PREVENTIVE MAINTENANCE
AND
MALFUNCTION ABATEMENT PLAN

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Updated September 2020

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SECTION 1

INTRODUCTION

1.1 BACKGROUND

The L'Anse Warden Electric Company, LLC. (LWEC) Facility ("the Facility") is located in L'Anse, Baraga County, Michigan. In addition to the production of electrical energy the facility provides thermal energy to the adjacent CertainTeed Corporation (CertainTeed) facility.

The boiler is designed to burn a variety of fuels including wood chips, tire derived fuel (TDF), wood fines and bark, ground creosote-treated railroad ties, referred to as cross-tie derived fuel (CDF), engineered fuel pellets (pellets), and natural gas.

The Facility operates under the State of Michigan Renewable Operating Permit (ROP) Number MI-ROP-B4260-2011, which was transferred to LWEC effective 5 July 2007. Construction activities were authorized under Permit to Install 168-07, issued on 29 October 2007 and subsequent permit modifications.

This revision to LWEC's Preventive Maintenance and Malfunction Abatement Plan (PM/MAP) is to incorporate the EUFAF Emission Unit which is the fuel storage and processing at the nearby Fuel Aggregation Facility as well as remove the EUASH emissions unit since it is no longer in LWEC's permit, while retaining preventative maintenance procedures for the ash handling system.

1.2 REGULATORY REQUIREMENTS

Preparation of a PM/MAP is a requirement of the permit. In accordance with Rule 911 (2) the PM/MAP (or "the Plan") specifies the following:

- A complete preventive 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 inspections or repairs
- Identification of major replacement parts that shall be maintained in inventory

- Identification of the source and air-cleaning devices 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.

- 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.

The boiler shall be operated in such a way to comply with the emission limits listed in **Table 1**.

TABLE 1 - EMISSION LIMITS	
Pollutant	**Limit**
Particulate Matter (PM)	0.06 pounds (lb)/million British Thermal Units (MMBTU) heat input
PM	19.2 pounds per hour (pph)
PM less than 10 microns in diameter (PM-10)	15.4 pph
Sulfur Dioxide (SO2)	290 pph
Oxides of Nitrogen (NOx)	145 pph
Carbon Monoxide (CO)	0.3 lb/MMBTU except for startup and shutdown
CO	97.2 pph
Volatile Organic Compounds (VOCs)	50 parts per million by volume (ppmvd) at 7% O2 (as methane) except for startup and shutdown
VOC	9.1 pph
Lead (Pb)	0.02 pph
HCl	2.17 pph or 9.5 tons per year (tpy)
Aggregate HAPs	Less than 20.0 tpy

1.3 DEFINITION OF MALFUNCTION EVENTS

Rule 113(a) of Michigan's Air Pollution Control Rules 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. Following are example malfunction events covered by this Plan that would be expected to cause an emissions exceedance.

- Complete failure of air pollution control equipment (e.g., electrical failure, etc.). This would be verified through the Continuous Opacity Monitoring System (COMS) readings.

- Failure of the fuel management system. In the event that excessive amounts of some fuels are burned in the boiler, excess emissions could occur. This would be verified through records of fuel consumption maintained by the plant.

It should be noted that, under Rule 912, a malfunction causing excess emissions lasting more than two hours must be reported to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Air Quality Division (AQD). **Appendix B** includes an example notification and information on reporting the malfunction.

1.4 RESPONSIBLE PARTIES

Overall responsibility for the Plan lies with the LWEC Plant Manager (or designated signee). The underlying responsibilities for implementing the Plan, however, lie within the area operations, maintenance, and environmental units. Identified personnel are charged with implementing the plan, documenting malfunction events and corrective actions taken to mitigate the events, updating the plan as required, and developing the appropriate reports. The Plant Manager will be responsible for the proper reporting and operation of the Facility; the Plant Operations/Maintenance Supervisor(s) will be responsible for directing of maintenance activities, proper documentation of maintenance activities, and will report to the Plant Manager; The Maintenance Staff will be performing and identifying maintenance activities, and will report to the Plant Operations/Maintenance Supervisor(s) and/or Plant Manager; The Operations Staff will be charged with the proper operation of the Facility, along with identifying problems through direct observation of equipment and/or plant operational indicators, they will report to the Plant Operations/Maintenance Supervisor(s) and/or Plant Manager; The Fuel Contractor will be tasked with supplying the fuel within the directives of the Fuel Procurement and Monitoring Plan to the Facility and will report to the Plant Manager and/or Plant Operations/Maintenance Supervisor(s); and environmental support personnel or consultants will aid the plant personnel in determining the need for and preparation of any required reports.

1.5 PLAN MAINTENANCE AND UPDATES

The PM/MAP will be adhered to by Facility personnel, and the Plan will be updated consistent with changes in Facility equipment and practices. Actions taken by Facility personnel that are not consistent with this Plan will require that the Plan be modified. The Plan will also be updated if process or system modifications occur that affect the details of the Plan.

The Facility maintains a complete copy of the PM/MAP. A copy of the Plan is maintained at the Power Plant Office. The Facility's Plant Manager has the overall responsibility to ensure that the Plan is maintained and updated as required by the rules. The Facility's Plant Manager will work with the Plant Operations/Maintenance Supervisor(s) and/or the Operations/Maintenance personnel to obtain the information needed to maintain and update the Plan.

1.6 REFERENCE TO STANDARD PROCEDURES AND EQUIPMENT MALFUNCTION CLASSIFICATIONS

Certain sections of this Plan may reference other LWEC Facility documents, including preventive maintenance procedures, standard operating procedures for equipment and systems, and other similar Facility documents. When referring to other documents, this Plan is referring to the most recent version of any such applicable document and is only referring to the portions of the referenced document that are specifically applicable to the equipment or system to which the relevant portion of this Plan is directed.

