FLORIDA POWER & LIGHT COMPANY

TURKEY POINT UNITS 3 AND 4

EMERGENCY POWER SYSTEM ENHANCEMENT PROJECT TESTING REPORT REVISION 1

MAY 1990

TURKEY POINT UNITS 3 AND 4
EMERGENCY POWER SYSTEM ENHANCEMENT REPORT
SUPPLEMENT NO 1: TESTING

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1.0 INTRODUCTION

Florida Power & Light (FPL) is installing two new Emergency Diesel Generators (EDGs) and associated electrical and mechanical equipment at the Turkey Point Nuclear site, as documented in the report enclosed with FPL letter L-88-269 dated June 23, 1988 and as revised by FPL letter submitted under separate cover. This Supplement #1 initially transmitted by FPL letter L-89-124 dated April 3, 1989, provided additional information regarding the testing to be performed on the various components and systems during turnover and startup, during preoperational testing and the testing performed to return to service. Normal inservice testing is governed by the Turkey Point In-Service Test (IST) Program and the Plant Technical Specifications. This submittal is Revision 1 to Supplement #1 of the Turkey Point EPS Enhancement Report. It provides updated information for various aspects of the EPS Enhancement Project test program requirements.

This Supplement is divided into nine sections. Following this introductory section, Section 2.0 outlines the purpose and scope of the testing described herein. Section 3.0 discusses the Startup testing required to make the EDGs ready for preoperational testing and power operation. Section 4.0 describes the Preoperational Testing of the enhanced Emergency Power System components (AC and DC) such as switchgear, load centers, etc. Section 5.0 discusses the Preoperational Testing of the new EDGs and their auxiliaries. Section 6.0 describes the testing performed to verify proper load-group assignments. Section 7.0 discusses the Integrated Testing to be performed to bring both Units back to power operation from the dual-Unit outage condition. Section 8.0 outlines the conformance to various Regulatory Guides related to testing, then Section 9.0 provides a list of references used in the preceeding discussions.

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2.0 PURPOSE AND SCOPE OF TESTING

2.1 PURPOSE OF TESTING

The test program outlined in this Supplement describes the engineering requirements to provide additional assurance (following factory testing of the components) that the EPS Enhancement modifications have been properly designed as well as verification that the installation of associated systems and components has been accomplished in accordance with the design. Successful completion of this testing program provides the necessary assurance that the enhanced EPS will operate in accordance with the applicable design and licensing requirements.

2.2 SCOPE OF TESTING

The Emergency Power System Enhancement testing covers the entire range of testing of equipment, components and systems, as outlined in this Supplement. New equipment (Emergency Diesel Generators (EDGs), 4.16 kV switchgear, 480V load centers, 480V motor control centers, 125V DC panels, battery chargers, sequencers, etc.) is being designed, fabricated and installed at the Turkey Point site to interface with existing equipment and systems, and the existing equipment and systems are being modified as required to result in an enhanced onsite Emergency Power System. The installation of new equipment, and the modification of existing equipment, is accomplished under FPL's controlled Plant Change/Modification (PC/M) process.

The test program requirements, outlined herein, encompass the scope of events that begins with completion of system/component construction and installation, and ends with completion of integrated acceptance testing. This testing submittal defines the engineering requirements to fully demonstrate the operability of the enhanced EPS. It is not intended to necessarily specify the required sequence or order of test implementation at Turkey Point.

The end result, an enhanced onsite AC Emergency Power System, therefore focuses the discussions contained herein to the testing of the new EDGs and the enhanced onsite electrical distribution system. Equal importance and attention is given by FPL to testing of the other equipment and systems being installed as a part of this project, particularly as part of the erection of a new EDG Building and new Diesel Oil Storage Tank Enclosure, but is not detailed in this supplement. Such additional testing includes the extensions of the Fire Protection, Lighting, HVAC, and Communications Systems in the new EDG buildings, testing of the idle start modifications to the existing EDGs, and testing of the new spare battery. These systems are tested using additional testing procedures which supplement the existing testing and surveillance procedures for the existing equipment and systems.

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A description of the shop qualification testing performed on the new EDGs was provided in FPL letter L-88-454, dated October 19, 1988. Based on that letter and additional information, the NRC provided FPL an SER enclosed with NRC letter dated August 10, 1989, whereby the Staff found the 30 Start and Load Test acceptable.

In addition, FPL provided responses to the NRC's Requests for Additional Information (RAIs), related to the new EDGs and the enhanced EPS. The NRC RAIs were transmitted in letters dated January 6, 1989 and March 16, 1990. FPL's responses were provided in letters L-89-54, L-89-107, and L-90-140. The above information supplements the information provided in this Testing Submittal.

The testing described in this Supplement covers the following tests of the EDGs and the EPS:

Onsite Startup (Installation) Testing, including testing performed under the direction/cognizance of the Factory Service Representative (Section 3.0)

Onsite Startup Testing of Initial Operation of the New EDGs and Their Auxiliaries (Section 3.0)

Onsite Preoperational Testing for the New EDGs and the Enhanced EPS (Sections 4.0 and 5.0)

Onsite Integrated Testing of the EDGs and EPS (Section 6.0) including performance of the Integrated Safeguards Testing prior to bringing one or both Units back on line (Section 7.0)

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3.0 STARTUP TESTING

The tests described in Sections 3.1, 3.2 and 3.3 below are performed on individual components and systems as prerequisites for startup and preoperational testing of the systems as a whole. Startup Testing is conducted under the direction of the Turkey Point Startup Superintendent. A Morrison--Knudsen field service representative is on site for this portion of the testing and acts as a consultant reporting to the Startup Superintendent. The Startup Superintendent is assisted by Mechanical, Electrical and I&C engineering disciplines and crafts.

3.1 MECHANICAL COMPONENTS TESTING

This section includes the checkout of individual pieces of equipment. This equipment is tested as a system as discussed in Section 3.4 below.

3.1.1 EDG Cooling Water System

The EDG Cooling Water System is shipped dry without any preservative in the piping. The engine portion of the Cooling Water System is protected with a rust inhibitor. The system is flushed per a startup flush procedure and is then filled with an appropriate coolant per the manufacturer's recommendation for normal operation.

The fan and motors on the radiators are checked for proper operation.

3.1.2 EDG Starting Air System

The EDG Starting Air System consists of two air compressors, one electric driven and one diesel driven, one air dryer, four air receivers, four air start motors and the associated valves, instrumentation and piping. These components are tested for proper operation.

3.1.2.1 Engine Air Barring Device

The engine air barring device is operated. The barring device limit switches are checked for proper operation and indication.

3.1.3 EDG Fuel Oil Transfer System

The new Fuel Oil Transfer System consists of two new fuel oil storage tanks and two new fuel oil transfer pumps and the associated piping.

[illegible]

The quality of the fuel oil is tested and verified per existing plant procedures prior to being put into the storage tanks from a fuel oil tanker. The two transfer pumps are run to supply fuel oil to the day tanks. The pressure drop across the fuel oil transfer pump suction strainers is monitored while pumps are in operation.

The Diesel Oil Storage Tanks are checked for cleanliness. Flow is established from the Diesel Oil Storage Tanks through all new piping to ensure adequate flushing.

The new fuel oil transfer pumps and motors are checked for proper operation. Each pump is checked for pressure and flow. Baseline data, for future In-Service Testing, is documented. The level instrumentation of the storage and day tanks is functionally checked.

