FLORIDA POWER & LIGHT COMPANY

TURKEY POINT UNITS 3 AND 4

EMERGENCY POWER SYSTEM ENHANCEMENT REPORT

SUPPLEMENT NO.1 - TESTING

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FPL

TURKEY POINT UNITS 3 AND 4
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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. This Supplement #1 provides additional information regarding the testing 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 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.

2.0 PURPOSE AND SCOPE OF TESTING

2.1 PURPOSE OF TESTING

The test program outlined in this Supplement provides additional assurance (following factory testing of the components) that the EPS Enhancement modifications have been properly designed and verifies 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, 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, outlined herein, encompasses the scope of events that begins with completion of system/component construction and installation, and ends with completion of integrated acceptance testing.

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 of various systems in the new EDG buildings includes the new extensions of the Fire Protection, Lighting, HVAC and Communications Systems. 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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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)

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 Supervisor. An M-K field service representative is on site for this portion of the testing and acts as a consultant reporting to the Startup Department. The Startup Department 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, a new fuel oil receiving tank, and three new fuel oil transfer pumps and the associated piping..

The fuel oil receiving tank is checked for cleanliness. The normal discharge valves and pumps are operated on recirculation to verify flow through the fuel oil filter.

The quality of the fuel oil is tested and verified per existing plant procedures. The receiving fuel oil transfer pump lines to the two new fuel oil storage tanks are flushed with fuel oil. 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.

Flow is established from the receiving fuel oil tank through all new piping to ensure adequate flushing. The proper operation of the transfer pump from the receiving fuel oil tank to the storage tank is verified.

The new fuel oil transfer pumps and motors are checked for proper operation. Each pump is checked for pressure and flow. The operation of the level instrumentation and the auto-start/auto stop functions of the fuel oil transfer pumps are verified. Baseline data, for future In-Service Testing, is documented. The level instrumentation of the receiving tank and the day tanks is functionally checked, and the pumps' performance characteristics are recorded.

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 flushed using the two AC and two DC pumps.

Each motor driven pump is operated individually to verify the pump flow. All instrumentation is checked for proper operation.

3.1.6 EDG Governor Hydraulic System

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

3.1.7 EDG Engine Exhaust Air

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.

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3.4 EDG SYSTEM AUXILIARIES TESTING

The tests outlined in this Section are run to assure that the previously individually tested components 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 Alarms

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 internal to the engine.

The various 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 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 and refrigeration system 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 discharge air is at an acceptable dew point before it enters the receivers.

c. Actual engine cranking capability, using the barring device, is checked. The alarms and interlocks are 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 Systems

3.4.3.1 Fuel Oil Receiving Tank and Transfer Pump

The receiving tank transfer pumps are placed in service and their various operating modes tested. The pump is operated through its bypass lines to verify flows.

The fuel oil sampling system is operated to verify its ability to withdraw a sample for testing.

The transfer pumps are used to pump the fuel to the main storage tanks. The pump flows and motor data are recorded to verify the pump performance.

3.4.3.2 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 the 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 similar verification tests to those of the 4A tank are performed.

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

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

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 system and the shaft driven pumps and systems.

The initial testing is the operation of the 4 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 without affecting air flow to the engine. It also ensures that the supply and exhaust fans are properly balanced and that they operate per design.

3.5 NEW EDGs CONTROL SYSTEMS TESTING

3.5.1 Simulated EDG Operation

Without running the engine, EDG operation is simulated in 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 and local/remote switch positions. The following signals are simulated:

i - Station undervoltage signal (LOOP)
ii- Engineered Safeguards Actuation Signal (SI)

3.5.1.2 Emergency Stop/Trip Signals

The emergency diesel generator shutdowns are tested via simulated emergency starts and the following simulated emergency stops/trips.

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

3.5.1.3 EDG Trip Signals

After all normal trips are disabled each of the following trips are tested following a simulated idle start and a simulated rapid start.