In addition, certain types of equipment and system malfunctions that may result in emissions exceeding permit limits have been grouped and classified for reference under this Plan. These equipment malfunction classifications are identified as follows:

- Power failure – Refers to the complete loss, interruption, or unplanned variation in electric supply serving a portion of the equipment or all of the equipment associated with a particular process.

- Loss of fuel – Refers to the complete loss, interruption, or unplanned variation in fuel serving a unit.

- Loss of instrument air – Refers to the complete loss, interruption, or unplanned variation in instrument air serving a portion of or all of the air-actuated equipment associated with a particular process.

- Structural malfunction/failure – Refers to failures of physical equipment, vessels, ductwork, and burners within the furnace, associated with the air pollution control systems.

- Loss of motor(s) – Refers to a reduction or termination of process liquid flow or hydraulic fluid flow provided by mechanical pump(s) outside of nominal operating limits.

- Loss of fan(s) – Loss of fan(s) can include a reduction or termination of gaseous flow caused by, but not limited to, a physical failure of the fan, housing, or damper system, buildup of material on fan blades, imbalance, loss of motor, failure of starters, failure of drive systems, failure of actuators/cylinders, failure of coolant or lubricant systems, or modulator, etc.

- Loss of valve(s) – Loss of valve(s) can include a reduction or termination of gaseous or liquid flow caused by, but not limited to, a physical obstruction, loss of actuator control, rupture or leakage of weld or flange gasket, or a valve stuck in the closed position. Loss of valve(s) can also include a failure to seat properly in the closed position (i.e., inability to adequately restrict or terminate flow).

- Loss of piping – Refers to a reduction or termination of process liquid, hydraulic fluid flow, or gas flow caused by, but not limited to, such things as a physical obstruction, rupture or leakage of connecting weld or flange, and material failure. Also refers to the dampers and valves within the piping that impact the ability of the operator to control the flow of process liquid, hydraulic fluid, or gas to a system.

- Loss of instrumentation– Refers to the inability of the process logic controller (digital or analog), process monitoring equipment, distributive control system (DCS), sensors, controllers, actuators, cylinders, modulators, solenoids, thermocouples, flame detectors, monitors and monitoring systems (including continuous monitoring systems required to

satisfy permit requirements), safety interlocks, etc., to function properly or perform a required task.

- Loss of data handling systems – Loss of data handling systems means the inability to monitor and/or record the appropriate data to ensure the proper operation and control of a permit regulated system. Example equipment includes a PLC, PI Data, other data acquisition system, computer, cabling, plotters, etc.

1.7 PLAN ORGANIZATION AND CONTENT

The following information is summarized within the Plan:

- Process Descriptions and Preventive Maintenance – These subsections include an overview of the regulated system and details for the process equipment and air pollution control and monitoring systems including simple process flow diagrams showing pertinent details and routine maintenance required to ensure normal operation.

- Malfunction Events – Where applicable, subsections are included for regulated systems that include important definitions, provide details for process-specific malfunction events and corrective actions.

- Recordkeeping – Summarizes records retention policies and reporting requirements in the event of a malfunction.

SECTION 2

AFFECTED UNITS

As designated in the permit, the following Emission Units are included in the Plan:

- EUFUEL – Fuel handling equipment, road(s) and storage piles
- EUBOILER#1 – Boiler system with associated air pollution control equipment.
- EUSORBENT – Dry sorbent injection system used to control acid gas emissions while combusting engineered fuel pellets.
- EUFAF – Fuel storage and processing at the nearby Fuel Aggregation Facility.

Figure 1 depicts the Facility's general process flow.

2.1 FUEL HANDLING SYSTEM

2.1.1 Process Description

Fuel is delivered to the site in self-unloading trucks. Fuel is generally unloaded into an enclosed Receiving Hopper Building near the Fuel Storage Building at the Generating Station. TDF is delivered directly to the Fuel Storage Building area and stored and metered separately. Pellets may also be delivered and stored similar to TDF or may be delivered to the enclosed receiving hopper via truck delivery either separately or mixed with other approved fuels. Depending on usage rates, pellets may also be delivered to the nearby Fuel Aggregation Facility (FAF) for mixing at known ratios with other approved fuels as they are brought to the Generating Station.

The Fuel Storage Building is covered and enclosed on three sides with the fourth side having three closed overhead doors that can be opened to load fuel by means of a front end loader in the event of a loading hopper equipment failure. Loading of fuel into the fuel storage building provides an opportunity for mixing the fuels in a uniform manner.

Fuel handling equipment, roads, and storage piles will be operated in such a way as to minimize visible fugitive dust emissions. The Facility will also utilize the EGLE-AQD approved Fugitive Emissions Control Plan (FECP) to maintain control of fugitive dust generated by the fuel and ash handling operations.

Fuel is delivered automatically from the fuel storage building to a conveyor that elevates and transports the fuel to the existing boiler house. Fuel from the conveyor is deposited into the fuel bin in the boiler house. Fuel from the bin is delivered to air swept spouts by bottom screw feeders. Fuel from the air swept spouts is spread evenly on the vibrating grate burning surface.

The complete operation is controlled by a process logic controller (PLC) that is interfaced to the Facility's distributed control system (DCS). The system typically operates 24 hours per day, 7 days per week.

2.1.2 Preventive Maintenance

The Facility uses Microwest Software Systems, Inc. Advanced Maintenance Management System (AMMS) application to manage and track maintenance activities. The Facility will perform routine preventive and corrective maintenance on the fuel handling equipment, which will include the following: the fuel unloading equipment, fuel conveying equipment, Fuel Storage Building, and fuel feeding equipment.