3.1.4 EDG Fuel Oil Systems

The suction piping to the DC priming pump is filled and vented, and proper operation of the DC fuel priming pump is verified.

3.1.5 EDG Lube Oil Systems

The engine skid and the lube oil sump are checked for cleanliness. The lube oil, turbo oil and auxiliary turbo oil filters are checked for proper operation.

The lube oil pump motors are bumped for rotation and then checked for proper operation. The engine box oil strainers are inspected for cleanliness and correct installation. The lube oil system is operated using the two AC and two DC pumps.

Each motor driven pump is operated individually to verify acceptable system pressure. All instrumentation is checked for proper operation.

3.1.6 EDG Governor Hydraulic System

The governor casing is inspected for cleanliness and filled with the manufacturer's recommended fluid.

3.1.7 EDG Engine Combustion and Exhaust Air

The combustion air piping is checked for cleanliness from the air filter to the turbocharger. The exhaust air piping is checked for cleanliness at the exhaust air line and the outlet of the turbocharger.

3.1.8 EDG Building Ventilation System

Motors are bumped for rotation and checked for proper lubrication and proper operation.

Fans are checked for operating speed, differential pressure across the fan and total air flow. Motor data and air flow data are taken to evaluate the performance of the fans.

3.2 ELECTRICAL COMPONENTS TESTING

The major system or component electrical testing is completed as discussed in Section 4.0 below. As a prerequisite to Section 4.0 preoperational testing, the following items are checked as appropriate:

a. Continuity check the wiring for motors, electrical power distribution equipment such as switchgears and panels, MCCs and control circuits.
b. Megger generators, motors and power distribution equipment.
c. Phase check generators and motors.
d. Trace protective device and control circuits, check terminations and calibrate instrumentation.
e. Check of all loop circuits and components for proper function.

3.3 INSTRUMENTATION AND CONTROL COMPONENTS TESTING

I&C testing is integrated into system testing in Section 3.4 below. As a prerequisite to the EDG System Auxiliaries testing, the following items are checked as appropriate:

a. Calibrate pressure switches, temperature switches, level switches and pressure, temperature and level gauges.
b. Check control cabinet instruments and logic.

3.4 EDG SYSTEM AUXILIARIES TESTING

The tests outlined in this Section are run to assure that the individual components (previously tested) are capable of performing as a total system. These tests are performed as prerequisites to the testing described in Section 5.0.

3.4.1 Cooling Water/Lube Oil Keep Warm Systems

With both the lube oil and cooling water system filled and vented, the AC circ lube oil and turbo lube oil pumps are checked (See 3.4.4). The cooling water immersion heater is also checked for proper operation.

The system is operated in this mode to check the lube oil and cooling water temperatures at the lube oil cooler outlet and internally to the engine.

The system operation is tested with the DC pumps in service as previously done with the AC pumps. The pump auto start functions are checked during the AC pump to DC pump changeovers.

3.4.2 Starting Air System with Air Compressors, Dryers and Alarms

Startup of the air start system consists of checking the following four areas:

a. The motor and diesel driven air compressors are run individually and checked for proper operation of the compressors and functional checks of the instrumentation.

b. The air dryer systems are run and checked for proper operation, and functional checks are performed of all alarms and control systems. The dryers are checked to verify that the air is at an acceptable dew point at the receivers.

c. The air barring device is checked for proper operation by rotating the engine. The alarm and interlock is also checked.

d. The air supply system is checked for proper operation, including testing of the starting air receivers and the associated instrumentation.

3.4.3 Fuel Oil Transfer System

3.4.3.1 Fuel Oil Transfer Pumps

The pump for each new diesel oil storage tank is operated on recirculation through the bypass line. Fuel oil is transferred from storage tank 4A to storage tank 4B. The tank indicators and alarms are checked for proper operation. In addition, all flow meters are verified operational. The storage tank 4B transfer pump is operated and verification tests similar to those of the 4A tank are performed.

During each pump operation, the suction duplex strainers are operated to verify that they can be changed in service.

Each individual pump is operated to check proper transfer function from the other storage tank.

When operability of the existing EDGs will permit, the cross-connect capability between the new fuel storage system and the existing fuel storage system is demonstrated.

3.4.4 Fuel Oil Day Tank

The day tank is filled using a fuel oil transfer pump. All tank level indicators, alarms and auto fill functions are checked for proper operation.

3.4.5 Lube Oil and Prelube System

Operation and startup testing of the lube oil system consists of two portions: the motor driven pumps and systems and the shaft driven pumps and systems.

The initial testing is the operation of the four motor driven pumps and the functional testing of their alarms and control interlocks. The pumps are checked for proper operation.

The shaft-driven pumps and lube system are tested for proper operation when the diesel engine is operated and tested.

3.4.6. EDG Building Ventilation System

System function testing consists of operation of the fans to verify their proper operation.

This test ensures that building heat can be removed while the diesel engine is shut down. Building and engine heat is removed by the radiator fan system during EDG operation and is tested in section 3.6.

3.5 NEW EDGs CONTROL SYSTEMS TESTING

3.5.1 Simulated EDG Operation

Without running the engine, EDG operation is simulated at the local control panel so all EDG start and trip functions can be tested.

3.5.1.1 Emergency Start Signals

The emergency diesel generator starts are tested for proper operation via simulated emergency start signals for various plant conditions, with each possible position of the normal/isolate, local/remote, and auto-start bypass switch positions. The following signals are simulated:

i - Station loss of power signal (LOOP)
ii- Engineered Safeguards Actuation Signal (SI)

3.5.1.2 Emergency Stop/Trip Signals

The following emergency trips are verified to operate in the normal (test) mode as well as in the emergency mode (LOOP and SI).

Overspeed
Generator Differential, Phase A
Generator Differential, Phase B
Generator Differential, Phase C
Emergency Stop Pushbuttons

3.5.1.3 EDG Equipment Protection Trip Signals

The following signals will shut down the EDG in the normal (test) mode of operation. These trips are verified to be bypassed in an emergency mode. This testing is simulated at the local control panel.

Crankcase High Pressure
Cooling Water Low Pressure
Lube Oil Temperature High
Exhaust Temperature High
Cooling Water Temperature High
Generator Overcurrent Phase A
Generator Overcurrent Phase B
Generator Overcurrent Phase C
Generator Reverse Power
Generator Loss of Excitation
Generator Underfrequency
Engine High Vibration
Main Manifold Lube Oil Low Pressure
Piston Cooling Oil Low Pressure

3.6 INITIAL EDGs OPERATION AND CHECKOUT

The EDGs are run to check proper operation, and the automatic operation of the system auxiliaries, such as, AC lube oil pump, cooling water fans, ventilation fans, etc., are verified to be functional.

Vibration levels of all new EDG support systems piping are observed at different load levels of the diesel generator. Any excessive vibration levels are analyzed to determine the cause of vibration and effective means of eliminating it (e.g., additional supports). The acceptance criteria for vibration testing is per ASME OM-1987, Part 3, including addenda OMa-1988.

The temperatures of the cylinder exhaust gases are recorded to assure that the thermocouples and their circuits are operational and that the diesel engine is operating properly.

