

## EXECUTIVE SUMMARY

Consumers Energy Regulatory Compliance Testing Section (RCTS) conducted hydrogen chloride (HCl) testing at the exhaust of coal-fired boiler EUBOILER2 (Unit 2), an electric utility steam generating unit (EGU), which generates steam to turn a turbine and produce electricity at the J.H. Campbell Generating Station in West Olive, Michigan. HCl emissions were measured during a trial burn of western bituminous and subbituminous coal that contained different chlorine, heat content, and moisture content compared to western subbituminous or mixtures of western subbituminous and eastern bituminous coals normally combusted. The test program was performed on July 8 and 9, 2020 to evaluate compliance with HCl emission limits in 40 CFR 63, Subpart UUUUU, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units*, (aka Mercury and Air Toxics Rule [MATS]) as incorporated in Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) MI-ROP-B2835-2020.

Six, 120-minute HCl test runs were conducted following the procedures in United States Environmental Protection Agency (USEPA) Reference Methods (RM) 1, 3A/3B (ALT-123), 4 (ALT-008), 19, and 26 in 40 CFR 60, Appendix A. During testing, Unit 2 was operated while firing a mixture of approximately 50% western bituminous and 50% western subbituminous coal by weight at an operating load representative of site specific normal operations as specified in 40 CFR §63.10007(2). Testing was performed over a 2-day period while the facility was attempting to optimize boiler performance through different fuel blending techniques and boiler operation. There were no deviations from the approved stack test protocol or the USEPA Reference Methods therein. The Unit 2 HCl results are summarized in the following table.

**Table E-1  
Summary of JHC EUBOILER2 Test Results**

Parameter and Date	Units	Run			Average	Emission Limit	
		1	2	3		MATS	MATS LEE <sup>1</sup>
HCl (7/8/20)	lb/mmBtu	<0.0001	<0.0001	<0.0001	<0.0001	<b>0.0020</b>	<b>0.0010</b>
HCl (7/9/20)		<0.0002	<0.0001	<0.0001	<0.0001		
<sup>1</sup> Applicable qualifying emission limit for low emitting EGU (LEE) status							

The results of the testing indicate that EUBOILER2 combusting a mixture of western bituminous and western subbituminous coal complies with the MATS and ROP HCl emission limit. Since the HCl emission rate measured was <50% of the applicable MATS limit, the source continues to meet the low emitting EGU threshold. Refer to Table 2-1 for a summary of the HCl test results.

Detailed results are presented in Appendix Tables 1 and 2. Sample calculations, field data sheets, and laboratory data are presented in Appendices A, B, and C. Boiler operating data and supporting documentation are provided in Appendices D and E.

## 1.0 INTRODUCTION

This report summarizes the results of hydrogen chloride (HCl) air emissions compliance tests conducted July 8 and 9, 2020 on EUBOILER2 operating at the Consumers Energy J.H. Campbell Plant in West Olive, Michigan.

This document was prepared using the Michigan Department of Environment, Great Lakes and Energy (EGLE) *Format for Submittal of Source Emission Test Plans and Reports* published in November of 2019. Please exercise due care if portions of this report are reproduced, as critical substantiating documentation and/or other information may be omitted or taken out of context.

### 1.1 IDENTIFICATION, LOCATION, AND DATES OF TESTS

Consumers Energy Regulatory Compliance Testing Section (RCTS) conducted HCl tests at the dedicated exhaust of coal-fired boiler EUBOILER2 (Unit 2) operating at the J.H. Campbell Generating Station in West Olive, Michigan on July 8 and 9, 2020.

A test protocol was submitted to EGLE on September 23, 2016 and subsequently approved by Mr. Tom Gasloli, Environmental Quality Analyst, in his letter dated October 18, 2016. The approval letter reflects standing approval of all quarterly MATS tests conducted at J.H. Campbell Units 1 and 2 as long as no modifications from the original protocol occur; however, updated and agency approved EGU diluent gas collection and analysis procedures in the March 2018 USEPA publication ALT-123 may be implemented. A 7-day notification of HCl performance testing was submitted to EGLE on June 11, 2020.

### 1.2 PURPOSE OF TESTING

HCl emissions were measured during a trial burn of western bituminous and subbituminous coal that contained different chlorine, heat content, and moisture content compared to western subbituminous or mixtures of western subbituminous and eastern bituminous coals normally combusted. The test program was performed to evaluate compliance with 40 CFR 63, Subpart UUUUU, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units*, (aka Mercury and Air Toxics Rule [MATS]) as incorporated in the Michigan Department of Environmental, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) MI-ROP-B2835-2020. The applicable MATS emission limit is presented in Table 1-1. MATS performance testing is required at an EGU when a new fuel is combusted per 40 CFR §63.10031(c)(3) and the July performance tests satisfy this requirement.

**Table 1-1**  
**Applicable MATS Emission Limits**

Parameter	Emission Limit	Units	Applicable Requirement
HCl	0.0020	lb/mmBtu	Table 2 to Subpart UUUUU of Part 63— Emission Limits for Existing EGU's
lb/mmBtu	pound per million British thermal unit heat input		

EUBOILER2 achieved MATS low emitting EGU (LEE) status on June 12, 2019. Maintaining MATS LEE status requires demonstrating that emissions from an EGU are less than or equal to 50 percent of the 0.0020 lb/mmBtu HCl applicable standard in Table 2 of the MATS rule on a triennial basis over a 36 month time period. The performance tests conducted on

July 8<sup>th</sup> and 9<sup>th</sup> demonstrate that LEE status can be maintained when combusting a mixture of western Bituminous and western Subbituminous coal at JHC EUBOILER2. The HCl tests conducted on July 8<sup>th</sup> and July 9<sup>th</sup> are not considered required periodic tests, to be performed once every 36 calendar months, to maintain LEE status as outlined in 40 CFR §63.10000(c)(1)(iii). The July 8<sup>th</sup> and July 9<sup>th</sup> tests, at EUBOILER2, are not spaced 1,050 days apart from the last LEE tests as required per 40 CFR §63.10006(f)(1)(iii), and thus do not qualify to be used as periodic LEE tests.

