TC Energy
700 Louisiana
Houston Texas 77002

March 17, 2022

FedEx No. 776328034470

Michigan Department of Environment, Great Lakes and Energy
Air Quality Division – Kalamazoo District Office
7953 Adobe Road
Kalamazoo, MI 49009

RE: Startup/Shutdown Plan
Malfunction Abatement Plan
ANR Pipeline Company - Hamilton Compressor Station (N5574)

Dear Sir/Madam,

ANR Pipeline Company (ANR) respectfully submits the enclosed Malfunction Abatement Plan and Startup/Shutdown Plan for consideration and approval by EGLE for the following units in accordance with PTI 98-20 FGTURBINES SC III.1 and 2.

Emission Unit ID	Emission Unit Description
EUHM015	22,546 hp (181.21 MMBtu/hr at 32°F) natural gas-fueled Solar Titan 130 Turbine with dry-low-NOx (SoLoNOx) control
EUHM016	22,546 hp (181.21 MMBtu/hr at 32°F) natural gas-fueled Solar Titan 130 Turbine with dry-low-NOx (SoLoNOx) control

If you have any questions regarding this submittal please contact me at (832) 320-5490 or by email at chris_mcfarlane@tcenergy.com.

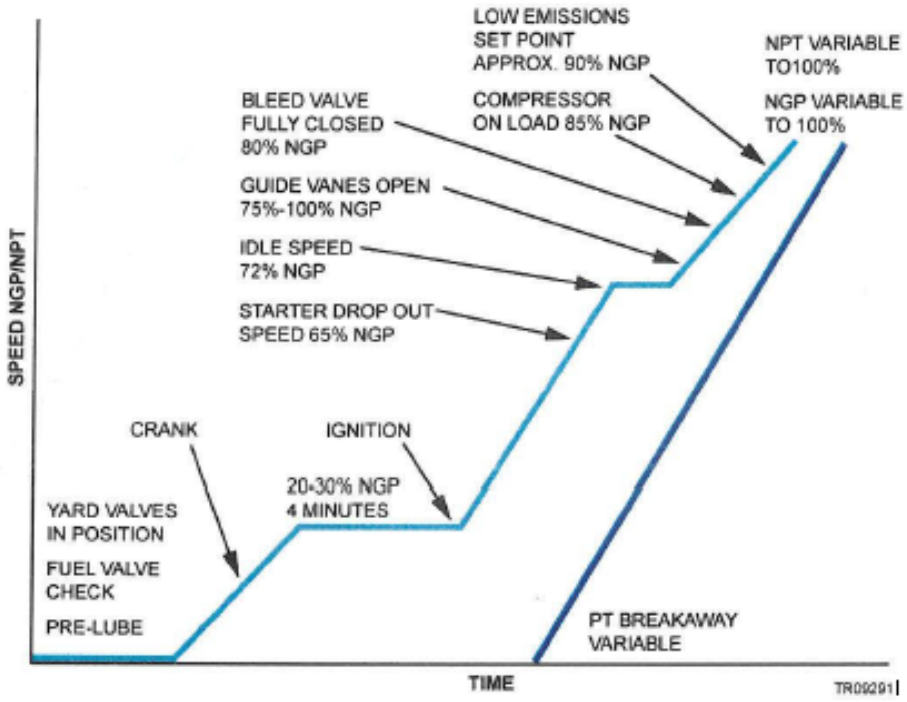
Sincerely,

Christopher McFarlane

Chris McFarlane
Analyst – US Natural Gas Environmental

Attachment – Solar Turbines Startup/Shutdown Plan and Malfunction Abatement Plan

STARTUP SEQUENCE



1. Select the Engine Summary display screen to monitor the package start.

2. Press the green START/STARTING Switch/Light on the Local control console.

3. The START/STARTING Switch/Light begins flashing and [Starting] is highlighted on Engine Summary display screen. The following system operational checks occur.

   a) The Backup lube oil pump is tested for operation.
   b) Pre-lube oil pressure is established using the Pre/Post lube oil pump.
   c) The control system begins a fuel system check.
   d) The seal system is tested for proper operation.

