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RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards response to Encl 2 of NRC 801124 ltr re fire water supply & cable spreading room.Fire brigade size & training requirements to be implemented 801119.

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February 4, 1981
L-81-37

Office of Nuclear Reactor Regulation
Attn: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

Re: Turkey Point Units 3 & 4
Docket No. 50-250 & 50-251
FIRE PROTECTION

This letter responds to the "open" items in Enclosure 2 of your November 24, 1980 letter.

The attachment addresses Fire Water Supply (Items 3.1.2 and 3.2.3), Auxiliary Building Corridor (Item 3.2.4), and Cable Spreading Room (Item 3.2.5). We intend to implement the Fire Brigade Size and Training requirements of Section III, paragraphs H and I of Appendix R to 10 CFR 50 published in the Federal Register on November 19, 1980.

We believe that the provisions of the revised Section 10 CFR 50.48 and new Appendix R are adequately satisfied as described in the attachment and as such demonstrate that the public health and safety is properly protected.

Very truly yours,

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/JEM/mrs

Attachments

cc. Mr. James P. O'Reilly, Region II
Harold F. Reis, Esquire

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RESPONSE TO STAFF
SUMMARY OF REQUIREMENTS
TO RESOLVE "OPEN ITEMS"

3.1.2 FIRE WATER SUPPLY

3.2.3

NRC CONCERN:

"In the Fire Protection Safety Evaluation Report, we were concerned about the adequacy of the screen wash pumps as an alternate source of water for fire fighting as well as the ability of the system to provide the water supply for fixed systems.

By letter dated May 7, 1980 the licensee proposed to install a spool piece to interconnect the screen wash pump to the fire protection water system. However, the licensee did not want the spool piece to be permanently connected, because of the possibility of contaminating the domestic water supply, which is connected to the water supply. The licensee also proposed to administratively control the volume of dedicated fire protection water in the gravity tanks and the raw water storage tanks. Because of the high rate of failure, administrative controls, by themselves alone, are not acceptable. We find that the screen wash pumps cannot be considered as an acceptable backup to the fire water supply.

In order to meet the requirements of Section III, Paragraph A, of the proposed Appendix R to 10 CFR 50, the licensee should provide a vertical standpipe for the existing 500,000 gallon raw water storage tank. The licensee should also install a new water storage tank as a secondary source of fire water. An automatic starting diesel fire pump with adequate capacity is required to supply water to the fire loop from the secondary source."

FPL RESPONSE:

Section 8.5.2 of the fire protection report[1] presents the design basis for the fire evaluations. The plant areas analyzed were those considered to be related to safe shutdown capability. Although fire suppression capability is available, no credit was assumed for mitigating the consequences of a design basis fire, i. e., the fire is assumed to burn at its maximum burnout until the available fuel is consumed. The Fire Hazards Analysis concludes that safe shutdown conditions can be achieved and maintained for the postulate design basis fire <u>without</u> the use of the available fire suppression capability.

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[1] FPL's report, "Fire Protection - A Reevaluation of Existing Plant Design Features and Administrative Controls", submitted 2/25/77.

Nonetheless, water for fire suppression is available from two primary sources (as stated in Section 6.1 of report[1].. The gravity tank has a design capability of 100,000 gallons and the raw water storage tank has a design capability of 500,000 gallons. Section 3.14 of the plant technical specifications concerning the Fire Protection System administratively places minimum water volumes to be contained in each of these separate tanks. The gravity tank (elevated storage tank) is specified to have a minimum of 30,000 gallons of water available for fire protection. The raw water storage tank is specified to have a minimum of 150,000 gallons available for fire protection. The tank capacities and technical specifications illustrate that water is available on site for fire protection.

An alternate source of water for firefighting shall also be available by way of the screen wash pumps. The maximum area of water demand was recalculated to determine the adequacy of the aforementioned pumps. As a result of our analyses, we have determined that these pumps do indeed provide an adequate alternate source of water for fire suppression. The calculations in support of this conclusion were part of attachment 4 to Florida Power and Light Company's letter of May 7, 1980 concerning Fire Protection. Deluge system flow rates for the hydrogen seal oil unit, the auxiliary transformer and the main transformer were added to our analysis which was submitted to the NRC Staff on May 21, 1979. (See attachment 4 to Florida Power and Light Company's letter of May 7, 1980.)

We do not intend to permanently connect the screen wash pumps to the fire water system. The fire water system is connected to the domestic water supply. In leakage from the screen wash pumps through a permanent connection to the fire water system could contaminate the domestic water supply. Thus, a permanent condition is not considered feasible.

A temporary connection has been proposed, in lieu of a permanent hard pipe connection. Appropriate connections have been installed and a rolled-up section of hose has been located in the area to facilitate rapid connection between the screen wash pumps and fire water system. If the screen wash pumps were connected to the fire water supply, appropriate measures would then be taken to prevent and monitor in leakage to the domestic water supply.

The only requirements in Appendix R, Section III. A. that the system described above does not meet are: 1.) The requirement for a permanent connection to the fire water supply and, 2.) The requirement for a vertical standpipe to insure minimum water volume. The need for a permanent connection to the fire water supply is precluded by designing the screen wash pump to fire main connection for rapid hookup (approximately 5 minutes).