### 1.3 BRIEF DESCRIPTION OF SOURCE

EUBOILER2 is a coal-fired EGU that operates as needed to provide electricity to the regional grid and Consumers Energy customers.

### 1.4 CONTACT INFORMATION

Table 1-2 presents the names, addresses, and telephone numbers of the contacts for information regarding the test and the test report, and names and affiliation of personnel involved in conducting the testing.

**Table 1-2  
Contact Information**

Program Role	Contact	Address
State Regulatory Administrator	Ms. Karen Kajiya-Mills Technical Programs Unit Manager 517-335-4874 <a href="mailto:kajiya-millsk@michigan.gov">kajiya-millsk@michigan.gov</a>	Michigan Department of Environment, Great Lakes, and Energy Technical Programs Unit 525 W. Allegan, Constitution Hall, 2nd Floor S Lansing, Michigan 48933
State Regulatory Inspector	Ms. Kaitlyn DeVries Environmental Quality Analyst 616-558-0552 <a href="mailto:devriesk1@michigan.gov">devriesk1@michigan.gov</a>	Michigan Department of Environment, Great Lakes, and Energy Grand Rapids District Office 350 Ottawa Avenue NW; Unit 10 Grand Rapids, Michigan 49503
Responsible Official	Mr. Nathan Hoffman Plant Business Manager 616-738-5436 <a href="mailto:nathan.hoffman@cmsenergy.com">nathan.hoffman@cmsenergy.com</a>	Consumers Energy Company J.H. Campbell Power Plant 17000 Croswell Street West Olive, Michigan 49460
Corporate Air Quality Contact	Mr. Michael E. Gruber Senior Engineer II 989-891-5580 <a href="mailto:michael.gruberII@cmsenergy.com">michael.gruberII@cmsenergy.com</a>	Consumers Energy Company Environmental Services Department – Air Quality Karn-Weadock Admin Building 2742 N. Weadock Hwy Essexville, MI 48732
Test Facility	Mr. Kevin Starken Sr. Engineer II 616-738-3241 <a href="mailto:kevin.starken@cmsenergy.com">kevin.starken@cmsenergy.com</a>	Consumers Energy Company J.H. Campbell Power Plant 17000 Croswell Street West Olive, Michigan 49460
Test Facility	Mr. Roger Vargo Senior Technician 616-738-3270 <a href="mailto:roger.vargo@cmsenergy.com">roger.vargo@cmsenergy.com</a>	Consumers Energy Company J.H. Campbell Power Plant 17000 Croswell Street West Olive, Michigan 49460
Test Team Representative	Mr. Thomas Schmelter, QSTI Engineering Technical Analyst 616-738-3234 <a href="mailto:thomas.schmelter@cmsenergy.com">thomas.schmelter@cmsenergy.com</a>	Consumers Energy Company L&D Training Center 17010 Croswell Street West Olive, Michigan 49460
Laboratory	Mr. Gordon Cattell 517-788-2334 Sr. Laboratory Tech Analyst Lead <a href="mailto:gordon.cattell@cmsenergy.com">gordon.cattell@cmsenergy.com</a>	Consumers Energy Company Laboratory Services 135 W Trail Street Jackson, Michigan 49201

## 2.0 SUMMARY OF RESULTS

### 2.1 OPERATING DATA

The boiler fired a mixture of approximately 50% western bituminous and 50% western subbituminous coal by weight during the performance test and operated at an average load of 323 gross megawatts (MWg), equating to 87.3% of the achievable capacity estimated at approximately 378 MWg based upon the coal blend. 40 CFR §63.10007(2) describes maximum normal operating load is generally between 90 and 110 percent of design capacity but should be representative of site specific normal operations during each test run. Maximum capacity electrical output could not be achieved due to an issue with a condenser and elevated cooling water temperature (i.e., Lake Michigan water temperature).

Refer to Attachment D for detailed operating data. The CEMS data is recorded in Eastern Standard Time (EST). Note the time convention for the reference method (RM) testing were in Eastern Daylight Savings Time (EDT), so there is a one hour offset between the CEMS data (i.e., Load, % CO<sub>2</sub> (wet), and SO<sub>2</sub> ppm) and RM data.

### 2.2 APPLICABLE PERMIT INFORMATION

The J.H. Campbell generating station, State of Michigan Registration Number (SRN) B2835, operates in accordance with and ROP MI-ROP-B2835-2020, which incorporates State and Federal air regulations, including applicable MATS Rule requirements. The permit identifies EUBOILER2 as an emission unit within the flexible group designation FGBOILER12. The facility is also associated with Federal Registry Service (FRS) ID: 110000411108.

### 2.3 RESULTS

The test results indicate the Unit 2 HCl emissions comply with applicable ROP and MATS regulation limits, as well as the associated qualifying MATS LEE emission rate thresholds. Refer to Table 2-1 for a summary of the HCl test results.

**Table 2-1**  
**Summary of JHC EUBOILER2 Test Results**

Parameter and Date	Units	Run			Average	Emission Limit	
		1	2	3		MATS	MATS LEE <sup>1</sup>
HCl (7/8/20)	lb/mmBtu	<0.0001	<0.0001	<0.0001	<0.0001	<b>0.0020</b>	<b>0.0010</b>
HCl (7/9/20)	lb/mmBtu	<0.0002	<0.0001	<0.0001	<0.0001		
<sup>1</sup> Applicable qualifying emission limit for low emitting EGU (LEE) status							

Detailed results are presented in Appendix Tables 1 and 2. A discussion of the results is presented in Section 5.0. Sample calculations, field data sheets, and laboratory results are presented in Appendices A, B, and C. Boiler operating data and supporting information are provided in Appendices D and E.

