing USEPA Method 10,

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"Determination of Carbon Monoxide Emissions from Stationary Sources". The CO analyzer utilizes a NDIR detector.

3.1.2 O_2, NO_x and CO Sampling Train

The EPA Methods 3A, 7E and 10 sampling system (Figure 2) consisted of the following components:

(1) Heated stainless steel sampling probe with heated filter.
(2) Heated Teflon™ sampling line.
(3) Universal® gas conditioner with particulate filter.
(4) Flexible unheated Teflon™ sampling line.
(5) Servomax 1400 O_2/CO_2 gas analyzer TECO 48i Chemiluminescent NO_x gas analyzer and TECO 48C NDIR CO gas analyzer.
(6) USEPA Protocol 1 calibration gases.
(7) Data Acquisition System

3.1.3 Sampling Train Calibration

The $O_2/NO_x/CO$ sampling trains were calibrated following the procedures outlined in USEPA Methods 3A, 7E and 10. Zero, span, and mid-range calibration gases were introduced directly into the O_2, NO_x and CO analyzers to determine the instruments linearity. A zero and mid-range span gas was then introduced through the entire sampling system to determine sampling system bias for each analyzer. Additional system calibrations were performed at the completion of each test.

3.1.4 Sampling Duration & Frequency

The RATA testing of the Units CT11 and CT12 O_2, NO_x and CO CEMS consisted of ten 21-minute samples at the test platform level of each unit's exhaust stack. Sampling was performed simultaneously for O_2, NO_x and CO. Data was recorded as 1-minute averages. The results are included in Appendix A.

3.1.5 Quality Control and Assurance (O_2, NO_x and CO)

All sampling and analytical equipment was calibrated following the guidelines referenced in Methods 3A, 7E and 10. Calibration gases were EPA Protocol 1 gases. The analyzer spans for Units CT11 and CT12 RATA testing were 0-18.27% (18.27, 10.04, and zero) for O_2, 0-17.85 ppm (17.85, 8.193, and zero) for NO_x, and 0-8.984 ppm (8.984, 5.052, and zero) for CO. The 10.04% O_2 gas was

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used to zero the NO_x and CO analyzers and the 8.193 ppm NO_x gas was used to zero the O_2 analyzer.

Calibration gas certification sheets are included in Appendix C.

3.1.6 Data Reduction

The NO_x and CO emission readings in parts per million, dry (ppm_{dry}) and O_2 emission readings in percent (%) were recorded at 4-second intervals and averaged to 1-minute increments. The O_2, NO_x and CO emissions were drift corrected utilizing pre and post-run calibration data. The O_2 data was used to convert the NO_x and CO ppm data to NO_x and CO ppm @15% O_2. The O_2 data was also used to convert the NO_x ppm data to pounds per million British thermal units (lb/MMBtu).

The RM data collected for the Units CT11 and CT12 testing can be found in Appendix A.

Corresponding CEMS data collected during the Units CT11 and CT12 testing can be found in Appendix B.

RA calculations are based upon calculations found in USEPA Methods 3A, 7E, 10, 19 and PS2, 3, 4 and 4A. Example calculations can be found in Appendix D.

4.0 OPERATING PARAMETERS

Each Unit was tested at full load conditions which were determined by plant personnel. Load in terms of megawatts (MW) are included with the CEMS data located in Appendix B.

5.0 RESULTS

Tables 1 and 2 present the RATA testing results from Units CT11 and CT12, respectively. The O_2, NO_x and CO monitors passed the RATA following the specifications of 40CFR60 – Performance Specification 2, 3, 4 and 4A and 40CFR75. The O_2 relative accuracy, calculated as %, met the criteria of <1.0% mean difference for CT11 and < 20% RA for CT12. The CO relative accuracy, calculated as ppm and ppm@15%O_2, met the criteria of <5 ppm mean difference for CT11 and CT12. The NO_x relative

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accuracy, calculated as ppm@15%O_2, met the criteria of <20% @15%O_2, and as pounds per million British Thermal units (lb/MMBtu), met the low emitter criteria of <0.015 lb/MMBtu mean difference for CT11 and CT12. In addition, unit CT11 and CT12 had a bias adjustment factor (BAF) = 1.111 and 1.107, respectively.

