RELATIVE ACCURACY TEST AUDIT (RATA) REPORT

EXHAUST GAS FLOW CEMS – UNIT 3

Performed At:

DTE ELECTRIC – MONROE POWER PLANT
MONROE, MICHIGAN
May 21-22, 2019

Performed By:

DTE CORPORATE SERVICES, LLC

DETROIT, MICHIGAN

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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources Environmental Field Services Group (DTE) conducted a Relative Accuracy Test Audit (RATA) on the Exhaust Gas Flow Monitor on Unit 3 at the Monroe Power Plant (MONPP), located in Monroe, Michigan. The fieldwork, performed during the 2nd Quarter of 2019, on May 21 – 22, was conducted to satisfy requirements of both 40CFR Part 75 and Michigan Permit to Install 27-13B.

The flow monitor passed the RATA. The results of the RATA testing are highlighted below:

Exhaust Gas Flow RATA Results
Units 3 – Monroe Power Plant
May 21 – 22, 2019

Load Range	Date	Relative Accuracy	Limit
High	5/22	0.23	10[(1)]
Mid	5/22	0.36	10[(1)]
Low	5/21	1.40	10[(1)]

[(1)] Part 75 Allowable Limit

1. 0 INTRODUCTION

DTE Energy's Environmental Management and Resources Environmental Field Services Group (DTE) conducted a Relative Accuracy Test Audit (RATA) at the of the Unit 3 Exhaust Gas Flow Monitor at Monroe Power Plant (MONPP), located in Monroe, Michigan. The fieldwork, performed on May 21 – 22, 2019. The RATA was conducted to satisfy requirements of both 40CFR Part 75 and Michigan Permit to Install 27-13B.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1 and 2H, and Part 75 Appendices A & B.

The following DTE personnel participated in the testing program: Mark D. Westerberg, Senior Specialist - Environmental, Jason Logan, Specialist – Environmental, Ken St. Amant, Senior Environmental Technician, and Frank Kurta, Senior Environmental Technician. Mr. Westerberg was the project leader. Ms. Kailyn Gerzich, Environmental Engineer at Monroe Power Plant, provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The Monroe Power Plant is a DTE Energy facility located at 3500 E. Front Street in Monroe, Michigan, the plant has four (4) coal-fired electric generating units, referred to as Units 1, 2, 3, and 4. These units were placed in service between 1971 and 1974, and have a total electric generating capacity of 3,135 megawatts (gross). The boiler (Babcock & Wilcox) for each unit is a similar supercritical pressure, pulverized coal-fired cell burner boiler. Units 1-4 exhaust into dedicated, separate stacks.

Units 1 and 4 have General Electric turbine generators, each having a current capability of 817 gross megawatts (GMW). Units 2 and 3 have Westinghouse turbine generators, each having a current capability of 823 GMW.

The boiler exhausts are each equipped with Research Cottrell electrostatic precipitators (ESPs), with particulate removal efficiencies of 99.6%. There is a sulfur trioxide flue gas conditioning system on each unit that is only used on an "as needed basis" to lower the resistivity of the fly ash for better collection by the ESPs. None of the four units is equipped with sulfuric acid mist control equipment.

Units 1 - 4 each have Selective Catalytic Reduction (SCR) systems to control 90% of the NO_x emissions prior to their respective ESP's. Each unit has wet Flue Gas Desulfurization (FGD) Scrubbers to control sulfur dioxide (SO_2), and other acid gases.

The exhaust stacks for Units 1-4 are each 580 feet tall with internal diameters of 28 feet. See Figure 1 for a diagram of Units' sampling locations and stack dimensions.

Stack flow on all units is measured using an ultrasonic principle. The ultrasonic systems are manufactured by Teledyne Monitor Labs.

In ultrasonic systems the volumetric flow rate of stack gas is measured by transmitting ultrasonic pulses across the stack in both directions. The tone pulses are accelerated or retarded due to the gas velocity in the stack. The time required traversing the distance of the stack traveling with and against the flow is a function of the sound velocity and the stack gas velocity. Stack flow can be calculated based on the difference in the times required to traverse the stack in both directions. The ultrasonic pulses must traverse the stack or duct at a minimum.

All Monroe units utilize two flow paths (X pattern) to measure exhaust gas flow for the purpose of improved accuracy. The "Combined Path" measurement averages the data from each of the individual paths. The individual paths are identified as Path A and Path B. This report presents the results for the Combined Path, which is how the flow monitor usually operates.

