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GEORGIA POWER
POWER GENERATION DEPARTMENT
VOGTELE ELECTRIC GENERATING PLANT

INSTRUCTIONAL UNIT

TITLE: PREPARE THE EMERGENCY DIESEL GENERATOR FOR STARTUP NUMBER: NL-IU-11205-001-01-C

PROGRAM: OUTSIDE AREA OPERATOR REVISION: 1

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REFERENCES:

VOGTELE PROCEDURE 11145-1 DG ALIGNMENT FOR S/U AND NORMAL OPERATIONS (REV 5)
13145-1 DIESEL GENERATOR (REV 17)

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PERFORMANCE OBJECTIVE

Given a directive from the control room, prepare the diesel generator for startup.

The Lubricating Oil System sump tanks must be correctly filled to the required level. The Starting Air System must be pressurized. The Fuel Oil System must be available. The Jacket Water System must be filled and vented correctly; the nuclear service cooling water (NSCW) must be properly aligned and flowing through the jacket water heat exchanger; and the generator space heater must be on. The diesel generator controls must be in the MAINTENANCE mode and the LOCAL/REMOTE control switch must be in the LOCAL position.

The task is complete when the generator is in the stand-by mode. All communication and activities must be performed in accordance with current, approved procedures.

INFORMATION

This task is performed when the diesel generator has been shut down for maintenance or for any other reason.

It may take up to 24 hours for the jacket water and lube oil heaters to bring up and stabilize the jacket water and oil temperature for startup. Power must be provided to the starting air dryer at least 24 hours before starting.

An alignment of the diesel building HVAC systems and fuel oil storage systems is performed before the major components to the diesel generator will be placed in service. In order to verify that the other diesel generator subsystems are aligned, you will be given a completed and verified copy of Plant Vogtle Procedure 11145-1, "Diesel Generator Alignment for Startup and Normal Operations." These subsystems include: starting air, fuel oil (day tank and engine), lube oil, cooling water, and electrical distribution. The valve alignments for the diesel generator systems and the fuel oil systems are assumed to be completed per procedure (11145-1, 11146-1) prior to beginning this task. In this Instructional Unit, diesel generator train A numbers (valves, breakers, etc.) will be followed by train B numbers in parentheses where applicable.

For many maintenance activities, the diesel generator must be ensured not to start. The 1-2403-X4-765 and the 1-2403-U4-769 DIESEL GEN. A AIR START RECEIVER (#1 AND #2) DISCH ISO valves are isolated and tagged out. The diesel CANNOT be started if BOTH of these valves are closed. Check with the control room operator for exact instructions concerning when to open these valves.

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PREPARE FOR DIESEL GENERATOR STARTUP

The control will inform you when to prepare the diesel generator for startup.

Check the oil level of the oil bath air cleaner for the diesel engine. If the level is low, check for leaks on the floor. The air cleaner does not function correctly without oil. A sludge buildup of about one inch in the bottom reservoir is normal after long use. The air inlet screen must be clear of paper or other loose debris.

Check the muffler room for any flammable material and debris. The muffler room can reach high temperatures after the diesel generator is started. High temperatures are especially hazardous if there are any oil spills or flammable material in the area. Before preparing the system for startup, notify the control room of the location of any flammable materials.

Ensure that the fire protection deluge valves are not isolated and that pressure is available at the fire hose reel station. The fire protection deluge valve for the A train diesel generator room is in the P train diesel generator room, and the B train deluge valve is in the A train diesel generator room.

Ensure there are no burned-out bulbs on the annunciator panel. Replace any burned-out bulbs.

Account for the annunciator alarms as follows. Ensure that the alarms specified are annunciated. If any of the alarms annunciated on the alarm panel differ from those specified, notify the control room.

Verify that the DG1A DISABLED MAINTENANCE LOCK OUT alarm (window E10) has annunciated. Do not continue with the procedure until this alarm has annunciated. This alarm ensures that the diesel has been locked out and will not start during certain phases of this procedure. Notify the control room if it is not illuminated.