4. After the pre-lube cycle is complete, the compressor begins a purge cycle, and is then pressurized up to line pressure.

5. When the compressor has reached line pressure and the yard valves are in the proper start positions, the engine begins to crank.

6. After the starter has cranked the engine to crank speed, the exhaust purge timer begins providing a period of exhaust system purging via engine air flow. [Purge Crank] is highlighted on Engine Summary display screen.

7. After the turbine purge timer times out, [Ignition] is highlighted on the Engine Summary display screen and the ignition sequence begins.

8. When the engine temperature increases to light off temperature, [Light Off] is highlighted on the Engine Summary display screen, the fuel ramp is activated, and ignition is de-energized.

9. Engine speed will increase to starter dropout speed.

    a) The engine-driven lube oil pump pressure increases, and the pre/post lube oil pump stops.
    b) The Start system is de-energized and the starter clutch overruns.

10. The engine speed increases to idle speed. START/STARTING Switch/Light is extinguished and [Running] is highlighted on the Engine Summary display screen.

OPERATION

After idle speed has been reached, the engine/compressor is ready to load. If process control has been set to automatic, then the control system will increase the engine speed to load the compressor. Once the Anti-Surge Control Valve has closed and the compressor is loaded, the process control system will control NGP to achieve the selected set point (typically suction pressure, discharge pressure, or compressor flow).

Above SO% load the SoLoNox system will be enabled if the unit is equipped with a SoLoNOx system. The control system will automatically modulate the bleed valve open and closed to control TS temperature at the SoLoNox TS set point. This will control the CO emissions. At the same time the Pilot Fuel Valve will be commanded to its minimum open position to reduce NOx emissions.

At this point the process control system or the operator should adjust the speed setpoint to obtain the desired output. This may be maximum power based on engine control limits or a lower value to maintain the desired process conditions.

There are typically two control limits to which the engine will normally be controlled: NGP and TS. The control system will restrict fuel flow preventing the engine from exceeding these limits. The ability to reach either of these two limits will be affected by ambient temperature. When temperature is high, the TS limit will be reached first and when low the NGP limit will be reached first.

In addition to these two main limits, the control system will also automatically restrict the fuel flow to prevent other limits being exceeded, such as maximum NPT.

POST START

The control system monitors parameters such as engine speed, temperatures, gas and air pressures, oil pressure and level, gas fuel pressure, engine and compressor vibration, dc control voltage, compressor suction and discharge pressures, and compressor discharge temperature. The control system provides fuel topping (throttling) in the event certain monitored conditions exceeds preset limits. For all monitored parameters, it also provides the appropriate malfunction indication on the display screen and provides automatic control of shutdown sequencing and post lubrication of the engine and compressor bearings.

Observe the Operation Summary display screen on the operator interface display for a summation of system conditions. Observe individual display screens for detailed and expanded system data. Use the following list as a basic guide to record speeds, pressures, temperatures, and vibration levels for comparison with established norms. If radical deviations exist, shut down the engine and determine causes.

1. Ambient temperature (T 1)
2. Engine compressor discharge pressure (Ped)
3. Gas producer speed (N gp)
4. Engine temperature (T5 and possibly T7)
5. Power turbine speed (Npt)
6. Lube oil header pressure
7. Engine fuel pressure
8. Vibration monitor readings
9. Compressor suction and discharge pressures and temperatures
10. Compressor flow
11. Anti-surge I recycle valve position
12. Seal gas differential pressure
13. Buffer air differential pressure
14. Malfunctions (if any)
15. Operating hours

SHUTDOWN

To initiate normal stop from turbine control panel, press the STOP/STOPPING Switch/Light. The following events occur:

1. [Cooldown] highlights on the Engine Summary display screen.
2. The surge control valve is opened to unload the compressor.
3. The engine speed decreases to idle speed and continues to run for a preset.