Fuel Oil Low Pressure
Crankcase High Pressure
Cooling Water Low Pressure
Lube Oil Temperature High
Combustion Air 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
Combustion Air Low Pressure
Exhaust Air High Pressure
Engine High Vibration
Main Manifold Lube Oil Low Pressure
Piston Cooling Oil Low Pressure
Turbocharger High Differential Temperature

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 checked to be functional.

Piping 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).

3.6.1 Starting Air

3.6.1.1 Air Compressor Performance Test

The motor driven air compressors are operated to show 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 show the auto "load-unload" function of the mechanical unloader also maintains the air receivers within the proper pressure range.

- Vibration data, operating speed (RPM) and the time required for one compressor to pressurize two air receivers is also recorded.

3.6.1.2 Air Dryer Performance Test

The air dryer dewpoint is measured and the air dryer power consumption data is taken at various operating pressures to determine maximum moisture content of the air in the air receivers. The auto "start-stop" function of the air dryer is also checked.

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 are checked to obtain flow data to the day tanks, the auto "start-stop" function with the day tank level switches and motor data. The level switches in the day tank are checked to see at what level they annunciate and at what level they clear. The suction strainer is changed 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 discharge pressure is recorded.

3.6.4 Lube Oil/Cooling Water Keep-Warm

The keep-warm system is operated to assure the lube oil, cooling water and engine in general is maintained at a temperature above its surroundings. This is to assure that condensation does not take place in the lube oil sump and also assure that the engine is at a temperature where a rapid start followed with fast loading will not be detremental to the EDG. The lube oil flow through the lube oil filter is verified along with the correct differential pressure.

The AC and DC lube oil pumps (circulating and turbo) are operated and motor data are recorded. The temperatures of the cylinders are recorded to assure the thermocouples and the circuit are operational. The temperature switches, level switches, pressure switches and differential pressure switches are shown to be functional. Each alarm point is actuated and verified to annunciate at the local control panel.

Lube oil flow to the turbocharger and engine bearings is verified to assure the prelubrication system is working effectively. The lube oil sump is pumped down to verify the low level alarm point and that it annunciates on the local control panel.

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

3.6.5 Generator

The generator standby space heater circuit is checked for cut-in and cut-out temperatures and amperage are recorded. Generator bearing temperature themocouples are checked to see that they are operational and that they have the proper readout at the local control panel.

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 specific startup/preoperational tests 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 No 4 new EDGs. The preoperational testing of the new EDGs is discussed in Sections 5.0 and 6.0, and the integrated EPS testing is 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 as outlined below commences upon completion of the appropriate interfaces required to support the tests.

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-T 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. Current transformer (CT) and potential transformer (PT) burdens are checked, and relay fault tripping currents in all three phases recorded. 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

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 under a separate submittal to the NRC to meet the schedular and information requirements of 10CFR50.63.

Testing of these circuit breakers is performed similarly to the tie breaker testing described 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 (LC) 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). The existing breaker is being spared.

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.

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-T 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.

4.4.4 MCC 4K

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

4.5 MODIFICATION OF EXISTING 480 VOLT MCCs

The modifications made to the existing MCCs are outlined below. Testing of the modifications on MCC 3D is performed to ensure proper operation. Refer to Figure 1-T as appropriate.

4.5.1 MCC 3A

Removal of Telemand transfer operators, control wiring and removal of tie from Load Center 3D. No testing is required at this stage; see Section 6.0.

4.5.2 MCC 3B

No changes, thus no individual testing is required at this time.

4.5.3 MCC 3C

No changes, thus no individual testing is required at this time.

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 4.2.7). All Unit No. 4 loads from vital section are moved to MCC 4D (see Subsection 4.4.2). These compartments are left as spares.

4.5.5 MCC 4A

Removal of Telemand transfer operators, control wiring and removal of tie from Load Center 4D. No testing is required at this time.

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). These motor starter compartments are left as spares. No testing is required at this time.

4.5.7 MCC 4C

No changes, thus no individual testing is required at this time.

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.

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 at the connected 4kV and 480V control circuits to assure correct operation and loading of equipment for each particular mode of operation.

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 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, 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, 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 3H and 4H 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.

