UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO.138TO FACILITY OPERATING LICENSE NO. DRP-31

AND AMENDMENT NO. 139TO FACILITY OPERATING LICENSE NO. DPR-41

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT UNIT NOS. 3 AND 4

DOCKET NOS. 50-250 AND 50-251

BASES (Continued)

The ACTION requirements specified when an A.C. vital panel is not energized from an inverter connected to its associated D.C. bus provides for two phases of restoration. Expedient restoration of an A.C. panel is required due to the degradation of the Reactor Protection System and vital instrumentation. The first phase requires reenergization of the A.C. vital panel within two hours. During this phase the panel may be powered by a Class 1E constant voltage transformer (CVT) fed from a vital MCC. However, the condition is permissible for only 24 hours as the second phase of the ACTION requires reenergization of the A.C. vital panel from an inverter connected to its associated D.C. bus within 24 hours. Failure to satisfy these ACTIONS results in a dual unit shutdown.

With one unit shut down one 4160-volt Bus on the associated unit can be deenergized for periodic refueling outage maintenance. The associated 480-Volt Load Centers can then be cross-tied upon issuance of an engineering evaluation.

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1.0 BACKGROUND

Turkey Point Units 3 and 4 are reactors of early Westinghouse design which began operation in 1972 and 1973. Over the years, the Florida Power & Light Company (FPL) has been upgrading the design of the plant in a number of areas to improve safety and operational capabilities. One of the most significant improvements to date is the Emergency Power System (EPS) enhancement which is evaluated in this report.

Turkey Point Units 3 and 4 currently share an emergency power system which includes two safety-grade emergency diesel generators (EDGs). Consequently, the reliability of the AC supply has always been of concern. To add backup electrical power sources, FPL provided five existing non-safety grade cranking diesel generators which could be manually started and used to power plant shutdown systems if ever needed. These backup diesels will be retained, and are, in fact, a backup power supply to the Standby Feedwater System (which is itself a backup to the Emergency Feedwater System). Another operational problem is that a problem with any one of the shared emergency power system components impacts both Turkey Point Units. This complicates operations and potentially requires shutting down both units at the same time. In addition, care must be exercised in the loading of the emergency diesel generators under accident conditions to keep the electrical loads within the EDG ratings. Under certain circumstances, this can require some manual loading and shedding of non-essential loads.

To alleviate these operational problems and to significantly improve the safety of the Turkey Point Plant, Units 3 and 4, FPL began to study possible plant improvements. Among them was the EPS Enhancement Project. To that effect, in 1986 FPL authorized a detailed design study, the Emergency Power System Enhancement Study, to provide a conceptual design for the EPS improvement option which had been selected based on earlier analyses.

By letter dated June 23, 1988, FPL submitted the description of the EPS Enhancement Project. This letter was supplemented by a letter dated October 19, 1988, in which FPL described further the two new EDGs and their proposed qualification testing. Additional information in response to NRC staff questions was provided in letters dated February 24, 1989, March 20, 1989, April 16, 1989, May 2, 1989, June 4, 1989, July 3, 1990, July 9, 1990, July 12, 1990, July 23, 1990, September 6, 1990 and September 28, 1990. The preoperational EPS testing plan was submitted by letter of April 3, 1989. The safety analysis was submitted by letter dated June 4, 1990. In addition, by letter dated July 2, 1990, FPL requested amendments to the licenses of both Turkey Point Units to modify the Technical Specifications to accommodate changes to the plant made as the result of the EPS Enhancement Project.

The EPS Enhancement Project consists of realigning the existing two EDGs to serve Turkey Point Unit 3 and installing two additional new EDGs (with support systems) to serve Turkey Point Unit 4. In addition, it includes providing a new EDG building, diesel oil storage tanks and transfer pumps, new 4.16 kV switchgear, new 480V load centers, new 480V motor control centers, new 125V DC transfer/distribution panels, new load sequencers, breakers, battery chargers, a spare battery bank, plus lighting distribution panels, transformers, cabling and numerous components necessary for modifying the existing equipment.

After implementation of the EPS Enhancement Project, the AC electrical system will have been separated to the extent practicable. However, complete electrical separation of the Turkey Point Units is not practical because some plant systems are shared (e.g., high head safety injection and DC electrical system).

The staff has reviewed FPL submittals and has prepared the following Safety Evaluation. The evaluation is divided into sections reflecting reviews by engineering discipline and/or system.

2.0 ELECTRIC POWER SYSTEMS

2.1 INTRODUCTION

Turkey Point units 3 and 4 presently have shared electrical power supplies between the two units. In particular, the two emergency diesel generators (EDGs), a 480V motor control center (MCC) 4D and two of the six battery chargers are shared by the two units. As a result, a problem with an EDG, a battery charger or the 480V MCC 4D impacts both units, complicating operations and possibly requiring the shutdown of both units. In addition, care must be exercised in the loading of the EDGs under certain accident conditions to prevent overloading them. This requires some manual loading and removal of non-essential loads to keep the loads within the EDG ratings.

To reduce the loading on the EDGs and to reduce the number of shared power supply sources, the licensee is proceeding with an Emergency Power System (EPS) Enhancement Project. The project includes a new emergency diesel generator building, two additional new EDGs with all support systems, new 4.16kV switchgear, new 480V load centers, new 480V MCCs, new 125V dc distribution panels, new battery chargers including two additional chargers and new load sequencers. In addition, a new additional battery bank to be used as a spare is being installed.

By letter dated June 23, 1988, the licensee described their EPS Enhancement Project. A supplemental letter dated October 19, 1988, described further the two new EDGs and the proposed qualification testing of them. Additional information in response to NRC staff questions was supplied by letters dated February 24, 1989, and March 20, 1989. The licensee's proposed preoperational testing plan was submitted by a letter dated April 3, 1989. Each of the above documents was revised and transmitted by letter dated June 4, 1990. A formal request for an amendment to the license was transmitted by letter dated July 2, 1990.

2.2 SYSTEM CHANGES

<u>General Description</u>

The existing 2500kW EDGs will be dedicated to Turkey Point unit 3. Two new 2874kW EDGs will be dedicated to unit 4.

For unit 4, a new 4160V swing bus 4D will be added. Similarly a new 4160V swing bus 3D will be provided for unit 3. Two new 480V load centers are being added, 3H for unit 3 and 4H for unit 4.

Three new 480V MCCs 4D, 4J and 4K are being added to unit 4 and one new 480V MCC 3K to unit 3.

The existing 125V dc distribution system consists of four 125V dc buses shared by both units. Each bus has one dedicated battery charger. Presently two battery chargers are shared, one between the 3A and 4B buses and the other between the 3B and 4A buses. Two new battery chargers are to be added and the existing six battery chargers replaced by new ones. Two battery chargers will be assigned to each of the four dc buses, such that each dc bus will have two dedicated chargers.

A new battery bank will be added along with associated cabling, switching and interlocks to permit the new battery to be temporarily substituted for any one of the four existing battery banks. This will permit testing of each battery bank (one at a time) without taking a dc bus out of service. A non-Class 1E battery charger will also be added to maintain a charge on the spare battery bank when it is in the standby alignment.

New load sequencers are provided for 4160V buses 3A, 3B, 4A and 4B to ensure timely automatic loading of essential loads for loss of offsite power supply (LOOP) and/or accident conditions.

General Evaluation

All safety-related electrical equipment and systems of the enhancement project are classified and qualified as 1E. The new EDG building and diesel oil storage building, containing the majority of the new enhancement equipment, is designed and constructed as a seismic Category I structure and is designed to withstand design basis natural phenomena including earthquake (maximum hypothetical earthquake of 0.15g), wind, tornado (including tornado-generated missiles) and flooding. The new equipment housed within this structure thus meets the current General Design Criterion (GDC) 2. New equipment located in the existing plant outside the new structures is also housed in seismic Class I structures and protected against the effects of natural phenomena, and as a minimum meets the criteria specified in the FSAR for compliance with GDC 2.

The new equipment installed in the new building is designed to accommodate the effects of the environmental conditions associated with normal operation, maintenance and testing. It is located in a mild environment and not subject to dynamic or postulated accidents such as pipe whip and jet impingement. Thus, the equipment meets the environmental criteria of GDC 4.

The new equipment located in the auxiliary building is designed, as a minimum, to meet the environmental conditions for the existing equipment located in the same locations, and is evaluated against the existing pipe break criteria in the FSAR. In addition, the location of the new equipment will consider the pipe break criteria presented in NUREG-0800[1], Appendix B, Branch Technical Position ASB 3-1.[6]

The new electrical equipment and cable additions will generally comply with the requirements of Regulatory Guide (RG) 1.6[3] for independence between redundant load groups. They will also meet the single failure criterion specified in RG 1.53.[13] Physical and electrical separation of equipment and cables will generally meet the requirements of RG 1.75[4] within the new EDG building, and in other parts of the plant where practical. Physical separation or protection of redundant electrical equipment to meet the criteria of RG 1.75 were not the bases for the existing design. Thus, although the additions may not meet current standards throughout the plant, they do in most instances and represent a substantial improvement as compared to the initially licensed facility. Also, imposing current standards on new installation, and not on the existing installation, could result in inconsistencies among equipment or cabling with undesirable human factor implications. For example, the licensee does not intend to uniquely identify "associated" circuits as defined in RG 1.75. Also, although cables would be identified at each end, the licensee does not intend to identify installed cables at five foot intervals as specified in IEEE Standard 384.[5] We find this to be acceptable since such identification of only part of the circuits could mislead contractor or plant personnel working with those circuits that are not so identified.

Class 1E circuits will comply with the requirements of RG 1.75 such as derating, environmental qualification, flame retardance, splicing restrictions, seismic qualification and raceway fill. Non-Class 1E circuits will also comply with these requirements except that connected non-Class 1E loads will be seismically supported, but not seismically qualified. We find this to be acceptable since these loads will be electrically separated from the Class 1E systems, and physically supported such that their failure should not impact the Class 1E systems.

For Class 1E control panels, boards and racks, and non-Class 1E equipment and circuits located within the same control panel, boards or racks are separated in accordance with the criteria of IEEE Standard 384. However, the licensee states that consistent with current plant criteria, wiring within enclosures associated with the dry contacts of relays and control switches for instrumentation and control are routed in the same wireways as the wiring associated with the redundant or non-Class 1E circuits. Once the cables exit the enclosure, control circuits to redundant equipment are routed in separate raceways. The NRC staff questioned the licensee as to what extent such non-separation of divisions would occur in the new switchgear building. The licensee responded that they did not expect it to occur except at the 4160V switchgear associated with the swing buses 3D and 4D. Since these buses can swing between Divisions A and B, it is necessary for both Division A and B control circuits to enter the breaker enclosures associated with swing buses. This will also occur at the 480V load centers 3H and 4H, which will be located in the electrical equipment room (formerly the hot machine shop).

We find the general design of the structures, systems and components of the enhancement project to be equivalent, as a minimum, to that of the existing plant and to meet the criteria of the FSAR. Further, the majority of the systems and components of the enhancement project lie within the new plant structures and generally meet the requirements of current standards, regulatory guides, and general design criteria. The changes and additions of the enhancement project improve safety and operating flexibility by increasing power supply capacity and redundancy. We therefore find the enhancement changes and additions to be acceptable. Specific systems and components are discussed further below.

Emergency Diesel Generators

Existing Emergency Diesel Generators

The existing 2500kW (2750kW short time rating) EDGs will be disconnected from the unit 4 buses and dedicated to Unit 3. The re-assignment of these EDGs to unit 3 service will require modifications to the present EDG control scheme to delete the unit 4 control features and to achieve a similarity in the operation between the unit 3 and unit 4 EDGs.

New Emergency Diesel Generators

The new EDGs will be connected to the unit 4 Division A and B 4160V buses using the circuit breakers that are presently used for connecting the existing EDGs to the unit 4 buses. The new EDGs are supplied by Morrison-Knudsen, Inc. Each set consists of a General Motors Electro-Motive Division Model 20-645F4B design, turbo-charged, two-cycle engine which is coupled to a Model #140 Electric Products generator. Each EDG has a continuous rating of 2874kW and a short time rating of 3162kW. The new EDGs are similar to the existing EDGs except for some minor design changes and a change in model number.

Operation at Idle Speed or Light Load

Operation of EDGs at light load for extended periods can result in an accumlation of lube oil in the exhaust system. As a result, the EDGs are designed with an idle start feature which allows the emergency signal to release the EDG to go from an idle speed of 440-560 rpm to rated speed of 900 rpm prior to accepting load. Also, if the engine has been running at light load for about 5 hours, or at idle speed for about 5 days, manufacturer recommendations specify operation at 40 percent load or greater for 30 minutes to clean out the exhaust stacks. In addition, during an extended idle period the air box drains are to be continually or periodically drained to remove oil accumulated in the engine air box.

New EDG Alarms

In addition to numerous local indications of EDG conditions, there are two annunciator windows in the control room that are alarmed for EDG conditions that could prevent an EDG from starting or that could indicate less than optimal conditions for the EDG. One of the annunciators would disclose when the master control switch is in the "off" or "local" position, either of which would prevent an automatic start of the EDG. The other annunciator is a common annunciator that would indicate any one or more of a number of abnormal conditions. To determine the specific condition, an operator could go to the local EDG panel, or in some instances could determine the condition based on indicating lights on the main control room panel. An unlit indicating light could indicate that the EDG is not available for an automatic start or that a condition exists that could prevent an EDG from functioning properly. Administrative procedures will ensure that these lights are on and the EDG is available for automatic start.

The following protective relays are provided for the new EDGs:

a. Generator Differential
b. Generator Overcurrent
c. Loss of excitation
d. Reverse Power
e. Underfrequency

All the above protective relays, except the generator differential, are bypassed under emergency operation. The only other signal that will trip the EDG during emergency operation is engine overspeed.

Evaluation

The two new EDGs make it possible to dedicate two EDGs to each unit. This provides additional emergency capacity and redundancy and therefore improves reliability and operational flexibility. The protective and alarm functions of the EDGs should limit degradation of the EDGs consistent with IEEE Standard 308.(9) Provisions for operation at idle speed and at light load will allow the EDGs to be running while disconnected from the grid such that a grid fault will not simultaneously impact both the offsite power source and the emergency backup source. The bypass of all protective relays during emergency operation except for overspeed and generator differential overcurrent should prevent these protective devices from interfering with the operation of the EDGs when they are most needed, consistent with Branch Technical Position (BTP) EICSB 17.(7)

New 4160V Swing Bus

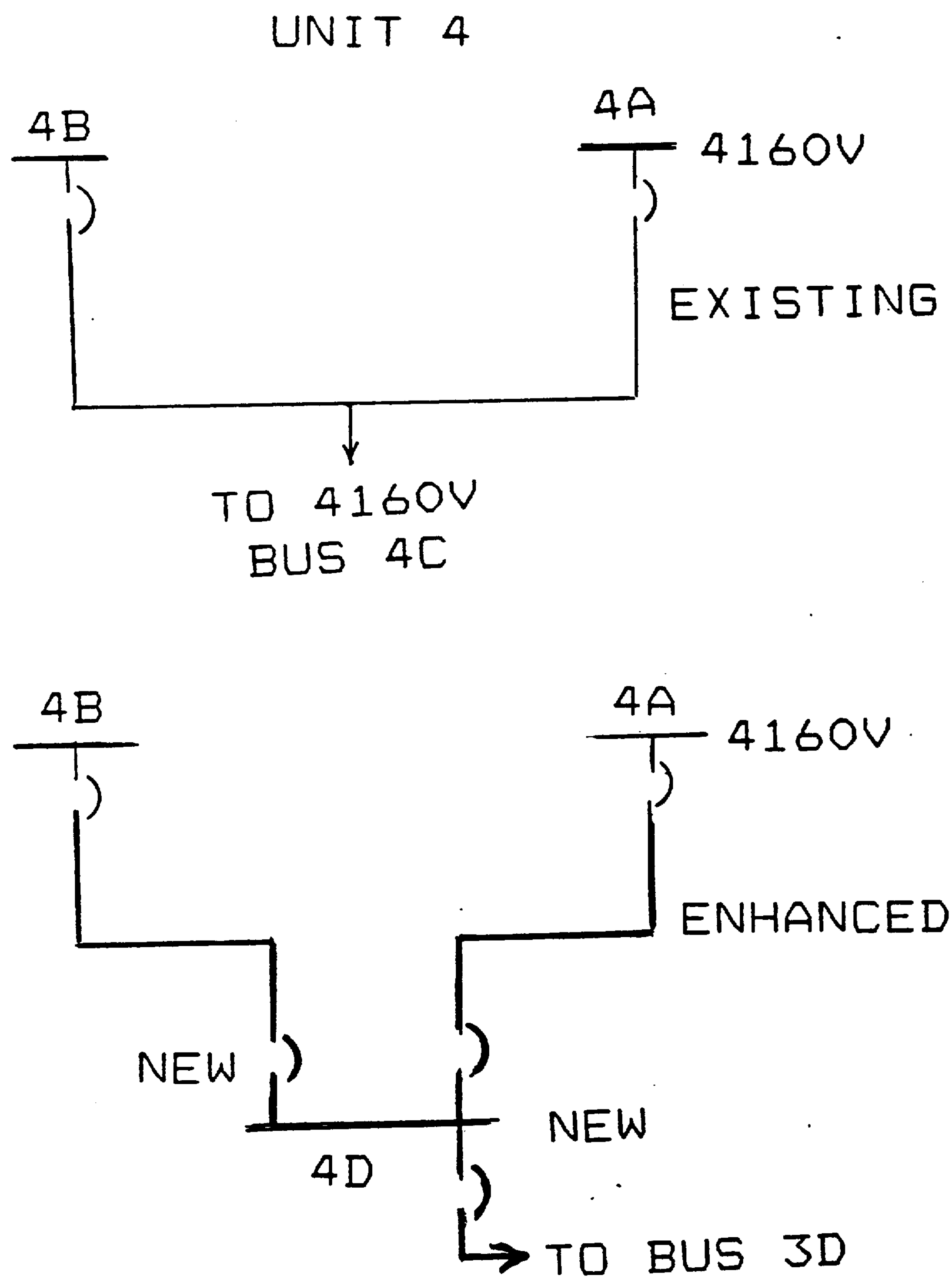
For unit 4, a new 4160V swing bus 4D will be connected to existing buses 4A and 4B. Similarly, a new 4160V swing bus 3D will be added to Unit 3 (see Figure 2-1). The swing buses power installed spare loads (i.e., component cooling water [CCW] or intake cooling water [ICW] pumps) when they are required to replace a non-operable Division A or B component cooling water pump or intake cooling water pump. The breaker cubicles in switchgear 3A/4A and 3B/4B previously supplying CCW 3C/4C and ICW 3C/4C pump motors will be reassigned as the power feeds to 4160V buses 3D/4D.

Each of the two tie lines to the 4160V swing buses have two breakers. Interlocks allow only one tie line to be closed at a time, thus maintaining separation between the two divisions. Both breakers of the alternate tie line are in the open position. Each breaker is provided with overcurrent protection and can be closed/tripped with a local control switch or from the control room.

For faults on the 4160V swing bus, a lockout relay will be activated by the overcurrent protection circuitry to prevent a fault on the swing bus from being transferred from one safety division to the other.

For a station blackout scenario, a new crosstie between buses 3D and 4D will be provided, including new tie breakers, one on bus 3D and one on bus 4D, to permit a manual crosstie between generating units 3 and 4. These tie breakers

FIGURE 2-1
4160V ADDITIONS



will normally be open. The control circuitry includes permissives and interlocks to prevent inadvertent closure of the crosstie breakers. When the required permissives are satisfied, administratively controlled key-lock operated control switches (one for each unit) in the control room will permit closure of the tie breakers. Breaker indicating lights are provided in the control room.

Evaluation

We find that the new 4160V swing buses contribute to improved safety by allowing transfer of safety equipment from an inoperable bus to an operable bus. Interlocks are provided to assure separation of the two Divisions A and B, and a breaker lock-out scheme is provided to prevent transferring a fault on the swing bus from one division to the other. The transfer is made manually and position indication is provided in the control room. These conditions are consistent with staff positions, in particular RG 1.6, and are therefore considered to be acceptable. Similarly, the use of two normally open administratively controlled crosstie breakers between units 3 and 4 is consistent with RG 1.155.[14]

New 480V Load Center Swing Buses

For unit 4, a new 480V load center swing Bus 4H powered by existing 480V load centers 4C or 4D is being added. Similarly for Unit 3, a new 480V load center swing Bus 3H powered by existing 480V load centers 3C or 3D is being added. Each of the two tie lines to the 480V swing buses have two breakers (See Figure 2-2). The breakers will have position indication in the main control room. Each swing load center can be aligned to either Train A or Train B of its associated unit. For each 480V load center, if the bus to which it is connected loses power, automatic circuit breaker operation connects the bus to the other power source if power is available there. The breakers have interlock logic to prevent simultaneous connection of the swing bus to Divisions A and B.