The Facility employs maintenance staff to service all aspects of plant operations who report directly to the Plant Operations/Maintenance Supervisor(s). Preventive maintenance (PM) activities for each operation and piece of equipment are based on manufacturer guidelines and operating experience. Once PM activities are identified, they are entered into a maintenance management database which generates a PM calendar and work orders for required PM tasks. Additionally, the system accommodates the generation of work orders for non-scheduled maintenance tasks. Work orders generated by AMMS are provided to appropriate maintenance staff for action. When the work order is completed, hours are entered into the Facility's accounting system, spare parts are ordered to maintain the spare parts inventory at adequate

levels, and the hard copy work order is filed as described in **Section 2.1.3**. Refer to **Appendix A** for a typical spare parts inventory.

Maintenance will be performed and scheduled as required or as needed. Refer to **Table 2-1** below.

TABLE 2-1
EUFUEL Preventative Maintenance Program

EUFUEL: Fuel Handling Equipment		
Item/Condition to be Inspected	**Frequency of Inspection or Repair**	**Recordkeeping Method**
Fuel handling system	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report

Problem identification will be done by the power plant operator, assistant plant operators, plant maintenance staff, or plant supervisors. Problems will be identified locally or by information presented in the DCS by process readings or alarm functions. Refer to **Table 2-2** for operating variables that are monitored.

TABLE 2-2
EUFUEL Operating Variables

Source: EUFUEL - Fuel Handling Equipment		
Operating Variable	**Normal Operating Range**	**Monitoring Method**
Fuel unloading equipment	In-Service	DCS and Visual
Doors on Receiving Hopper Building	Open	Visual
Overhead Doors on Fuel Storage Building	Closed unless doorway(s) being used or plant is shutdown	Visual
Fuel conveying equipment	In-Service	DCS and Visual
Roads and storage piles (if any)	No to minimal visible dust	Per the FECP
Fuel feeders	In-service, 6 to 14 amps	DCS and Visual
Reclaimers	In-service, 12 to 15 amps	DCS and Visual

The staff will identify problems and submit them to the Operations/Maintenance Supervisor(s) for correction, at which point the Operations/Maintenance Supervisor(s) will assign the repair to the maintenance staff. Refer to **Table 2-3** for corrective procedures for malfunctions.

TABLE 2-3 **EUFUEL Corrective Procedures**	
Source: EUFUEL - Fuel Handling Equipment	
Malfunction or Failure	**Corrective Procedure**
Fuel unloading equipment	If the fuel unloading equipment fails and the Receiving Hopper Building cannot be used, repairs will be initiated and fuel may be delivered into the Fuel Storage Building through the side doors with dust controlled following the FECP.
Overhead Doors on Fuel Storage Building	If an overhead door on the Fuel Storage Building fails to open, it will be repaired. If an overhead door fails to close or a portion or an entire door is removed, it will be repaired or replaced. As an interim measure the opening may be covered with a tarpaulin or other covering to control dust.
Fuel conveying equipment	If the conveying system fails, it will be repaired. If the incline conveyor into the Fuel Storage Building fails and cannot be quickly repaired, the overhead doors on the Fuel Storage Building may be used to deliver fuel. If the conveyor into the Power Plant building fails and cannot be repaired prior to the Fuel Bin being emptied, the plant may switch to natural gas firing or begin a boiler shut-down.

Upon completion of maintenance activities, the Operations/Maintenance Supervisor(s) will update the AMMS and file a hard copy of the completed activities. Any changes beyond manufacturer specifications will be reported to the Plant Manager to update the plan and make notifications**.**

2.1.3 Record Keeping

The Facility will maintain electronic and hard copy records of maintenance activities for fuel handling equipment through use of AMMS. Hard copy records of equipment covered by the PM/MAP and the associated maintenance activities will be maintained in the power plant office.

Logkeeping of equipment operation will be made and kept by the operations staff, the logs will be completed daily, and reviewed by plant management for accuracy and proper operation. The log will note equipment problems found and corrective actions taken. This log will be kept at the

Power Plant in accordance with **Section 3**. Any operations that result in exceeding of the limitations set forth in this plan will be identified and reported as required by the Plan**.**

If at any time the Plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the Plan within 45 days after such an event occurs.

2.2 BOILER OPERATION

2.2.1 Process Description

The boiler is equipped with an underfire/overfire air system, vibrating grate fuel bed**,** natural gas startup burners, and a multicyclone mechanical separator. Flue gas will be controlled by various combustion optimization techniques. Particulates will be removed from the flue gas by the multicyclone and by an electrostatic precipitator (ESP) before the flue gas is discharged from the facility stack.

The boiler also includes an ash handling system. The fly ash discharge from the rear pass ash hoppers and the multicyclone fly ash discharge are combined in the wet ash drag chain with the bottom ash. The wet ash drag chain transfers wet ash to the unloading drag chain into the ash storage building. Fly ash collected in the ESP is transferred mechanically with the ash screws to the ash unloading drag chain where it mixes with the wet ash before being deposited into the ash storage building.

The following boiler components are addressed by this PM/MAP:

- Vibrating grate fuel burning surface
- Boiler underfire/overfire air system
- ID fan
- Air heater

- Soot blowing equipment
- Multicyclone
- ESP
- Continuous Emissions Monitoring System (CEMS)
- COMS

2.2.2 Preventive Maintenance

The Facility will perform routine preventive and corrective maintenance on the boiler equipment, which will include the items listed at the end of **Section 2.2.1**. Refer to **Appendix A** for a typical spare parts inventory. Maintenance will be performed and scheduled as required or as needed. Refer to **Table 2-4** below.

