05-43-90

FOR INFORMATION ONLY

GEORGIA POWER
POWER GENERATION DEPARTMENT
VOGTLE ELECTRIC GENERATING PLANT

TRAINING LESSON PLAN

TITLE:	EMERGENCY DIESEL GENERATOR CONTROL AND PROTECTION	NUMBER:	NL-LP-11205-01-C
PROGRAM:	OUTSIDE AREA OPERATOR	REVISION:	1
AUTHOR:	G. D. STONE	DATE:	7/31/89
APPROVED:		DATE:	8/29/89

INSTRUCTOR GUIDELINES:

I. FORMAT

A. Lecture with visual aids

II. MATERIALS

A. Overhead projector

B. Transparencies

C. White board with markers

III. EVALUATION

A. Written or oral exam in conjunction with other lesson plans

IV. REMARKS

A. A performance-based instructional unit (IU) is attached to the lesson plan as a student handout. After the lecture, instruction should be provided for the attached instructional unit. The instructor should be available to answer any questions that may arise concerning the IU material. After instruction on the IU, the student will perform, simulate, observe or discuss (as identified on the cluster signoff criteria list) the task covered in the instructional unit in the presence of an evaluator.

MASTER COPY

I. PURPOSE STATEMENT:

FOLLOWING COMPLETION OF THIS LESSON, THE STUDENT WILL POSSESS THOSE KNOWLEDGES SYSTEMATICALLY IDENTIFIED FOR THE PERFORMANCE OF DIESEL ENGINE CONTROL AND PROTECTION SYSTEM TASKS

II. LIST OF OBJECTIVES:

1. State the purpose of the generator.
2. State the basic function of the voltage regulator.
3. State the function of the Neutral Grounding Transformer.
4. State the function of current transformers on the generator leads.
5. State the function of potential transformers on the generator lead.
6. For the following controls on the generator control panel, state the response of the diesel generator to the selection of each position, and state operating conditions in which that selection would be made:

   a. LOCAL/REMOTE switch
   b. SPEED RAISE/LOWER switch
   c. AUTO/MANUAL pushbutton for voltage regulator
   d. EXCITER ENABLE switch
   e. FIELD FLASH pushbutton
   f. VOLTAGE CONTROL SWITCHES/RAISE/LOWER (Auto, and Man sw)
   g. EXCITER SHUTDOWN pushbutton
   h. UNIT PARALLEL switch

7. State permissives that must be made to allow automatic closure of the Emergency Diesel Generator Output Breaker.
8. State the source of excitation voltage for the generator section of the EDG.
9. State which 480V auxiliary systems of the emergency diesel generator are affected when the non-class 1E busses (1NB01 and 1NB10) are not energized.
10. Describe the purpose for which 125VDC systems interface with the emergency diesel generator system:

REFERENCES:

1. PLANT VOGTLE PROCEDURES:

   - 13145, DIESEL GENERATOR
   - 13146, DIESEL GENERATOR FUEL OIL TRANSFER SYSTEM
   - 14980, DIESEL GENERATOR OPERABILITY TEST
   - 13427, 4160 VAC 1E ELECTRICAL DISTRIBUTION SYSTEM
   - 17035, ANNUNCIATOR RESPONSE PROCEDURES
   - 17038, ANNUNCIATOR RESPONSE PROCEDURES

2. TECHNICAL SPECIFICATIONS:

   3.8.1 ELECTRICAL POWER SYSTEMS, AC SOURCES

3. STANDBY (EMERGENCY) DIESEL GENERATOR, VOGTLE TRAINING TEXT CHAPTER 16C, VEGP

4. PLANT MANUAL CHAPTER 23

5. P&IDS, LOGICS AND OTHER DRAWINGS:

   PIPING AND INSTRUMENT DIAGRAMS:

   1X4DB170-1
   1X4DB170-2

   VENDOR DRAWINGS:

   AX4AK01-27 (LUBE OIL)
   AX4AK01-26 (JACKET WATER)
   AX4AK01-29 (STARTING AIR)
   AX4AK01-28 (FUEL OIL)

   CONTROL LOGIC DIAGRAMS:

   1X5DN107-1 (DG FUEL OIL SYSTEM)
   1X5DN107-2 (DG UNIT ENGINE)
   1X5DN107-3 (GENERATOR)

   ELEMENTARY DIAGRAMS:

   1X3D-BH-G03C
   1X3D-BH-G03D
   1X3D-BH-G03E
   1X3D-BH-G03F
   1X3D-BH-G03G
   1X3D-BH-G03H
   1X3D-BH-G03I
   1X3D-BH-G03J

   ONE-LINE DIAGRAMS

   1X3D-AA-A01A
   1X3D-AA-K01A

REFERENCES:

6. VENDOR MANUALS:

AX4AK01-509
AX4AK01-510
AX4AK01-563

7. F.S.A.R.: 3.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8

8. QAP COMMITMENTS:

SOER 83.006	UNAVAILABILITY OF EMERGENCY POWER CAUSED BY DIESEL AND BREAKER UNAVAILABILITY
SOER 83.001	DIESEL GENERATOR FAILURES
SOER 84.042	SYSTEM INTERDEPENDENCY OVERSIGHTS RESULTS IN LOSS OF REDUNDANT SAFEGUARDS FUNCTIONS
IEN 85.028	PARTIAL LOSS OF AC POWER AND DIESEL GENERATOR DEGRADATION
IEN 84.069	OPERATION OF EMERGENCY DIESEL GENERATORS
GMR 297	GRID HIGH VOLTAGE AND UNDERVOLTAGE TRIP RELAYS CONTRIBUTE TO EDG OUTPUT BREAKER LOCKOUT
NUREG 1216.000	SAFETY EVALUATION REPORT-RELATED TO OPERABILITY AND RELIABILITY OF EMERGENCY DIESEL GENERATORS MANUFACTURED BY TRANSAMERICA DELAVAL, INC" (NOT AN QAP ACTION ITEM, BUT A TRAINING COMMITMENT)

9. INSTRUCTIONAL UNITS:

NL-IU-11205-C-001	PREPARE EMERGENCY DIESEL GENERATOR FOR STARTUP
NL-IU-11205-C-002	MANUALLY START THE DIESEL GENERATOR LOCALLY
NL-IU-11205-C-003	EMERGENCY START THE EMERGENCY DIESEL GENERATOR
NL-IU-11205-C-004	MANUALLY STOP THE EMERGENCY DIESEL GENERATOR LOCALLY
NL-IU-11205-C-005	PERFORM EMERGENCY DIESEL GENERATOR OPERABILITY TEST
NL-IU-11205-C-006	EMERGENCY STOP THE DIESEL GENERATOR LOCALLY
NL-IU-11205-C-007	RESPOND TO EMERGENCY DIESEL GENERATOR "DISABLED" ALARMS
NL-IU-11205-C-008	RESPOND TO EMERGENCY DIESEL GENERATOR "GENERATOR" ALARMS
NL-IU-11205-C-009	RESPOND TO EMERGENCY DIESEL GENERATOR "MISCELLANEOUS" ALARMS

10. TRANSPARENCIES:

NL-TP-11205-001	LESSON OBJECTIVE
NL-TP-11205-002	TYPICAL SCHEMATIC - EXCITER
NL-TP-11205-003	VOLTAGE REGULATOR BLOCK DIAGRAM
NL-TP-11205-004	SOLID STATE VOLTAGE REGULATOR
NL-TP-11205-005	DG CONTROLS, QEAB
NL-TP-11205-006	GENERATOR CONTROL PANEL

11. STUDENT HANDOUTS: NONE

III. LESSON OUTLINE: NOTES

I. INTRODUCTION

A. This lesson describes the generator and generator-related controls of the EDG, primarily at the local station. Included will be a brief overview of the remote station (QEAB), and some of the permissives/interlocks involving the output breaker, located in the Control Building

B. This is the final lesson in the diesel generator series

C. Present lesson objectives NL-TP-11205-001

II. PRESENTATION

A. Purpose

1. Generator

The output of the generator provides 4160VAC for the purpose of providing the power requirements of the 4160V class 1E bus when needed (if Preferred Power Source is lost) Objective 1

2. Generator Controls

Provides means for controlling the electrical output of the generator, and provides generator protection

B. Function

1. Voltage regulation and excitation Objective 2

a. Provides enough DC power for the generator field under all conditions of generator loading while maintaining voltage at a proper level

b. Sources of excitation Objective 8

1) 125VDC initially, from DG circuits A & B, 125VDC 1E

2) Self-excited once the 125VDC has excited the field to a certain minimum voltage ~ 50 - 60% normal voltage

2. DG Breaker (overview)

a. When closed, connects generator output to its 4160V bus. Closes automatically on

undervoltages on bus

b. Opens in response to manual or automatic trip signals

3. Safeguards Sequencer (overview)

a. Responds to:

1) 1E bus undervoltage (UV)

2) Safety Injection signal

b. Initiates the following:

1) Start emergency diesels

2) Stop any sequencer test in progress

3) Strip 1E bus of loads (UV only)

4) Shut DG breaker

5) Energize appropriate ESF loads as determined by initiating signal (SI or UV)

C. Component Description

1. Generator

a. Single-bearing (insulated sleeve-type pedestal bearing)

b. AC Synchronous

c. 7000 KW

d. Suitable for 10% overload for 2 hrs/24 hrs

e. 8750 KVA

f. 4160V

g. 1214.4 amps

h. Three-phase (six leads out, wye connected)

i. 60 Hz

j. Power factor 0.8

k. 16 Poles

III. LESSON OUTLINE

NOTES

l. Continuous duty

m. 450 rpm

2. Exciter and Regulator

a. 125VDC

b. 40 KW continuous

c. 303 amps, DC

d. 60 Hz

e. Dual bridge exciter

f. Solid state voltage regulation

g. Local and remote control

h. Brushes and sliprings overhung from bearing pedestal

3. DC Output Breaker (4160 VAC)

a. Not controls from DG room

b. 2000 amps continuous rating

c. 1AA02/1BA03

d. Local control at breaker's switchgear

e. Remote control at Control Room

4. General Electrical Layout — 1X3D-AA-K01A

a. "Low" side of DG - three leads tie together to a common "neutral" lead

b. Neutral transformer low side grounded

c. On phase-to-ground fault, current flows through neutral transformer before it can return to phase

d. Neutral transformer

1) Provides method of protecting the generator should a phase-to-ground fault occur — Objective 3

2) Neutral overcurrent relay operates to trip a lockout relay, opening the DG

III. LESSON OUTLINE:

NOTES

breaker and shutting down the DG (depending upon conditions under which the DG was started)
Neutral transformer provides step-down voltage to operate the relay.

3) 1.85 ohm secondary resistor is a known load

4) Transformer located in cubicle on floor at generator level

e. Current transformers

1) Sense current flowing through the generator leads, and step it down to a level which can be used by meters and relays — Objective 4

2) Diff. relays

3) Power relay (132, reverse power)

4) Field relay (140 loss of field

5) Neg phase sequence (146)

6) Overcurrent relays (151, 151N)

7) Regulator

8) Amp and KW meters

Turns ratio determines how much current will flow in secondary, with a given primary current

f. Potential transformers

1) Steps down bus voltage to a level which can be used by meters and relays — Objective 5

2) Regulator (through reactors)

3) Voltmeters

4) Frequency meters

5) Undervoltage relay - 127

6) Overvoltage relay - 159

7) KW meter

III. LESSON OUTLINE: NOTES

8) Var meter

9) Reverse power relay (132)

10) Loss of field relay (140)

11) Negative phase sequence relay (146)

12) Underfrequency relay (181)

13) Overcurrent relay for phases (have an inverse voltage input) (151V)

Primary-to-secondary winding ratios determine the voltage in the secondary, with a given primary voltage
i.e., 4200 - 120

g. Generator Protective relays - when they operate and general functions

The 1 of 187 means 4160V

1) 187: Differential

Looks for phase-to-phase faults in the area between CTs

See also 1X3D-AA-D02B

Causes 186A lockout relay (LOR) to trip

Trips DG, and breaker (and Locks out) regardless of how started

2) 151V: Phase Overcurrent (each phase)

Looks for high current in each phase

Trips 186B lockout relay

3) 151N - Neutral Overcurrent Relay

Looks for high current returning to generator through ground (indicates phase to ground fault)

Trips 186B Lockout relay

4) 140 Loss of Field Relay

Indicates collapse of rotating DC field

Trips 186B - Lockout Relay

5) 186B Lockout Relay

III. LESSON OUTLINE: NOTES

Trips DG breaker and shuts down DG unit (except SI cond.) — Can see on 1X3D-BA-D02D

Prevents reclosure of breakers or restart (except SI)

6) 132 - Reverse Power Relay

Detects if DG is being carried by grid

Trips 186C L.O.R.

7) 146 - Negative Phase Sequence Relay

Detects phase imbalance

Trips 186C L.O.R.

8) 186C L.O.R.

