

DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR QUALITY DIVISION  
ACTIVITY REPORT: On-site Inspection

B652769229

FACILITY: Midland Cogeneration Venture		SRN / ID: B6527
LOCATION: 100 E. Progress Place, MIDLAND		DISTRICT: Bay City
CITY: MIDLAND		COUNTY: MIDLAND
CONTACT: Chad Elrod, Environmental Lead		ACTIVITY DATE: 08/30/2023
STAFF: Benjamin Witkopp	COMPLIANCE STATUS: Compliance	SOURCE CLASS: MAJOR
SUBJECT: Facility Inspection		
RESOLVED COMPLAINTS:		

On August 30, 2023, Ben Witkopp of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) - Air Quality Division (AQD) conducted an inspection of Midland Cogeneration Venture (MCV) located in Midland Michigan. The site had recently been purchased by Capital Power headquartered in Canada. I met with Chad Elrod of MCV. The previous contact was Jim Lazzaro. Jim was the lead technician responsible for overseeing the facility's continuous emission monitoring (CEM) equipment and has been given the additional responsibility of dealing with chemistry aspects of the site. Chad previously dealt with the site warehousing, waste, and chemistry issues. He is now responsible for the site's environmental issues. He had not dealt with AQD on air related issues prior to his position change.

MCV operates 12 natural gas fueled combined cycle turbines, with a net facility electrical output of greater than 1550 megawatts (MW). The twelve gas turbines (GTs) are equipped with heat recovery steam generators (HRSGs) with a combined steam capacity of 1,200,000 lbs/hr. GTs 9-14 are equipped with duct burners (DBs) for supplemental firing each unit with a maximum heat input capacity of 249 million British thermal units per hour (MMBtu/hr). The gas turbines are also equipped with a fogging system to reduce inlet air temperature during the warm weather season. The fogging system usually operates at temperatures above 88 degrees Fahrenheit and relative humidity above 55%. Nitrogen Oxide (NOx) emissions from GT 3-11, 13, 14 are controlled using steam injection. NOx emissions from GT 12 are controlled using a dry low NOx burner. GT 12 is essentially unlike the other units and is operated as the workhorse of the units.

The facility also operates 6 natural gas fired boilers, each with a heat capacity of 370 MMBtu/hr. The boilers are capable of supplying 250,000 pounds per hour (lb/hr) of steam used to generate electricity and for purchase by process steam customers located near the facility. Chad confirmed that two of the six boilers (boilers 5 and 6) have questionable operating status.

The remaining equipment consists of a diesel generator and a cold cleaner. The diesel generator had been permitted on June 16, 2022, via permit to install 80-22. The unit is dual fuel fired which can operate on natural gas or diesel fuel. It has a maximum rated capacity of 7,385 horsepower. It is intended to be able to operate as both a black start (using diesel) and as a peaking unit (using natural gas). It had not commenced operation yet. Notifications and subsequent post-commencement operation stack testing have yet to occur. The cold cleaner has limited use. An outside firm provides maintenance service. It removes spent solvents and provides additional solvent if needed.

Records were spot checked to verify compliance with permit limits. It should be noted the various pieces of equipment typically contain requirements to track fuel usage though there is no limit. The records are being kept and the information is used in calculating fuel-based emissions e.g. pounds per MMBTU.

## **TURBINE 12**

The unit is different from other turbines used by MCV in that it is equipped with dry low NOx burners. As such it has separate limits and conditions. It does have a fogging system, like the other turbines, to reduce inlet air temperatures. The fogging systems are usually used as temperatures near the 90-degree Fahrenheit mark and humidity levels above 55%.

NOx limits cover a variety of operational stages. There is a one-hour average of 98 pounds. Each startup is limited to 400 pounds while each shutdown is limited to 200 pounds. There is also a fuel-based limit of 0.10 pounds per MMBTU during ozone season as well as for the calendar year. Lastly there is NOx limit of 429.2 tons per year based on a 12-month rolling time period.

Typical operating conditions produced less than 60 to 80 pounds per hour of NOx. The fuel-based limits were found to have a high of 0.09 pounds per MMBTU which occurred during ozone season. The latest calendar year value was 0.0783 pounds per MMBTU. Both of these values are below the established limits. The latest 12 month rolling total of NOx emissions was 331.2 tons which is less than the limit. The values during startup / shutdown were 132 and 151 pounds per hour respectively. Anything over the one-hour average limit of 98 pounds is internally evaluated for startup / shutdown status.