TABLE 2-4
EUBOILER#1 Preventative Maintenance Program

EUBOILER#1: Boiler System		
Item/Condition to be Inspected	**Frequency of Inspection or Repair**	**Recordkeeping Method**
Vibrating grate	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Underfire air system	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Distribution air system (includes the overfire air system)	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
ID fan	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Air heater	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report

Boiler tubes	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Soot blowing equipment	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Multicyclone	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
ESP	Routine per AMMS, periodic visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Combustion controls	Routine per AMMS, whenever a discrepancy is identified, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
CEMS - CO monitoring equipment	Annual RATA test, quarterly calibration, and routine per AMMS	RATA report, CEMS log
COMS - Opacity monitoring	Annual RATA test, quarterly calibration, automatic daily self-calibration, and routine per AMMS	RATA report, COMS log

Problem identification will be done by the power plant operator, assistant plant operators, plant maintenance staff, or plant supervisors. Problems will be identified locally or by information presented in the DCS by process readings or alarm functions. Refer to **Table 2-5** and **Table 2-6** for operating variables that are monitored.

TABLE 2-5
EUBOILER#1 Operating Variables

Source: EUBOILER#1 - Boiler System

Operating Variable	Normal Operating Range	Monitoring Method
Grate speed	Generally 6-10 second duration and frequency between 48-54 seconds but varies depending on fuel mix and plant load	DCS

Main steam temperature and pressure	Generally 900 degrees F and 850 psig but varies depending on fuel mix and plant load	DCS
Soot blowers	Used as needed based on schedule, currently 3X per 24 hours	DCS
CEMS - CO monitoring equipment	24 hr average of less than 0.3 Lb/mmBTU per the PTI and ROP	CEMS log

TABLE 2-6
ESP Operating Variables

Air-Cleaning Device: ESP

Operating Variable	Normal Operating Range	Monitoring Method
Opacity	6-minute averages not exceeding 20% and one 6-minute average per hour not more than 27% per the PTI and ROP	COMS log
T-R sets voltage	Primary voltage above 100 volts	DCS

Note: Except for opacity, the above are examples and values can change as conditions change.

The staff will identify problems and submit to the Operations/Maintenance Supervisor(s) for correction, at which point the Operations/Maintenance Supervisor(s) will assign the repair to the maintenance staff. Refer to **Table 2-7** and **Table 2-8** for corrective procedures for malfunction of air pollution control equipment.

TABLE 2-7 **EUBOILER#1 Corrective Procedures**	
Source: EUBOILER#1 - Boiler System	
Malfunction or Failure	**Corrective Procedure**
Grate speed	If there is a problem with controlling the grate speed, air lances and/or rakes may be used to move the fuel and ash. Alternatively, the load may be reduced to help control the burn characteristics and control emissions or a boiler shut-down may occur.
Soot blowers	If there is a problem with the soot blowers they will be repaired.
CEMS - CO monitoring equipment and COMS – Opacity monitoring equipment	If the CEMS/COMS equipment experiences a problem, troubleshoot the problem and begin repairs as quickly as reasonably possible during normal working hours. In the interim, take the following steps to ensure compliance: - Continue to operate the boiler within the stable and emissions-compliant conditions at the time of the malfunction. - If the CEMS/COMS repairs are going to take more than a short period of time or replacement parts must be obtained, proceed with repairs as swiftly as reasonably possible and continue to operate the boiler within normal ranges of operation with extensive history of emissions compliance. - If repairs/replacement are going to take an excessive length of time, evaluate if rental CEMS/COMS equipment would allow for resumption of monitoring sooner than completion of repairs. If not, or if rental is not feasible, continue repairs as quickly as possible and operate the boiler within normal ranges of operation with extensive history of emissions compliance. - If necessary as a last option, switch to natural gas firing or shut down the boiler until CEMS/COMS repairs can be completed.

TABLE 2-8 **ESP Corrective Procedures**	
Air-Cleaning Device: ESP	
Malfunction or Failure	**Corrective Procedure**
Opacity exceeding 20% 6-minute average limitations or one 6-minute average per hour not more than 27% limitation	Troubleshoot and identify the problem. If the problem can be corrected while operating more quickly than a normal shut-down/start-up procedure, the repairs and/or adjustments will be made while operating. If the problem cannot be corrected while operating, load may be reduced to control emissions until a scheduled or more convenient time for shut-down. If none of the above can control opacity to within permit limits, switch to natural gas firing or a boiler shut-down will occur so repairs can be performed.
Controls for T-R sets and rappers are not functioning acceptably	Troubleshoot and identify the problem. If the problem can be corrected while operating more quickly than a normal shut-down/start-up procedure, the repairs and/or adjustments will be made while operating. If the problem cannot be corrected while operating, COMS will be monitored to validate compliance and load may be reduced if needed to control emissions until a scheduled or more convenient time for shut-down. If none of the above can control opacity to within permit limits, switch to natural gas firing or a boiler shut-down will occur so repairs can be performed.
Loss of effective operation of an ESP section	Troubleshoot and identify the problem. If the problem can be corrected while operating more quickly than a normal shut-down/start-up procedure, the repairs and/or adjustments will be made while operating. If the problem cannot be corrected while operating, COMS will be monitored to validate compliance and load may be reduced if needed to control emissions until a scheduled or more convenient time for shut-down. If none of the above can control opacity to within permit limits, switch to natural gas firing or a boiler shut-down will occur so repairs can be performed.

Upon completion of maintenance activities, the Operations/Maintenance Supervisor(s) will update the AMMS and file a hard copy of the completed activities. Any changes beyond manufacturer specifications will be reported to the Plant Manager to update the plan and make notifications**.**

2.2.3 Malfunction Events

For the purposes of this Plan, malfunctions that can result in excess emissions have been grouped into three distinct categories: Boiler Process Control System Malfunctions, Boiler Equipment Malfunctions, and Electrostatic Precipitators or Monitoring Equipment Malfunctions. A description of each type of malfunction follows:

- **Boiler Process Control System Malfunctions** are malfunctions that result in the partial or full loss of Boiler control PLC's or DCS logic control equipment.
- **Boiler Equipment Malfunctions** are malfunctions that result in the partial or complete failure of physical equipment within the Boiler.
- **Electrostatic Precipitators or Monitoring Equipment Malfunctions** are malfunctions that result in the partial or complete failure of physical equipment within the air pollution control or monitoring systems.

