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# 40 CFR Part 60 and 75 CEMS Relative Accuracy Test Audit Report

## LM1, LM2, LM3, LM4, LM5, LM6, and 7EA

Consumers Energy Company
Jackson Generating Station
2219 Chapin Street
Jackson, Michigan 49203
SRN: N6626
ORIS: 55270

June 27, 2023

**Test Dates: May 15 through 19, 2023**

Test Performed by the Consumers Energy Company
Regulatory Compliance Testing Section
Air Emissions Testing Body
Laboratory Services Section
Work Order No. 41190290
Initial Revision No.: 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: 55270, SRN: N6625 Date(s) Tested May 15-19, 2023

Facility Name: Jackson Generating Station

Facility Address: 2219 Chapin Street, Jackson, MI 49203

Equipment Tested: LM1, LM2, LM3, LM4, LM5, LM6, and 7EA O2, NOx, and CO CEMS

AETB Firm: CECo/RCTS AETB

Business Address: 135 W. Trail St., Jackson MI 49201

Phone: 616-738-3234 Email: thomas.schmelter@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:  Date: June 27, 2023

Name: Thomas R. Schmelter Title: AETB Technical Director

Phone: (616) 738-3234 Email: thomas.schmelter@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] |
| ☐ | Meter box post-test calibration results (Appendix C) [15.3.16] |
| ☑ | $NO_x$ converter check results (Appendix C) [15.3.16] |
| ☐ | Pitot calibrations and inspections (Appendix C) [15.3.16] |
| ☐ | FRRS/manometer/Magnehelic gage calibration results (Appendix C) [15.3.16] |
| ☑ | Reference Method calibration gas certificates of analysis (Appendix C) [15.3.16] |
| ☑ | 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] |
| ☑ | 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) |
| ☑ | 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] |

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# 1.0 INTRODUCTION

Consumers Energy Company (CECo), Regulatory Compliance Testing Section (RCTS) conducted continuous emission monitoring system (CEMS) quality assurance (QA) audits on seven combined-cycle natural gas-fired combustion turbine generator emission units operating at the CECo Jackson Generating Station located in Jackson, Michigan.

The relative accuracy test audits (RATA) were conducted on May 15 through 19, 2023, to satisfy requirements in Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) No. MI-ROP-N6626-2019a, which incorporates requirements of United States Environmental Protection Agency (USEPA) Title 40, Code of Federal Regulations (40 CFR) Part 75, Appendices A and B. The 40 CFR Part 75 required monitoring plan designates the emission units evaluated as: LM1, LM2, LM3, LM4, LM5, LM6, and 7EA. Within the ROP the emission units are referenced as: EULMDB1, EULMDB2, EULMDB3, EULMDB4, EULMDB5, EULMDB6 (collectively FGLMDB1-6) and EUEADB7.

A test protocol describing the sampling, calibration, and QA procedures in USEPA Reference Methods (RM) 1, 3A, 7E, 10, and 19, in conjunction with Performance Specifications (PS) 2, 3, 4A, and 40 CFR 75, Appendices A and B, was submitted April 13, 2023, to the USEPA Region 5 and EGLE offices. The protocol was subsequently approved in a letter dated May 5, 2023, by EGLE representative Andrew Riley. EGLE representatives did not witness the field testing.

The CEMS audits were performed by RCTS representatives Dillon King, Joe Gallagher, and Thomas Schmelter. Mr. Doug Mallory, Senior Environmental Analyst, with the Jackson Generating Station coordinated the tests with applicable plant personnel and provided support.

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 gas CEMS audits.