4.8.1 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 No 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 at this time. Further verification 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 No 4 is removed and/or disconnected. This also includes alternate shutdown panel modifications and testing. Additional testing is performed to verify proper separation.

Further 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 Subsection 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:

- Main control room control console and vertical panel modifications, including relabeling, new metering, 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 3H and 4H 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.

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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 at this time. Further verification 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 similiarly to those specified in Subsection 4.9.1 and below, EDG 4B/Train 4B testing includes testing of the alternative shutdown capability.

Further verification 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.

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 and locally, along with all ECCS 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 the testing 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 Five-Start Test

With one train of starting air receivers isolated at the starting air skid, the air compressor to "off" and the other air receivers bled down to the pressure where one air compressor starts, the air capacity test for the air receivers is completed. The EDG undergoes four start failures and then is rapid started on the fifth attempt.

After the fifth start, the EDG is loaded to greater than 50% load and run for one hour. The hot engine overspeed trip setpoint is verified after the above run.

The above five-start testing is repeated for the other air receivers.

5.1.2 Emergency Start Bypass

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.

5.1.3 Idle Start

A cold EDG is idle started. After five minutes, the EDG is idle released to 900 rpm, then shut down via overspeed trip, recording standby engine overspeed trip setpoint data.

5.1.4 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 correct. The EDG is synchronized to grid (e.g., through a temporary transformer) and slowly loaded to 50% load. Fifty percent (50%) load is maintained until all engine parameters are stable. Load is increased to 75% and all engine parameters are allowed to stabilize. Load is increased to 100% and all engine and generator parameters are allowed to stabilize, including generator bearing temperatures. The EDG is operated at 100% load for one hour. The EDG output breaker is opened and frequency, speed and voltage transients are measured to assure the voltage requirements are met and the EDG does not trip on overspeed.

5.1.5 Twenty-four Hour Run

For the twenty-four hour run the EDG is normal started, synchronized and slowly loaded to 100%. After all engine parameters are stable, load is increased to 110% (-0, + 50kW). After 15 minutes of operation a complete set of EDG data is taken and repeated every 30 minutes while at 110% load. After two hours at 110% load is reduced to 100% (-0, + 50kW). After 30 minutes 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.

During the above twenty-four hour run fuel oil and lubrication oil consumption tests are performed.

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 testing in Section 4.0 above is completed and temporary sequence of events recorders, oscilliographs, etc., are readied and in place, 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 5.2 except all controls are from the Main Control Room:

Emergency Start Bypass
Normal Start with Normal Shutdown
Fast Start with Normal Shutdown
Emergency Start using simulated SI signal, with emergency shutdown.

The test in Section 5.1.4, one hour run with 100% load rejection, is repeated.

5.2.2 Auto-Start Tests

After the EDG is started with a simulated SI signal the normal trips are assured bypassed by attempting to trip EDG via normal trips. The EDG and all auxiliary support equipment are verified to continue to operate.

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.

5.2.3 EDG Reliability Test

These tests demonstrate the reliability of the EDG by means of 69/n consecutive valid tests, with no failures. 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 starts, with no failures. Each start below will monitor speed, voltage and frequency.

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

The above test is repeated such that each EDG has at least 35 successful starts without a failure. Each start must come to rated frequency and voltage, $\pm$10%, within 15 seconds.

5.2.4 31-Day Tests Required

This completes the Startup and Preoperational Testing for the new EDGs and from this point on, the normal periodic testing every 31 days is performed.

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 successively in the various possible combinations of power sources and load groups with all DC and on-site AC power sources for one load group 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 (e.g., the lack of forced cooling of a vital device).

c. During each test, the DC and on-site AC buses and related loads not under test are monitored to verify absence of voltage at these buses and loads.

Planning and scheduling efforts are underway to integrate the above testing with the acceptance testing of the EPS discussed in Section 7.0. These efforts will also determine how the above tests are performed on a per-unit or a per-plant basis.