PLACE THE JACKET WATER KEEP WARM PUMP AND STANDPIPE HEATER IN SERVICE

1. Ensure that the LOW LEVEL JACKET WATER annunciator is not lit. If the level is low, slowly add water to the standpipe by opening jacket water makeup valve 1-2403-U4-753(713) located underneath the jacket water heat exchanger near the front of the engine at ankle level. Ensure that the Demineralized Water System valve is opened first. Notify the control room to reset the alarm. Little or no water should have to be added if the jacket water system was not disturbed during maintenance. If excessive water must be added, investigate to see if the water may have leaked into the engine.
2. Check to see if the LI-19100(19101) level indicator on the standpipe indicates a high or low level. A small change in stand pipe level causes a large movement in the indicator needle.

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3. Inspect the pump motor to ensure that it is free of foreign objects or missing parts. Ensure the couplings are intact and grounding cables are attached to the motor.
4. Start the jacket water circulating pump 1-2403-G4-001(002)-P04 by placing the local handswitch at the 480V AC MCC 1NBI(1NB0) in the AUTO position. Independent verification is required. The yellow AUTO light must illuminate and the red ON light must illuminate. The pump will start. Notify the control room if it does not. (This pump is also referred to as the jacket water keep warm pump.)
5. Verify that the jacket water pressure indicator 1-PI-19172(19173) reads between 10 and 20 psig.
6. Inspect the pump for leaks and unusual noises. Inspect the jacket water system by following the piping flow path using a flashlight to check for leaks.
7. Check the indicator on the standpipe for a change in the level.
8. Energize the jacket water heater 1-2403-G4-001(002)-H01 by placing the local handswitch in the AUTO position. The red ON light will illuminate. Independent verification of this switch is required.

CHECK THE LUBE OIL SUMP DIPSTICK LEVEL.

The lube oil dipstick is in the left side of the lube oil sump as you look at the diesel engine front. Remove the dipstick by turning the "T" handle counterclockwise. This reduces the diameter of the rubber plug. Pull the dipstick out. Use a lint-free paper towel to wipe the oil from the dipstick. Reinsert the dipstick fully; then withdraw it to read the level. The dipstick has three marks which indicate level. Verify that the level is between MAX STATIC and MIN STATIC.

Replace the dipstick fully, and turn the "T" handle clockwise to provide a snug fit of the rubber plug with the oil sump fitting. Do not overtighten.

PLACE THE LUBE OIL CIRCULATING PUMP AND LUBE OIL HEATER IN SERVICE

1. Inspect the circulating lube oil pump. Look for excess oil puddles which indicate leaks in the pump or piping. Check for loose or missing bolts or parts at or near the couplings. Ensure that the grounding cables are connected. Listen for unusual noises and vibrations after starting the pump. (This pump is also referred to as the lube oil keep warm pump.)
2. Start the lube oil circulating pump 1-2403-G4-001(002)-P07 at the 480 AC MCC 1NBI(1NB0) by placing the local handswitch in the AUTO position. The pump will start and the yellow AUTO indicating lamp and the red ON indicating lamp will illuminate. Independent verification is required on this handswitch.
3. Verify that the lube oil pressure indicator 1-PI-19176(19177) reads between 10 and 20 psig.
4. Energize the lube oil heater 1-2403-G4-001(002)-H02 at MCC 1NBI(1NB0) by placing the local handswitch in the AUTO position. Verify the red ON indicating lamp is illuminated.

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CHECK THE JACKET WATER AND LUBE OIL KEEP WARM THERMOSTATS

It takes several hours for the lube oil and jacket water temperatures to reach their maintained levels (dependent upon the initial temperatures). The lube oil temperature to the engine is maintained between 142 and 170 degrees as read on 1-TI-19158(19159). The jacket water temperature to the engine is maintained between 142 and 170 degrees as read on 1-TI-19115(19122).