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

**Table 1-1**
**Contact Information**

| Program Role | Contact | Address |
|---|---|---|
| EPA Regional Contact | Michael Compher<br>312-886-5745<br>compher.michael@epa.gov | U.S. EPA Region 5<br>77 W. Jackson Blvd. (AR-18J)<br>Chicago, Illinois 60604 |
| Regulatory Agency Technical Programs Manager | Jeremy Howe<br>Technical Programs Unit Manager<br>231-878-6687<br>howej1@michigan.gov | EGLE AQD Technical Programs Unit<br>525 W. Allegan, Constitution Hall<br>2nd Floor S<br>Lansing, Michigan 48933-1502 |
| Regulatory Technical Programs Representative | Andrew Riley<br>Environmental Quality Analyst<br>586-565-7379<br>rileya8@michigan.gov | EGLE AQD Warren District Office<br>27000 Donald Ct.<br>Warren, Michigan 48902 |
| Regulatory District Representative | Scott Miller<br>Environmental Manager<br>517-416-5992<br>millers@michigan.gov | EGLE AQD Jackson District Office<br>State Office Building, 4th Floor<br>301 East Louis Glick Highway, Suite 4<br>Jackson, Michigan 49201 |
| Regulatory District Representative | Mr. Brian Carley<br>Environmental Specialist<br>517-416-4631<br>carleyb@michigan.gov | EGLE AQD Jackson District Office<br>State Office Building, 4th Floor<br>301 E. Louis B Glick Highway<br>Jackson, Michigan 49201 |
| Responsible Official | Mr. Norman Kapala<br>VP Generation Operations<br>616-738-3200<br>norman.kapala@cmsenergy.com | Consumers Energy Company<br>J.H. Campbell Annex<br>17000 Croswell Street<br>West Olive, Michigan 49460 |
| Authorized Representative | Ms. Janna Spitz<br>Senior Manager Plant Operations<br>517-841-5710<br>janna.spitz@cmsenergy.com | Consumers Energy Company<br>Jackson Generating Station<br>2219 Chapin Street<br>Jackson, Michigan 49203 |
| Corporate Air Quality Contact | Mr. Jason Prentice<br>Principal Environmental Engineer<br>517-788-1467<br>jason.prentice@cmsenergy.com | Consumers Energy Company<br>1945 W Parnall Road<br>Jackson, Michigan 49201 |
| Test Facility | Mr. Doug Mallory<br>Senior Environmental Analyst<br>517-841-5723<br>doug.mallory@cmsenergy.com | Consumers Energy Company<br>Jackson Generating Station<br>2219 Chapin Street<br>Jackson, Michigan 49203 |
| Test Facility | Mr. Nathan Parker<br>Manager Plant Operations<br>989-316-6519<br>nathan.parker@cmsenergy.com | Consumers Energy Company<br>Jackson Generating Station<br>2219 Chapin Street<br>Jackson, Michigan 49203 |
| Test Team Representative | Mr. Thomas Schmelter, QSTI<br>Sr. Engineering Technical Analyst<br>616-738-3234<br>thomas.schmelter@cmsenergy.com | Consumers Energy Company<br>L&D Training Center<br>17010 Croswell Street<br>West Olive, Michigan 49460 |

# 2.0 SUMMARY AND DISCUSSION

The LM1, LM2, LM3, LM4, LM5, LM6, and 7EA oxygen ($O_2$), oxides of nitrogen ($NO_x$), and carbon monoxide (CO) CEMS relative accuracy (RA) results indicate the CEMS meet the semi-annual RA frequency standards in 40 CFR 75, Appendix A and the annual reduced RA test frequency incentives in 40 CFR 75, Appendix B or the quality assurance requirements in 40 CFR Part 60, Appendix F, Procedure 1, as applicable. In addition, the results comply with requirements in EGLE ROP MI-ROP-N6626-2019a. Results are presented in Tables 2-1 through 2-3 and Appendix B of this report.

## 2.1 $O_2$ GAS RATA

The facility operates $O_2$ dry extractive paramagnetic CEMS at the exhaust stacks of each unit to report continuous emissions. The percent (%) $O_2$ concentrations are used to calculate diluent-corrected $NO_x$ concentrations (ppmv at 15% $O_2$), and to support pound per million British thermal unit (lb/mmBtu) and pound per hour (lb/hr) mass emissions reporting. The $O_2$ RATA results met the ≤10% RA and the mean difference of no greater than ±1.0% $O_2$ specifications in 40 CFR 75, Appendix A §3.3.3 and the reduced RATA test frequency incentive standard in 40 CFR 75, Appendix B §2.3.1.2(a) and (h) where the RA is ≤7.5% or the mean difference does not exceed ±0.7% $O_2$, respectively. The $O_2$ CEMS RA results are summarized in Table 2-1.

