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# COMPLIANCE TEST REPORT

for

# RELATIVE ACCURACY TEST AUDIT (RATA)

## CONTINUOUS EMISSIONS MONITORING SYSTEM (CEMS)

**CTG Turbine Units EU-CTG01-DP and EU-CTG03-DP**

**Belle River Power Plant**
**Dean CTGs**
**East China Township, Michigan**

**October 25-26, 2022**

**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 Belle River Power Plant (BRPP) Dean CTGs, located in China Township, Michigan. The fieldwork, performed on October 25-26, 2022, was conducted to satisfy Permit to Install conditions for DTE Electric Company, Belle River Peakers (PTI No. 116-01B) (state.mi.us).

The results of the RATA testing are highlighted below:

### $O_2$, $NO_x$ and CO RATA Results
### Turbine Units EU-CTG03-DP and EU-CTG01-DP
### Belle River Power Plant
### Dean Peaker's
### October 25-26, 2022

| Parameter | Unit | Date | CEMS | RM | Relative Accuracy | Limit |
|---|---|---|---|---|---|---|
| CO (ppm) | EU-CTG03-DP | 10-25 | 4.77 | 5.13 | 0.4 | 5(1) |
| NOx (lb/MMBtu) | EU-CTG03-DP | 10-25 | 0.021 | 0.023 | 0.002* | <0.015(2) |
| O2 (%) | EU-CTG03-DP | 10-25 | 15.1 | 15.1 | 0.0 | 1.0(3) |
| CO (ppm) | EU-CTG01-DP | 10-26 | 7.5 | 6.1 | 1.6 | 5(1) |
| NOx (lb/MMBtu) | EU-CTG01-DP | 10-26 | 0.025 | 0.022 | 0.003** | <0.015(2) |
| O2 (%) | EU-CTG01-DP | 10-26 | 14.9 | 15.1 | 0.2 | 1.0(3) |

(1) Part 60 (alt. criteria of abs mean diff + 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 1.106 must be applied to DAHS per Part 75 criteria
** A Bias Adjustment Factor (BAF) of 1.095 must be applied to DAHS per Part 75 criteria
(3) Part 75 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 Belle River Power Plant (BRPP) Dean CTGs, located in China Township, Michigan. The fieldwork, performed on October 25-26, 2022 was conducted to satisfy Permit to Install conditions for DTE Electric Company, Belle River Peakers (PTI No. 116-01B) (state.mi.us).

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, and Matthew T. D'Anna, Temporary Employee Projects. Mr. Westerberg was the project leader. Mr. Joseph R. Grave, Lead O & M Technician at Belle River Power Plant Dean Peaker's, provided process coordination for the testing program.

## 2.0 SOURCE DESCRIPTION

The Belle River Power Plant is a DTE Energy facility located at 4505 King Road in China Township, Michigan. The plant has four (4) simple cycle stationary combustion turbines at the Dean site, referred to as Units EU-CTG01-DP through EU-CTG04-DP operating as Peaker units.

Each combustion turbine includes a compressor, combustor, turbine and electric generator with a nominally rated load capacity of 82.4 megawatts (MW) at perfect conditions in simple cycle operation.

$NO_x$ emissions are controlled by dry low $NO_x$ technology and good combustion practices. 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 EU-CTG01-DP through EU-CTG04-DP are rectangular ducts approximately 60 feet tall with an internal equivalent diameter of approximately 12 feet. See Figure 1 for a diagram of Units EU-CTG01-DP through EU-CTG04-DP sampling locations and stack dimensions.

