Consumers Energy
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40 CFR 60 & 75 CEMS Relative Accuracy Test Audit Report

EUGT1A, EUGT1B, EUGT2A, and EUGT2B

Consumers Energy Company
Zeeland Generating Station
425 Fairview Road
Zeeland, Michigan 49464
SRN: N6521
ORIS: 55087

July 13, 2022

Test Dates: June 6-7, 2022

Test Performed by the Consumers Energy Company
Regulatory Compliance Testing Section
Air Emissions Testing Body
Laboratory Services Section
Work Order No. 39889809
Initial Revision 1.0

CERTIFICATION FOR 40 CFR PART 75 TEST REPORT

(To be completed by authorized AETB firm representative and included in source test report)

Facility ID: ORIS 55087; SRN N6521 Date(s) Tested June 6 and 7, 2022

Facility Name: Zeeland Generating Station

Facility Address: 425 Fairview Road, Zeeland, Michigan 49464

Equipment Tested: EUGT1A; EUGT1B; EUGT2A; EUGT2B CEMS

AETB Firm: Consumers Energy; RCTS AETB

Business Address: 2742 N. Weadock Hwy, ESD Trailer #4, Essexville, MI 48732

Phone: (989) 891-3492 Email: brian.pape@cmsenergy.com

As the legally authorized representative of the RCTS AETB, I certify that I have reviewed this test report in conjunction with the relevant Quality Manual Appendix D checklist. Having checked each item, I believe the information provided in this test report is true, accurate, and complete.

Signature: Digitally signed by Brian Pape DN: cn=Brian Pape, o=Regulatory Compliance Testing Services, ou=Laboratory Services, email=brian.pape@cmsenergy.com, c=US Date: 2022.07.13 14:13:57 -04'00' Date: July 13, 2022

Name: Brian C Pape Title: AETB Technical Director

Phone: (989) 891-3492 Email: brian.pape@cmsenergy.com

RELATIVE ACCURACY TEST REPORT CHECKLIST

	Description (Typical location(s) in report) [ASTM D 7036-04 Section Reference]
☐	Title (Title Page) [15.3.1]
☐	AETB name & address (QM App. D pg. D-2) [15.3.2]
☐	Unique identification number on each page and a clear identification of the end of the report (Headers & Footers; "End of Report" page) [15.3.3]
☐	Name and address of the customer (Title Page; QM App. D pg. D-2) [15.3.4]
☐	Date(s) the testing was performed (Title page; Introduction; QM App. D pg. D-2) [15.3.10]
☐	Identification of the units tested (Title page; Introduction) [15.3.9]
☐	Identification of regulatory personnel that observed testing (Introduction; Appendix D1) [Note 13]
☐	Clear identification of the pollutants/parameters tested (Summary & Discussion) [15.3.5]
☐	Identification of the test methods used (Sampling and Analytical Procedures) [15.3.8]
☐	Identification of the sampling location, including diagrams, sketches or photographs (Figures) [15.3.6]
☐	Detailed process description and process operations for each test run (Source and Monitor Description; Appendix B CEMS data sheets) [15.3.7]
☐	Reference to the test protocol and procedures used by the AETB (Introduction) [15.3.11]
☐	Test results and units of measure (Summary and Discussion) [15.3.12]
☐	Information on specific test conditions, including text description of process operations for each test run and description of any operational issues with the unit or the control device (Discussion of Test Results) [15.3.14]
☐	Discussion of the test results including the uncertainty associated with the test and discussion of possible errors or limiting conditions (Quality Assurance Procedures) [15.3.15]
☐	Reference Method analyzer calibrations for each RM gas RATA run. (Appendix B) [15.3.16]
☐	Raw plant CEMS data for each RATA run and each CEMS component (i.e. all gas analyzers, flow monitors). (Appendix B) [15.3.17]
☐	Raw Reference Method DAS data for each RM gas RATA run. (Appendix B) [15.3.17]
☐	CEMS "Operating Load Analysis" report. (Appendix C) [15.3.11]
N/A	Meter box post-test calibration results (Appendix C) [15.3.16]
☐	NO_x converter check results (Appendix C) [15.3.16]
N/A	Pitot calibrations and inspections (Appendix C) [15.3.16]
N/A	FRRS/manometer/Magnehelic gage calibration results (Appendix C) [15.3.16]
☐	Reference Method calibration gas certificates of analysis (Appendix C) [15.3.16]
N/A	RATA field data sheets verified against spreadsheet data (Field data sheets in project file) [15.3.17]
☐	RCTS AETB Letter of Certification (Appendix D1) [15.3.19]
☐	Completed QM Appendix F – "AETB Field Test Signature Form" (Appendix D1) [3.1.3; 3.1.9; 3.1.14; 8.3; Note 14; 12.2; 12.3; 12.4; 14.1.1]
N/A	Deviations from, additions to, or exclusions from the test protocol, test methods, or AETB Quality Manual entered on QM App. F pg. F-2 (Appendix D2) [15.3.13]
☐	Names, titles and signatures of persons authorizing the test report – "QM App. D pg. D-2" (After Title Page) [15.3.18]
☐	QSTI certificates for Qualified Individuals overseeing/performing the test (Appendix D2) [3.1.12]
☐	Table of Contents is correct (Report Body) [Neatness & professionalism]
☐	Report Headers & Footers are correct (Report Body) [Neatness & professionalism]
☐	RM and CEMS run data in correct order (Appendix B) [Neatness & professionalism]

