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COMPLIANCE TEST REPORT

for

CARBON MONOXIDE EMISSIONS (CO)

UNITS 11-1 to 11-5

SRN: B2804

Wilmot Substation
Kingston Township, Michigan

October 30-November 2, 2023

Prepared By:
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EXECUTIVE SUMMARY

DTE Energy's Environmental Management & Safety (EM&S) Ecology, Monitoring, & Remediation Group, performed emissions testing on five (5) 3,600 Brake-HP diesel engines located at the Wilmot Substation in Kingston Township, Michigan. The fieldwork, performed October 30 through November 2, 2023 was conducted to satisfy requirements of MI-ROP-B2804-2018, and 40CFR Part 63 Subpart ZZZZ. Emission tests were performed on Units 11-1 to 11-5 for carbon monoxide (CO) destruction efficiency.

The results of the emissions testing are highlighted below:

CO Emissions Test Results
Wilmot Substation
October 30 - November 2, 2023

Date	Unit	Average CO Destruction Efficiency (%) or Outlet Emissions (ppm)[1]
10-30-23	11-1	20.8 ppm
10-31-23	11-2	14.3 ppm
11-1-23	11-3	74.3% DE
11-1-23	11-4	19.9 ppm
11-2-23	11-5	71.2% DE

(1) ppm @ 15% O_2

Subpart ZZZZ Limit: Limit the concentration of CO in the stationary RICE exhaust to 23 ppmvd or less at 15% O_2; or Reduce CO emissions by 70% or more

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1.0 INTRODUCTION

DTE Energy's Environmental Management & Safety (EM&S) Ecology, Monitoring, & Remediation Group, performed emissions testing on five (5) 3,600 Brake-HP diesel engines located at the Wilmot Substation in Kingston Township, Michigan. The fieldwork performed October 30 through November 2, 2023 was conducted to satisfy requirements of MI-ROP-B2804-2018, and 40CFR Part 63 Subpart ZZZZ. Emission tests were performed on Units 11-1 to 11-5 for carbon monoxide (CO) destruction efficiency.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 3A and 10.

The fieldwork was performed in accordance with EPA Reference Methods, the requirements outlined in MI-ROP-B2804-2018, 40CFR Part 63 Subpart ZZZZ, and EM&S's intent to test[1], test plan submittal, which was approved in a letter by Mr. Daniel Droste from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) dated January 27, 2023. The following EM&S personnel participated in the testing program: Mr. Mark Westerberg, Sr. Environmental, and Mr. Fred Meinecke, Environmental Specialist. Mr. Zach Josefiak, Associate Environmental Engineer with DTE, provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The Wilmot Substation located at 5977 E. Bevens Rd, Kingston Township, Michigan, employs the use of five EM&D, MP45, 20 cylinder, 3,600 Horse Power diesel engines (Units 11-1 to 11-5). The engines generate supplemental electrical power during peak electrical demand periods or when required for load stability. On site diesel generators produce the electrical power supply which is sent to the electrical grid. Each unit can produce approximately 2.5 GMW at full load conditions.

The emissions from the engines are exhausted through individual catalyst beds and to the atmosphere through individual exhaust stacks.

During the emissions testing the engines were operated at 100% load conditions (2.5 MW).

A schematic representation of the engines exhausts and sampling locations are presented in Figure 1. Sampling was performed in the duct prior to and downstream of the catalyst bed.

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[1] EGLE, Test Plan, Submitted January 9, 2023. (Attached-Appendix A)
[2] EGLE, Approval Letter (Attached-Appendix A)

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3.0 SAMPLING AND ANALYTICAL PROCEDURES

DTE Energy obtained emissions measurements 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:

Sampling Method	Parameter	Analysis
USEPA Method 3A	Oxygen	Instrumental Analyzer Method
USEPA Method 10	Carbon Monoxide	NDIR Instrumental Analyzer Method

3.1 OXYGEN AND CARBON MONOXIDE (USEPA METHODS 3A AND 10)

3.1.1 Sampling Method

Oxygen (O_2) emissions were evaluated using 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.

Carbon monoxide (CO) emissions were evaluated using USEPA Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources". The CO analyzer utilizes a NDIR detector.