Dean Peaker's utilizes Thermo-Fisher Scientific Continuous Emissions Monitoring Systems (CEMS) to record emissions during unit operations. The following Units were audited:

| Unit | Analyzer | Manufacturer / Model | Serial Number |
|---|---|---|---|
| EU-CTG03-DP | $NO_x$ | Thermo-Fisher Sci 42IQ/LS | 12108911582 |
| EU-CTG03-DP | $O_2$/CO | Thermo-Fisher Sci 48IQ | 12108911579 |
| EU-CTG01-DP | $NO_x$ | Thermo-Fisher Sci 42IQ/LS | 12108911584 |
| EU-CTG01-DP | $O_2$/CO | Thermo-Fisher Sci 48IQ | 1201137288 |

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

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### 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) Servomex 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 EU-CTG03-DP and EU-CTG01-DP $O_2$, $NO_x$ and CO CEMS consisted of ten 21-minute samples at the test platform level of each unit's exhaust stack. Sampling was conducted at three points along a single path across the duct. 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 were calibrated following the guidelines referenced in Methods 3A, 7E and 10. Calibration gases were EPA Protocol 1 gases. The analyzer spans for Units EU-CTG03-DP and EU-CTG01-DP RATA testing were 0-17.51% (17.51, 9.990, and zero) for $O_2$, 0-18.44 ppm (18.44, 7.943, and zero) for $NO_x$, and 0-9.116 ppm (9.116, 5.125, and zero) for CO. The 9.990% $O_2$ gas was used to zero the $NO_x$ and CO analyzers and the 7.943 ppm $NO_x$ gas was used to zero the $O_2$ analyzer.

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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 $NO_x$ ppm data to pounds per million British thermal units (lb/MMBtu).

The RM data collected for the Units EU-CTG03-DP and EU-CTG01-DP testing can be found in Appendix A.

Corresponding CEMS data collected during the Units EU-CTG03-DP and EU-CTG01-DP 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 EU-CTG03-DP and EU-CTG01-DP, respectfully. 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 both units. The CO relative accuracy, calculated as ppm met the criteria of <5 ppm mean difference for both units. The $NO_x$ relative accuracy, calculated as pounds per million British Thermal units (lb/MMBtu), met the low emitter criteria of <0.015 lb/MMBtu mean difference for both units. In addition, unit (EU-CTG03-DP) had a bias adjustment factor (BAF) = 1.106, and unit (EU-CTG01-DP) had a BAF = 1.095 per 40CFR75 criteria.

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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."

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# RESULTS TABLES

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# Table 1
## Unit 11-1 (EU-CTG03-DP) CO, $NO_x$ and $O_2$ CEMS RATA Results
## Dean Peakers
## October 25, 2022

| Test No. | Test Times (DAHS) | CO RM (ppm) | CO CEM (ppm) | CO Difference (ppm) | $O_2$ RM (% O2) | $O_2$ CEM (% O2) | $O_2$ Difference (ppm) | NOx RM (lb/MMBtu) | NOx CEM (lb/MMBtu) | NOx Difference (lb/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8:49-9:10 | 6.1 | 5.8 | 0.3 | 15.1 | 15.1 | 0.0 | 0.023 | 0.021 | 0.002 |
| 2 | 9:20-9:41 | 5.9 | 5.6 | 0.3 | 15.1 | 15.1 | 0.0 | 0.023 | 0.021 | 0.002 |
| 3 | 9:50-10:11 | 5.3 | 4.9 | 0.4 | 15.1 | 15.1 | 0.0 | 0.023 | 0.021 | 0.002 |
| 4 | 10:20-10:41 | 5.1 | 4.7 | 0.4 | 15.1 | 15.1 | 0.0 | 0.023 | 0.021 | 0.002 |
| 5 | 10:52-11:13 | 4.9 | 3.5 | 1.4 | 15.1 | 15.1 | 0.0 | 0.023 | 0.021 | 0.002 |
| 6 | 11:22-11:43 | 5.0 | 4.5 | 0.5 | 15.1 | 15.1 | 0.0 | 0.024 | 0.021 | 0.003 |
| 7 | 11:52-12:13 | 4.8 | 4.5 | 0.3 | 15.1 | 15.1 | 0.0 | 0.023 | 0.021 | 0.002 |
| 8 | 12:23-12:44 | 4.7 | 4.3 | 0.4 | 15.1 | 15.1 | 0.0 | 0.023 | 0.021 | 0.002 |
| 9 | 12:56-13:17 | 4.6 | 4.3 | 0.3 | 15.1 | 15.1 | 0.0 | 0.023 | 0.020 | 0.003 |
| 10 | 13:26-13:47 | 4.7 | 4.3 | 0.4 | 15.1 | 15.1 | 0.0 | 0.023 | 0.020 | 0.003 |
| **Avg:** | | **5.1** | **4.8** | **0.4** | **15.1** | **15.1** | **0.0** | **0.023** | **0.021** | **0.002** |
| | | **Standard Deviation:** | | **0.06** | **Standard Deviation:** | | **0.00** | **Standard Deviation:** | | **0.0004** |
| | | **Confidence Coefficient (CC):** | | **0.04** | **Confidence Coefficient (CC):** | | **0.00** | **Confidence Coefficient (CC):** | | **0.0003** |
| | | **[1]RELATIVE ACCURACY:** | | **0.4** | **RELATIVE ACCURACY:** | | **0.0** | **[2]RELATIVE ACCURACY:** | | **11.08** |

