Consumers Energy
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Hydrogen Chloride Test

EUBOILER3

Consumers Energy Company
J.H. Campbell Plant
17000 Croswell Street
West Olive, Michigan 49460
SRN: B2835
FRS: 110000411108

Test Date: August 30, 2016

October 14, 2016

Test Performed by the Consumers Energy Company
Regulatory Compliance Testing Section – Air Emissions Testing Body
Laboratory Services Section
Work Order No. 26701577

Revision 0

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Consumers Energy, J.H. Campbell Plant   County: Ottawa

Source Address: 17000 Croswell   City: West Olive

AQD Source ID (SRN): B2835   ROP No.: MI-ROP-B2835-2013a   ROP Section No.: 1

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From ________ To ________

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From ________ To ________

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From NA To NA

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

Performance test report for hydrogen chloride compliance with the MATS regulation for Unit 3 (EUBOILER3), as required by 40 CFR Part 63.10031(f).

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Norman J. Kapala — Name of Responsible Official (print or type)

Executive Director of Coal Generation — Title

616-738-3200 — Phone Number

[signature] — Signature of Responsible Official

10-27-2016 — Date

* Photocopy this form as needed.

EXECUTIVE SUMMARY

Consumers Energy Company (Consumers Energy) Regulatory Compliance Testing Section (RCTS) conducted hydrogen chloride (HCl) testing at the single dedicated exhaust location of coal-fired boiler EUBOILER3 (Unit 3) operating at the JH Campbell Generating Station in West Olive, Michigan. The 820-megawatt (MW) net output electric utility steam generating unit (EGU) creates steam to turn a turbine associated with an electricity producing generator.

The HCl test program was performed to satisfy the initial performance test requirements in 40 CFR 63, Subpart UUUUU, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units* (MATS Rule) as incorporated in the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-B2835-2013a, and to verify compliance with the 2.0E-03 HCl pound per million British thermal unit (lb/mmBtu) MATS Rule limit specified in Table 2, *Emission Limits for Existing EGU's*.

Triplicate 70-minute HCl runs were conducted on August 30, 2016 following the procedures in United States Environmental Protection Agency (EPA) Reference Methods (RM) 3A, 19, and 26 in 40 CFR 60, Appendix A, as required in the MATS Rule, Table 5—*Performance Testing Requirements*. During the test program, Unit 3 operated within the maximum normal operating load requirement of *between 90 and 110 percent of design capacity but should be representative of site specific normal operations* described in the MATS Rule, § 63.10007(2), and each HCl run achieved the minimum 120 liter sample volume collection requirement specified in the MATS Rule, Table 2. The Unit 3 HCl lb/mmBtu results are summarized in the following table.

Run	Boiler Operating Load (Mw, Gross)	HCl Emission Rate (Lb/mmBtu)	40 CFR 63, Subpart UUUUU HCl Limit,(Lb/mmBtu)
1	863	1.13E-04	-
2	864	1.61E-04	-
3	863	1.45E-04	-
Average	**863.3**	**1.40E-04**	**2.0E-03**

The preceding HCl lb/mmBtu results indicate EUBOILER3 is in compliance with the 2.0E-03 HCl lb/mmBtu MATS Rule limit. Example calculations and calculation data sheets are presented in Appendix A and B. Laboratory data is presented in Appendix B.

1.0 INTRODUCTION

Consumers Energy Company (Consumers Energy) Regulatory Compliance Testing Section (RCTS) conducted hydrogen chloride (HCl) testing at the single dedicated exhaust location of coal-fired boiler EUBOILER3 (Unit 3) operating at the JH Campbell Generating Station in West Olive, Michigan. The 820-megawatt (MW) net output electric utility steam generating unit (EGU) creates steam to turn a turbine associated with an electricity producing generator.

The HCl test program was performed to satisfy the initial performance test requirements in 40 CFR 63, Subpart UUUUU, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units* (MATS Rule) as incorporated in the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-B2835-2013a, and to verify compliance with the 2.0E-03 HCl pound per million British thermal unit (lb/mmBtu) MATS Rule limit specified in Table 2, *Emission Limits for Existing EGU's.*

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1.1 CONTACT INFORMATION

Figure 1-1 presents the test program organization, major lines of communication, and names of responsible individuals. Table 1-1 presents contact information for these individuals.