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Consumers Energy Company (CECo), Regulatory Compliance Testing Section (RCTS) conducted continuous emission monitoring systems (CEMS) quality assurance (QA) audits at the exhaust of simple cycle combustion turbine emission units EUGT1A (Unit 1A), EUGT1B (Unit 1B), and combined cycle combustion turbines EUGT2A (Unit 2A), and EUGT2B (Unit 2B) operating at the CECo Zeeland Generating Station (ZGS) in Zeeland, Michigan.

The relative accuracy test audits (RATA) were conducted on June 6 and 7, 2022, to satisfy requirements in Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) No. MI-ROP-N6521-2020a, Appendix 3.1 and United States Environmental Protection Agency (USEPA) Title 40, Code of Federal Regulations (40 CFR) Part 60, Appendix F, and Part 75, Appendices A and B. The 40 CFR Part 75 required monitoring plan designates EUGT1A as CC1; EUGT1B as CC2; EUGT2A as CC3; and EUGT2B as CC4.

A test protocol describing the sampling, calibration and QA procedures in USEPA Reference Methods (RM) 3A, 7E, 10, and 19, in conjunction with Performance Specifications (PS) 2, 3, 4, and 4A was submitted May 6, 2022, to the USEPA Region 5 and EGLE offices. The protocol was subsequently approved in a letter dated June 1, 2022, by EGLE representative Mr. Trevor Drost.

The CEMS audits were performed by RCTS representatives Thomas Schmelter, Dillon King, Joe Mason and Joe Gallagher. Mr. J. Homer Manning, ZGS Senior Environmental Analyst coordinated the test with applicable plant personnel and collected CEMS data. EGLE representative Mr. Trevor Drost witnessed portions of the testing on June 6, 2022.

RCTS operates as a self-accredited Air Emission Testing Body (AETB) as described in the AETB Letter of Certification contained in Appendix D of this report and is accordingly qualified to conduct 40 CFR Part 75 test programs. RCTS' AETB program is developed in accordance with the American Society for Testing and Materials (ASTM) D 7036-04, *Standard Practice for Competence of Air Emissions Testing Bodies*, in which the AETB is required during test projects to provide at least one qualified individual (QI), qualified in the specific methods for that project, to be on-site at all times. RCTS representative Mr. Schmelter met these requirements and assumed the on-site lead QI role for the duration of the CEMS audits.

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Table 1-1 contains the test program organization, major lines of communication, and names of responsible individuals.

Table 1-1
Test Program Contact List

Program Role	Contact	Address
EPA Regional Contact	Michael Compher 312-886-5745 compher.michael@epa.gov	USEPA Region 5 77 W. Jackson Blvd. (AR-18J) Chicago, IL 60604
State Regulatory Administrator	Technical Programs Unit Supervisor c/o Diane Eisinger 517-242-3299 eisingerD1@michigan.gov	EGLE Technical Programs Unit (TPU) Constitution Hall, 2nd Floor S 525 W. Allegan Lansing, Michigan 48933
State Technical Programs Field Inspector	Mr. Trevor Drost Environmental Quality Analyst 517-245-5781 DrostT@michigan.gov	
State Regional Agency Inspector	Ms. Kaitlyn DeVries Environmental Quality Analyst 616-558-0552 devriesk1@michigan.gov	EGLE Grand Rapids District Office 350 Ottawa Avenue NW, Unit 10 Grand Rapids, Michigan 49503-2316
Responsible Official	Mr. Jason Ricketts Plant Business Manager–Gas Generation 616-237-4001 jason.ricketts@cmsenergy.com	Consumers Energy Company Zeeland Generating Station 425 N. Fairview Road Zeeland, Michigan 49464
Test Facility	Mr. J. Homer Manning Sr. Environmental Analyst 616-237-4004 homer.manningiii@cmsenergy.com	
Corporate Environmental Coordinator	Mr. Jason Prentice Sr. Engineer III 517-788-1467 jason.prentice@cmsenergy.com	Consumers Energy Company Parnall Office (P22-334) 1945 W. Parnall Road Jackson, Michigan 49201
Test Team Representative	Mr. Thomas Schmelter, QSTI Sr. Engineering Technical Analyst II 248-388-1525 thomas.schmelter@cmsenergy.com	Consumers Energy Company L&D Training Center 17010 Croswell Street West Olive, Michigan 49460

2.0 SUMMARY AND DISCUSSION

The ZGS CEMS relative accuracy (RA) results (Tables 2-1, 2-2, 2-3 and Appendix B of this report) indicate the CEMS meet the semi-annual RA frequency standards in 40 CFR 75, Appendix A, the annual RA frequency incentives in 40 CFR 75, Appendix B, and the 40 CFR Part 60 requirements in EGLE ROP MI-ROP-N6521-2020a.