7.0 INTEGRATED ACCEPTANCE TESTING INCLUDING SAFEGUARDS TESTING

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

As noted earlier, FPL's present plans are to make the final installation tie-ins and subsequent testing of the enhanced EPS during a scheduled Unit refueling outage, with a dual-Unit outage required. At present, three outage options are under active consideration:

- One Unit (the Unit in a refueling outage) defueled, and one Unit in Mode 6 (with Reactor Vessel head removed)
- Both Units defueled
- One Unit defueled and one Unit in Mode 5 (with RV head in place)

The impetus for these three options is the allowable outage time for equipment under the Plant Technical Specifications: a Unit in Mode 6 with the RV head removed is required to have one EDG and its associated Train and engineered safeguards equipment OPERABLE, including one train of Residual Heat Removal.

When a Unit is defueled, i.e., the fuel is outside the Reactor Vessel and is being stored in the Spent Fuel Pit, then the requirement for RHR cooling of the Reactor Coolant System is unnecessary, but a requirement can be imposed for that equipment needed to mitigate a Fuel Handling accident to be available (e.g., SFP ventilation/ filtration unit; SFP cooling, etc.). In addition, there is some minimum amount of other equipment that may be required to be OPERABLE such as certain effluents radiation monitoring equipment.

Initial planning is focused on keeping one EDG and one Unit's Train OPERABLE while the other EDGs and Trains are being installed or modified. Once those modifications are made, then one or more of the modified EDGs and Trains are declared OPERABLE and the EDG and Train previously kept OPERABLE would be modified. However, if both Units are defueled, the feasibility of providing temporary power for the minimum equipment required, and of providing backup portable cooling to the Spent Fuel Pits, is being investigated.

7.2 INTEGRATED PREOPERATION TEST

In order to meet the single failure criterion, each Unit must have its two EDGs (and associated safeguards equipment) OPERABLE, plus at least one EDG and its associated HHSI pump on the other Unit OPERABLE as a Limiting Condition for Operation (LCO) in Modes 1-4 (as presently envisioned for the EPS enhancement Technical Specifications). 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) as well as three of the four 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.

All of the EDG starts discussed herein are fast starts and must meet the fifteen (15) second requirement to attain proper speed, frequency and voltage. Complete bus and EDG independence are demonstrated including interunit trains.

While any safety injection signal initiates the prompt starting of all four EDGs and High Head Safety Injection (HHSI) pumps, the starting circuits are demonstrated to do so via (safeguard rack) relay dry contacts and/or an interposing relay at each associated EDG/pump sequencer. As indicated, at least three of the four EDGs and HHSI pumps are demonstrated to receive the SIS start signal.

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 bus LOOP, by opening the startup transformer bus supply circuit breaker. Breaker command initiation, opening, bus frequency & voltage decay, undervoltage relay dropout actuation, sequencer start, bus stripping & clearing, EDG start, EDG ready-to-accept load signal, EDG 4kV circuit breaker close initiation, EDG breaker closure, sequencer timing intervals with required load starting, step-load starting characteristics, EDG terminal and field voltages, EDG line and field currents, etc., are monitored. In short, the complete event sequence of LOOP initiation/detection, starting the EDG and picking up all required loads is captured on tape for later data processing and analysis.

7.2.1.1 LOOP then Immediate 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 EDG and the sequential starting of safety related loads to the EDG. During the sequencing, the design voltage conditions are monitored. Voltage conditions are also monitored at the appropriate 480V MCCs and load centers for vital loads. The diesel generators must be able to perform the above from a normal standby condition or a hot operating condition.

7.2.1.2 LOOP then Later LOCA

After reset of the auto-start signal and synchronization of the EDG to the startup transformer, and while in parallel with the offsite source, a LOCA signal is simulated. Connected recording equipment captures the immediate tripping of the EDG breaker (with machine continuing to run at rated speed, frequency and voltage) to allow the preferred power source to power the connected loads and those emergency loads which are starting responding to the accident signal.

7.2.2 LOCA

Each EDG is auto-started by an individual train (3A, 3B, 4A, 4B) safety injection signal and three of the four HHSI pumps start immediately. Sequencer start, HHSI pump breaker command initiation and closure, EDG start, EDG ready-to-accept load signal are all demonstrated by sequence-of-events recording. Additional safety-related loads are started for the affected train only.