Figure 1-1. Test Program Organization

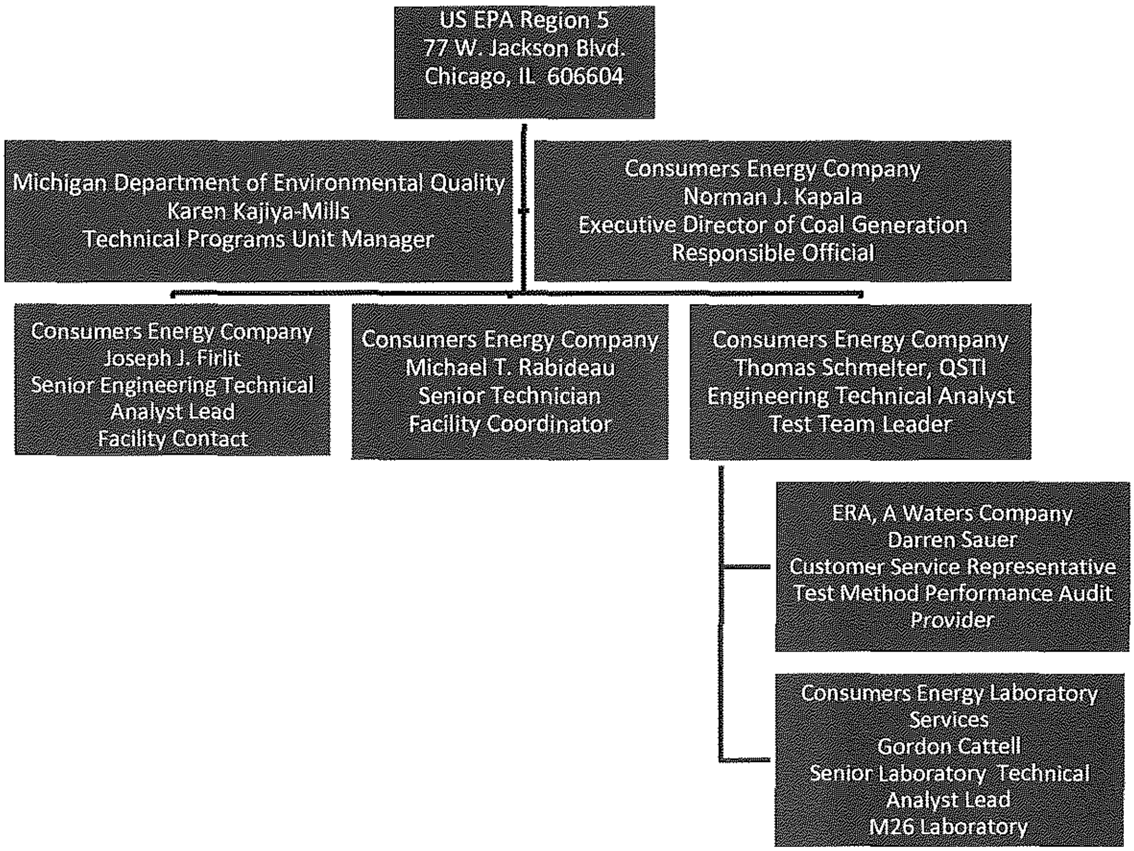


Table 1-1
Contact Information

Program Role	Contact	Address
EPA Consent Decree Contact	Director, Air Division	U.S. EPA Region 5 77 W. Jackson Blvd. (AE-17J) Chicago, IL 60604
Regulatory Agency Representative	Ms. Karen Kajiya-Mills Technical Programs Unit Manager 517-335-4874 kajiya-millsk@michigan.gov	Michigan Department of Environmental Quality Technical Programs Unit 525 W. Allegan, Constitution Hall, 2nd Floor S Lansing, Michigan 48933
Responsible Official	Mr. Norman J. Kapala 616-738-3200 Executive Director of Coal Generation Norman.Kapala@cmsenergy.com	Consumers Energy Company J. H. Campbell Power Plant 17000 Croswell Street West Olive, Michigan 49460
Test Facility	Mr. Joseph J. Firlit 616-738-3260 Sr. Engineering Tech Analyst Lead Joseph.Firlit@cmsenergy.com	Consumers Energy Company J. H. Campbell Power Plant 17000 Croswell Street West Olive, Michigan 49460

Table 1-1
Contact Information

Program Role	Contact	Address
Test Facility	Mr. Michael T. Rabideau 616-738-3273 Senior Technician Michael.Rabideau@cmsenergy.com	Consumers Energy Company J. H. Campbell Power Plant 17000 Croswell Street West Olive, Michigan 49460
Test Team Representative	Mr. Thomas Schmelter, QSTI 616-738-3334 Engineering Technical Analyst Thomas.Schmelter@cmsenergy.com	Consumers Energy Company L&D Training Center 17010 Croswell Street West Olive, Michigan 49460
Laboratory	Mr. Gordon Cattell 517-788-2334 Senior Laboratory Technical Analyst Lead Gordon.Cattell@cmsenergy.com	Consumers Energy Company Laboratory Services 135 W Trail Street Jackson, MI 49201
Test Method Performance Audit Provider	Mr. Darren Sauer 303-463-3515 Customer Service Representative dsauer@eraqc.com	ERA, A Waters Company 16341 Table Mountain Parkway Golden CO 80403

2.0 SUMMARY OF RESULTS

2.1 OPERATING DATA

Unit 3 is a dry bottom, wall-fired boiler with a nominal heat input capacity lb/mmBtu rating of 8,240, generating approximately 820 MW, net, and 900 MW gross electricity output. During the HCl test program, the boiler was operated at maximum normal operating load conditions, which was between 90 and 110 percent of design capacity and representative of normal Unit 3 operations. A summary of Unit 3 gross MW (MWg) electrical generation during each HCl test is provided in Table 2-1. Refer to Attachment D for detailed operating data.