The unit also has a limit on carbon monoxide (CO) of 26 pounds per hour. There is basically very little CO emitted from the unit.

Lastly there is a restriction on MCVs system wide use of foggers. The limit is 20,400 hours on a 12-month rolling time period. The records indicated a total of 9,488 hours.

#### **TURBINE 12 (with duct burner)**

The pollutants limited are the same as those presented above. However, to account for use of the duct burner the limits are set higher.

The one-hour average limit rises to 122.9 pounds of NOx. The fuel-based limit of 0.10 pounds per MMBTU during ozone season as well as for the calendar year remains the same. NOx limit per year based on a 12-month rolling time period increases to 538.3 tons.

The unit's limit on CO increases to 60.9 pounds per hour. There is an additional limit on CO of 266.8 tons per year based on a 12-month rolling time period. There is basically very little CO emitted from the unit.

Even though the limits are increased to account of the duct burner, the emissions remain less than the limits for the unit running without the duct burner. The closest one was NOx rising to the mid 80 pounds per hour which was still lower than the limit for running without the duct burner. CO emissions per year based on a 12-month rolling time period were only 19.7 tons.

Testing is also routinely conducted on the natural gas being burned in the unit. Total sulfur is less than 1.0 ppmw and less than 0.032 gr per 100 cubic feet. The limit is 0.2 gr per 100 cubic feet.

There are also visible emissions reading limits and requirements. The limits are 10% during normal operation and 20% during startup, shutdown, and malfunction. Once every three months readings are to be conducted during normal operations. Readings for startup, shutdown, or malfunction are to be taken at least once per year. Readings were recorded for operation with and without duct burner activity. The readings were zero percent. Startup, shutdown, or malfunction readings had yet to be conducted.

#### **SITE TURBINES**

The site has turbines 3 through 14 (excluding 12) which use steam injection for NOx control but, like unit 12, have a fogging system in place to lower inlet air temperatures during periods of warm weather.

NOx limits cover a variety of operational stages. There is a one hour average of 159 pounds. Each startup is limited to 1,500 pounds while each shutdown is limited to 750 pounds. There is also a fuel based limit

of 0.149 pounds per MMBTU during ozone season as well as for the calendar year. Lastly there is NOx limit of 697 tons per year based on a 12 month rolling time period.

Typical running conditions resulted in 125 pounds or less of NOx per hour. The fuel-based limits were found to have a high of 0.094 pounds per MMBTU (unit 3) during ozone season. The latest 12-month value was 0.0966 pounds per MMBTU (unit 4). Both values are below the established limits. The highest and latest 12 month rolling total of NOx emissions was 328.9 tons (unit 8) which is less than the limit. The highest value during startup was 695 pounds per hour (unit 4). The highest value for a shutdown was 404 pounds per hour (unit 10).

The units also have a limit on CO of 26 pounds per hour. There is basically very little CO from the units.

There is a restriction on use of foggers for Site Turbines (excluding unit 12). The limit is 18,700 hours on a 12-month rolling time period. The records for 2020 indicated a total of 11,778 hours and that is even with unit 12 included.

Testing is also routinely conducted on the natural gas being burned in the units. The sulfur content limit is 0.2 gr per 100 cubic feet. Total sulfur is less than 1.0 ppmw and less than 0.032 gr per 100 cubic feet.

There are also visible emissions reading limits and requirements. The limits are 10% during normal operation and 20% during startup, shutdown, and malfunction. Readings are to be conducted once every three months during normal operations. Readings for startup, shutdown, or malfunction are to be taken at least once per year. Readings were conducted for operation without duct burner activity. Readings were zero percent during such operation. Readings for startup, shutdown, or malfunction are performed on a scheduled basis. The highest reading was 5 percent. It occurred on units 9 and 10. Readings were typically 5 to 10 percent on other units. Readings for startup, shutdown, or malfunction had yet to be conducted for units 11, 12, and 14.

Lastly, the facility is required to track the number of startups and shutdowns on a monthly and rolling 12-month basis. However, there is no limit on the number of startups and shutdowns. The highest number of startups was 166 and was for unit 9. Keep in mind for each startup there is a corresponding shutdown.

## **DUCT BURNERS**

The facility is required to track and record the fuel combusted each day for each duct burner. The information is used to calculate the capacity factor which is determined on a 12-month rolling average basis. The highest capacity factor was found to be 13 percent and was from unit 12. The lowest amount from any duct burner equipped unit ten percent.

