24 - DIESEL GENERATOR OPERATIONS—STARTUP, SHUTDOWN, REFUELING, AND PERIODIC MAINTENANCE

Title: Diesel Generator Operations—Startup, Shutdown, Refueling, and Periodic Maintenance **Doc. No.** 2015-MMTS-24

Approval Signatures and Date

Prepared/Reviewed by:		Date: 3/12/15
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***NOTE:** This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

***NOTE:** Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0007	Management of Change (Tier 1)
	Equipment Maintenance Checklist, The Hartford Steam Boiler Inspection and Insurance Company, 06/2008, http://www.hsb.com/HSBGroup/uploadedFiles/HSB_COM/Information_Resources/433%20%20%20Equipment%20Maintenance%20Checklist.pdf
	Electrical Preventive Maintenance, The Hartford Steam Boiler Inspection and Insurance Company, 06/2008, http://www.hsb.com/HSBGroup/uploadedFiles/HSB_COM/Information_Resources/Electrical%20Preventive%20Maintenance.pdf
	US Power and Environment, Procedural Guidelines—Projects Powered by Expertise, December 30, 2009, http://dieselgeneratorservice.com

24.1 PURPOSE

This procedure outlines operation, refueling, and maintenance of the diesel backup generator (Cummins Power Generation 100DSGAA Diesel Generator Set) for the MMTS.

24.2 SCOPE

This procedure covers operation, refueling, and maintenance for the diesel generator that will support MMTS operations in the event of an emergency loss of electrical power. Backup generation is intended to allow full facility operation for a sufficient length of time for any in-process mercury transfer operations to be completed and to bring the MMTS facility to a safe shutdown condition.

24.3 OPERATIONS

Connect to and Disconnect from Power

NOTE: *The MMTS MMS and PCDAS have approximately eighty (80) minutes of operation on internal battery backup; this allows time for staff to connect and power up backup generation as needed once it is known that the site power failure will be more than momentary. All other systems have no battery backup and will cease operation as soon as site power is lost.*

24.3.1 Switch from Site Power to Backup Generation

- Switch off the Site Power Disconnect to the MMTS.
- Move the MMTS power transfer switch from Site to Backup.
- Connect the backup generator power cable to the MMTS.
- Execute backup generator startup sequence (Section 24.6.3).

24.3.2 Switch from Backup Generation to Site Power

- Execute backup generator shutdown sequence (Section 24.6.4).
- Disconnect backup generator power cable to the MMTS.
- Move the MMTS power transfer switch from Backup to Site.
- Switch on the Site Power Disconnect to the MMTS

24.3.3 Startup Sequence

- Ensure MMTS electrical equipment, except for MMS and PCDAS, are powered off.
- Switch from site power to backup power cabling and switch positions.

- Conduct equivalent of weekly periodic maintenance check (Section 24.6.7).
- Execute backup generator engine startup.
- Allow engine to run at idle for 5 minutes before placing it under load.
- Sequentially switch on MMTS facility electrical loads.
- Verify MMTS electrical systems functional.
- Verify backup generator functioning in a proper stable manner—power output, engine temperature, and safe operation in general.
- During initial operation of the generator and periodically until generator-powered operations cease, confirm that the carbon monoxide concentration in the MMTS is within safe working limits.

24.3.4 Shutdown Sequence

- Verify that site electrical power is available and stable at the MMTS
- Ensure MMTS electrical equipment, except for MMS and PCDAS, are powered off.
- Allow engine to run at idle for 5 minutes before shutdown.
- Execute engine shutdown.
- Switch from backup power to site power cabling and switch positions.
- Sequentially switch on MMTS facility electrical loads.
- Verify MMTS electrical systems functional.

24.3.5 Refueling

- Fuel level should be monitored during operation. Monthly load testing should be used to determine fuel use rate and to determine periodic check intervals.
- Under normal circumstances, refueling should occur only when the engine is not running and cold.
- Under extreme circumstances, refueling may occur on a running engine. Extreme caution must be exercised, and at least two staff members must be present. Fire extinguishers should be immediately at hand.
- When not in operation, maintain fuel tank level at ¾ full or greater.

24.3.6 Periodic Maintenance

- Regular maintenance is necessary to ensure operation in time of need. Failures of the engine are typically related to lubrication, cooling, fuel system, or starting circuits.

Failures of the generator are typically related to moisture buildup in the generator windings.

- Keep a maintenance log of all maintenance activities along with fluid levels and any periodic test results.

24.3.7 Conduct weekly inspections

- Look for fluid leaks (coolant, oil, fuel).
- Check and document all fluid levels and condition (coolant, oil, fuel).
- Check that electrical connections are tight and free from corrosion.
- Inspect intake, exhaust, and radiator for damage, dirt, and/or corrosion.

24.3.8 Monthly

Run the generator under facility load for one hour.

24.3.9 Annually or 500 hours of operation, whichever comes first:

- Dispose and replace any fuel that is over one year old.
- Change engine oil and filter; change air filter and fuel filter.
- Inspect any/all belts for cracks and/or wear and replace as necessary.
- Inspect engine and generator mounts.
- Inspect crankshaft vibration damper.
- Inspect water pump for play in shaft.

24.3.10 4000 hours of operation:

- Inspect/adjust fuel injectors and valve lash.
- Internal engine rebuilding is not expected to occur. In the event of a major failure or excessive wear upon inspection, the unit should be replaced.

NOTE: MMTS Facility Manager must consider Management of Change implications for any issues or problems. Information may be found in the reference documents listed in Section 24.11.

24.4 RECORDS

- Operation (runtime, etc.), refueling, and maintenance log
- Management of Change records

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Revision History

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2	Replaced verbiage in §24.3. Refer to "MMTS Initial Operations Observations, Communications and Improvements for Implementation Crosswalk- July 10, 2015".	Burton Packard and Renee Rodriguez
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

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	Electrical Preventive Maintenance, The Hartford Steam Boiler Inspection and Insurance Company, 06/2008, http://www.hsb.com/HSBGroup/uploadedFiles/HSB_COM/Information_Resources/Electrical%20Preventive%20Maintenance.pdf