Trips DG breakers only during test when it it operating parallel with preferred power source

9) 181 Underfrequency Relay

Trips DG breaker if paralleled — At one time, tripped 186C. Has been changed to direct trip to breaker

10) 160 relay (for PT failure)

Detects difference in voltages from the PTs on generator leads (normally identical voltages)

Blocks functioning of certain relays, since the 160 has detected PT failure

5. How Generator and Exciter Operate — NL-TP-11205-002

a. 4160VAC conducted to DG output breaker by leads (three phases)

b. Rotor of generator driven by engine

c. Rotor has DC field, similar to a spinning electromagnet (N & S poles)

1) Field's lines of force cut stator windings

III. LESSON OUTLINE: NOTES

2) Produce voltage across output leads of stator (stationery windings)

3) Excitation provided to rotating field through slipring and brushes

d. Self-exciting (once started)

1) One three-phase power transformer

2) Linear reactors (3) shift current produced by the three-phase power transformers, so that current lags voltage

3) With load, current flows through primaries of power CTs

4) Currents in secondaries of CTs in phase with load currents

5) With Inductive load, CT secondary lags gen voltage

Capacitive loads cause leading currents

Resistive loads produce in-phase currents

e. Rectifier Bridges 1X3D-EH-G03H

1) Semiconductors

2) Output is (+, -) to generator via brushes, sliprings

3) Input to bridge is vector sum of current from T-1 and from CTs

4) Two bridges, one on standby, one in service

5) Bridge transfer switch in PDG1/3 - large switch

6) Transfer instructions in 13145.1

6. Regulator

a. Controls output of exciter

b. Solid state NL-TP-11205-003

III. LESSON OUTLINE:

NOTES

c. Sensing circuit produces DC signal representing generator output voltage — NL-TP-11205-004

d. Error amplifier compares DC signal from generator output voltage with DC signal from voltage adj. potentiometer

e. Firing comparator (each phase)

Saw tooth circuit senses when SCR conduction begins (sync)

Signal from error amplifier, after comparing with sawtooth (sync) circuit, determines how long SCR should conduct

D. Controls and Instrumentation

1. Remote (QEAB) Overview - controls

a. DG start PB — NL-TP-11202-005

b. DG stop PB

c. DG speed control PBs

1) Raise speed

2) Lower speed

3) When parallel with RAT, changing speed changes KW load

4) When in unit, and supplying the 1E bus, changing speed changes frequency of generator and bus loads

d. DG voltage control PBs

1) Raise voltage

2) Lower voltage

3) Changing voltage when paralleled will change KVAR load

4) Changing voltage when in unit (DG only provides 1E bus), generator and bus load voltage change

e. Sync mode sel. switch

f. Auto sync permissive PB

III. LESSON OUTLINE:

NOTES

g. Sync switch (for DG)

h. EDG breaker control

i. DG emergency stop - 2 PBs

j. DC unit/parallel switch

2. Remote (QEAB) indicator

a. Normal incoming ammeter

b. A, B, C, phase ammeters

c. DG voltmeter, with sel. switch

d. DG frequency

e. Kilowatt meter

f. KVAR meter

g. Sync scope

h. Sync lights (2)

i. Auto sync permissive light

j. Voltmeter and frequency meter

k. Potentiometer lights

3. Remote Shutdown Panels

a. DG ESF HVAC controls

b. Indicators for DG breaker (open/closed)

c. DG Ammeters (3 phases)

4. Local Controls

NL-TP-11202-006

a. LOCAL/REMOTE switch

Objective 6a

1) Transferring to LOCAL transfers control to DG room

2) DG inoperable - will not auto start if in LOCAL

3) LOCAL usually used along with Maintenance mode

III. LESSON OUTLINE:	NOTES
b. Speed RAISE/LOWER switch If in LOCAL, will increase/decrease DG speed (and frequency)	Objective 6b
c. AUTO/MANUAL pushbuttons for voltage regulators In Local, pushing one or the other selects MAN or AUTO regulator. White light illuminates above selected mode In Manual, the generator voltage would not be sensed for feedback to regulator	Objective 6c
d. EXCITER ENABLE switch 1) Manually enables exciter 2) Exciter normally enabled when DG not tripped, and field not being flashed 3) After Emergency Exciter shutdown, reset by pressing EXCITER ENABLE	Objective 6d
e. FIELD FLASH pushbutton 1) Provides DC for manual flashing of field 2) Normally not needed 3) Procedures allow manual field flashing during loss of offsite power after bridge transfer or transfer to manual voltage regulator	Objective 6e 13145-1
f. Voltage Control Switches 1) Auto - RAISE/OFF/LOWER handswitch for setting the reference voltage of the Auto regulator (if in Local) 2) MAN - RAISE/OFF/LOWER handswitch for setting manual regulator voltage (if in Local) 3) Moving handswitch changes power - driven potentiometer settings	Objective 6f
g. EXCITER SHUTDOWN pushbutton 1) Shutsdown exciter, allowing generator voltage to go to zero, even with	Objective 6g