Table 2-1
Summary of Unit 3 Boiler Operating Data

Date	Run	Sampling Time (EDT)	Boiler (MWg)
August 30, 2016	1	09:05 to 10:15	863.0
August 30, 2016	2	10:30 to 11:40	864.0
August 30, 2016	3	11:58 to 13:08	863.0
Average			**863.3**

2.2 APPLICABLE PERMIT INFORMATION

The J.H. Campbell Generating Station, State of Michigan Registration Number (SRN) B2835, operates in accordance with Renewable Operating Permit (ROP) Number MI-ROP-B2835-2013a, in which EUBOILER3 is identified as an emission unit. The applicable Unit 3 MATS Rule requirements are described in the ROP under *EUBOILER3 Emission Unit Conditions*, § IX, *Other Requirement(s)*. The J.H. Campbell facility is also associated with the comprehensive EPA Facility Registry System (FRS) database, FRS number 110000411108.

2.3 RESULTS

The individual and 3-run average HCl results shown in Table 2-2 below are below the MATS HCl emission rate limit of 2.0E-03 lb/mmBtu. Please note that each of the HCl samples collected and submitted for analysis were reported by the laboratory as "not detected" or below the quantitation limit. The HCl results provided in this report are therefore based upon the reported quantitation limit (QL); however the actual HCl concentrations reported were less than the QL. The HCl Results Summary table at the end of this report and the Laboratory data in

Appendix B contains additional details. Example calculations and calculation data sheets are presented in Appendix A and B.

Table 2-2
Summary of Unit 3 Hydrogen Chloride Emission Rates

Run	HCl Emission Rate (Lb/mmBtu)	40 CFR 63, Subpart UUUUU HCl Limit (Lb/mmBtu)
1	1.13E-04	-
2	1.61E-04	-
3	1.45E-04	-
Average	**1.40E-04**	**2.0E-03**

3.0 SOURCE DESCRIPTION

3.1 PROCESS

EUBOILER3 is a pulverized coal-fired 8,240 mmBtu per hour dry bottom, wall-fired boiler with fuel oil startup capability, manufactured by Foster Wheeler and constructed in 1974.

The basic operating parameters used to regulate boiler operations consist of ambient air temperature and humidity, fuel consistency and feed rate, and electrical or steam output.

- Total heat input
- Gross electric output

3.2 PROCESS FLOW

The flue gas generated through coal combustion is controlled by multiple pollution control devices. The unit is currently equipped with low-NOx burners (LNB), over-fire air (OFA), and selective catalytic reduction (SCR) for NOx control, activated carbon injection (ACI) for mercury (Hg) reduction, spray dry absorbers (SDAs) for acid gases [e.g., sulfur oxides (SOx), HCl], and a low pressure/high volume pulse jet fabric filter (PJFF) system baghouse for particulate matter control.

Two parallel twelve compartment PJFF baghouse systems are installed and operating at the Unit 3 exhaust duct. Once the gas enters the compartments the velocity decreases and large particles fall out of suspension and are collected within the bottom ash hopper. As the flue gas passes through the fabric filters suspended particles are collected on the exterior surface of the bags. The particles are removed by pulsing clean air through the interior of the bags. The jet of air flexes and reverses the direction of airflow through the bag causing the particles to be released and collected in a hopper below. Four induced draft fans draw the clean exhaust gas from the PJFF system and direct it to common 28.5-by-28.5-foot header duct prior to being exhausted to atmosphere through the 600-feet high stack.

All pollution control equipment was operational during the stack test event.

3.3 MATERIALS PROCESSED

Sub-bituminous coal is combusted in the boiler producing heat and steam that is used for electricity generation. The coal arrives via railcar from various mines located in the Western United States. The boiler is classified as a coal-fired unit not firing low rank virgin coal as described in Table 2 to Subpart UUUUU.

3.4 RATED CAPACITY

Unit 3 is a dry bottom, wall-fired boiler with a nominal heat input capacity lb/mmBtu rating of 8,240, generating approximately 820 MW, net, and 900 MW gross electrical output. 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. EUBOILER3 is considered a baseload unit because it is designed to operate 24 hours a day, 365 days a year.
During the performance tests, the boiler was operated at maximum normal operating load conditions. 40 CFR 63.10007(2) states the maximum normal operating load is generally between 90 and 110 percent of design capacity but should be representative of site specific normal operations. The performance testing was performed while the boiler was operating within the range of 810 MWg to 990 MWg. Refer to Table 2-1 for the boiler gross megawatt electrical generation during testing.