2.2.4 Record Keeping

The Facility will maintain electronic and hard copy records of maintenance activities for boiler equipment through use of AMMS. Hard copy records of equipment covered by the PM/MAP and the associated maintenance activities will be maintained in the power plant office.

Logkeeping of equipment operation will be made and kept by the operations staff, the logs will be completed daily, and reviewed by plant management for accuracy and proper operation. The log will note equipment problems found and corrective actions taken. This log will be kept at the Power Plant in accordance with **Section 3**. Any operations that result in exceeding of the limitations set forth in this plan will be identified and reported as required by the plan**.**

If at any time the Plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the Plan within 45 days after such an event occurs.

2.3 ASH HANDLING

2.3.1 Process Description

The ash handling equipment includes enclosed screw conveyors (for the ESP fly ash and from the rear pass ash hoppers and multicyclone to the wet ash drag chain)**,** a wet ash drag chain, an ash unloading drag chain, and an ash storage building. The wet drag chain takes the rear pass, multicyclone, and bottom ash to the ash unloading drag chain. Fly ash collected in the ESP is transferred mechanically with the ash screws to the ash unloading drag chain where it mixes with the wet ash from the wet drag chain. The ash unloading drag chain transports the ash in an enclosed housing to the ash storage building.

The ash storage building will be emptied regularly by trucks and the ash will be transferred off-site for proper disposal.

Ash handling equipment will be operated in such a way as to prevent the emission of particulate matter as required by the air permit.

2.3.2 Preventive Maintenance

The Facility will perform routine preventive and corrective maintenance on the ash handling equipment, which will include: The enclosed ash screw conveyors (dust collectors and ESPs), wet drag chain, ash unloading drag chain, and the ash storage building. Refer to **Appendix A** for a typical spare parts inventory. Maintenance will be performed and scheduled as required or as needed. Refer to **Table 2-9**.

TABLE 2-9 **Ash Handling Preventative Maintenance Program**		
Ash Handling Equipment		
Item/Condition to be Inspected	**Frequency of Inspection or Repair**	**Recordkeeping Method**
Ash hoppers	Daily visual, repaired as necessary	Daily Operating Log, Outage Work List or Report
Ash screw conveyors	Routine per AMMS, daily visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Ash drag chains	Routine per AMMS, daily visual, repaired as necessary	AMMS/Daily Operating Log, Outage Work List or Report
Ash storage building	Daily visual, repaired as necessary	Daily Operating Log, Outage Work List or Report

Problem identification will be done by the power plant operator, assistant plant operators, plant maintenance staff, or plant supervisors. Problems will be identified locally or by information presented in the DCS by process readings or alarm functions. Only exceptions to normal operation will be noted along with corrective actions required. Refer to **Table 2-10** for operating variables that are monitored.

TABLE 2-10 **Ash Handling Operating Variables**		
Source: Ash Handling Equipment		
Operating Variable	**Normal Operating Range**	**Monitoring Method**
Ash screw conveyors	In-Service	DCS
Drag chains	In-service and ash sufficiently moist to limit dust	Visual
Ash hoppers and storage building	Containing ash	Visual

The staff will identify problems and submit to the Operations/Maintenance Supervisor(s) for correction, at which point the Operations/Maintenance Supervisor(s) will assign the repair to the maintenance staff. Refer to **Table 2-11** for corrective procedures for malfunctions of air pollution control equipment.

TABLE 2-11 **Ash Handling Corrective Procedures**	
Source: Ash Handling Equipment	
Malfunction or Failure	**Corrective Procedure**
Multicyclone and ash hoppers	If there is a problem or breach in the multicyclone or ash hoppers troubleshoot and identify the problem. If the problem can be corrected while operating more quickly than a normal shut-down/start-up procedure, the repairs will be made while operating. If the problem cannot be corrected while operating, COMS will be monitored to validate compliance and load may be reduced if needed to control emissions until a scheduled or more convenient time for shut-down. If none of the above can control opacity to within permit limits, the plant may switch to natural gas firing or a boiler shut-down will occur so repairs can be performed.
Ash screw conveyors	If there is a problem with the ash screw conveyors they will be repaired. Interim measures will be taken if necessary to control dust generation while repairs are completed. Alternatively, the plant may switch to natural gas firing or a boiler shut-down may occur so repairs can be performed.
Drag chains	If there is a problem with a drag chain it will be repaired or the plant may switch to natural gas firing or a boiler shut-down may occur so repairs can be performed. If the ash being transferred to the unloading drag chain is not moist enough to inhibit dust generation, it will be manually moistened inside the Ash Storage Building prior to loading into haul trucks.

Upon completion of maintenance activities, the Operations/Maintenance Supervisor(s) will update the AMMS and file a hard copy of the completed activities. Any changes beyond manufacturer specifications will be reported to the Plant Manager to update the plan and make notifications.

2.3.3 Record Keeping

The Facility will maintain electronic and hard copy records of maintenance activities for ash handling equipment through use of AMMS. Hard copy records of equipment covered by the PM/MAP and the associated maintenance activities will be maintained in the power plant office.

Logkeeping of equipment operation will be made and kept by the operations staff, the logs will be completed daily, and reviewed by plant management for accuracy and proper operation. The log will note equipment problems found and corrective actions taken. This log will be kept at the Power Plant in accordance with **Section 3**. Any operations that result in exceeding of the limitations set forth in this plan will be identified and reported as required by the Plan**.**

If at any time the Plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the Plan within 45 days after such an event occurs.

2.4 DSI SYSTEM

2.4.1 Process Description

A DSI system has been added as emission control technology when combusting pellets to further reduce SO2 and HCl emissions. DSI consists of the direct injection of an alkaline reagent material into the flue gas before the ESP.