The RA equations and other applicable sample calculations are presented in Appendix A. Comprehensive test data are presented in Appendix B.

2.1 O_2 Gas RATA

The oxygen (O_2) CEMS measure diluent concentrations in tandem with pollutant CEMS in a nitrogen oxides (NO_x)–diluent and carbon monoxide (CO)–diluent configuration to report emissions in units of pound per million British thermal unit (lb/mmBtu). As such, O_2 CEMS audits are not necessary in this configuration; however, they were conducted to allow potential application of alternate PS criteria during pollutant CEMS audits.

The O_2 RATA results (Table 2-1) met the ≤10.0% RA and ±1.0% O_2 mean RM/CEMS difference semi-annual RA frequency standard in 40 CFR Part 75, App A, § 3.3.3 and the reduced test frequency incentives of ≤7.5% RA or ±0.7% O_2 mean RM/CEMS difference in 40 CFR 75, Appendix B §2.3.1.2 (a) and (h).

Table 2-1
Summary of Oxygen RATA Results

CEMS Make and Model	CEMS Location and Serial Number	Required Performance Criteria	Actual RATA Performance
Servomex 1440D	Unit 1A 01440D1V02/5355	10% of mean RA or ±1.0% O_2 RM-CEMS difference	1.35% RA 0.14% difference
	Unit 1B 01440D1VO2/5358		1.34% RA 0.14% difference
	Unit 2A 1440D1V02/5359		1.15% RA 0.11% difference
	Unit 2B 01440D1V02/5354		1.49% RA 0.17% difference

2.2 NO_x Gas RATA

The 40 CFR Part 75 NO_x RA criteria was on a NO_x-diluent lb/mmBtu basis, while the 40 CFR Part 60 NO_x RA criteria was on a part per million by volume dry (ppmvd) basis, corrected to 15% O_2 (ppmvd@15% O_2).

The NO_x-diluent lb/mmBtu RATA results (Table 2-2) met the semi-annual RA frequency standard ≤10% RA criteria and the ±0.020 lb/mmBtu mean RM/CEMS difference criteria where the average measured RM NO_x emission rate is ≤0.200 lb/mmBtu as specified in 40 CFR Part 75, App A, § 3.3.2. Further, the NO_x-diluent CEMS also met the reduced test frequency incentives of ≤7.5% RA or ±0.015 lb/mmBtu mean difference criteria in 40 CFR Part 75, App. B §2.3.1.2(f).

The NO_x ppmvd @15% O_2 RATA results also met the ≤20% RA criteria in 40 CFR 60, Appendix B, Performance Specification (PS) 2, §13.2.

Table 2-2
Summary of Nitrogen Oxides RATA Results

CEMS Make and Model	CEMS Location & Serial Number	RATA Performance Criteria	Required RATA Performance	Actual RATA Performance	
Thermo Model 42iQLS-ABBNN	Unit 1A 12105510965	lb/mmBtu	10% of mean RM or ≤0.020 lb/mmBtu difference	7.88%	-0.002 lb/mmBtu
		Bias (lb/mmBtu)	|d| ≤ |CC| =Pass	Pass	
		ppmv@15% O_2	20% of mean RM[1]	8.50%	
	Unit 1B 121055110963	lb/mmBtu	10% of mean RM or ≤0.020 lb/mmBtu difference	0.00%	0.000 lb/mmBtu
		Bias (lb/mmBtu)	|d| ≤ |CC| =Pass	Pass	
		ppmv@15% O_2	20% of mean RM[1]	1.12%	
Thermo Model 42iQLS-ABBNN	Unit 2A 12105610987	lb/mmBtu	10% of mean RM or ≤0.020 lb/mmBtu difference	9.09%	0.001 lb/mmBtu
		Bias (lb/mmBtu)	|d| ≤ |CC| =Pass	Bias Needed 1.100	
		ppmv@15% O_2	20% of mean RM[1]	6.67%	
	Unit 2B 12105610988	lb/mmBtu	10% of mean RM or ≤0.020 lb/mmBtu difference	0.00%	0.000 lb/mmBtu
		Bias (lb/mmBtu)	|d| ≤ |CC| =Pass	Pass	
		ppmv@15% O_2	20% of mean RM[1]	0.00%	

[1] 40 CFR Part 60, Appendix B, PS 2 §13.2, 20% RA criteria is applied when the average RM value measured is ≥50% of the applicable emission standard, which for Units 1A and 1B is 9.0 ppmvd at 15% O_2 and 3.5 ppmvd at 15% O_2 for Units 2A and 2B. Actual RM NO_x concentrations @15% O_2 for Units 1A and 1B were 8.8 and 8.7 ppmvd at 15% O_2, respectively. Actual RM NO_x concentrations @15% O_2 for Units 2A and 2B were 2.8 and 2.7 ppmvd, respectively.