3.5 PROCESS INSTRUMENTATION

The process was continuously monitored by boiler operators and environmental technicians. Due to the various instrumentation systems, the sampling times were correlated to instrumentation times. The control equipment process instrumentation is recorded on Eastern Daylight Time (EDT), whereas, the continuous emissions monitoring systems records data on Eastern Standard Time (EST). Refer to Appendix D for detailed operating data.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

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

Table 4-1
Test Methods

Parameter	USEPA	
	Method	Title
Molecular weight (O_2 and CO_2)	3A	*Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)*
Pollutant emission rate	19	*Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates*
Hydrogen Chloride	26	*Determination of Hydrogen Chloride Emissions from Stationary Sources*

In addition, the MATS Rule requires test method performance audit (PA) samples (if available), for each test method employed for regulatory compliance purposes as described in 40 CFR Part 63.7(c)(2)(iii). The PA samples consist of blind audit samples, as supplied by an accredited audit sample provider (AASP), which are analyzed during the performance test in order to provide a measure of test data bias. After determining the approximate HCl concentration needed using The NELAC Institute (TNI) Stationary Source Audit Sample (SSAS) Program audit sample calculation tool, the HCl PA was requested from Environmental Resource Associates (ERA) and obtained prior to the test event.

4.1 DESCRIPTION OF SAMPLE APPARATUS 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

No. of Runs	Sample/Type Pollutant	Sampling Method	Sampling Organization	Sample Run Time (min)	Analytical Method	Analytical Laboratory
3	Oxygen and Carbon dioxide	M3A	Consumers Energy	70	Instrumental	NA
3	Pollutant Emission rate	M19	Consumers Energy	-	Stoichiometric calculation	NA
3	Hydrogen Chloride	M26	Consumers Energy	70	Ion Chromatography	Consumers Energy; Laboratory Services

4.1.1 Sample Location and Traverse Points

Method 26 is a non-isokinetic test procedure in that an integrated sample is collected from a single sample point, rather than multiple traverse points within the duct or stack. Furthermore, HCl lb/mmBtu emission rate calculations using stoichiometric Method 19 as required by the MATS rule do not employ exhaust gas velocity, temperature or moisture content data. Therefore, the sample apparatus was positioned at the second of five eastern-facing vertically oriented sample ports. During each seventy-minute HCl run, the sample was drawn from a single point located *no closer to the walls than 1.0 m (3.3 ft)*, within the Unit 3 common exhaust duct as described in 40 CFR 60, Method 3, Section 8.1.1. A drawing of the Unit 3 exhaust duct and existing test port locations is shown in Figures 4-1 and 4-2.

Figure 4-1. Unit 3 Upstream and Downstream Disturbances

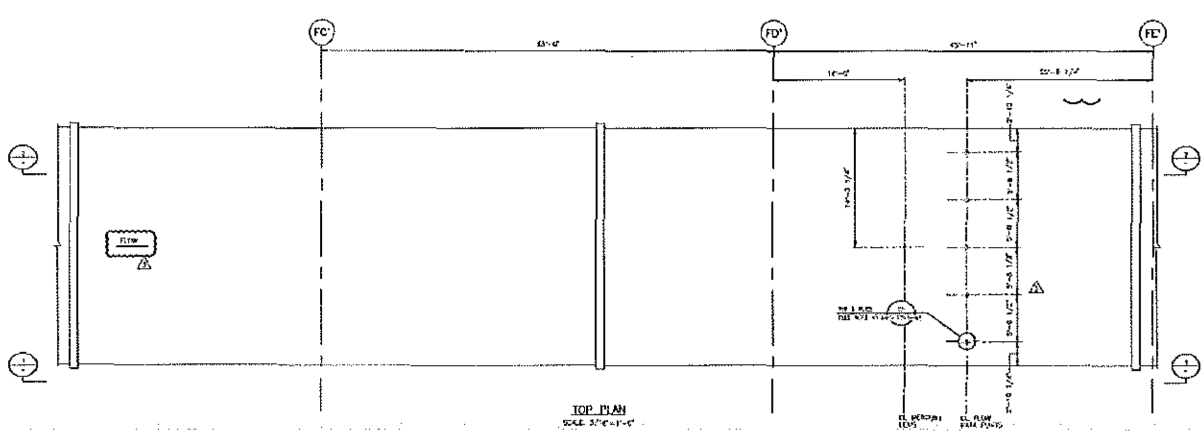
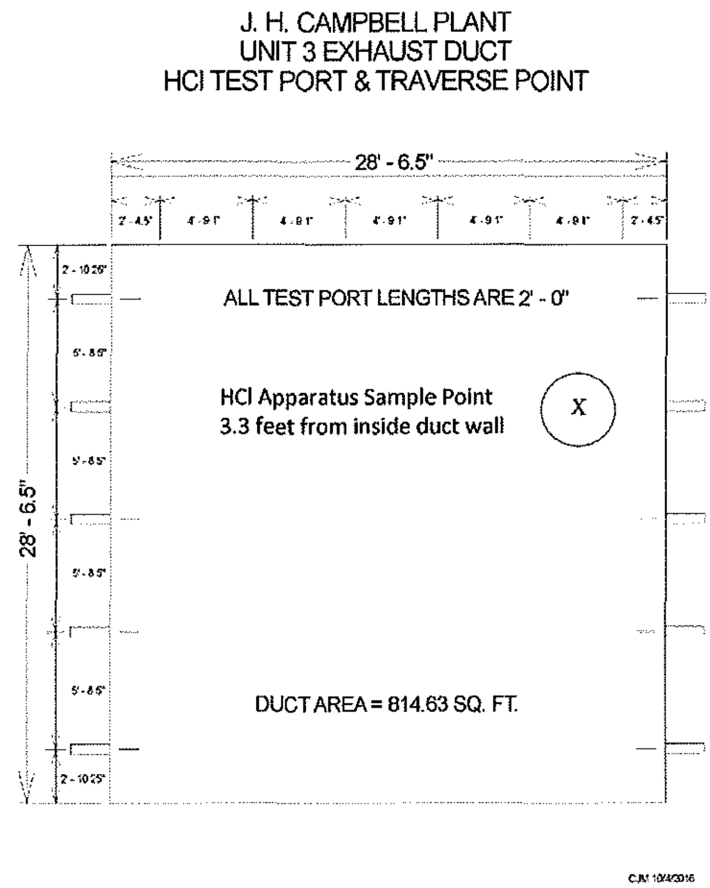