III. LESSON OUTLINE: NOTES

engine running

2) Possible use: Generator failure during loss-of-offsite power. With engine running, EXCITER SHUTDOWN performed prior to transferring bridges, or changing to MAN voltage regulator

h. UNIT/PARALLEL switch — Objective 6h

1) Spring return to center

2) No way to tell locally whether UNIT or PARALLEL

3) LOCAL selection of PARALLEL unlikely

4) UNIT is selected locally when placing DG on a dead bus from outside Control Room

5) LOCAL selection primarily for maintenance uses

6) When transfer is made from REMOTE to LOCAL, unit/parallel mode go to UNIT

- Governor and regulator

7) Control of governor and regulator also go to UNIT when SIS, or loss of offsite power signals occur

5. LOCAL Indicator

a. Field voltmeter, 0-150VDC, ~ 125VDC nominal

b. Field ammeter, 0-500 amps DC, variable, full load rating 303 amps

c. Voltmeter (bus) 0-5250VAC

d. Phase ammeters (A, B, C) 0-1500 amps

e. Bus frequency meter 55-60-65 HZ

NOTE: NO synchronization indicators, or VARmeters, KWmeters, locally - Parallel operations, and synchronization, done from Control Room

6. DG OUTPUT BREAKER - Closure

III. LESSON OUTLINE:

NOTES

a. Breakers on 1AA02/1BA03, compt 17, in Control Building

*Commitment SOER 83.006 1X3D-EA-D02D Objective 7

b. Undervoltage (Auto)

1) No bus faults (no lockouts on preferred breakers)

2) Preferred breakers open

3) No DG lockouts (186A, B, C)

4) "Close Permissive from Sequencer" (indicates load shed complete)

5) DG voltage > 90%

6) DG speed > 440 rpm

7) DG breaker closes approx. 9.5 sec. after UV initiating signal from sequencer

8) Sequencer beings to sequence loads back on, at 5 second intervals

c. Manual Close Sequence (QEAB)

1) Manual or Auto sync selected

2) Sync scope on

3) Transfer switch on switchgear in "Cont. Run"

4) Auto sync permissive if in Auto Sync

d. Manual Close Sequencer (Local, at SWGR)

1) Incoming breakers open

2) LRS in Local

3) Manually close

e. Test Close Sequence

1) Breaker in "TEST" position

2) T.S. to CLOSE

7. DG Breaker Trips

a. 186A Trip/lockout

VII. LESSON OUTLINE:

NOTES

Trips DG regardless of how started — 1X3D-AA-K01A and 1X3D-BA-D02D

b. 186B Trip/lockout
Trips DG unless SI condition

c. 186C Trip/lockout
Trips DG breaker, engine continues to run

d. Underfrequency relay
Trips DG breaker, engine continues running

e. DG Tripped signal

f. DG Emerg stop

g. DG Overspeed

h. DG Paralleled to RAT, RAT breaker faults, trips/locksout

i. DG Paralleled with RAT, SIS occurs, DG breaker trips

j. Manual Trip (Remote)

1) LRS in Remote

2) Breaker racked in

3) Place C.S. in TRIP

k. Manual Trip (Local)

1) Breaker racked in

2) LRS in LOCAL

3) Trip Locally — End SOER 83.006

8. Sequencer/DG Relationships

a. Three levels of UV detection

1) Four PTs monitor bus voltage

2) Test pushbuttons and ind. lights on 4160V bus, to simulate de-energization

3) PTs supply three sets of bistables in sequencer logic cabinet — One sequencer per train

4) ≤ 93.1 % voltage, 2/4 bistables, for > 10 sec

III. LESSON OUTLINE: NOTES

Alarm on QEAB

5) ≤ 88.5% voltage, 2/4 bistables for > 20 sec - degraded voltage

Sequencer operates on UV

6) < 70% voltage, 2/4 bistables (.8 sec) UV due to loss of voltage

Sequencer operates due to UV

b. Sequencer operation on UV

1) t = 0 DG Start signal generated - only the DG whose bus had UV

2) t = ~ .2 sec Trips preferred normal (or alt.) feeder breaker to 1E bus

Safety and non-safety loads shed (except load center transformers)