3.6.1 Starting Air System

3.6.1.1 Air Compressor Performance Test

The motor driven air compressors are operated to verify that the auto "on-off" functions properly to maintain required air receiver pressure. Motor data is recorded. The diesel driven air compressor is also tested to verify that the auto "load-unload" function of the mechanical unloader also maintains the air receivers within the proper pressure range.

During compressor operation, vibration data and operating speed (RPM), are recorded as baseline data. Capacity testing of the electric compressor will be performed as described in Section 5.1.2.

3.6.1.2 Air Dryer Performance Test

The air dryer dewpoint is measured to determine maximum moisture content of the air in the air receivers.

3.6.1.3 Barring Device

The barring device is checked for operability along with its interlocks.

3.6.1.4 Instrumentation

All water detectors, pressure switches and alarms and their annunciation are checked at the local control panel.

3.6.2 Fuel Oil Transfer System

The fuel oil transfer pumps and their associated motors are checked to obtain operational characteristics such as flow. The auto "start-stop" function based on day tank level is also verified. The suction strainer is shifted to the duplex side while the pump is in operation and the pressure drop across the strainer is recorded. All annunciators are checked at the local control panel.

3.6.3 DC Fuel Oil Priming

The start-stop function of the DC fuel oil priming pump is checked and the engine pressures are recorded.

3.6.4 Lube Oil/Cooling Water Keep-Warm System

The keep-warm system is operated to assure that the lube oil, cooling water and engine are generally maintained at temperatures above their surroundings. This is to assure that condensation does not take place in the lube oil sump and also to assure that the engine is at a temperature where a rapid start followed with fast loading will not be detrimental to the EDG. The lube oil flow as well as differential pressure across the lube oil filter is verified.

3.6.5 Lube Oil and Pre-lube System

The AC and DC lube oil pumps (circulating and turbo) are operated and motor data are recorded. The temperature switches, level switches, pressure switches and differential pressure switches are shown to be functional. Each annunciator is actuated and verified to annunciate at the local control panel.

Lube oil flow to the turbocharger and engine bearings is verified to assure that the prelubrication system is working effectively. The lube oil sump low level alarm is functionally tested.

3.6.6 Radiator Fan System

The operation of the radiators and fans, temperature regulation valve and expansion tank are observed when the EDG is in operation.

3.6.7 Generator

The generator standby heater circuit is checked for operability and heater current is recorded.

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4.1.1 Cubicle Space Heater Bus

Each cubicle space heater is demonstrated to be operable when the space heater bus is energized.

4.1.2 125V DC Control Power

The load side of each 125V DC fuse within each cubicle is demonstrated to be energized with the 125V DC control power distribution bus energized free of grounds, and all undervoltage alarms reset.

4.1.3 Bus 3D (4D) Voltage Monitoring

Voltmeter, voltmeter selector switch, bus undervoltage detection circuitry, annunciation and SPDS voltage input are tested to assure proper operation of the bus voltage monitoring equipment.

4.1.4 Bus 3D (4D) Lockout Relay Features

The new lockout relays 186/3D (186/4D) are functionally tested for proper operation, including indications and alarms, for the various combinations of the normal/isolate selector switches.

4.1.5 Functional Testing of Associated Circuit Breakers

The circuit breakers noted below are tested for intended functions and proper operation of interlocks; refer to Figure 1 for a depiction of the ties. As appropriate, new phase overcurrent relays, current transformers, ammeter and ammeter selector switches are demonstrated to be correctly calibrated and operable. The following are functionally checked: annunciation, breaker indication, closing and tripping circuits with the circuit breaker racked-in, racked-out in test, locally, remote, etc.

4.1.5.1 Bus 3D (4D) Tie Circuit Breakers at Existing Buses A and B:

Bus A Circuit Breakers
Bus B Circuit Breakers

4.1.5.2 Bus 3D (4D) Tie Circuit Breakers:

Train A Tie Circuit Breakers
Train B Tie Circuit Breakers

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4.1.5.3 Bus 3D/4D Station Blackout (SBO) Tie Circuit Breakers:

The EPS enhancement project intends to provide a design which complies with 10CFR50.63 and meets the provisions of Regulatory Guide 1.155, by providing a crosstie between Unit 3 and Unit 4 such that one of the four EDGs serves as an Alternate AC power source for a Unit which is encountering a station blackout event. This topic is described in FPL letter L-89-144 dated April 17, 1989 which addressed the schedular and information requirements of 10CFR50.63.

Testing of these circuit breakers is performed similarly to the tie breaker testing above.

4.1.5.4 Motor Feeder Circuit Breakers:

CCW Pump 3C (4C) Circuit Breakers
ICW Pump 3C (4C) Circuit Breakers
Spare Circuit Breakers

4.2 480V SWING LOAD CENTER 3H AND 4H

The new 480V load centers 3H (4H) are installed in the new Electrical Equipment Room. Startup testing commences as outlined below upon completion of the appropriate interfaces required to support the tests.

4.2.1 Cubicle Space Heater Bus

Each cubicle space heater is demonstrated to be operable when the space heater bus is energized.

4.2.2 125V DC Control Power

The load side of each 125V DC fuse within each cubicle is demonstrated to be energized with the 125V DC control power distribution bus energized free of grounds, and all undervoltage alarms reset.

4.2.3 LC 3H (4H) Voltage Monitoring

Voltmeter, voltmeter selector switch, undervoltage relays, annunciation and SPDS voltage input via voltage transducer are tested to assure proper operation.

4.2.4 Functional Testing of Associated Circuit Breakers

The circuit breakers noted below are tested for intended functions and proper operation of interlocks similar to the testing described in 4.1.5 above.

4.2.4.1 Bus 3H (4H) Tie Circuit Breakers at Existing Load Centers:

a. Circuit Breakers Located in the Existing Load Center 3C (4C) - Train A

Since the LC 3C (4C) compartment spaces have no breakers, the compartment is refurbished to accept new breaker(s).

b. Circuit Breakers Located in the Existing Load Center 3D (4D) - Train B

Since the LC 3D (4D) compartment spaces have no breakers, the compartment is refurbished to accept new breaker(s).

4.2.4.2 Bus 3H (4H) Tie Circuit Breakers

a. Circuit Breakers Located in the New Load Center 3H (4H) providing the Train 'A' Tie

b. Circuit Breakers Located in the New Load Center 3H (4H) providing the Train 'B' Tie

4.2.4.3 Circuit Breakers for Charging Pump 3C (4C) located in new Load Center 3H (4H)

4.2.4.4 Circuit Breakers for MCC 3D (4D) Located in New Load Center 3H (4H)

4.2.4.5 Spare Circuit Breakers:

(Four spare cubicles do not require any testing at this time since no breaker is installed.)

4.3 MODIFICATION OF EXISTING 480V LOAD CENTERS

4.3.1 Load Centers 3A (4A)

Circuit Breakers located in the Existing Load Center 3A (4A)

The existing compartment is refurbished to accept a new breaker. The closing and tripping circuits are functionally checked with the circuit breaker racked-in and racked-out in test.

4.3.2 Load Centers 3B (4B)

No changes are made to Load Center 3B (4B), thus no individual testing is required.

4.3.3 Load Center 3C (4C)

The feed to the charging pump is moved to new Load Center 3H (4H). Some loads are moved to MCC 3D (4D). Load Center undervoltage relaying is modified to replace certain relays associated with bus undervoltage annunciation and tripping of non-vital feeder breakers. These modifications are tested.

