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GEORGIA POWER  
POWER GENERATION DEPARTMENT  
VOGTLE ELECTRIC GENERATING PLANT

1 of 2

INSTRUCTIONAL UNIT

TITLE: RESPOND TO EMERGENCY DIESEL  
GENERATOR GENERATOR ALARMS

NUMBER: NL-IU-11205-008-01-C

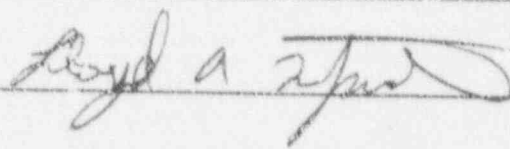
PROGRAM: OUTSIDE AREA OPERATOR

REVISION: 1

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APPROVED:



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REFERENCES:

VOGTLE PROCEDURE 17035-1, ANNUNCIATOR RESPONSE PROCEDURES (REV 4)

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PERFORMANCE OBJECTIVE

Given that a generator alarm on the engine control panel has annunciated, respond to the diesel generator GENERATOR alarm.

The alarm must be acknowledged. The condition causing the alarm must be investigated and, if possible, corrective actions taken. Where possible, the diesel generator must be returned to normal operating conditions. All communication and activities must be performed in accordance with current, approved procedures.

INFORMATION

The alarms associated with the generator portion of the diesel generator are located on ALB35 (ALB38) and are as follows:

DG1A (B)	GENERATOR TROUBLE	WINDOW E1
DG1A (B)	LOW VOLTAGE	WINDOW E2
DG1A (B)	HIGH TEMP GEN CNTL PNL	WINDOW E3
DG1A (B)	LOW EXCITATION	WINDOW E4
DG1A (B)	TRIP GENERATOR FAULT	WINDOW E6
DG1A (B)	TRIP GEN DIFF	WINDOW E7
DG1A (B)	HIGH TEMP GEN BEARINGS	WINDOW E8
DG1A (B)	GENERATOR UNDER FREQUENCY	WINDOW D6

NOTE: DG1A (B) DISABLED GEN CNTL POWER FAILURE, AND DG1A (B) DISABLED NON-RESET OF EMERGENCY TRIP are covered in another instructional unit.

E01 DG1A GENERATOR TROUBLE

ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A GENERATOR TROUBLE alarm is located in window E01 on the annunciator panel.

INVESTIGATE THE ALARM

The control room operator will dispatch the QAO to determine the trouble with the diesel generator. The generator trouble alarm responds to some of the same diesel generator relays that the DG trip generator fault alarm responds to, but the generator trouble alarm does not necessarily mean a trip of the diesel generator has occurred.

At the generator control panel, check the three lockout relay handles (186A, B and C) and report to the control room immediately if any one is in the tripped position, or if the red light above any of the 186 lockouts is

not lit. Check each of the diesel generator relays for targets. Targets are orange/red indicators and are visible if the relay picks up. Report findings to the control room.

The relays which can cause the alarm are auxiliary (X) relays actuated by the following primary relays:

132	Reverse Power Relay
140	Loss of Excitation (field)
146	Negative Phase Sequence Relay
151V/A	Voltage Restrained Overcurrent (OC) Relay
151V/B	Voltage Restrained Overcurrent (OC) Relay
151V/C	Voltage Restrained Overcurrent (OC) Relay
151N	Neutral Ground Overcurrent Relay
159	Generator Bus Overvoltage Relay (alarm only)
160	Potential Transformers (PT) Failure Relay (alarm only)
164	Generator Field Ground Relay (alarm only)
181	Underfrequency
127	Undervoltage

On the primary relay for the above functions, a target will appear showing that the relay has "picked up" when it detected the condition. The diesel generator and its relays do not respond in the same manner for all relays. The response of each depends on the conditions under which the diesel generator was started, i.e., emergency start or normal start situation. This can affect whether the diesel generator continues to run or not.

The three lockout relays on the generator control panel each have a TRIP and a RESET position.