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6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

Mark D. Westerberg

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RESULTS TABLES

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Table 1

CT11 CO, NO_x and O_2 CEMS RATA Results

Blue Water Energy Center

June 26, 2024

Test No.	Test Times (DAHS)	CO RM (ppm)	CO CEM (ppm)	CO Difference (ppm)	CO @15%O_2 RM (ppm)	CO @15%O_2 CEM (ppm)	CO @15%O_2 Difference (ppm)	O_2 RM (% O2)	O_2 CEM (% O2)	O_2 Difference (ppm)	NO_x RM (ppm)	NO_x RM (ppm) @15%O2	NO_x CEM (ppm) @15%O2	NO_x Difference (ppm)	NO_x RM (lb/MMBtu)	NO_x CEM (lb/MMBtu)	NO_x Difference (lb/MMBtu)
1	11:02-11:23	0.1	0.6	-0.5	0.1	0.4	-0.4	11.4	11.4	0.0	3.0	1.9	1.8	0.1	0.007	0.006	0.001
2	11:40-12:01	0.2	0.6	-0.4	0.1	0.4	-0.3	11.4	11.4	0.1	3.1	1.9	1.7	0.2	0.007	0.007	0.000
3	12:16-12:37	0.1	0.6	-0.5	0.1	0.4	-0.3	11.5	11.4	0.1	3.0	1.9	1.7	0.2	0.007	0.006	0.001
4	12:50-13:11	0.2	0.7	-0.6	0.1	0.5	-0.4	11.6	11.5	0.1	3.0	1.9	1.8	0.1	0.007	0.006	0.001
5	13:24-13:45	0.2	0.8	-0.6	0.1	0.5	-0.4	11.6	11.5	0.1	3.0	1.9	1.8	0.1	0.007	0.006	0.001
6	14:01-14:22	0.2	0.7	-0.5	0.1	0.4	-0.3	11.5	11.5	0.0	3.0	1.9	1.8	0.1	0.007	0.006	0.001
7	14:35-14:56	0.2	0.7	-0.5	0.1	0.4	-0.3	11.5	11.5	0.0	3.0	1.9	1.8	0.1	0.007	0.006	0.001
8	15:10-15:31	0.2	0.7	-0.5	0.1	0.4	-0.3	11.5	11.5	0.0	3.0	1.9	1.8	0.1	0.007	0.006	0.001
9	15:46-16:07	0.2	0.7	-0.6	0.1	0.4	-0.3	11.5	11.5	0.0	3.0	1.9	1.8	0.1	0.007	0.006	0.001
10	16:25-16:46	0.2	0.1	0.1	0.1	0.4	-0.3	11.5	11.4	0.1	3.0	1.9	1.7	0.2	0.007	0.006	0.001
Avg:		0.1	0.6	-0.5	0.1	0.4	-0.3	11.5	11.5	0.04	3.0	1.9	1.8	0.1	0.007	0.006	0.001
		Standard Deviation:		0.19	Standard Deviation:		0.03	Standard Deviation:		0.03	Standard Deviation:			0.05	Standard Deviation:		0.000
		Confidence Coefficient (CC):		0.15	Confidence Coefficient (CC):		0.02	Confidence Coefficient (CC):		0.02	Confidence Coefficient (CC):			0.04	Confidence Coefficient (CC):		0.000
		[1]RELATIVE ACCURACY:		0.6	[1]RELATIVE ACCURACY:		0.3	RELATIVE ACCURACY:		0.6	RELATIVE ACCURACY:			8.2	[2]RELATIVE ACCURACY:		15.4

Test not used in Calculation

[1] using PS4A alternate criteria of the absolute difference between the RM and CEMs plus the confidence coefficient (CC).