4.3.4 Load Center 3D (4D)

The "B" train Telemand transfer to MCC 3A (4A) is eliminated and the breakers are used for MCC 3K and MCC 4K. The closing and tripping circuits are functionally checked with the circuit breaker racked-in and racked-out in test. Load Center undervoltage relaying is modified to replace certain relays associated with bus undervoltage annunciation and tripping of non-vital feeder breakers. These modifications are tested.

4.4 NEW 480V MOTOR CONTROL CENTERS (MCCs) AND RELOCATED LOADS

Each cubicle space heater is demonstrated to operate when the space heater bus is energized. Incoming line breakers and lighting panel circuit breakers are molded case and are checked for functionality. Each new MCC and its relocated load is tested to ensure proper operation. The new MCCs are listed below; refer to Figure 1 as appropriate.

4.4.1 MCC 3K Located in existing EDG Building

This MCC feeds EDG 3B loads.

4.4.2 MCC 4D

This MCC is located in the new electrical room.

4.4.3 MCC 4J

This MCC is located in the new EDG Building and feeds Diesel Generator 4A loads plus other miscellaneous loads.

4.4.4 MCC 4K

This MCC is located in the new EDG Building and feeds Diesel Generator 4B loads plus other miscellaneous loads.

4.5 MODIFICATION OF EXISTING 480 VOLT MCCs

The modifications made to the existing MCCs are outlined below. Testing of the modifications on each MCC is performed as necessary to ensure proper operation. Refer to Figure 1 as appropriate.

4.5.1 MCC 3A

Removal of Telemand transfer operators, control wiring and removal of tie from Load Center 3D. Some loads are moved to MCC 3D. No startup/preoperational testing is required at this stage; see Section 6.0.

4.5.2 MCC 3B

Some loads are moved to MCC 3D. No individual testing is required as a result of these modifications.

4.5.3 MCC 3C

No individual testing is required.

4.5.4 MCC 3D

MCC D is relabeled MCC 3D and the Telemand operator is removed. The vital section feeders from Load Center 4C, and Load Center 3D, are removed and MCC 3D resupplied from Load Center 3H (see Section 4.2.4.1). All Unit 4 loads from vital section are moved to Unit 4 and these compartments are left as spares. Unit 3 loads from MCCs 3A and 3B are repowered from MCC 3D.

4.5.5 MCC 4A

Removal of Telemand transfer operators, control wiring and removal of tie from Load Center 4D. Some loads are moved to MCC 4D. No testing is required as a result of these modifications.

4.5.6 MCC 4B

Modification involves removal of EDG 3B auxiliary loads and transfer of these to MCC 3K (see Subsection 4.4.1). The motor starter compartments are left as spares. A transfer switch for Control Room AC "A" is added to this MCC and tested for operability.

4.5.7 MCC 4C

Some loads are moved to MCC 4D. No individual testing is required as a result of these modifications.

4.6 125V DC SYSTEM MODIFICATIONS

4.6.1 New DC Panels

Six (6) 125V DC panels are added. The load side of each 125V DC breaker or fuse for each branch circuit is demonstrated to be energized free of grounds, and all undervoltage alarms reset.

4.6.2 New Battery Chargers

Two (2) new Battery Chargers are added. The battery charger remote bypass control switch is removed from the Unit 3/4 control consoles. The new battery chargers are permanently connected to their associated 480V MCC source, and tested to ensure proper operation and to ensure that they function in accordance with design.

4.6.3 New DC Transfer Switches

Two (2) new DC transfer switches are added at the 3D (4D) switchgears. The new transfer switches are tested to ensure proper operation.

4.7 EMERGENCY BUS LOADING SEQUENCERS

Testing commences upon completion of the necessary modifications to existing sequencers 3C23A, 4C23A, 3C23B, & 4C23B. New sequencers 3C23A-1, 4C23A-1, 3C23B-1, & 4C23B-1 are installed and wired as required to power supplies, annunciation and associated equipment to make each sequencer ready for testing.

4.7.1 Existing (Modified) Emergency Bus Loading Sequencers

Sequencers 3C23A (Train A), 3C23B (Train B), 4C23A (Train A) and 4C23B (Train B)

These existing sequencers no longer play an active role in the bus stripping and sequencing of load, however they are tested in conjunction with the new sequencers, as described in Subsection 4.7.2 below.

4.7.2 New Emergency Bus Loading Sequencers

Sequencers 3C23A-1 (Train 3A), 3C23B-1 (Train B), 4C34A-1 (Train A) and 4C23B-1 (Train B)

Auto, or continuous, testing as well as manual testing via test selector switches demonstrate proper functions.

Bus stripping logic is demonstrated to respond to real or test inputs placing the sequencer in the correct mode of operation. All output/blocking relays are monitored at the connected 4kV and 480 V control circuits to assure correct operation. Bus lockout relay signals are similarily monitored.

Load sequencing logic is demonstrated to respond to real or test inputs. Particular time delays are verified by measuring and recording the output signals and their signal duration to assure correct operation and loading of equipment for each particular mode of operation. Input signals to the sequencers are verified to meet design requirements.

Existing bus clearing relays located at the 4kV switchgear are actuated and demonstrated to be tested via the new sequencer test selector switches and monitoring pilot lights.

The existing remaining sequencer equipment, including power supplies, fuses, relays, etc., is tested and demonstrated to function as part of the integrated bus stripping/loading scheme. The Reactor Coolant Pump backup underfrequency relaying scheme, including annunciation, is demonstrated to function as intended.

4.8 ASSIGNMENT OF EXISTING EDGs TO UNIT 3

Preoperational testing begins after completion of the necessary prerequisites as applicable to per-train testing. Some examples of the prerequisites are:

- Main control room control console and vertical panel modifications, including relabeling, new metering, new meter scales, controls, indication and annunciation.
- Modifications to EDG 4.16kV circuit breaker controls.
- Modifications to EDG protective and lockout relaying.
- MCC Telemand transfer schemes removed.
- New 480V swing load center installed and tested.
- New MCCs installed and tested, including new and relocated 480V loads.
- Existing bus loading sequencers modified.
- New bus loading sequencers connected and ready to operate.
- Proper starting, operation and loading of the EDGs from their respective sequencers is demonstrated.

4.8.1 Train 3A Modifications

Existing EDG A is assigned and relabeled as EDG "3A" and all power, controls, indication and metering associated with the existing "A" machine at Unit 4 are removed and/or disconnected (to be reutilized for new EDG 4A per Section 4.9).

Additional testing to verify proper functional separation of the EDG and Train alignment is performed as part of the integrated enhanced Emergency Power System testing, per Sections 6.0 and 7.0.

Train 4A modifications are discussed in Subsection 4.9.1, below.

4.8.2 Train 3B Modifications

Existing EDG B is assigned and relabeled as EDG "3B" and all power, controls, indication and metering associated with the existing "B" machine at Unit 4 is removed and/or disconnected. This also includes any alternate shutdown panel modifications and testing. Additional testing is performed to verify proper separation.

Verification is performed as part of the Enhanced Emergency Power System testing, per Sections 6.0 and 7.0.

Train 4B modifications are discussed in Subsections 4.9.1 and 4.9.2.