1. 186A lockout relay will trip when a diesel generator differential relay picks up. This is further explained in the discussion of the TRIP GEN DIFF alarm.
2. 186B lockout relay will trip when the 140-loss of excitation relay picks up; 151V/A, B, or C-voltage restrained overcurrent (OC) relays for each phase relay picks up; 151N picks up on an overcurrent at the neutral lead of the generator; 160 indicates a failure of a potential transformer (PT).
3. 186C lockout relay will trip while the engine is running on a 132 reverse power, or 146 negative phase sequence.

#### TAKE CORRECTIVE ACTION

Make note of primary relays and lockout relays having targets showing. Report findings to the control room operator. Reset the relays when directed by the control room operator. The control room operator may be aware of what caused the relays to pick up.

1. Press relay target reset pushbutton on the generator control panel.

NOTE: Never reset a relay target or lockout relay until directed to do so. Shift Supervisor (or higher) approval is required.

2. To reset the orange target indicator on the primary relay, press up on the push rod on the front of the primary relay panel. The push rod is usually located on the lower left side.
3. Turn the handle on the lockout relay to the RESET position and quickly release it. The red monitor light illuminates. Quickly release the handle. Never hold the handle in the reset position. Communicate with the control room operator while you are resetting the TRIP-RESET handle on the lockout relay. If it trips again, report the re-trip and await further instructions.
4. RESET the annunciator alarm.

#### LOG THE ACTIVITY

The activity must be logged in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

#### E02 DG1A LOW VOLTAGE

#### ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A LOW VOLTAGE alarm is located in window E02 on the annunciator panel.

#### INVESTIGATE THE ALARM

The control room operator will direct the QAO to check local instrumentation at the generator control panel and determine the cause. Observe the reading on the field V meter on the generator control panel, which has a scale of 0-150 DC and a field ammeter of 0-500 amps. Also, locally check bus voltage using a bus V meter and selecting phase A-B, B-C, and C-A voltages. Report the voltages to the control room operator. The readings should agree in both places.

Remain in constant communication with the control room operator for additional specific instructions.

#### TAKE CORRECTIVE ACTION

Initial corrective action will be taken primarily by the control room operator, since it involves adjusting the voltage from the control room. Specific corrective actions may be directed by the control room operator.



Should the control room operator not be able to restore voltage, and the diesel generator is supplying load due to a loss-of-offsite power, the OAO will be directed to transfer to the manual voltage regulator (per Procedure 13145-1). Remain in constant communication with the IO while performing the following:

- a. Depress emergency shutdown pushbutton (1-HS-4474) on generator control panel.
- b. Verify the generator field volts are zero.
- c. Place local/remote switch 1-HS-4516 to local.
- d. Depress manual voltage regulators pushbutton 1-HS-4495.
- e. Verify manual voltage regulator light is on.
- f. Press exciter enable pushbutton 1-HS-4457.
- g. Press field flash pushbutton 1-HS-4459 for 3 to 5 seconds.
- h. Adjust the generator voltage to 3750 to 4330 volts, using the voltage regulator raise-lower switch handle.
- i. Place the local/remote switch (1-HS-4516) to remote.

#### LOG THE ACTIVITY

Log the activity in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

E03 DG1A HIGH TEMP GEN CNTRL PNL

#### ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A HIGH TEMP GEN CNTRL PNL alarm is located in window E03 on the annunciator panel.

#### INVESTIGATE THE ALARM

This alarm is functional when the diesel generator is operating and can be caused by the following conditions:

1. overheating of exciter components.
2. rising temperature in the diesel generator room.
3. loss of HVAC.
4. failure of high temperature switch 1-TS-4774

Check for rising temperature in the diesel generator room by checking temperature at thermostats for HVAC located in the diesel generator room. Feel the back of the generator control panel for higher than normal temperature. Notice any unusual smell, such as burning insulation. Look for smoke on or near the generator control panel. With the DG in standby, check that HVAC is operating correctly with the non-ESF fan running and dampers open if above 85 degrees F. Report any indication of smoke or fire to the control room immediately. Report findings to the control room operator.