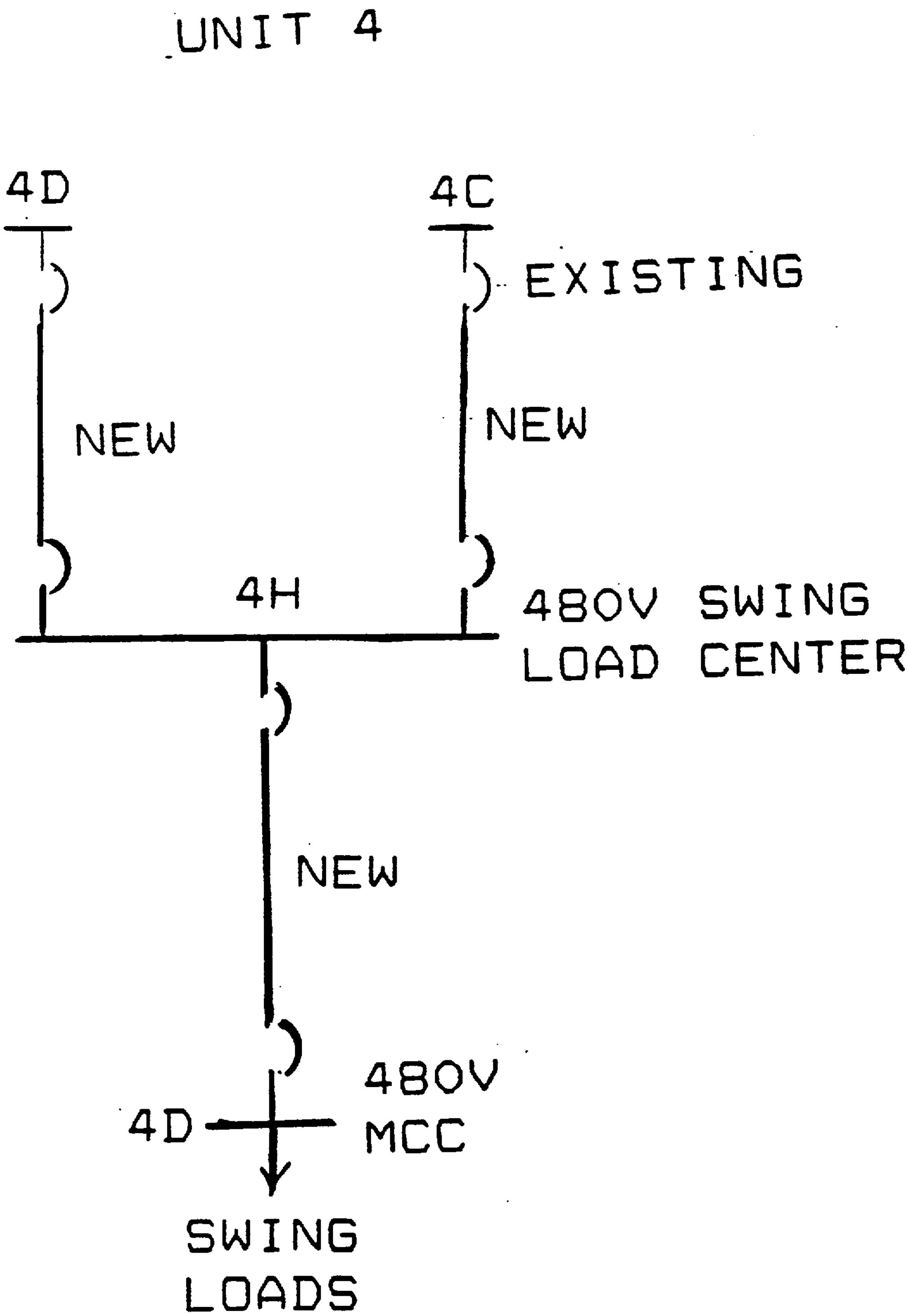
For faults on the 480V swing bus, a lockout relay will be activated by the overcurrent protection circuitry to prevent a fault on the swing bus from being transferred from one safety division to the other.

Evaluation

RG 1.6 discourages the automatic transfer of safety loads from one power source to another. It is preferred that there is sufficient redundancy in the loads that an automatic transfer is not required. However, such redundancy does not always exist at older plants. As compared to the existing situation at Turkey Point, the addition of the 480V swing bus improves reliability by quickly re-energizing needed safety loads upon loss of power from the primary source. The automatic transfer should occur rarely and the interlock arrangement will prevent the inadvertent connection of two 480V trains. We therefore find the 480V swing bus addition to be acceptable.

FIGURE 2-2

480V ADDITIONS



New 480V MCCs

For unit 4, three new 480V MCCs 4D, 4J and 4K will be powered respectively by a new 480V load center swing bus 4H and by existing 480V load center Buses 4A and 4D. For unit 3, a new 480V MCC 3K will be powered from existing load center 3D. Existing MCC D will be relabeled 3D and powered by a new 480V load center swing Bus 3H. New MCC 4J will power the new EDG 4A fans and auxiliaries, 4K the new EDG 4B fans and auxiliaries, and 4D the existing unit 4 swing loads (See Figure 2-2). New MCC 3K will power the EDG 3B auxiliaries which are presently powered by MCC 4B. Existing MCC 3A will continue to power the EDG 3A auxil-iaries. The existing shared MCC 4D will be relabeled 3D, connected to the new swing load center 3H, and used to power existing unit 3 swing loads.

The circuit breakers at the 480V load centers supplying the 480V MCCs can be closed/opened with a pushbutton located at the load center or can be opened manually. Each breaker is provided with overcurrent protection. The circuit breakers at the 480V MCCs receiving power from the 480V load centers are main-tained in the closed position and are opened only for maintenance purposes. Each breaker can be opened/closed at the MCC. The function of the new 480V breakers is the same as the existing breakers.

Evaluation

The additional MCCs allow a greater dispersion of loads among the MCCs such that the impact of the loss of an MCC or a load center bus has less impact. This improves safety and allows greater surveillance and maintenance flexibility. Separa-tion between electrical divisions or trains is not compromised by the new MCCs. We therefore find them to be acceptable.

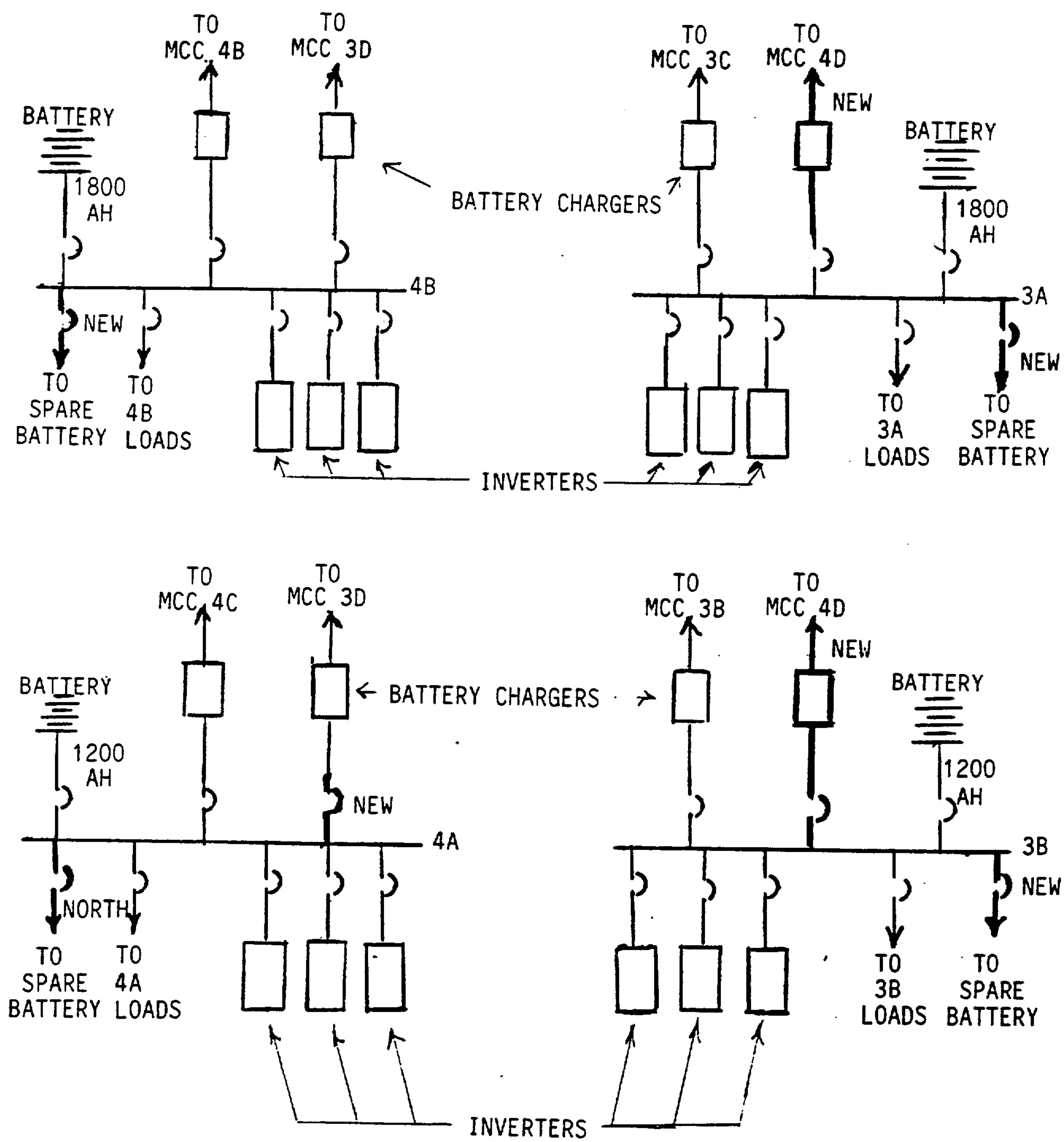
D.C. System

The present system has four 125V dc buses, which we here refer to as 3A, 3B, 4A and 4B. Although the four existing dc buses are shared by both units, most of the dc loads for a given unit and division are powered from its associated dc bus (i.e., Unit 3, Division A loads are powered from dc bus 3A, etc.). Buses 3A and 4B each have an 1800 ampere-hour battery and a 50kW static battery charger. Buses 3B and 4A each have a 1200 ampere-hour battery and a 37.5kW static battery charger. Each of these battery chargers is powered from a 480V MCC of its respective Unit and Division. In addition, bus 3A has a 50kW battery charger and bus 4A has a 37.5kW battery charger powered from 480V MCC 4D. This MCC is presently common to both units and is supplied from a unit 3 or unit 4 (Division A) 480V load center.

The existing six battery chargers are being replaced and two new battery chargers are being added such that each dc bus will have two full capacity chargers. One of the chargers on each dc bus will be powered from a motor control center from the same unit and division (i.e., the battery charger to dc bus 3A will be powered from a unit 3, Division A MCC, etc.). The second battery charger on each dc bus will be powered from the swing MCC from the other unit (i.e., the second battery charger to dc bus 3A will be powered from MCC 4D, etc.) After the system changes, each 125V dc bus will have two battery chargers; one supplied from each unit (See Figure 2-3).

FIGURE 2-3

125 DC BUSES



Presently, 125V dc buses 3A and 4B have a normally* open tie between them which may be temporarily closed when testing either battery. A new Class 1E spare battery will be added with provisions for connecting to each 125V dc bus. Non-automatic circuit breakers with kirk key locks will prevent the spare battery from being connected to more than one 125V dc bus at a time (see Figure 2-4). The spare battery will be used to power a 125V dc bus while the normal dedicated battery is being tested and recharged (e.g., for the performance discharge or battery capacity tests). The spare battery will first be paralleled with the normal battery using the key-locked breaker. Then, the normal battery will be disconnected from the 125V Class 1E bus and connected to the test load (see Figure 2-4).

The spare battery charger is non-Class 1E. However, it will only be used to maintain the charge on the spare battery or to recharge one of the normal station batteries after a discharge test. During these times the battery being charged would not be connected to the Class 1E 125V dc bus, nor would the 125V dc bus depend on the battery that is being charged.

The licensee has indicated that the cables from the 125V Class 1E buses to the spare battery bus are relatively long (adding approximately 100 feet for the worst case). This will expose the Class 1E 125V dc bus to possible additional cable faults when a breaker feeding the cable from the Class 1E 125V dc bus is closed. Although the cable meets Class 1E requirements and is protected within conduits or cable trays within the building structures, the staff believes that provisions should be implemented to maintain the breakers in the open position during normal conditions and to limit the time that the spare battery is connected to a 125V Class 1E bus. The licensee has indicated that the breakers to the spare battery will normally be open and controlled by administrative procedures, and that the spare battery would only be used during times when a normal battery is not available, e.g., when one is being tested and re-charged following a capacity or performance discharge test.

Battery Chargers

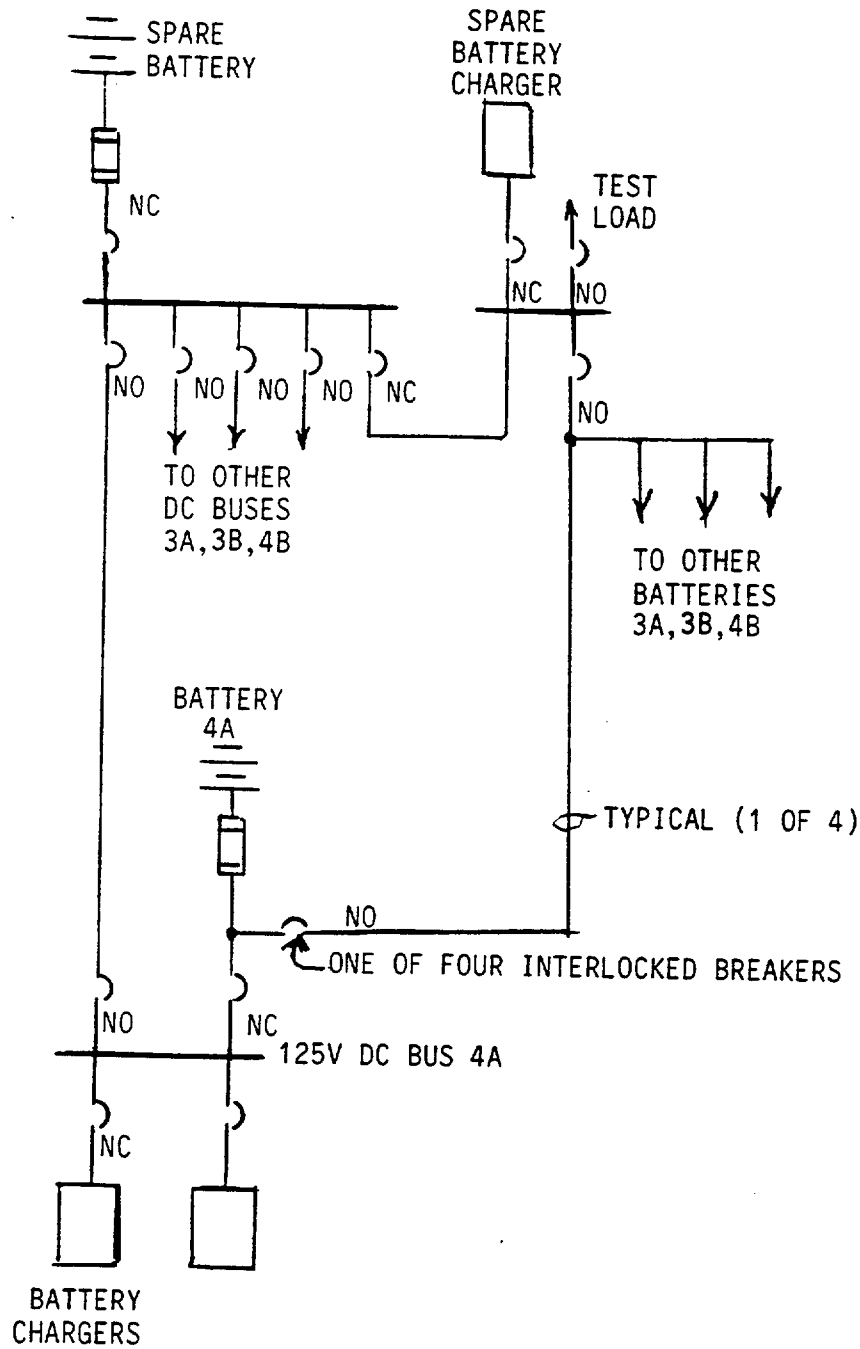
Two new battery chargers will be added and the six existing chargers replaced. Six of the chargers will use existing circuit breakers. Each battery charger is equipped with an automatic load limiting feature which prevents the output from exceeding 115% of rated output amperes. An alarm is provided whenever the charger goes into a current limiting condition. In event of failure of the load limiting feature, backup protection will trip the charger off line and provide annunciation of this condition.

The dc system is protected against overvoltage from the new battery charger by an overvoltage relay connected internally across the output terminals. Actuation of the relay will trip the charger off the line and provide an alarm.

*However, current practice is to connect 125V dc Bus 3A or Bus 4B to the existing C-bus batteries, and not to each other, whenever battery testing is required.

FIGURE 2-4

SPARE BATTERY CONNECTIONS



Battery Loads

The system enhancement will increase the loading on the 125V dc batteries. Battery sizing calculations have been revised to show that the batteries are adequate for the worst accident loading condition.

Evaluation

Sharing of the dc system between units is not consistent with RG 1.81[15]. However, the licensing of Turkey Point preceded RG 1.81. The addition of the two battery chargers, the replacement of the existing six battery chargers, and the reconnection of two battery chargers so that each dc bus has a battery charger from each unit should improve the reliability and increase the operating flexibility of the present dc system. The existing batteries have been shown to be adequate for an accident on one unit and shutdown of the other unit, for a worst case single failure. We therefore find the proposed changes to the 125V dc system to be acceptable.

Control Room and Other Plant

The enhancement project involves the relocation of several loads to different buses, as well as the installation of the cables and circuits for the new EDGs, battery chargers, switchgear, etc. Therefore, there will be new safety instrumentation and controls installed in the control room, and cabling will be routed through other parts of the plant.

Control Room

Each of the existing Control Consoles 3C02 and 4C02 have control/indication for both EDG A and EDG B. Console 3C02 will be relabeled for EDG 3A and EDG 3B. Control Console 4C02 will be relabeled and rewired for new EDG 4A and EDG 4B. All new safety instrumentation and controls installed in the control room for the enhancement project will be qualified 1E, and control room modifications will comply with NUREG-0700, "Guidelines For Control Room Design Review."[2] The control room modifications will be performed during a dual outage to avoid operational transients which might otherwise occur.

Other Plant

The licensee states that the enhancement project will affect virtually all power block areas within the existing plant with the exception of the reactor buildings. Interconnecting raceway containing safety-related power, control, indication and alarm circuits will be routed between areas through the existing plant. Circuits to redundant equipment within the existing plant are routed in separately located raceway in accordance with the updated FSAR Amendment 6, to provide divisional separation/isolation and to ensure that any physical damage affecting one circuit will not affect its duplicate.

Evaluation

The control room instrumentation and controls are classified and qualified as 1E, and the modification will comply with NUREG-0700. Cables and circuits routed through the existing plant will provide divisional/isolation in accordance with the plant FSAR. Although the separation criteria do not meet all present day criteria such as RG 1.75 in all cases, the existing plant criteria are maintained or exceeded. We therefore conclude that the enhancement changes will result in an increase in overall plant safety and are therefore acceptable.

2.3 EMERGENCY LOADING OF EDGS

Automatic startup and loading of the EDGs consist essentially of five steps:

1. Detection of loss of preferred power supply
2. Clearing of (opening of breakers to) emergency buses
3. Disconnection of non-safety loads from the buses used for the emergency power application
4. Startup of the EDGs
5. Loading of the EDGs

Loss Of Preferred Power Supply

The existing scheme of loss-of-power detection is used. Each 4160V bus has voltage monitoring relays that monitor phase-to-phase voltage at the buses. When there is a loss of voltage at a 4160V bus, the relays will initiate the undervoltage actuation system. This initiates the bus stripping function of relays which opens all bus supply and feeder breakers, energizes the bus isolation relays, and starts the associated EDG. The 4160V swing bus (for each unit) is considered as an extension to the bus to which it is connected in the bus tripping logic used for loss of normal power supply.

In the emergency mode of operation, the EDG achieves operating speed and voltage within 15 seconds, and the trip functions of all protective devices, with the exception of the overspeed and generator differential relays, are bypassed. When the frequency and voltage of the EDG reach acceptable limits and the associated bus clear signal is present, the EDG breaker is automatically closed to the dead bus. The automatic load sequencer starts and begins to sequentially close the breakers to the equipment required for safe shutdown of the plant 15.5 seconds after the loss of voltage, provided the EDG breaker is closed.

Accident Loading

Accident Loading Following Loss Of Preferred Power

If a safety injection signal (SIS) occurs following loss of preferred power, actuation of the SIS resets the timing contacts of the sequencer to the zero time condition and sheds all loads from the EDG while keeping the EDG breaker closed. The sequencer, operating in the LOCA/LOOP mode, sequences on the loads needed to mitigate the accident. For loss of normal power supply on both units, and a SIS on unit 3, the licensee presented a load analysis showing the loading on each EDG, assuming failure of the other divisional EDG. That is, the loading shown on EDG 3A assumes failure of EDG 3B, and the loading shown on EDG 3B assumes failure of EDG 3A. Similarly, the loading shown on EDG 4A assumes failure of EDG 4B, and the loading shown on EDG 4B assumes failure of EDG 4A. Thus the values shown assume a simultaneous failure of a unit 3 and unit 4 EDG. The resultant loadings are as follows:

	EDG 3A	EDG 3B	EDG 4A	EDG 4B
Automatic Loads	2029kW	2059kW	1415kW	1710kW
Manual Loads	175	100	1005	850
Total	2204kW	2159kW	2410kW	2255kW

For loss of preferred power supply on both units and a SIS on unit 4, the maximum loading was calculated as follows:

EDG 3A	EDG 3B	EDG 4A	EDG 4B
2314kW	2204kW	2260kW	2185kW

The loadings are well within the 2500kW continuous rating of the EDGs 3A and 3B, and the 2874kW continuous rating of EDGs 4A and 4B.

Accident Loading Without Loss Of Preferred Power

For an SIS on either unit, without loss of preferred power supply, the associated unit load sequencer automatically starts equipment required for mitigation of the accident in a predetermined sequential order. All EDGs (both units) are started automatically in the emergency mode and remain in the emergency mode until they obtain normal operating speed. They continue to operate unloaded and disconnected from the bus. If a loss of preferred power then occurs, the sequence of events described above under "Loss of Preferred Power Supply" occurs, except that the EDG(s) are already at operating speed.

Manual Loading Of The EDG

In the normal (test) mode, the diesel is started manually, either from the local panel or main control board by operating the normal (idle) start/stop selector switch or the rapid start pushbutton or the emergency start/stop selector switches. During the normal start-up period the diesel operates at a predetermined idle speed (450 rpm) to allow an orderly warm up. After warm up, the diesel accelerates to rated speed (900 rpm). A bus undervoltage signal or SIS will take precedence over the manual mode of operation as long as the key-operated auto start bypass switch has not been activated at the local control panel with the master switch in the "local" position. After the EDG obtains normal speed, it can be manually synchronized and connected to the bus. It can then be manually loaded while operating in parallel with the normal power supply. For manual shutdown, the load on the EDG is reduced to a preset minimum and the breaker opened via the control switch. This initiates a normal shutdown. For a normal shutdown, the EDG will continue to operate for a period of time at a predetermined idle speed to allow the heat to dissipate in an orderly manner.

A fast stop of the EDG can be initiated by depressing the "emergency stop" push-button. The stop or fast-stop signals are not effective when the EDG is in its emergency mode of operation. A rapid start function is provided for a fast start test of the diesel. The period of engine warmup, at idle speed, is eliminated. However, all machine electrical and mechanical protective features are enforced in contrast to an emergency start where only the overspeed and generator differential protection features are present.

