Malfunction Abatement Plan

Wolverine Power Cooperative, Inc.

Alpine Power Plant

Elmira, Michigan

November 15, 2016

Fishbeck, Thompson, Carr & Huber, Inc.
engineers | scientists | architects | constructors

MALFUNCTION ABATEMENT PLAN
ALPINE POWER PLANT

PREPARED FOR:
WOLVERINE POWER COOPERATIVE
ELMIRA, MICHIGAN

NOVEMBER 15, 2016

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LIST OF ABBREVIATIONS/ACRONYMS

CT	combustion turbines
°F	degrees Fahrenheit
FG	Flexible Group
MAP	Malfunction Abatement Plan
MDEQ	Michigan Department of Environmental Quality
MW	megawatt
NO_X	nitrogen oxides
PI	Plant Information
psig	pounds per square inch gage
PTI	Permit to Install
ROP	Renewable Operating Permit

1.0 INTRODUCTION

This MAP has been prepared to comply with the Wolverine Power Supply Cooperative, Inc. Alpine Power Plant (Wolverine Power) PTI No. 206-14, specifically, FG-CTG Condition III.1. The purpose of this document is to describe actions that will be taken at this facility: (1) to prevent excess emissions during malfunctions via scheduled maintenance; (2) identify any issues which could cause imminent malfunction; and (3) in the event of any sudden malfunction of equipment, as required by the ROP. To describe the steps to be taken to prevent excess emissions via scheduled maintenance of the equipment, this Plan is arranged in accordance with Michigan Air Pollution Control Rule 911.

Rule 911 states:

> *(1) Upon request of the department, a person responsible for the operation of a source of an air contaminant shall prepare a malfunction abatement plan to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limitation.*
>
> *(2) A malfunction abatement plan required by subrule (1) of this rule shall be in writing and shall, at a minimum, specify all of the following:*
>
> *(a) A complete preventative maintenance program, including identification of the supervisory personnel responsible for overseeing the inspection, maintenance, and repair of air-cleaning devices, a description of the items or conditions that shall be inspected, the frequency of the inspections or repairs, and an identification of the major replacement parts that shall be maintained in inventory for quick replacement.*
>
> *(b) An identification of the source and air-cleaning device operating variables that shall be monitored to detect a malfunction or failure, the normal operating range of these variables, and a description of the method of monitoring or surveillance procedures.*
>
> *(c) 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.*
>
> *(3) A malfunction abatement plan required by subrule (1) of this rule shall be submitted to the department and shall be subject to review and approval by the department. If, in the opinion of the commission, the plan does not adequately carry out the objectives as set forth in subrules (1) and (2) of this rule, then the department may disapprove the plan, state its reasons for disapproval, and order the preparation of an amended plan within the time period specified in the order. If, within the time period specified in the order, an amended plan is submitted which, in the opinion of the department, fails to meet the objective, then the department, on its own initiative, may amend the plan to cause it to meet the objective.*
>
> *(4) Within 180 days after the department approves a malfunction abatement plan, a person responsible for the preparation of a malfunction abatement plan shall implement the malfunction abatement plan required by subrule (1) of this rule.*

2.0 DEFINING MALFUNCTIONS

Rule 113(a) defines a malfunction as:

> *Malfunction means any sudden, infrequent and not reasonably preventable failure of a source, process, process equipment, or air pollution control equipment to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not malfunctions.*

A true malfunction must have a reasonable potential to cause an exceedance in emissions or operating parameter. Following is a list of malfunction events covered by this Plan.

- Failure of emission control system components, e.g., monitoring equipment and/or data acquisition equipment.
- Sudden and unavoidable failure of control or process equipment, not due to poor operation or maintenance.

3.0 EMISSION CONTROL DEVICE

Wolverine Power utilizes two natural gas-fired CTs, which inherently have low emissions; therefore, no post-combustion air cleaning devices are employed. Each CT is equipped with Dry Low NO_X Burner technology to minimize NO_X emissions, which is part of the integral design of each CT. Dry Low NO_X Burner technology prevents the formation of NO_X, as opposed to capturing and destroying NO_X after its formation.

For the purpose of the preventative maintenance requirement in Rule 911(2)(a), Wolverine Power will perform normal and routine maintenance activities on the CTs to ensure their proper and reliable operation. Air emissions will be minimized by proper operation of the CTs.

4.0 SOURCE DESCRIPTION

Wolverine Power operates two natural gas-fired General Electric Frame 7FA.05 simple-cycle CTs, each with a nominal 203 MW electrical output, and each equipped with dry low NO_X burners.

Table 1 – Source Description

Emission Source	Control Equipment	Emissions Controlled
FG-CTG	2 Dry Low NO_X Burners	NO_X

5.0 RESPONSIBLE PERSONNEL

Primary responsibility for the operation, maintenance, and repair of the facility rests with the Chief Operator. The Chief Operator will direct plant personnel to perform repairs. Should the need arise, outside contractors may be brought in to complete repairs. Titles of the personnel responsible for tasks under this MAP, and their duties, are listed in Table 2.

Table 2 – Responsible Personnel

Position	Responsibility
Chief Operator	Overall operations and maintenance; responsible for overseeing the inspection, maintenance, and repair of the CTs.
Operations and Maintenance	Corrective actions, malfunction response, and routine inspections. Preventative maintenance inspections and repairs.
VP of Environmental Strategy	Company-wide environmental monitoring and oversight.
Outside Contractors	Calibration, repairs, and maintenance of emission control instrumentation.