4.9 ASSIGNMENT OF NEW EDGs TO UNIT 4

Preoperational testing, on a per-train basis, begins after completion of the necessary prerequisites as applicable to per-train testing. Some examples of the prerequisites are:

- o Main control room control console and vertical panel modifications, including relabeling, new metering, new meter scales, controls, indication and annunciation.
- o Modifications to EDG 4.16kV circuit breaker controls.
- o Modifications to EDG protective and lockout relaying.
- o MCC telemand transfer schemes removed.
- o New 480V swing load center installed and tested.
- o New MCCs installed and tested, including new and relocated 480V loads.
- o Existing bus loading sequencers modified.
- o New bus loading sequencers connected and ready to operate.
- o Proper starting, operation and loading of the EDGs from their respective sequencers is demonstrated.

4.9.1 Train 4A Modifications

In addition to testing items specified in this Section and below, additional EDG tie-in testing includes the EDG differential current and overcurrent relaying, EDG lockout relaying, SPDS and annunciation, modification of existing EDG 4kV bus 4A circuit breaker controls including synchronizing and indication, safety injection and loss of offsite power auto-starting of the machine, remote governor control, remote voltage control and indication, battery charger remote bypass control removal per 4.6 and MCC telemand auto transfer removal per 4.5.

Additional testing to verify proper separation of the EDG and Train assignment is performed as part of the EDG preoperational testing and the Enhanced Emergency Power System testing, as described in Sections 6.0 and 7.0.

4.9.2 Train 4B modifications

In addition to testing items similarly to those specified in Subsection 4.9.1 and below, EDG 4B/Train 4B testing includes testing of any modifications made to the alternate shutdown panel.

Verification is performed as part of the Enhanced Emergency Power System testing, as described in Sections 6.0 and 7.0.

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5.0 NEW EDG PREOPERATIONAL TESTING

The preoperational tests of the new EDGs are completed in two parts. Part 1 locally tests the operating engine without load, and with load (for example, via a temporary transformer). Part 2 tests the EDG with permanent system buses from the control room, along with all ESF start tests. Most of the testing outlined in Section 5.1 can be performed following completion of the preoperational testing previously discussed in Section 3.0. The testing outlined in Section 5.2 can be performed following completion of the electrical components/system testing previously discussed in Section 4.0.

Successful completion of these testing requirements described in this Section results in each new EDG accepted as qualified to operate.

5.1 PART 1 - LOCAL EDG OPERATIONS

The EDG is in the normal standby condition with the Master Control Switch in local for the following tests.

5.1.1 Idle Start

An EDG at standby conditions is idle started. After operating at idle speed for sufficient time for engine checks, the EDG is idle released to 900 rpm, then shut down via overspeed trip, recording standby engine overspeed trip setpoint data.

5.1.2 Five-Start Test

With the air compressor control switches to "off" and the four air receivers bled down to the pressure where the low pressure alarm actuates, the air capacity test for the air receivers is performed. The EDG undergoes four start failures and then is started on the fifth attempt. Following the fifth start the time required to re-pressurize the two air receivers is demonstrated to be in accordance with design. This test demonstrates that the air start system meets design requirements.

5.1.3 Hot Overspeed Trip

With the EDG loaded to greater than 50% load, engine temperatures are allowed to stabilize to the hot engine conditions. The hot engine overspeed trip setpoint is verified after the above run.

5.1.4 EDG Reliability Test

These tests demonstrate the reliability of the EDG pursuant to R.G 1.108 position C.2.(a)(9). Since there are two identical new EDGs, each EDG is required to undergo at least 35 consecutive valid tests, with the total starts of both EDGs equal to 70 tests, with no failures. Voltage and frequency will be monitored for each start below.

The EDG is started, synchronized to the grid, loaded to greater than 50% load and operated for greater than one hour.

The above test is repeated such that each EDG has at least 35 successful tests without a failure. Each start must come to required frequency and voltage within acceptable limits and times.

5.1.5 Start and Load Test

An EDG is normal started (with a 60-second idle start period) and then auto-released to allow the EDG to go to 900 rpm. Speed and voltage values are verified to be within acceptable limits. The EDG is synchronized to grid and slowly loaded to 100% load. The engine parameters are allowed to stabilize.

5.1.6 Full Load Rejection Test

The EDG is operated at a minimum of 100% load with stable engine parameters. The EDG output breaker is opened, frequency and voltage transients are measured to assure the voltage requirements are met, and it is verified that the EDG does not trip on overspeed.

5.1.7 Twenty-four Hour Run

For the twenty-four hour run the EDG is normal started, synchronized and slowly loaded to 110% (approximately 3160 kW). After two hours at 110%, load is reduced to 100%. After one hour at 100% load a complete set of EDG data is recorded and repeated every hour. Twenty-two hours after load was adjusted to 100%, load is reduced slowly, the generator breaker is opened and the EDG is placed in a normal shutdown. This test also verifies that the cooling system functions within acceptable limits.

Note: Revision 0 of this report stated that a fuel oil and lubrication oil consumption test would be performed during this twenty-four hour run. However, the current testing program provides for this testing at the vendor's facility.

5.2 PART 2 - REMOTE EDG OPERATION

After the EDGs are permanently tied in to the plant buses, they are controlled and supervised by their respective main control room panels, local panels, etc. After the prerequisite testing in Section 4.0 above is completed, the following testing can proceed.

5.2.1 Operation from the Main Control Room

The starts in this section are similar to the starts in Section 5.1 except all controls are from the Main Control Room.

Idle Start with Normal Shutdown
Emergency Start, Bypass of Non-Vital Trips
Rapid Start with Normal Shutdown
Emergency Stop

5.2.2 Isolation Switch Tests

With master control switch in "Local" position and two (2) isolation switches in "Isolate" positions on the local EDG control panel, it is verified that all control room EDG controls are disabled, and that the EDG control room alarms remain functional.

With master control switch in "local" position, and keylocked "auto-start" bypass switch in bypass, it is verified that Control Room EDG starts are disabled, including all emergency auto-start signals, and that the EDG Control Room alarms remain functional.

5.2.3 Emergency Start, Bypass of Non-Vital Trips

An emergency start is performed and attempts made to trip the EDG with normal trips, to assure normal trips are bypassed. The EDG is then tripped by actuating a generator differential relay.

5.2.4 EDG Surveillance Testing

This completes the Startup and Preoperational Testing for the new EDGs and the normal periodic testing is performed in accordance with existing plant procedures and Technical Specifications.

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6.0 VERIFICATION OF PROPER LOAD-GROUP ASSIGNMENTS

In addition to the pre-operational testing described in Sections 4.0 and 5.0 above, plus the integrated acceptance testing outlined in Section 7.0 below which meets the recommendations of Regulatory Guide 1.108 (Rev 1, 08/77), the onsite testing program also meets the recommendations of Regulatory Guide 1.41 (Rev 0, 03/73), which indicates that:

> "...after major modifications...to a facility, those on-site electric power systems designed in accordance with Regulatory Guides 1.6 and 1.32 (Safety Guides 6 and 32) should be tested as follows to verify the existence of independence among redundant on-site power sources and their load groups."