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
## Unit 12-2 (EU-CTG01-DP) CO, $NO_x$ and $O_2$ CEMS RATA Results
## Dean Peakers
## October 26, 2022

| Test No. | Test Times (DAHS) | CO RM (ppm) | CO CEM (ppm) | CO Difference (ppm) | $O_2$ RM (% O2) | $O_2$ CEM (% O2) | $O_2$ Difference (ppm) | NOx RM (lb/MMBtu) | NOx CEM (lb/MMBtu) | NOx Difference (lb/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8:07-8:28 | 5.7 | 7.2 | -1.5 | 15.0 | 14.9 | 0.1 | 0.025 | 0.022 | 0.003 |
| 2 | 8:39-9:00 | 6.1 | 7.6 | -1.5 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 3 | 9:09-9:30 | 6.0 | 7.5 | -1.5 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 4 | 9:38-9:59 | 6.2 | 7.6 | -1.4 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 5 | 10:13-10:34 | 6.1 | 7.7 | -1.6 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 6 | 10:43-11:04 | 6.1 | 7.6 | -1.5 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 7 | 11:17-11:38 | 6.1 | 7.6 | -1.5 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 8 | 11:50-12:11 | 6.2 | 7.9 | -1.7 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 9 | 12:23-12:44 | 6.4 | 8.1 | -1.8 | 15.0 | 14.9 | 0.1 | 0.024 | 0.022 | 0.002 |
| 10 | 12:55-13:16 | 6.3 | 7.8 | -1.5 | 15.0 | 14.9 | 0.1 | 0.026 | 0.023 | 0.003 |
| **Avg:** | | **6.1** | **7.6** | **-1.5** | **15.0** | **14.9** | **0.1** | **0.024** | **0.022** | **0.002** |
| | | | **Standard Deviation:** | **0.1** | | **Standard Deviation:** | **0.0** | | **Standard Deviation:** | **0.000** |
| | | | **Confidence Coefficient (CC):** | **0.1** | | **Confidence Coefficient (CC):** | **0.0** | | **Confidence Coefficient (CC):** | **0.000** |
| | | | **[1]RELATIVE ACCURACY:** | **1.6** | | **RELATIVE ACCURACY:** | **0.7** | | **[2]RELATIVE ACCURACY:** | **9.77** |