[2] passes on low emitter criteria - mean difference of + or - 0.015 lb/MMBtu for units emitting <0.200 lb/MMBtu

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Table 2

CT12 CO, NO_x and O_2 CEMS RATA Results

Blue Water Energy Center

June 27, 2024

Test No.	Test Times (DAHS)	CO RM (ppm)	CO CEM (ppm)	CO Difference (ppm)	CO @15%O_2 RM (ppm)	CO @15%O_2 CEM (ppm)	CO @15%O_2 Difference (ppm)	O_2 RM (% O2)	O_2 CEM (% O2)	O_2 Difference (ppm)	NO_x RM (ppm)	NO_x RM (ppm) @15%O2	NO_x CEM (ppm) @15%O2	NO_x Difference (ppm)	NO_x RM (lb/MMBtu)	NO_x CEM (lb/MMBtu)	NO_x Difference (lb/MMBtu)
1	7:22-7:43	0.2	0.9	-0.7	0.1	0.5	-0.4	11.6	11.5	0.1	2.9	1.8	1.8	0.0	0.007	0.006	0.001
2	8:00-8:21	0.1	0.9	-0.7	0.1	0.5	-0.4	11.6	11.5	0.2	2.9	1.8	1.8	0.0	0.007	0.007	0.000
3	8:40-9:01	0.1	0.9	-0.8	0.1	0.6	-0.5	11.6	11.5	0.2	3.0	1.9	1.8	0.1	0.007	0.006	0.001
4	9:17-9:38	0.2	0.9	-0.7	0.1	0.5	-0.4	11.7	11.5	0.2	3.1	2.0	1.9	0.1	0.007	0.007	0.000
5	9:52-10:13	0.2	0.8	-0.6	0.1	0.5	-0.4	11.6	11.4	0.2	2.9	1.8	1.8	0.0	0.007	0.006	0.001
6	10:30-10:51	0.1	0.9	-0.7	0.1	0.5	-0.4	11.7	11.5	0.2	2.8	1.8	1.8	0.0	0.007	0.006	0.001
7	11:14-11:35	0.2	0.9	-0.7	0.1	0.6	-0.5	11.6	11.5	0.1	2.8	1.8	1.8	0.0	0.007	0.006	0.001
8	11:50-12:11	0.2	0.8	-0.7	0.1	0.5	-0.4	11.6	11.5	0.2	2.8	1.8	1.7	0.1	0.007	0.006	0.001
9	12:26-12:47	0.2	0.8	-0.6	0.1	0.5	-0.4	11.6	11.5	0.2	2.8	1.8	1.7	0.1	0.007	0.006	0.001
10	13:02-13:23	0.1	0.8	-0.7	0.1	0.5	-0.4	11.6	11.4	0.2	2.7	1.7	1.7	0.0	0.006	0.006	0.000
Avg:		0.1	0.8	-0.7	0.1	0.5	-0.4	11.6	11.5	0.2	2.9	1.8	1.8	0.0	0.007	0.006	0.001
		Standard Deviation:		0.04	Standard Deviation:		0.03	Standard Deviation:		0.02	Standard Deviation:			0.0	Standard Deviation:		0.000
		Confidence Coefficient (CC):		0.03	Confidence Coefficient (CC):		0.02	Confidence Coefficient (CC):		0.02	Confidence Coefficient (CC):			0.03	Confidence Coefficient (CC):		0.000
		[1]RELATIVE ACCURACY:		0.7	[1]RELATIVE ACCURACY:		0.4	RELATIVE ACCURACY:		1.4	RELATIVE ACCURACY:			3.7	[2]RELATIVE ACCURACY:		11.8

Test not used in Calculation

[1] using PS4A alternate criteria of the absolute difference between the RM and CEMs plus the confidence coefficient (CC).