PLACE THE STARTING AIR SYSTEM IN SERVICE

1. Verify that 120V AC power is available to the air dryers by verifying that the amber POWER ON indicating light on the air dryer control panel is illuminated. Power must be available to the dryers at least 24 hours before starting the dryers. This is to energize the air dryer compressor crankcase heater, so that the compressor oil temperature is higher than the other system components, preventing the liquid refrigerant from accumulating in the compressor while it is shut down.
2. Ensure the condenser is free of dirt and foreign objects. If it is dirty, notify the control room to initiate an MWO. The condenser is the part of the dryer that looks similar to an automobile radiator.
3. Use a flashlight to visually inspect the two parallel drive belts (fan belts) on the air compressor beneath the belt guard. Look for frays and loose parts. Keep your hands clear of the belts.
4. Check the oil level in the air compressor crankcase by unscrewing and removing the dipstick, wiping and reinserting it, and checking the level and reinstalling it.
5. Start the 1-2403-G4-001(002)-K01 (K02) air dryer refrigeration unit from the air dryer control panel by depressing the black pushbutton with the 'I' inscribed on it. The dryer runs continuously, whether or not the air compressor is running. The red HIGH TEMP light is expected to illuminate just after the air dryer starts. The light will go out after the air has cooled (approximately 15 minutes).
6. Energize the air after-cooler fan 1-2403-G4-001(002)-E01(E02), at MCC 1NBI(1NBO), by placing the local handswitch to the AUTO position. Independent verification will be required for that handswitch.
7. Start air compressor 1-2403-G4-001(002)-C01(C02), at MCC 1NBI(1NBO), by placing the local handswitch to the AUTO position at least 15 minutes after the air dryer has been started. The air dryer should be started at least 15 minutes prior to starting the air compressor. Independent verification is required.
8. Check the air dryer gauges:
 - a. REFRIGERANT SUCTION PRESSURE
The pressure should be approximately 33 psig when the air compressor is running.
 - b. TEMPERATURE IN
The temperature varies dependent upon ambient conditions. A temperature of approximately 90 degrees F. is expected. The maximum expected value is 120 degrees F. High temperatures

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- indicate problems with air compressor intercooler or after cooler.
- c. PRESSURE IN
The air compressor discharge pressure should be the same, to as much as 5 psig higher than, the pressure out.
 - d. TEMPERATURE OUT
The temperature out must be less than the temperature in. The expected temperature is approximately 85 degrees F. High temperatures indicate a malfunctioning refrigeration system or loss of power to the air dryer.
 - e. PRESSURE OUT
The expected reading is the same as the receiver air pressure.

BLOWDOWN AIR RECEIVERS NO. 1 AND NO. 2

Crack open the 1-2403-X4-762(723) and the 772(728) receiver drain valves as the starting air pressure 1-PI-9060(9061) and 9064(9065) indicators show 25 psig. The drain valves are on the bottom of the starting air receiver. Check for an accumulation of water, oil, and sediment approximately every 30 minutes, until the pressure has increased to 250 psig, where the compressors shut down. The valve should be cracked open and checked for accumulation, then reclosed. Independent verification is required after positioning these valves.

COMPLETE THE TRAIN A (B) DIESEL GENERATOR STANDBY MODE STATUS CHECK

NOTE: Sections of Plant Vogtle Procedure 13145-1 are completed by the control room operator.

NOTE: For this IU it is assumed that the fuel oil system was aligned. At this point, the control room operator will place the DFOST pump in AUTO.

Complete Standby Mode Status Check

Some steps require independent verification. Deliver Checklist A from Procedure 13145-1 to the control room operator when the DG room portions have been completed. Check the parameters listed and initial in the space provided. Most items are self-explanatory, but the following may give a better understanding:

a. UNIT AVAILABLE light

This blue light indicates greater than 150 psig starting air pressure, no overspeed trip signal, no barring device lockout and start circuit DC power available.

b. POWER AVAILABLE lights

A power, B power, and C power do not refer to phases of AC voltage, but rather three separate 125V DC control power circuits for the diesel generator. A power and B power each provide a starting circuit to operate

air start solenoids, flash the generator field, and other functions. B power is also used as control power to shut down the DG. C power provides annunciator power and power for several control power indicating lights.

c. Lockout Relays 186A, B and C

The red light associated with each will be dimly lit, indicating continuity of electrical current through the trip coil of each. Never reset a lockout relay or relay target flag without being directed to do so, and always report any tripped lockout relays or target flags.

d. It is important that the three control knobs on the governor must never be tampered with. The settings are, in very basic terms:

--Speed Droop. This is a function of how much the engine speed would try to change going from no load to full load. The speed droop control helps compensate that change.