Figure 4-2. Unit 3 Outlet Duct Test Port Detail



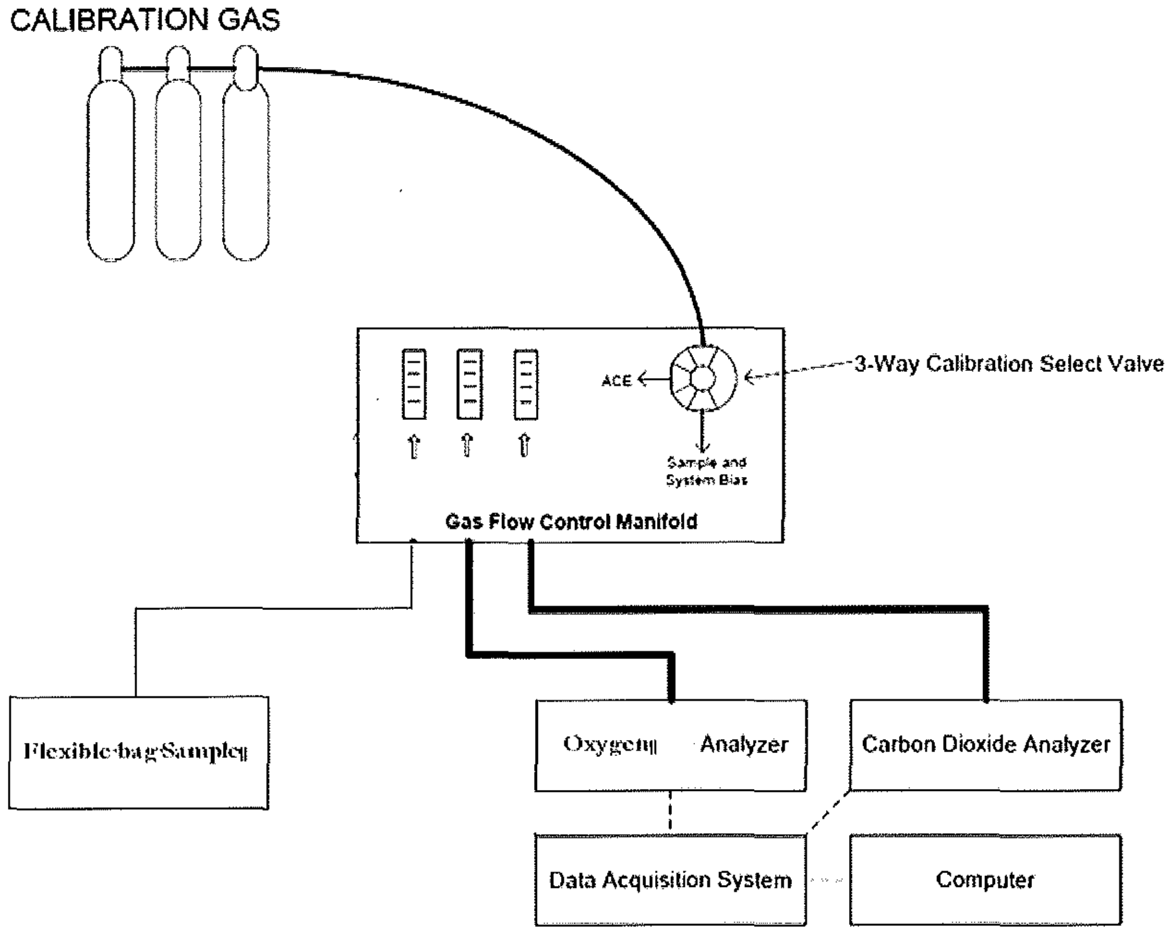
4.1.2 Velocity and Temperature

The Method 26 HCl lb/mmBtu emission rate calculation using stoichiometric Method 19 does not require exhaust gas velocity and temperature measurements; therefore, a velocity and temperature profile measurement was not performed.

4.1.3 Molecular Weight

The exhaust gas composition and molecular weight was measured using the sampling and analytical procedures of EPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)*. Oxygen (O_2) and carbon dioxide (CO_2) concentrations were continuously extracted from the stack through a heated stainless steel lined probe and Teflon® sample line into a gas conditioning system to remove water content before entering the paramagnetic and infrared gas analyzers. Figure 4-3 depicts the Method 3A sampling system.

Figure 4-3. Method 3A 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 are introduced to the back of the analyzers. The calibration error check was performed to evaluate if the analyzers response was within ±2.0% of the calibration gas span. A system-bias and drift test was performed where the zero- and mid- or high- calibration gases are introduced at the inlet to the gas conditioner to measure the ability of the system to respond to within ±5.0 percent of span.

At the conclusion of each test run, 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 analyzers drift was within the allowable criterion of ±3.0% of span from pre- to post-test system bias checks. The measured O_2 and CO_2 concentrations were corrected for analyzer drift. Refer to Appendix E for analyzer calibration supporting documentation.