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

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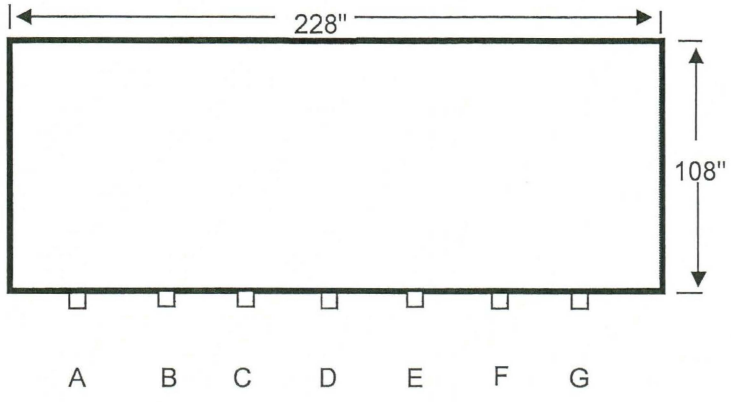
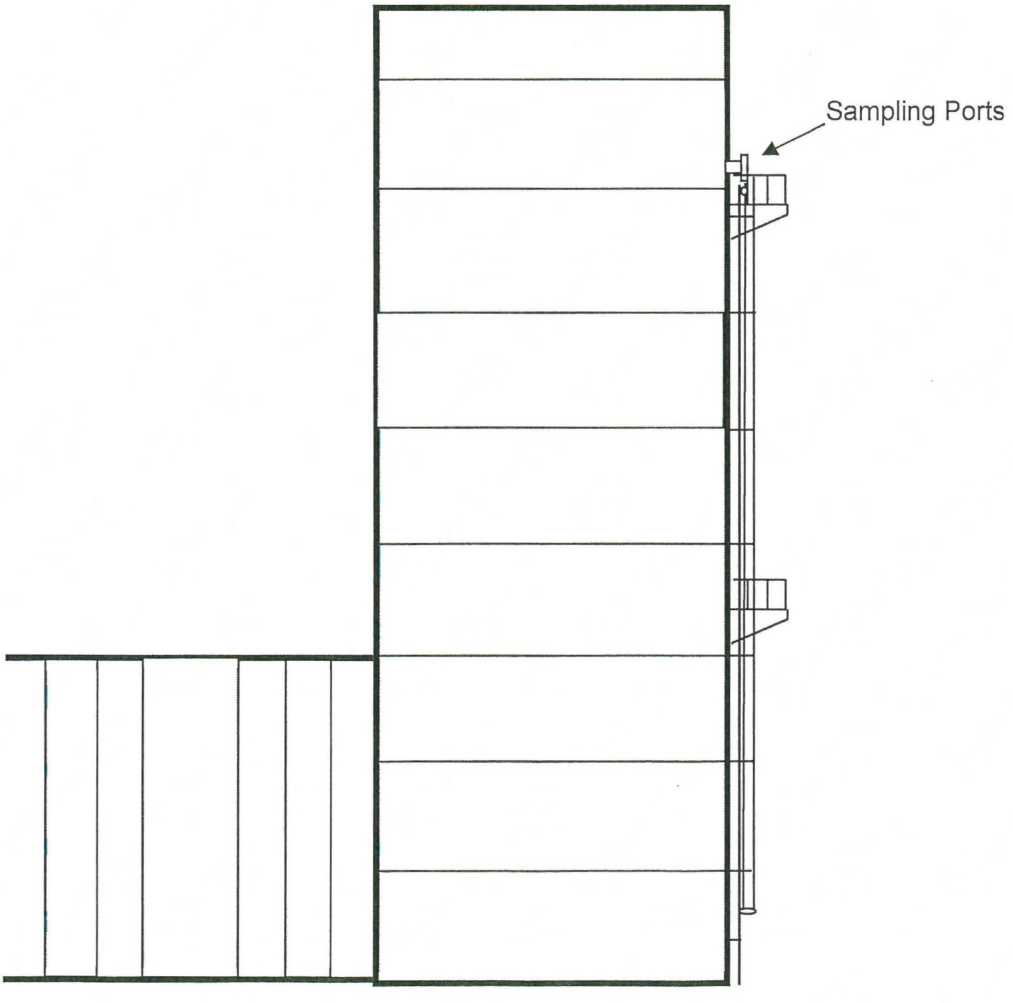
# Figure 1 – Sampling Location
## DTE – Dean CTGs

