

# Malfunction Abatement and Preventative Maintenance Plan

## Energy Developments Michigan, LLC

April 2019

Prepared for:



Brent Run Generating Station  
8247 Vienna Road  
Montrose, MI 48457



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# 1 BACKGROUND

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The Energy Developments Michigan, LLC (EDM) owns and operates the Brent Run Generating Station (BRGS). This Malfunction Abatement and Preventative Maintenance Plan (Plan) was prepared in accordance with Permit to Install No. 176-18, dated April 1, 2019, and PTO MI-ROP-R5987-2017 issued by Michigan Department of Environmental Quality Air Quality Division. The relevant condition reads as follows:

*...the permittee shall submit to the AQD District Supervisor, for review and approval, a revised malfunction abatement/preventative maintenance plan for FGICEENGINES. After approval of the malfunction abatement/preventative maintenance plan by the AQD District Supervisor, the permittee shall not operate FGICEENGINES unless the malfunction abatement/preventative maintenance plan, or an alternate plan approved by the AQD District Supervisor, is implemented and maintained. The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum the plan shall include:*

- a) Identification of the equipment and, if applicable, air-cleaning device, and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.*
- b) Description of the items or conditions to be inspected and frequency of the inspections or repairs.*
- c) Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.*
- d) Identification of the major replacement parts that shall be maintained in inventory for quick replacement.*
- e) A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.*

*If the plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the AQD District Supervisor. Should the AQD determine the malfunction abatement/preventative maintenance plan to be inadequate, the AQD District Supervisor may request modification of the plan to address those inadequacies. (R 336.1702(a), R 336.1910, R 336.1911, R 336.1912, R 336.2803, R 336.2804)*

This Plan has been developed to satisfy the above requirements. As such, it provides procedures and elements of inspection, inspection frequencies, back up equipment inventories and general information used to prevent, detect, and correct malfunctions.

It is important to note that the regulations anticipated that periodic shutdown of individual control equipment at a landfill is anticipated. Since periodic malfunctions, unforeseen circumstances or short duration maintenance activities are anticipated by the regulations, EDM believes they have implemented a program consistent with these requirements.

EDM understands that MDEQ expects BRGS to address any temporary break down of a control device or devices. While a plan has been written suggesting parts lists, inspections, inspection frequencies, etc. to comply with the above paragraph it is anticipated the short duration shutdown events will continue to occur which are beyond BRGS's control.

## 2 AFFECTED EQUIPMENT

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BRGS plans to operate five (5) internal combustion engines that are covered by this Plan. The engines are used for combusting treated landfill gas to produce electricity. These engines are identified as Emission Units EUENGINE3, EUENGINE4, EUENGINE5, EUENGINE6, EUENGINE7 from PTI No. 176-18 issued by the Michigan Department of Environmental Quality Air Division Program.

### 3 RESPONSIBLE PERSONNEL

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All supervisory personnel responsible for overseeing the inspection, maintenance, and repair of the engine plant are listed below:

<b>Name</b>	<b>Title</b>	<b>Phone Number</b>
Kevin Ackerman	Plant Operator	517-927-0299
Jenna Hiltz	Plant Operator	517-927-2131
Dan Zimmerman	Director of N.A. HSE & Compliance	517-896-4417
Greg Micale	Maintenance Manager	517-372-8335

## 4 MALFUNCTION ABATEMENT AND PREVENTATIVE MAINTENANCE PLAN

The following section of this Plan contains prevention of malfunctions, detection of malfunctions, and correction of malfunctions for each of the engines.

### 4.1 Description of Equipment

BRGS plans to operate five (5) internal combustion engines that are covered by this Plan. The engines are used for combusting treated landfill gas to produce electricity. These engines are identified as Emission Units EUENGINE3, EUENGINE4, EUENGINE5, EUENGINE6, EUENGINE7 from PTI No. 176-18 issued by the Michigan Department of Environmental Quality Air Division Program.

### 4.2 Equipment Inspection

Table 1 shows the Engine Plant items or conditions that are inspected, the frequency of the inspections, the procedures followed to aid in the prevention of a malfunction, monitoring parameters that are used to detect and aid in the prevention of a malfunction or equipment failure, the normal range of these parameters, and recording / retaining of the monitoring records.

**Table 1  
List of Engine Maintenance Procedures**

Item or Conditions to Be Inspected	Frequency of Inspection /Monitoring	Procedures to be Followed to Aid in the Prevention of Malfunctions
Engine Air Cleaner Element	*Performance based assessment	Check Sensor (difference in pressure) Replace when necessary
Engine Oil	*Performance based assessment	Establish baseline, use oil chemistry and performance as a guide (Change when necessary)
Engine Oil Sample	Establish Baseline for each engine (Performance/oil sample)	Once baseline is established verify frequency with oil chemistry sampling results
Engine Oil Level	Daily	Check float & secondary auto-fill
Engine Oil Temperature	Daily	Check temperature gauge