The following flow monitor was audited:

Unit	Analyzer	Manufacturer/ Model	Serial Number
3	Flow	Teledyne Ultraflow 150	1500140

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:

Sampling Method	Parameter	Analysis
USEPA Method 1 & 2H	Exhaust Gas Flow Volume	Differential Pressure (S-Type Pitot Tube)

3.1 EXHAUST GAS FLOW VOLUME MEASUREMENT (USEPA METHODS 1 and 2H)

3.1.1 Sampling Method

The RATA was conducted using the Multiple Automated Probes (MAP) System. This MAP System is owned and operated by DTE Corporate Services, LLC. The MAP System is a fully computer controlled, PC-based, automated flow measurement system. All system control, data acquisition, data reduction, and report generation tasks are performed automatically. The MAP System directly measures gas flow rate, gas velocity, gas temperature, gas static pressure, total gas pressure and atmospheric pressure. The MAP System performs flow rate measurements according to EPA Method 1, 2, 2G, 2H and 2 J as found in 40CFR Part 60.

3.1.2 Flow Sampling Train

The MAP EPA Method 2H sampling system (Figure 2) consisted of the following components:

(1) Stainless steel s-type pitot, with attached Type K thermocouple.
(2) Flexible Tygon tubing bundle, including Type K thermocouple wire.
(3) particulate filter.
(4) Junction box containing barometric pressure transducer, differential pressure transducer, and heater.
(5) Ethernet cable.
(6) Computer MAPS patented software.
(7) Data Acquisition System

Support data collected during the testing to support flow data include moisture determination by EPA Method 4 (one test run during each hour of testing), and O_2 data from the certified CEM, for the purpose of calculating the molecular weight of the exhaust gas.

3.1.3 Sampling Train Calibration

The gas flow sampling train was calibrated following the procedures outlined in EPA Methods 2H, plus some additional calibration unique to automated flow measuring systems. At the beginning and end of each test day, a leak check is conducted on the system. Additional leak checks are conducted, if parts of the sampling train are changed during the test period. Additionally, pre and post zero checks are conducted each day and the systems conducts a transducer calibration check at the end of the test period to confirm that the transducer has accurately measured pressures during the test period.

3.1.4 Sampling Duration & Frequency

The RATA was conducted at each of three load ranges, with twelve runs conducted at each load. Each test run was five minutes in duration. Twelve points were sampled in each of the four test ports, for a total of 48 points. A single wall effect factor determination test run was completed immediately prior to the start of each 12 run period.

3.1.5 Quality Control and Assurance (gas flow measurement)

Quality Control was completed, as described above in Section 3.1.3.

Quality Control data is provided in Appendix C.

3.1.6 Data Reduction

All data is processed instantaneously by the automated sampling system processing system.

The reference method test data is provided in Appendix B.

4.0 UNIT 3 OPERATION

The Unit 3 RATA was conducted in each of the three load ranges, as specified in 40CFR Part 75 regulations. The CEMS Monitoring Plan for Unit 3 shows the operating range for the unit to be from 400 to 845 GMW. In the one year period leading up to the RATA, the unit operated as follows:

Load Range	Percent Time Operating
High	59%
Mid	16%
Low	25%

Immediately prior to the RATA, the flow monitor was relinearized. A new correlation curve was entered into the flow monitor at the conclusion of the calibration.

Flow monitor data from the RATA period is contained in Appendix A.

5.0 RESULTS

Tables 1 presents the RATA testing results from Units 3. The results show that the exhaust gas flow monitor passed the RATA, with measured relative accuracies (RA) all well below the limit of 10. Additionally, the low RA values meet the reduced RATA frequency criteria.

On the basis of this data, the Bias Adjustment Factor for the flow monitor is 1.000.

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."