#### **SITE TURBINES (with duct burners)**

Only units 9, 10, 11, 13, and 14 are equipped with duct burners. Though unit 12 also has a duct burner, it has its own set of conditions as presented above. The discussion here is similar to that previously presented for unit 12 as the emissions situation is comparable.

The pollutants limited are the same as those for the site turbines. To account for use of the duct burner the limits are higher.

The one hour average limit rises to 183.9 pounds of NO<sub>x</sub>. The fuel based limit of 0.149 pounds per MMBTU during ozone season as well as for the calendar year remains the same. NO<sub>x</sub> limit per year based on a 12 month rolling time period increases to 806.1 tons.

The units limit on CO increases to 246.0 pounds per hour. The limit is for each turbine and duct burner set. There is an added limit on CO limit of 266.8 tons per year based on a 12 month rolling time period. There is basically very little CO emitted from the turbines themselves. CO does increase when duct burners are being fired.

Even though the limits are increased to account for duct burners, the emissions remain less than the limits for the units running without the duct burner. The closest one was NO<sub>x</sub> from unit 13 rising to 113 pounds per hour which was still lower than even the limit of 159 for running without the duct burner. CO emissions per year based on a 12-month rolling time period were up to 135.2 tons. That amount was from unit 11 and is less than half of the limit. The lowest amount of CO came from unit 10 which emitted 113.9 tons per year based on a 12-month rolling time period.

Testing is also routinely conducted on the natural gas being burned in the units. The sulfur content limit is 0.2 gr per 100 cubic feet. Total sulfur is less than 1.0 ppmw and less than 0.032 gr per 100 cubic feet.

There are also visible emissions reading limits and requirements. The limits are 10% during normal operation and 20% during startup, shutdown, and malfunction. Readings are to be conducted once every three months during normal operations. Readings for startup, shutdown, or malfunction are to be taken at least once per year.

Readings were indeed conducted for operation with duct burner activity. The readings were five percent. Bear in mind the actual requirement is to conduct the readings on each turbine "operating alone or in conjunction with the respective duct burner." Since the readings were already taken when the turbines were operating alone (see Site Turbines above), the readings taken in conjunction with the duct burners were above and beyond actual requirements.

## **BOILERS**

The facility has six boilers. For tracking purposes boilers one through six correspond to being identified as units 16 through 21 in MCVs records. Boilers 1-3 (units 16-18) are the ones that are used the most. Usage depends upon the price structure of generating steam via the boilers or the gas turbines that are equipped with heat recovery steam generators. The boilers have limits on particulate matter (PM), PM10, SO<sub>2</sub>, NO<sub>x</sub>, CO, volatile organic compounds (VOCs) and visible emissions. Given the boilers are gas fired, the permit has a "testing may be required" provision for PM, PM10, and VOC. The boilers have continuous emissions monitors for NO<sub>x</sub> and CO. The SO<sub>2</sub> limits which are met by using pipeline quality natural gas. Testing is also routinely conducted on the gas. Total sulfur is less than 1.0 ppmw and less than 0.032 gr per 100 cubic feet. The limit is 0.2 gr per 100 cubic feet.

NO<sub>x</sub> has limits of 0.037 lbs per MMBTU and 13.7 pph both based on a 24 hour time period as determined at the end of each calendar day. They also have a NO<sub>x</sub> limit of 0.2 lbs per MMbtu based on a 30 day rolling average.

The lbs of NO<sub>x</sub> per MMBTU from the boilers were usually 0.033 on a daily basis. The typical pph of NO<sub>x</sub> was less than 4 with the highest being 4.24 from boiler 1. The highest 30-day rolling average was 0.035 lbs per MMBTU and was from boiler 4. The values comply with permit limits.

CO has a limit of 50 ppm by volume corrected to 3% oxygen and a limit of 21.6 pph based on a 24 hour time period as determined at the end of each calendar day. The highest ppm CO was from boiler 4 with 19.2. The highest pph CO came from boiler 4 at 0.94. The values comply with permit limits.

The boilers have a 10% opacity limit. A certified visible emission (VE) reading is to be conducted during normal operation once every three months per permit conditions. Records indicated the VEs were conducted, and the readings were zero.

There is an operational restriction of 370 MMBTU per hour for the boilers and records indicated it was not exceeded.

**CONCLUSION**

The facility is deemed to be in compliance.

NAME B. Rich

DATE 9/26/23

SUPERVISOR C. Kase