Evaluation

GDC 17 requires that provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies. We find the planned method of EDG starting and loading for such events to be consistent with GDC 17. The continuous rating of each EDG exceeds by a substantial margin the largest emergency load projected on the EDGs for an emergency condition consisting of a loss of the preferred power supply, a safety injection signal on one unit, a shutdown requirement on the other unit, and a loss of one EDG on each unit. We find this to be consistent with GDC-17.

Generic Letter (GL) 84-15(8) describes staff guidelines for improving EDG reliability by reducing the number of fast starts. The licensee's method of manual starting, loading, and shutdown of the EDGs is consistent with GL 84-15. Branch Technical Position (BTP) EICSB 17 states that the design of standby diesel generator systems should retain only the overspeed and generator differential trips, with other trips bypassed under accident conditions. The EDG design is consistent with BTP EICSB 17.

2.4 EDG AUXILIARY SYSTEMS

The Division A EDG auxiliaries receive their power supply from Division A MCCs, and the Division B EDGs receive their power supply from Division B MCCs. This prevents the loss of power in one load group from causing loss of equipment function in another load group, consistent with IEEE Standard 308.(9) The auxiliary systems for the new EDGs have pressure, differential pressure, temperature and other instrumentation as required for indication, control and alarms for all modes of operation. Abnormal conditions are alarmed locally and in the main control room by common annunciator "Diesel Generator 4A Trouble" for EDG 4A and "Diesel Generator 4B Trouble" for EDG 4B. Required operator action following alarm indication will be specified in off-normal operating procedures. These actions will be consistent with manufacturers's guidelines. System components will be tested by the manufacturer, and after installation before plant startup. Testing will be performed to verify operability per Technical Specification requirements and in accordance with manufacturer recommendations and applicable codes and standards.

Diesel Oil Storage And Transfer System

For each new EDG, there is a new diesel oil storage tank and transfer system consisting of a new diesel oil storage tank, a transfer pump, a day tank, piping, valves, instrumentation and control.

Diesel Oil Storage Tank

Each storage tank has a capacity of 42,000 gallons, and the Technical Specification requirement of 34,700 gallons is sufficient to operate the EDG for 7 days at continuous loading. The storage tank also has the capability of receiving a diesel oil load of 8,000 gallons from a transport vehicle while the tank inventory is maintained above that required by Technical Specifications. The two tanks are connected via a cross-connected line which can be used to move fuel from one tank to the other if necessary. The storage tanks are made of steel-lined concrete, fabricated in accordance with the requirements of ASME Code Section VIII and meet seismic Category I requirements. The tanks are enclosed in a seismic Category I building designed with missile protection capability. The building is also designed to retain the entire contents of a tank failure.

The licensee has considered and discussed provisions to prevent and actions to overcome such possibilities as damage to the storage tank fill or vent lines due to tornado missiles, growth of algae in the storage tank, corrosion in the piping and tank, protection of the fuel oil system from ignition sources, and the need for replenishment of fuel oil for a prolonged period of EDG operation.

Diesel Oil Transfer Pumps

Each diesel oil transfer pump has enough capacity to supply the diesel oil for two EDGs at continuous load rating. Each pump is powered from its associated EDG. It starts and stops automatically on low and high level signals from its associated day tank. The transfer pump is designed to meet the requirements of ASME Code Section III for Class 3 components and meets seismic Category I. The new (for Unit 4) and the existing (for Unit 3) discharge lines are interconnected for added flexibility.

Piping And Valves

The system piping external to the engine skid is designed to meet the ASME Code Section III for Class 3 components and seismic Category I requirements. The engine mounted piping, as a minimum, is designed to meet the stresses specified by ANSI B31.1 Power Piping and to accommodate the mechanical, pressure, thermal and seismic loads.

Fuel Oil Day Tank

The day tank has enough fuel to support about 3 hours of EDG operation. The tank has fuel oil transfer pump auto-start and auto-stop levels, a low level alarm, a 1-hour alarm and a high level alarm. The tank is located to take into consideration fire safety, required maintenance, fuel oil head pressure, seismic loadings, tornado missiles, and possible sabotage.

Diesel Engine Starting System

Each EDG will have two redundant starting systems consisting of two air compressors (one diesel and one motor driven), four air receivers, four air start motors, piping, valves and instrumentation. Two air receivers and two air motors form one of two redundant sets of 100% capacity cranking for the diesel engine. The air receivers have capacity for cranking the cold diesel engine five times without the need for recharging. A deliquescent-type air dryer will be installed between the air compressors and the air receivers.

Diesel Engine Cooling Water System

Two engine-driven centrifugal pumps circulate water through a closed loop system including a radiator, expansion tank and electric motor-driven cooling fans. An electric immersion heater controlled by temperature switches is provided for recirculating hot water, by convection, through the oil cooler for standby heating.

The cooling system is designed to maintain a top tank temperature of 190°F at 110% rated load with radiator cooling air at 122°F. A piping connection failure could result in loss of cooling system fluid and eventually force the affected EDG out of service. However, this is unlikely to happen because the system normally operates at relatively low pressure and temperature (less than 30 psig and 190°F) and is designed for all normal and postulated loads including thermal and seismic conditions. Also, should such a failure happen, alarms and indication would normally alert operators so that appropriate action could be taken.

During non-emergency operation, automatic shutdown of the diesel would occur before temperature became excessive.

The licensee has considered and discussed provisions to prevent and actions to overcome such possibilities as long-term corrosion or organic fouling, and adequate cooling system water inventory. An expansion tank is provided for water expansion during temperature change. An air venting system is provided to insure that air is not entrapped in the radiator or water lines.

Diesel Engine Lubrication System

The engine lubrication system consists of three subsystems: the scavenging oil system, the main lubricating system and the piston cooling system. Each subsystem has its own positive displacement pump driven from the accessories gear train at the front of the engine.

In addition to the three lube oil systems, electric motor-driven external lube oil pumps run continuously to supply oil to the turbocharger bearings for proper lubrication during emergency starts and coasting down.

Evaluation

The diesel generator auxiliary systems are powered by MCCs within the same division as the diesel generator, thus maintaining divisional separation. The diesel oil storage and transfer system has sufficient capacity to supply the diesel for 7 days and provision for adding fuel to the tank if required. This assures adequate fuel availability for extended periods. The 7-day storage provision is consistent with RG 1.108. Each transfer pump has sufficient capacity to supply two diesels, thus providing adequate supply to the day tanks with one transfer pump inoperable. There is 100% redundancy in the air starting system and com-pressed air for five starting attempts. This provides adequate starting capacity. There is redundancy in the cooling fans and the circulating water pumps of the engine cooling system. External lube oil pumps continuously supply lube oil to the turbocharger bearings and engine oil is kept warm during standby conditions thus reducing wear, consistent with Generic Letter 84-15, for fast emergency or surveillance starts. Surveillance instrumentation for indication, control and alarm is provided to monitor, control and maintain the auxiliary systems con-sistent with IEEE Standard 387-1977.[12] We conclude that the design features of the auxiliary systems are of the type that provide for adequate and reliable operation consistent with GDC-17.

2.5 QUALIFICATION OF EDGS

Requirements

RG 1.9[11] endorses, with minor exceptions, IEEE Standard 387-1977 for qualification testing of EDGs. IEEE Standard 387-1977 specifies a 300 valid start and load test as an ac-ceptable method of qualification. IEEE Standard 387-1977 also states that other methods with proper justification may be found equivalent for demonstrating an acceptable level of reliability. It is noted that the qualification testing is aimed at proving initial reliability, and not the effect of aging. IEEE Standard 387-1977 states that the effect of aging may be established by previous operating experience and a program of preventive maintenance, inspection and replacement to be conducted throughout the operating life of the plant.

Qualification Tests For New EDGs

The licensee proposed a 30 valid start and load test rather than a 300 start and load test. The justification for this is that the new EDGs are similar, and better, than other EDGs that have undergone the 300 start and load test. The existing EDGs at Turkey Point are 20 cylinder, 645 cubic inches per cylinder, 900 rpm General Motors Model EMD-20-645E4. General Motors has phased out the Model 645E4 and replaced it with the current Model 645F4B. The current model has a higher rated brake horsepower (BHP), higher break mean effective pressure (BMEP) and a higher compression ratio as follows:

	900 RPM	
	EMD-645E4	EMD-645F4B
BHP	3600	4000
BMEP	123	136
Compression Ratio	14.5:1	16:1

In addition, the later model has improvements in the materials used and has a 12 row turbocharger aftercooler as compared to the 10 rows used in the previous model.

Because of the higher stresses encountered in the "F" series as compared to the "E" series, the NRC staff made a visit to the vendor's facility in LaGrange, Illinois to see the vendor's construction and testing facilities and to obtain information pertaining to the stress analysis and results. The staff concluded that the stress margins were conservative.

In addition to the 30 start and load qualification test in accordance with IEEE Standard 387-1984 (equivalent to IEEE Standard 387-1977), the following tests will be performed:

1. Load Capability Test in accordance with Paragraph 7.2.1 of IEEE 387-1984 (equivalent to Paragraph 6.3.1 of IEEE 387-1977).

2. Two 10% Margin Tests in accordance with Paragraph 7.2.3 of IEEE 387-1984 (equivalent to Paragraph 6.3.3 of IEEE 387-1977).

3. Onsite preoperational tests consisting of 69 in-situ start and load tests in accordance with Paragraph C.2.a(9) of RG 1.108.

Evaluation

A letter dated August 10, 1989 (G. E. Edison to J. Goldberg), stated that the staff had reviewed the 30 start and load qualification test and found it to be acceptable.

The load capability, 10% margin, and preoperational tests are in accordance with the applicable standards(12) and regulatory guides.(10) We therefore find them to be acceptable.

2.6 TESTING OF SYSTEM ADDITIONS AND CHANGES

By submittal dated April 3, 1989, the licensee described their proposed testing plan for the enhancement project. The initial submittal was updated by Revision 1 submitted on June 4, 1990. The test plan would consist primarily of three stages. The first stage would be the inspection and testing of the individual components and subsystems. The second stage would be the onsite testing of EDGs for various system conditions. The third stage would be the integrated testing of the systems to assure the adequacy, redundancy and independence of load groups.

Inspection and Testing of Individual Components and Subsystems

EDG Components and Subsystems

The new EDG components will be visually checked and functionally tested individually, including the pumps, motors, fans, compressors, valves, and instrumentation associated with the fuel oil transfer system, the cooling water system, the air starting system, the lube oil system and the ventilation systems.

The lube oil and prelube system will be tested first using each of the four motor-driven pumps without running the EDG and then again using the shaft-driven pumps while the EDG is running. Without running the EDG, the EDG is simulated in the local control panel so that all EDG start and trip functions can be tested. Emergency start signals will be tested for various plant conditions, with each combination of normal/isolate, local/remote switch positions, and auto-start bypass switch positions. The temperature switches, level switches, and pressure switches will be checked for functionality. Each alarm point will be actuated and verified to annunciate at the local control panel. The EDG emergency stops/trips will be tested including overspeed, generator differential on each phase, and the emergency stop pushbutton.

Other Electrical Components and Systems

The circuit breakers for the new ac switchgear will be locally and remotely tested for closing and tripping with the circuit breakers racked in or racked out in test. The proper operation of the interlocks, annunciators and indicators will be checked. The bus voltage monitoring equipment and bus undervoltage detection circuitry will be tested. The molded case circuit breakers at the new 480V MCCs will be checked for functionality. The new battery chargers will be tested to ensure proper operation.

The new emergency bus loading sequencers will be both automatically and manually tested using test selector switches to demonstrate proper function. All output/blocking and lockout relay signals will be monitored to demonstrate correct operation. Time delays will be verified by recording output signals including signal duration.

EDG Onsite Testing

Each new EDG will be tested locally and again from the control room.

Local Tests

With the master control switch set to local, the following tests will be conducted.

Air Start System

The capability of the air system to start the EDG on the fifth try after four unsuccessful starts will be verified. For this test, with the air compressor control switches to "off" and the four air receivers bled down to where the low pressure alarm actuates, the EDG will be subjected to four unsuccessful start attempts and then be rapidly started on the fifth attempt.

Hot Overspeed Trip

Temperatures are allowed to stabilize to hot engine conditions with the EDG loaded to greater than 50% load. Then, the hot engine overspeed trip setpoint is verified.

EDG Reliability Test

Each EDG is subjected to at least 35 consecutive valid tests without failure in accordance with R.G. 1.108[10] position C.2.(a)(9). The EDG is started, synchronized to the grid and loaded to greater than 50% load for at least 1 hour. Each start must come to the required frequency and voltage within specified limits and times.

Normal Start And Load Test

Each EDG is subjected to a normal start test (60-second idle start period) and then auto-released to allow the EDG to accelerate to 900 rpm. Speed and voltage values are verified to within specified limits. After synchronization to the grid, the EDG is slowly loaded to 100% and the engine parameters allowed to stabilize.

Full Load Rejection Test

After stabilizing at 100% load, the EDG output breaker is opened. The EDG must not trip on overspeed and frequency and voltage transients must not exceed specified limits.

Twenty-four Hour Run

The EDG is normally started, synchronized to the grid and slowly loaded to 110% load. After 2 hours at 110% load, the load is reduced to 100% load and operated for 22 additional hours. A complete set of data is taken after the third hour and every hour thereafter. After 24 hours, the load is gradually reduced and the EDG placed in normal shutdown. This test also verifies that the cooling system functions within acceptable limits.

Tests From Main Control Room

The EDG will be tested similarly to the local tests except from the main control room.

Tests Similar to Local Tests

The following tests will be made from the control room. These tests are similar to the local tests discussed above.

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

Other Tests

A test will be made to verify that the control room EDG controls are disabled when the master control switch is in the "local" position and the two isolation switches on the local EDG panel are in the "isolate" position. The control room alarms will also be verified.

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

Evaluation

The initial inspection and testing of the components and equipment associated with the enhancement project includes tests to confirm circuit continuity, absence of improper grounds and proper functioning of equipment, including EDG components and subsystems, battery chargers, load sequencers, circuit breakers, indication, alarms, controls and interlocks. These tests will disclose most of the problems with individual components or subsystems prior to more extensive integrated system testing. Also, in some cases, the integrated system testing may not disclose all the problems with individual components. We therefore find the initial inspection and testing of the individual components and subsystems to be desirable and consistent with staff positions pertaining to safety system quality and reliability.

EDG Integrated Testing

The high head safety injection (HHSI) pumps at Turkey Point are shared by the two units. To meet the single failure criterion for an SIS, one of the EDGs of the opposite unit and an associated HHSI pump must be operable.

Several integrated tests will be made to assure proper sequencing of the EDGs and loads for various combinations of loss of offsite power (LOOP) and/or a loss of coolant accident (LOCA) requiring a safety injection.

Loss of Offsite Power (LOOP)

A LOOP will be simulated for each unit. These tests will demonstrate the required opening of the bus feeder breakers, bus stripping of all loads, clearing of all loads and feeds, start-up of the associated EDGs, EDG breaker closure and sequential loading of the buses. The complete event sequence will be recorded for later data processing and analysis.

LOOP Then LOCA

Tests will be conducted to demonstrate proper sequence of events for a LOOP followed by LOCA on each unit. These tests will demonstrate the sequence of events discussed above for LOOP only. Then, the SIS would result in stripping of the loads and the sequential starting of the safety loads.

LOCA With EDG In Parallel With Offsite Source

This test will simulate a condition after a LOOP has cleared and the EDG has synchronized to the offsite source such that the EDG will be in parallel with the offsite source when the LOCA signal is simulated. The test data will confirm the immediate tripping of the EDG breaker with the machine continuing to run at rated speed.

LOCA

Tests will be conducted for a LOCA on each unit with offsite power available. These tests should demonstrate the starting of all four EDGs, breaker closure for all four HHSI pumps, and the sequencing on of the additional required safety loads by the sequencers of the affected unit.

LOCA Then LOOP

A LOOP is simulated following the LOCA and the associated loading of the buses. Loads are stripped, the EDG breakers closed and the loads re-sequenced onto the buses.

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. The containment spray pump sequencer loading relay re-actuates after the sequencer completes its timing.

LOOP Plus Other Unit LOCA

A LOOP is imposed on one unit and a simultaneous LOCA on the other unit. For the unit with the LOCA, the load sequencing begins immediately whereas for the unit with the LOOP, the load sequencing is delayed until the EDGs are connected to the buses.

Bus Independence

Safety-related ac buses will be tested in various combinations to show that each bus is independent of every other safety-related ac bus, considering swing loads where applicable. This will be accomplished by making each EDG inoperable, and then conducting tests on the other buses to assure that no redundant loads or power supplies are impacted by the inoperable bus. For example, each EDG's associated dc power supply bus will be made inoperable and the other EDGs then verified to auto-start on LOOP.

Other EDG Tests

Other EDG tests will be conducted to demonstrate that the EDGs can:

a. Reject the largest load and restart it while maintaining specified voltage and frequency limits,

b. Synchronize to the grid, transfer its emergency loads to the grid, and be returned to a standby condition.

c. Respond to the design accident load while the EDG is at full load temperature.

EDG Testing Criteria

The licensee indicates that the testing discussed above will meet the redundancy, independence and capability requirements of IEEE 387-1984 and RGs 1.6, 1.9, and 1.108. Also, EDG voltages and frequencies for the various EDG starting and loading conditions will fall within the limits specified by these guides and standards.

Evaluation

Regulatory Guides 1.6, 1.9 and 1.108; and IEEE Standard 387-1984 specify extensive testing of EDGs to demonstrate that they can automatically and rapidly start, accept all required safety loads and run for extended periods while maintaining acceptable voltage, frequency and temperature conditions. To meet the guidance of the regulatory guides and the IEEE Standard, the EDGs should: (1) be highly reliable, (2) be able to automatically and rapidly start and/or load from any credible initial condition, whether cold or hot, with or without a LOOP, with or without a LOCA, and with both a LOOP and LOCA, (3) accept or reject the largest safety load while maintaining acceptable voltage and frequency limits, (4) be capable of being controlled locally or from the main control room, (5) be able to start and operate simultaneously or independently of each other, and (6) be able to automatically synchronize, transfer load to the grid, and/or come off the grid. In addition, they should have the capability of being started and loaded slowly. During emergency operation, the normal trips should be bypassed.

Our review of the licensee's proposed testing plan indicates that it is sufficiently comprehensive to test the above features in accordance with the guidance, and should disclose any significant shortcomings of the EDG systems, including the control, indication or alarm systems. We therefore find the proposed testing plan to be acceptable.

Other Independence Testing

In addition to the independence testing of the EDGs, the onsite electric power system will be functionally tested to assure independence among load groups.

Method of Testing

Various possible combinations of power sources and load groups will be tested with all dc and onsite ac power sources for one load group at a time completely disconnected. Prior to the test(s), the onsite system will be separated from the offsite system by direct actuation of the undervoltage-sensing relays. Each test will include the injection of simulated accident signal, startup of the onsite power source(s) and load group(s) under test, sequencing of the loads, and functional performance of the loads. During each test, the dc and onsite ac buses and related loads not under test will be monitored to verify absence of voltage at these buses and loads.

Evaluation

The proposed method of testing for independence between load groups conforms to RG 1.41[16] and will disclose any errors in design or installation that could defeat the electrical independence between load groups. We therefore find the proposed testing plan to be acceptable.

2.7 SUMMARY AND CONCLUSION

The present Turkey Point Units 3 and 4 have shared EDGs as well as other shared systems and equipment. To improve onsite capability, reliability and operating flexibility, the licensee is adding two new EDGs in a new building and other systems and equipment including new load sequencers, battery chargers, 4160V swing buses, 480V load control swing buses, and 480V MCCs.

We have reviewed the proposed design and proposed testing of the new equipment and systems against NRC general design criteria, regulatory guides and other standards. The design of the present plant preceded many of the present-day standards and does not meet these standards in all respects. It would not be practical for all the new electric power sources and associated cabling that is located in the existing plant to fully conform to present day standards. Full compliance would require extensive redesign and rework of numerous existing structures including ductbanks, raceways and electrical enclosures throughout the plant. Also, in the interest of maintaining consistency between the present and the new equipment and facilities, deviations from current standards exist in some instances even in the new building. However, in all instances the standards of the Turkey Point FSAR are met, and in most instances the current NRC standards are met.

Our review of the new equipment and facilities indicates that the current NRC standards are met to the extent practical, and to the extent desirable in maintaining consistency with the present plant design. We find that the additions being made substantially improve plant capability, reliability and operating flexibility, thus enhancing safety. We also find that the proposed preoperation testing will disclose any problems or inadequacies associated with the equipment and systems being added or changed, or any undesirable interactions between redundant systems or load groups. We therefore find the proposed changes and additions, and the proposed preoperational testing plan to be acceptable.

The detailed calculations associated with the new changes and additions, such as circuit breaker coordination, circuit breaker adequacy, battery adequacy, and voltage drop, should be maintained at the Turkey Point site or Florida Power and Light corporate headquarters for possible NRC audit. The licensee has stated that these calculations are being updated in accordance with the latest design changes, and will be available for NRC audit.

2.8 REFERENCES

1. NUREG-0800, U.S. Nuclear Regulatory Commission Standard Review Plan

2. NUREG-0700, "Guidelines for Control Room Design Reviews"

3. Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems"

4. Regulatory Guide 1.75, "Physical Independence of Electrical Systems"

5. IEEE Standard 384, "Standard Criteria for Independence of Class 1E Equipment and Circuits"

6. Branch Technical Position ASB 3-1, "General Information Required for Consideration of the Effects of a Piping System Break Outside Containment"

7. Branch Technical Position EICSB 17, "Diesel Generator Protective Trip Bypasses"

8. Generic Letter 84-15, "Testing of Emergency Diesel Generators, Technical Specification Changes"

9. IEEE Standard 308, "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Generating Stations"

10. Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used As Onsite Electric Power Systems at Nuclear Power Plants"

11. Regulatory Guide 1.9, "Selection, Design, and Qualification of Diesel Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants"

12. IEEE Standards 387-1977 and 387-1984, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations"

13. Regulatory Guide 1.53, "Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems"

14. Regulatory Guide 1.155, "Station Blackout"

15. Regulatory Guide 1.81, "Shared Emergency and Shutdown Electric Systems for Multi-Unit Nuclear Power Plants"

16. Regulatory Guide 1.41, "Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments"

3.0 INSTRUMENTATION AND CONTROL

By letters dated June 23, 1988, April 3, 1989, June 4, 1990, and July 2, 1990 Florida Power and Light Company (FPL) submitted descriptions of the proposed enhancements to the Turkey Point Units 3 & 4 Emergency Power System (EPS) (References 1, 2, 3 and 4).

