

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: Scheduled Inspection

N652139443

FACILITY: Consumers Energy Co. - Zeeland Generating Station		SRN / ID: N6521
LOCATION: 425 Fairview Rd., ZEELAND		DISTRICT: Grand Rapids
CITY: ZEELAND		COUNTY: OTTAWA
CONTACT: J. Homer Manning III , Environmental Health & Safety Specialist		ACTIVITY DATE: 04/21/2017
STAFF: Steve Lachance	COMPLIANCE STATUS: Compliance	SOURCE CLASS: MAJOR
SUBJECT: Unannounced, Scheduled Inspection for Full Compliance Evaluation (FCE) for FY '017 - see CA_N652139443 (SLachance, 4/24/17)		
RESOLVED COMPLAINTS:		

This was an unannounced scheduled inspection. SLachance and CRobinson of this office arrived at the facility at about 10 AM, Friday, April 21, 2017. SL announced the intent to conduct an Air Quality Inspection of the facility to site contact, Mr. J. Homer Manning, III. Mr. Manning then provided all requested records and accompanied staff on a physical tour of the facility.

Weather conditions were humid, about 44 degrees F, and raw, with NW winds over 10 mph.

While no visible emissions (stacks or fugitives) or malodors were noted upon approaching the site, it was noted that a condensed water vapor plume from the cooling towers was being blown across Washington Street at ground level. The road was closed (in coordination with the City of Zeeland) at this time due to the lack of visibility on this roadway.

Mr. Manning confirmed that only combined cycle operations (Units 2A, 2B) were in operation; the simple cycle units (1A, 1B) were idle. Mr. Manning reported no operational issues at this time.

The facility had completed Relative Accuracy Test Audits (RATAs) of each CEMS in place earlier in the week. Draft results indicated that each system "Passed" these requirements. Moreover, each system had "Passed" the day's required calibrations (see attached) and so all CEMS values reviewed during the inspection are considered to be valid at this time.

Facility Contacts include Mr. Manning (616-237-4004; jhmanning@cmsenergy.com) and Plant Manager Mr. Loren Barnes (616-237-4001).

FACILITY DESCRIPTION

The Consumers Energy - Zeeland Generating Station, gas-fired power plant is located in Zeeland, Ottawa County, Michigan. The plant is a natural gas-fired electrical generation facility with a total of four units consisting of two combustion turbines operating in simple-cycle mode; and two combustion turbines, two duct burners and a steam generator collectively operating in combined cycle mode. Total output for the facility is about 800 megawatts. Support equipment for the facility includes two gas-fired auxiliary boilers and a 2.6 million Btu natural gas fired emergency generator.

Each of the four General Electric 7FA combustion turbines is equipped with dry low-NOx combustor systems. Nitrogen oxide (NOx) emissions from the turbines operating in combined cycle are controlled by Selective Catalytic Reduction (SCR) devices, using aqueous ammonia as the reactant. Emissions from each turbine are monitored by Continuous Emissions Monitoring Systems (CEMS) for carbon monoxide and nitrogen oxides.

The stationary source is subject to 40 CFR Part 70 because the potential to emit (PTE) for carbon monoxide, nitrogen oxides, PM-10 and volatile organic compounds exceeds 100 tons. The facility is an Area Source of HAPs based on restrictions on Formaldehyde emissions in the permit.

The stationary source is subject to Prevention of Significant Deterioration (PSD) (40 CFR 52.21) regulations because the stationary source has the potential to emit of carbon monoxide, nitrogen oxides, PM-10 and volatile organic compounds greater than 250 tons per year. In addition to PSD-required best available control technology (BACT), VOC emissions were evaluated relative to Rule 702. Emissions of individual toxic air contaminants (formaldehyde, ammonia) were evaluated relative to Michigan's Air Toxic regulations per Rule 224 and 225.

The stationary source is subject to Standards of Performance for New Stationary Sources (New Source Performance Standards (NSPS)) for the gas turbines and duct burners promulgated in 40 CFR Part 60 Subparts A, Da and GG. Certain requirements (monitoring for nitrogen content of natural gas, NOx monitoring method, NOx emission limit, sulfur content of gas, sulfur dioxide initial performance testing) were streamlined in MI-ROP-N6521-2015, based on other, more stringent applicable requirements (i.e. BACT, CEMS, use of pipeline quality natural gas). Streamlined requirements have been identified in Tables FGSIMPLECYCLE and FGCOMBINEDCYCLE of the Renewable Operating Permit (ROP). All required NSPS initial performance testing has been completed. Testing requirements in the ROP pertain to ongoing and future testing.