|d| average absolute difference between the RM and CEMS

|CC| confidence coefficient

2.3 CO Gas RATA

The CO RATA results (Table 2-3) met the 40 CFR Part 40, Appendix B, PS 4, §13.2, ≤5.0% lb/mmBtu RA criteria using the Unit 1A and 1B 0.021 lb/mmBtu applicable emission standard and the Unit 2A and 2B 0.042 lb/mmBtu applicable emission standard. The CO CEMS also met the 40 CFR Part 40, Appendix B, PS 4A, §13.2, ≤5 ppmvd RM/CEMS absolute average RM/CEMS difference plus the 2.5% CC criteria.

Table 2-3
Summary of Carbon Monoxide RATA Results

CEMS Make and Model	CEMS Location & Serial Number	RATA Performance Criteria	Actual RATA Performance	
			lb/mmBtu (Emission Limit Basis)	ppmv Abs Diff + 2.5% CC Basis
CO Thermo Model 48iQ-ABN	Unit 1A 12105510966	≤5% of the Emission Limit[1] -or- Within 5 ppmv Absolute Difference + 2.5% CC[2]	0.00%	0.142
	Unit 1B 12105510967		4.76%	0.805
	Unit 2A 12105510968		4.76%	1.100
	Unit 2B 12105510969		4.76%	1.112

[1] The 5% RA limit is applied when the average measured RM value is ≤50% of the applicable emission standard; which for Units 1A and 1B is 0.021 lb/mmBtu and 0.042 lb/mmBtu for Units 2A and 2B. Actual CO lb/mmBtu emissions on both Units 1A and 1B were 0.002 lb/mmBtu. Actual CO emissions on Units 2A and 2B were 0.001 and 0.002 lb/mmBtu.
[2] 40 CFR Part 60, Appendix B, PS 4A §13.2, when $|d|+2.5\%\ |CC| \leq \pm 5$ ppmv
|d| average absolute difference between the RM and CEMS
|CC| confidence coefficient

3.0 SOURCE AND MONITOR DESCRIPTION

ZGS operates four General Electric (GE) model 7FA natural gas fired combustion turbines. Units 1A and 1B are simple cycle units rated at 2,205 mmBtu/hr heat input, with an Upper Bound Range of Operation (UBRO) of 190 megawatts (MW) and a Lower Bound Range of Operation (LBRO) of 17 MW. Units 2A and 2B are combined-cycle units rated at 2,323 mmBtu/hr heat input for Unit 2A and 2,345 mmBtu/hr heat input for Unit 2B, with an UBRO of 307 MW for Unit 2A and 308 MW for Unit 2B and an LBRO of 17 MW for each unit. The combined cycle units are equipped with natural gas-fired duct burners to augment steam production and selective catalytic reduction (SCR) systems for controlling NO_x.

Each combustion turbine is equipped with dedicated dry extractive NO_x, O_2, and CO CEMS to continuously monitor exhaust gas concentrations, and are operated in accordance with 40 CFR Parts 60 and/or 75, as dictated by the specific pollutant or unit of measure. Specifically, the NO_x and O_2 CEMS operate in tandem as NO_x–diluent CEMS to monitor NO_x lb/mmBtu emission rates in accordance with 40 CFR Part 75. These analyzers are also subject to the NO_x ppmvd at 15% O_2 RA criteria contained in 40 CFR Part 60. The O_2 and CO CEMS used to monitor CO lb/mmBtu emission rates are regulated by 40 CFR Part 60 CEMS RA criteria. Each CEMS is connected to an ESC Spectrum (ESC) StackVision© data acquisition and handling system (DAHS).

In preparation for the audits, an Operating Load Analysis (OLA) was obtained for each unit encompassing the April 1, 2021 – March 31, 2022, time period. Based on these four quarters of representative historical operating data, the first (i.e., normal) and second most frequently (i.e., additional normal load) used load levels were determined to ensure appropriate load level selection during the RATA.

The OLA indicated High Load Level was most frequently used for Units 1A, 1B, 2A, and 2B, with Mid Load the second most frequently used load level, which is identical to the load usage levels identified in the ZGS 40 CFR Part 75 Monitoring Plan.

Therefore, each unit operated at its respective normal load during this test event, which equated to approximately 149 MWg for Unit 1A, 151 MWg for Unit 1B, 253 MWg for Unit 2A and 246 MWg for Unit 2B.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

Specific test procedures detailed in 40 CFR Part 60, Appendix A, Reference Methods 3A,7E, 10, and 19 were used to conduct 10 runs at each source to calculate CEMS RA. O_2, NO_x, and CO concentrations were measured for 21-minutes during each gas RATA run. The following sections provide the sampling and analytical procedures employed.

