RELATIVE ACCURACY TEST AUDIT (RATA) REPORT

for

CONTINUOUS EMISSION RATE MONITORING SYSTEM (CERMS)

Underfire Combustion Stack

EES Coke Battery, L.L.C.
River Rouge, Michigan

April 19, 2023

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EXECUTIVE SUMMARY

DTE Energy's Environmental Management & Safety (EM&S) Ecology, Monitoring, and Remediation Group conducted a Relative Accuracy Test Audit (RATA) on the Continuous Emission Rate Monitoring System (CERMS) installed on the Underfire Combustion stack at EES Coke Battery, L.L.C. (EES Coke) located in River Rouge, Michigan. The Annual RATA was conducted to satisfy regulatory requirements in the Michigan Permit-to-Install No. 51-08C. The CERMS measures sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), carbon dioxide (CO_2), and volumetric flowrate (KSCFH) in accordance with 40 CFR, Part 60 regulations. Field testing occurred on April 19, 2023. The RATA was conducted while the process was operating on 100% Coke Oven Gas (COG).

The results of the RATA are summarized below:

RATA Summary
Underfire Combustion Stack
EES Coke Battery, L.L.C.
River Rouge, Michigan
April 19, 2023

Parameter	Reference Method	CERMS	Relative Accuracy (%)	Regulatory Limit
SO_2 (lbs/hr)	394.0	426.7	13.1	≤20%
NO_X (lbs/hr)	283.8	272.7	6.6	≤20%
CO (lbs/hr)	78.4	73.9	8.5	≤20%
CO_2 (%)	4.5	4.5	0.91	≤20%
Flow (scfh)	8,474,000	7,653,111	12.0	≤20%

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1.0 INTRODUCTION

DTE Energy's Environmental Management & Safety (EM&S) Ecology, Monitoring, and Remediation Group conducted a Relative Accuracy Test Audit (RATA) on the Continuous Emission Rate Monitoring System (CERMS) installed on the Underfire Combustion stack at EES Coke Battery, L.L.C. (EES Coke) located in River Rouge, Michigan. The Annual RATA was conducted to satisfy regulatory requirements in the Michigan Permit-to-Install No. 51-08C. The CERMS measures sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), carbon dioxide, and volumetric flowrate (KSCFH) in accordance with 40 CFR, Part 60 regulations. Field testing occurred on April 19, 2023. The RATA was conducted while the process was operating on 100% Coke Oven Gas (COG).

Field measurements were conducted pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 Appendix A, Methods 2, 2H, 3A, 6C, 7E and 10). In addition the RATAs followed the procedures of 40 CFR, Part 60 Performance Specifications 2, 3, 4 and 6.

The fieldwork was performed in accordance with EPA Reference Methods and DTE Energy Test Plan Submittal (Appendix A). The following personnel participated in the testing program: Mr. Mark Westerberg, Senior Environmental Specialist, Mr. Kenneth St. Amant, Environmental Specialist, Mr. Thomas Snyder, Senior Environmental Specialist, Mr. Fred Meinecke, Environmental Specialist, Mr. Mark Grigereit, Principal Engineer, and Matthew Gentry, Engineer. Mr. Westerberg was the project leader. Ms. Laura Harris, Associate Environmental Engineer at EES Coke provided process coordination for the testing program. Mr. Andrew Riley with the Air Quality Division of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) reviewed the Test Plan and observed portions of the testing.

2.0 SOURCE DESCRIPTION

The EES Coke facility is located on Zug Island in River Rouge, Michigan. The coke battery consists of eighty-five six meter high ovens for producing furnace coke. The process includes a pushing emissions control system (PECS) baghouse, "Pushing Stack" and a underfire combustion of the battery that is routed to the "Underfire Combustion Stack".

A blend of coal is charged to individual ovens on a timed interval of 11 to 22-minutes, depending on current production of the battery. Each charge consists of approximately 32 dry tons of coal. Current permit limits allow for the charging of up to 1.420 million dry tons of coal. The production rate of the facility during the test periods was 113 oven charges per day (3,616 tons/coal charged per day) and approximately 333 kscf of fuel per 21 minute run.

Coking of the coal occurs in an oxygen free environment for 17 to 30-hours. Gases produced during the coking cycle are collected, cleaned, and used to underfire the battery and can supply fuel for other site sources or sold to permitted off-site sources.

After coking, the coke is pushed from each oven on a timed interval of 11 to 22 minutes, depending on the current production of the battery. Emissions from the pushing activities are collected using a belted duct and directed toward the PECS baghouse. The PECS baghouse operates on a variable speed fan and only operates during a coke oven push. The hot coke is water quenched. Approximately 25 dry tons of coke is produced per oven.