4.1.4 Moisture Content

When determining HCl lb/mmBtu emission rates via stoichiometric Method 19 as allowed by the MATS rule, moisture content is not a required test parameter and was therefore not determined.

4.1.5 Emission Rates (USEPA Method 19)

EPA Method 19, *Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates* was used to calculate HCl lb/mmBtu emission rates using carbon dioxide concentrations and F factors (ratios of combustion gas volumes to heat inputs) to calculate emission rates using equation 19-6 from Method 19:

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

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

Where:

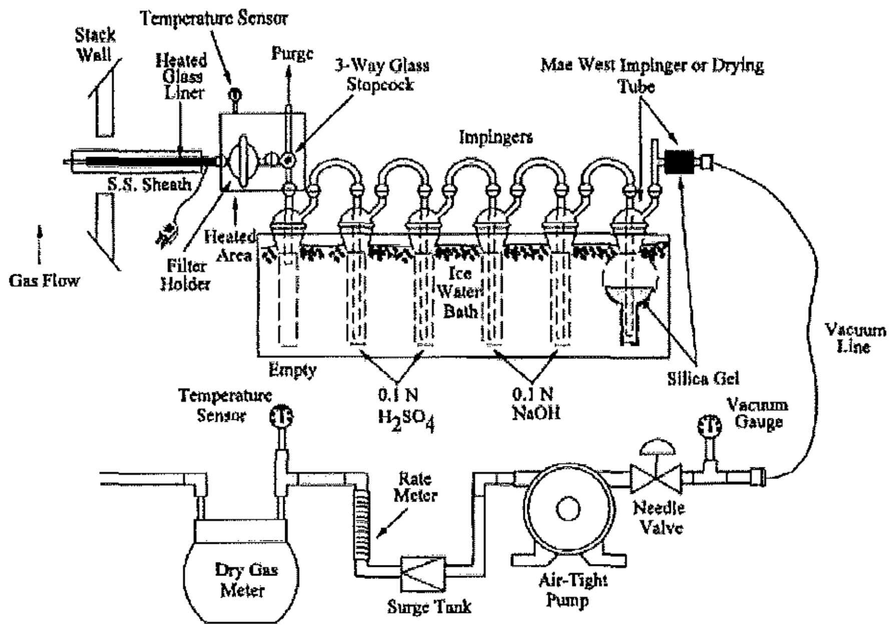
E	=	Pollutant emission rate (lb/mmBtu)
C_d	=	Pollutant concentration, dry basis (lb/dscf)
F_c	=	Volumes of combustion components per unit of heat content (scf/mmBtu) 1,840 scf/mmBtu for subbituminous coal
$\%CO_{2d}$	=	Concentration of carbon dioxide on a dry basis (%, dry)

Refer to Appendix A for example calculations.

4.1.6 Hydrogen Chloride

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 70-minute test runs were performed at the EUBOILER3 sampling location by passing flue gas through a heated glass-lined probe, Teflon filter, and into a series of absorbing solutions. The filter collects particulate matter and halide salts, and the acidic and alkaline absorbing solutions collect the gaseous hydrogen halides (HCl) and halogens, respectively. Figure 4-5 depicts the EPA Method 26 sample apparatus.