Mark Westerberg (MS)
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Mr. Mark D. Westerberg, QSTI (Groups 1 & 3)

This report reviewed by: ___________________________________
Mr. Thomas Durham
Manager, Field Services Group
Environmental Management and Resources
DTE Energy Corporate Services, LLC

RESULTS TABLE

TABLE 1
EXHAUST GAS FLOW MONITOR CEM RATA RESULTS
UNIT 3 – MONROE POWER PLANT
May 21 – 22, 2019

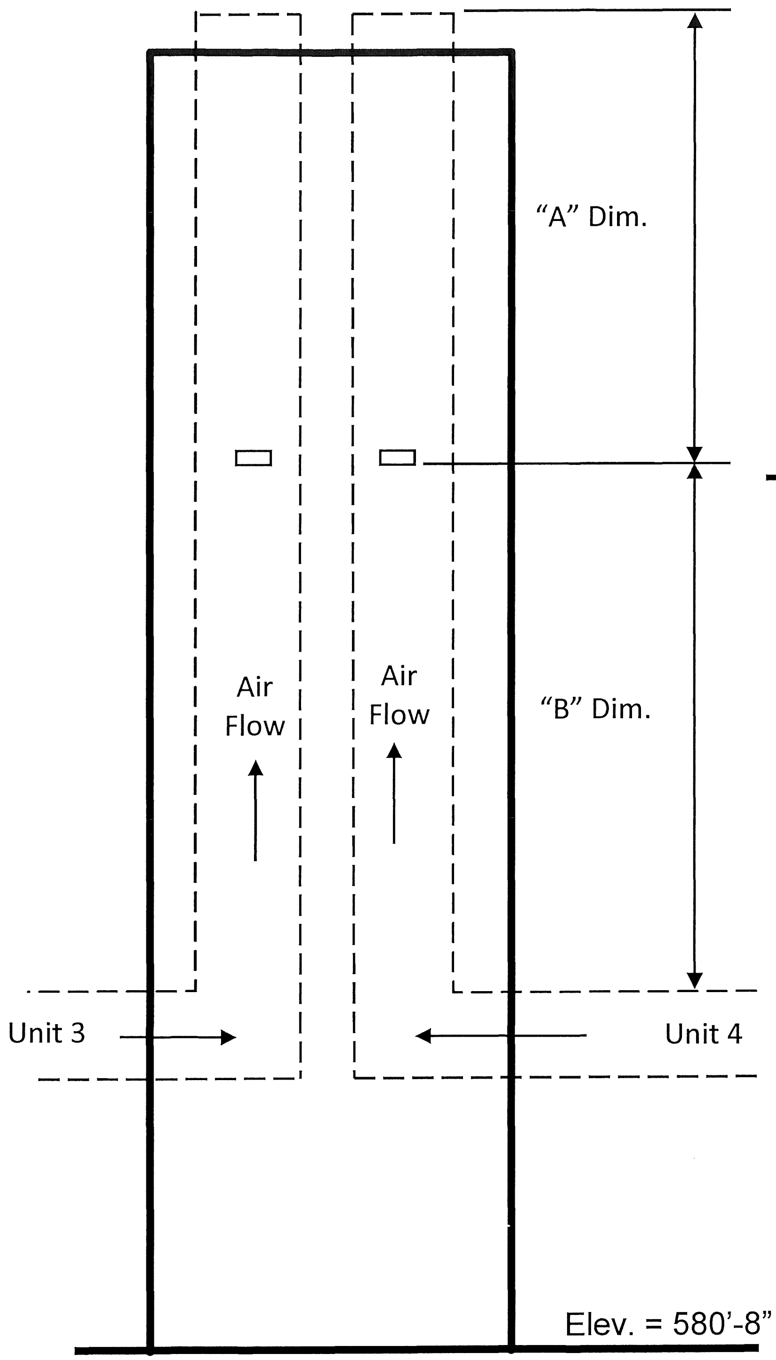
Load Range	Ave GMW Load	Wall Affects Factor	Ave RM (kscfh)	Ave CEM (kscfh)	Difference (kscfh)	Relative Accuracy	Bias Adjustment Factor	Relative Accuracy Limit
High	738	0.9936	112,657	112,713	-56	0.23	1.000[1]	10[2]
Mid	600	0.9938	98,023	97,881	142	0.36		10[2]
Low	474	0.9945	85,709	84,770	938	1.40		10[2]

[1] High load was determined to be the "normal" load range

[2] Limit as specified in 40CFR Part 75

FIGURES

Figure 1 – Sampling Location
Monroe Power Plant – Units 3 & 4
May 21 – 22, 2019



Details

"A" Dim = Upstream Distance
"A" Dim = 201.6'
"B" Dim = Downstream Distance
"B" Dim = 233.8'

Dia. @ Sample Location = 28'-0"

Figure 2 – EPA Method 2H
Monroe Power Plant – Unit 3
May 21 – 22, 2019