3.1.2 O_2 and CO Sampling Train

The EPA Methods 3A and 10 sampling systems at the inlet and outlet (Figure 2) consisted of the following components:

(1) Single-point stainless steel sampling probe with a cintered filter.
(2) Heated PTFE™ sampling line.
(3) Universal® and MAK® gas conditioners with a particulate filter.
(4) Flexible unheated PTFE sampling line.
(5) Servomex 1400 O_2/CO_2 gas analyzer and TECO 48i NDIR CO gas analyzer.
(6) USEPA Protocol 1 calibration gases.
(7) Data Acquisition System.

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3.1.3 Sampling Train Calibration

The O_2 / CO sampling trains were calibrated per procedures outlined in USEPA Methods 3A & 10. Zero, span, and mid-range calibration gases were introduced directly into the CO and O_2 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 emissions testing of each engine consisted of triplicate 60-minute samples at the inlet and exhaust of the catalyst. Testing was conducted at three points across the diameter of the exhaust duct during each run. Sampling was performed simultaneously for O_2 and CO. Data was recorded as 1-minute averages.

3.1.5 Quality Control and Assurance (O_2 and CO)

All sampling and analytical equipment was calibrated per the guidelines referenced in Methods 3A and 10. Calibration gases were EPA Protocol 1 certified and the concentrations were within the acceptable ranges (40-60% mid-range and span) specified in Method 7E. Calibration gas certification sheets are in Appendix C.

3.1.6 Data Reduction

The O_2 and CO emission readings in percent (%) and parts per million (ppm) were recorded at 4-second intervals and averaged to 1-minute increments. The CO emissions were normalized to 15% O_2, and that number was used to determine CO % Destruction Efficiency (DE) as required by 40CFR Part 63 Subpart ZZZZ. Emission calculations are based upon calculations found in USEPA Methods 3A, 7E, 10 and 19. Example calculations can be found in Appendix D.

The 1-minute O_2 and CO readings collected can be found in Appendix B.

4.0 OPERATING PARAMETERS

The test program included the collection of catalyst inlet temperature (°F), catalyst pressure drop ("H_2O), and crank case vacuum ("H_2O). Ambient temperature (°F), Relative Humidity (%), and Barometric Pressure (in) were also recorded during each test. Operational and atmospheric data collected during the testing is in Appendix E.

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5.0 RESULTS

Tables 1-5 present the CO emissions @ 15% O_2 results from Units 11-1 to 11-5. The CO emissions are presented in parts per million (ppm) for the inlet and outlet and the destruction efficiency in percent (%). Also presented are the Oxygen inlet and outlet in percent (%), the catalyst inlet temperature in degrees Fahrenheit (°F), and pressure drop across the catalyst in inches of water ("H_2O). The results of the testing indicate that Units 11-1 to 11-5 comply with MI-ROP-B2804-2018, and 40CFR Part 63 Subpart ZZZZ requirements of reducing CO emissions by 70% or more.

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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."

Mr. Mark Grigerelt, QSTI

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RESULTS TABLES

Carbon Monoxide (CO) Emissions Testing Results
Diesel Peaker 11-1
DTE Energy, Wilmont Substation
Kingston, Michigan

Parameter	Run 1	Run 2	Run 3	Average
Sampling Date	10/30/23	10/30/23	10/30/23	
Sampling Start Time	0905-1005	1018-1118	1128-1228	
Average Inlet O_2 Content (%, dry)	12.6	12.8	12.8	12.7
Average Inlet O_2 Content (%, dry, corrected)[1]	12.5	12.7	12.6	12.6
Average Inlet CO Concentration (ppmv, dry)	64.4	64.7	66.6	65.2
Average Inlet CO Concentration (ppmv, dry, corrected)[1]	66.2	66.1	68.1	66.8
Average Inlet CO Concentration (ppmv @ 15% O2)[2]	46.5	47.4	48.6	
Average Outlet O_2 Content (%, dry)	12.9	12.9	12.9	12.9
Average Outlet O_2 Content (%, dry, corrected)[1]	12.9	12.8	12.8	12.8
Average Outlet CO Concentration (ppmv, dry)	29.0	28.4	28.6	28.7
Average Outlet CO Concentration (ppmv, dry, corrected)[1]	28.8	28.2	28.5	28.5
Average Outlet CO Concentration (ppmv @ 15% O2)[2]	**21.2**	**20.5**	**20.7**	**20.8**
CO Destruction Efficiency	54.5%	56.7%	57.5%	56.2%