In accordance with Regulatory Guide 1.41 (Rev 0, 03/73), Positions C.1 through C.3, the following tests are performed:

a. The plant electric power distribution system, not necessarily including the switchyard and the startup and auxiliary transformer, is isolated from the off-site transmission network. This isolation is effected by direct actuation of the undervoltage-sensing relays within the on-site system.

b. Under the conditions above, the on-site electric power system is functionally tested in the various possible combinations of power sources and load groups (i.e., trains) available with all on-site AC power sources for three load groups (i.e., trains) at a time completely disconnected. Each test includes injection of simulated accident signals, startup of the on-site power source(s) and load group(s) under test, sequencing of loads, and the functional performance of the loads. Each test is of sufficient duration to achieve stable operating conditions and thus permit the onset and detection of adverse conditions which could result from improper assignment of loads.

c. During each test, the on-site AC buses and related loads under test are monitored to verify proper operation. The above testing demonstrates conformance to Regulatory Guide 1.41 R0 as it applies to the PTN enchanced EPS configuration.

The above load group verification testing is implemented as a part of the Integrated Safeguards testing described in Section 7.0.

[illegible]

7.0 INTEGRATED ACCEPTANCE TESTING INCLUDING SAFEGUARDS TESTING

7.1 UNITS 3 AND 4 TRAIN "A" AND "B" MODIFICATIONS

Refer to Section 4.0.

7.2 INTEGRATED PREOPERATION TEST

In order to meet the single failure criterion, each Unit must have its two EDGs (and associated safeguards equipment, including their individual HHSI pumps) OPERABLE, plus one EDG and its associated HHSI pump on the other Unit OPERABLE as a Limiting Condition for Operation (LCO) in Modes 1-4. Thus, in order to bring one Unit out of the planned dual-Unit outage, this test includes at least three of the four 4kV

buses (3A, 3B, 4A & 4B) and their associated EDGs (3A, 3B, 4A & 4B). If required, the remaining EDG and its buses are tested prior to bringing the second Unit up, from its outage configuration. That Unit will require OPERABILITY of its two EDGs (and associated safeguards equipment) plus OPERABILITY of at least one other EDG and its associated HHSI pump on the other Unit. In addition, all four EDGs are demonstrated to start simultaneously as noted in Subsection 7.3.9.

For a LOCA on one Unit, a Safety Injection Signal (SIS) is sent to all four sequencers which results in the starting of all four EDGs and all four HHSI pumps. If a safeguards actuation train fails, then three EDGs receive a start signal and three of the HHSI pumps receive a start signal (one HHSI/EDG on the unfailed train and both HHSI/EDGs on the other Unit). The starting circuits are demonstrated to function via relay dry contacts and/or an interposing relay at each associated EDG/pump sequencer.

All of the EDG starts discussed herein are fast starts and must meet the fifteen (15) second requirement to attain required frequency and voltage. Complete bus and EDG independence including that between interunit trains are demonstrated. During each of the test sequencers, verification is made that design loads on the EDGs are not exceeded.

The following sections present revised test objectives and the intended sequence of tests for the Integrated Safeguards Testing. These revisions provide for compliance with R.G.1.108 and R.G.1.41 requirements (Section 6.0), as they apply to the EPS Enhancement Project modifications. The following test objectives are accomplished in each section of the Integrated Preoperational Test; acceptance criteria for these tests are delineated in Section 7.3.

7.2.1 LOOP

Each EDG is auto-started with individual Unit LOOP. Bus feeder breaker opening, bus stripping & clearing, EDG start, EDG frequency, voltage and current output, EDG breaker closure, and sequencer timing intervals with required load starting are monitored. In short, the complete event sequence of LOOP initiation/detection, starting the EDG and picking up all required loads is recorded for later data processing and analysis.

7.2.1.1 LOOP then LOCA

After a successful LOOP start test but prior to synchronization of the EDG to the startup transformer, a subsequent LOCA signal is simulated. Test data is gathered demonstrating the tripping of all loads connected to the bus and the sequential starting of safety related loads on the bus. During the sequencing, the design voltage conditions are monitored.

7.2.1.2 LOCA with EDG Loaded to Off-Site Power

After reset of the auto-start signal and synchronization of the EDG to the startup transformer and in parallel with the offsite source, a LOCA signal is simulated. Connected recording equipment captures the tripping of the EDG breaker (with the machine continuing to operate) to allow the preferred source to power the connected loads and those emergency loads which start in response to the accident signal.

7.2.2 LOCA

Each EDG is auto-started by an individual Unit Safety Injection Signal and the affected HHSI pumps start. Sequencer start, HHSI pump breaker closure, EDG start, and EDG voltage and frequency output are all demonstrated. Additional safety-related loads are started for the affected Unit only.

7.2.2.1 LOCA then LOOP

Prior to resetting of the accident signal and with the EDG running at rated frequency and voltage, a LOOP is simulated. The EDG output circuit breaker is closed and applicable parameters previously mentioned in Subsection 7.2.1 are monitored.

7.2.3 Bus LOOP, LOCA and Hi-Hi Containment Pressure (HHCP)

Each EDG is auto-started by individual bus LOOP with simultaneous LOCA and HHCP (associated train) signals. Applicable parameters previously mentioned in Subsection 7.2.1 are monitored. In this mode, the containment spray pump sequencer loading relay reactuates after the sequencer is not timing.

7.2.3.1 LOOP plus Other Unit LOCA

During the above test in 7.2.3, the non-LOCA Unit's EDGs are started, and, the associated HHSI pumps and LOOP loads are correctly sequenced on the EDGs.

7.2.4 Bus Independence

Safety related AC buses are tested in various combinations to show that each bus is independent of every other safety related AC bus, considering swing loads as necessary. In particular each EDG is made inoperable with a subsequent dual Unit LOOP initiated with a simultaneous Unit LOCA/HHCP signal. The remaining EDGs auto-start per 7.2.1 demonstrating no effect or interdependence to the failed train.

7.2.5 Simultaneous EDG Starting

Simultaneous starting of the EDGs is demonstrated as part of the testing specified above.

7.2.6 Loss of Largest Single Load

The new EDGs are further tested by shutting down the largest single load, while maintaining voltage and frequency within acceptable limits. Subsequent restarting of this load shall be demonstrated to do so without experiencing unacceptable voltage and frequency degradation.

7.2.7 Transfer from EDG to Off-Site Power

These tests also demonstrate that each diesel generator can parallel its bus to the grid, transfer its emergency loads to the grid and be returned to a standby condition.

7.2.8 EDG Operability at Hot (Operating) Condition

Capability of the EDG to respond to the design accident load conditions while the EDG engine is in a hot (full load temperature) condition will be demonstrated by performing step 5.1.7 prior to step 7.2.3.

7.3 ACCEPTANCE CRITERIA

The following acceptance criteria demonstrate that the onsite electrical distribution systems adequately support the necessary systems during a simulated emergency condition.

Below are the acceptance criteria for both the existing and new diesel generators. Since there is approximately 20 years difference between the existing and new diesel generators, the criteria, codes and standards that pertain to the new diesel generators may not pertain to the existing diesel generators.