The Turkey Point 3 & 4 EPS enhancement includes the installation of four new computer-based load sequencers, one for each of the four Class 1E electrical busses. The licensee states that these new load sequencers will duplicate the functions of the old load sequencers, with some improvements to the sequence timing for loading of safety equipment. The load sequencers utilize Allen-Bradley, commercial-grade programmable logic controllers (PLCs) to execute the control functions and provide continuous monitoring of the load sequencer functions.

The use of commercial-grade PLCs and the use of software for emergency applications requires assurance that these PLCs are qualified as Class 1E, and will provide for the safe operation of the plant. This assurance was requested from the licensee.

3.1 EVALUATION

NRC staff reviewed the licensee's documentation (References 1, 2, 3 and 4) and requested additional information to clarify several design details.

The load sequencer system consists of redundant trains of load sequencers, each train dedicated to an Emergency Diesel Generator (EDG). A cross-tie connects the emergency power supplies in the two nuclear plants to ensure availability of an EDG during a loss of offsite power (LOOP). Additionally, the licensee has provided battery back-up capabilities, and key lock manual access to the load sequencers. This degree of redundancy is acceptable.

The licensee has committed to follow the Verification and Validation (V&V) program in IEEE Standard 1012-1986, "IEEE Standard for Software Verification and Validation Plans," and the guidelines in Regulatory Guide 1.152 (Reference 5), which endorses ANSI/IEEE-ANS-7.4.3.2-1982, "American National Standard, Application Criteria for Programmable Digital Computer Systems in Safety Systems of Nuclear Power Generating Stations" (Reference 6). Additionally, the contractor responsible for developing and installing the load sequencer, United Controls, Inc. (UCI), will perform a V&V of the PLCs and the load sequencer logic, and submit the results to FPL. The staff finds this commitment acceptable.

The verification phase of the licensee's V&V plan addresses verification of hardware requirements, software requirements, software design, software implementation, and hardware/software integration. System validation will consist of preparation and independent verification of test procedures, execution of the tests, and documentation with independent verification of the test results.

The documentation describing the results of the PLC and load sequencer logic testing will be provided to the licensee after shipment of the load sequencers from UCI. Additionally, the licensee will verify the testing of the integrated system by UCI to ensure its compliance with the licensee's requirements for a Class 1E load sequencer system.

The licensee will qualify the PLCs as Class 1E through dedication of the commercial-grade equipment. The licensee states that their commercial dedication procedures are based upon the guidance provided in a report issued by the Electric Power Research Institute (EPRI), EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)" (Reference 7). The staff will audit the results of the commercial-grade equipment dedication to ensure that the licensee addresses Criteria III, IV, and VII of Appendix B to 10 CFR Part 50, and adequately considers the guidance provided in Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," which endorses EPRI NP-5652, in terms of engineering involvement in the procurement process and product acceptance.

The staff requested that the licensee provide a discussion of the acceptance criteria for checking control cabinet instruments and logic. The licensee states that the control cabinet instruments and all logic functions will be initially tested under the guidelines of the above-mentioned V&V program. The tests to be performed will address the following loss-of-offsite power (LOOP) and loss-of-coolant accident (LOCA) scenarios:

1. LOOP
2. LOOP with simultaneous LOCA in the same train
3. LOOP followed sometime later by a LOCA in the same train
4. LOOP with simultaneous LOCA in the other unit
5. LOOP followed sometime later by a LOCA in the other unit
6. LOCA in the same train
7. LOCA in the other unit
8. HI-HI containment pressure concurrent or less than 13 seconds after a LOCA or LOOP/LOCA
9. HI-HI containment pressure later than 13 seconds after a LOCA or LOOP/LOCA.

One of the purposes of these tests is to ensure that there are no common mode failures between the redundant trains of load sequencers. The licensee states that the PLC functions will be tested during the integrated preoperational test phase to verify the PLC properly strips and clears its bus, the EDG is started, the EDG breaker closes, and the load sequencer timing intervals for loading the buses is within the load sequencer design specifications. The tests will be conducted for the following plant conditions:

1. LOOP
2. LOOP followed by LOCA
3. LOCA with EDG Loaded in Parallel with Offsite Power
4. LOCA
5. LOCA followed by LOOP
6. Bus LOOP, LOCA, and HI-HI Containment Pressure
7. LOOP plus Other Unit LOCA

The licensee states that, in addition to the regularly scheduled EDG startup and bus loading tests, the load sequencer function will be tested "continuously" using an automatic self-test mode that provides continuous surveillance of sequencer operation, from its input signals through the logic and counter states, relay drivers, and continuity through the relay coils. The time to complete the automatic tests for the above scenarios is 179 seconds, with a 1-second interval between each test. During the test cycle, the sequencer is receptive to operational signals. The load sequencer requires 0.3 second to change from test mode into operating mode and begin loading buses.

The licensee further states that, in addition to the above tests, during preoperational testing, power will be removed from the PLC and all programmable functions will be verified to function per design requirements upon restoration of power to the PLCs.

A watchdog timer is built into the load sequencer system, such that a loss of load sequencer function is annunciated. The watchdog timer monitors the proper functioning of software events that occur periodically. The licensee states that the operating procedures are being revised to incorporate manual actions to respond to an annunciated problem and to bypass a failed load sequencer to allow bus stripping, starting the EDG, and loading onto the EDG the equipment necessary for safe plant shutdown.

The load sequencers contain an on-board battery back-up capable of retaining all stored program data through a continuous power outage for 12 months. The expected life of this battery is approximately 3 years. The licensee will replace the battery every refueling outage. Additionally, low battery voltage is detected by the load sequencer processor and annunciated as a sequencer trouble alarm in the control room.

In addition to the battery back-up capability described above, the licensee states that, in the event of a failure of the load sequencer system, an operator can remove power from the load sequencer through a key-lock switch located at the PLC cabinet. The operator can then manually load the required buses. Because the time required to manually load the required buses upon failure of the load sequencer has not changed from the previous design, the staff finds the manual override provisions to be acceptable. Using RG 1.47

(Reference 8) as a guideline, the staff will audit the licensee's method of providing the control room operators with load sequencer bypass indications and inoperable status indications.

The PLC vendor, Allen-Bradley, will perform a NEMA Noise Susceptibility test in accordance with NEMA ICS 2, Part 2-230, and NEMA ICS 3, Part 3-304.42. This test subjects the equipment to electrical noise that is commonly produced by electrical contacts interrupting inductive loads. Additionally, a Surge Transient Test is performed by Allen-Bradley in accordance with IEEE 472-1974 (ANSI C37.90a-1974). This test subjects the equipment to the type of electrical spikes that are generated by switching relays. The licensee must have available for audit verification that the electromagnetic environment qualification at the plant is enveloped by the vendor's tests.

The staff reviewed the potential for load sequencer system damage caused by lightning strikes. For lightning strikes and switching surges occurring on the transmission system and in the switchyard, system design (e.g., ground wires and station grounding, lightning arresters, surge protectors) limits the magnitude of surges propagating into the plant. These surges are further attenuated by cabling and equipment (e.g., transformers, buses, battery chargers, inverters) between the outdoor station and the PLCs. Additionally, the PLCs are designed and tested in accordance with IEEE Standard 472-1974 to withstand any credible surges that propagate to the 120 V ac and dc buses which serve as the power source for the PLCs. Based on the above factors, the staff concludes that there is reasonable assurance that lightning strikes and switching surges emanating from the outdoor station would not disable the PLCs.

The licensee states that Allen-Bradley performs two tests; a Radiated Electromagnetic Susceptibility test in accordance with SAMA Standard PMC 33.1-1978 and IEC Standard 801-3, Edition 1, 1984; and a Conducted Electromagnetic Susceptibility test for line-connected equipment in accordance with MIL-STD-461/462, tests CS01, CS02, and CS06 for Class A3 equipment. The tests subject the PLCs to frequencies of 20 MHz to 1 GHz, with a field strength of 10 V/m. This range of frequencies envelopes typical radio frequencies for portable two-way radios, which have field strengths less than 10 V/m. The staff will verify that the eletromagnetic environment qualifications at the plant are enveloped by the vendor's test during the site audit.

The licensee states that the only non-1E system interfacing with the PLC is the plant annunciator system, which will be isolated from the PLC with a coil-to-contact isolation relay. This form of isolation is acceptable. The staff will verify that the non-1E control room annunciators are isolated during the site audit of the load sequencer implementation.

The licensee states that the software portion of the load sequencer will be controlled using the existing FPL Quality Assurance program. Revisions to the load sequencer after installation will require, as a minimum, an engineering evaluation and 10 CFR 50.59 evaluation. The staff will verify that the configuration control for software changes is consistent with the V&V program.

3.2 CONCLUSION

Based on the above evaluation, the staff finds the instrumentation and control systems aspects of the Turkey Point Units 3 & 4 load sequencer system to be acceptable. The licensee has committed to a detailed V&V program, augmented by extensive testing of both the hardware and software. The V&V program follows the guidelines in IEEE Standard 1012-1986, "IEEE Standard for Software Verification and Validation Plans," and Regulatory Guide 1.152, which endorses ANSI/IEEE-ANS-7.4.3.2-1982.

The staff will audit the licensee's implementation of the load sequencer hardware and software design. The purpose of these audits is to confirm that the licensee has:

1. Assessed the functional equivalence and improvement of the upgrade relative to the original design basis,

2. Assessed the vendor's design (Functional Requirements and Specifications) and Verification and Validation processes,

3. Confirmed that the design functional requirements have been satisfactorily translated into the software configuration,

4. Assessed their own development of the design modification with respect to the design basis,

5. Implemented and followed their configuration management process for the new design,

6. Isolated the non-Class 1E systems from the Class 1E portion of the load sequencers,

7. Dedicated the load sequencer commercial grade components,

8. Verified that the electromagnetic environment qualification at the plant is enveloped by the vendor's tests, and

9. Provided the control room operators with load sequencer bypass indications and inoperable state indications.

Based on the above evaluation, we find the licensee's load sequencer system and the commitment to a V&V program to be acceptable.

3.3 REFERENCES

1. FPL letter to NRC, L-88-269, dated June 23, 1988, "Emergency Power System (EPS) Enhancement Project."

2. FPL letter to NRC, L-89-124, dated April 3, 1989, "Emergency Power System Enhancement Project, Supplement No. 1: Testing."

3. FPL letter to NRC, L-90-196, dated June 4, 1990, "Revised EPS Enhancement Report, Testing Report, Responses to the January 6, 1989, NRC Request for Additional Information, and FPL Safety Analysis for the Enhancement EPS configuration."

4. FPL letter to NRC, L-90-68, dated July 2, 1990, "Proposed License Amendment [for] Emergency Power System (EPS) Enhancement Project.

5. IEEE Std 1012-1986, "IEEE Standard for Software Verification and Validation Plans."

6. ANSI/IEEE-ANS-7.4.3.2-1982, "American National Standard, Application Criteria for Programmable Digital Computer Systems in Safety Systems of Nuclear Power Generating Stations."

7. EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," Electric Power Research Institute, June 1988.

8. Regulatory Guide 1.47, "Safety System Status Monitoring for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, May 1973.

4.0 MECHANICAL ENGINEERING

4.1 EVALUATION

In References 1 and 5 the licensee provided a report describing in detail the proposed enhancement project, including Section 5.2, "Description of Mechanical Equipment," which describes the classification and rules which form the basis of the design of various safety-related mechanical systems and components, which are required to start and maintain diesel engine operation. These Category I systems consist of the starting air system, the air intake system, the exhaust system, the cooling water system, and the lube oil and the fuel oil systems. The demineralized water system and the service air system are considered as non-safety related. All safety-related systems are comprised of skid and off-skid piping and components. The skid piping and components are provided by the EDG manufacturer (General Motors) while the off-skid piping and components are provided by FP&L.

The classification of various systems associated with EDGs is stated in NRC Standard Review Plan Section 3.2.2 "System Quality Group Classification." All EDG safety-related systems are classified as Quality Group C, which requires the design to be based on ASME Section III Class 3 rules. The classification of the various systems by FP&L was provided in Reference 2. The licensee has based the design and fabrication of off-skid piping and components on ASME Section III Class 3 (1989 with Summer 1984 Addenda), and on ANSI B31.1, 1986. Components such as silencers and radiators were designed to ANSI B31.1 since such components are not commercially available as designed to ASME Section III. The exhaust system was designed to ANSI B31.1 for reasons of high temperature material compatibility with skid piping and the silencers. The diesel oil storage tank was designed to ASME Section VIII Rules, as permitted by Regulatory Guide 1.137 (1979). All skid piping and components provided by the EDG manufacturer were designed to ANSI B31.1 except for the surge tank, which was designed to ASME Section VIII. These are the EDG supplier's standard design and fabrication codes since he has no ASME-approved quality system, including appropriate stamping. Likewise, although the off-skid piping and components are designed to ASME Section III, they are installed to ANSI B31.1 requirements for a similar reason, namely, since Turkey Point Units 3 and 4 are not ASME Section III plants they lack an ASME approved quality system including appropriate stamping. However, the licensee has performed a comparison (Reference 2) between ASME Section III and ANSI B31.1, 1986 installation requirements and has demonstrated that these requirements are essentially equivalent. Furthermore, the licensee also stated that the installations are in accordance with 10 CFR Part 50 Appendix B quality assurance requirements. We have reviewed the licensee submittals and find these acceptable.

In addition to the issues on quality classification, the licensee has also committed (Reference 3) to adopt the acceptance criteria for piping vibration during start-up as stated in ASME OM-1987 with Addenda OMa-1988 (Reference 4). The licensee has also stated that Section XI IWD-2500 inservice inspection requirements will be applied to all off-skid piping systems. On-skid piping and components will be inspected according to the manufacturer's requirements. We find these commitments acceptable.

4.2 CONCLUSION

We find the design, fabrication, installation and testing of the mechanical systems associated with the new EDGs at Turkey Point Units 3 and 4 acceptable.

4.3 REFERENCES

1. Letter (L-88-269) dated June 23, 1988, W. F. Conway, FP&L, to NRC.

2. Letters of July 3 and July 12, 1990, from K. N. Harris, FP&L, to NRC.

3. Letter of May 2, 1989, from K. N. Harris, FP&L, to NRC.

4. ASME OM-1987 with Addenda OMa-1988, Operation and Maintenance of Nuclear Power Plants, Part 3, "Requirements for Preoperational and Initial Start Up Vibration Testing of Nuclear Power Plant Piping Systems."

5. Letter (L-90-196) dated June 4, 1990, K. N. Harris, FP&L, to NRC.

5.0 STRUCTURAL AND GEOSCIENCES

The proposed Emergency Power System Enhancement Project (Reference 1) includes separation of existing emergency diesel generators, the installation of two new emergency diesel generators, with all support systems and the construction of a new diesel generator building (DGB) and, a diesel oil storage building (DOSB).

The new diesel generator building (DGB) is a Seismic Category I building located northeast of the Unit 3 containment structure. The building is two stories high with the diesel generators located on the lower floor, and the auxiliaries such as air start skids, control panels, motor control centers, distribution centers, etc., located on the upper floor. The diesel oil storage building (DOSB) is attached to but separated from the DGB by means of a 26-inch thick reinforced concrete wall.

5.1 EVALUATION

The proposed DGB is a Seismic Category I reinforced concrete structure which encloses the diesel generators and auxiliary equipment. The building is approximately 55 feet wide, 56 feet long and 51 feet high, with the top of the roof at elevation 61.00 feet. The building is partitioned by a reinforced concrete wall, such that the two diesel generators are separated by a 3-hour rated fire barrier. Each division of the building has two floors: the ground floor, approximately at elevation 18.00 feet, and the second floor, approximately at 42.00 feet. The second floor is partly reinforced concrete and partly structural steel with grating.

The DOSB is also a Seismic Category I reinforced concrete structure, connected to the DGB and shares a 26-inch thick reinforced concrete common wall with the DGB. The building is 29 feet wide, 38 feet long and 39 feet high, with the top of the roof at elevation 49.00 feet. The DOSB is also partitioned by a reinforced concrete wall so that the two diesel oil storage tanks (DOST) are separated by a 3-hour rated fire barrier. Each division of the building encloses a steel-lined concrete DOST.

Both the buildings share a common foundation mat. The bottom of the reinforced concrete foundation mat is at elevation 10.00 feet. The grade level elevation varies from 17.00 feet to 18.00 feet. The soil under the foundation mat consists of compacted crushed liner rock fill underlaid by limestone formation. The average bearing capacity of the soil is 70 ksf. The allowable bearing pressure for normal loadings is 6 ksf and for accident and extreme environmental loading is 10 ksf. These values indicate a substantial margin over the failure bearing pressures and are acceptable.

<u>Seismic Loading</u>

The DGB and the DOSB have been represented as a single building to determine the seismic loading. The building dynamic analysis model consists of a lumped mass cantilever with the appropriate soil springs. The seismic input was based on the Updated Final Safety Analysis Report (UFSAR), Appendix 5A (Reference 2). The zero period ground acceleration (ZPGA) for the Safe Shutdown Earthquake (SSE) is 0.15g, and that for the Operating Basis Earthquake (OBE) is 0.05g. The ZPGA in the vertical direction is two-thirds of the horizontal. The corresponding Design Response Spectra were developed in accordance with the provisions of Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants." The damping values are considered following the provisions of Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants." The structure was designed using the response spectra analysis. The combination of modes was performed using the provisions of Regulatory Guide 1.92, "Combining Modal Response and Spatial Components in Seismic Response Analysis" (Reference 3).

The floor response spectra were developed using a synthetic time-history that would envelope the corresponding response spectra and in accordance with the provisions of Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor Supported Equipment or Components." Thus the seismic design loads on the structure were determined using the acceptable criteria.

Wind and Tornado Loadings

The wind loading on the structure was determined using the straight wind velocity of 125 miles per hour (mph). For the site, the 100 year wind was determined as 120 mph. The wind loading on the building was determined using the acceptable criteria in NRC Standard Review Plan (SRP) Section 3.3.1.

Tornado wind velocities and differential pressure drop were determined as recommended in RG 1.76, "Design Basis Tornado for Nuclear Power Plants." The equivalent static loading was determined using the provisions of Reference 4. The licensee has also indicated that the exterior walls of the buildings are designed to withstand a spectrum of tornado generated missiles specified in SRP Section 3.5.1.

The wind and tornado loading criteria used in the design of the structures (DGB and DOSB) are thus acceptable.

Protection Against Flood

The new EDG building is protected from flooding by barriers designed in accordance with RG 1.102, "Flood Protection." The maximum flood and wave run-up elevations are in accordance with those specified in the FSAR. This is acceptable.

Load Combinations and Acceptance Criteria

Load combinations used for design of the structure are in accordance with the provisions of SRP Section 3.8.4. The structural acceptance criteria are also in accordance with SRP Section 3.8.4.

For the design of the foundation mat and walls affected by the diesel oil storage tanks, each of the tanks is considered full or empty, depending upon the situations which constitute the most adverse loading. However, for seismic load combinations, the minimum oil volume of each tank is considered to be 34,000 gallons and the maximum volume in each tank is considered to be 42,000 gallons. The proposed Technical Specification (Section 3.8.1.1.4) for Turkey Point Unit 4 requires a minimum oil volume of 34,700 gallons. Continuous operation of an emergency diesel generator for 7 days during a loss-of-offsite power requires 34,000 gallons of oil. Thus, this deviation from the normal design procedure is acceptable.

5.2 CONCLUSION

On the basis of the evaluation of the licensee submittals, meetings with the licensee and subsequent teleconferences, the staff concludes that the criteria for design and construction of the proposed new structures, associated with the Emergency Power System Enhancement Project, conforms with the provisions of the latest version of the applicable Standard Review Plan sections and hence are acceptable.

5.3 REFERENCES

1. Letter (L-88-269) dated June 23, 1988, W. F. Conway, FP&L, to NRC.

2. Letter (L-90-140) dated April 16, 1990, K. N. Harris, FP&L, to NRC.

3. Letter (L-90-196) dated June 4, 1990, K. N. Harris, FP&L to NRC.

4. ANSI A58.1, "Minimum Design Loads for Buildings and Other Structures."

6.0 PLANT SYSTEMS

6.1 EVALUATION

6.1.1 Emergency Diesel Generators

As part of the EPS enhancement project, the two existing EDGs are aligned as the emergency AC power supplies for Unit 3, and the two new EDGs are aligned as the emergency AC power supplies for Unit 4. Each new EDG consists of a diesel engine manufactured by General Motors Electro-Motive Division (EMD) and a generator manufactured by NEI Peebles Electric Products, Inc. The complete EDG assembly is supplied by Morrison-Knudsen Company and has a continuous rating of 2865 KW and a short time rating of 3150 KW. Each of the new EDGs, which is similar to the existing EDGs except for some minor design changes, has 20 cylinders and a turbocharger with 12 rows of aftercoolers. In addition, each EDG has the following auxiliary systems which are evaluated below: (1) diesel oil storage and transfer system, (2) emergency diesel engine starting system (3) diesel engine cooling water system, (4) diesel engine lubrication system, and (5) diesel engine combustion air intake and exhaust system.

<u>Diesel Oil Storage and Transfer System (DOSTS)</u>

For each new EDG, there is a new diesel oil storage and transfer system which consists of a new diesel oil storage tank, a transfer pump, a day tank, and the associated piping, valves, instrumentation and control to permit operation of the EDG at engineered safety feature load requirements for a minimum of 7 days without replenishment of fuel.

In a response to the staff's request for additional information, dated March 20, 1989, the licensee stated that the new diesel oil storage and transfer system will be designed in accordance with Regulatory Guide 1.9, "Selection, Design, and Qualification of Diesel Generator Units used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," and ANSI Standard N195-1976, "Fuel Oil System for Standby Diesel Generators," as endorsed by Regulatory Guide 1.137, "Diesel Generator Fuel Oil Systems." In addition, the system will meet the guidance of Standard Review Plan (SRP) Section 9.5.4, "Emergency Diesel Engine Fuel Oil Storage."

Specific design standards for system components include the following:

- Design Oil Storage Tanks

  Each storage tank has a capacity of 38,000 gallons, sufficient to operate the EDG for 7 days at continuous loading. The storage tank also has the capability of receiving a diesel oil load of 8,000 gallons from a transport vehicle while the tank inventory is maintained above that required by Technical Specifications. The storage tanks are steel-lined concrete fabricated in accordance with the requirements of ASME Code Section VIII and meet seismic Category I requirements. The tanks are enclosed in a seismic Category I building designed with missile protection capability. The building is also designed to retain the entire contents of a tank failure.