**Table 2-1**
**Summary of $O_2$ RATA Results**

| CEMS Make and Model | CEMS Location & Serial Number | RATA Performance Criteria | Required Performance Criteria | Actual RATA Performance |
|---|---|---|---|---|
| Teledyne Monitor Labs T802 | LM1 178 | % | ≤10% of mean RM or ±1.0% $O_2$ RM-CEMS difference | 0.39% |
| | | Absolute mean difference, % | | 0.011% |
| | LM2 178 | % | ≤10% of mean RM or ±1.0% $O_2$ RM-CEMS difference | 0.58% |
| | | Absolute mean difference, % | | 0.033% |
| | LM3 179 | % | ≤10% of mean RM or ±1.0% $O_2$ RM-CEMS difference | 0.59% |
| | | Absolute mean difference, % | | 0.033% |
| | LM4 179 | % | ≤10% of mean RM or ±1.0% $O_2$ RM-CEMS difference | 0.57% |
| | | Absolute mean difference, % | | 0.011% |
| | LM5 180 | % | ≤10% of mean RM or ±1.0% $O_2$ RM-CEMS difference | 0.40% |
| | | Absolute mean difference, % | | 0.011% |
| | LM6 180 | % | ≤10% of mean RM or ±1.0% $O_2$ RM-CEMS difference | 0.75% |
| | | Absolute mean difference, % | | 0.078% |
| | 7EA 181 | % | ≤10% of mean RM or ±1.0% $O_2$ RM-CEMS difference | 2.50% |
| | | Absolute mean difference, % | | -0.289% |

## 2.2 $NO_x$ Gas RATA

The facility operates $NO_x$ dry-extractive chemiluminescence CEMS used to support 40 CFR Part 75 lb/mmBtu and mass emissions reporting and to evaluate compliance with rolling $NO_x$ emission limits, including ppmv @ 15% $O_2$, lb/hr, and ton per year (tpy). The $NO_x$ ppm CEMS met the PS 2 criteria of ≤20% RA as the average emissions during the RATA were ≥50% of the emission standard (25 ppm @ 15% $O_2$ for LM1 through LM6, and 9 ppm @ 15% $O_2$ for 7EA based on a 30-day rolling average as determined at the end of each calendar day).

The $NO_x$-diluent CEMS met the ≤10% RA or the ±0.020 lb/mmBtu mean difference criteria where the RM measured $NO_x$ average emission rate is ≤0.200 lb/mmBtu, as specified in 40 CFR Part 75, App A, § 3.3.2. 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). Table 2-2 summarizes the $NO_x$ RATA results.

**Table 2-2**
**Summary of $NO_x$ RATA Results**

| CEMS Make and Model | CEMS Location & Serial Number | RATA Performance Criteria | Required RATA Performance | Actual RATA Performance |
|---|---|---|---|---|
| Teledyne Monitor Labs T200M | LM1 00-0664 | ppmv @ 15% $O_2$ | ≤20% of mean RM | 5.06% |
| | | lb/mmBtu | ≤10% of mean RM or ±0.020 lb/mmBtu RM-CEMS difference | 5.75% |
| | | | | 0.001 lb/mmBtu |
| | | Bias | \|d\|≤\|CC\|=Pass | Pass |
| | LM2 00-0664 | ppmv @ 15% $O_2$ | ≤20% of mean RM | 3.08% |
| | | lb/mmBtu | ≤10% of mean RM or ±0.020 lb/mmBtu RM-CEMS difference | 2.98% |
| | | | | 0.001 lb/mmBtu |
| | | Bias | \|d\|≤\|CC\|=Pass | 1.017 |
| | LM3 00-0665 | ppmv @ 15% $O_2$ | ≤20% of mean RM | 3.80% |
| | | lb/mmBtu | ≤10% of mean RM or ±0.020 lb/mmBtu RM-CEMS difference | 3.41% |
| | | | | 0.002 lb/mmBtu |
| | | Bias | \|d\|≤\|CC\|=Pass | 1.023 |

| CEMS Make and Model | CEMS Location & Serial Number | RATA Performance Criteria | Required RATA Performance | Actual RATA Performance |
|---|---|---|---|---|
| Teledyne Monitor Labs T200M | LM4 00-0665 | ppmv @ 15% $O_2$ | ≤20% of mean RM | 4.64% |
| | | lb/mmBtu | ≤10% of mean RM or ±0.020 lb/mmBtu RM-CEMS difference | 4.34% |
| | | | | 0.002 lb/mmBtu |
| | | Bias | \|d\|≤\|CC\|=Pass | 1.033 |
| | LM5 00-0663 | ppmv @ 15% $O_2$ | ≤20% of mean RM | 6.66% |
| | | lb/mmBtu | ≤10% of mean RM or ±0.020 lb/mmBtu RM-CEMS difference | 6.89% |
| | | | | 0.003 lb/mmBtu |
| | | Bias | \|d\|≤\|CC\|=Pass | 1.039 |
| | LM6 00-0663 | ppmv @ 15% $O_2$ | ≤20% of mean RM | 3.84% |
| | | lb/mmBtu | ≤10% of mean RM or ±0.020 lb/mmBtu RM-CEMS difference | 3.44% |
| | | | | 0.002 lb/mmBtu |
| | | Bias | \|d\|≤\|CC\|=Pass | 1.021 |
| | 7EA 00-0666 | ppmv @ 15% $O_2$ | ≤20% of mean RM | 3.69% |
| | | lb/mmBtu | ≤10% of mean RM or ±0.020 lb/mmBtu RM-CEMS difference | 4.18% |
| | | | | 0.001 lb/mmBtu |
| | | Bias | \|d\|≤\|CC\|=Pass | 1.031 |

|d| average absolute difference between the RM and CEMS
|CC| confidence coefficient