## 3.0 SOURCE DESCRIPTION

EUBOILER2 is a coal-fired EGU that turns a turbine connected to an electricity-producing generator.

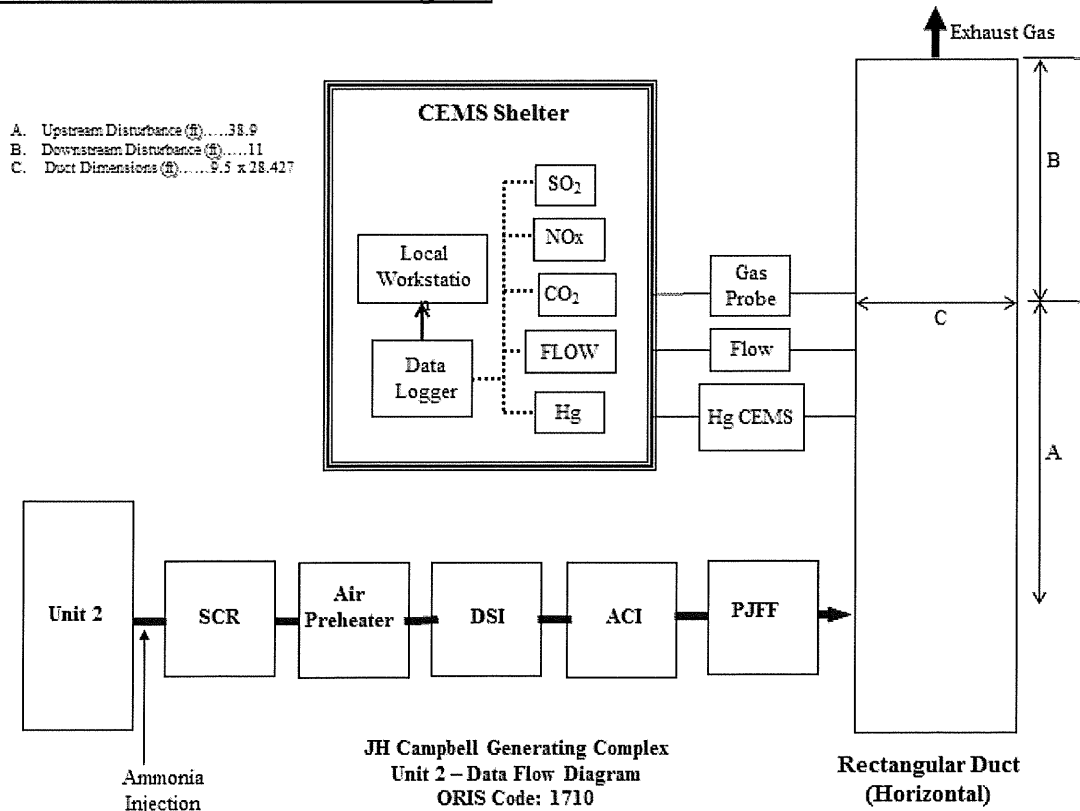
### 3.1 PROCESS

Unit 2 is a wall-fired boiler, classified as an existing unit under MATS, which combusts pulverized subbituminous coal as the primary fuel and oil as an ignition/flame stabilization fuel. The unit is also designed to burn eastern bituminous coal blends. During this test program, the unit fired a blend of western bituminous and subbituminous coal. Coal is fired in the furnace where the combustion heats water within boiler tubes producing steam. The steam turns a turbine that is connected to an electricity-producing generator. The electricity is routed through the transmission and distribution system to consumers.

### 3.2 PROCESS FLOW

The flue gas generated through coal combustion is controlled by multiple pollution control devices. The unit is equipped with low nitrogen oxides (NO<sub>x</sub>) burners (LNB), a selective catalytic reduction (SCR) system for NO<sub>x</sub> control, a dry sorbent (lime) injection (DSI) system for control of sulfur dioxide (SO<sub>2</sub>) and other acid gasses, an activated carbon injection (ACI) system for mercury (Hg) reduction, and a pulse jet fabric filter (PJFF) baghouse to control particulate emissions. Post control flue gas exhausts to atmosphere through an approximately 400-foot high stack shared with EUBOILER1. CEMS and reference method measurements are conducted in a dedicated exhaust duct upstream of the common stack. Refer to Figure 3-1 for the Unit 2 Data Flow Diagram.

**Figure 3-1. Unit 2 Data Flow Diagram**



### **3.3 MATERIALS PROCESSED**

Unit 2 is classified as a coal-fired unit not firing low rank virgin coal as described in Table 2 to Subpart UUUUU. The unit fired a blend of 50% western bituminous and 50% western subbituminous coal for this compliance test. The unit is also capable of firing blends of eastern and low-sulfur western coal.

### **3.4 RATED CAPACITY**

Unit 2 has a nominal heat input capacity of 3,560 mmBtu/hr and a gross electrical output of approximately 378 MWg while firing a blend of eastern and western coal. Unit 2 is capable of firing 100% bituminous (typically eastern) coal, 100% subbituminous (western) coal, and various mixtures of the two coal types. However, the unit is limited to approximately 300 MW gross when firing only western subbituminous coal, and the nominal heat input rating is achievable only when firing at least 40% eastern coal with all coal mills operating.