Sample connections to the tanks will be provided in accordance with ASTM-D270, "Sampling Petroleum and Petroleum Products." Connections to non-safety related piping will be provided with ASME Section III, Class 3, isolation valves.

The licensee has considered and discussed provisions to prevent, and actions to overcome, such possibilities as damage to the storage tank fill or vent lines due to tornado missiles, growth of algae in the storage tank, corrosion in the piping and tank, protection of the fuel oil system from ignition sources, and the need for replenishment of fuel oil for a prolonged period of EDG operation.

° Diesel Oil Transfer Pumps

Each diesel oil transfer pump has enough capacity to supply the diesel oil for two EDGs at continuous load rating. The discharge lines are interconnected so that one pump can supply either or both EDGs. Each pump is powered from its associated EDG. It starts and stops automatically on low and high level signals from its associated day tank. The transfer pump is designed to meet the requirements of ASME Code Section III for Class 3 components and meets seismic Category I requirements. In-service testing capability for these pumps will be provided in accordance with ASME Section XI.

° Piping and Valves

The system piping external to the engine start skid is designed to meet the ASME Code Section III for Class 3 components and seismic Category I requirements. The engine mounted piping, as a minimum, is designed to meet the stresses specified by ANSI B31.1, "Power Piping," and to accommodate the mechanical, pressure, thermal and seismic loads.

° Fuel Oil Day Tank

The day tank has enough fuel to support about 3 hours of EDG operation. The tank has fuel oil transfer pump auto-start and auto-stop levels, a critical low level alarm, 1-hour alarm and a high level alarm. The tank is located to take into consideration fire safety, required maintenance, fuel oil head pressure, seismic loadings, tornado missiles, and possible sabotage.

The licensee also indicated that the quality and reliability of the fuel oil supply is assured per existing procedures. For particulate testing, the program follows the requirements of ASTM-2276, "Particulate Containments in Aviation Turbine Fuels." The remainder of the fuel oil testing follows the requirements of ASTM D975-1981, "Standard Specification for Diesel Fuel Oils." All monthly tests are completed every 31 days and all quarterly tests are performed on a bi-monthly basis. Every 18 months, the fuel oil is also tested per manufacturer standards, which includes all requirements of ASTM D975-1981 plus testing for chlorides.

Based on its review, the staff concludes that the design of the new diesel oil storage and transfer system for Turkey Points, Units 3 and 4 enhanced emergency power system conforms to the guidelines of RG 1.9, RG 1.137 and SRP Section 9.5.4, and, therefore, is acceptable.

Emergency Diesel Engine Starting System

Each EDG will have two redundant starting systems consisting of two air compressors (one diesel and one motor driven), four air receivers, four air start motors, piping, valves and instrumentation. Two air receivers and two air motors form one of two redundant sets of 100% cranking capacity for the diesel engine. The air receivers have capacity for cranking the cold diesel engine five times without recharging. A refrigerant type air dryer will be installed between the air compressors and the air receivers to preclude fouling of the air start valves by moisture carry-over. A dew point of less than 40°F and a maximum particulate size of 1 micron have been specified as minimum air quality requirements for the air dryer package. In addition, the air receivers, system piping up to the diesel engine skid, valves and instruments will be made of stainless steel to prevent the generation of rust particles.

The diesel engine air starting system is provided with pressure indication at the compressor discharge, on each set of the two air receivers, at the headers supplying the engine air motors, and a pressure switch for each set of the two air receivers to provide a low pressure alarm in the control room. In addition, the air receivers will be monitored for moisture buildup with water detection devices.

Based on its review, the staff concludes that the design of the emergency diesel engine starting system is in accordance with the guidelines described in SRP Section 9.5.6, "Emergency Diesel Engine Starting System," and therefore, is acceptable.

Emergency Diesel Engine Cooling Water System

The design function of an emergency diesel engine cooling water system is to maintain the temperature of its associated diesel engine within a safe operating range under all load conditions and to maintain the engine coolant preheated during standby conditions to improve starting reliability. The system, which is a closed-loop system, consists of an expansion tank, circulating pumps, three-way thermostatic control valve, water to air heat exchanger (radiator), three electric, direct-coupled, motor-driven cooling fans, standby immersion heater, piping, valves and the required instrumentation.

During operation of the diesel engine, two engine-driven centrifugal pumps circulate water through the closed-loop system. The heat generated is rejected to the environment by means of the radiator. Temperature regulation of the diesel engine coolant is accomplished automatically through the action of a temperature sensing three-way thermostatic valve. When the diesel engine is idle, the engine coolant is heated to a predetermined temperature by the immersion heater and continuously circulated through the engine by natural convection.

The licensee stated that the diesel engine cooling water system will be designed in accordance with RG 1.9. The system, except for the engine skid piping, the surge tank and radiator, will be designed to ASME Section III for Class 3 components and will meet Seismic Category I requirements. The engine mounted piping, as a minimum, will be designed to ANSI B31.1 and meet Seismic Category I requirements. The radiators and surge tank will be designed in accordance with the requirements of ASME Case Section VIII and will meet Seismic Category I requirements. The licensee has discussed how the design of the emergency diesel engine cooling water system will meet the guidelines of SRP Section 9.5.5, "Emergency Diesel Engine Cooling Water System."

Based on its review, the staff concludes that the design of the emergency diesel cooling water system, which conforms to the guidelines of RG 1.9 and SRP Section 9.5.5, is acceptable.

Diesel Engine Lubrication System

The diesel engine lubrication system, which is an integral part of the diesel engine, is a combination of three subsystems. Each subsystem has its own positive displacement pump, driven from the accessories gear train at the front of the engine. The three subsystems are: (1) the scavenging oil system, (2) the main lube oil system, and (3) the piston cooling oil system. The scavenging oil system supplies the main lube oil pump and piston cooling oil pump with cooled and filtered oil. The main lube oil system supplies oil to the various moving parts of the diesel engine including all main bearings and camshaft bearings. The piston cooling oil system supplies lube oil for piston cooling and lubrication of the piston pin bearing surfaces.

The licensee stated that the diesel engine lubrication system will be designed in accordance with RG 1.9. All engine lube oil piping will be designed to ANSI B31.1 and will meet Seismic Category I requirements. In addition, the licensee has discussed how the design of the diesel engine lubrication system will meet the guidelines of SRP Section 9.5.7, "Emergency Diesel Engine Lubrication System."

Based on its review, the staff concludes that the design of the diesel engine lubrication system conforms to the guidelines of RG 1.9 and SRP Section 9.5.7, and therefore, is acceptable.

Diesel Engine Combustion Air Intake and Exhaust System

The design function of the diesel engine combustion air intake and exhaust system is to supply filtered air for combustion to the diesel engine and to dispose of the diesel engine exhaust to atmosphere. The system is designed in accordance with RG 1.9. The exhaust piping is designed in accordance with ANSI B31.1 and is seismically supported. In addition, the licensee has discussed how the design of the diesel engine combustion air intake and exhaust system will meet the guidelines of SRP Section 9.5.8, "Emergency Diesel Engine Combustion Air Intake and Exhaust System."

Based on its review, the staff concludes that the design of the diesel engine combustion air intake and exhaust system conforms to the guidelines of RG 1.9 and SRP Section 9.5.8, and therefore, is acceptable.

6.1.2 Diesel Generator Building Ventilation System

The diesel generator building ventilation system is required and designed to maintain a suitable ambient temperature range in the areas serviced. For the diesel generator room ventilation, combustion and cooling intake air enters the EDG building through the air intake intrusion barrier on the north side. The air travels through the air compressor room and into the diesel generator room. Some of the air goes into the diesel engine as combustion air, and the remainder is exhausted out the south wall through the diesel engine cooling water radiators. Each EDG control panel room is equipped with a dedicated ventilation system. A single active failure resulting in a loss of one ventilation system will not affect the performance capability of the other ventilation system. For each switchgear room, a dedicated ventilation system consisting of redundant fans is provided. Therefore, a single active failure will not result in the loss of both fans to either switchgear room.

The ventilation systems for the diesel generator rooms, EDG control panel rooms, and switchgear rooms will be designed in a safety-related way and meet seismic Category I requirements.

Based on its review, the staff concludes that the design of the diesel generator building ventilation system conforms to the guidelines as described in SRP Section 9.4.5, "Engineered Safety Feature Ventilation System," and therefore, is acceptable.

6.1.3 Fire Protection

The staff has reviewed the licensee's proposed fire protection modifications associated with the emergency power enhancement project. These proposed fire protection modifications were reviewed against the guidance of BTP ASB 9.5-1, Appendix A and the requirements of 10 CFR Part 50, Appendix R, Sections III.G, III.J, and III.L. Our review included an evaluation of the licensee's proposed fire protection features (i.e., additional automatic fire suppression and detection systems, manual fire suppression capabilities and passive fire protection features); fire protection methodology for assuring safe shutdown capability; proposed modifications and procedure changes to assure alternate shutdown capability; and proposed changes to fire protection administrative controls resulting from the electrical system upgrade design. The evaluation of the licensee's proposed changes to their existing fire protection program and the additional fire protection features resulting from the electrical system modifications has been reviewed under the following three major areas:

(1) General Plant Fire Protection Features

(2) Fire Detection and Suppression Capability

(3) Fire Protection Features for Specific Plant Areas

6.1.3.1 General Plant Fire Protection Features

(a) Building Design

The licensee has indicated that, generally, the wall assemblies which separate the new EDG building and the electrical equipment room (EER) from the remainder of the facility will have a fire resistive rating of 3 hours. In addition, the licensee indicated that redundant trains of safe shutdown systems located inside the EDG and EER are separated from each other so that both trains are not damaged by a single fire. Door assemblies installed in fire barrier walls within the new EDG and EER structures are fire rated for 3 hours. In addition, the exterior doors of these structures are fire rated for 3 hours.

Mechanical and electrical penetrations through fire barriers will be appropriately protected. HVAC penetrations, except as identified in Section 6.1.3.3, through fire barriers will be protected by fire damper assemblies. These dampers will have an equivalent fire rating to that of the fire barrier. Conduit and piping penetrations through fire barriers will be sealed to prevent fire and smoke propagation. The penetration sealant material will have a fire rating equivalent to that of the fire barrier.

The licensee has indicated that personnel access and escape routes are provided in each fire area and fire exit routes are clearly marked.

The staff, based on its review, finds that the licensee's proposed EDG building and EER passive fire protection features are acceptable and that they meet the guidance provided in BTP ASB 9.5-1, Appendix A.

(b) Safe Shutdown Capability

As a result of the electrical power system upgrade modifications, the licensee has committed to perform an analysis and revise the essential equipment list, essential cable list, and safe shutdown analysis to reflect the effects of the electrical upgrade modifications on equipment necessary for post-fire safe shutdown of the plant. In addition, for fire zones containing redundant safe shutdown equipment or cabling, the licensee will verify that adequate fire protection measures or alternative shutdown capability exists in accordance with 10 CFR Part 50, Appendix R, Sections III.G and III.L.

The licensee also committed to perform an associated circuit analysis. This analysis will ensure that the emergency power system upgrade modifications will not adversely affect safe shutdown capability resulting from fire induced hot shorts, shorts to ground, or spurious signals causing equipment maloperations. The licensee, in order to ensure that safe shutdown capability is not affected by associated circuits, will verify the following:

1. Coordinated fuse/breaker circuit protection is provided such that the power supply to any of the required safe shutdown loads is not affected by a fire involving a non-safe shutdown load;

2. High/low pressure interfaces are protected against fire-induced spurious operations;

3. All raceways passing through fire barriers are adequately sealed, as required, to ensure that fire does not propagate inside the raceway enclosure itself; and

4. Potential fire-induced spurious equipment actuations are provided with adequate circuit protection or have been analyzed and the appropriate manual actions to be taken during post-fire conditions to ensure safe shutdown capability are incorporated into shutdown procedures.

As a result of a safe shutdown analysis, the electrical equipment room will change from a train "A" shutdown train area to a train "B" shutdown train area and the appropriate fire protection features will be installed to protect safe shutdown circuits as required.

The staff finds the licensee's safe shutdown methodology and their proposed fire protection features for maintaining one safe shutdown train free from fire damage to comply with the performance criteria of 10 CFR Part 50, Appendix R, Section III.G and are, therefore, acceptable.

(c) Alternate Shutdown Capability

The licensee addressed alternative shutdown (ASD) capability by identifying areas of the plant for which a fire would require ASD (cable spreading room, electrical cable chase, control room, control room roof, mechanical equipment room, and the north-south breezeway). The addition of the new EDGs will affect their alignment to the Unit 3 and 4 ASD panels. As a result of the overall enhancement project, changes affecting ASD will be necessary due to the realignment of electrical power distribution to some equipment. These changes include provisions for 1-hour fire barrier protection for cabling to certain equipment (normal containment cooler fans circuits, boric acid transfer pump power and control circuits, and new EDG train "B" circuits located in outdoor raceway) and provisions for normal/isolate transfer switches which will mitigate spurious operation of safety-related equipment (e.g., charging pumps) during an ASD fire.

Specific detailed changes will be made to the procedures to address modifications which affect equipment relied upon for safe shutdown in the event of a fire that requires the evacuation of the control room. Examples include:

- Revision of procedures from reading EDG B volts and watts (dual meter) on each ASD panel to reading volts and watts for EDG 3B on the Unit 3 ASD panel and EDG 4B on the Unit 4 ASD panel;

- Addition of transfer/isolate switches;

- Addition and deletion of actions required due to the new electrical system; and

- Fire zone and fire area additions and modifications.

Based on this information, the staff concludes that the alternate shutdown capability of the plant will be adequately maintained and that these proposed changes meet the requirements of 10 CFR Part 50, Appendix R, Sections III.G, and III.L, and are, therefore, acceptable.

(d) Ventilation

For the new diesel generator building, the licensee is providing protection for grade level exterior wall ventilation openings from the effects of a postulated exposure fire by adding external fire barriers. This prevents an exposure fire from affecting both units. The licensee states that the potential for exposure fires extending to above-grade ventilation openings is too insignificant, due to height above-grade and the outdoor nature of the space, to warrant additional fire protection. The staff finds this acceptable.

In the new electrical equipment room, the licensee has provided protection for all penetrations and doors in the fire areas with the exception of HVAC duct penetrations in the exterior (west) wall. This is because a safe shutdown analysis indicated that the exterior wall does not serve to separate redundant safe shutdown circuits. The staff finds this acceptable.

(e) Lighting and Communication

The licensee has stated that a fixed self-contained lighting system consisting of sealed beam units with minimum 8-hour battery power are provided in accordance with 10 CFR Part 50, Appendix R, Section III.J. The existing alternate shutdown communication system is extended to include the new EDG building.

This information provides the staff with reasonable assurance that adequate emergency lighting and communication are available, and are, therefore, acceptable.

6.1.3.2 Fire Detection and Suppression Capability

(a) Fire Detection

The licensee stated that fire detection is provided for all accessible areas in the EDG buildings and EER. The licensee stated that the design of the proposed fire detection system and the application and the spacing of the fire detectors will be in compliance with National Fire Protection Association (NFPA) standards 72D and 72E, respectively, and give an audible and visual alarm and annunciation in the main control room. EDG building fire protection panels include the feature of supervising the alarm circuits while in standby; i.e., instrumentation monitoring (1) the removal of a detector from the detector circuit, (2) an open circuit in the detector circuit, (3) an open circuit in the main control room annunciator circuit, (4) an open or shorted condition on the audible circuit line, (5) the removal of a supervised system module, (6) the loss of main power, and (7) a ground fault on any detector circuit, audible signal circuit or dc power line within the system.

Based on the above, the staff concludes that the fire detection system meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

(b) Water Sprinkler and Hose Standpipe Systems

The licensee has committed to install pre-action sprinkler protection in each EDG room. These sprinkler systems are independent and capable of being manually actuated. The piping integrity for each system is supervised by nitrogen and upon the loss of nitrogen pressure or system integrity, an alarm will be generated. This alarm will be annunciated in the control room. Each pre-action sprinkler system will be automatically actuated by a signal from a separate, dedicated fire detection system which utilizes thermal rate compensated fire detectors. In addition, the licensee has committed to install wet pipe sprinkler protection in the diesel fuel oil transfer pump rooms. The actuation of either of these systems will be alarmed and annunciated both locally in the EDG building and in the control room. The fire suppression system piping material, design, and installation will be in accordance with NFPA 13 and is seismically designed and supported.

In order to support manual fire suppression capability to the EDG building, the licensee will install a hose cabinet at fire hydrant HY18. This hydrant is located within 100 feet of the EDG building. The proposed hose cabinet at HY18 will be appropriately equipped with sufficient hose, nozzles, adapters, hydrant and hose wrenches, etc. to readily provide an effective hose stream to any location in the EDG building. In addition, the licensee, following the guidance of NFPA 24, will install a standpipe and hose station/cabinet with the appropriate equipment just outside the EDG access doors on the north side of the building.

The staff has reviewed the design criteria and bases for the water suppression systems and concludes that these systems meet the guidelines of BTP ASB 9.5-1, Appendix A, and are, therefore, acceptable.

(c) Portable Extinguishers

As a result of the electrical system modifications, additional portable fire extinguishers, in accordance with NFPA 10, will be provided in the EDG building, EER, and areas adjacent to the EER. The staff finds this acceptable.

6.1.3.3 Fire Protection Features for Specific Plant Areas

(a) Switchgear Rooms and EDG Control Panel Rooms

Switchgear and EDG control panel rooms are separated from each other and their respective EDG by 3-hour-rated barriers. Fire detection (smoke detectors) has been provided for these rooms, tied into the local EDG building fire detection panels which will alarm/annunciate in the main control room at the existing main fire alarm panel.

Based on its evaluation, the staff concludes that the fire protection for the switchgear and EDG control panel rooms meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

(b) Diesel Generator Areas/Diesel Fuel-Oil Storage Areas/Diesel Oil Transfer Pump Areas

The redundant diesel generators and associated auxiliary equipment are separated from each other by a 3-hour-rated fire barrier. In addition, the diesel oil storage and transfer pump area is also partitioned by a reinforced concrete wall such that the two diesel oil storage tanks (DOST) and their associated oil transfer pumps are separated from each other and other areas in the EDG building by 3-hour-rated fire barriers.

The licensee has committed to install automatic fire suppression capability in the EDG rooms and the diesel oil transfer pump rooms. Each EDG room is protected by a pre-action sprinkler system, and wet pipe sprinkler protection will be provided in the diesel oil transfer pump rooms. Manual fire suppression capability in the form of portable fire extinguishers and hose stations is appropriately provided for the EDG building. In addition, the licensee will provide fire detection capabilities for all the accessible areas in the EDG building.

The staff, based on its evaluation, finds that the fire protection for the diesel generator areas and oil storage and transfer areas meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

(c) Electrical Equipment Room (EER) in the Auxiliary Building

The EER is separated into two fire zones by 3-hour fire barriers with all penetrations and doors protected by 3-hour fire rated assemblies. The exterior walls of the EER, which separate redundant safe shutdown trains, will be 3-hour fire rated and all associated penetrations will be appropriately fire-rated. Interior to the EER structure, at the east end, the licensee is constructing a 3-hour fire-rated room to house the spare station battery. The mezzanine, open to the EER, is located above the spare battery room and contains the 3A2 and 3B2 battery chargers and the EER/battery room air handling unit.

In order to preclude hydrogen accumulation, during battery charging and discharge periods, inside the battery room and the EER, the licensee is designing the air conditioning and ventilation system to establish a continuous flow of air from the EER to the battery room. This air flow will be established by having the ventilation supply air, under a slightly positive pressure, enter the EER and exhaust out through the battery room. The battery room exhaust capability is designed to maintain the hydrogen concentration limit below 2% by volume in accordance with Regulatory Guide 1.128. The battery room exhaust is connected to the plant air exhaust system which is capable of being manually loaded on the EDG.

Portable fire extinguishers will be installed in the area and a standpipe hose station is provided in the auxiliary building hallway which is adjacent to this area. Smoke detectors will be installed throughout the EER and battery room which will alarm/annunciate in the main control room at the existing main fire alarm panel.

Based on its evaluation, the staff finds that the fire protection for the new EER and spare battery room in the auxiliary building meets the guidelines of BTP ASB 9.5-1, Appendix A, and is, therefore, acceptable.

6.2 CONCLUSION

The diesel generator auxiliary systems are powered by motor control centers within the same division as the diesel generator, thus maintaining divisional separation. The diesel oil storage and transfer system has sufficient capacity to supply diesel fuel for 7 days. The system has a provision for adding fuel to the tank, if required. This should assure adequate fuel availability for extended periods. Each transfer pump has sufficient capacity to supply two diesels, thus providing adequate supply to the day tanks with one transfer pump inoperable. There is 100% redundancy in the air starting system and compressed air for five starting attempts. This should provide adequate starting capacity. There is redundancy in the cooling fans and the circulating water pumps of the engine cooling system. External lube oil pumps continuously supply lube oil to the turbocharger bearings and engine oil is kept warm during standby conditions, thus reducing wear consistent with Generic Letter 84-15, for fast emergency or surveillance starts. Surveillance instrumentation for indication, control and alarm is provided to monitor, control and maintain the auxiliary systems consistent with IEEE Standard 387-1977. The staff concludes that the design features of the auxiliary systems are of the type that should provide for adequate and reliable operation consistent with GDC-17.

Redundant trains of systems required for safe shutdown are separated from each other in the EDG building by 3-hour fire barriers, so that both trains are not subject to the same fire hazard. In addition, automatic fixed water fire suppression is provided in the EDG rooms and the diesel fuel oil transfer pump rooms. The EER structure is separated into two fire zones by 3-hour fire barriers. The ventilation provided for the spare battery room located in the EER structure will be designed to ensure that the exhaust capability will limit hydrogen concentration to levels below 2% by volume. Manual fire suppression capability in the form of fire hose stations is provided for the EDG building and will be accessible to the EER. Portable fire extinguishers will be appropriately located in the EER and the EDG building. Emergency lighting and communication, consistent with existing guidelines, will be provided to support safe shutdown operations. Fire detection capability, with adequate provisions made for supervision of detection alarm circuits is provided for the EDG building and the EER. To assure that post-fire shutdown capability of the plant complies with the requirements of 10 CFR Part 50, Appendix R, the licensee has commited to perform an analysis, revise their essential equipment and cable lists, and, as required, provide the required fire protection features to assure that one train of systems necessary to achieve and maintain safe shutdown conditions is free from fire damage. The staff concludes that the licensee's proposed fire protection features for the EDG building and the EER are in conformance with GDC 3 and 5; with BTP ASB 9.5-1, Appendix A, and applicable industry standards.