Figure 4-5. USEPA Method 26 Sample Apparatus



After charging the impingers, assembling the apparatus, and completing a leak check, the sample probe is inserted into the sampling port. Ice is placed around the impingers and upon achieving probe and filter temperatures between 248°F and 273°F, sampling begins. During the run, the probe and filter temperatures are maintained and dry gas meter (DGM) volume, impinger outlet temperature and sample apparatus vacuum are documented. After the minimum 120 liter sample volume requirement is met, the sample apparatus is withdrawn from the sample port and leak checked.

The sample probe, filter and impinger apparatus are then disassociated and transported to the recovery area where the filter is removed from the filter housing and discarded. The probe liner and front half of the filter housing is rinsed with deionized water to remove particulate matter and the rinsate is discarded. The acidic and alkaline impinger contents are transferred to separate, labeled, amber glass sample containers and the impingers are triple rinsed with DI water with the rinsate captured in the appropriate sample container.

The sample, reagent and DI water blank collection time, date and analysis parameters required were noted on a laboratory chain of custody form throughout the test event, as were the PA sample and paper work provided by the AASP. Upon completion of the test event, the PA was packaged and shipped with the collected HCl sample fractions via courier to the Consumers Energy Laboratory Services facility in Jackson Michigan. At the laboratory, the same analyst conducting the HCl sample analysis performed the PA sample analysis, using the same analytical reagents and analytical system, at the same time as the compliance samples.

Following QA verification, the laboratory submitted PA value successfully met the ± 10% fixed acceptance limit criteria for the specific HCl audit concentration requested for the Unit 3 test event. The reported and assigned HCl value is presented in the following table, along with the allowable acceptance limits.

Summary of Stationary Source Audit Program Test Method Performance Audit Results

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation
1770	Hydrogen Chloride	mg/L	53.7	54.2	48.8 – 59.6	Acceptable

5.0 TEST RESULTS AND DISCUSSION

The HCl test program was performed to satisfy the initial performance test requirements in 40 CFR 63, Subpart UUUUU, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units* (MATS Rule) as incorporated in the MDEQ ROP MI-ROP-B2835-2013a , and to verify compliance with the 2.0E-03 HCl lb/mmBtu MATS Rule limit specified in Table 2, *Emission Limits for Existing EGU's.* As noted earlier, the test result comparisons relative to the MATS Rule HCl emission limit are shown in Table 2-2, which verifies Unit 3 is in compliance with the MATS HCl emission rate limit of 2.0E-03 lb/mmBtu.

5.1 VARIATIONS AND UPSET CONDITIONS

No sampling procedure or results affecting boiler operating condition variations were encountered during the test program. The process and control equipment were operating under routine conditions and no upsets were encountered.

5.2 Air Pollution Control Device Maintenance

The SDA control system is currently in the final stages of initial testing and optimization, but was operated throughout the HCl test to ensure flue gas characteristics reflective of normal SDA operations. Optimization of the air pollution control devices is a continuous process to ensure compliance with regulatory emission limits.

5.3 Quality Control Procedures

The EPA reference methods performed state reliable results are obtained by persons equipped with a thorough knowledge of the techniques associated with each method. To that end, 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 are included in this test program.

5.3.1 QC Checklists and Control Limits

A summary of primary QC checks and control limits are provided in Table 5-1.

Table 5-1
QC Procedures

QC Specification	Purpose	Procedure	Frequency	Acceptance Criteria
M1: Sampling Location	Evaluate if the sampling location is suitable for sampling	Measure distance from ports to downstream and upstream disturbance	Pre-test	≤2 diameters downstream; ≤0.5 diameter upstream.
M1: Duct diameter	Verify area of stack is accurately measured	Review as-built drawings and field measurement	Pre-test	Field measurement agreement with as-built drawings
M3A: Calibration gas standards	Ensure accurate calibration standards	Traceability protocol of calibration gases	Pre-test	Calibration gas uncertainty ≤2.0%
M3A: Calibration Error	Evaluates operation of analyzers	Calibration gases introduces directly into analyzers	Pre-test	±2% of the calibration span
M3A: System Bias and Analyzer Drift	Evaluates ability of sampling system to delivery stack gas to analyzers	Cal gases introduced at sample probe tip, heated sample line, and into analyzers	Pre-test and Post-test	±5% of the analyzer calibration span for bias and ±3% of analyzer calibration span for drift