The stationary source has several emission units (each turbine) subject to the federal Acid Rain program promulgated in 40 CFR Part 72. The facility's Acid Rain Permit is attached to the ROP as Appendix 9.

The stationary source has several emission units (each turbine) subject to the Cross-State Air Pollution Rule (CSAPR) and associated budgeting and permitting. These permits are appended to MI-ROP-N6521-2015a as Appendix 10.

COMPLIANCE EVALUATION

As a Full Compliance Evaluation of this major source (criteria pollutants), the final compliance determination is determined based on review of all required reports and field activities (including this site evaluation) in the last year. See the attached FCE Summary Report that accompanies this report.

The inspection began with an Entrance Interview with Mr. Manning. The following items were discussed:

***Calibration Reports for each CEMS passed this day. See attached.

***Each CEMS for each of the four turbine units "passed" the required RATA earlier this week. Final report pending.

***At the time of each RATA, required Visible Emissions readings were completed. SL viewed the Method 9 Data Sheets for each test; all indicated "0%" opacity at all times.

***No excess emissions were identified or reported for 2016 (quarterly, semi-annual and annual reporting.)

***On a side note, SLachance suggested that non-excludable monitor downtime always be included as a reportable, semi-annual deviation. Both Mr. Manning and Mr. Barnes (checking in on the discussion and inspection) indicated that each instance is carefully evaluated internally and by technical staff in Jackson for Consumers. They will verify the appropriateness of (non-)identification of occasional monitor downtime as deviation(s).

***The required quarterly reporting for Q1 2017 (currently in draft form) indicates no excess emissions for that period.

***Mr. Manning indicated no excess emissions to date in April 2017.

***No operational issues this day, with only combined cycle operations.

***Semi-annual sampling and analysis of the natural gas consumed on-site, per Appendix 3.2, most recently completed in March 2017, indicated <0.5 ppm sulfur-in-gas (pipeline quality natural gas, from the original supplier for the site.)

***Quarterly operating hours (Q1 2017) for Simple Cycle Units 1A and 1B are low (135 and 155 hours, respectively.) See attached Monthly Emissions Summary data accumulation for UNIT1A and UNIT1B for Q1 2017.

***SL requested and received Hourly Averaging Reports for Combined Cycle Operations for the preceding two days (April 19 and 20, 2017.) See attached Average Data Reports for UNIT2A and UNIT2B for this time period. These reports are the basis for much of the facility's records and emissions estimating. Note that the basis for estimating emissions is heat input for each operating hour/day as well as corresponding CEMS values for NOx and CO {ppmc}; or most recent stack test results for PM, VOC and HCHO.

***The last round of stack tests was in 2013; SL requested and reviewed this December 10, 2013 report and confirmed the Emissions Factors presented in MAERS (and used for developing emissions records) as being derived from these tests. The next round of tests will be in the fall of 2018.

***Daily reports are compiled into Monthly and 12-Month Rolling Average Data Reports. See attached for each unit. In addition to emissions, these also total/track startup and shutdown hours for each unit, as required by the permit.

The inspection continued with a tour including Unit 2A CEMS shelter; maintenance garage; an overview of Phase 1 turbine operations; access to the emergency engine; and finishing in the facility's Control Room.

FGSIMPLECYCLE

FGSIMPLECYCLE includes two General Electric model 7Fa natural-gas-fired combustion turbines which operate in simple cycle mode and are referred to 1A and 1B or Phase 1. They are equipped with a dry-low-NOx combustor and generate approximately 170 MW each of electric power. The units fire only pipeline quality natural gas. In simple-cycle operation the compressed gas is ignited and the heat energy is converted into shaft rotation. The information provided appears compliant with Appendix 3.2, and the Custom Fuel Monitoring Program (CFMP) required by 40 CFR Part 60 Subpart GG.

I. Emission Limits; FGSIMPLECYCLE

Not in operation at the time of this visit; "tpy" estimates are based on the most recent 12-month rolling time period records (through March 2017), which are attached.