7.0 TECHNICAL SPECIFICATIONS

Turkey Point Units 3 and 4 initially operated with custom Technical Specifications (CTS) issued with operating licenses in 1972 and 1973 and amended from time to time over the years. In September 1984, Florida Power and Light Company (FPL) committed to the development of a fully revised and reformatted set of Turkey Point Technical Specifications based on the Standard Technical Specifications (STS) for Westinghouse-designed plants. In August 1990, license Amendment Nos. 137 and 132 were issued approving Revised Technical Specifications (RTS) for Turkey Point Units 3 and 4 that are, except for the electrical power systems, consistent with the STS. Amendments 137 and 132 also approved an interim electrical power systems chapter of the RTS that maintains a degree of safety which is equivalent to or greater than that of the electrical power systems chapter of the CTS. Thus, the interim electrical power systems chapter of the RTS was appropriate for the current Turkey Point electrical design, but was not completely upgraded to be consistent with the STS.

In its amendment application dated July 2, 1990, FPL proposed TS for the EPS enhancement project to bring the electric power systems TS in conformance with STS appropriate to the Turkey Point design.

Following a series of technical meetings between NRC staff and FPL representatives, NRC issued the Proof and Review version of the Enhanced Electrical TS (EETS) on May 4, 1990. By letter L-90-174 dated May 9, 1990, FPL commented on the Proof and Review version of the EETS. NRC staff also provided additional comments on the Proof and Review version of the EETS. Resolutions of the issues raised by those comments were included in the final draft issued on June 15, 1990 by letter to Mr. J. H. Goldberg (FPL) from Dr. Gordon E. Edison (NRC). On July 2, 1990, FPL submitted its request for amendment based on the Final Draft EETS. The resulting EETS are the same as the Final Draft EETS except for minor corrections. In the July 2, 1990 letter, FPL certified that the EETS are consistent with the Emergency Power System Enhancement Design Report, Supplement 0, Revision 1, and Supplement 2 to the Emergency Power Systems Enhancement Report (Safety Analysis), Revision 0, both of which were attached to an FPL submittal (letter L-90-196) dated June 4, 1990. FPL also certified that the EETS will be consistent with the as-built condition of the plant at the completion of the dual-unit outage to upgrade the emergency power systems. The FSAR will be updated in mid-1991 to reflect the design changes. FPL also stated that the EETS are consistent with the emergency power systems configurations and equipment out-of-service conditions that were evaluated in the design verification failure modes and effects analyses.

7.1 EVALUATION

Since 1974, new operating licenses have included Technical Specifications (TS) in a standard format as Appendix "A". These standard format TS are based on a set of model TS called the Standard Technical Specifications. These STS are based on the design and design basis safety analyses of a typical plant and are adjusted to account for differences between the plant's actual design and safety analyses and those of the typical plant. The actual plant design and design basis safety analyses are described in the licensee's FSAR. The NRC reviews the FSAR and issues a Safety Evaluation Report (SER) explaining the acceptability of the plant design and safety analyses. Therefore, the SER provides the NRC's basis for granting the plant's operating license. At the same time, the SER provides the NRC's basis for approving the plant's TS which are part of the license and based on the FSAR.

This process has been repeated for about 60 plant operating licenses since 1974. Therefore, the acceptability of the STS, as modified to account for differences associated with a particular plant, has been well established by the staff, as reflected in about 60 SERs. In addition, since 1974 nuclear power plants have amassed hundreds of reactor-years of experience using STS. The STS have been adjusted over the years because experience has identified areas which needed or could benefit from improvement. Also, changes in plant design since 1974 have resulted in changes in the "typical" plant design reflected by the STS. Many parts of the STS have also been examined using probabilistic risk assessment (PRA) as a tool. Except for rare instances which were corrected, PRA showed that the STS are conservative in terms of safety.

Following are two examples of how the STS are applied generically to an actual plant design. In the first example, LCO 3.0.3 provides a schedule for shutting down the plant when the safety function capability of a system becomes inoperable. The schedule allows time periods for taking the plant to cold shutdown. These time periods are intended to shut down the plant as quickly and as safely as possible because of the lost safety function. At the same time, the time periods are long enough to allow the plant to be shut down in a controlled and orderly manner. This reduces the potential for transients that could challenge safety systems. Also, this schedule allows the plant cooldown rate to be maintained well within the maximum limits, which minimizes the thermal stresses on the primary coolant system. These time periods are based on the experience from thousands of plant shutdowns. This LCO is applied to almost all plants with STS.

A second example of the direct application of STS to an actual plant is the allowance of up to 72 hours to provide the licensee an opportunity to repair a system and return it to service without shutting down the plant. In the typical design, many safety systems have two redundant trains of equipment, each train being individually capable of performing the safety function. These redundant systems provide "single failure" protection--if one train fails the other train is completely capable of performing the safety function. In the STS, if one of these trains is inoperable, the plant is allowed to continue to operate without beginning a shutdown for 72 hours. During this time, "single failure" protection has been lost for the safety system; however, the operable train still provides full capability if an accident occurs. The risk of an accident occurring during the 72 hours is low, and the combined risk of an accident occurring within 72 hours and the operable train failing is even lower. On the other hand, a plant shutdown, no matter how careful, involves some risk of initiating a transient or challenging safety systems. The NRC concluded that the allowed limit of 72 hours provides the appropriate balance of safety. This allowed limit is applied unrevised to almost all dual train safety systems for plants with STS.

Turkey Point was not licensed with STS; however, the TS were derived from analyses in the Final Safety Analysis Report. The SER which supported issuance of the operating license for Turkey Point supported the acceptability of the plant design, design basis safety analyses, and TS. The EETS approved by this Safety Evaluation are the plant-specific application of the STS to the Turkey Point emergency electrical design in the same manner described above for new operating licenses. Therefore, this Safety Evaluation relies on the original SER for Turkey Point as amended over the years and on the collective SERs for plants licensed with STS since 1974.

The development of the EETS consisted of modifications to the STS to account for electrical design differences and the constraints identified in FPL's letter of September 26, 1986. Specifically, action times and surveillance frequencies in the STS were considered acceptable for comparable design features, even though certain RTS included more restrictive requirements.

On the basis that much of the STS has been retained without changes, and that when modified, it has been consistent with the general guidance of the STS, and with reliance on the licensee's certification, we conclude that the EETS is an acceptable TS for Turkey Point Units 3 and 4.

Finally, NRC programs to improve nuclear reactor safety by improved TS are ongoing. As improvements are identified and found to be acceptable for a class of plants, incorporation of such improvements is achieved in individual plants by license amendments. Such opportunities will continue to be available for Turkey Point.

Acceptability of the EETS was determined by evaluating the acceptability of differences from the STS. In the SER for Amendments 137 and 132, five categories were used to help evaluate differences from the STS. That scheme was used here. All changes (except for simple editorial changes such as renumbering the INDEX to make it consistent with new page numbering) fell into one category, EETS like STS except for design differences. That is, some modification of the STS was needed to accommodate design differences. This tailoring is a common step in applying STS in the development of TS for operating licenses. The approach for those TS and for the EETS has been to modify the STS only as necessary to accommodate the design differences, which reflect the current licensing basis. We conclude on the basis of our review and the licensee's certification that the accommodation of the design differences in each of the EETS has been consistent with STS format and guidance.

The following table lists all the Limiting Conditions of Operation (LCOs) that were changed by the EETS. If only editorial and minor corrections were made to the STS to arrive at the EETS, it is so noted. However, if significant design differences forced some tailoring of the STS, then that design difference is listed.

EETS	Title	Design Difference
----	INDEX	Editorial/Minor Corrections only.
3/4.1.2.3	Charging Pumps - Operating	A third charging pump for each unit (3C or 4C) is powered from a swing load center 3H or 4H.
3/4.3.2	Engineered Safety Feature Actuation System Instrumentation	No response time instrumentation, different setpoint methodology, and different functional units and number of channels
3/4.3.3.4	Fire Detection Instrumentation	Editorial/Minor Corrections only.
3/4.5.2	ECCS Subsystems - Tavg Greater than or Equal to 350 degrees F.	Shared High Pressure Safety Injection Pumps and centrifugal charging pumps not used for safety injection.
3/4.5.3	ECCS Subsystems - Tavg Less than or Equal to 350 degrees F.	Safety injection is by RHR system only.
3/4.5.4	Refueling Water Storage Tank	Two tanks with various flow path alignments.
3/4.7.8.2	Spray and/or Sprinkler Systems	System shared by two units.
3/4.8.1.1	A.C. Sources - Operating	Cross-unit sharing of emergency diesel generators. Second offsite circuit is not immediately available.
3/4.8.1.2	A.C. Sources - Shutdown	Credit for alternate offsite circuit. Tailored list of diesel generator auxiliaries.

EETS	Title	Design Difference
3/4.8.2.1	D.C. Sources - Operating	All four DC busses must be energized when one or more units are in MODES 1,2,3, or 4. Eight battery chargers, two per DC bus. Only one required per DC bus. One battery bank per DC bus, plus spare battery D-52 which can be substituted for any one of the other four battery banks.
3/4.8.2.2	D.C. Sources - Shutdown	Three DC busses must be energized when both units are shutdown. One battery charger required for each of the three DC busses. One battery bank required for each of the three DC busses, plus spare battery D-52 which can be substituted for any one of the three battery banks.

EETS	Title	Design Difference
3/4.8.3.1	Onsite Power Distribution-Operating	Shared AC system - Unit 3 and 4 loads powered from common AC busses, load centers, and motor control centers. Swing load centers and motor control centers provide flexible distribution system. Shared DC system - Unit 3 and 4 loads powered from common DC busses. With one or more units operating, all four DC busses must be energized. Flexible electrical distribution system in which battery chargers can be powered from multiple sources because of swing Motor Control Centers (MCCs).

EETS	Title	Design Difference
3/4.8.3.2	Onsite Power Distribution-Shutdown	Shared AC system - Unit 3 and 4 loads powered from common AC busses, load centers, and motor control centers. Swing load centers and motor control centers provide flexible distribution system. Shared DC system - Unit 3 and 4 loads powered from common DC busses. With both units shutdown, three, DC busses must be energized. Flexible electrical distribution system in which battery chargers can be powered from multiple sources because of swing Motor Control Centers (MCCs).

7.2 CONCLUSION

On the basis of the evaluation of the licensee's submittals, several meetings with the licensee, and subsequent teleconferences, the staff concludes that the EETS are acceptable. The EETS are in accordance with the requirements of 10 CFR 50.36. The design changes resulting from the EPS enhancement project have been appropriately accounted for in the EETS, and FPL's commitment to develop electrical TS based on the STS has been fulfilled.

8.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION

The licensee's request for amendments to the operating licenses for the Turkey Point Plant, Unit Nos. 3 and 4, including a proposed determination by the staff of no significant hazards consideration, was noticed in the Federal Register on September 26, 1990 (55 FR 39331). Because the staff received a request for hearing on this issue, the comments of the intervenor were considered in making a final no significant hazards determination. The staff has evaluated the effects of the intervenor's proposed contentions upon our no signifcant hazards determination. This is the staff's final determination of no significant hazards consideration.

The Commission's regulations in 10 CFR 50.92(c) include three standards used by the NRC staff to arrive at a determination that a request for amendment involves no significant hazards considerations. These regulations state that the Commission may make such a final determination if operation of a facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

In Attachment 1 of its July 2, 1990 amendment request, the licensee submitted its no significant hazards evaluation (NSHE) of the proposed changes, in the context of the proposed changes to the TS, against the three standards of 10 CFR 50.92 cited above. The licensee identified and characterized the changes (see Table 1) as belonging to five categories: (1) EPS enhancements, (2) administrative changes, (3) changes that are more restrictive, (4) changes that relax requirements, and (5) deletions of requirements. The licensee concluded that the proposed amendments involve no significant hazards consideration.

The NRC staff performed its own evaluation (below) of no significant hazards consideration in accordance with 10 CFR 50.92, taking into account the licensee's evaluation provided in Attachment 1 of its July 2, 1990 license amendment proposal as well as public comments received. The staff agrees with the licensee's conclusions that the proposed amendments involve no significant hazards consideration. The staff has selected examples of the proposed TS changes in each of the five categories of characterization (administrative, more restrictive, etc.) employed by the licensee, and they are discussed below. These examples are considered to be typical of the proposed changes. The staff's evaluation of no significant hazards is presented below.

Category 1 - EPS Enhancement Changes

EPS enhancement changes are changes to design values and requirements resulting from the plant reconfiguration for reasons of design. These changes do not result in either relaxed or more restrictive requirements; rather, the technical requirements remain unchanged. Examples of these types of changes are described below.

Table I - CATEGORIZATION OF CHANGES TO THE TECH SPECS

PROPOSED TS NO.	LICENSED TS NO.[1]	TYPE OF CHANGE[2]	NSH[3] PAGE REFERENCE
3.1.2.3	3.1.2.3	5	5-6
3.1.2.3, Action	3.1.2.3 Action a-c	2,5	6-7
Table 3.3-3, Item 7b,c	Table 3.3-3, Item 7b,c	1	8
3.3.3.4, Action b,c	3.3.3.4 Action b,c	2	11
Table 3.3-6, Fire zone 25	--------	1	9
Table 3.3-6, Fire zones 72-75	Table 3.3-6 Fire zones 72-75	1,2	9-10
Table 3.3-6, Fire zones 72,73	Table 3.3-6 Fire zones 72,73	2	10
--------	Table 3.3-6 footnote***	5	10
Table 3.3-6, Fire zones 133-136, 138-141	--------	1	9
3.5.2.a	3.5.2.a	1	12-13
3.5.2, Action c,d	3.5.2, Action c,d	1	13-15
3.5.2, Actions e,f	--------	1	13-15
4.5.2.g.2	4.5.2.g.2	2	15
3.7.8.2.c	3.7.8.2.c	2	16-17
3.7.8.2.d	3.7.8.2.d	1	16
3.7.8.2.e	--------	1	16
3.7.8.2, Action a	3.7.8.2, Action a	2	17
Table 3.7-5, HY26	Table 3.7-5, FH6	1	18-19
Table 3.7-5, HY18	--------	1	18-19
Table 3.7-5, HY-	Table 3.7-5, FH-	2	19
Table 3.7-5, HY10,11	Table 3.7-5, FH10,11	2	19
3.8.1.1	3.8.1.1	1,2,3	20-22
3.8.1.1, Applicability	3.8.1.1, Applicability	2	23
3.8.1.1, Action a-f	3.8.1.1, Action a-f	2,3,4,5	23-30
4.8.1.1.1	4.8.1.1.1	2	31
4.8.1.1.2	4.8.1.1.2	1,2,3,4,5	32-39
4.8.1.1.3	4.8.1.1.3	3	39-40
--------	4.8.1.1.4	5	40
Table 4.8-1	Table 4.8-1	3	36-37
3.8.1.2.a	3.8.1.2.a	2	41-42
3.8.1.2.b	3.8.1.2.b,c	1,2,3	41-43
3.8.1.2, Applicability	3.8.1.2, Applicability	2	43
3.8.1.2, Action	3.8.1.2, Action	2	44
4.8.1.2	4.8.1.2	2,3	45-46
3.8.2.1.a-d	3.8.2.1.a,b	1,2	47-50
3.8.2.1, Applicability	3.8.2.1, Applicability	2	50
3.8.2.1, Action b	3.8.2.1, Action a,b	1	51-55

Table 1 - CATEGORIZATION OF CHANGES TO THE TECH SPECS (CONTINUED)

PROPOSED TS NO.	LICENSED TS NO.[1]	TYPE OF CHANGE[2]	NSH[3] PAGE REFERENCE
3.8.2.1. Action a	3.8.2.1. Action b	1	51-55
--------	Table 3.8-1	1	51-55
4.8.2.1.a-f	4.8.2.1. a-g	1,2,3,4,5	55-60
Table 4.8-2	Table 4.8-2	2,5	56-57,59-60
3.8.2.2	3.8.2.2	1,2	61-62
3.8.2.2. Applicability	3.8.2.2. Applicability	2	62
3.8.2.2. Action	3.8.2.2. Action	1,2	63-64
3.8.3.1.a-o	3.8.3.1.a-d	1,2,3,5	65-68
3.8.3.1. Applicability	3.8.3.1. Applicability	2	69
3.8.3.1. Actions a-d	3.8.3.1. Actions a-i	1,3,4	69-72
Table 3.8-1	--------	1	69-70
Table 3.8-2	--------	1	69-70
3.8.3.2.a-c	3.8.3.2.a	1,2,3	73-75
3.8.3.2. Applicability	3.8.3.2. Applicability	2	75-76
3.8.3.2. Action	3.8.3.2. Action	2	73-76

NOTES:

(1) Amendments 137 and 132, issued August 28, 1990.

(2) Types of changes

1 - EPS Enhancements
2 - Administrative
3 - More restrictive
4 - Relaxations
5 - Deletion of selected requirements

(3) FPL proposed license amendment submittal dated July 2, 1990, Attachment 1, No Significant Hazards Determination.

Example 1 - Addition of Two Diesel Generators and Modification of Existing Electrical Distribution System

The licensee has evaluated this change beginning on page 20 of its NSHE in the context of TS 3/4.8.1.1 (AC Sources - Operating), Limiting Condition for Operation. The licensee has addressed the three criteria of 10 CFR 50.92(c) and determined that they are satisfied. The licensee's evaluation follows; note that the evaluation refers to PTP (Plant Turkey Point), and to reference 1, which is a letter from K.N. Harris to U.S. NRC dated June 4, 1990 and designated L-90-196. Some other acronyms frequently used throughout the licensee's evaluations include: MCC (motor control center), LC (load center), LOOP (loss of offsite power), EDG (emergency diesel generator), LBLOCA (large break loss of coolant accident), and AOT (allowed outage time).

> The EPS Enhancement Project at PTP adds two Class 1E EDGs and modifies the existing distribution system (for design details and a safety analysis of these modifications see Reference 1). As a result of these modifications each Unit requires three EDGs (the two associated with the Unit and either one of the EDGs associated with the opposite Unit) to meet the single failure criterion and to mitigate an accident. Also, the fuel requirements for the new Unit 4 EDG fuel systems are added to the LCO.
>
> 1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated.
>
>   As postulated, LOOP and LBLOCA require the start and operation of Engineered Safety Features (ESF) equipment. The enhanced system with load redistribution and addition of swing 4 kV switchgear, swing 480V LCs, and 480 V MCCs provides a greater degree of power source availability to power the required equipment. Required ESF loads are accommodated with the enhanced EPS configuration, and no single failure will prevent the enhanced EPS from performing its required safety function in the event of an accident on either unit. The LBLOCA analysis as presented in the FSAR remains bounding under the enhanced EPS configuration. The added fuel requirements for the new Unit 4 EDG fuel systems provide requirements which are commensurate with the requirements for the existing EDG fuel systems.
>
>   Since the EDGs are not initiators of accidents, there is no increase in the probability of an accident.
>
>   There is also no increase in the consequences of an accident previously evaluated. The enhanced EPS configuration provides an improved response to the existing FSAR limiting Design Basis Accident (DBA) by providing enhanced equipment availability on the accident unit with increased EDG loading margin.
>
> 2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different

kind of accident from any accident previously evaluated. The proposed change introduces no basic changes in operation or new modes of operation. These changes have not resulted in new types of plant operating requirements given that the requirements for the new EDGs and the associated level of detail is commensurate with the requirements for the existing TS.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. The addition of two new EDGs enhances the margin of safety by providing added onsite AC capacity and increased equipment availability.

The staff agrees with the licensee's conclusion that there are no significant hazards considerations, with the following comments. The changes reduce the probability and consequences of an accident because additional emergency power redundancy and capacity are provided to prevent an accident and to provide power to accident-mitigating systems. No new or different kind of accident will be created because the changes add more redundancy and capacity. Accidents resulting from a loss of power have been previously considered in the design and analyzed. Safety margins will be enhanced by the availability of added electrical power sources.

Example 2 - Addition of Battery Bank, Two Battery Chargers, and Associated Equipment

The licensee has evaluated this change beginning on page 47 of its NSHE in the context of TS 3/4.8.2.1 (DC Sources - Operating), Limiting Condition for Operation. The licensee has addressed the three criteria of 10 CFR 50.92(c) and determined that they are satisfied. The licensee's description of the changes, and portions of the licensee's lengthy evaluation follow; note that the evaluation refers to the RTS which are the Revised Technical Specifications issued by NRC as Amendments 137 and 132 for Units 3 and 4, respectively, on August 28, 1990.

> The proposed change revises the specification to reflect the existence, following the completion of the EPS Enhancement Project, of a spare 125-volt Battery Bank (D-52) and eight (8) dedicated (2 per battery) full capacity battery chargers (currently there are four (4) dedicated and two (2) swing battery chargers). The proposed change specifies which battery charger(s) can be supplying power to a required battery bank for the battery bank to be considered OPERABLE. In addition the proposed change adds the specific MCC which powers a specified battery charger for credit to be taken for a battery charger being OPERABLE. The proposed change also requires, via a new footnote, that each of the battery chargers used to satisfy this LCO be powered by a different MCC. It also, [sic] identifies the EDG(s) associated with each MCC required to be OPERABLE to supply emergency power (swing MCCs 3D and 4D require two EDGs 3A and 3B or 4A and 4B, respectively) with a clarifying footnote, identified by a "#" symbol, identifying that inoperability of the EDG(s) specified in the LCO does not constitute inoperability of the associated battery chargers or battery banks.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated for the following reasons:

   The number of D.C. electrical sources required to be OPERABLE following this amendment remains the same as in the RTS; only existence of a new full capacity 125-volt D.C. Battery Bank (D-52) has been added. The new "spare" battery bank OPERABILITY will be assured by the new battery bank undergoing the same surveillances as the existing battery banks.... The addition of this battery bank allows one battery bank to be taken out of service without the unit(s) entering into an ACTION statement.

   With the enhanced EPS design two battery chargers are being added and the two existing "swing" chargers are being dedicated to a particular battery. Though the number of battery chargers required to be OPERABLE decreases from five (5) to four (4), each OPERABLE battery bank will be connected to an OPERABLE full capacity charger. The criteria used for the existing LCO and for the proposed LCO for the new design is identical ....