## 2.3 CO Gas RATA

The facility operates CO dry-extractive infrared gas filter correlation CEMS at the exhaust stacks of each unit to report continuous emissions. The CO mass emission rates are used to evaluate compliance with rolling lb/hr and tpy emission limits within the ROP.

The ROP CO emission limits for FGLMDB1-6 and FGEADB7 are expressed on a lb/hr basis (79 lbs/hr/unit and 132 lbs/hr, respectively, based on a 24-hour rolling averages). The applicable emission limit was used as the denominator in the RA calculation because the average RM emissions during the RATA were <50% of the emission standard pursuant to PS

4 / 4A. The RM CO lb/hr emission rates were calculated as the run average RM CO lb/mmBtu emission rates multiplied by the run average heat input rates (mmBtu/hr) as reflected in the CEMS data printouts in Appendix B.

The CO CEMS RA met one or more of the quality assurance criteria of PS 4A: 1) ≤10% RA when the average RM value was used to calculate RA, 2) ≤5% RA criterion when the applicable emission standard was used to calculate RA, or 3) a difference of <5 ppmv calculated as the absolute difference between the RM and CEMS measurements, plus the 2.5 percent confidence coefficient. Table 2-3 summarizes the CO RATA results.

**Table 2-3**
**Summary of CO RATA Results**

| CEMS Make and Model | CEMS Location & Serial Number | RATA Performance Criteria | Required RATA Performance | Actual RATA Performance |
|---|---|---|---|---|
| Teledyne Monitor Labs T300 | LM1 00-2783 | ppmv† | ≤5 ppmv difference, or ≤10% of mean RM | 3.252 ppmv |
| | | lb/mmBtu | ≤10% of mean RM | 12.72% |
| | | lb/hr†† | ≤5% of emission limit | 4.18% |
| | LM2 00-2783 | ppmv† | ≤5 ppmv difference, or ≤10% of mean RM | 3.515 ppmv |
| | | lb/mmBtu | ≤10% of mean RM | 15.38% |
| | | lb/hr†† | ≤5% of emission limit | 3.77% |
| | LM3 00-2303 | ppmv† | ≤5 ppmv difference, or ≤10% of mean RM | 1.12% |
| | | lb/mmBtu | ≤10% of mean RM | 2.30% |
| | | lb/hr†† | ≤5% of emission limit | 1.00 % |
| | LM4 00-2303 | ppmv† | ≤5 ppmv difference, or ≤10% of mean RM | 2.91% |
| | | lb/mmBtu | ≤10% of mean RM | 4.47% |
| | | lb/hr†† | ≤5% of emission limit | 2.16% |
| | LM5 00-2782 | ppmv† | ≤5 ppmv difference, or ≤10% of mean RM | 4.92% |
| | | lb/mmBtu | ≤10% of mean RM | 3.90% |
| | | lb/hr†† | ≤5% of emission limit | 1.24% |
| | LM6 00-2782 | ppmv† | ≤5 ppmv difference, or ≤10% of mean RM | 3.30% |
| | | lb/mmBtu | ≤10% of mean RM | 1.95% |
| | | lb/hr†† | ≤5% of emission limit | 0.53% |

| CEMS Make and Model | CEMS Location & Serial Number | RATA Performance Criteria | Required RATA Performance | Actual RATA Performance |
|---|---|---|---|---|
| Teledyne Monitor Labs T300 | 7EA 00-2532 | ppmv† | ≤5 ppmv difference, or ≤10% of mean RM | 1.321 ppmv |
| | | lb/mmBtu | ≤10% of mean RM | 16.27% |
| | | lb/hr†† | ≤5% of emission limit | 1.50% |

† absolute average difference between RM and CEMS plus 2.5% of confidence coefficient

†† emission limit from facility permit (in lbs/hr) used as denominator for purposes of assessing RA in accordance with 40 CFR Part 60, Appendix B, PS4, § 13.2