The underfire combustion stack is a steady state operation, except during a reverse. During a reverse, no underfire gases are burned. The reverse cycle occurs every 20 minutes and lasts approximately 2-minutes. During a burning cycle, coke oven gas is used to underfire the battery.

The pushing emissions control baghouse stack serves the coke oven battery during an oven push. The PEC stack is unique in that the fan associated with the exhaust stack only operates during a coke oven push. During this push the variable speed fan ramps up to 100% of capacity. The fan maintains this speed for approximately 2.5 - 3 minutes and then shuts down until the next push. Normal operating capacity of the PECS baghouse is one fan cycle every 11 to 22 minutes depending on the current production of the battery.

The Underfire Combustion Stack is approximately 353 feet tall with an internal diameter of 227.4 inches at the sampling port elevation. See Figure 1 for a diagram of the unit's sampling locations and stack dimensions.

3.0 CERMS DESCRIPTION

The CERMS serving the Underfire Combustion Stack is a dilution-extractive system, configured to measure concentrations of SO_2, NO_X, CO and CO_2 in the exhaust gas stream. All concentration measurements are on a wet basis. In addition, exhaust gas volumetric flowrate in the Underfire Combustion Stack is measured.

Data from the gas analyzers and the flow monitor are managed by a data acquisition and handling system (DAHS).

The specific analyzers tested during the RATA are as follows:

Parameter	Analyzer	Serial Number
SO_2	TECO 43i	CM09130063
NO_X	TECO 42i	CM09130064
CO_2	CA 600D	V09023
CO	TECO 48i	CM09130062

Flow	OFS-2000W	15080767R and 15080767T

4.0 SAMPLING PROCEDURES

All testing associated with the RATA of the Underfire Combustion Stack CERMS was performed in accordance with USEPA methods and procedures. The specific methods and procedures followed were Reference Methods 1, 2, 2H, 3A, 4, 6C, 7E and 10, and Performance Specifications 2, 3, 4 and 6. All of these are found in 40 CFR Part 60 – Appendix A.

An multi automatic probe system (MAPS) was utilized for the flow monitor RATA. Only 3-ports were used to measure flow, due to the 4th port being occupied by the CERMS (this approach was previously approved by EGLE). The MAPS is subject to routine quality control procedures including a post-test probe leak check and flow transducer calibration.

A schematic of the Reference Method Gas Sampling Train is presented in Figure 2.

4.1 Stack Gas Flow Rate (USEPA Reference Method 2 & PS 6)

4.1.1 Sampling Method

Stack gas volume was determined in accordance with USEPA Method 2 and Performance Specification – 6 (PS-6). Prior to conducting the flow RATA, a calibration factor was determined by conducting preliminary runs. This factor was input into the CERMS DAHS prior to conducting the RATA. This factor will continue to be used until a new RATA is performed.

4.1.2 Sampling Train

The autoprobe system is a computer-operated sampling system that uses S-type pitot tubes in conjunction with differential pressure transducers and thermocouples to determine exhaust gas volumetric flowrate. A separate pitot assembly is located at each port to allow for simultaneous sampling in all three ports. Data acquisition and handling is accomplished by proprietary software. The train is operated in accordance with USEPA approved procedures.

4.1.3 Sampling Train Calibration

The autoprobe system is calibrated in according to procedures developed by the manufacturer and approved by the USEPA. Intermittent QC procedures include pitot/thermocouple calibration, transducer accuracy verification and linear positioning system calibration. Routine, on-site QC procedures include system leak checks (pre/post RATA), auto zero (pre/post test) and pressure calibration (post RATA).

4.1.4 Sampling Duration & Frequency

A flow RATA was performed on 100% COG combustion according to Part 60 provisions. A total of 36 points were traversed during each flow run. The flow RATA runs were conducted in conjunction with the Gas RATA runs and were 21-minutes in duration. A total of 11 runs were conducted, with the best 9 runs utilized to calculate the Relative Accuracy according to Part 60 provisions.

4.2 Carbon Dioxide, Carbon Monoxide, Nitrogen Oxides, and Sulfur Dioxide Measurements (USEPA Reference Methods 3A, 6C, 7E, and 10)

4.2.1 Sampling Method

Carbon dioxide (CO_2), carbon monoxide (CO), Nitrogen Oxides (NOx), and Sulfur Dioxide (SO_2) concentrations in the exhaust gas stream were measured in accordance with USEPA Reference Methods 3A, 10, 7E, and 6C, respectively. Pollutant sampling was conducted at 0.4, 1.0, and 2.0 meters from the stack wall.