   This amendment adds additional requirements for equipment associated with an OPERABLE battery bank. The revised specification provides requirements as to which MCC must be supplying power to a battery charger for it to be considered OPERABLE. The addition of this requirement assures that no single failure of an MCC concurrent with a LOOP can result in more than one battery bank without an OPERABLE charger.

   Following the EPS Enhancement Project completion, each unit will require 3 EDGS to be OPERABLE to supply emergency power (both of its and one of the other unit's EDGs).... The addition of this requirement assures that no single failure of [an] EDG concurrent with a LOOP can result in more than one battery bank without an AC emergency power source....

   The equipment involved in this change are not initiators of FSAR evaluated accidents and the proposed requirements will ensure that no single failures, as assumed in the FSAR analyses, will prevent the plant from mitigating the consequences of an accident as evaluated in the FSAR, thus there is no significant increase in the probability of the occurrence of an accident or significant increase in the consequences of previously analyzed accidents.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated. The added requirements are in accordance with the design details and safety analysis as presented in Reference 1, and assure that no single failure concurrent with a LOOP can result in the loss of more than one D.C. electrical system. As discussed in this safety evaluation, a Failure Modes and Effects Analysis has been performed and no new accidents are created. The proposed change

introduces no basic changes in operation or new modes of operation.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety .... The number of required OPERABLE D.C. electrical systems remains the same between the proposed requirements and the RTS.

   The PTP D.C. system requires 3 of 4 D.C. busses (and associated chargers) to be operable to perform its accident functions. RTS (existing system) require chargers 3B, 4A and 4S to be OPERABLE (at all times) and 2 of 3 chargers 3A, 3S and 4B to be OPERABLE for the plant to not be in an ACTION statement (Note: Table 3.8.1 matrix of the RTS shows these conditions)....[o]perator action is still required to align the swing charger 3S to either the 4A or 3B D.C. bus so that 3 D.C. busses are energized via the chargers....

   For the new system, the proposed TS require a select 4 of 8 chargers to be OPERABLE. The new design of the Enhanced EPS, eliminates the .... condition where failure of the 3A or 4B battery/bus results in the condition of two D.C. busses being without a battery charger....

   Thus, the new design does not rely on [o]perator action and its reliability is... greater than the existing when the minimum equipment required by the LCO is satisfied.....

The staff agrees with the licensee's conclusion that there are no significant hazards considerations, with the following comments. The addition of one more battery bank and two battery chargers provides increased reliability of D.C. power supplies at the plant. Because D.C. power supplies provide power for equipment to prevent and mitigate accidents, there is no increase in the probability or consequences of an accident; rather, the probability of an accident is expected to be reduced. The consequences of an accident will not be increased and, depending on the accident scenario, the consequences could be reduced because of the added D.C. power capability. No new or different kind of accident is created because the changes add more safety equipment of a type that already exists at the plant. The added reliability of D.C. power supplies will enhance safety margins.

The staff further concludes that, throughout the amendment request, where EPS enhancement changes are proposed, there are no significant hazards considerations.

<u>Category 2 - Administrative Changes</u>

The proposed administrative changes to the TS include editorial changes, reformatting, and changes for consistency.

Examples of administrative changes are evaluated by the licensee beginning on page 21 of its NSHE in the context of TS 3/4.8.1.1 (A.C. Sources - Operating), Limiting Condition for Operation. The licensee has addressed the three criteria of 10 CFR 50.92(c) and determined that they are satisfied. The licensee's evaluation follows.

The LCO has been reformatted (items b and c) to enhance consistency with the STS by combining all requirements to assure EDG OPERABILITY in one LCO (new 3.8.1.1b). A new associated footnote was added to this LCO to ensure that if one or more of the four EDG's is out-of-service that compliances with Technical Specifications 3.5.2 and 3.8.2.1 is reviewed. This administrative change also includes the consolidation of the EDG support requirements by adding the MCCs required to power each EDG's auxiliaries. Also, the rating of the startup transformers was deleted to enhance consistency with the STS and since this information was not pertinent to the LCO.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated. The reformatting including the new associated footnote is intended to make the TS easier to use for plant operations personnel. The addition of the MCC requirements with this LCO consolidates the OPERABILITY requirements of the EDGs. The consolidation of the EDG OPERABILITY requirements into one item improves the TS organization.

   The transformer rating is FSAR design data that is not required by the reactor operators or other personnel by whom the TS are used. There are only two startup transformers at PTP and the removal of the nameplate rating will not affect identification of the startup transformers.

   The above changes have not resulted in any new plant operating requirements. No accident initiating events are affected. These administrative changes do not affect the probability of the occurrence or the consequences of an accident.

2. Based on the above discussion it can also be concluded that operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated. No new types of equipment are added by this change. The proposed change introduces no basic changes in operation or new modes of operation. The changes are administrative only.

3. Based on the above discussion it can also be concluded that operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. The changes only enhance the TS by deleting unnecessary information, consolidating requirements, and providing an additional reminder note resulting in improved TS organization and clarity.

The staff agrees with the licensee's evaluation and conclusion that there are no significant hazards considerations. The staff further concludes that there are no significant hazards considerations associated with administrative changes throughout the amendment request.

Category 3 - Requirements Which are More Restrictive

Examples of proposed changes in requirements which are more restrictive than those currently licensed are described below. These examples include changes to frequency of verifying operability and changes in surveillance requirements.

Example 1 - Verification of Startup Transformer Operability.

Technical Specification 3/4.8.1 (pages 3/4 8-1 and 8-2 of Attachment 2 of the July 2, 1990 amendment request) describes proposed requirements for operability of A.C. power sources. For example, the present TS 3/4 8.1 (License Amendment 137 and 132, issued August 28, 1990) requires that, if one of two startup transformers, an associated circuit or a required EDG is inoperable, the remaining startup transformer(s) be demonstrated operable within 24 hours. The licensee proposes increasing the frequency of verification from 24 to 8 hours for the operable startup transformers. This proposed time limit is consistent with the STS.

In the licensee's no significant hazards evaluation, Attachment 1 of the July 2, 1990 amendment request, pages 25 and 26, the licensee evaluated more restrictive changes, including startup transformer operability verification frequency in accordance with the three standards of 10 CFR 50.92 and concluded that the changes do not involve a significant hazards consideration. The licensee's evaluation follows.

> The frequency for verification of OPERABILITY of the OPERABLE startup transformers as required by ACTIONs "a", "b" and existing "d" and "e", has been increased from once every 24 hours to once every eight hours. The allowable time to reduce power to less than or equal to 30% in ACTION "a" has been reduced from 30 hours to 24 hours. If power is not reduced to less than or equal to 30% within 24 hours, the associated unit must be shut down within the next 54 hours if the startup transformer remains inoperable. This provision is incorporated into ACTIONs "a" and the new "e". The existing TS allows continued operation at a maximum of 30% reactor power for 30 days before requiring shutdown. Also in ACTIONs "b" and new "f", the number of hours for reaching hot shutdown has been reduced from twelve hours to six hours.
>
> 1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated. The increase in the surveillance of the startup transformer(s) is more restrictive than the existing requirements. This change will provide added assurance that the OPERABLE startup transformer(s) is (are) available to perform its (their) function, if needed. The reduction in the time for reducing power on the loss of a startup transformer will result in the plant being in a low power, stable condition sooner than required in the existing TS. Because

these requirements are more restrictive than the existing requirements, the probability of an accident and its consequences are reduced. The reduction in the time allowed to reach hot shutdown from twelve hours to six hours is a direct result of the elimination of the dual unit shutdown requirement (see discussion below on deletions). This change makes this time period consistent with the rest of the TS when only a single unit shutdown is required and is more restrictive than before.

The requirement to restore an inoperable startup transformer within 72 hours following loss of an associated startup transformer with no compensatory ACTIONs (i.e., reduction of reactor power to less than or equal to 30%) reduces the AOT from 30 days to 72 hours. This new AOT for the startup transformers is consistent with the STS and NRC guidelines. This AOT change reduces the likelihood of an accident (LOOP) being initiated with the reactor at power. Therefore, this proposed change would reduce the probability of a previously evaluated accident.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any previously evaluated. The proposed change introduces no basic changes in operation or new modes of operation.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. The margin of safety would be enhanced because the plant operators would take compensatory ACTIONs sooner and additional assurance of equipment OPERABILITY would be provided. Also, the startup transformers are not required for mitigation of a design basis accident. While offsite power, via the startup transformer, is normally utilized during plant shutdown, PTP has the capability of maintaining stable conditions assuming a reactor trip with no offsite power available.

The staff adds the following clarification of the first paragraph of the licensee's above evaluation. In ACTION "a", if power is not reduced to less than or equal to 30% within 24 hours, the associated unit must be in HOT STANDBY (Mode 3), as opposed to shutdown, within 54 hours and COLD SHUTDOWN within the following 30 hours. Also, in the last paragraph of item 1, above, the licensee has referred to LOOP (loss of offsite power) as an accident. The staff does not consider LOOP, by itself, to be an accident.

The staff agrees with the licensee's conclusion that more frequent verification of transformer operability is a more restrictive requirement, and that the three criteria of 10 CFR 50.92 are satisfied and there are no significant hazards considerations.

Example 2 - Verification of Diesel Generator Operability

Technical Specification 4.8.1.1.2 (pages 3/4 8-4 through 8-6 of Attachment 2 of the July 2, 1990 amendment request) adds requirements to verify the inventory, quality, and availability of EDG lubricating oil in storage, as well as verifying certain other EDG test and operability requirements. For example, the licensee added a requirement to check lubricating oil in storage because the Unit 3 EDGs require the addition of lubricating oil after 3 days of operation. Verifying the inventory, quality, and availability of lubricating oil in storage provides assurance that an EDG can operate for a minimum of 7 days as required. In the licensee's no significant hazards evaluation, Attachment 1 of the July 2, 1990 amendment request, pages 36 and 37, the licensee evaluated more restrictive changes to Section 4.8.1.1.2 of the Technical Specifications in accordance with the three standards of 10 CFR 50.92 and concluded that the changes do not involve a significant hazards consideration. The licensee's evaluation follows.

> The following new restrictions are proposed: Surveillance 4.8.1.1.2a.3) requires verification of lubricating oil inventory in storage. Surveillance 4.8.1.1.2a.5 requires verification [of] automatic transfer of fuel from the day tank to the skid-mounted tank on Unit 3. Surveillance 4.8.1.1.2c through f are added in their entirety to add requirements concerning the EDG fuel oil. These requirements include, at least once per 31 days, checking for and removing accumulated water from the fuel oil storage and day tanks (Units 3 & 4) and the skid-mounted fuel tanks (Unit 3). Also, at least once per 31 days obtaining a sample from the fuel oil storage tank and verifying that the total particulate contamination is less than 10mg/liter when checked in accordance with the applicable industry standard. In addition, requirements are included to test new fuel oil in accordance with the applicable industry standards for items such as appearance, flash point, viscosity, and API Gravity. These requirements replace the current requirement to at least once per 92 days verify a sample of fuel oil is within acceptable limits for viscosity, water and sediment (4.8.1.1.2b in the RTS). In Surveillance 4.8.1.1.2a.4), 2d.1)a, 2d.4), and 2e, the voltage tolerance of ±624 volts is reduced to ±420 volts. Table 4.8-1, "DIESEL GENERATOR TEST SCHEDULE", is modified to add testing frequency requirements associated with the number of failures in the last 100 valid tests. This included deleting the word "valid" in the footnotes for Table 4.8-1. Also, the word "prior" before "NRC" in the first footnote of Table 4.8-1 is deleted. These Table 4.8-1 changes enhance conformance to the STS. In Surveillance Requirement 4.8.1.1.2g.7 (4.8.1.1.2d.5 in the RTS), the test duration is extended from 8 hours to 24 hours of EDG operation (this extension provides enhanced consistency with the STS). Surveillance Requirement 4.8.1.1.2g.10 verifies that a Safety Injection signal overrides an EDG operating in the test mode. Surveillance Requirement 4.8.1.1.2g.12 verifies OPERABILITY of the automatic load sequence timer. Surveillance Requirement 4.8.1.1.2g.13 verifies proper operation of the EDG lockout relay. Finally, Surveillance Requirement 4.8.1.1.2i specifies a pressure test of the Unit 4 (only) diesel fuel oil system designed to ASME Section III, Subsection ND. This surveillance requirement also specifies a drain-down and cleaning of each EDG fuel oil storage tank to ensure a reliable source of high quality fuel.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated. The additional surveillance will have no impact on the probability of an accident since EDGs are not initiators of FSAR analyzed Design Basis Accidents (DBAs). Extending the duration of EDG operation during testing, and adding the additional surveillance requirements to verify lube oil storage inventory, verify Unit 3 automatic fuel transfer to the skid mounted tank, and checking and analyzing diesel fuel oil serve to provide increased confidence that the EDGs will function as designed. The tightening of the tolerance allowed for the voltage provided by the EDG is more restrictive and will provide added assurance that the equipment powered by the EDGs can function as designed. The addition of testing frequency requirements associated with the number of failures in the last 100 valid tests provides increased confidence of EDG OPERABILITY by requiring an increased testing frequency due to the total number of failures in the last 100 valid tests instead of just the last 20. The required tests to ensure that a Safety Injection signal overrides the EDG test mode circuitry; the automatic load sequence time operates per design; and the EDG lockout relay prevents EDG starts, all verify that the control circuitry of the EDGs operate properly. This provides greater confidence that the EDGs will operate, as designed, to power required accident loads. Finally, the new Unit 4 EDG fuel oil system pressure test verifies the integrity of this required system and reduces the probability of EDG failure due to fuel starvation during a design accident. Thus, there will be no increase in accident consequences.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated. The proposed change introduces no basic changes in operation or new modes of operation.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. The proposed change would enhance the margin of safety by reducing the possibility of an EDG failure due to contaminated fuel or fuel starvation, ensuring an adequate supply of lube oil for an extended EDG run, ensuring proper operation of the EDG control circuits, ensuring a voltage well within the design tolerance of the required electrical equipment, providing increased confidence of EDG reliability by requiring increased EDG testing due to the total number of failures in the last 100 valid tests, and by lengthening the EDG run test from 8 to 24 hours which provides added assurance the EDG will function as designed.

The staff agrees with the licensee's conclusion that there are no significant hazards considerations associated with these added and more restrictive requirements. The added requirements improve surveillance and alert operators to problems sooner. Therefore, the three criteria of 10 CFR 50.92 are met. Futhermore, throughout the amendment request where additional or more restrictive requirements are imposed, the staff concludes there are no significant hazards considerations.

Category 4 - Changes that Relax Requirements

Relaxations are changes which result in reduced requirements, but not a significant reduction in safety. Examples of relaxations are described below.

Example 1 - Testing of Diesel Generators

The licensee has proposed a change to Technical Specifications 3.8.1.1.b and c (pages 3/4 8-2 and 3/4 8-3 of Attachment 2 of the July 2, 1990 amendment request) whereby if an EDG is intentionally made inoperable due to pre-planned maintenance or testing, special testing of the remaining EDGs is not required. In Attachment 1 of the amendment request, pages 26 and 27, the licensee evaluated the proposed changes against the three standards of 10 CFR 50.92 and concluded there are no significant hazards considerations. The licensee's evaluation is reproduced below.

> In ACTIONs "b" and "c" an exception to the requirement to demonstrate the OPERABILITY of the remaining required EDGs is added for the case when the EDG became inoperable because of preplanned preventative maintenance or testing.
>
> 1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated. Consistent with the STS and current NRC guidance, testing of the redundant (i.e., remaining required EDGs) EDGs are to be performed after any failure or any problem which renders the EDG inoperable. The purpose of this testing is to demonstrate that the redundant EDGs have not been degraded by a similar problem. When an EDG is intentionally taken out of service, the above concern does not exist. Therefore, it is acceptable to provide an exemption to this testing when an EDG is taken out of service for preplanned preventive maintenance or testing. Reducing the number of unnecessary EDG tests is in accordance with Generic Letter 84-15 and current NRC guidance. Since the EDGs are not initiators of FSAR analyzed accidents and this change serves to enhance EDG reliability, there is no increase in the probability or consequences of a previously analyzed accident.
>
> 2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated. The change only affects the number of times an EDG OPERABILITY demonstration may be performed. The proposed change introduces no basic changes in operation or new modes of operation.
>
> 3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of

safety. This change serves to enhance EDG reliability by reducing the number of unnecessary EDG tests which minimizes EDG wear.

The staff agrees with the licensee's evaluation and concludes that the three criteria of 10 CFR 50.92 are satisfied and that there are no significant hazards considerations.

Example 2 - Battery Pilot Cell Surveillance

The licensee has proposed relaxing the surveillance interval for the station battery pilot cell specific gravity surveillance (TS 4.8.2.1.a, page 3/4 8-14 of Attachment 2 of the July 2, 1990 amendment request) from once per 24 hours to once per 7 days. The proposed surveillance interval is consistent with the STS. In Attachment 1 of the amendment request, pages 58 and 59, the licensee evaluated this proposed change against the three standards of 10 CFR 50.92 and concluded there are no significant hazards considerations. The licensee's evaluation is reproduced below.

The required surveillance (4.8.2.1a) frequency for verifying the pilot cell specific gravity for each 125 volt battery bank is reduced from once per 24 hours to once per 7 days. The revised surveillance frequency conforms to the requirements of the STS.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated. Since PTP received its operating license in the early 1970's, industry experience on nuclear safety-related 125 volt battery banks, as concluded in IEEE 450, has determined that a rapid drop in pilot cell specific gravity during a 7 day period is highly unlikely. For this reason, the NRC has specified a 7 day surveillance frequency for 125 volt battery bank pilot cell specific gravity in the STS. The 24 hour surveillance requirement is inconsistent with present NRC guidelines.

   Since IEEE 450 has determined that a 7 day surveillance frequency is acceptable for pilot cell specific gravity, it is concluded that this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated. No new types of equipment are added by this change. The proposed change introduces no basic changes in operation or new modes of operation.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. Based on the above discussion, IEEE 450 and NRC guidance indicates that a 7 day surveillance frequency versus a 24 hour surveillance frequency does not significantly reduce the margin of safety.

The staff agrees with the licensee's evaluation and conclusions. The staff also notes that in footnote 1 of Table 4.8-2 of the proposed TS (page 3/4 8-16 of Attachment 2 of the July 2, 1990 amendment request), the failure of a Category A parameter, such as pilot cell specific gravity, to be within the TS limits is not sufficient to indicate an inoperable battery. Instead, it is an early indication that the battery is potentially trending towards inoperability.

The staff concludes that the three criteria of 10 CFR 50.92 have been met and there are no significant hazards considerations.

Example 3 - Diesel Generator Testing

In another example, described on pages 32-35 of Attachment 1 of the July 2 amendment request, the licensee has provided a lengthy and detailed evaluation of certain EPS enhancement changes and administrative changes related to testing of the EDGs. Among these changes, the test loading for the Unit 3 EDGs has been relaxed from 2500kw to permit a test load band of 2300-2500kw. A new and higher test load band is specified for the two new EDG's of Unit 4. In addition, the proposed test procedure permits warming the EDGs with gradual loading instead of cold, fast test starts. The technical basis for these relaxations was described in more detail in the staff's Generic Letter 84-15. Basically, it was to reduce stress and wear on the engine that accompanies cold, fast test starts, and which could lower the reliability of the EDGs. The staff agrees with the licensee's evaluation and conclusions regarding these changes, but would characterize the changes as relaxations rather than EPS enhancements or administrative changes.

Throughout the proposed TS, where relaxations have been proposed by the licensee, the staff concludes that the proposed changes involve no significant hazards considerations.

Category 5 - Deletions

The licensee has identified TS requirements that are to be deleted. Generally, these deletions are a natural result of the design changes associated with the Emergency Power System upgrade. In a few cases the deletions are made to complete the conversion to STS, which are based on significantly more operating experience than were the original plant custom TS. Examples of deletions are described below.

Example 1 - Operability Requirement for Cranking Diesel Generators

The licensed Technical Specifications (TS 3/4.8.1, pages 3/4 8-1 through 3/4 8-7 of Amendments 137 and 132 issued August 28, 1990) require that, with one startup transformer inoperable or one startup transformer and one EDG inoperable, two cranking diesel generators be demonstrated operable. This requirement is intended to provide an additional non-safety grade source of power to assist in the safe shutdown of the unit without its associated startup transformer, if required. Implementation of the EPS enhancement project will add two safety-grade EDGs to the plant with capability for cross-connect between units, replacing the need to have two cranking EDGs operable as backup to the safety EDGs or startup transformer. The EPS design eliminates this requirement with better design based on safety-grade EDGs.

In Attachment 1 of the July 2, 1990 amendment request, pages 27 through 30 and on page 40, the licensee presented a lengthy and detailed evaluation of this change against the three standards of 10 CFR 50.92 and determined there is no significant hazards consideration associated with this change. The staff's evaluation is provided below.

In the current design, Turkey Point has two safety-grade EDGs, with any two out of five non-safety cranking diesels available as backup. In the proposed design, the plant will have four safety-grade EDGs with the non-safety cranking diesels available as backup. The two additional safety EDGs will have a complete set of TS, and thus replace the cranking diesels with higher capability and more reliable equipment. The cranking diesels will be maintained and available as a backup power source. In addition, a requirement for surveillance of the cranking diesels every 18 months is imposed on page 3/4 7-11 of the licensed TS. However, it is no longer necessary for the TS to require a demonstration of operability of the cranking diesels when a safety EDG and/or startup transformer is inoperable. The deletion of this requirement is more than compensated for by the two additional safety EDGs which are required to be operable as described in the proposed TS.

The proposed change does not involve a signficant increase in the probability or consequences of an accident previously evaluated because deletion of the requirement to demonstrate operability of cranking diesel generators is more than compensated for by the new requirement to demonstrate operability of the additional safety EDGs, as stated in LCO 3.8.1.1.b and in ACTION b of proposed TS 3.8.1.1 on pages 3/4 8-1 and 8-2 of Attachment 2 of the July 2, 1990 amendment request. The proposed change does not create the possibility of a new or different kind of accident because the cranking diesels will still be maintained and available and because no change in potential accident initiators has occurred. The addition of two safety-grade EDGs helps to make the plant safer and provide added protection. The proposed change does not involve a significant reduction in a margin of safety because the added safety EDGs provide additional safety margin. In addition, the cranking diesels will still be available.

Therefore, the staff concludes that there are no significant hazards considerations associated with deleting the TS requirement to demonstrate operability of the cranking diesels when a safety EDG and/or startup transformer is inoperable.