NL-IU-11205-008-01-C; Respond to Diesel Generator "Generator" Alarms

TAKE CORRECTIVE ACTION

Take measures to restore proper ventilation to the DG room, and to the generator control panel. In addition, follow any other instructions given by the control room operator. Ensure that the diesel generator room HVAC is operating normally.

LOG THE ACTIVITY

Log the activity in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

E04 DG1A LOW EXCITATION

ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A LOW EXCITATION alarm is located in window E04 on the annunciator panel.

INVESTIGATE THE ALARM

This alarm could be caused by the following conditions:

1. Problems with the exciter regulator
2. The generator being operated with a leading reactive power.

The alarm can occur due to testing.

TAKE CORRECTIVE ACTION

Follow the directives of the control room operator. The situation is cleared when the annunciator light is no longer illuminated. The control room operator will make the corrections, by adjusting voltage.

LOG THE ACTIVITY

Log the activity in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

E06 DG1A TRIP GENERATOR FAULT

ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A TRIP GENERATOR FAULT alarm is located in window E06 on the annunciator panel.

INVESTIGATE THE ALARM

This alarm will appear when the 186B or 186C trip and lockout relays have tripped. 186B will trip, causing the DG breaker to open and the DG to shutdown (except during an SI) if any of the following relays pick up:

NL-IU-11205-008-01-C; Respond to Diesel Generator "Generator" Alarms

1. loss of field 140 relay.
2. phase overcurrent 151VA, 151VB, and 151BC.
3. neutral ground overcurrent 151N.

136C will trip after a time delay if either of the following occurs:

1. Reverse power relay 132.
2. Negative phase sequence relay 146.

The 186C will cause the DG output breaker to trip (but the engine continues to run), if the DG is running in parallel (as during testing). The control room operator will direct the OAO to locate the relays to the right of the generator control panel. Identify targets, note which relays have targets showing, and report to the control room operator which 186 lockout relay tripped.

#### TAKE CORRECTIVE ACTION

The control room operator should perform the necessary actions from the control room to correct the conditions causing the alarm. If the target is showing on phase overcurrent relay, read phase A, B, and C ammeters to determine which phase had overcurrent. This will apply if the diesel is still running under emergency startup conditions. Report findings to the control room. Once the situation is corrected and the IO directs, reset the relay target by:

1. pressing the relay target reset pushbutton.
2. lifting up on the push rod on the front of the relay panel.
3. resetting lockout relay B or C (only after being directed to do so)
4. resetting the annunciator alarm.

Never hold an 86-type lockout relay to the reset position. To do so can result in damage to the relay coil.

#### LOG THE ACTIVITY

Log the activity in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

E07 TRIP GEN DIFF

#### ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A TRIP GEN DIFF alarm is located in window E07 on the annunciator panel.

#### INVESTIGATE THE ALARM

The probable cause of this alarm is any one or more of three 187 differential relays sensing differential current. A 187 relay is designed to be a sensitive relay that protects the generator by causing the diesel



engine and excitation to shut down and the generator breaker to open when a phase-to-phase overcurrent occurs. When a 187 relay picks up, it causes the 186A lockout relay to trip. The 186A lockout relay will cause the tripping functions to initiate. This diesel generator trip is available even during emergency startups. Ensure that the diesel engine has shut down. This is an automatic emergency stop situation. If this alarm occurs and the diesel generator does not trip, the diesel generator must be emergency stopped.

The control room operator will dispatch the QAO to determine the cause of the trip. Inspect the generator to detect smoke, hot spots, fire, burning odors, or burning electrical insulation. Make notes of relay targets showing at the generator control panel, including which phase(s) of differential relays are showing targets. Check for other 186 lockout relays which may have tripped. Report findings to the control room operator.

#### TAKE CORRECTIVE ACTION

If a fire has occurred, assist with firefighting. Further corrective actions may include extensive repairs to the diesel generator. The diesel generator will be inoperable in an actual phase differential situation.

Follow any further directives received from the control room operator. When directed, reset the target reset pushbutton, differential relay flag(s), and reset lockout relay 186A.