[illegible]

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7.3.1 Systems required to operate independently between diesel generators during a LOCA and/or LOOP condition operate within time and load requirements of their design. (Sections 7.2.1, 7.2.2, 7.2.3 and 7.2.4)

Regulatory Guide 1.9, C.4
Regulatory Guide 1.108, C.2.a.1, C.2.a.2 and C.1.c.1
IEEE 387-1984, 5.1.2

7.3.2 In the event one diesel generator division becomes unavailable, the remaining diesels are capable of feeding the loads necessary for safe plant shutdown. (Section 7.2.4)

Regulatory Guide 1.6, D.1
Regulatory Guide 1.108, C.1.b.1

7.3.3 The failure of any one electrical division does not affect the operation of the other or its LOCA functions. (Section 7.2.4)

Regulatory Guide 1.6, D.1

7.3.4 The diesel generators can start and assume their LOCA and/or loss of offsite power loads in the specified times and sequence while maintaining voltage and frequency within specified limits from hot (operating) temperature conditions. (Section 7.2.3)

Regulatory Guide 1.108, C.2.a.5

7.3.5 On a loss of the largest single load, each diesel generator does not exceed nominal speed plus 75 percent of the difference between nominal speed and the overspeed trip setpoint or 115 percent of nominal speed whichever is lower. Also, on the addition of the largest single load or sequencing load, the voltage is not reduced below 75 percent of normal and the frequency is not reduced below 95 percent of normal. (Section 7.2.6)

Regulatory Guide 1.9, C.4
Regulatory Guide 1.108, C.2.a.4
ANSI/IEEE Std 387-1984

7.3.6 The LOCA loads can be started, accelerated, and run while being supplied from standby AC power systems. (Section 7.2.1, 7.2.2 and 7.2.3)

Regulatory Guide 1.108, C.2.a.2

7.3.7 Each diesel generator has the capability to assume and sustain its emergency loads during a LOOP with or without a LOCA signal present. (Sections 7.2.1, 7.2.2 and 7.2.3)

Regulatory Guide 1.108, C.2.a.2

7.3.8 Each diesel generator, while loaded with its emergency loads, can be synchronized and transfer its emergency loads to the offsite power source. After transfer of its load, the diesel generator can be returned to standby status. (Section 7.2.7)

Regulatory Guide 1.108, C.2.a.6

7.3.9 Demonstrate that diesel generators 3A, 3B, 4A and 4B can be started simultaneously and that they accelerate to their nominal running speed, to 4160V ± 420V and to 60 Hz ± 1.2 Hz within 15 seconds after the start signal. (Section 7.2.5)

Regulatory Guide 1.108, C.2.b

7.3.10 Demonstrate the ability of the generator and excitation system to accept the most severe load without experiencing instability resulting in generator voltage collapse, or significant evidence of the inability of the voltage to recover. Also demonstrate that there is sufficient engine torque available to prevent engine stall, and to permit the engine speed to recover, when experiencing the most severe load requirements. (Sections 7.2.1, 7.2.2 and 7.2.3)

Regulatory Guide 1.9, C.4
Regulatory Guide 1.108, C.2.1.2
ANSI/IEEE Std 387-1984, 5.1.5

[illegible]

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8.0 CONFORMANCE TO NRC REGULATORY GUIDES RELATED TO TESTING

The design, installation, testing and operation of the new electrical equipment provided for the enhanced Emergency Power System conforms to the current NRC guidance contained in the applicable Regulatory Guides (RGs) listed below. As indicated, these RGs in turn endorse (generally with some qualification) the industry standards noted. Some of the Regulatory Guides listed do not pertain, primarily, to testing requirements but are listed for completeness. Refer also to the FPL responses to NRC's January 1989 Request for Additional Information (FPL letters L-89-54 and L-89-107).

RG 1.9 "Selection, Design, and Qualification of Diesel Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants", Revision 2 dated December 1979. RG 1.9 provides the NRC position on EDG capacity pursuant to GDC 17, and on testing pursuant to 10CFR50 Appendix B. The RG endorses, with comment, IEEE Standard 387-1977. Section 7.3 of this submittal describes the conformance of the enhanced EPS to RG 1.9, particularly for the new EDGs being provided.

RG 1.41 "Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load-Group Assignments", Revision 0 dated March 1973. This RG provides the NRC position on testing of onsite emergency power systems which have been designed to RGs 1.6 and 1.9, to meet GDC 1 and 10CFR50 Appendix B. RG 1.41 clarifies a portion of IEEE Standard 308-1971. The conformance to RG 1.41 is described in Section 6.0 of this report.

RG 1.108 "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants", Revision 1, dated August 1977 (including Errata published September 1977). This RG provides the NRC positions for complying with GDCs 17 and 18, and with the testing provisions of 10CFR50 Appendix B. It encompasses preoperational and periodic testing of diesel electric power Units to ensure they will meet their availability requirements. This submittal describes the construction, startup, preoperational and integrated testing performed on the EDGs and on the enhanced EPS. Periodic testing is conducted under the applicable Turkey Point Technical Specifications.

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RG 1.137 "Fuel Oil Systems for Standby Diesel Generators", Revision 1 dated October 1979. This RG provides the NRC positions for complying with GDC 17 and 10CFR50 Appendix B, and endorses, with comment, ANSI N 195-1976 regarding fuel-oil systems for standby diesel generators and assurance of adequate fuel-oil quality. Fuel-oil quality is assured at Turkey Point by administrative procedures which follow ANSI N 195-1976, and the quality of fuel-oil is tested in accordance with Technical Specifications which specify, as applicable, ASTM Standards (or equivalent) D4057, D975-81, D1552-79, D2622-82, and D2276-78. (These Technical Specifications are currently under NRC review.)

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9.0 REFERENCES

1. IEEE 387-84 - IEEE Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations
2. NUREG CR-4440 - A Review of Emergency Diesel Generator Performance at Nuclear Power Plants
3. Regulatory Guide 1.9 - Selection, Design and Qualification of Diesel-Generator Units used as Standby (On Site) Electric Power Systems at Nuclear Power Plants, Rev 2, December 1979
4. Regulatory Guide 1.41 - Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments, Rev 0, March 1973
5. Regulatory Guide 1.108 - Periodic Testing of Diesel Generator Units used as On-Site Electric Power Systems at Nuclear Power Plants, Rev 1, August 1977
6. Regulatory Guide 1.137 - Fuel Oil Systems for Standby Diesel Generators, Rev 1, October 1979
7. Regulatory Guide 1.155 - Station Blackout, Rev 0, August 1988
8. FPL Letter L-88-269 dated June 23, 1988
9. FPL Letter L-88-454 dated October 19, 1988
10. NRC Letter dated January 6, 1989, Request for Additional Information on Emergency Power System Enhancement Project (TAC Nos. 69023 and 69024).
11. FPL Letter L-89-54 dated February 24, 1989
12. FPL Letter L-89-107 dated March 20, 1989
13. FPL Letter L-89-124 dated April 3, 1989
14. FPL Letter L-89-144 dated April 17, 1989.
15. NRC Letter dated August 10, 1989, Qualification of New Emergency Diesel Generators.
16. NRC Letter dated March 16, 1990, Request for Additional Information on Emergency Power System Enhancement Project (TAC Nos. 69023 and 69024).
17. FPL Letter L-90-140 dated April 16, 1990
18. ASME OM-1987, Operation and Maintenance of Nuclear Power Plants, Part 3 - Requirements for Preoperational and Initial Startup Vibration Testing of Nuclear Power Plant Piping Systems.

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4.0 ELECTRICAL SYSTEM STARTUP/PREOPERATIONAL TESTING

A dual-Unit outage is planned for modifications and tie-in installation of the enhanced Emergency Power System electrical components. The outage activities include the tie-in of the new EDGs, modification of the existing EDGs and the modification of the electrical trains, plus component/system testing and safeguard testing.

During a scheduled Unit refueling outage, both Units are planned to be shut down in order to implement the tie-in of the new EDGs, the modifications to the existing EDGs, and separation of the EDG sequencers to the electrical system.