[1]corrected for analyzer drift as per USEPA Method 7E

MW : megawatts

O_2 : oxygen

CO : carbon monoxide

ppmv : parts per million on a volume-to-volume basis

lb/hr : pounds per hour

Carbon Monoxide (CO) Emissions Testing Results
Diesel Peaker 11-2
DTE Energy, Wilmont Substation
Kingston, Michigan

Parameter	Run 1	Run 2	Run 3	Average
Sampling Date	10/31/23	10/31/23	10/31/23	
Sampling Start Time	956-1056	1105-1205	1214-1314	
Average Inlet O_2 Content (%, dry)	12.3	12.2	12.2	12.2
Average Inlet O_2 Content (%, dry, corrected)[1]	12.4	12.3	12.3	12.3
Average Inlet CO Concentration (ppmv, dry)	53.8	56.4	57.2	55.8
Average Inlet CO Concentration (ppmv, dry, corrected)[1]	53.9	56.6	57.4	55.9
Average Inlet CO Concentration (ppmv @ 15% O2)[2]	37.2	38.8	39.4	
Average Outlet O_2 Content (%, dry)	12.3	12.3	12.2	12.3
Average Outlet O_2 Content (%, dry, corrected)[1]	12.5	12.4	12.4	12.4
Average Outlet CO Concentration (ppmv, dry)	19.1	19.6	19.7	19.4
Average Outlet CO Concentration (ppmv, dry, corrected)[1]	20.1	20.8	21.0	20.6
Average Outlet CO Concentration (ppmv @ 15% O2)[2]	**14.1**	**14.4**	**14.5**	**14.3**
CO Destruction Efficiency	62.2%	62.8%	63.1%	62.7%

[1]corrected for analyzer drift as per USEPA Method 7E

MW : megawatts

O_2 : oxygen

CO : carbon monoxide

ppmv : parts per million on a volume-to-volume basis

lb/hr : pounds per hour

Carbon Monoxide (CO) Emissions Testing Results
Diesel Peaker 11-3
DTE Energy, Wilmont Substation
Kingston, Michigan

Parameter	Run 1	Run 2	Run 3	Average
Sampling Date	11/01/23	11/01/23	11/01/23	
Sampling Start Time	914-1014	1024-1124	1134-1234	
Average Inlet O_2 Content (%, dry)	12.0	11.9	11.9	11.9
Average Inlet O_2 Content (%, dry, corrected)[1]	12.1	11.9	11.9	12.0
Average Inlet CO Concentration (ppmv, dry)	176.8	186.8	190.8	184.8
Average Inlet CO Concentration (ppmv, dry, corrected)[1]	177.0	186.6	190.8	184.8
Average Inlet CO Concentration (ppmv @ 15% O2)[2]	118.0	122.6	125.0	
Average Outlet O_2 Content (%, dry)	12.1	12.0	12.0	12.0
Average Outlet O_2 Content (%, dry, corrected)[1]	12.1	12.0	12.0	12.0
Average Outlet CO Concentration (ppmv, dry)	46.8	47.0	45.7	46.5
Average Outlet CO Concentration (ppmv, dry, corrected)[1]	47.0	47.4	46.3	46.9
Average Outlet CO Concentration (ppmv @ 15% O2)[2]	31.4	31.6	30.7	31.3
CO Destruction Efficiency	**73.4%**	**74.2%**	**75.4%**	**74.3%**

[1]corrected for analyzer drift as per USEPA Method 7E

MW : megawatts

O_2 : oxygen

CO : carbon monoxide

ppmv : parts per million on a volume-to-volume basis

lb/hr : pounds per hour

Carbon Monoxide (CO) Emissions Testing Results
Diesel Peaker 11-4
DTE Energy, Wilmont Substation
Kingston, Michigan

Parameter	Run 1	Run 2	Run 3	Average
Sampling Date	11/01/23	11/01/23	11/01/23	
Sampling Start Time	1256-1356	1408-1508	1520-1620	
Average Inlet O_2 Content (%, dry)	12.6	12.6	12.5	12.6
Average Inlet O_2 Content (%, dry, corrected)[1]	12.7	12.6	12.5	12.6
Average Inlet CO Concentration (ppmv, dry)	83.8	83.6	84.1	83.8
Average Inlet CO Concentration (ppmv, dry, corrected)[1]	84.0	83.8	84.0	83.9
Average Inlet CO Concentration (ppmv @ 15% O2)[2]	60.1	59.4	59.2	
Average Outlet O_2 Content (%, dry)	12.7	12.7	12.6	12.7
Average Outlet O_2 Content (%, dry, corrected)[1]	12.7	12.7	12.7	12.7
Average Outlet CO Concentration (ppmv, dry)	27.2	27.5	27.6	27.4
Average Outlet CO Concentration (ppmv, dry, corrected)[1]	27.5	27.7	27.7	27.6
Average Outlet CO Concentration (ppmv @ 15% O2)[2]	**19.8**	**20.0**	**19.9**	**19.9**
CO Destruction Efficiency	67.0%	66.3%	66.4%	66.6%