# 3.0 SOURCE AND MONITOR DESCRIPTION

The Jackson Generating Station operates seven combined-cycle natural gas-fired combustion turbine generator emission units designated as LM1, LM2, LM3, LM4, LM5, LM6, and 7EA within the 40 CFR Part 75 Monitoring Plan and as EULMDB1, EULMDB2, EULMDB3, EULMDB4, EULMDB5, EULMDB6 (collectively FGLMDB1-6) and EUEADB7 within the ROP. A heat recovery steam generator (HRSG) equipped with natural gas-fired duct burners is installed at the exhaust of each turbine. The turbines produce high-pressure exhaust gas, which turn electricity-producing generators. The individual HRSGs feed two (2) common steam extraction turbines and electrical generators.

$NO_x$ emissions are controlled from LM1-LM6 using steam injection, while dry low $NO_x$ combustors are used to control $NO_x$ from the 7EA combustion turbine. Each combustion turbine is equipped with a dedicated stack. The individual monitoring systems use time shared analyzers at LM1 and LM2, LM3 and LM4, LM5 and LM6, whereas 7EA has its own dedicated monitoring system. Each system completes a cycle of operation (sampling, analyzing, and data recording) in each successive 15-minute interval.

Each CEMS is comprised of a Teledyne Monitor Labs Inc. (TML) Model T802 dry $O_2$ analyzer, a TML T200M $NO_x$ analyzer, and a TML T300 CO analyzer. A Teledyne Instruments Monitor Labs (Teledyne) RegPerfect® Data Acquisition and Handling System (DAHS) is used to record the CEMS data, perform data validation and calculations, and generate various reports.

Units LM1, LM2, LM3, and LM5 are each rated at 650 mmBtu/hour maximum heat input. LM4 and LM6 are rated at 672 mmBtu/hr heat input. Each of these units each have a Lower Operating Boundary of 15 megawatts (MW) and an Upper Operating Boundary of 75 MW. 7EA is rated at 1,300 mmBtu/hour maximum heat input, with Lower and Upper Operating Boundaries of 75 MW and 156 MW, respectively.

In preparation for the testing, Operating Load Analyses (OLA) were obtained encompassing the previous four calendar quarters. Based on these four or more quarters of representative historical operating data, the first (i.e., normal) and second most frequently used (additional normal) load levels were identified to ensure the appropriate load levels were selected during the RATAs. Refer to Appendix C for the OLA's reviewed.

Since two load levels, High and Mid, have been designated normal for each source, the RATAs were performed at the High Load operating condition for all but Unit LM2 where the RATA was performed at the Mid Load operating condition.

# 4.0 SAMPLING AND ANALYTICAL PROCEDURES

Specific test procedures detailed in 40 CFR Part 60, Appendix A, Reference Methods 1, 3A, 7E, 10, and 19 were followed in conjunction with Part 75 Appendices A and B to conduct 10 or more runs and to calculate CEMS RA. The $O_2$, $NO_x$, 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 Traverse Points (USEPA Method 1)

The number and location of traverse points used for determining flue gas concentrations were determined in accordance with 40 CFR 75, Appendix A, Section 6.5.6. Since the stack diameters are greater than 7.8 feet and stratification was not expected, flue gas concentrations were measured at three traverse points located on a line 15.7 (0.4 m), 47.2 (1.2 m) and 78.7 (2.0 m) inches from the duct wall parallel to the sample port at 7-minute intervals throughout each test run.

The test ports at Units LM1-6 are located approximately 25 feet (2.6 duct diameters) downstream of a flow disturbance (duct confluence and bend) and 43 feet (4.5 duct diameters) upstream of a flow disturbance (exhaust to atmosphere). The test ports at Unit 7EA are located approximately 54.6 feet (3.6 duct diameters) downstream of a flow disturbance (duct confluence and bend) and 8 feet (0.5 duct diameters) upstream of a flow disturbance (exhaust to atmosphere). Refer to Appendix Figures 1 and 2 for drawings of the LM1-LM6 and 7EA in-stack test port location elevation details.

## 4.2 $O_2$, $NO_x$, and CO Concentrations (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)*
- USEPA Method 10, *Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure).*

The sampling procedures of the methods are similar except for the analyzers and analytical technique used to quantify the parameters of interest. Components of the extractive gaseous RM system in contact with flue gas are constructed of Type 316 stainless steel and Teflon. Exhaust gas was extracted from the stacks through a heated steel tube probe, heated Teflon® tubing, and a gas conditioning system to remove water and dry the sample before entering a pump, manifold, and the gas analyzers. The output signal from each analyzer was connected to a 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. Refer to Appendix Figure 3 for a drawing of the reference method gaseous RATA sample apparatus.