For storage and distribution an enclosed pneumatic system is used and can be fed by a bulk silo or super sack delivery system. The super sacks of DSI reagent will be stored indoors or covered with a tarp.

The performance of this system depends on:

- Flue gas characteristics, such as composition, temperature, and humidity.
- Reagent used as sorbent.
- Dispersion of the sorbent through the flue gas and location of the injection.

The chemistry associated with DSI technology is relatively straight forward and well understood. Trona (sodium sesquicarbonate) is injected into the gas stream where it thermally decomposes to a more porous sodium carbonate particle upon heating, which then reacts with the acid gases present in the flue gas stream. The basic trona reaction for sulfur capture is outlined below:

$2(Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O) \rightarrow 3Na_2CO_3 + CO_2 + 5H_2O$

$Na_2CO_3 + 0.5O_2 + SO_2 \rightarrow Na_2SO_4 + CO_2$

The global hydrogen chloride and hydrogen fluoride capture mechanisms for trona are as follows, respectively, following the trona decomposition step to Na2CO3:

$Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$

$Na_2CO_3 + 2HF \rightarrow 2NaF + CO_2 + H_2O$

As another example, calcium hydroxide is a common reagent used in DSI. Calcium hydroxide (Ca(OH)2) facilitates the following chemical reactions to reduce acid gas emissions depending on which acid gases are present:

Ca(OH)2 + SO2+ 0.5O2 CaSO4 + H2O

Ca(OH)2 + 2HCl CaCl2 + 2H2O

Ca(OH)2 + 2HF CaF2 + 2H2O

Accordingly, the primary reaction products of calcium based DSI are calcium sulfate, calcium chloride, and calcium fluoride for these scenarios.

The relative volume of the reaction products is a function of relative initial acid gas concentrations and the capture efficiency for each pollutant. Note that there are other less critical reaction products resulting from interaction with other flue gas constituents, such as CO2; however, the primary reaction products are those associated with the acid gases present.

Other reagents such as sodium bicarbonate and other industry recognized acceptable reagent may also be utilized to reduce HCl and other acid gases in the flue gas.

The DSI system will deliver sorbent material into the flue gas exhaust duct prior to the ESP. Cartridge filter dust collectors are integrated into the bulk silo system to control emissions when receiving reagent deliveries. The DSI system will be operated in such a way as to prevent the emission of particulate matter as required by the air permit.

2.4.2 Preventive Maintenance

The Facility will perform routine preventive and corrective maintenance on the DSI system. A spare parts list will be developed and kept on site. Maintenance will be performed and scheduled as required or as needed. Refer to **Table 2-12**.

TABLE 2-12
EUSORBENT Preventative Maintenance Program

EUSORBENT: DSI System		
Item/Condition to be Inspected	**Frequency of Inspection or Repair**	**Recordkeeping Method**
Storage and injection equipment	Daily visual, as recommended by the system vendor, repaired as necessary	Daily Operating Log, Outage Work List or Report
Controls	Daily visual, as recommended by the system vendor, repaired as necessary	Daily Operating Log, Outage Work List or Report

Problem identification will be done by the power plant operator, assistant plant operators, plant maintenance staff, plant supervisors, or others supporting the process. Problems will be identified locally or by information presented in the control system by process readings or alarm functions. Refer to **Table 2-13** for operating variables that are monitored.

TABLE 2-13
EUSORBENT Operating Variables

Source: EUSORBENT – DSI System		
Operating Variable	**Normal Operating Range**	**Monitoring Method**
Reagent Use	Reagent used at various target rates depending on the pellet use rate.	Control system and depletion of reagent from the super sacks or silo.

The staff or others assisting LWEC will identify problems and submit to the Operations/Maintenance Supervisor(s) for correction, at which point the Operations/Maintenance Supervisor(s) will assign the repair to the maintenance staff. Refer to **Table 2-14** for corrective procedures for malfunctions of the DSI system.

TABLE 2-14
EUSORBENT Corrective Procedures

Source: EUSORBENT – DSI System	
Malfunction or Failure	**Corrective Procedure**
Plugging of the reagent delivery system	If there is a problem with plugging, troubleshoot and identify the problem location, and remove the plug of reagent. If the problem can be corrected while operating more quickly than a normal shut-down/start-up procedure for feeding engineered fuel pellets, the repairs will be made while operating. Interim measures will be taken if necessary to feed reagent via alternate means, stop the feed of pellets, or feed pellets at a rate that has been demonstrated through testing to not exceed permitted emissions limits for HCl.
Mechanical or electronic controls failure of the DSI system	If there is a mechanical or controls failure, troubleshoot and repair the problem. If the problem can be corrected while operating more quickly than a normal shut-down/start-up procedure for feeding engineered fuel pellets, the repairs will be made while operating. Interim measures will be taken if necessary to manually record sorbent use rate, feed reagent via alternate means while repairs are completed, stop the feed of pellets, or feed pellets at a rate that has been demonstrated through testing to not exceed permitted emissions limits for HCl.

Upon completion of maintenance activities, the Operations/Maintenance Supervisor(s) will file an electronic and/or hard copy of the completed activities. Any changes beyond manufacturer specifications will be reported to the Plant Manager to update the plan and make notifications.

2.4.3 Record Keeping

The Facility will maintain electronic and/or hard copy records of maintenance activities for the DSI system.

Log-keeping of equipment operation will be made and kept by the operations staff, the logs will be completed daily, and reviewed by plant management for accuracy and proper operation. The log will note equipment problems found and corrective actions taken. Any operations that result in exceeding of the limitations set forth in this plan will be identified and reported as required by the plan**.**

If at any time the PM/MAP fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the PM/MAP within 45 days after such an event occurs.