Unit	Pollutant	Limit	Observed Value	Basis
EUGT1A	NOx	0.04 lb/mmBtu	---	CEMS; average of all operating hours in a day
		9.0 ppmv,c	---	CEMS; average of all operating hours in a day
		334.6 tpy	34.14	CEMS; 12-month rolling total
	PM10	10.8 pph	EF	Stack test
		47.3 tpy	2.34	Stack test and operating hours; 12-month rolling total
	CO	0.021 lb/mmBtu	---	CEMS; average of all operating hours in a day
		175.6 tpy	15.6	CEMS; 12-month rolling total
	VOC	5.8 pph	EF	Stack test
		25.4 tpy	0.8	Stack test and operating hours; 12-month rolling total
Opacity	10%	---	6-minute average; Method 9	

Unit	Pollutant	Limit	Observed Value	Basis
EUGT1B	NOx	0.04 lb/mmBtu	---	CEMS; average of all operating hours in a day
		9.0 ppmv,c	---	CEMS; average of all operating hours in a day
		334.6 tpy	28.8	CEMS; 12-month rolling total
	PM10	10.8 pph	EF	Stack test

	47.3 tpy	3.4	Stack test and operating hours; 12-month rolling total
CO	0.021 lb/mmBtu	---	CEMS; average of all operating hours in a day
	175.6 tpy	15.9	CEMS; 12-month rolling total
VOC	5.8 pph	EF	Stack test
	25.4 tpy	0.5	Stack test and operating hours; 12-month rolling total
Opacity	10%	---	6-minute average; Method 9

Note, the compiled emissions for NO_x and CO include all operations, even though the permit excludes emissions during startup, shutdown and malfunction. Startup and shutdown periods are precisely defined in the permit; normal operations require full firing of all fuel injection points.

II. Material Limits

Material limits for these units include the requirement for firing only pipeline quality natural gas with a 0.0006 lb/mmBtu sulfur content, equivalent to 0.2 grains total sulfur per 100 scf, or 3.4 ppm by volume. The facility only receives this type of gas pursuant to the CFMP in Appendix 3.2. The most recent sulfur content report (March 31, 2017) indicates a sulfur content of 0.5 ppm by volume.

III. Process/Operational Restrictions

Required startup, Shutdown and Malfunction Abatement Plans were readily available, reside in the Control Room and were last updated in May of 2014. The process and operational restrictions include operating pursuant to these plans and restrict hours of Startup and Shutdown. Startup hours are limited to 182 hours per turbine. Unit 1A has reported total startup hours of 23.99 on a 12-month rolling total through March 2017; while Unit 2A has reported total startup hours of 22.82 hours for the same period. Shutdown hours are limited to 85 hours per turbine. Unit 1A has reported total shutdown hours of 19.23 on a 12-month rolling total through March 2017, while Unit 2A has reported total shutdown hours of 19.83 hours for the same period.

IV. Design/Equipment Parameters

The process can not operate without the low NO_x burners, as they are integral to firing.

V. Testing/Sampling

The facility conducts visible emissions testing during each annual RATA and has provided the records to demonstrate this. The facility conducted the last required stack testing in October 2013; the next scheduled test is for the fall of 2018. Emission factors derived from past tests appear to be in appropriate use.

VI. Monitoring/Recordkeeping

The following non-CEMS monitoring was verified to be in place:

- ***Heat input (per gas flow)
- ***Log of startup and shutdown hours
- ***Documented sampling and analysis of sulfur content of natural gas utilized on-site
- ***Required visible emissions assessments

The CEMS monitor NO_x, CO and O₂ (diluent) for the simple cycle units. This is required both by Part 60 and Part 75. Due to the more stringent requirements, the facility operates them pursuant to Part 75 and that requirement subsumes the Part 60 regulation. Daily average emissions are taken on a continuous basis by the CEMS, and then the DAHS takes the information and converts it to the daily averages. This information is then calculated and recorded on a monthly and 12-month rolling time period. The attached reports demonstrate these records for CEMS-inception through presentation of 12-month rolling time period emissions.

VII. Reporting

As discussed above, the facility has met the reporting requirements of this permit. Each required report within the last year has been evaluated as part of this FCE.

VIII. Stack/Vent Restrictions

The stack height limits are based on design and modeling information provided during permitting and they have not changed since installation.

IX. Other Requirements

Other requirements pertain to the Acid Rain and Cross State Air Pollution Rule Permits in Appendices 9 and 10 of the ROP.