The representative, normal fuel scenario for Unit 2 is 100% western coal. Based on the coal blend of bituminous and subbituminous coal fired during this test program the estimated electrical output was approximately 378 MWg (~360 MWnet). However, equipment performance issues with a condenser and elevated cooling water temperature (i.e., Lake Michigan water temperature), prevented the unit from operating at the planned ~360 MWnet level. In addition, combusting 100% western bituminous coal was not pursued during this test program due to operational restrictions (uneven coal flow in fuel handling equipment) and electricity demand.

The boiler operates in a continuous manner in order to meet the electrical demands of Midcontinent Independent System Operator, Inc. (MISO) and Consumers Energy customers. EUBOILER2 is considered a baseload unit because it is designed to operate 24 hours a day, 365 days a year.

### **3.5 PROCESS INSTRUMENTATION**

The process was continuously monitored by boiler operators, environmental technicians, and data acquisition systems during testing. One-minute data for the following parameters were collected during each HCl test run:

- Heat Input Rate (mmBtu/hr)
- Load (MWg)
- CO<sub>2</sub> (Vol-%)
- SO<sub>2</sub> concentration (ppm)

Due to the various process monitoring systems, the reference method sampling times were correlated to instrumentation times. The RM testing was recorded on Eastern Daylight Time (EDT), whereas the equipment process instrumentation and CEMS records data on Eastern Standard Time (EST). During the test program, EDT was one hour later than EST (i.e., 8:00 am EDT = 7:00 am EST). Refer to Appendix D for operating data.

## 4.0 SAMPLING AND ANALYTICAL PROCEDURES

RCTS tested for HCl using the USEPA test methods presented in Table 4-1. The sampling and analytical procedures associated with each parameter are described in the following sections.

**Table 4-1  
Test Methods**

Parameter	Method	USEPA Title
Sample/traverse point locations	1	Sample and Velocity Traverses for Stationary Sources
Molecular weight (O <sub>2</sub> and CO <sub>2</sub> )	3A / 3B ALT-123	Alternative Test Method for Diluent Measurement to Support Particulate Matter Testing Under 40 CFR 63, Subpart UUUUU
Moisture content	4 / ALT-008	Alternative Moisture Measurement Method Midget Impingers
Emission rates	19	Sulfur Dioxide Removal and Particulate, Sulfur Dioxide and Nitrogen Oxides from Electric Utility Steam Generators
Hydrogen chloride	26	Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Non-Isokinetic Method

### 4.1 DESCRIPTION OF SAMPLING TRAIN AND FIELD PROCEDURES

The test matrix presented in Table 4-2 summarizes the sampling and analytical methods performed for the specified parameters during this test program.

**Table 4-2  
Test Matrix**

Date 2020	Run	Sample Type	Start Time (EDT)	Stop Time (EDT)	Test Duration (min)	EPA Test Method	Comment
July 8	1	O <sub>2</sub> /CO <sub>2</sub> Moisture HCl	8:57	10:57	120	1 3A/3B ALT-123 4/ALT-008 19 26	242.00 liters of sample volume collected to meet LEE minimum of 240 liters
	2		11:13	13:13	120		248.96 liters of sample volume collected
	3		13:30	15:30	120		244.37 liters of sample volume collected
July 9	1		9:14	11:14	120		251.94 liters of sample volume collected
	2		11:33	13:33	120		255.70 liters of sample volume collected
	3		13:53	15:53	120		255.87 liters of sample volume collected

#### 4.1.1 SAMPLE LOCATION AND TRAVERSE POINTS (USEPA METHOD 1)

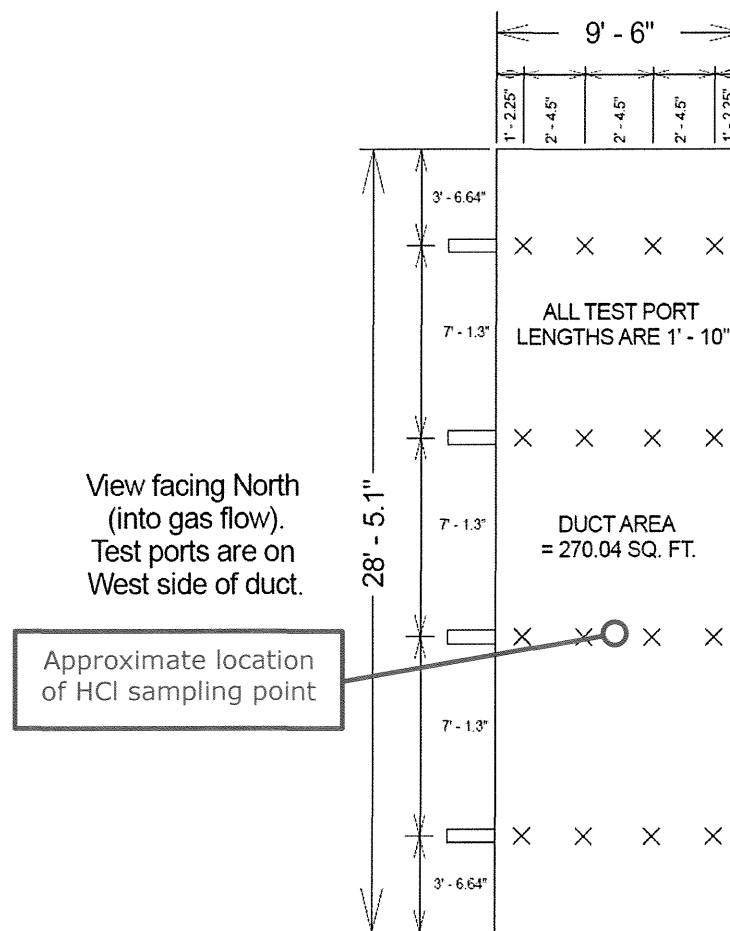
The number and location of traverse points was determined in accordance with USEPA Method 1, *Sample and Velocity Traverses for Stationary Sources*. Four test ports are located in the horizontal plane on west side of the 9.5 feet by 28 feet 5.1-inch rectangular

duct. The duct has an equivalent duct diameter of 14 feet 2.9 inches. The ports are situated:

- Approximately 38.9 feet or 2.7 equivalent duct diameters downstream of a duct cross sectional area change flow disturbance, and
- Approximately 11 feet or 0.8 duct diameters upstream of flow disturbance caused by a change in duct cross sectional area as it enters the exhaust stack.