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

### 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*, was used to calculate lb/mmBtu emission rates. Measured $O_2$ and pollutant concentrations and F factors (ratios of combustion gas volume to heat input) were used to calculate emission rates using equation 19-1 from the method.

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, (dscf $O_2$/mmBtu) |
| $\%O_{2d}$ | = | Concentration of oxygen on a dry basis (%, dry) |

An $F_d$ factor of 8,710 dscf $O_2$/mmBtu for natural gas was used to calculate RM lb/mmBtu emissions and calculate CEMS relative accuracy. Refer to Appendix A for a RATA calculation summary presenting 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 and individual QSTI Certificates are contained in Appendix D.

### 5.1 USEPA Protocol Gas Standards

USEPA Protocol gas standards used by RCTS 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) following RCTS AETB Standard Operating Procedure 2-10. 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*). Appendix C contains a summary of the PGVP calibration gas standards used during this test program and the certificates of analysis.

### 5.2 Analyzer Calibrations

The gaseous RM instruments were calibrated on-site, and operated following manufacturer's specifications and the applicable reference method based in part on the quality assurance and quality control requirements contained in USEPA Methods 3A, 7E, and 10.

Before beginning the gas RATA, a three-point analyzer calibration error (ACE) check was conducted on each RM analyzer by injecting zero-, mid-, and high-level calibration gases directly into the instruments and measuring the responses. The instrument response must be within ±2.0% of the respective analyzer span or within ±0.5 ppmv or ±0.5% for $O_2$ absolute difference to be acceptable.

A $NO_x$ analyzer nitrogen dioxide ($NO_2$) to nitric oxide (NO) conversion efficiency (CE) test was conducted to verify the analyzer's ability to convert $NO_2$ to NO and accurately measure $NO_x$ by chemiluminescence.

An initial system bias check was performed by measuring the instrument response while introducing zero- and mid- or high-level (upscale) calibration gases at the probe, upstream of all sample conditioning components, and drawing it through the various sample components in the same manner as flue gas. System response times were documented during the initial system bias tests. The initial system bias check is acceptable if the instrument response at the zero and upscale calibration is within ±5.0% of the calibration span or ±0.5 ppmv or ±0.5% for $O_2$ absolute difference.

After each gas RATA run, post-test zero and upscale system bias checks were performed to quantify and compensate for RM analyzer drift and bias. The RM system bias is acceptable if those values remain within ±5.0% of the calibration span or ±0.5 ppmv or ±0.5% for $O_2$ absolute difference. The RM drift is acceptable if the zero and upscale values are within ±3.0% of the calibration span.

Calibration gas flow rates were maintained at the target sample rate, with each subsequent run started after twice the system response time elapsed. Analyzer bias and drift data is presented in Appendix B, while calibration data is in Appendix C.

## 6.0 Discussion of Test Results

The CEMS RATA results presented in Appendix B indicate the CEMS operating at Jackson Generating Station Units LM1-6 and 7EA meet the performance specifications in 40 CFR 75, Appendix A, and the annual reduced RATA test frequency incentive standards in 40 CFR 75, Appendix B, or the annual QA criteria in 40 CFR Part 60, Appendix F, Procedure 1, as appliable. These data indicate compliance with the CEMS monitoring and recordkeeping requirements of the facility's air permit MI-ROP-N6626-2019a.

During the test event, no deviations were observed by the QI in attendance. The criteria specified in the applicable Reference Methods and the agency-approved Test Protocol were followed. 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 the appropriate AETB and Reference Method quality measures were met.

Quality Assurance data, including protocol gas certificates of analysis, analyzer calibration error and system response time, $NO_2$ to NO CE checks and instrument interference information are presented in Appendix C. Gas RATA instrument system bias/drift data are presented in Appendix B. AETB certifications and signature forms are provided in Appendices D1 and D2.

## 6.1 Clock Time Synchronization

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

## 6.2 LM5 RATA Interruption

After completing two RATA runs for Units LM5 and LM6, the RATA was paused as LM5 needed to be shut down due to a loss of oil pressure during Run 3. Run 3 was from 08:21 to 08:41, and LM5 commenced shutdown around 08:29 and was completely offline by 08:37. Based upon the runs that were completed, there was no indication that anything was wrong with the LM5 or LM6 CEMS. Since it was not certain when LM5 would return to service, the RATA was continued at LM6 and completed on May 18, 2023.