#### LOG THE ACTIVITY

Log the activity in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

### E08 DG1A HIGH TEMP GEN BEARINGS

#### ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A HIGH TEMP GEN BEARINGS alarm is located in window E08 on the annunciator panel.

#### INVESTIGATE THE ALARM

Determine oil levels using a sight glass. This alarm occurs at approximately 180° F. at the generator bearings, and is probably caused by low oil level, or failure of the generator pedestal bearings. The control room operator will dispatch the QAO to locally check bearing oil temperature and level. The temperature indicator is a digital readout type on front of the generator control panel. Report the temperature and level to the control room operator. Check for oil leaks or smoke at the pedestal



NL-IU-11205-008-01-C; Respond to Diesel Generator "Generator" Alarms

bearings. The problem could also be a temperature sensor malfunction or loss of power to the temperature switch.

TAKE CORRECTIVE ACTION

Assist while Maintenance personnel adds oil to the pedestal bearings.

LOG THE ACTIVITY

Log the activity in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

D06 DG1A GEN UNDER-FREQUENCY

If the DG is in parallel with the RAT and this alarm occurs (at 59.5 Hz), the generator output breaker trips. The control room operator will then stop the engine. If the DG is isolated and powering the 4160V 1E bus, the control room operator will adjust the engine speed control to restore frequency to 60 Hz.

ACKNOWLEDGE THE ALARM

Acknowledge the alarm condition by depressing the ACKNOWLEDGE button on the diesel generator panel. The DG1A GEN UNDER-FREQUENCY alarm is located in window D06 on the annunciator panel.

INVESTIGATE THE ALARM

This alarm is caused by under-frequency conditions when the diesel generator is running. The control room operator will dispatch the QAO to the generator control panel to check the targets on the relays. Report findings to the control room operator.

TAKE CORRECTIVE ACTION

Corrective action will primarily be taken by the control room operator. When directed by the control room operator, depress the relay target reset and reset the under-frequency relay target. Reset the annunciator and notify the control room operator.

LOG THE ACTIVITY

Log the activity in the diesel generator log book. This must be done after the cause of the alarm is determined and action is taken to correct the condition causing the alarm.

PERFORMANCE GUIDE

Follow these steps to investigate the diesel generator alarms.

1. Acknowledge the alarm.
2. Investigate the alarm.
3. Take corrective action.
4. Log the event.

SELF-TEST

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

1. How many lockout relays are on the generator control panel?
  - a. 3
  - b. 5
  - c. 7
2. State the physical steps to take in resetting a relay target and a lockout relay.
3. Which type of generator relay, if picked up, will trip the diesel generator under both normal start and emergency start situations?
4. If you see a 186 A, B, or C lockout relay handle in the TRIP position, you should reset the lockout relay immediately.
  - a. True
  - b. False

ANSWERS

1. a. 3
2. a. Press relay target reset pushbutton.  
b. Reset target indicator(s) on the relay(s).  
c. Turn the lockout relay's handle to reset, and quickly release it.  
d. Reset the annunciator.
3. 187 differential relay
4. False. You must first inform your supervisor, who must clear you to reset it.



TASK PRACTICE

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

1. Review Procedure 17035-1. Be sure that you understand all precautions, limitations, and steps associated with responding to diesel generator "Generator" alarms.
2. Take this instructional unit and Procedure 17035-1 to the diesel generator building. Be sure that you can locate all local components and instrumentation associated with responding to diesel generator "Generator" alarms.
3. In the diesel generator building, walk through the task of responding to diesel generator "Generator" alarms. If possible, have a fellow trainee evaluate your performance using Procedure 17035-1 and this instructional unit.

FEEDBACK ON TASK PRACTICE

1. If you have any questions about the precautions, limitations, or steps in Procedure 17035-1, ask your instructor.
2. You should have been able to locate all local components and instrumentation associated with responding to diesel generator "Generator" alarms. If you had any difficulty, ask your instructor for help.
3. You should have walked through the steps necessary to respond to diesel generator "Generator" alarms. If you had any difficulty, re-read the pertinent sections of this instructional unit and the procedure. Resolve any questions with your instructor.