4.1 Sample Location and Traverse Points (USEPA Method 1)

The number and location of traverse points for measuring gas concentrations were determined in accordance with 40 CFR 75, Appendix A, Section 6.5.6. The flue gas concentrations were measured while traversing the exhaust stack sample ports at 7-minute intervals from each of three traverse points located 15.7 (0.4 m), 47.2 (1.2 m) and 78.7 (2.0 m) inches from the duct wall.

The test ports at Units 1A and 1B (Figure 1) are located approximately 36 feet (2.2 duct diameters) downstream of a flow disturbance (duct confluence and bend) and 29 feet (1.8 duct diameters) upstream of a flow disturbance (baffles). The test ports at Units 2A and 2B (Figure 2) are located approximately 67 feet (4 duct diameters) downstream of a flow disturbance (duct confluence and bend) and 20 feet (1.2 duct diameters) upstream of a flow disturbance (exhaust to atmosphere).

4.2 O_2, NO_x, and CO Concentration (USEPA Methods 3A, 7E, and 10)

Oxygen, nitrogen oxides, and carbon monoxide concentrations were measured using the following sampling and analytical procedures:

- USEPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure),*
- USEPA Method 7E*, Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)*, and
- USEPA Method 10, *Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure).*

The sampling procedures of the methods are similar, apart from the analyzers and analytical technique used to quantify the parameters of interest. The measured oxygen concentrations were used to adjust pollutant concentrations to 15% O_2 and calculate pollutant emission rates in units of lb/mmBtu.

Components of the extractive gaseous RM system (Figure 3) in contact with flue gas are constructed of Type 316 stainless steel and Teflon. Exhaust gas was extracted from the stacks through a steel tubing probe, heated Teflon® tubing, and a gas conditioning system to remove water and dry the sample before entering a sample pump, gas flow control manifold, and the gas analyzers. The output signal from each analyzer was connected to a

computerized data acquisition system (DAS). The RM analyzers were calibrated with USEPA Protocol calibration gases and operated to ensure that zero drift, calibration gas drift, bias and calibration error met the specified method requirements.

Data collected from the RM analyzers were averaged for each run with NO_x concentrations measured in ppmvd, corrected to 15 percent O_2 using Equation 2-2 from 40 CFR Part 60, Appendix B, PS 2. Equation 19-1 from 40 CFR Part 60, Appendix A, Method 19 was used to calculate NO_x and CO lb/mmBtu emission rates. O_2 concentrations were measured as percent by volume on a dry basis.

Where applicable, the *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume III, Stationary Source Specific Methods, was used as a reference.

4.3 Emission Rates (USEPA Method 19)

USEPA Method 19, *Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates*, Equation 19-1 was used to calculate lb/mmBtu emission rates using Measured O_2 concentrations and F factors (ratios of combustion gas volume to heat input).

USEPA Method 19, Equation 19-1:

$$E = C_d F_d \frac{20.9}{(20.9 - \%O_{2d})}$$

Where:

E	=	Pollutant emission rate (lb/mmBtu)
C_d	=	Pollutant concentration, dry basis (lb/dscf)
F_d	=	Volumes of combustion components per unit of heat content, 8,710 dscf O_2/mmBtu for natural gas from 40 CFR 75, Appendix F, Table 1
$\%O_{2d}$	=	Concentration of oxygen on a dry basis (%, dry)

Refer to the RATA calculation summary (Appendix A) for the calculations used in this report.

5.0 QUALITY ASSURANCE PROCEDURES

The objective of a Quality Assurance (QA) program is to produce data that are complete, representative, and of known precision and accuracy. Within the RATA test program, completeness can be defined as the percentage of the required field measurements and associated documentation achieved. Representativeness, defined as the "when," "how," and "how many" measurements taken, is typically specified within the regulations governing the source to be tested as well as the Test Protocol submitted to the regulatory agency prior to the test event. Precision and accuracy are measures of data quality and exist by design within each of the USEPA reference test methods and procedures incorporated during the RATA.

RCTS addresses these QA goals by operating within a Quality System in compliance with ASTM D 7036-04, Standard Practice for Competence of Air Emissions Testing Bodies; a practice specifying the general competence requirements applicable to all AETB staff engaged in air emission testing at stationary sources, regardless of testing scope. By employing these requirements in conjunction with the precision and accuracy standards in each reference method, RCTS is better able to ensure consistently accurate data quality

from an individual and AETB perspective. RCTS' AETB Letter of Accreditation, QSTI Certificates and signature forms are contained in Appendix D.

5.1 USEPA Protocol Gas Standards

USEPA Protocol gas standards used by RCTS (Appendix C) were purchased from an outside vendor participating in the USEPA Protocol Gas Verification Program (PGVP) calibration gas audit program described 40 CFR Part 75 § 75.21(g). The standards are certified to have a total relative uncertainty of no greater than ±2.0 percent according to the *USEPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards; EPA – 600/R-97/121; September 1997* or the current version of the traceability protocol (*EPA – 600/R-12/531; May, 2012*).