4.2.2 Sampling Train

The reference method (RM) sampling train is depicted in Figure 2. The RM CEMS measures dry concentrations of the target gas. Since the CERMS measures exhaust gases on a wet basis, moisture correction was necessary. The reference method data acquisition system generates one minute average gas concentrations for use in the calculation of the relative accuracy.

4.2.3 Sampling Train Calibration

The sampling train was calibrated according to procedures outlined in USEPA Method 3A. Initially, zero, span, and mid-range calibration gases were introduced directly into the analyzer to determine the instruments linearity. Prior to, and at the completion of, each test run, instrument drift and system bias determinations were used by introducing upscale and downscale gases through the entire sample system. Prior to the first run, system response times were determined for each pollutant and a NO_2-NOx converter was performed. The NOx converter check passed at 92% of the bottle value.

4.2.4 Sampling Duration & Frequency

Each gas RATA run was 21 minutes in duration. A total of 11 RATA runs were completed with the best 9 runs being utilized to calculate the relative accuracy according to Part 60 provisions.

4.3 Exhaust Moisture Determinations (USEPA Reference Method 4)

4.3.1 Sampling Method

Determination of the moisture content of the exhaust gas was performed using the method described in USEPA Method 4, "Determination of Moisture Content in Stack Gases". The exhaust gas condensate was collected in glass impingers and the

percentage of moisture was derived from calculations outlined in USEPA Method 4. Exhaust moisture content was used to convert dry reference methods to wet for comparison to the CERMS emission values.

5.0 RESULTS

Results from the gas and flow RATA completed on April 19, 2023 are presented in Tables 1 and 2. All of the gas analyzers and the flow monitor passed the RATA according to the specifications of 40 CFR, Part 60 – Performance Specification 6. Testing was conducted while the battery operated at normal conditions on 100% COG.

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 - Gas RATA Results

Underfire Combustion Stack

EES Coke Battery, L.L.C.

April 19, 2023

Test No.	SO_2 (lb/hr)			CO2 (%)			NO_x (lb/hr)			CO (lb/hr)		
	RM	CERMS	Difference	RM	CERMS	Difference	RM	CERMS	Difference	RM	CERMS	Difference
1	432.7	441.1	-8.4	4.6	4.7	-0.1	313.4	281.8	31.6	85.1	75.6	9.5
2	429.6	409.5	20.1	4.5	4.5	0.0	309.4	261.5	47.9	80.9	68.9	12.0
3	394.2	432.3	-38.1	4.5	4.5	0.0	284.1	274.1	10.0	75.1	71.6	3.5
4	360.5	444.7	-84.2	4.4	4.4	0.0	279.6	289.4	-9.8	68.9	70.8	-1.9
5	382.1	439.4	-57.3	4.4	4.5	-0.1	305.7	292.1	13.6	77.8	71.7	6.1
6	350.8	407.4	-56.6	4.4	4.4	0.0	286.3	266.9	19.4	75.4	70.2	5.2
7	390.6	434.3	-43.7	4.7	4.6	0.1	293.7	273.8	19.9	82.0	75.7	6.3
8	394.2	425.9	-31.7	4.7	4.6	0.1	277.6	261.1	16.5	84.2	77.4	6.8
9	380.0	434.9	-54.9	4.6	4.6	0.0	267.2	265.0	2.2	79.9	78.2	1.7
10	388.9	424.5	-35.6	4.5	4.5	0.0	286.3	266.4	19.9	80.1	73.1	7.0
11	384.8	430.8	-46.0	4.6	4.6	0.0	274.1	265.2	8.9	82.2	76.8	5.4
	394.0	426.7	-32.8	4.5	4.5	0.0	283.8	272.7	11.2	78.4	73.9	4.5
	Standard Deviation:		24.3	Standard Deviation:		0.05	Standard Deviation:		9.9	Standard Deviation:		2.9
	Confidence Coefficient (CC):		18.7	Confidence Coefficient (CC):		0.03	Confidence Coefficient (CC):		7.6	Confidence Coefficient (CC):		2.2
	RELATIVE ACCURACY:		13.1	RELATIVE ACCURACY:		0.91	RELATIVE ACCURACY:		6.6	RELATIVE ACCURACY:		8.5

= Test not used in Calculation

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Table 2 - Flow RATA Results
Underfire Combustion Stack
EES Coke Battery, L.L.C.
April 19, 2023