3) t = approx 9.5 sec DG breaker closes

4) t = breaker close plus .5 sec. First major load starts, CCP

5) Other major loads sequence on at 5 sec intervals

c. Sequencer on SI signal

1) Emergency start of both DGs, but they run unloaded, since RATs are energized

Start signal from SSPS relays; directly and through sequencer

2) RATs power safeguard loads, which start sequencing

d. Loss of Power monitor

Sequencer will allow two DG starts, sheds, and sequencing in a two hour period. If a third one occurs in that same two hour window, DG starts but will not load

Prevents excess starting duty of loads

9. EDG functions not available while INB01/INB10, non Class 1E, is de-energized: Objective 9

III. LESSON OUTLINE:	NOTES
a. De-energized in SIS	(list 480V loads) 1X3D-AA-F401A
b. Air compressors and aftercoolers (480V)	
c. JW keepwarm pump and heater (480V)	
d. Lube oil keepwarm pump and heater (480V)	
e. Gen space heater (480V)	
f. CC fans 120V	
g. Gen cont. panel sync voltage 120V	
h. Air dryers 120V	
10. Interfaces, general uses	
a. 125VDC	Objective 10
1) 1E - Circuit A control power starting and gen annunciators	
2) 1E - Circuit B control power starting, and stopping	
3) Non-1E circuit C control power: PDG2/4 light indicators, annunciator control power	
4) 125VDC for breaker control power in 1AA02 (or 1BA03) bus at switchgear	
5) 125VDC for field flashing, protection relay control power, and regulator - 1E DIST Panel 1AD11 (1A) - 1E DIST Panel 1BD11 (1B) Via breaker inside generator control panel for each (PDG-1, PDG-3) right hand bay	1X3D-BH-G035
11. Automatic Field Flashing	
a. When DG reaches 200 rpm, or after one second, from start initiation signal	Objective 8
b. Source of 125 VDC, 1E Dist Panel 1AD11, 1BD11 (see above) for 1A and 1B diesel generators	

III. LESSON OUTLINE: NOTES

c. Breaker inside right-hand bay of generator control panel

d. 125V Control power for starting:

1) 'A' Circuit 125V, on engine control panel (from 1E source)

2) 'B' Circuit 125V, on engine control panel (from 1E source)

3) Solenoids 202-5A and -5B reposition air valves, and supply control air to PS 30A & B, which, in turn, close contacts, providing the circuit of 125VDC to the regulator chassis for field flashing

E. Operations

1. Normal Plant Operations

a. Both DGs in standby, to Auto Start on SI, and to start and power 1E bus if preferred power is lost

b. Be periodically tested

2. Loss of Offsite Power

a. One or both offsite sources not available

b. Loads on de-energized system(s) shed from bus

c. DG starts, and energizes bus

d. Loads sequenced on in pre-programmed order by sequencer

3. Accident Conditions (LOCA)

a. Both DGs start, and are AVAILABLE to supply respective trains

b. NOT connected if preferred offsite power available

4. Generator Local Limits

a. Normal full load 7000 KW continuous NUREG 1216

b. Maximum during overload:
7700 KW for two hours out of 24 hours

III. LESSON OUTLINE:

NOTES

1) Tested every eighteen months when shutdown

c. Minimum loads - DG should not be operated at less than 30% load for extended periods

d. If running no-load or low-load, DG is loaded for two hours to 50% load for each 24 hours run at no-load or low load

5. Using Procedure 13145-1, review:

a. Precautions

1) 2.1.2 - relay bypassed when not parallel

2) 2.1.3 - emergency start protective devices

3) 2.1.7 - DG not used for peaking

4) 2.1.8 - transfer to LOCAL takes gov. and V.R. out of DROOP

5) 2.1.10 - DG not operated parallel for prolonged time

b. Procedures:

1) 4.4.7 - generator failure during loss of offsite power

6. Using Procedure 18038, Review Attachment B

a. Starting and placing a DG on a dead bus from outside the Control Room

7. Using Procedure 14980-1, "Diesel Generator Operability Test" review load test local items for DGs, including steps and acceptance criteria

III. SUMMARY

A. Review Objectives