5.2 Analyzer Calibrations

The RM instruments measuring gaseous concentrations were calibrated on-site and operated following manufacturer's specifications and the applicable RM based in part on the quality assurance and quality control requirements contained in USEPA Method 7E.

Before beginning the gas RATA, a three-point analyzer calibration error (ACE) check was conducted on each analyzer by injecting zero-, mid-, and high-level calibration gases directly into the instruments and measuring the responses. An acceptable instrument response is within ±2.0% of the respective analyzer span or within ±0.5 ppmv (or ±0.5% for O_2) absolute difference. A nitrogen dioxide (NO_2) to nitric oxide (NO) conversion efficiency (CE) test was conducted on the NO_x analyzer (Appendix C) to verify the analyzer's ability to convert NO_2 to NO.

An initial system bias check was then performed by measuring instrument responses to zero- and mid- or high-level (upscale) calibration gases introduced at the probe, upstream of all sample conditioning components, drawing it through the various sample components in the same manner as flue gas. An acceptable initial system bias check is within ±5.0% of the calibration span or ±0.5 ppmv (or ±0.5% for O_2) absolute difference. Final bias's were conducted after each gaseous run in the same manner to quantify bias and compensate for analyzer drift (Appendices B1 – B4). Acceptable drift is where zero and upscale values fall within ±3.0% of the calibration span.

System response times were documented during initial system bias tests (Appendix C). Calibration gas flow rates were maintained at the target sample rate, with each subsequent run started after twice the measurement system response time had elapsed.

6.0 DISCUSSION OF TEST RESULTS

The test results indicate the simple and combined cycle combustion turbine CEMS operating at ZGS met the semi-annual RA frequency standards in 40 CFR 75, Appendix A; the annual RA reduced test frequency incentives in 40 CFR 75, Appendix B; the quality assurance requirements in 40 CFR Part 60, and the facility CEMS monitoring and recordkeeping requirements in EGLE ROP MI-ROP-N6521-2020a.

Please note that the RM NOx analyzer span values at Units 2A and 2B, as represented by the High-Level calibration gas value of 12.17 ppm, meet the Low-Concentration Analyzer definition found in USEPA Method 7E, Section 3.12, which states a *Low-Concentration Analyzer means any analyzer that operates with a calibration span of 20 ppm NO_X or lower.* The definition goes on to say that *Each analyzer model used routinely to measure low NO_X concentrations must pass a manufacturer's stability test (MST)*...which *subjects the*

analyzer to a range of line voltages and temperatures that reflect potential field conditions to demonstrate its stability following procedures similar to those provided in 40 CFR 53.23.

With that said, while the RM NOx analyzer spans used at Units 2A and 2B were less than 20 ppm, the same analyzers are not *routinely* used to measure low NO_x concentrations, as further defined by Method 7E. Therefore, RCTS has not provided any MST documentation in this report.

No deviations from the applicable RM and agency-approved Test Protocol were observed during the test event by the attending QI. Hard copy and/or electronic field data were completed in the field and upon return to the home office, verified for data precision and accuracy, further ensuring appropriate AETB and RM quality measures were met.

6.1 Clock Time Synchronization

The electronic timestamps recorded for RM gas RATA runs are on military time basis and synchronized to the CEMS DAHS, which is in Eastern Standard Time (EST).