6.0 PREVENTATIVE MAINTENANCE PROGRAM, OPERATIONAL VARIABLES, AND CORRECTIVE PROCEDURES

Preventative maintenance will include scheduled equipment inspections, replacement of parts in accordance with manufacturer recommendations and schedule, and maintaining an inventory of critical spare parts. To ensure normal operation of the CTs, some inspections of the plant equipment which are to be done on a daily basis, at minimum, when the plant is in operation, are made during the operator's hourly inspections. These inspections include checks made to the plant control systems and checks for any physical problems, such as oil leaks or any disrepair. Normal lubrication of equipment is also performed at this time.

Wolverine Power has a built in alarm for the dry low NO_X burners. This alarm ensures that the combustion unit is running properly by measuring combustion parameters and estimating NO_X emissions. If the calculated NO_X emission concentration is above 9 ppm, or if the dry low NO_X burner is not operating within the correct parameters, an alarm will be triggered. Once an alarm is triggered, the unit will not be able to operate under normal conditions until the unit parameters return to the normal operating ranges.

6.1 OPERATIONAL VARIABLES

As the dry low NO_X burners are integral to the CT design, the electric generating unit parameters, integral NO_X emission concentration, and fuel flow are monitored as well as the variables listed in Table 3.

Table No. 3 – Operational Variables

Operating Parameter	Normal Operating Range
Load (%)	>50%
Compressor Discharge Pressure (psig)	140 to 252
Inlet Guide Vane (%)	(-10) to 30.7
Combustion Reference Temperature	91 to 100
Exhaust Temperature (°F)	900 to 1300
Exhaust Temperature Span (°F)	200

6.2 OPERATION AND MAINTENANCE SCHEDULE

Wolverine Power is using a Maintenance Management computer software program for all preventative maintenance. Work orders are provided on a weekly basis. These work orders are printed, completed, and reviewed for completeness at the end of each week. If a work order is not completed, when the next week's Open Work Order Reports are run and work orders are printed, the incomplete order will be flagged as backlogged. The backlogged work order will remain flagged until it is marked complete. The preventative maintenance activities in the program are all in accordance with the Original Equipment Manager recommendations and scheduled to take place within their specified time ranges.

Operators perform hourly gauge readings and inspections of the plant when operating. These inspections include checking the plant control systems and looking for any physical problems, such as oil leaks or any disrepair. Gauge readings and any significant issues identified during an inspection are recorded. An example of the Hourly Operational Walkdown Inspection Sheet – which may be updated at any time – is included as Appendix 1. Any updates will be kept at the plant and made available to the MDEQ upon request.

6.3 CORRECTIVE ACTION

If a malfunction occurs during plant operations which causes, or may cause, excess emissions, the equipment causing the (potential) excess emission will be evaluated as soon as practicable in accordance with safe operating procedures to determine the proper procedure to correct the issue or to determine that the malfunction will not cause excess emissions.

The corrective procedures or operational changes used to ensure compliance with the emission limits involve careful monitoring of the PI systems. If a malfunction results in the possibility of an emissions exceedance, the unit will not allow normal operation and an alarm will sound. If the unit has any difficulty during operation, such as mechanical or control system failure which results in high emissions, the first step will be to validate the data in an expeditious manner and determine the cause of the deficiency.

Repairs or operational changes will be quickly assessed with the unit on-line for the purpose of minimizing emissions. Every reasonable and practical effort will be made to bring a malfunctioning unit back into compliance; however, if these efforts are unsuccessful or continued operation is dangerous either to equipment or personnel, the unit will be shut down and the problem corrected. If possible, the unit may be restarted during the calendar day and brought to normal operating loads to average in the lower emission of higher load operation along with the high emissions during start-up period to avoid any exceedances of the emission limits contained in the permit.

6.4 PREVENTATIVE MAINTENANCE RECORDS

The following records will be maintained:

- Wolverine Power will keep records of inspections which are outside normal operating ranges (i.e., Exception Reports). These records will include the date, finding(s), and corrective action(s) taken or repair(s) made, if necessary.
- All significant, unscheduled maintenance activities performed on the CTs. Records will include the date, finding(s), and corrective action(s) taken, or repair(s) made, if necessary.

7.0 MAJOR PARTS KEPT ONSITE FOR QUICK REPLACEMENT

Spare parts are managed by a computerized maintenance management system. This system is used to manage parts onsite, parts warehoused offsite at the manufacturer, and the manufacturer's contact information. The principal replacement parts needed to ensure the continued and reliable operation of the CTs are primarily electronic cards for the control system (Control Cards). These Control Cards are usually kept onsite.

Appendix 1

U____ Hourly Walkdowns H_2

Date:	96GK1 Gen pressure	63HVG-2 H2 Regulated pressure gauge	63HVG-1 Regulated pressure	Gas Purity-line to TE/CE/Case	96SA-3 CE seal oil pressure differential (psi)	96SA-4 TE Seal oil differential (psi)	96SA-5 TOT SO DIFF (PSI)	96SF-3 SO REG DIFF (PSI)	Bearing Oil Feed 4A / 4B	Bulk H2/Cylinder PSI H2 House
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