[1]corrected for analyzer drift as per USEPA Method 7E

MW : megawatts

O_2 : oxygen

CO : carbon monoxide

ppmv : parts per million on a volume-to-volume basis

lb/hr : pounds per hour

Carbon Monoxide (CO) Emissions Testing Results
Diesel Peaker 11-5
DTE Energy, Wilmont Substation
Kingston, Michigan

Parameter	Run 1	Run 2	Run 3	Average
Sampling Date	11/02/23	11/02/23	11/02/23	
Sampling Start Time	830-930	940-1040	1050-1150	
Average Inlet O_2 Content (%, dry)	12.4	12.3	12.3	12.3
Average Inlet O_2 Content (%, dry, corrected)[1]	12.4	12.4	12.3	12.4
Average Inlet CO Concentration (ppmv, dry)	96.2	98.2	105.3	99.9
Average Inlet CO Concentration (ppmv, dry, corrected)[1]	95.9	97.9	104.9	99.5
Average Inlet CO Concentration (ppmv @ 15% O2)[2]	66.9	68.1	72.3	
Average Outlet O_2 Content (%, dry)	12.5	12.5	12.4	12.4
Average Outlet O_2 Content (%, dry, corrected)[1]	12.5	12.5	12.4	12.5
Average Outlet CO Concentration (ppmv, dry)	28.1	28.0	28.8	28.3
Average Outlet CO Concentration (ppmv, dry, corrected)[1]	28.3	28.0	28.7	28.3
Average Outlet CO Concentration (ppmv @ 15% O2)[2]	19.9	19.7	20.1	19.9
CO Destruction Efficiency	**70.3%**	**71.1%**	**72.3%**	**71.2%**

[1]corrected for analyzer drift as per USEPA Method 7E

MW : megawatts

O_2 : oxygen

CO : carbon monoxide

ppmv : parts per million on a volume-to-volume basis

lb/hr : pounds per hour

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FIGURES

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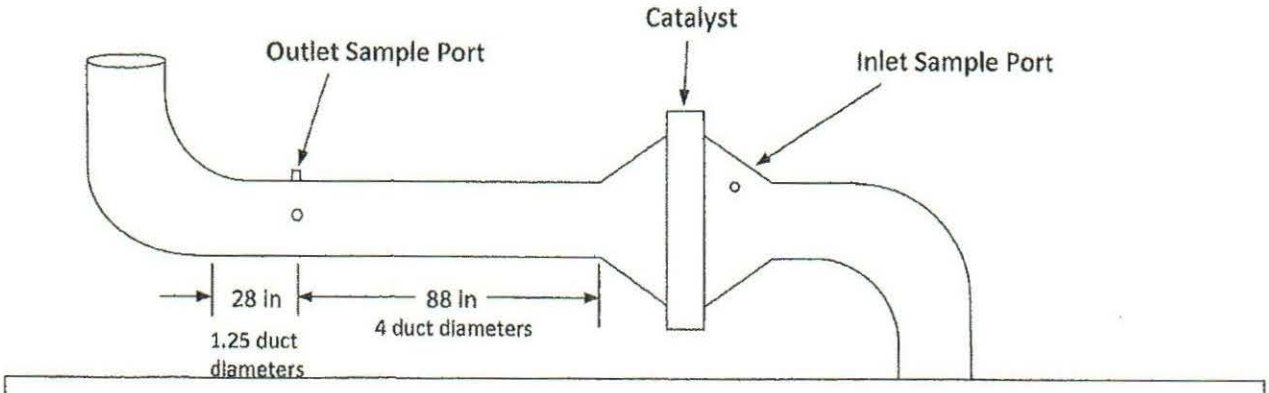
Figure 1 - Stack Drawing & Sampling Location
Wilmot Substation Diesel Generators
October 30-November 2, 2023