After the preset cooldown period the following events occur:

1. The fuel system valves close, combustion ceases, and the engine begins to decelerate.
2. The [Cooldown] indication changes to normal, the STOP/STOPPING Switch/Light illuminates, and the [Stopping] indication highlights on the Engine Summary display screen.
3. The compressor suction valve and discharge valve close and the vent valve remains closed to maintain pressure in the compressor and process piping for a preselected pressurization hold time period.
4. The [Running] indication changes to normal.
5. After the engine coasts to a stop and the rundown timer is complete, a preset post lubrication cycle will be initiated.
6. After a preselected pressurization hold time period ends, the vent valve opens to depressurize the compressor and process piping and the seal system is de-energized.

ANR Pipeline Company

Malfunction and Abatement Plan

Hamilton Compressor Station
ANR Pipeline Company
Michigan

February 2022

Table of Contents

1.0 Background

Facility:	Hamilton Compressor Station
	ANR Pipeline Company (ANR)
Physical Address:	4193 134th Avenue
	Hamilton, Allegan County, Michigan
Plan Adoption Date:	February 17, 2022
Revisions:	

In accordance with flexible group conditions FGTURBINES, Part III (1) of the Michigan Permit to Install (PTI) #98-20 and the Michigan Administrative Code (MAC) R.336.1911, this Malfunction Abatement Plan (MAP) has been prepared for the above reference ANR facility which operates two natural gas-fired turbines (Solar Titan, 22,546 hp), and one natural gas-fired 2,664 (kW) emergency generator.

The purpose of this MAP is to prevent, detect, and correct malfunctions or equipment failures which may cause any applicable emission limitation to be violated or which may cause air pollution.

Please note none of the above-referenced emission sources is equipped with any air pollution control or monitoring equipment per Michigan PTI #98-20.

2.0 Elements of the Plan

In accordance with the PTI #98-20 FGTURBINES, Part III (1) and the elements specified in MAC R.336.1911 (2)(a) – (d) are addressed as follows:

(a) This element specifies that the MAP identified an individual responsible for inspecting, maintaining, and repairing the air pollution control equipment. Although no units will be equipped with any air pollution control equipment as mentioned above, ANR is appointing the Area Manager for this facility as the responsible person. At this time the Area Manager is:

Jacob Schultz
Area Manager, Michigan Area
ANR Pipeline Company
4193 134th Avenue
Hamilton, Michigan 49419
Office: (269) 751-3135

(b) This element is not applicable as no unit is equipped with any air pollution control equipment or monitoring equipment at the Hamilton Compressor Station.

(c) Please see Section 3.0 below for Malfunction Correction Procedures

(d) The Hamilton Compressor Station is equipped with an automatic control system which will generate an alarm and/or shutdown the unit(s) in case of a malfunction or equipment failure. The calibration schedule for any device(s) that monitor the units' operational variables may not exceed one year or as specified in this plan, whichever is shorter.

Malfunction Corrective Procedures

MAC R.336.1911(2)(c) specifies that the plan include the corrective procedures that will be taken in the event of a malfunction or failure that results in the exceedence of the applicable emission limitation.

In the event of a malfunction or failure that has the potential to exceed applicable emission limitation or cause air pollution as indicated by visual observations, the following corrective actions will be implemented.

- Shut the unit down as soon as possible consistent with safe operating procedures;
- Troubleshoot or investigate the cause of a potential malfunction or failure;
- Repair and/or replace components as required;
- Restart the unit and confirm normal operation.

A limited selection of replacement parts are maintained on site with a more extensive selection of spare parts maintained in a centralized warehouse facility. The spare parts list is frequently updated based on materials management analysis with input from engineering groups, the facility and other stakeholders (e.g., CS&E).

Maintenance on the listed equipment is guided by Integrity Plans, implemented by Operating Procedures and directed by TC Energy's Computerized Maintenance Management System (CMMS). Work tasks are based on vendor literature, industry best practices and company experience operating an extensive fleet of engines. The task list includes preventive and corrective maintenance activities and is updated on a regular basis. There are no monitors for the emergency generator.

The above malfunction corrective procedures are consistent with good air pollution control practices and are developed with intent to minimize the release of any air contaminant and restore normal operations as soon as practicable.