The tie-in of the EDG 4A to the Unit 4 Train A electrical auxiliary system also includes the tie-in of the 4.16kV Switchgear 4D, 480V Load Center 4H, the connection of MCC 4J to Load Center 4A, and the relocation of loads to Load Center 4H, MCC 4D and Switchgear 4D. Simultaneous to the tie-in of the EDG 4A, the EDG presently supplying power to Buses 3A and 4A will be disconnected and Sequencers 3A and 4A replaced as described below.

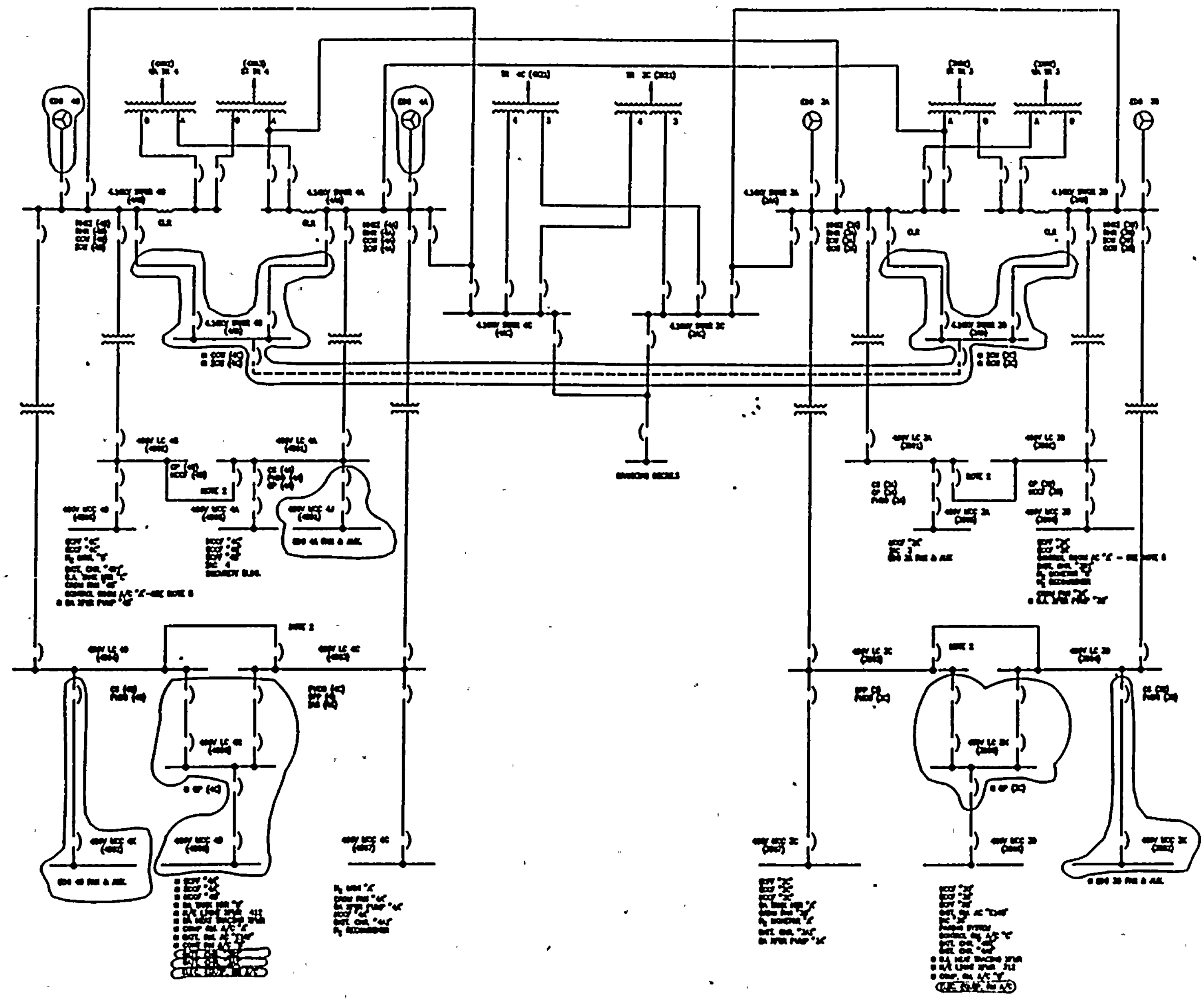
The Train 3A modifications will include the tie-in of the 4.16kV Switchgear 3D, 480V Load Center 3H, and the relocation of loads. The activities to modify Trains 3B and 4B are similar to those described for Trains 3A and 4A. Details are provided below.

This section augments Section 3.2 startup testing, and includes a description of the startup/preoperational test requirements for the enhanced power system relocated loads and added loads, both AC and DC, including the new 4.16 kV swing switchgear, 480V swing load centers, 480V MCCs, 125V DC buses, panelboards and emergency bus stripping and loading sequencers.

This section discusses the electrical separation of the existing EDGs from the Unit 4 new EDGs. The preoperational testing requirements of the new EDGs are discussed in Sections 5.0 and 6.0, and the integrated EPS testing requirements are discussed in Section 7.0.

4.1 4.16 kV SWING SWITCHGEAR 3D (4D)

The new 4.16 kV switchgears 3D (4D) are installed in the new EDG building. Startup testing commences upon completion of the appropriate interfaces required to support the tests.



SYMBOLS:

■ RELOCATED EQUIPMENT (POWER SUPPLY) NOTE 1

—— SBO CROSSTIE

NOTES:

1. ONLY SELECTED SAFETY RELATED LOADS ARE SHOWN
2. BREAKER NORMALLY RACKED OUT
3. THE FOLLOWING NEW EQUIPMENT IS BEING ADDED UNDER EPS ENHANCEMENT PROJECT:
   - EDGs 4A & 4B
   - 4.16KV SWGR 3D & 4D
   - 480V LOAD CENTERS 3H & 4H
   - MCCs 3K, 4D, 4J & 4K
   - BATTERY CHARGERS 3A2 & 3B2
4. THE FOLLOWING EXISTING EQUIPMENT IS RELABELED UNDER EPS ENHANCEMENT PROJECT:

EXISTING	RELABELED
EDG A	EDG 3A
EDG B	EDG 3B
MCC D	MCC 3D
BATTERY CHARGER 3A	BATTERY CHARGER 3A1
BATTERY CHARGER 3B	BATTERY CHARGER 3B1
BATTERY CHARGER 3S	BATTERY CHARGER 4B2
BATTERY CHARGER 4A	BATTERY CHARGER 4A1
BATTERY CHARGER 4B	BATTERY CHARGER 4B1
BATTERY CHARGER 4S	BATTERY CHARGER 4A2

EXISTING BATTERY CHARGERS WILL BE REPLACED AND RELABELED AS SHOWN ABOVE.

5. CONTROL ROOM AC "A", FED FROM MCC 3B, CAN BE POWERED FROM MCC 4B VIA TRANSFER SWITCH.

INDICATES EQUIPMENT ADDED BY EPS ENHANCEMENT PROJECT

FLORIDA POWER & LIGHT COMPANY

TURKEY POINT PLANT UNITS 3 & 4

EMERGENCY POWER SYSTEM ENHANCEMENT

AC ONE-LINE DIAGRAM

FIGURE 1 -

MAY 18 1990