The sample ports are 6-inches in diameter and extend 22 inches beyond the duct wall. The HCl samples were collected from the second from the bottom test port at a single sample point approximately 1 meter from the stack wall for 120 minutes during each test. A drawing of the Unit 2 exhaust test port and traverse point locations is presented as Figure 4-1.

**Figure 4-1. Unit 2 Duct Cross Section and Test Port/Traverse Point Detail**



#### 4.1.2 MOLECULAR WEIGHT (USEPA ALT-123)

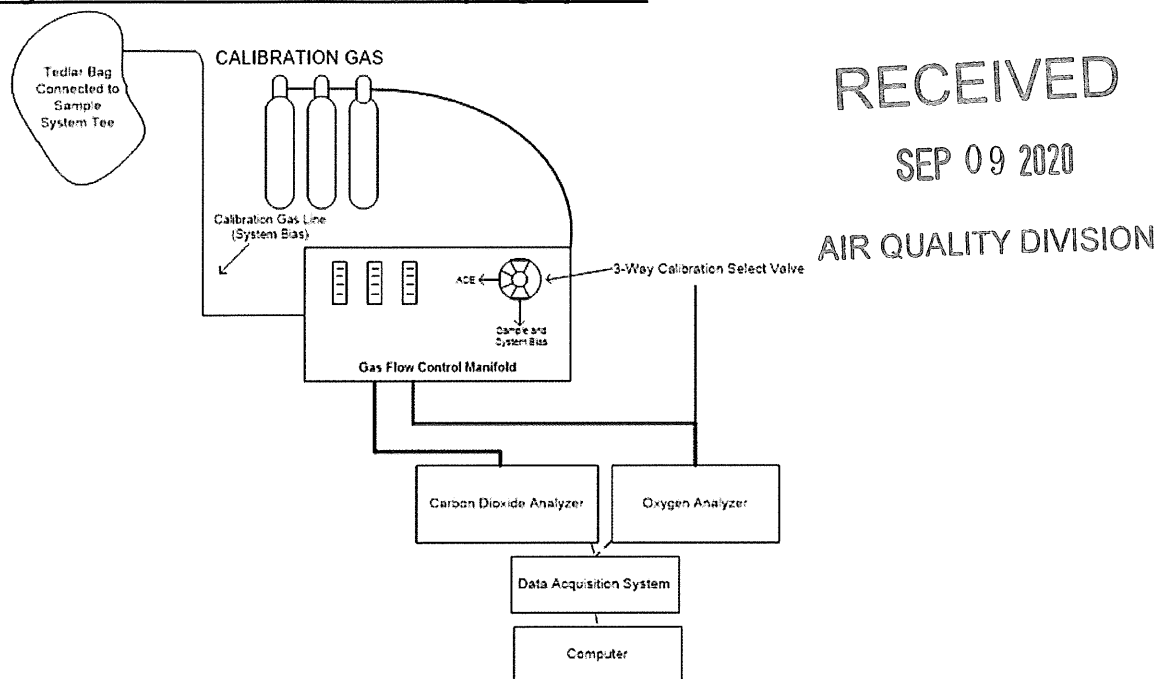
The exhaust gas composition and molecular weight was measured using the sampling and analytical procedures of USEPA ALT-123, Alternative Test Method for Diluent Measurement to Support Particulate Matter Testing Under 40 CFR 63, Subpart UUUUU. ALT-123 combines the sample collection procedures of USEPA Method 3B, Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air with the analytical procedures of USEPA Method 3A, Oxygen and Carbon Dioxide Concentrations from Stationary Sources –



(Instrumental Analyzer Procedure.) The flue gas oxygen and carbon dioxide concentrations were used to calculate emissions in lb/mmBtu.

Flue gas was extracted from the stack during each test through a stainless steel lined probe and inert tubing into a flexible sample bag. The sample was then withdrawn from the flexible bag and conveyed into gas analyzers that measured oxygen and carbon dioxide concentrations. Figure 4-2 depicts the ALT-123 sampling system.

**Figure 4-2. USEPA ALT-123 Sampling System**



Prior to sampling flue gas, the analyzers were calibrated by performing a calibration error test where zero-, mid-, and high-level calibration gases were introduced directly to the analyzer. The calibration error check was performed to evaluate if the analyzer response was within  $\pm 2.0\%$  of the calibration gas span or  $\pm 0.5\%$  absolute difference. Analyzer system-bias and drift tests were performed by filling inert flexible sample bags with zero- and mid- or high- calibration gases and introducing these calibration standards into the gas analyzer to measure the ability of the system to respond to within  $\pm 5.0$  percent of span or  $\pm 0.5\%$  absolute difference.

RCTS ensured the  $O_2$  and  $CO_2$  concentrations measured each minute from the bag samples were within 0.3% from the mean 5-minute concentration used as the diluent average for the test run. The ALT-123 criteria require the  $CO_2$  and  $O_2$  concentrations differ by no more than 0.3% when the  $CO_2$  concentrations were greater than 4.0% and  $O_2$  concentrations were less than 15.0% and no more than 0.2% when the  $CO_2$  concentration is less than 4.0% and  $O_2$  concentration is greater than 15.0%.