FGCOMBINEDCYCLE

FGCOMBINEDCYCLE includes two General Electric model 7FA combustion turbines, heat recovery steam generators (HRSG) with integral duct burners which operate in tandem in combined cycle mode and are referred to 2A and 2B or CC3 and CC4. A combined cycle unit operates like a simple-cycle unit with the addition of a HRSG. Following the turbine, the exhaust gases flow through the HRSG, which is supplementally fired with a duct burner. The exhaust is cooled by heating high pressure water from a liquid at ambient temperature up to a temperature where the fluid becomes superheated steam. The steam is supplied to a steam generator, condensed to a liquid state, recovered, and pumped along with make-up water through the HRSG again. The units fire only pipeline quality natural gas. The information provided appears compliant with Appendix 3.2 and the CFMP required by 40 CFR Part 60 Subpart GG.

I. Emission Limits;

FGCOMBINEDCYCLE

Unit	Pollutant	Limit	Observed Value	Basis
EUGT2A (w/ or w/o duct burner)	SO2	0.20 lb/mmBtu	Verified	Use of pipeline quality natural gas; applies to duct burner only
	NOx	0.013 lb/mmBtu	0.009	CEMS; average of all operating hours in a day
		3.5 ppmv,c	2.6	CEMS; average of all operating hours in a day
		119.6 tpy	60.4	CEMS; 12-month rolling total
	PM10	14.7 pph	EF	Stack test
		64.4 tpy	20.6	Stack test and operating hours; 12-month rolling total
		0.03 lb/mmBtu	EF	Stack test
	CO	0.042 lb/mmBtu	0.001	CEMS; average of all operating hours in a day
		238.0 tpy	36.3	CEMS; 12-month rolling total
	VOC	16.8 pph	EF	Stack test
		73.6 tpy	4.6	Stack test and operating hours; 12-month rolling total
	Opacity	10%	0%	6-minute average; Method 9



Unit	Pollutant	Limit	Observed Value	Basis
EUGT2B (w/ or w/o duct burner)	SO2	0.20 lb/mmBtu	Verified	Use of pipeline quality natural gas; applies to duct burner only
	NOx	0.013 lb/mmBtu	0.011	CEMS; average of all operating hours in a day
		3.5 ppmv,c	3.0	CEMS; average of all operating hours in a day
		119.6 tpy	65.0	CEMS; 12-month rolling total
	PM10	14.7 pph	EF	Stack test
		64.4 tpy	16.2	Stack test and operating hours; 12-month rolling total
		0.03 lb/mmBtu	EF	Stack test
	CO	0.042 lb/mmBtu	0.001	CEMS; average of all operating hours in a day
		238.0 tpy	41.8	CEMS; 12-month rolling total
	VOC	16.8 pph	EF	Stack test
		73.6 tpy	4.5	Stack test and operating hours; 12-month rolling total
	Opacity	10%	0%	6-minute average; Method 9

The above values are based on 12-Month Rolling Records through March 2017 and Control Room Observations on 4/21/17 (CO in #/mmBtu). See attached. At the time of these observations (a bit after 1 PM, 4/21/17), the units were operating at the following production rates:

***Unit 2A; 167 MW net

***Unit 2B; 168 MW net

***Combined Cycle Steam Turbine; 171 MW net

***Unit 2A Ammonia Slip; calculated per ammonia injection and reduction in NOx; 2.7 pph; limit is 27.1 pph

***Unit 2B Ammonia Slip; calculated per ammonia injection and reduction in NOx; 3.6 pph; limit is 27.1 pph

FORMALDEHYDE (HCHO)

Pollutant	Limit	Observed Value	Basis
HCHO	9.4 tpy	2.4	Stack test and records of operations; ALL COMBUSTION TURBINE OPERATIONS COMBINED

This estimate is based on stack test results from simple and combined cycle operations; and heat input into each method of operation; through the 12-month rolling period ending March 31, 2017.

Note, the compiled emissions for NOx and CO include all operations, even though the permit excludes emissions during startup, shutdown and malfunction. Startup and shutdown periods are precisely defined in the permit; normal operations require full firing of all fuel injection points.

II. Material Limits

Material limits for these units include the requirement for firing only pipeline quality natural gas with a 0.0006 lb/mmBtu sulfur content, equivalent to 0.2 grains total sulfur per 100 scf, or 3.4 ppm by volume. The facility only receives this type of gas pursuant to the CFMP in Appendix 3.2. The most recent sulfur content report indicated a sulfur content of 0.5 ppm by volume.

III. Process/Operational Restrictions

Each unit is equipped with Selective Catalytic Reduction utilizing aqueous ammonia injection for control of NOx. The process and operational restrictions include operating pursuant to the SSMP (discussed above) and restricts hours of Startup and Shutdown.