The Part 75 regulations and Policy Manual are clear that when a RATA is interrupted due to a problem unrelated to the CEMS (i.e., the reference method or unit operational issue), the runs already completed can be counted as part of the official RATA to the extent that the RATA is completed within 168-unit operating hours relative to the start of the RATA. This concept was discussed with EGLE before recommencing the LM5 RATA, and there was agreement that Runs 1 and 2 completed on May 18, 2023, could be treated as valid. The oil leak at LM5 was diagnosed and resolved with the unit restarting on May 19, 2023.

Subsequent daily LM5/LM6 CEMS calibrations were passed and no CEMS adjustments were performed. On May 19, 2023, the LM5 RATA was continued, and an additional 8 runs were completed.

Data from LM5 Run 3 is included in this report; however, this run was excluded from all LM5 RATA results as the run is not valid (LM5 was not in continuous operation throughout the entire run).

# Figures

Figure 1 – Jackson Generating Station LM1 – LM6 In-Stack Test Port Location Elevation

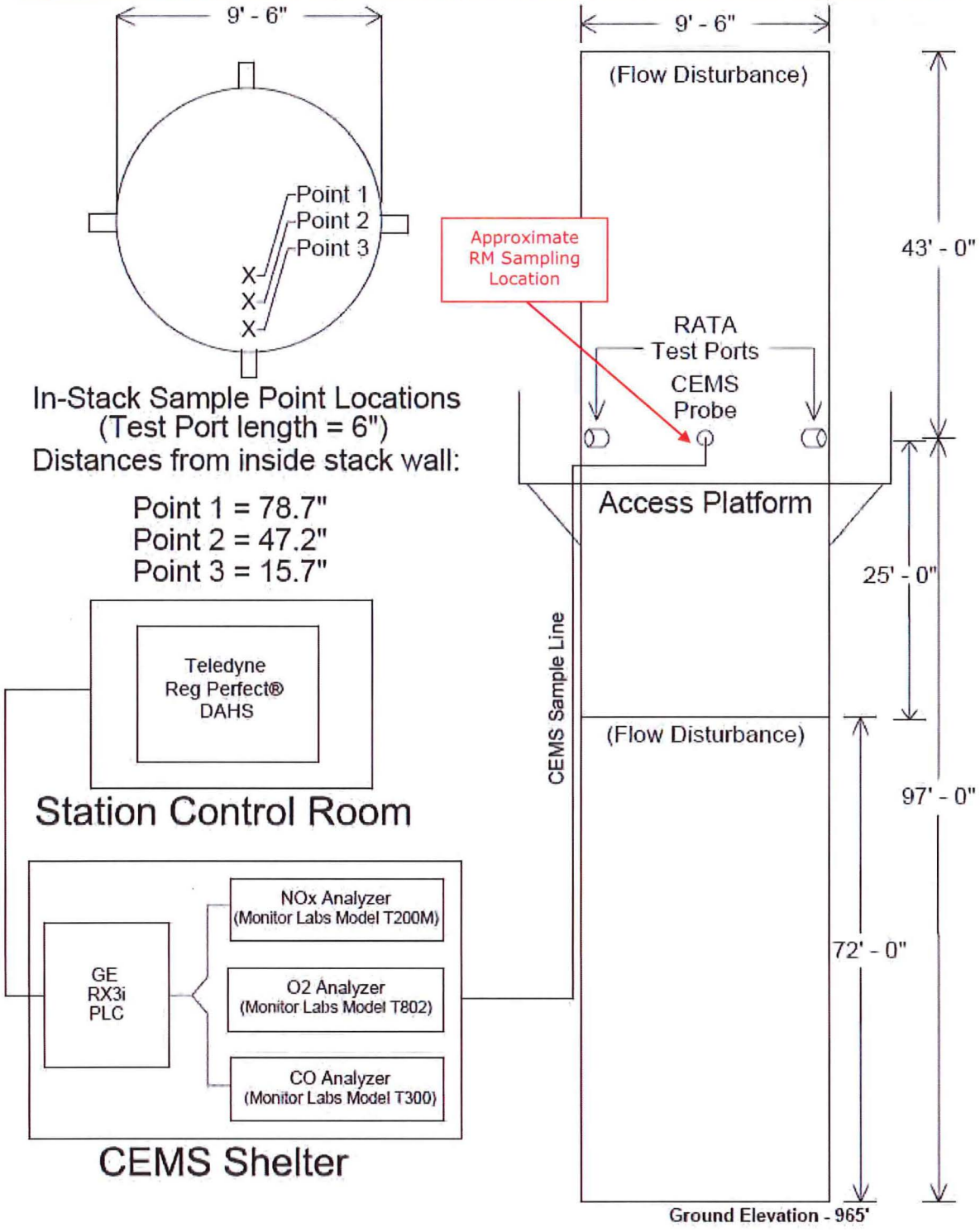

Figure 2 – Jackson Generating Station 7EA In-Stack Test Port Location Elevation

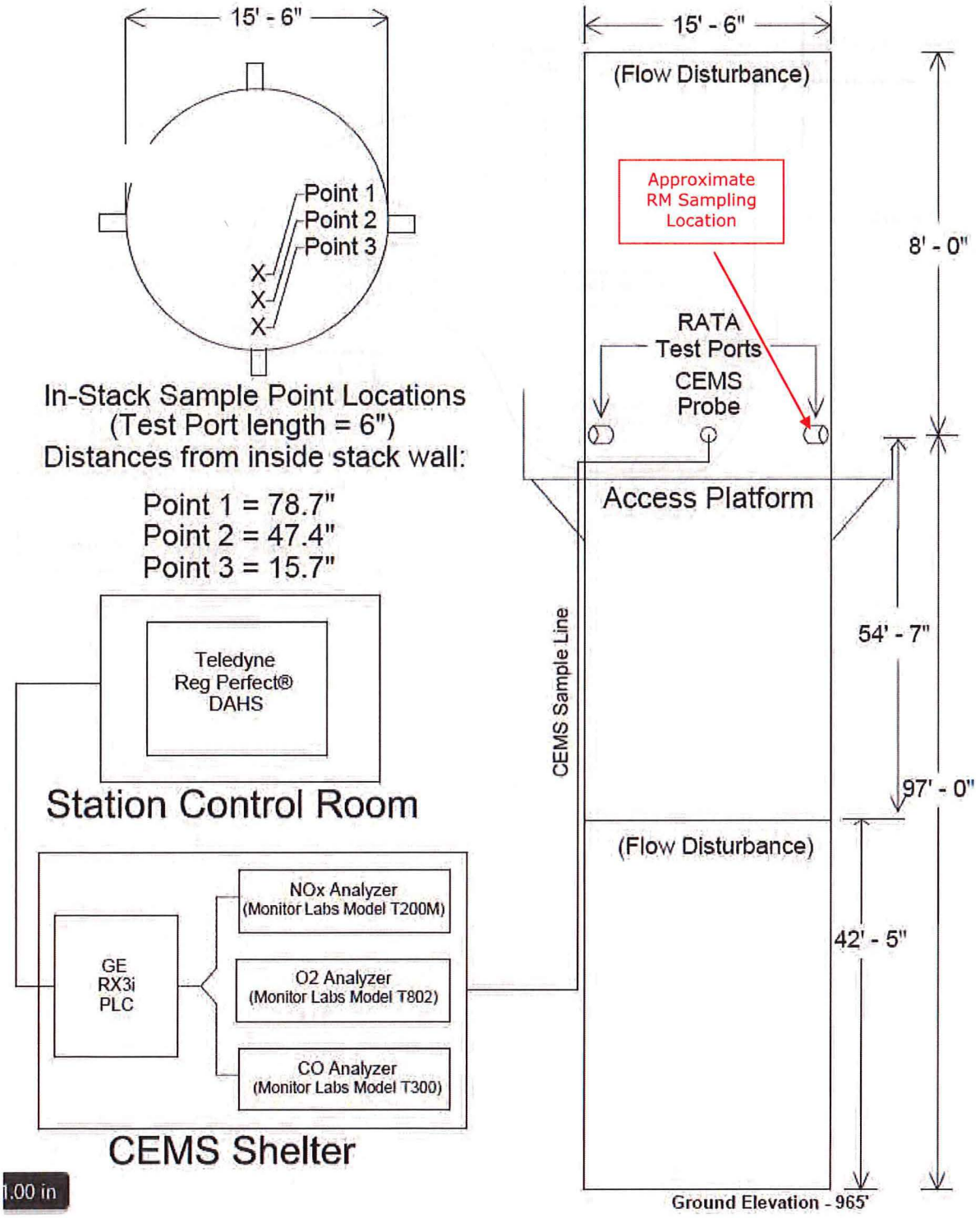

Figure 3 – Reference Method Gaseous RATA Sample Apparatus