Figures

Figure 1 – Zeeland Generating Station Units 1A & 1B Stack and CEMS Schematic

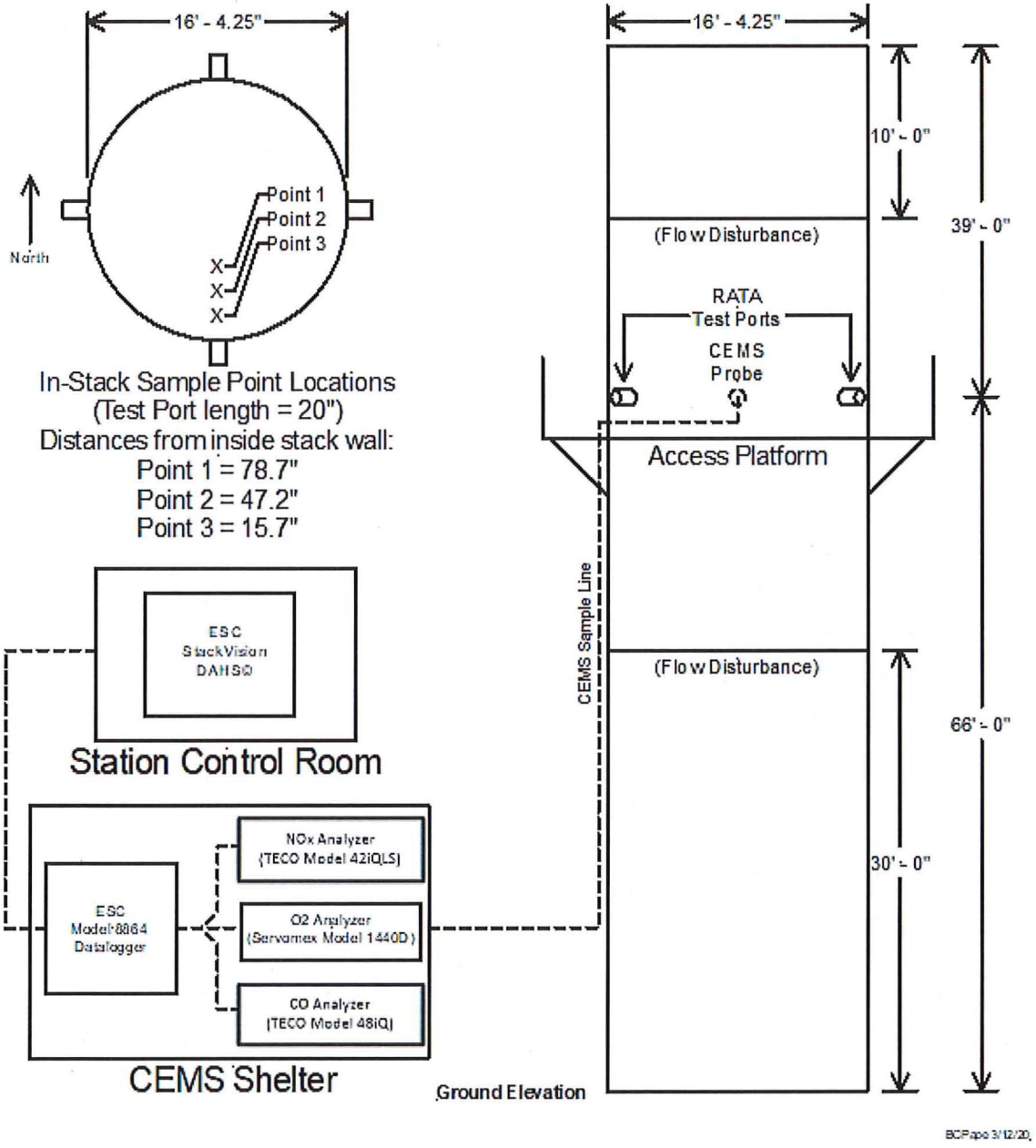


Figure 2 – Zeeland Generating Station Units 2A & 2B Stack and CEMS Schematic