Item or Conditions to Be Inspected	Frequency of Inspection /Monitoring	Procedures to be Followed to Aid in the Prevention of Malfunctions
Oil Filter Differential Pressure	Daily	Check Electronic Technician (ET) software
Engine Oil Filter	Establish Baseline for each engine (Performance/oil sample)	Check pressure differential, change engine oil filter as needed
Fuel Metering Valve	Performance based assessment	Check codes, clean sensor
Throttle Control Valve (Check electronic valves)	Performance based assessment	Check electronic valves Technician (ET) software
Cooling System Coolant Level	Daily	Check sight glass for level and color
Cooling System Coolant Temperature	Daily	Check Technician (ET) software
Cooling System Coolant Pressure	Daily	Check Technician (ET) software
Differential Pressure Crankcase Vent	Daily	Check pressure, control vacuum (walk around)
Generator Load	Daily	Check load conditions (Kilowatts)
Generator	*Performance based assessment (assess at approximately 13,000 hours of use)	Visually inspect system for loose wires/fittings, vibration damage etc.
Walk-Around Inspection	Daily	Check for any unusual conditions, leaks, broken gauges, pinched wires/tubing etc.
Battery Electrolyte Level	*Every 6 months of service	Check battery electrolyte level
Belts (Radiator)	*Every 12 months	Inspect/Adjust/Replace
Engine Valve	Performance based assessment	Adjust as needed



Item or Conditions to Be Inspected	Frequency of Inspection /Monitoring	Procedures to be Followed to Aid in the Prevention of Malfunctions
Radiator	Performance based assessment	Check inlet & outlet temperatures, clean/wash exterior surfaces as needed
Water Pump	Performance based assessment	Inspect for leaks during walk-around inspection
Ignition System Spark Plugs	Performance based assessment	Inspect/Replace
Turbocharger	*Performance based assessment (assess at approximately 13,000 hours of use)	Establish baseline to use as a guide (Change when necessary)
Overhaul - Top End	*Performance based assessment (assess at approximately 13,000 hours of use)	Overhaul
Overhaul - In-Frame	Performance based assessment (assess at approximately 50,000 hours of use)	Overhaul
Overhaul - Major	*Performance based assessment (assess at approximately 80-100,000 hours of use)	Overhaul

*\*Engine performance supersedes frequency of maintenance activities. Approximate values used in this table **should only be used as a guideline** in evaluation of each parameter to be inspected, maintained and replaced.*

### 4.3 Additional Preventative Maintenance Procedures

The preventative maintenance program followed at the site is based on facility records and input from EDM personnel. Routine maintenance is conducted on the engines in accordance with manufacturer and company specifications, which include replacing engine spark plugs, oil, and lubrication. Maintenance is also conducted on an as needed basis. In addition, a “top-end overhaul”, which includes replacing/cleaning cylinder heads,

turbochargers and valves, is conducted on each engine when necessary. This is typically completed on site.

Less frequent “major overhauls” are also routine maintenance procedures for the engines. A “major overhaul” includes all of the work of a top-end overhaul plus disassembling all of the bearings, seals, gaskets, and components that wear and may even include replacing the crankshaft. When an engine is due for a major overhaul, it is swapped out with another engine. When the engine is swapped, it is removed from the facility and either replaced with an engine with a different serial number and manufacture date or the same unit is brought back after being rebuilt and will have the same serial number and manufacture date. Swapping engines in this manner is an industry standard for maintaining the engines.

#### **4.4 Replacement Parts**

To facilitate quick replacement, the following spare or replacement parts necessary for proper engine operation and routine maintenance will be located on site at each generation facility or at BRGS’s central maintenance facility (major components or specialty parts will be ordered as needed). Inventory may vary from time to time.

#### **4.5 Corrective Procedures**

The corrective procedures or operational changes (see Table 1) shall be undertaken in the event of a malfunction or failure of the generation facility. BRGS will expeditiously implement the appropriate procedures to correct the event. Repair records will be maintained in an operations log.

## 5 IMPLEMENTATION OF AND UPDATES TO PLAN

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### 5.1 Implementation of the Plan

The overall goal of this plan is to provide assurance to MDEQ-AQD the engines are being operated and maintained in a manner that complies with the manufacturer's recommended operating procedures while allowing EDM the operational flexibility to maximize combustion of the landfill gas.

If the plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the MDEQ District Supervisor. Should the MDEQ determine the malfunction abatement/preventative maintenance plan to be inadequate, the MDEQ District Supervisor may request modification of the plan to address those inadequacies.

### 5.2 Updates to the Plan

This Plan will be updated within 60 days of replacing or expanding the components of the Engine Plant with components not described herein. If no components of the Engine Plant are replaced or expanded with components described herein, the Plan will be updated at least once every 5 years or as needed.

## LIMITATIONS

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The work product included in the attached was undertaken in full conformity with generally accepted professional consulting principles and practices and to the fullest extent as allowed by law we expressly disclaim all warranties, express or implied, including warranties of merchantability or fitness for a particular purpose. The work product was completed in full conformity with the contract with our client and this document is solely for the use and reliance of our client (unless previously agreed upon that a third party could rely on the work product) and any reliance on this work product by an unapproved outside party is at such party's risk.

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