TREATMENT SYSTEM OPERATING PLAN
PREVENTATIVE MAINTENANCE PLAN

Central Generating Station
Montcalm County, Michigan

1. Purpose

North American-Central, LLC (NANR) (owned by Kinder Morgan) prepared this Treatment System Operating Plan (TSOP) and Preventative Maintenance Plan (PMP) to ensure proper monitoring and operation of the facility and gas treatment system and to comply with the requirements to maintain a site-specific treatment system monitoring plan as specified in 40 CFR Part 62, Subpart OOO and 40 CFR Part 63, Subpart AAAA

2. Responsible Personnel

The personnel responsible for overseeing the inspection, maintenance, and repair of the equipment and process identified in this Plan are:

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Operations Supervisor
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3. Equipment Identification

The NANR renewable energy facility primarily consists of:

- Gas treatment equipment
- One (1) CAT G3516 lean-burn engine-generator set
- Two (2) CAT G3520C lean-burn engine-generator sets

NANR maintains a stock of long-lead time or hard to obtain replacement parts for the electric generating units and for the treated landfill gas (LFG) fueled engines. The part list is balanced against the requirement given NANR's long-term engine maintenance program following practices in the industry.

Michigan Caterpillar also stocks a list of parts as required by the various LFG-to-energy power producers in the state of Michigan. Additionally, NANR works in concert at the operator level to network with other likely situated companies to exchange parts when required.

4. Gas Treatment System Operation

The gas received from the Central Sanitary Landfill (Central Landfill) is initially de-watered in knockout tanks that are located upstream of the NANR gas treatment system where a portion of the condensate in the LFG is removed. After the initial knockout de-watering, the LFG is treated in equipment and processes operated by NANR that consist of:

1. A scrubber / filtration vessel that contains a wire-mesh filter which is designed to remove particles in the gas stream that are 10 microns or larger. Condensate collected by the scrubber collects in the bottom of vessel where it is transferred by gravity sump back to the landfill's condensate management system.

2. Gas compressors that increase the pressure (and temperature) of the gas.

3. An air-to-gas heat exchanger that uses ambient air to cool the compressed gas from approximately 200°F to 120°F. This cooling produces additional condensate

4. An oil-water separator that uses a coalescing filter to remove condensate formed in the air-to-gas heat exchanger and also removes any compressor oil from the gas stream.

5. Treatment System Monitoring and Operating Ranges

Based on the design of the Central LFG treatment system, the following equipment and processes are monitored daily during normally scheduled workdays and records are maintained weekly. Table 1 at the end of this Plan summarizes the treatment system process monitoring and required parameter ranges.

The Scrubber Vessel is monitored with a liquid level sight tube and a differential pressure gauge. The liquid level should be maintained at less than 50% on the sight tube and is controlled by manually draining condensate from the vessel. The differential pressure from the inlet to outlet of the vessel should be maintained at 0.5 pounds per square inch (psid) or less. A high differential pressure indicates filter plugging. If this occurs, the vessel must be isolated from the gas stream and the filters blown out or changed.

The Compressor has a normal discharge pressure between 3 and 7 pounds per square inch gauge (psig). The temperature of the gas after compression is typically approximately 150°F. Temperature readings above 200°F indicate a problem requiring shutdown of the compressor for investigation. The compressor oil level should be maintained at 2 gallons or more and operate with no visible leaks.

The Air-to-Gas Cooler typically cools the compressed gas to 100°F or lower. Outlet gas temperatures above 150°F indicate an unusually high inlet temperature (check compressed gas temperature) or poor heat transfer most likely caused build up within the cooler. If this occurs, the unit must be isolated and cleaned.

The Oil Water Separator has an automatic drain to maintain an appropriate liquid level within the vessel. An abnormal liquid may require manual draining or indicates a problem with the automatic drain system that must be investigated.

6. Generator Set Monitoring

At any time, if one of the generating units shuts down, the plant operator is paged immediately by the automatic notification system. This operator is on call twenty-four (24) hours a day, seven (7) days a week and returns to the plant to investigate the nature of the shutdown. A rotation system is in place with operators from near-by locations covering for each other. Whenever a shutdown occurs, the flare immediately picks up the extra gas. As such, the flare is a backup to the renewable energy plant.