Example 2 - Surveillance of D.C. Power Sources

The licensee proposes to delete certain DC power surveillances as described on pages 59 and 60 of Attachment 1 of the July 2, 1990 amendment request. The licensee's decription of the proposed changes and no significant hazards evaluation follows.

> Surveillances 4.8.2.1c and e have been deleted. Surveillances 4.8.2.1c required rotating the pilot cell and checking water level every 31 days. This surveillance requirement is a maintenance activity only and does not verify battery OPERABILITY. Surveillance 4.8.2.1e required

performance of a battery charger visual inspection quarterly. This surveillance requirement is a preventive maintenance activity and does not verify battery charger OPERABILITY. Also, the requirement to verify a battery equalizing charge is started, found in Notes 1 and 2 of Table 4.8-2, has been deleted.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated. Surveillances 4.8.2.1c and e are maintenance activities only. NRC guidance indicates that the above deleted surveillance requirements are not required to verify OPERABILITY of this equipment. The latest STS do not contain these surveillance requirements. Instead, Surveillance 4.8.2.1a contains a requirement to verify pilot cell electrolyte level weekly. Also, the requirement in Table 4.8-2, Notes 1 and 2, to start an equalizing charge when a battery's cell does not comply with the category A and B limits of the table, is not included in STS. An equalizing charge will be applied, as needed.

   Therefore, based on the above discussion, the probability or consequences of a previously evaluated accident is not significantly increased.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or a different kind of accident from any accident previously evaluated. No new types of equipment are added by this change. The proposed change introduces no basic changes in operation or new modes of operation. They only delete extraneous surveillance requirements that are not contained in the STS.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. The deleted surveillance requirements (4.8.2.1c and e) are preventive maintenance items only. Failure to perform Surveillance 4.8.2.1c will have no effect on the margin of safety because Surveillance 4.8.2.1a, which is performed more frequently then Surveillance 4.8.2.1c (weekly versus monthly), verifies redundant pilot cell requirements. The Surveillance 4.8.2.1e deletion does not significantly affect the margin of safety because its required inspection of the battery chargers does not determine if this equipment is OPERABLE or not. Finally, deletion of the requirement to verify that an equalizing charge is started in Notes 1 and 2 of Table 4.8-2 has no affect on the margin of safety, because the OPERABILITY requirements of the batteries are determined by the battery parameter limits of Table 4.8-2. An equalizing charge will be applied as needed, to conform with the OPERABILITY requirements.

The staff notes that comprehensive surveillance requirements for D.C. power sources are provided in the proposed TS on pages 3/4 8-14 through 8-18 of Attachment 2 of the July 2, 1990 amendment request. In particular, requirements for important battery parameters are shown in Table 4.8-2 on page 3/4 8-16. The staff agrees with the licensee's evaluation and conclusions and concludes that the three criteria of 10 CFR 50.92 have been met and there are no significant hazards considerations involved in deleting the surveillance requirements described above.

The staff also concludes that, throughout the amendment request, where deletions are proposed, there are no significant hazards considerations involved.

The staff has treated the statements made in the intervention petition of the Nuclear Energy Accountability Project and Thomas J. Saporito, Jr., dated October 25, 1990, as comments on the staff's proposed no significant hazards determination. The petition included seven contentions, and their effect on the staff's no significant hazards determination is discussed below as public comments.

Comment 1 is that the proposed license amendments "are a major Federal action significantly affecting the quality of the human environment and therefore require an environmental impact statement."

Section 9.0 of this report notes that categorical exclusion is appropriate under 10 CFR 51.22(c)(9) and (10), and that no environmental impact statement is needed. Therefore, this comment has no effect on the staff's no significant hazards determination.

Comment 2 states that "the license and regulatory actions subject to the applicant's license amendment requests require an environmental assessment."

However, Section 9.0 of this report concludes that categorical exclusion is appropriate under 10 CFR 51.22(c)(9) and (10), and therefore no environmental assessment or environmental impact statement need be prepared. Therefore, this comment has no effect on the staff's no significant hazards determination.

Comment 3 states that "The Applicant failed to address the alternate AC intertie in their Technical Specifications. The failure of this intertie to operate properly when challenged could result in a serious nuclear accident releasing fission products into the environment because the Applicant cannot ensure the operability of the necessary Station Blackout equipment."

The U.S. Nuclear Regulatory Commission has not required that station blackout equipment be included in the Technical Specifications. Station blackout requirements are addressed elsewhere. Specifically, on July 21, 1988, the Code of Federal Regulations, 10 CFR Part 50, was amended to include a new section 50.63, entitled "Loss of All Alternating Current Power" (Station Blackout). The station blackout (SBO) rule requires that each light-water-cooled nuclear power plant be able to withstand and recover from an SBO of a specified duration. The SBO rule also requires licensees to submit information as defined in part 50.63 and to provide a plan and schedule for conformance to the SBO rule. The SBO rule further requires that the baseline assumptions, analyses and related information be available for NRC review. Guidance for conformance to the SBO rule is provided by Regulatory Guide (RG) 1.155, Station Blackout, and NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors."

Florida Power and Light's response to the SBO rule was provided by a letter (L-89-144) from W. F. Conway to the U. S. Nuclear Regulatory Commission, dated April 17, 1989. On June 15, 1990 the NRC staff issued a Safety Evaluation Report (SER) titled, "Safety Evaluation by the Office of Nuclear Reactor Regulation, Florida Power and Light Company, Turkey Point Units 3 and 4, Compliance with Station Blackout Rule 10 CFR 50.63, Docket Nos. 50-250 and 50-251." The NRC staff's SER covers "Quality Assurance and Technical Specifications" in Section 2.6, which states:

> "The licensee has committed to incorporate equipment used to cope with an SBO and not covered by current QA programs into a QA program that meets the guidance of RG 1.155, Appendix A. The staff finds this to be acceptable.
>
> The TS for the SBO equipment are currently being considered generically by the NRC in the context of the Technical Specifications Improvement Program. However, the staff understands that the plant procedures will reflect the appropriate testing and surveillance requirements to ensure the operability of the necessary SBO equipment. If the staff later determines that TS regarding the SBO equipment are warranted, the licensee will be notified of the implementation requirements."

Therefore, the Turkey Point 3 and 4 plant procedures will reflect the appropriate testing and surveillance requirements to ensure the operability of the necessary SBO equipment, and the licensee is in compliance with the Commission's regulations regarding TS for SBO. Comment 3 does not affect the staff's no significant hazards determination.

Comment 4 states that "The Applicant's amendment request would relax existing plant safety margins at TS 3/4.8.1.1 AC SOURCES - OPERATING which currently require the testing of the redundant Emergency Diesel Generators after any failure or any problem which renders the EDG inoperable."

Two numbered items are presented as the basis for Comment 4:

> "1. The current requirement to test the redundant EDG(s) after any failure or any problem which renders the EDG inoperable is to demonstrate that the redundant EDG(s) are, in fact, fully operational and free from any similar problem or any new problem which may have been created as a direct or indirect result of the repair to the failed EDG.
>
> 2. Therefore, it is not acceptable to provide an exemption to this testing when an EDG is taken out of service for preplanned preventive maintenance or testing. Since EDG(s) are essential safety equipment required to mitigate a serious nuclear accident, there is an increase in the probability of a previously analyzed accident."

There is no relaxation of the TS-required testing to assure reliability of EDGs to start and operate free from defects and new problems. This program is described in Table 4.8-1 of the proposed (and the presently-licensed) TS and is based on Regulatory Guide 1.108. This testing could be as frequent as weekly depending on the EDG failure rate. Therefore, this testing assures reliability of the EDGs.

However, if an EDG fails to start, special testing of the redundant EDGs is required to check for common cause failure. The sole reason for such a test is to confirm the absence of common cause failure. Clearly, if a diesel generator is taken out of service for preplanned preventive maintenance or testing, the reason for the inoperability is well known, and it is, therefore, not necessary to test (start) the redundant diesel generator to see if it is inoperable because of a common cause failure mechanism.

Furthermore, the NRC staff issued Generic Letter 84-15 that recommends a reduction of unnecessary testing of EDGs. Deleting the requirement to test (start) the redundant diesel generator when an EDG is taken out of service for preplanned preventive maintenance or testing is in accordance with this Generic Letter and in the interest of safety.

Based on the above, comment 4 does not affect the staff's no significant hazards determination.

Comment 5 states that "As evidenced at page 27 of the Applicant's NSHE, TS 3/4.8.1.1 AC SOURCES - OPERATING provides for a deletion." Comment 5 then lists five deletions, here numbered 5a - 5e. Below, each deletion is stated in the petitioners' words, and the staff's response follows each statement.

5a. "Verification of the cranking diesel generator OPERABILITY has been removed from ACTIONS "a" and "d"."

With the addition of two new emergency diesel generators at Turkey Point, the importance of the cranking diesel generators to plant safety at Turkey Point will be greatly reduced. Before the electrical enhancement at Turkey Point, the cranking diesels served as a backup or alternate source of ac electrical power. However, the two additional emergency diesel generators will fulfill the role as the primary onsite ac electrical power source. Thus, it is now the EDGs that have to be verified OPERABLE upon the loss of an ac source (old ACTIONs a and d for an offsite circuit and a diesel generator, respectively), not the cranking diesel generators.

Note, however, that the cranking diesel generators have not been completely removed from the TS. Surveillance Requirement 4.7.1.6.3 requires that at least once per 18 months, the licensee will verify operability of the respective standby feedwater pump by powering it from the non-safety grade cranking diesel generators. This surveillance is sufficient, considering the reduced importance of the cranking diesel generators in the new Turkey Point design. In addition, during 1989 and 1990, the licensee completely refurbished the five cranking diesels. The licensee has committed to maintain these diesels in good condition through its own maintenance and surveillance procedures.

5b. "The requirement to repeat EDG OPERABILITY demonstrations on a 24 hour frequency.... is deleted...."

As discussed in the staff's response to comment 4, the sole reason for testing (starting) the redundant diesel generator is to determine the absence of a common cause for the other diesel generators inoperability. It is clear that if the redundant diesel generator starts and runs one time, it has not suffered a common cause failure. Therefore, additional starts every 24 hours are unnecessary. This position is consistent with Generic Letter 84-15 and in the interest of safety.

5c. "The requirement ... to verify compliance with LCO 3.8.2.1 .... is deleted..."

This claim is not correct. The specific requirement to verify compliance with LCO 3.8.2.1 is redundant. The requirement is retained in the new ACTION "d" to verify the OPERABILITY of all required systems, subsystems, trains, components, and devices that depend on the remaining OPERABLE EDGs. This requirement will provide assurance that the dc sources of LCO 3.8.2.1 will function in accordance with their design. Since this requirement will be retained, this portion of the comment is incorrect.

5d. "The requirement .... to implement a dual unit shutdown is deleted from ACTIONS "b" and "d"."

The addition of two new diesel generators at Turkey Point has changed the design basis of the plant. In the existing (old) design, both existing EDGS were required for single unit or dual unit operation, which results in both units being impacted simultaneously on the loss of an EDG. Under the new design with four diesel generators, only three diesel generators (two associated with the operating unit and one from the opposite unit) are required for single unit operation. When both units are at power, all four diesel generators must be OPERABLE.

When both units are at power, which is the only operating configuration where a dual unit shutdown would be of concern, loss of one diesel generator (old ACTION b) only impacts the unit associated with the inoperable diesel generator (assuming all other TS requirements for the opposite unit are satisfied). The opposite unit is still in compliance with its LCOs so that a dual unit shutdown is not justified.

The condition described in old ACTION "d" (i.e., one diesel generator and one startup transformer inoperable) is not applicable to both units simultaneously, because the loss of an EDG only affects one unit. Therefore, for the condition of one inoperable diesel generator and one inoperable startup transformer, only the unit with the associated inoperable diesel generator would enter the action for one diesel generator and one startup transformer inoperable. The other unit would enter the ACTION for an inoperable startup transformer only.

5e. "The dual unit shutdown requirement in ACTION "c", which addresses the inoperability of a EDG due to the performance of Surveillance Requirement 4.8.1.1.2c, is deleted in its entirety. This deletion is a relaxation of an existing plant safety margin and therefore should not be permitted."

There appears to be a misunderstanding of the new design basis of Turkey Point as compared to the old design basis. In the old design basis, there were only two diesel generators, and each diesel was completely shared between the two units. Therefore, old ACTION c was required so that the old Surveillance Requirement 4.8.1.1.2c could be performed on one of the diesel generators with one of the units that depended on that diesel generator at power.

In the new design, only 3 out of the 4 EDGs are required for one reactor unit to operate. Therefore, the surveillance requirement for which old ACTION c was written can be performed on the fourth diesel while shutting down only one reactor unit.

The only ACTION remaining in this TS for the loss of a required EDG is a 72 hour allowed outage time in the new TS, as compared to a 7-day allowed outage time in the old TS. This is more restrictive, and thus is it not correct to say that a margin of safety has been relaxed.

Comment 5 also presents two numbered paragraphs as its basis. The first paragraph states that "The elimination of a dual unit shutdown, where appropriate, involves a reduction in the margin of safety of plant operation." As discussed above in 5d and 5e, this is incorrect because no appropriate dual unit shutdowns have been eliminated. The second paragraph states that "operation of the facility in accordance with the proposed amendment would involve a significant reduction in a margin of safety. The cranking diesels will remain electrically connected with the plants safety systems and therefore this equipment should not be deleted from TS." As explained in 5a above, this is also incorrect. In the new design, the cranking diesels are no longer needed as a backup for EDGs. The cranking diesels, however, will be retained and provide an extra source of ac power if needed. The cranking diesels are demonstrated OPERABLE by Surveillance Requirement 4.7.1.6.3. The primary source of onsite emergency ac power is the EDGs, which will be subject to normal diesel generator surveillances. Since the effect of this amendment request is to add two entirely new sources of emergency ac power (diesel generators) with full TS, as well as to keep the cranking diesel generators, it is not correct to state that a margin of safety has been reduced.

Therefore, based on the discussion above, the staff concludes that comment 5 does not affect the staff's no significant hazards determination.

Comment 6 states that "As evidenced in the Applicant's NSHE at page 37, a relaxation of existing plant safety margin will be incorporated in the TS 3/4.8.1.1 AC SOURCES - OPERATIONS. Relaxations - Surveillance 4.8.1.1.2a.3 which required verification that a fuel transfer pump started and transferred fuel from the storage tank to the day tank in accordance with the frequency of Table 4.8-1 is revised and renumbered as 4.8.1.1.2b. This revised version requires a demonstration on a 92 day frequency with an automatic start."

The basis for Comment 6 states that, "The intent of this surveillance is to ensure that the fuel transfer system will function as designed by automatically transferring fuel from the storage tank to the day tank when a predetermined low level is reached in the day tank. The system is designed to automatically maintain an adequate fuel supply to the EDG during extended operation."

The basis for Comment 6 continues, "The most important aspect of this surveillance is the frequency of testing to ensure proper operability of the automatic function of the design and to ensure a proper fuel supply in the day tank. Therefore, the frequency of testing should remain unchanged and the length of the EDG test run should be increased to permit the functional testing of the automatic design feature of the system."

The comment here seems to focus on what is the proper frequency of testing of the automatic start feature of the fuel transfer pumps. Note that the old TS did not require testing of the automatic start feature at all. It did require starting of the transfer pump at a frequency in accordance with Table 4.8-1 (either 7 days or 31 days), but that start could be a manual start. In actual practice, nearly all transfer pump starts were manual and did not test the automatic start feature. The EDG fuel transfer pumps were started manually on a daily basis. The new TS require automatic start testing while the old TS did not. Therefore, the new TS are not a relaxation but are more restrictive as far as testing of the automatic start feature is concerned. The licensee has indicated that, in addition to the new automatic start test, manual testing on a daily basis will continue.

The comment that "the frequency of testing should remain unchanged and the length of the EDG test run should be increased to permit the functional testing of the automatic design feature of the system" is not supported. Such an approach would require many unnecessary hours of diesel generator operation. Furthermore, such an approach would be in conflict with the guidance of Generic Letter 84-15, which recommends a reduction in unnecessary diesel generator operation in the interest of safety.

Therefore, based on the discussion above, the staff concludes that comment 6 does not affect the staff's no significant hazards determination.

Comment 7 can be divided into three parts, here labelled 7a, 7b, and 7c. Below, each part is presented in the petitioners' words, and the staff's response follows each part.

Comment 7a states that "Surveillance 4.8.2.1c ... has been deleted. Surveillances 4.8.2.1c required rotating the pilot cell and checking water level every 31 days."

New surveillance requirement 4.8.2.1a contains a requirement to check the electrolyte level (i.e., water level) in the pilot cells weekly. Therefore, the new surveillance is more restrictive than the old surveillance that was deleted. The choice of pilot cells, and the frequency with which they are rotated, is a decision that is best left to the battery manufacturers and the utility. Proper choice and rotating of the pilot cells is a part of a good maintenance plan. Note that the pilot cells are checked to verify that Category A parameters are met. Failure of a battery to meet Category A parameters does not necessarily mean that a battery is inoperable. Instead, it is an early indication that the battery is potentially trending toward inoperability. Category B allowable values in Table 4.8-2 are the basis for operability determinations. For these reasons, most nuclear plant TS do not prescribe how the pilot cells are chosen or rotated. The Standard Technical Specifications (STS), which are the model for the plant-specific TS, do not prescribe how to choose pilot cells or how to rotate them. The deletion of surveillance 4.8.2.1c does not significantly affect the margin of safety because its required rotating of the pilot cells, which are used to determine if Category A parameters are met, does not determine if the batteries are operable or not, and because pilot cell rotation will still be carried out via the licensee's maintenance plan if the battery manufacturer and utility's recommendations are to do so. In actual practice, the licensee's maintenance procedures have provided for monthly rotation of the pilot cells. The licensee has indicated this practice will be continued.

Comment 7b states that "Surveillance 4.8.2.1e [which] required performance of a battery charger visual inspection quarterly ... has been deleted."

Visual inspection does not assure battery charger operability. It is simply part of normal plant maintenance. Battery charger operability is assured by surveillance 4.8.2.1.c4 which requires

> "Each 400 amp battery charger (associated with Battery Banks 3A and 4B) will supply at least 400 amperes at ≥ 129 volts for at least 8 hours, and each 300 amp battery charger (associated with Battery Banks 3B and 4A) will supply at least 300 amperes at ≥ 129 volts for at least 8 hours."

The deletion of surveillance 4.8.2.1e does not significantly affect the margin of safety because its required visual inspection of the battery chargers does not determine if the battery chargers are operable or not. The battery functional tests above provide much better information regarding whether a charger is operable. In actual practice, the licensee's maintenance procedures have provided for visual inspection every 92 days, and the licensee has indicated this will be continued. While visual inspection is being removed from the TS, it will still be done as part of good maintenance practice, but it is unnecessary for determining operability.

Comment 7c states that "the requirement to verify a battery equalizing charge is started, found in Notes 1 and 2 of Table 4.8-2 [of the old TS] has been deleted."

It is not the function of the TS to prescribe when a maintenance procedure should be started. Instead, the battery TS provide surveillances and battery parameter allowable values of Table 4.8-2, which are used to determine battery operability. If operability is not maintained, appropriate actions, such as reduction of power, are required by the TS. It is up to the utility to perform whatever maintenance procedures (including starting of an equalizing charge) that are required to assure battery operability. The margin of safety is not reduced unless a required battery becomes inoperable. The deletion of the requirement to verify that a battery equalizing charge has been started does not significantly affect the margin of safety because its required starting of the equalizing charge does not determine if the batteries are operable or not.

Comment 7 also includes three numbered paragraphs, which present the basis for comment 7. These are discussed below.

The first paragraph states that "The probability or consequences of a previously evaluated accident is significantly increased as a direct result of this TS deletion." It should be noted that, as a part of the Turkey Point electrical enhancement, an entire new spare battery bank has been added, which can substitute for any inoperable battery bank. Furthermore, two additional battery chargers have been added. These additions have increased the reliability of the dc sources at Turkey Point which provide dc power to prevent and mitigate accidents. The improved dc power reliability will not reduce any safety margin and, for the reasons discussed earlier in the response to 7a, b, and c, the TS changes will not significantly increase the probability or consequences of a previously-evaluated accident.

Paragraph 2 of the basis for Comment 7 states that the applicant failed to address any parameters or indicators by which the plant operators would be required to initiate an equalizing charge on the batteries. This is because, as stated above in 7c, it is not the function of TS to prescribe when a maintenance procedure should be started. Rather, TS specify a limiting condition of operation (LCO) and an action to be taken, such as power reduction within a specified time, if the LCO is exceeded. The requirement is on operability, which is determined by parameters described in Table 4.8-2 of the proposed TS.

Paragraph 3 of the basis for Comment 7 states that "[t]he current requirement to rotate the pilot cell and check battery water level every 31 days is essential in ensuring that the batteries are maintained in a satisfactory state of readiness and that they will perform when challenged." As noted earlier, battery water level is now checked weekly (more frequently than in the old TS). The pilot cells are used to monitor Category A parameters in Table 4.8-2 which means the pilot cells are useful for indicating a trend towards potential inoperability. However, failure of the pilot cell parameters to meet Category A limits is not regarded as an essential indicator of inoperability, which is what TS concern themselves with. Instead, the Category B parameter allowable values are used to determine inoperability. Rotation of the pilot cells does not change any parameter limits nor the ability to meet the limits; it is part of the good maintenance practice of a plant operator to preclude a pilot cell from misleading them in trending battery performance.

The licensee has stated that the practice of monthly rotation of the pilot cells will be continued in its maintenance procedures. Therefore, there will be no deletion of pilot cell rotation in practice. However, the maintenance practice of rotating pilot cells does not belong in the TS. Therefore, the battery surveillances in the new Turkey Point TS and the battery cell parameter limits in the new Table 4.8-2 will ensure battery operability.

Based on the discussion above, the staff concludes that comment 7 does not affect the staff's no significant hazards determination.

For all the reasons given above, including those given (above) by the licensee, the staff agrees with the licensee's determination, and therefore has made a final determination that the amendments do not involve a significant hazard consideration.

9.0 ENVIRONMENTAL CONSIDERATION

These amendments involve a change to requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. These amendments also involve changes in recordkeeping, reporting or administrative procedures or requirements. We have determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that these amendments involve no significant hazards consideration, and public comments on that proposed finding have been addressed in the final evaluation of no significant hazards consideration in section 8.0 of this safety evaluation. Accordingly, these amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and (10). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of these amendments.

10.0 CONCLUSION

We have concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Dated: December 28, 1990

11.0 PRINCIPAL CONTRIBUTORS

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