At the conclusion of the bag sample analysis, an additional system bias check was performed to evaluate the drift from the pre- and post-test system bias checks. The system-bias checks evaluated if the analyzer drift was within the allowable criterion of  $\pm 3.0\%$  of span from pre- to post-test system bias checks. The measured oxygen and carbon dioxide concentrations were corrected for analyzer drift. Refer to Appendix for analyzer calibration data and supporting documentation.

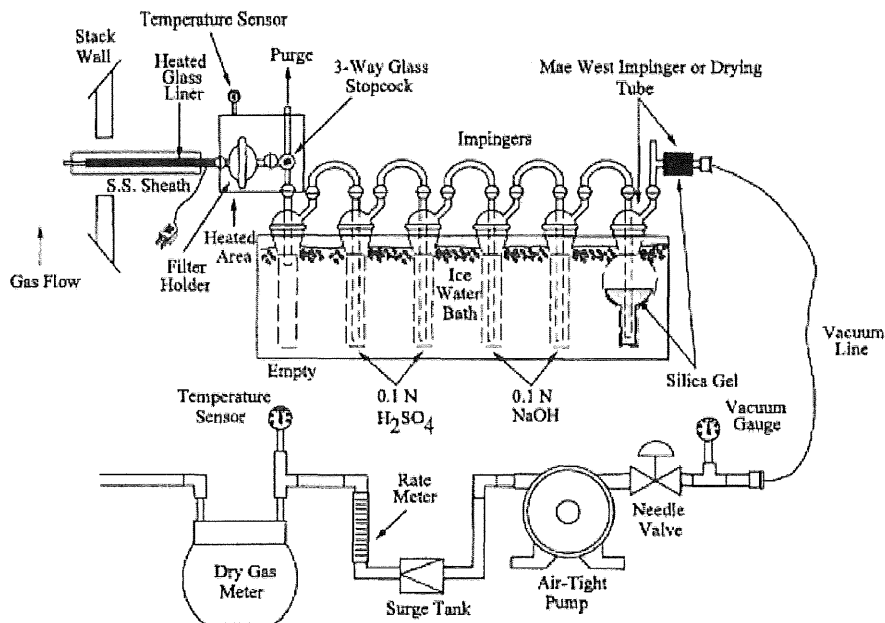
### 4.1.3 MOISTURE CONTENT (USEPA METHOD 4)

The moisture content of the flue gas was measured using USEPA Method 4, *Determination of Moisture in Stack Gases*, modified to USEPA ALT-008, *Alternative Moisture Measurement Method Midget Impingers*, in conjunction with the Method 26 sample apparatus. Sampled gas was drawn through a series of impingers immersed in an ice bath to condense and remove water from the flue gas. The amount of water condensed and collected in the impingers was measured gravimetrically and used to calculate the moisture content of the sampled flue gas.

### 4.1.4 HYDROGEN CHLORIDE (USEPA METHOD 26)

HCl was measured by collecting an integrated sample of the flue gas following the procedures of USEPA Method 26, *Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources*. Triplicate 120-minute test runs were performed at EUBOILER2 by sampling flue gas through a heated glass-lined probe, Teflon filter, and into a series of impingers containing absorbing solutions. The filter collects particulate matter and halide salts, and the acidic and alkaline absorbing solutions collect the gaseous hydrogen halides (i.e., HCl) and halogens, respectively. Figure 4-3 depicts the USEPA Method 26 sample apparatus.

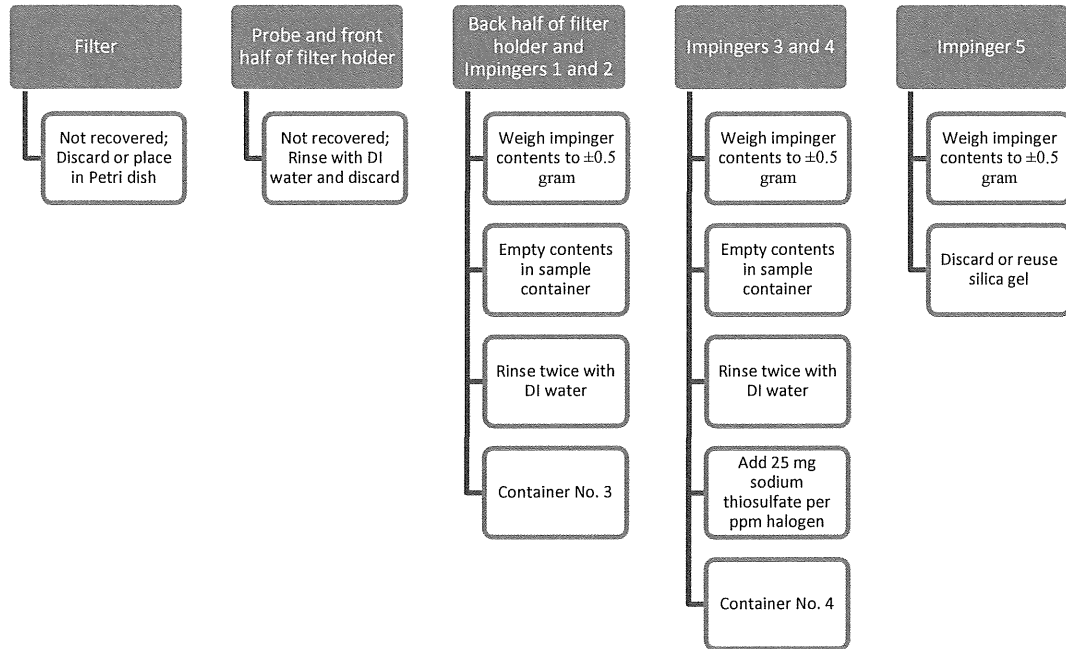
**Figure 4-3. USEPA Method 26 Sample Apparatus**



After charging the impingers, assembling the apparatus, and completing a leak check, the sample probe was inserted into the sampling port. Ice was placed around the impingers and upon achieving probe and filter temperatures between 248°F and 273°F, the probe and filter portion of the sampling apparatus was purged with flue gas for a minimum of 5-minutes prior to initiating the test run. During the run, the probe and filter temperatures were maintained and dry gas meter (DGM) sample rate, volume, temperatures, and vacuum were recorded at 5-minute intervals. After collecting a minimum 240-liter sample volume, sampling was stopped, and a post-test leak check was performed. Refer to Appendix B for the field test data sheets.