7.2.2.1 LOCA then LOOP

Prior to resetting of the accident signal and with the EDG running at rated speed, 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 Unit LOOP and LOCA

Each EDG is auto-started by individual bus LOOP with a simultaneous LOCA (associated train) signal. Applicable parameters previously mentioned in Subsection 7.2.1 are monitored.

7.2.3.1 Unit LOOP and LOCA then Later Hi-Hi Containment Pressure

The test described in 7.2.3 is performed, but with the Containment Spray (CS) Pump sequencer loading relay reactuating after the sequencer is not timing. This simulates prompt starting of a CS pump on later demand.

7.2.3.2 Other Unit LOCA, Plus LOOP

The above test in 7.2.3 is repeated with the EDG to be tested in a full-load temperature condition, but with a simultaneous LOCA signal from one of the other trains, demonstrating start of the HHSI pump in addition to those loads required for the LOOP.

7.2.4 Bus Independence

Buses are tested in various combinations of safety buses, non-safety buses and DC buses to show that each bus is independent of every other bus, considering swing loads as necessary. In particular each EDG's associated DC distribution bus is made inoperable with a subsequent dual unit (three of four train) LOOP initiated. The remaining EDGs are verified to auto-start per 7.2.1, demonstrating no effect or interdependence to the failed train.

7.2.5 Simultaneous EDG Starting

With all required loads in the recirculation mode, three of the four EDGs are auto-started simultaneously by opening the switchyard breakers to Unit 3 and Unit 4 startup transformers, with a concurrent LOCA signal in one Unit. This test is later repeated with the LOCA signal in the other Unit, when that Unit is being readied for Mode 4.

All machines are demonstrated to respond as intended as described in Subsections 7.2.1 and 7.2.3 as applicable.

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 at 4160V ± 420 volts and 60 Hz ± 1.2 Hz. Subsequent restarting of this load shall be demonstrated to do so without experiencing voltage degradation.

These tests also demonstrate that each diesel generator can parallel its bus to the grid and transfer its emergency loads to the grid. They demonstrate an EDG can come off the grid and resynchronize to the grid and pick up the emergency loads if the offsite power system were to lose power.

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.

7.3.1 Systems required to operate independently between diesel generators during a LOCA and/or LOOP condition operates within time and load requirements of their design. (Sections 7.2.1, 7.2.2, 7.2.3, 7.2.4 and 7.2.5)

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 new 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 both cold (normal standby) and hot (operating) temperatures for the following. (Sections 7.2.1, 7.2.2, 7.2.3, 7.2.4 and 7.2.5)

- LOOP
- LOOP with previous LOCA
- LOOP with subsequent LOCA
- LOOP with simultaneous LOCA

Regulatory Guide 1.9, C.4
Regulatory Guide 1.108, C.2.a.1, 2, 4 and 5

7.3.5 On a loss of the largest single load, each new 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 7.2.5)

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 7.2.2)

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 7.2.5)

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)

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 and 7.2.5)

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

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 (provided under separate cover).

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.

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.)