Outlet	Distance
Point 1	3.67 in
Point 2	11.00 in
Point 3	18.33 in

Duct Diameter = 22 in

Diesel Generator

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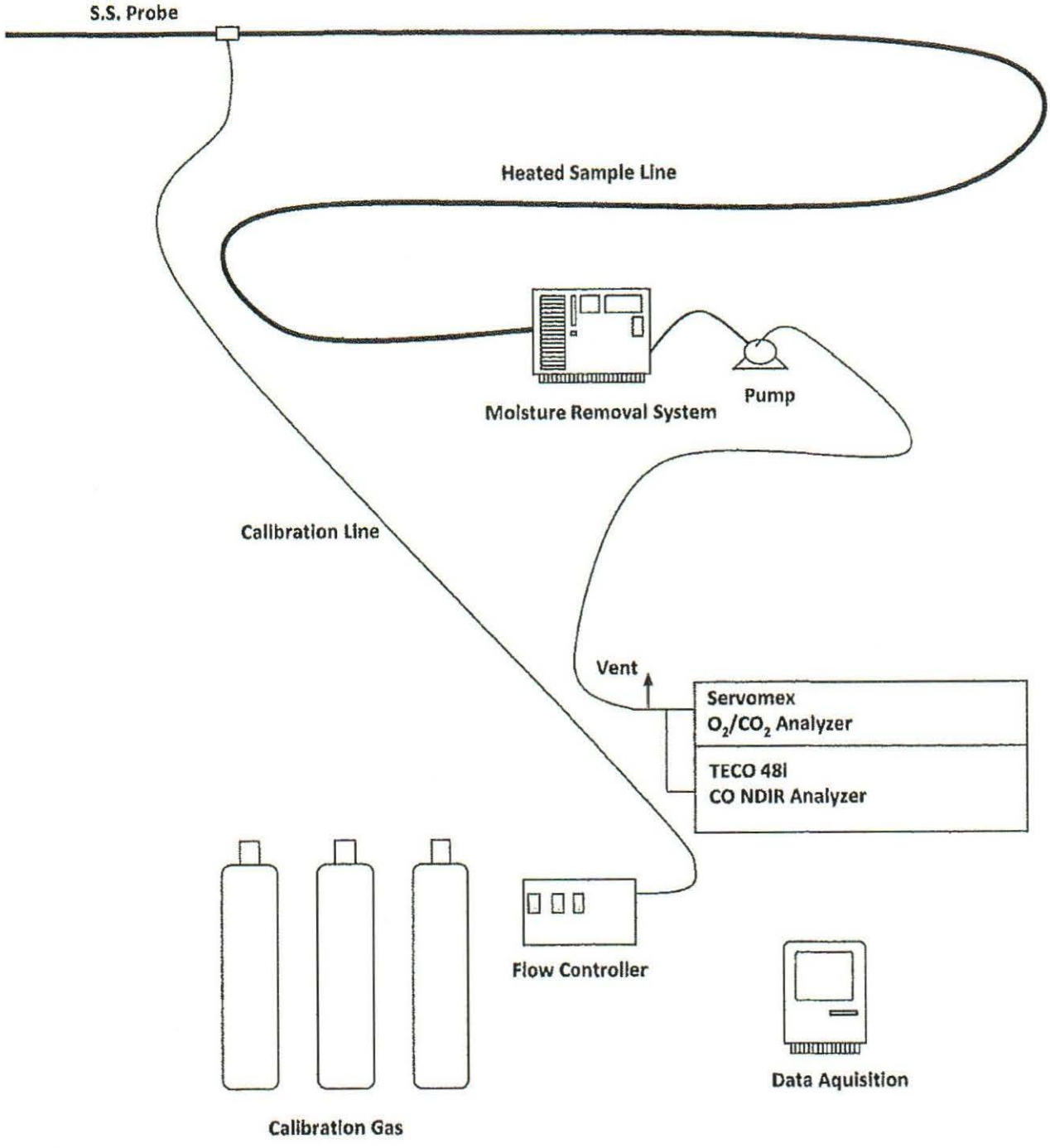
Figure 2 – EPA Methods 3A/10
Wilmot Substation Diesel Generators
October 30-November 2, 2023



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APPENDIX A

EGLE TEST PLAN & ACCEPTANCE LETTER