Records indicate the following for the 12-month rolling period ending March 31, 2017:

Cold Start Hours (limit = 564); Unit 2A = 21.33; Unit 2B = 19.95
Warm Start Hours (limit = 456); Unit 2A = 46.41; Unit 2B = 41.02
Hot Start Hours (limit = 341); Unit 2A = 13.93; Unit 2B = 11.02
Shutdown (limit = 85); Unit 2A = 6.25; Unit 2B = 6.91

Each of these states is precisely defined in the permit.

Operations at 60% load or less are flagged; the permit limits simultaneous operation of the Phase 2 turbines in this condition to 16 continuous hours. No such periods were identified for 2017, the facility is aware of the emissions implications of operating at these load conditions.

IV. Design/Equipment Parameters

The process can not operate without the low NO_x burners, as they are integral to firing, and each system is equipped with SCR. Operation of the SCR appears to be sufficient in that the ppmc limit for NO_x was being achieved. In the Unit 2A CEMS Shelter, SL noted the following NO_x reduction:

2.6 ppm outlet NO_x; 10.8 ppm inlet NO_x; $\{(10.8 - 2.6)/10.8\} * 100\% = 76\%$ reduction of NO_x.

V. Testing/Sampling

As discussed above, the facility conducts visible emissions testing and stack testing in accordance with the permit. Latest Method 9 results from earlier in the week indicate "No" visible emissions. The facility last stack testing October 8, 2013; appropriate emissions factors are being used for mass emissions estimates. The next scheduled stack test will be in the fall of 2018.

VI. Monitoring/Recordkeeping

As discussed above, the following non-CEMS monitoring was verified to be in place:

***Heat input (per gas flow)

***Log of startup and shutdown hours

***Documented sampling and analysis of sulfur content of natural gas utilized on-site

***Required visible emissions assessments

The CEMS monitor NO_x, CO and O₂ (diluent) for the simple cycle units. This is required both by Part 60 and Part 75. Due to the more stringent requirements, the facility operates them pursuant to Part 75 and that requirement subsumes the Part 60 regulation. Daily average emissions are taken on a continuous basis by the CEMS, and then the DAHS takes the information and converts it to the daily averages. This information is then calculated and recorded on a monthly and 12-month rolling time period. The attached reports demonstrate these records for CEMS-inception through presentation of 12-month rolling time period emissions

The facility is required to calculate ammonia slip for each unit. This is conducted using the calculations provided and agreed upon located in Appendix 7 of the ROP.

VII. Reporting

The facility has met the reporting requirements of this permit.

VIII. Stack/Vent Restrictions

The stack height limits are based on design and modeling information provided during permitting and they have not changed since installation.

IX. Other Requirements

Other requirements pertain to the Acid Rain and CSAPR Permits in Appendices 9 and 10 of the ROP.

FGPARTSWASHERS

At the time of the inspection, there was one parts washer present at the facility's maintenance garage. It was observed to be closed while not in use, and operating procedures were properly posted at the machine's location. No heating or agitation is involved, and the unit is physically small enough (2' X 3') so as to qualify for exemption per Rule 281(2)(h). The facility uses a very limited amount of "ZEP 143" solvent, which is used at other Consumers' locations; it is basically mineral spirits (non-halogenated.)

FGRICEMACT

The facility has a compression ignition (diesel-fired) Reciprocating Internal Combustion Engine (RICE) for emergency/fire pump purposes. It is on the required RICE maintenance plan; in fact, service is performed annually as opposed to every 500 hours of service. The engine is equipped with a non-resettable hour meter, and has accumulated 58.5 hours of service (less than 2 hours per month) since the meter was required in 2013.

NON-APPLICABLE REQUIREMENTS

At the time of the ROP issuance, the AQD has determined that the facility is not subject to Part 11 Rules as they are not fossil fuel-fired steam generators as detailed in Section E of the ROP.

EVALUATION SUMMARY

Based on the information received and data reviewed, the facility appeared to be in compliance at the time of the inspection.

Attachments

- A CEMS Calibration Reports for April 21, 2017
- B Monthly Emissions Summary (Includes Operating Hours) for UNIT1A, UNIT1B, Q1 2017
- C Average Data Reports, Hourly for April 19 and 20, Units 2A and 2B
- D Average Data Reports, 12-month rolling period through March 31, 2017 for each unit
- E Control Room Report, 4/21/17 (Ammonia slip and CO in #/mmBtu) for Units 2A and 2B

NAME



DATE

4/25/17

SUPERVISOR