RATA SAMPLING POINTS

| PORT | POINT |
|---|---|
| D | 0.4 meter |
| D | 1.0 meter |
| D | 2.0 meter |



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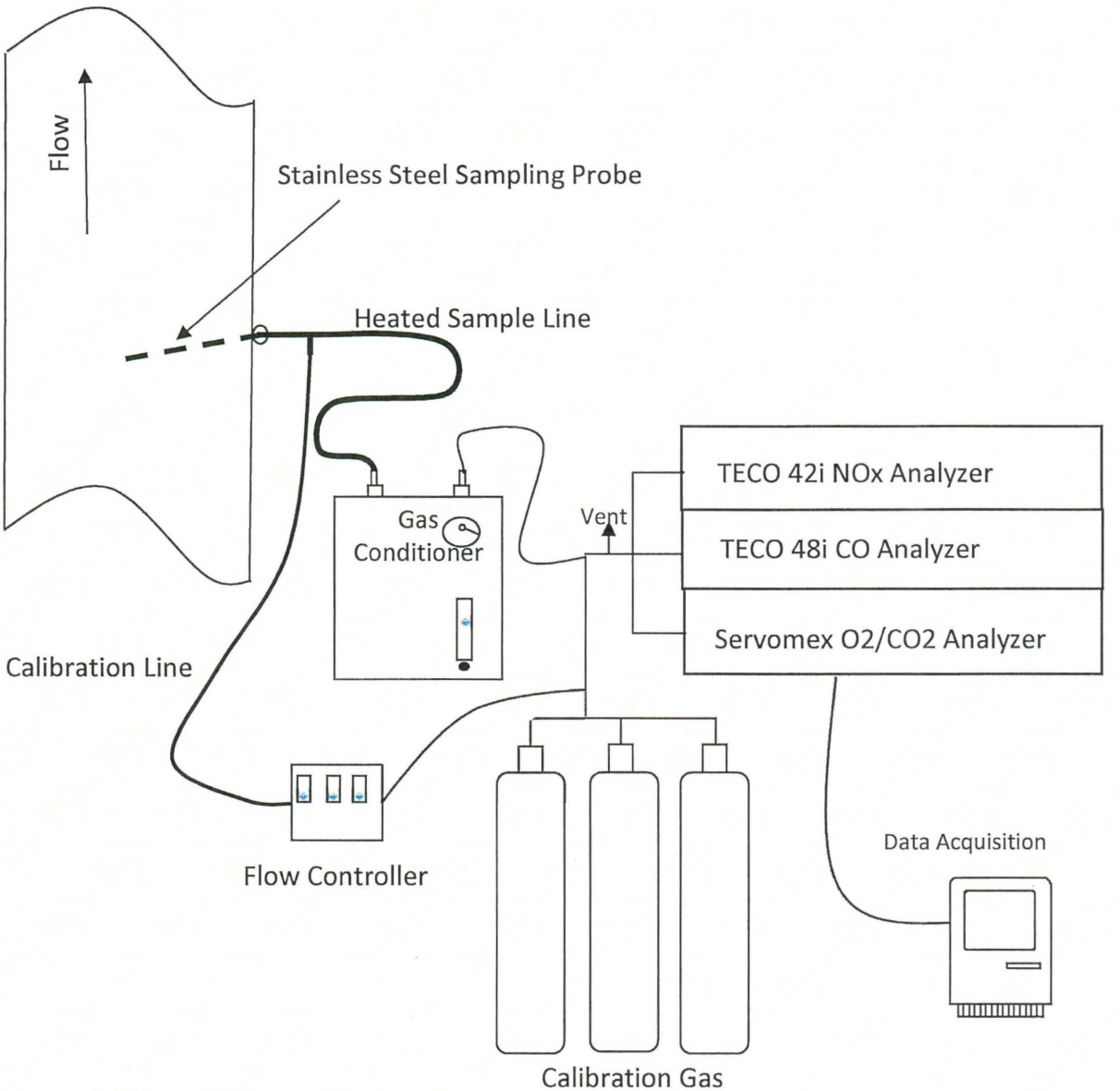
## Figure 2 – EPA Methods 3A, 7E and 10
## DTE – Dean CTGs



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# APPENDIX A
# UNITS 11-1, 12-2 RM TEST DATA