In general, investigation and corrective actions follow these procedures:

(i) Evaluate the problem.
(ii) If the issue can be safely and easily corrected, perform the corrective and action and restart the equipment.
(iii) If corrective action requires replacement of parts that are in on-site inventory, isolate the equipment, replace the parts, and restart equipment.
(iv) If the repair or corrective action cannot be performed in a timely manner, verify that the flare is running and make arrangements for repairs (outside service technician, procuring new parts, etc.).

7. Recordkeeping

NANR's personnel keep Daily Logs recording the status of operations for each of the generating units and gas treatment system. Shutdowns of the generating units or entire gas treatment system (whether automatic or manual) are logged with the likely cause of the shutdown, downtime period, and time that operations were restarted.

An example of the Daily Log Report form is included at the end of this Plan as an attachment.

8. Regulatory Requirements

This Plan was prepared to ensure proper monitoring and operation of the facility and gas treatment system and to comply with the requirements to maintain a site-specific treatment system monitoring plan as specified in 40 CFR Part 62, Subpart OOO and 40 CFR Part 63, Subpart AAAA. These requirements are summarized in this section. The regulatory language in Subpart OOO and NESHAP AAAA are similar but not identical. Where applicable, similar citations are grouped together.

This site-specific treatment system monitoring plan is required because the associated landfill is or will be subject to control requirements under 40 CFR 62, Subpart OOO and 40 CFR 63, Subpart AAAA. As part of the landfill gas collection and control system (GCCS) on-site, all or a portion of the landfill gas is "treated" as part of its overall management prior to sale or beneficial use. Per §62.16730/§63.1990, a treatment system is one that filters, de-waters, and compresses landfill gas for sale or beneficial use.

A treatment system is one of the acceptable "control systems" under the NSPS/NESHAP rule as set forth in §62.16714(c)(3)/§63.1959(b)(2)(iii)(C), which specify that the owner may:

Route the collected gas to a treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-Btu gas for pipeline injection, or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to §62.16714 *(c)(1) or (c)(2)/* §63.1959(b)(2)(iii)(A) or (B).

NANR and/or the landfill operator operates the treatment system as a control system for the landfill gas subject to NSPS/NESHAP control, the monitoring requirements, specifically §62.16722(g)/ §63.1961(g) require that:

The treatment system must maintain and operate all monitoring systems associated with the treatment system in accordance with the site-specific

treatment system monitoring plan required in §62.16726(b)(5)(ii)/§63.1983(b)(5)(ii).

This site-specific treatment system monitoring plan satisfies the requirements of §62.16726(b)(5)(ii)/§63.1983(b)(5)(ii). Each element of the monitoring plan is listed here followed by the site-specific information related to this specific treatment system.

§62.16726(b)(5)(ii)(A)/§63.1983(b)(5)(ii)(A) *Monitoring records of parameters that are identified in the treatment system monitoring plan and that ensure the treatment system is operating properly for each intended end use of the treated landfill gas. At a minimum, records should include records of filtration, de-watering, and compression parameters that ensure the treatment system is operating properly for each intended end use of the treated landfill gas.*

Per §62.16722(g)(1)/§63.1961(g)(1), flow must be continuously (at least once every 15 minutes) monitored into the treatment system. The flow measurement device will be maintained and calibrated per manufacturer's recommendations. Also, per §62.16722(g)(2)/§63.1961(g)(2), if there is a bypass line, from the treatment system, it must be secured in the closed position and inspected at least monthly to verify that gas is not being diverted to the bypass line and circumventing appropriate NSPS control.

Per §62.16726/§63.1983 all records must be 5 years up-to-date, readily accessible, on-site. Off-site records may be maintained if they are retrievable within 4 hours. Either paper copy or electronic formats are acceptable. The person(s) performing the inspection as per the frequency listed in Table 1, will record the observed value and determine if the value is within the range of operation. If the recorded value is out of the range of operation, they will immediately take corrective action, including contacting all relevant staff, as necessary. Furthermore, collected data and a description of the actions taken will be placed into the plant file.

§62.16726 (b)(5)(ii)(B)/§63.1983(b)(5)(ii)(B) *Monitoring methods, frequencies, and operating ranges for each monitored operating parameter based on manufacturer's recommendations or engineering analysis for each intended end use of the treated landfill gas.*

Table 1 outlines monitoring methods, frequencies, and operating ranges for each monitored treatment operating parameter.