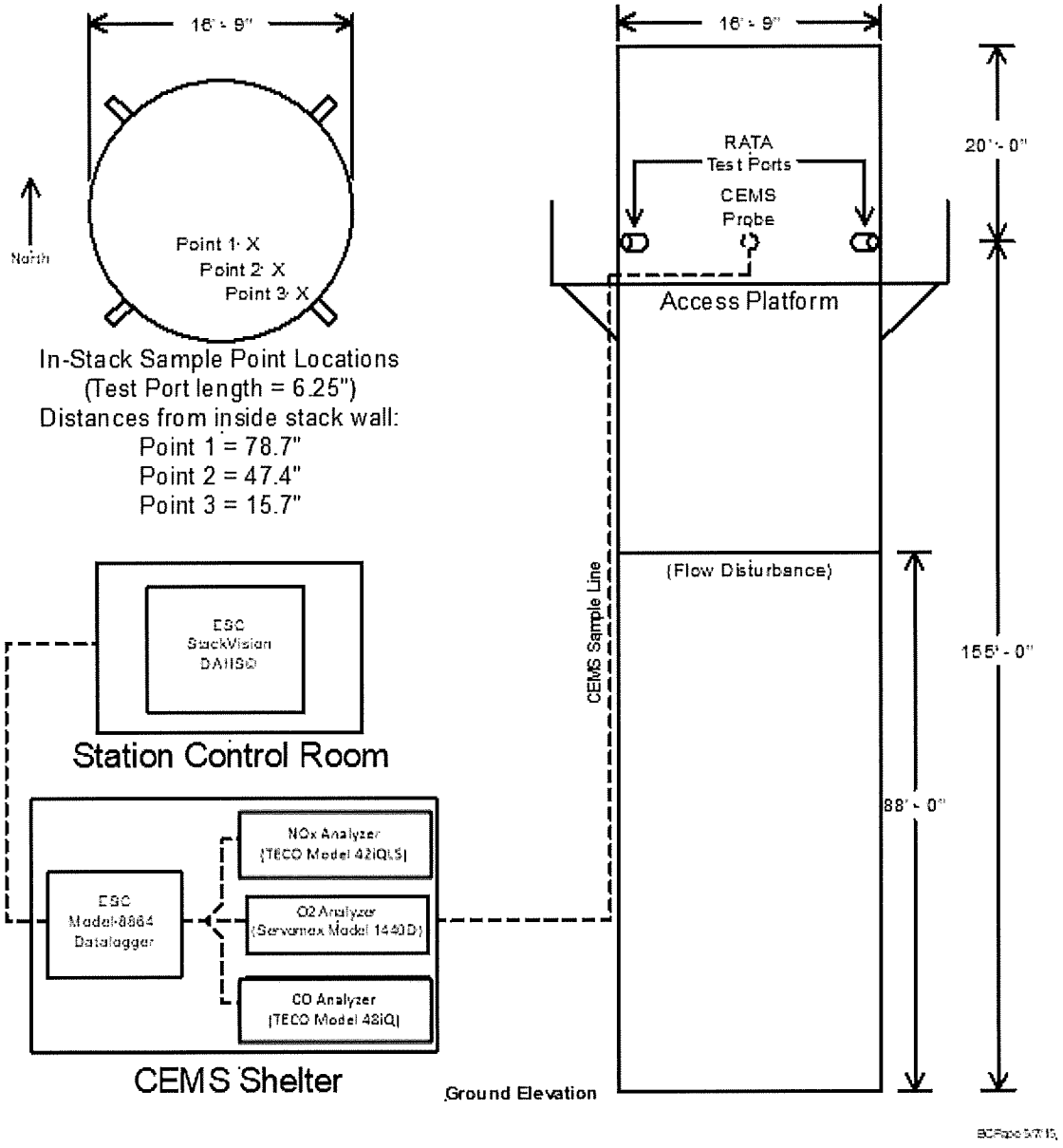
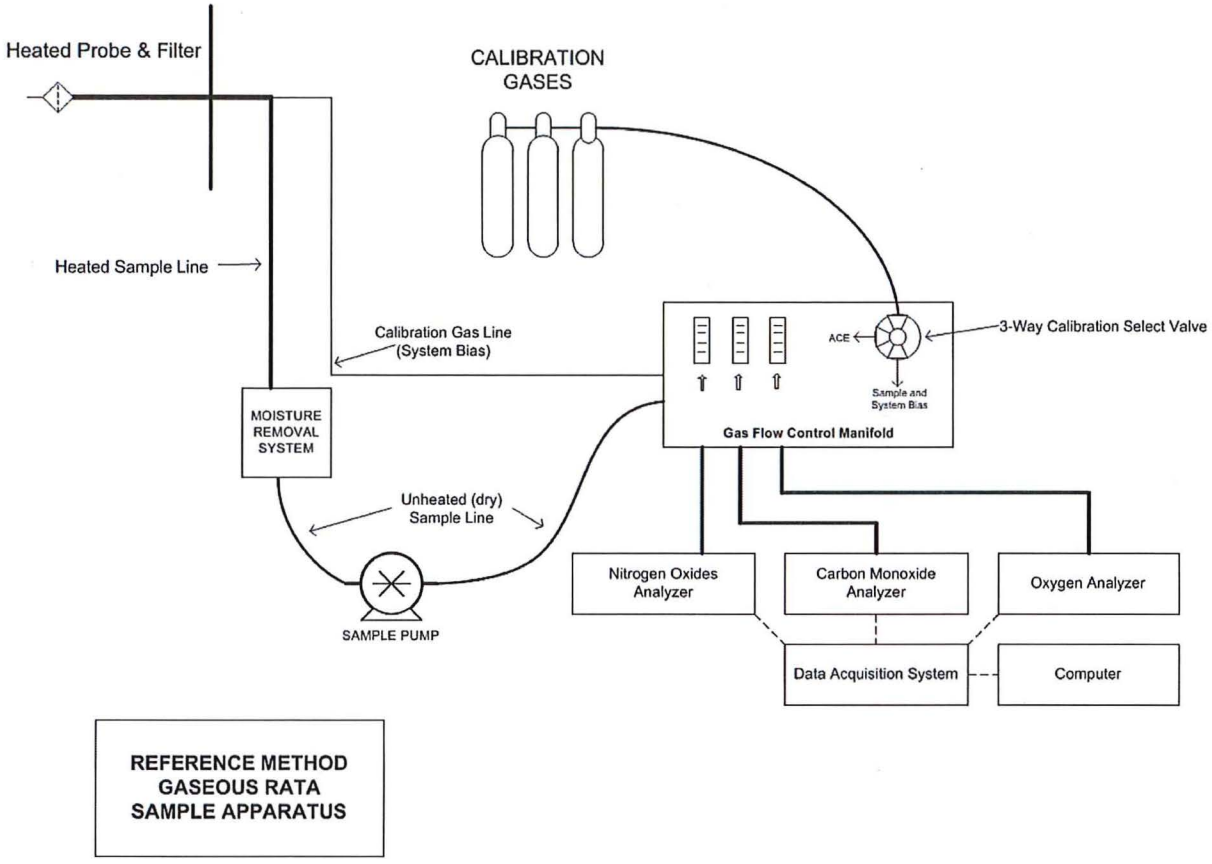


Figure 3 – Reference Method Gaseous RATA Sample Apparatus



Appendix A
RATA Calculation Summary