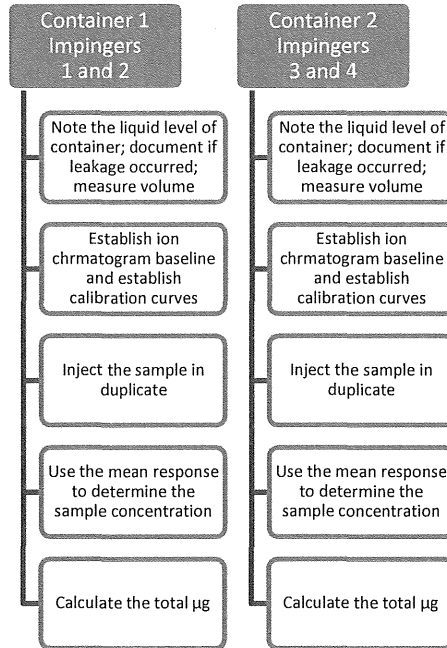
The impingers were removed from the sample apparatus and transported to the recovery area. The acidic and alkaline impinger contents were transferred to separate, labeled polyethylene sample containers. While the alkaline impinger contents were submitted to the laboratory, they were not analyzed, as halogens were not being assessed as part of the test program. Each impinger was rinsed with deionized water and the rinsate collected in the appropriate sample container. Approximately 0.5 milligrams of sodium thiosulfate was added to the sample storage bottle containing the 0.1 N NaOH impinger catch to assure a complete reaction with the hypochlorous acid to form a second chlorine ion. Refer to Figure 4-4 for the Method 26 sample recovery scheme.

**Figure 4-4. USEPA Method 26 Sample Recovery Scheme**



The sample containers, including reagent and water blanks, were transported via courier to the Consumers Energy Laboratory Services facility in Jackson, Michigan under chain-of-custody for hydrogen chloride analysis. The chain of custody was prepared in accordance with ASTM D4840-99(2018) procedures and included the sample date, collection time, identification, and requested analysis. Refer to Figure 4-5 for the Method 26 laboratory analytical scheme and Appendix C for the laboratory data sheets and Section 5.4.2 for further discussion of the audit sample results.

**Figure 4-5. USEPA Method 26 Analytical Scheme**



**4.1.5 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 HCl emission rates in units of lb/mmBtu. Measured carbon dioxide concentrations and F factors (ratios of combustion gas volumes to heat inputs) were used to calculate emission rates using equation 19-6 from the method. Figure 4-6 presents the equation used to calculate lb/mmBtu emission rate:

**Figure 4-6. USEPA Method 19 Equation 19-6**

$$E = C_d F_c \frac{100}{\%CO_{2d}}$$

Where:

- E = Pollutant emission rate (lb/mmBtu)
- C<sub>d</sub> = Pollutant concentration, dry basis (lb/dscf)
- F<sub>c</sub> = Volumes of combustion components per unit of heat content  
1,840 scf CO<sub>2</sub>/mmBtu for subbituminous coal  
F<sub>c</sub>-factors from 40 CFR 75, Appendix F, Table 1)
- %CO<sub>2d</sub> = Concentration of carbon dioxide on a dry basis (% , dry)

## **5.0 TEST RESULTS AND DISCUSSION**

HCl emissions were measured during a trial burn of western bituminous and subbituminous coal that contained different chlorine, heat content, and moisture content compared to western subbituminous or mixtures of western subbituminous and eastern bituminous coals normally combusted. The test program was performed to evaluate compliance with the HCl emission limits in the MATS rule and ROP for possible future purchase and combustion of an alternative fuel.

The Unit 2 HCl 3-run average emissions over both test days were less than or equal to 50 percent of the 0.0020 lb/mmBtu HCl applicable standards in Table 2 of the MATS rule, thus complying with applicable MATS and LEE limits.

### **5.1 TABULATION OF RESULTS**

Table 2-1 in Section 2 of this report summarizes the results and Appendix Tables 1 and 2 contain a detailed tabulation of results, process operating conditions, and exhaust gas conditions.

### **5.2 SIGNIFICANCE OF RESULTS**

The HCl emissions results from EUBOILER2 combusting a mixture of western bituminous and western subbituminous coal demonstrate compliance with applicable HCl limits of the MATS rule and ROP. Further, since the HCl emissions are less than 50% of the MATS HCl limit of 0.002 lb/mmBtu, EUBOILER2 operating at the J.H. Campbell Generating Station continues to meet the low-emitting EGU (LEE) limit for HCl. Because this HCl test program was performed 393 days from the last LEE test completed June 12, 2019, it is not considered a periodic LEE test, which are required per 40 CFR 63.10006(f)(1)(iii) to be performed at least 1,050 calendar days from the last LEE test.

### **5.3 VARIATIONS FROM SAMPLING OR OPERATING CONDITIONS**

Unit 2 was unable to achieve an operating load greater than 90% of the estimated maximum achievable due to a condenser issue and elevated cooling water temperatures (i.e., Lake Michigan water temperature). In addition, the facility intended to combust 100% western Bituminous coal during the test program; however, operational concerns, such as coal moisture content, clumping / fuel handling issues, and electricity demand, prohibited evaluating emissions under this condition.

No other sampling or operating condition variations were encountered during the test program.