§62.16726 (b)(5)(ii)(C)/ §63.1983(b)(5)(ii)(C) *Documentation of the monitoring methods and ranges, along with justification for their use.*

The justification for the monitoring methods and ranges for each monitored treatment operating parameter is based on operational experience and/or

manufacturer recommendation. This section is required since the ranges of these treatment parameters are not prescribed by the NSPS rules, rather, they are to be set on a site-specific basis (since different beneficial uses and gas sales require different levels of treatment).

§62.16726 (b)(5)(ii)(D)/§63.1983(b)(5)(ii)(D) *Identify who is responsible (by job title) for data collection.*

Personnel responsible for data collection are identified in Section 2 of this Plan. These individuals may assign responsibility to another facility operator.

§62.16726 (b)(5)(ii)(E)/§63.1983(b)(5)(ii)(E) *Processes and methods used to collect the necessary data.*

Table 1 specifies how each type of treatment parameter (filtration, de-watering, and compression) will be monitored.

§62.16726 (b)(5)(ii)(F)/§63.1983(b)(5)(ii)(F) *Description of the procedures and methods that are used for quality assurance, maintenance, and repair of all continuous monitoring systems.*

The data and equipment are reviewed regularly during the month to verify accuracy and to evaluate for trends that may be characteristic of diminishing performance. Additionally, staff will perform visual inspections of the equipment and note issues as they arise. Repairs will be made as necessary. At a minimum, filters will be cleaned and or replaced as needed to maintain the listed differential pressures.

9. Gas Sulfur Monitoring / SO_2 Emissions

Sulfur monitoring is performed according to the Sulfur Monitoring Plan developed by NANR as prescribed by the facility's air permit (Renewable Operating Permit).

Table 1 - Landfill Gas Treatment System Monitoring Plan

Equipment	Parameter	Inspection Frequency[1]	Monitoring Device	Range of Operation[2]	Basis[3]
Scrubber / Filter	Differential Pressure	Weekly	Diff. Pressure Monitoring Device	0 – 0.5 psi	Operational Experience
	Liquid Level	Weekly	Sight Glass	< 50% Level	Operational Experience
Compressor	Discharge Pressure	Weekly	Pressure Gauge	3 to 7 psig	Operational Experience
	Discharge Temperature	Weekly	Temperature Monitor	< 200°F	Operational Experience
Air-Gas Cooler	Outlet Temperature	Weekly	Temperature Monitor	< 150°F	Operational Experience
Oil / Water Separator	Liquid Level (Auto Operation)	Weekly	Sight Glass	Level as marked on sight glass	Operational Experience

1. Proper operation is checked daily during normally scheduled workdays, records of individual components taken weekly.
2. Refer to Section 5 of this Plan for possible corrective actions if the monitored value is outside of the range(s) specified in the table.
3. NANR has operated gas-to-energy facilities for greater than 20 years and established these ranges based on experience with designing and operating these facilities.

ATTACHMENT 1
DAILY LOG RECORDING SHEET

Switch Gear Room					Date	2-23-22
					Time	9:00 A.M
		1500 - 1450	1550 - 1450	1550 - 1450	Name	Vic
		Unit 1	Unit 2	Unit 3		
	Energy	60088	79588	68471		
	Volts	4.248	4.236	4.231		
	Amps	205.1	204.8	204.1		
	KW	1.452	1.429	1.447		
	Pwr factor	97	97	97		
	HZ	59.9	59.9	59.9		

CAT ET Laptop		Unit 1 70/75	Unit 2 58/62	Unit 3 68/71	Temp	
	Exhaust Temp	1128	1137	1141		
	Oil Pressure	75	78	74		
	Coolant Temp	221	221	223		
	Manifold Pressure	43.2	41.6	40.5		
	Oil Filter Diff Pres	5	4-5	6		
	Coolant Pressure	25	44	42		
	Inlet Air Temp	127	125	110		
	Oil Temperature	196	198	198		
	Gas Pressure	3.5	3.5	3.5		
	Fuel Flow SCFM	562	554	531		
	Throttle Position %	55.36	50.51	48.72		
	Fuel Factor	102	101	103		
	Fuel BTU	430	410	440		
	Inlet Fuel Temp	109	109	102		
	Engine Hours	89003	80611	83,371		
Gas Chiller	Inlet Air Temp	128				
	Outlet Air Temp	91				
Gas Analyzer						
	Oxygen %	1.1%				
	Methane %	49.0%				
Flare Pad						
	Vacuum	-65				
	Total Flow					
Diagnostic Codes:		Clean Run	Clean Run	Clean Run		