--Load Limit Knob. Sets the maximum limit that the mechanical portion of the governor will allow. Usually set at MAX FUEL.

--Speed Setting Knob. This setting can vary from engine to engine, and determines the speed at which the mechanical governor will control (approximately 470 rpm).

Special attention must be given to the governor. When the governor sightglass is checked, look for the level to be at or above the black line marked on the sight glass. Look for evidence of oil leaks from the governor. Examine the linkage from the governor to the fuel racks using a flashlight. Examine the linkage from the shutdown cylinder to the fuel racks, and the linkage to the two combustion air dampers.

At a nuclear plant that also used a Transamerica Delaval diesel with a Woodward governor, a diesel overspeed occurred for about 15 seconds on a startup following preventive maintenance on the governor. It is postulated that inadequate filling and venting of the governor, along with a slowly reponding overspeed trip protective device, allowed the diesel to overspeed. Numerous engine components were damaged, including rods, rod bearings, and main bearings.

Visually inspect the governor, fuel rack linkage, and shutdown cylinder linkage to determine that they will function correctly. Also, check for linkage bolts that may be loosening.

NOTIFY THE CONTROL ROOM THAT THE TASK IS COMPLETE

Ensure that the PED sections of the STANDBY MODE STATUS CHECK checklist are completed, verified, and the time of completion noted before giving it to the Control Room Operator. The Control Room Operator will complete this

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portion of the Standby Mode Status Checklist. The diesel generator is now operable and aligned for automatic starting.

LOG THE ACTIVITY

Record the activity in the proper log book.

PERFORMANCE GUIDE

Follow these steps to prepare the diesel generator for start.

1. Receive a directive from the control room to prepare the diesel generator for startup.
2. Place the jacket water keep warm pump and standpipe heater in service.
3. Check the lube oil sump dipstick level.
4. Place the lube oil circulating pump and lube oil heater in service.
5. Check the jacket water and lube oil keep warm thermostats.
6. Blow down air receivers No. 1 and No. 2.
7. Place the starting air system in service.
8. Complete standby mode status check.
9. Complete the train A (B) diesel generator standby mode status check.
10. Notify the control room that the task is complete.
11. Log the activity.

SELF-TEST

Before proceeding to the Task Practice, answer the following questions.

1. Which of the following actions pertains to performing a lamp check on the diesel generator alarm panel?
 - a. Make sure that there are no burned out bulbs on the annunciator panel.
 - b. Account for the annunciator alarms.
 - c. Ensure that any burned-out bulbs are replaced.
 - d. All of the above
 - e. None of the above
2. What should you do if you find any flammable materials in the area around the diesel generator?
3. When placing the starting air system in service, what should you do if you find the condenser dirty?
4. When you place the lube oil circulating pump and the lube oil heater in service, lube oil pressure indicator 1-PI-19176(19177) should read between _____ and _____ psig.

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ANSWERS

1. d. All of the above
2. Notify the control room of the location of any flammable materials before preparing the system for startup.
3. Notify the control room to initiate an MWO.
4. 10 and 20

TASK PRACTICE

Before proceeding to the Performance Test, complete the following Task Practice exercise.

1. Review Procedure 13145-1. Be sure that you understand all precautions, limitations, and steps associated with preparing the diesel generator for startup.
2. Take this instructional unit and Procedure 13145-1 to the diesel generator building. Be sure that you can locate all local components and instrumentation associated with preparing the diesel generator for startup.
3. In the diesel generator building, walk through the task of preparing the diesel generator for startup. If possible, have a fellow trainee evaluate your performance using Procedure 13145-1 and this instructional unit.

FEEDBACK ON TASK PRACTICE

1. If you have any questions about the precautions, limitations, or steps in Procedure 13145-1, ask your instructor.
2. You should have been able to locate all local components and instrumentation associated with preparing the diesel generator for startup. If you had any difficulty, ask your instructor for help.
3. You should have worked through the steps necessary to prepare the diesel generator for startup. If you had any difficulty, re-read the pertinent sections of this instructional unit and the procedure. Resolve any questions with your instructor.