2.5 FUEL AGGREGATION FACILITY

2.5.1 Process Description

At the FAF, which is operated independently by a contractor, woodchips and fines and bark are delivered by truck. Creosote-treated railroad ties (CTRT) usually arrive via railroad car or via truck. Cross-tie derived fuel (CDF), which is ground CTRT, may also be received via truck and railroad car. The FAF roadways and majority of the surface areas are not paved. Vehicle speeds in the FAF are posted to reduce the potential for dust generation. Wetting of the roadways and other areas is conducted as needed during non-freezing operating conditions to control fugitive dust emissions.

The trucks delivering fuel to the Facility are required to comply with the Michigan Vehicle Code, including tarpaulin coverage of loads in open-top trailers.

Fuel storage at the FAF is not an appreciable source of fugitive dust due to the moisture content of the material which typically exceeds 20% moisture. Stockpiled material is visually monitored

daily for dust generation. If dust generation occurs, the stockpile is re-worked to cover the dusty material with wetter fuel or water will be applied to the stockpile.

Walking floor trailers are used for material transfer to the extent possible. Transfer vehicles and trucks bringing CDF to the FAF deposit the material at the entrance to the Processed Railroad Tie Storage Building or may use the truck dumper.

Unloading of CDF on the truck dumper is visually monitored and water will be available for dust control as the material is unloaded, during non-freezing weather conditions. Dumping of CDF will be avoided on windy days (wind speed greater than 25 mph). If use of water is ineffective, LWEC will cease CDF dumping using the truck dumper. The dumped CDF will be transferred from the concrete pad to the Processed Railroad Tie Storage Building each day, will be covered with a tarp if stored on the concrete pad for longer than one day, or loaded directly into delivery trucks.

Dust generation from CTRT processing at the FAF is controlled by a water spray during non-freezing operating conditions. During winter conditions, some snow is left on the ties during processing, which serves as a source of moisture for dust suppression. Grinding and transfer equipment operators monitor for visible fugitive dust during operations.

Pellets may also be delivered to the FAF for blending into the fuel stream. The pellets will be unloaded in a manner similar to woodchips and then blended into the fuel for loading and delivery by truck to the Generating Station. The dust suppression and monitoring measures discussed above for the FAF will apply to pellets handled and blended at the FAF.

The FAF also uses the EGLE-AQD approved FECP to maintain control of fugitive dust generated by the fuel processing and handling operations.

2.5.2 Preventive Maintenance

The FAF contractor will perform routine preventive and corrective maintenance on the fuel processing and handling equipment, which will include the following: water feed and spray equipment to control dust generation on the CTRT grinder. There is not any processed fuel

conveying equipment in use. Trucks, grapple loaders, and front-end loaders are used to move material.

Problem identification will be done locally by the contractor's grinder operator or maintenance staff. When repairs are completed spare parts that are not available locally will be ordered to maintain the spare parts inventory at adequate levels.

Maintenance will be performed and scheduled as required or as needed. Refer to **Table 2-15** below.

TABLE 2-15
EUFAF Preventative Maintenance Program

EUFAF: Fuel Processing Equipment		
Item/Condition to be Inspected	**Frequency of Inspection or Repair**	**Recordkeeping Method**
Water spray system on grinder	Periodic visual, repaired as necessary	Contractor Records

Refer to **Table 2-16** for operating variables that are monitored.

TABLE 2-16
EUFAF Operating Variables

Source: EUFAF - Fuel Processing Equipment		
Operating Variable	**Normal Operating Range**	**Monitoring Method**
Water spray system on grinder	In-Service, weather allowing	Visual

Refer to **Table 2-17** for corrective procedures for malfunctions.

TABLE 2-17 EUFAF Corrective Procedures	
Source: EUFAF - Fuel Processing Equipment	
Malfunction or Failure	**Corrective Procedure**
Water spray system on grinder	If the water spray equipment fails, repairs will be initiated. If the fuel is dry enough during processing that excessive visible dust generation occurs, a temporary water spray system such as a garden hose with nozzle may be used to control dust. If temporary means of controlling dust generation are not adequate, grinding will cease until the spray system can be repaired or an alternate means of controlling dust is implemented.

Upon completion of maintenance activities, a record will be made by the FAF contractor.

2.5.3 Record Keeping

The FAF contractor will maintain records of maintenance activities for the fuel processing equipment. Any operations that result in exceeding of the limitations set forth in this plan will be identified and reported as required by the Plan**.**

If at any time the Plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the Plan within 45 days after such an event occurs.

SECTION 3

RECORD RETENTION AND REPORTING REQUIREMENTS

PM/MAP records will be kept at the Facility, in a satisfactory manner, for a period of at least five years. PM/MAP records will be made available to EGLE-AQD upon request.

LWEC will provide notice of abnormal conditions, start-up, shut down, or malfunctions that result in the following conditions:

- Emissions of hazardous or toxic air pollutants which continue for more than one hour in excess of any applicable standard or limitation, or

- Emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation.

Notice will be provided to EGLE AQD, Marquette District Supervisor, 1504 West Washington Street, Marquette, Michigan 49855, telephone 906.228.4853 not later than two business days after discovery of the abnormal condition or malfunction. Notice will be made via telephone, electronic, or oral communications.

Written reports, if required, will be filed with the Department within 10 days after the abnormal condition or malfunction is corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first.

The written reports will include:

- The time and date, the probable causes or reasons for, and the duration of the abnormal conditions, start-up, shutdown, or malfunction.

- An identification of the source, process or process equipment which experienced abnormal conditions, or which malfunctioned and other affected process or process equipment that have emissions in excess of an applicable requirement, including a

description of the type and, where known or where it is reasonably possible to estimate, the quantity or magnitude of emissions in excess of applicable requirements.

- Information describing the measures taken and air pollution control practices followed to minimize emissions.