### **5.4 PROCESS OR CONTROL EQUIPMENT UPSET CONDITIONS**

The boiler and associated control equipment were operating under routine conditions and no upsets were encountered during testing.

### **5.5 AIR POLLUTION CONTROL DEVICE MAINTENANCE**

No significant maintenance to the air pollution control device equipment occurred during the three months prior to the test. Optimization of the air pollution control equipment is a continuous process to ensure compliance with regulatory emission limits.

## 5.6 RE-TEST DISCUSSION

Based on the results of this test program, a re-test is not required. The next required quarterly MATS test event will be conducted in the second quarter of 2022.

## 5.7 RESULTS OF AUDIT SAMPLES

### 5.7.1 PERFORMANCE AUDIT SAMPLE

A performance audit (PA) sample (if commercially available) for each test method employed is required, unless waived by the administrator for regulatory compliance purposes as described in 40 CFR 63.7(c)(2)(iii). A PA sample consists of blind audit sample(s), as supplied by an accredited audit sample provider (AASP), which are analyzed with the performance test samples in order to provide a measure of test data bias. As of May 2019, less than two accredited audit sample providers have blind audit samples available for purchase. Since there are no longer two providers, the requirement to obtain audit samples is no longer in effect. Performance audit samples were not analyzed as part of this test program.

### 5.7.2 REFERENCE METHOD AUDITS

The USEPA reference methods performed state that reliable results are obtained by persons equipped with a thorough knowledge of the techniques associated with each method. Factors with the potential to cause measurement errors are minimized by implementing quality control (QC) and assurance (QA) programs into the applicable components of field-testing. QA/QC components were included in this test program. Table 5-2 summarizes the primary field quality assurance and quality control activities that were performed. Refer to Appendix E for supporting documentation.

**Table 5-2**  
**QA/QC Procedures**

QA/QC Activity	Purpose	Procedure	Frequency	Acceptance Criteria
M1: Sampling Location	Evaluates if the sampling location is suitable for sampling	Measure distance from ports to downstream and upstream flow disturbances	Pre-test	≥2 diameters downstream; ≥0.5 diameter upstream.
M1: Duct diameter/ dimensions	Verifies area of stack/duct is accurately measured	Review as-built drawings and field measurement	Pre-test	Field measurement agreement with as-built drawings
M3A: Calibration gas standards	Ensures accurate calibration standards	Traceability protocol of calibration gases	Pre-test	Calibration gas uncertainty ≤2.0%
M3A: Calibration Error	Evaluates operation of analyzers	Introduce calibration gas directly into analyzers	Pre-test	±2.0% of the calibration span or ±0.5% absolute difference
M3A: System Bias and Analyzer Drift	Evaluates analyzer and sample system integrity and accuracy	Calibration gas introduced upstream of all sample conditioning components	Pre-test and Post-test	Bias: ±5.0% of calibration span or ±0.5% absolute difference Drift: ±3.0% of calibration span or

**Table 5-2  
QA/QC Procedures**

QA/QC Activity	Purpose	Procedure	Frequency	Acceptance Criteria
				±0.5% absolute difference
M4: Field balance calibration	Verify moisture measurement accuracy	Use Class 6 weight to check balance accuracy	Daily before use	The field balance must measure the weight within ±0.5 gram of the certified mass
M26: sample rate	Ensure representative sample collection	Calculate rate based on volume collected	During and post-test	Target sampling rate is ~2 liters/minute
M26: Apparatus Temperature	Ensures purge of acid gases in probe and on filter	Set probe & filter heat controllers to ≥248°F	Verify prior to and during each run	Apparatus temperature must be ≥248°F and ≤ 273°F
M26: Sample volume	Ensure minimum required sample volumes collected	Record pre- and post-test dry gas meter volume reading	Post test	HCl: ≥120 liters LEE HCl: ≥240 liters
M26: Post-test leak check	Evaluate if system leaks biased the sample	Cap sample train; monitor DGM	Post-test	Leak rate ≤2% of the average sample rate
M26: post-test meter audit	Evaluates sample volume accuracy	DGM post-test; comparison to primary standard	Pre-test Post-test	±5%

## 5.8 CALIBRATION SHEETS

Calibration sheets, including dry gas meter, analyzer, and gas protocol sheets are presented in Appendix E. Analyzer quality control and assurance check information is presented in Appendix B, along with the field sheet information.

## 5.9 SAMPLE CALCULATIONS

Sample calculations and formulas used to compute emissions data are presented in Appendix A.

## 5.10 FIELD DATA SHEETS

Field data sheets are presented in Appendix B.

## 5.11 LABORATORY QUALITY ASSURANCE / QUALITY CONTROL PROCEDURES

The method specific quality assurance and quality control procedures in each method employed during this test program were followed, without deviation. Refer to Appendix C for the laboratory data sheets.

### 5.11.1 QA/QC BLANKS

Reagent and media blanks were analyzed for the parameters of interest. The results of the blanks analysis are presented in the Table 5-3. Laboratory QA/QC and blank results data are contained in Appendix C.

**Table 5-3  
QA/QC Blanks**

Sample Identification	Result	Comment
July 8, 2020 Method 26 0.1 N H <sub>2</sub> SO <sub>4</sub> Reagent Blank	<31.3 µg	Blank corrections were not applied; 68 milliliter sample volume
July 8, 2020 Method 26 Water Blank	<31.3 µg	Blank corrections were not applied; 125 milliliter sample volume
July 9, 2020 Method 26 0.1 N H <sub>2</sub> SO <sub>4</sub> Reagent Blank	<31.3 µg	Blank corrections were not applied; 80 milliliter sample volume
July 9, 2020 Method 26 Water Blank	<31.3 µg	Blank corrections were not applied; 130 milliliter sample volume