Test No.	Flow (scfh) RM	CEM	Difference
1	8,836,000	7,501,500	1,334,500
2	8,856,000	7,133,200	1,722,800
3	8,493,000	7,701,500	791,500
4	8,079,000	7,816,300	262,700
5	8,851,000	7,825,000	1,026,000
6	8,385,000	7,411,200	973,800
7	8,631,000	7,687,300	943,700
8	8,421,000	7,499,300	921,700
9	8,213,000	7,652,200	560,800
10	8,654,000	7,587,500	1,066,500
11	8,539,000	7,697,700	841,300
Avg:	**8,474,000**	**7,653,111**	**820,889**
		Standard Deviation:	**257,761**
		Confidence Coefficient (CC):	**198,132**
		RELATIVE ACCURACY:	**12.0**

= Test not used in Calculation

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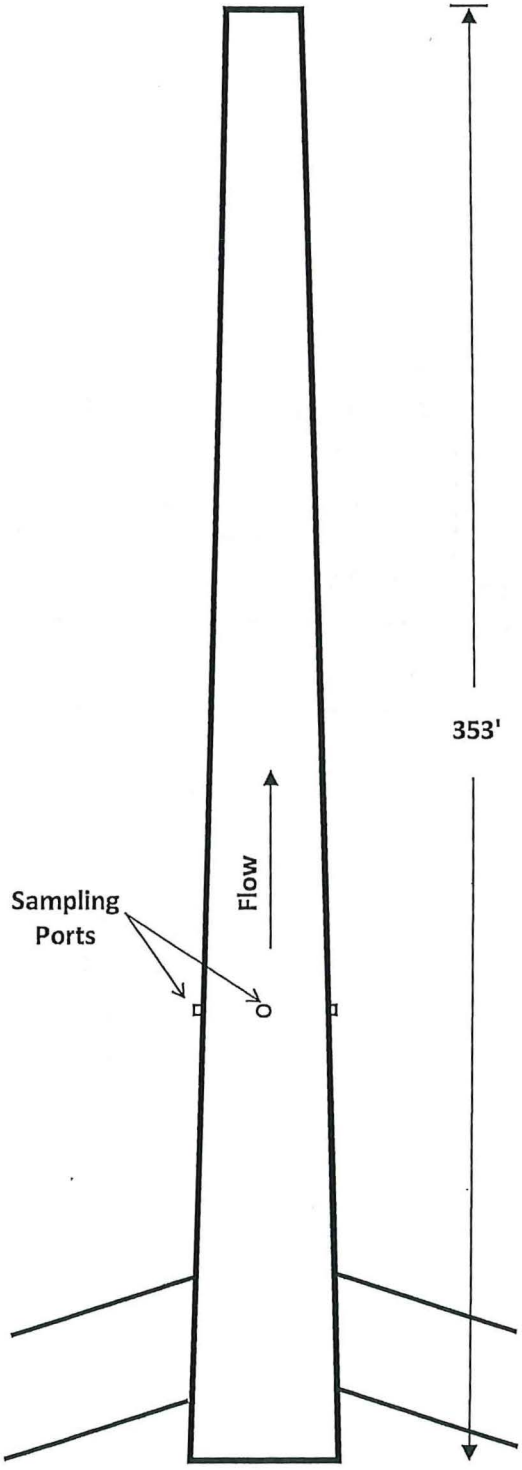
FIGURES

EES Coke Battery L.L.C.

Figure 1 – Sampling Location
Underfire Combustion Stack
EES Coke Battery, L.L.C.



Stack Diameter 227.4 Inches

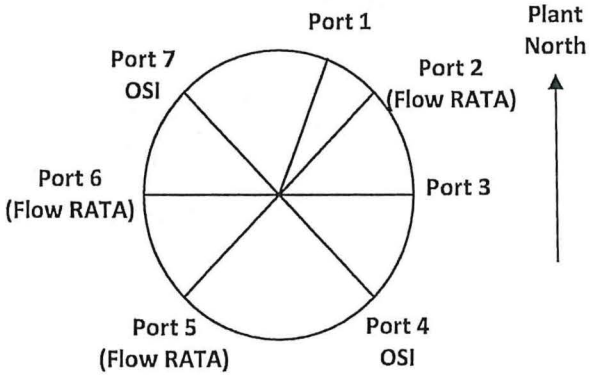


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Figure 2 – EPA Methods 3A, 6C, 7E and 10
Underfire Combustion Stack
EES Coke Battery, L.L.C.