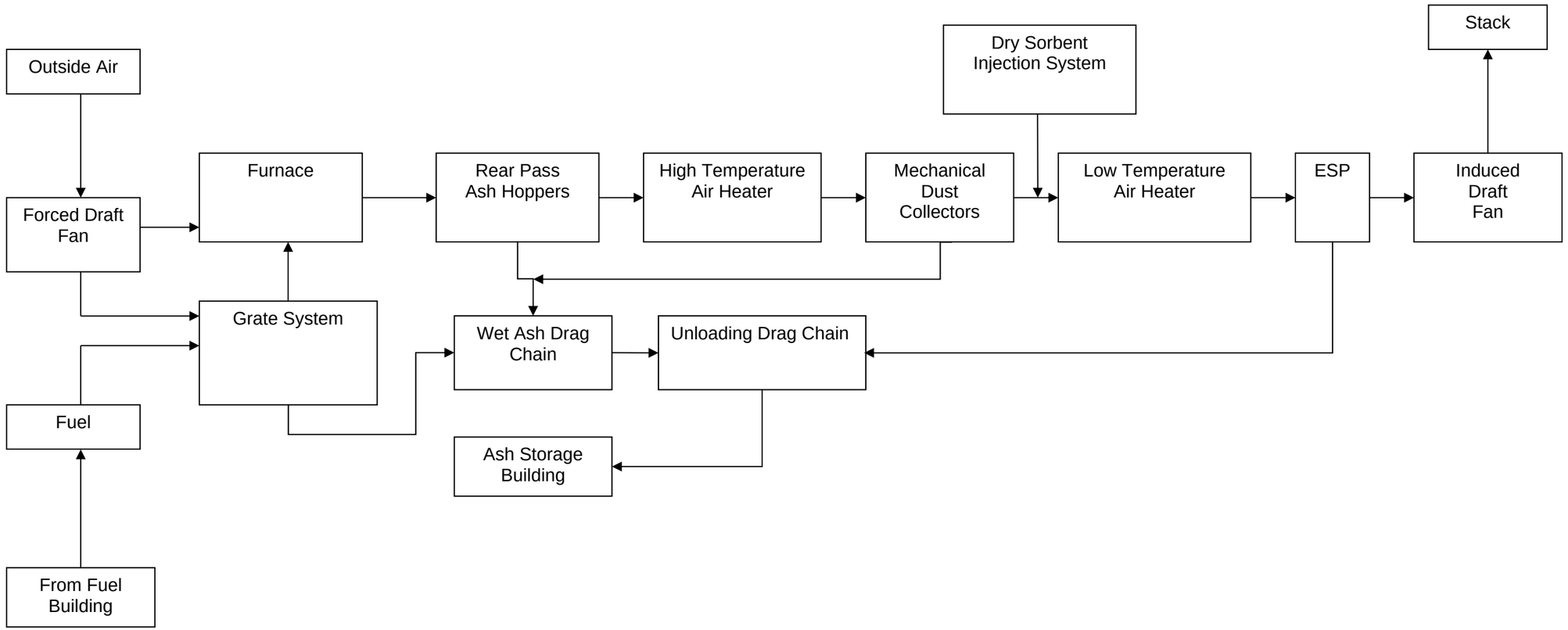
- For abnormal conditions and malfunctions, the report shall also include a summary of the actions taken to correct and to prevent a reoccurrence of an abnormal condition or a malfunction and the time taken to correct the malfunction.

- Certification by a responsible official of the truth, accuracy and completeness of the written report.

A sample malfunction notification report is included in **Appendix B**.

FIGURE

Figure 1
L'Anse Warden Electric Company, LLC.
Process Flow Diagram



APPENDICES

APPENDIX A
Typical Spare Parts Inventories

PM/MAP Typical Spare Parts

Emission Source – EU Boiler

Typical parts and items maintained on site.
- Shaker grate miscellaneous parts (gates, side seals, T bars, etc)

Air Cleaning Device: Mechanical Dust Collector

Typical parts and items maintained on site.
- Inlet Tubes (cones)
- Inlet Vanes
- Outlet Tubes
- Outlet Vanes
- Misc bolts, nuts, and gaskets

Air Cleaning Device: Electrostatic Precipitator

Typical parts and items maintained on site.
- Insulators
- Insulator heaters
- Hammers
- Anvils
- Hex shaft
- Gear Reducers
- Motors
- Couplings
- Collecting surface partial plate sections

Stack Monitoring: CEMs and COMs Units

Typical parts and items maintained on site.
- CO analyzer
  - Sample line filters
  - Purge solenoid valves
- O2 analyzer
  - Sample line filters
  - Purge solenoid valves
- Opacity analyzer
  - Sample line filters
  - Purge solenoid valves
- Spare sample cooler unit
- Misc tubing and fittings

DSI System:

Typical parts and items maintained on site.
- Typical spare parts will be identified and maintained on site

APPENDIX B
Malfunction Notification Report Template

Date

Michigan Department of Environment, Great Lakes, and Energy
Air Quality Division
Attn: Marquette District Supervisor
1504 West Washington Street
Marquette, Michigan 49855

Subject: L'Anse Warden Electric Company, LLC.
Malfunction Notification Report

To Whom it May Concern:

The L'Anse Warden Electric Company, LLC. is submitting this Malfunction Notification Report pursuant to EGLE Rule 336.1912. This report provides a summary of actions taken during a malfunction event. The fax copy of this report satisfies the requirement to notify EGLE within two (2) business days of the event. The original copy of the report will be submitted to the Agency within ten business (10) working days of the event. A full description of the event is provided below.

Regulated System:
Date:
Time:
Duration:
Event Type:
Probable Cause:
Estimated Emissions:
Corrective Actions:
Plans to prevent reoccurrence:
Malfunction Abatement Plan Followed: Yes/No

The Preventive Maintenance and Malfunction Abatement Plan has been updated to include preventive maintenance and malfunction abatement actions applicable to this event.

If you have any questions, or require additional information, please contact me at 906-524-4855.

Sincerely,
L'Anse Warden Electric Company, LLC.

John Polkky
LWEC General Manager