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

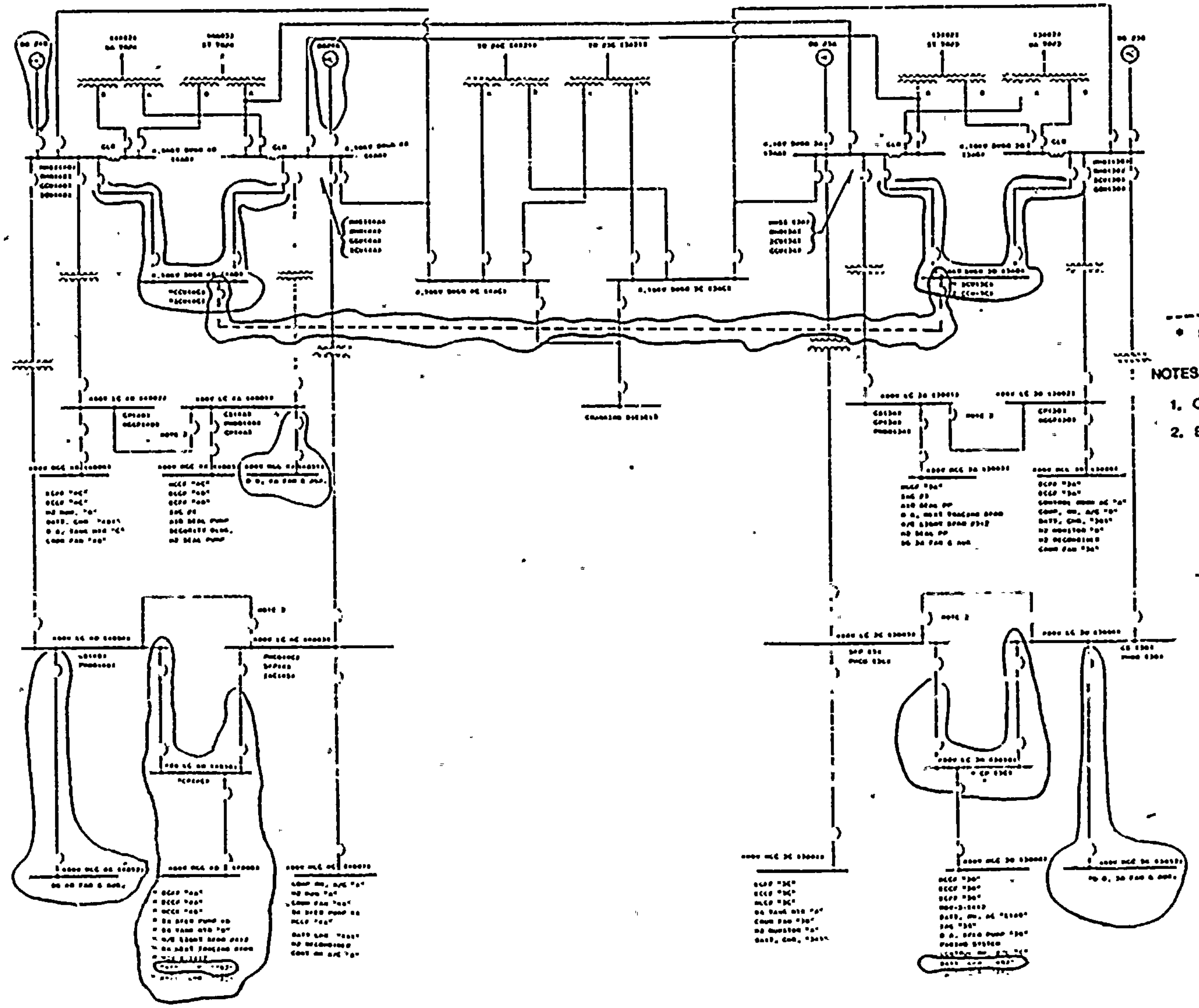
4. Regulatory Guide 1.41 - Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments, Rev 0, March 1973

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



SYMBOLS

- - - - - PROPOSED SBO CROSSTIE

* RELOCATED EQUIPMENT (POWER SUPPLY)

NOTES

1. ONLY SAFETY RELATED LOADS ARE SHOWN
2. BREAKER NORMALLY RACKED OUT

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-T

Attachment 2

Schedule for Emergency Power System

Enhancement Project Submittals

Emergency Power System (EPS) Enhancement Report	June 23, 1988 L-88-269
Testing (EDG Qualification)	October 19, 1988 L-88-454
Response to January 6, 1989 NRC request for additional information	February 24, 1989 L-89-54
Response to January 6, 1989 NRC request for additional information	March 20, 1989 L-89-107
Supplement 1 to EPS Enhancement Report - Testing	April 3, 1989 L-88-124
Supplement 2 to EPS Enhancement Report - Safety Evaluation	May 26, 1989
Revised Technical Specifications and No Significant Hazards Evaluation	June 30, 1989