[2] passes on low emitter criteria - mean difference of + or - 0.015 lb/MMBtu for units emitting <0.200 lb/MMBtu

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FIGURES

Figure 1 – Stack Drawing & Sampling Location
EUCTGHRSG1 & EUCTGHRSG2
Bluewater Energy Center

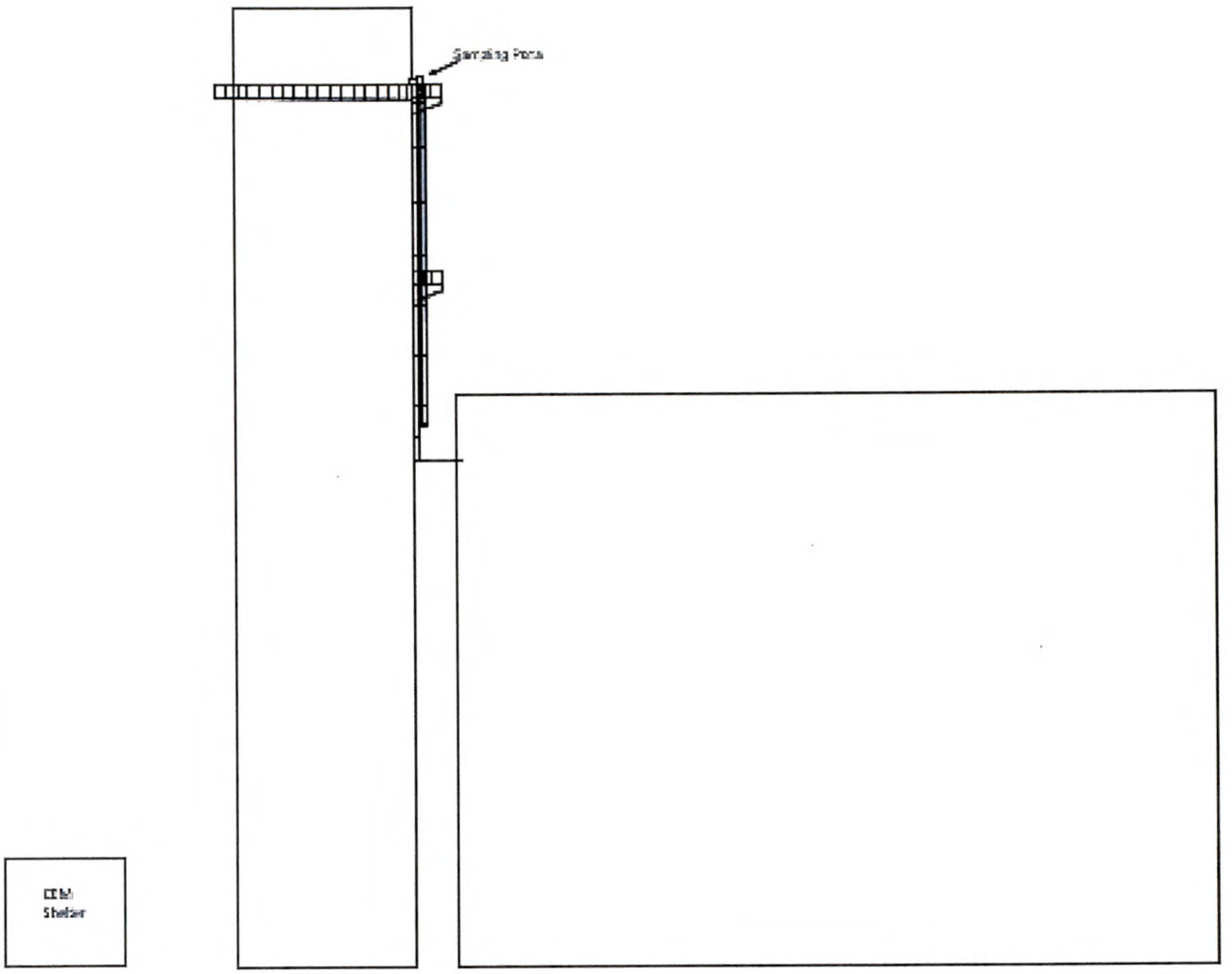

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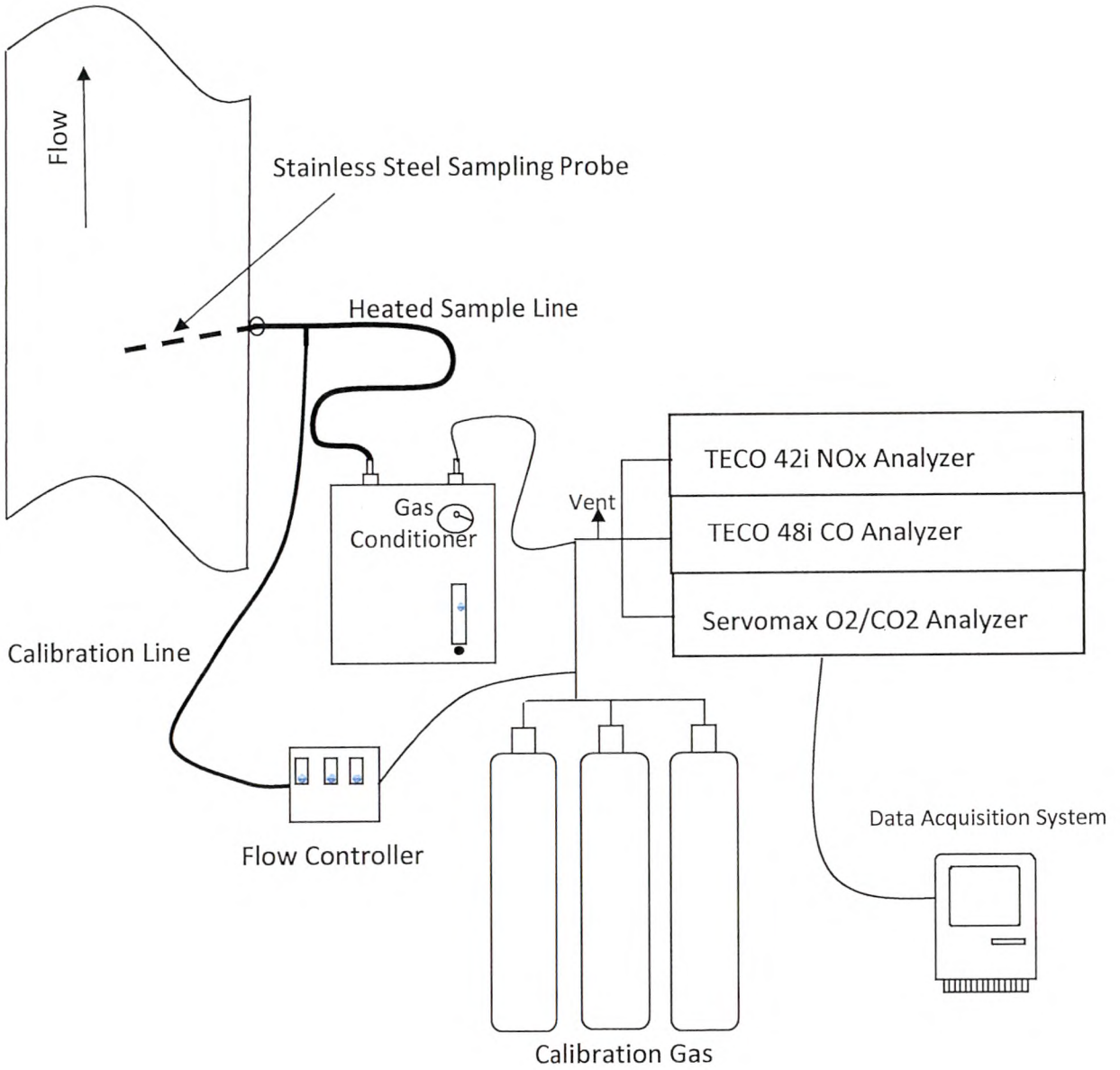
Figure 2 – Method 3A/7E/10
EUCTGHRSG1 & EUCTGHRSG2
Bluewater Energy Center



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