Table 5-1
QC Procedures

QC Specification	Purpose	Procedure	Frequency	Acceptance Criteria
M3: Single point grab sample	Ensure representative sample collection	Insert probe into stack and purge sample system	Pre-test	Collect sample no closer to the stack walls than 1.0 meter
M26: Apparatus Temperature within ≥248°F and ≤273°F	Ensures purge of acid gases in glass probe liner and Teflon filter	Set probe & filter heat controller to ≥248°F	Verify prior to and during each run	Apparatus temperature must be ≥248°F and ≤ 273°F
M26: sample rate	Ensure representative sample collection	Calculate rate based on volume collected	During and post-test	Target sample rate is ~ 2 liters/minute
M26: sample volume	Ensure sufficient sample volume is collected	Record pre- and post-test DGM volume reading	Post test	120 liters minimum requirement
M26: post-test leak check	Evaluate if the collected sample was affected by leak	Cap sample train; monitor DGM	Pre-test optional, post-test mandatory	Leak rate ≤ 2% of the average sample rate
M26: post-test meter audit	Evaluates accurate measurement equipment for sample volume	Calibrate DGM pre- and post-test; compare calibration factors (Y)	Pre-test Post-test	±5 %

5.3.2 Dry Gas Meter QA/QC Checks

Table 5-2 summarizes the dry-gas meter calibration checks in comparison to the acceptable EPA tolerance. Refer to Appendix E for complete DGM calibrations.

Table 5-2
Dry-Gas Meter Calibration QA/QC Audit

Dry-Gas Meter	Pre-test DGM Calibration Factor (Y) (dimensionless)	Post-Test DGM Calibration Check Value (Y_{qa}) (dimensionless)	Difference Between Pre-and Post-test DGM Calibration (%)	Acceptable Tolerance (%)	Performance Evaluation
2039	1.003	0.998	0.47	5	Acceptable

5.3.3 Thermocouple QA/QC Checks

Thermocouple temperature calibrations were conducted following *Alternative Method 2 Thermocouple Calibration Procedure ALT-011.* ALT-011 describes the inherent accuracy and precision of the thermocouple within ±1.3°F in the range of -32°F and 2500°F and states that a system that performs accurately at one temperature is expected to behave similarly at other temperatures. Therefore, the two-point calibration described in Method 2 may be replaced with a single point calibration procedure that verifies the thermocouple and reference thermometers shall agree to within ±2.0°F, while taking into account the presence of disconnected wire junctions, other loose connections or a potential miscalibrated temperature display. Thermocouple calibration data is presented with the Dry Gas Meter Calibration Data in Appendix E of this report.

5.3.4 Oxygen and Carbon Dioxide Analyzer Calibration Gases

The Method 3A sampling apparatus described in Section 4.1.3 were audited for measurement accuracy and data reliability using the calibration gas cylinders, parameters and concentrations in the table below. The instrument QA/QC calibration error, drift and system bias information is contained in Appendix E.

Table 5-3
Calibration Gas Cylinder Information

Parameter	Gas Vendor	Cylinder Serial Number	Cylinder Value (%)	Expiration Date
N_2	Airgas	EB0013140	99.9995	2/18/2023
O_2	Airgas	CC159768	9.030	3/8/2024
CO_2			9.985	
O_2	Airgas	CC220123	20.11	1/5/2023
CO_2			19.04	

CERTIFICATION

I hereby certify the statements and information in this test report and supporting enclosures are true, accurate, and complete, and the test program was performed in accordance with test methods specified in this report.

Brian C. Pape, QSTI
Senior Engineering Technical Analyst Lead
Laboratory Services – Regulatory Compliance Testing Section

Report prepared by:

Joe Mason, QSTI
Senior Engineering Technical Analyst
Laboratory Services – Regulatory Compliance Testing Section

Report reviewed by:

Kathryn Cunningham
Senior Engineer II
Environmental Services – Air Quality Section

Table

JH Campbell Generation Station SUMMARY OF EUBOILER3 HCl RESULTS August 30, 2016										
RUN No.	Test Location	O_2, Percent, Dry	CO_2, Percent, Dry	Hydrogen Chloride Concentration, (mg [1])	Hydrogen Chloride Concentration, (ppm)	Hydrogen Chloride Emission Rate, (lb/mmBtu)	MATS Rule HCl Limit, (lb/mmBtu)	Unit 3 Operating Load (MW)	Unit 3 Heat Input (MBtu/hr)	Unit 3 Fuel Factor (Btu/scfh)
1	Unit 3 Exhaust Duct	5.29	14.42	0.0178	0.09	1.13E-04	2.00E-03	863	7,747.8	1,840
2	Unit 3 Exhaust Duct	5.32	14.38	0.0252	0.13	1.61E-04	2.00E-03	864	7,179.9	1,840
3	Unit 3 Exhaust Duct	5.32	14.37	0.0227	0.12	1.45E-04	2.00E-03	863	8,273.1	1,840
	Average	5.31	14.39	0.0219	0.12	1.40E-04	2.00E-03	863	7,733.6	1,840

[1] The milligram HCl concentrations reported by the laboratory were not detected at the quantitation limit. Therefore, the reported quantitation limit for each run was used for determining the HCl emission rates