Administrative controls have classically been utilized to ensure minimum water volumes for all safety-related tanks (i. e., Refueling Water Condensate Storage, etc.). We therefore contend that administrative controls as established in the Technical Specifications with the appropriate limiting conditions for operation will ensure minimum water volume in the Raw Water Storage Tank and in the gravity tank.

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[1] FPL's report, "Fire Protection - A Reevaluation of Existing Plant Design Features and Administrative controls," submitted 2/25/77.

Based on the above discussion, the fire water supply system as described above meets the intent of Section III. A. of Appendix R and no further modifications are required.

3.2 AUXILIARY BUILDING CORRIDOR

NRC CONCERN:

"In the Fire Protection Safety Evaluation Report, it was our concern that a fire in the auxiliary building corridor could damage redundant safety-related cables that could affect both units from achieving cold shutdown.

By letters dated May 7, 1980 and June 9, 1980, the licensee provided additional information. The licensee stated that all cables in the corridor are coated with a fire retardant coating. The licensee also stated that although some of these cables are needed for the safe cold shutdown, the units can be placed in hot shutdown mode, and these specific cables could be repaired or replaced to bring the units to a cold shutdown condition. The additional information submitted by the licensee has been previoulsy evaluated and the licensee informed that it does not meet our concerns.

The licensee has not demonstrated that adequate protection features have been provided for cables and equipment of redundant systems important to achieving safe shutdown conditions to ensure that at least one means of achieving such conditions survives postulated fires.

In order to meet the requirements of Section III.G. of proposed Appendix R to 10 CFR Part 50, the licensee should provide the following:

1. An automatic sprinkler system in the auxiliary building corridor to protect the cable trays from an exposure fire;

2. A fire detection system in the chemistry laboratories (hot and cold labs) and in the new laundry facility;

3. Three-hour fire doors in the auxiliary building for the chemistry laboratories (hot and cold labs) and new laundry facility;

4. Three-hour fire rated fire dampers for ventilation ducts in the chemistry laboratories (hot and cold labs) and the new laundry facility; and,

5. The plastic barrels used to collect radiation protective clothing be replaced with barrels made of a fire retardant material.

To meet our fire protection guidelines, alternate shutdown capability should be provided when safe shutdown cannot be ensured by barriers and detection and suppression systems because of the exposure of redundant safe shutdown equipment, cabling or components in a single fire area, to an exposure fire, or fire suppression activities, or rupture or inadequate operation of fire suppression systems.

To meet Section III, Paragraph G. of the proposed Appendix R to 10 CFR Part 50, the licensee should provide an alternate shutdown capability independent of this area. The alternate shutdown system should meet the requirements of Section L, Paragraph III of proposed Appendix R to 10 CFR Part 50."

FPL RESPONSE:

The following modifications have been completed.

1.) Fire detection in the chemistry laboratories and laundry facility.

2.) Three-hour fire rated doors for the chemistry laboratories and laundry facility.

3.) Three-hour fire rated fire dampers for ventilation ducts in the chemistry laboratories and laundry facility.

4.) Replacement of the plastic barrels used to collect radiation protective clothing with barrels made of steel with automatic closing fusible link lids.

Attached (see Attachment 1) are the safe shutdown evaluations for the auxiliary building hallway and the cable spreading room. Note that these evaluations were performed assuming total loss of all cable functions.

Total loss of all cable functions, however, is not considered credible based on the design basis fire considerations for this area (see Section 8.5.2.20 of "Fire Protection - A Reevaluation of Existing Plant Design Features and Administrative Controls") and a number of inherent design features at the facility. These features include:

1. Safe shutdown related cables are separated in accordance with criteria licensed and accepted by the NRC. (Note: This separation criteria is minimum spacial criteria between trains. Specific "A" and "B" train functions may be separated far in excess of the minimum criteria.)

2. All safe shutdown cable trays and trays in safe shutdown fire areas are sprayed with Flamemastic 71A which has been demonstrated to not only protect cable functions under certain fire conditions, but also to prevent fire propagation under extreme fire conditions (see Section 3.1 of our fire protection report and Attachment 2).

3. The auxiliary building hallway is occupied continuously.

4. Early warning fire detectors are installed.

5. Our fire methodology for determining burn rates and gas and surface

temperatures was developed in the fall of 1976. Florida Power and Light Company's technique and results have been shown to be conservative when compared to similar methodology developed by Sandia. Even based on our conservative methodology, design basis fires in areas of large cable concentrations were considerably smaller than any used in Florida Power and Light Company or Sandia test efforts. Thus, no cable damage or fire propagation will occur as a result of design basis fires in these areas.

6. Based on our conservative fire methodology and conservative assumptions on suppression capability (i. e., 50% effectiveness), Florida Power and Light Company demonstrated that although the fire could burn till extinguished in each area, the manual suppression capability at the facility is sufficient to extinguish all design basis fires.

We believe that the items we have implemented in conjunction with the features described above, ensure that fire-induced cable function loss cannot occur in the auxiliary building hallway. Even with the incredible assumption that total loss of cable functions has occurred we have demonstrated the capability to bring the plant to cold shutdown.

3.2.5 CABLE SPREADING ROOM

NRC CONCERN:

"In the Fire Protection Safety Evaluation Report it was our concern that a fire in the cable spreaidng room could prevent both units from achieving safe shutdown.

By letters dated May 7, 1980 and June 9, 1980, the licensee provided additional information. The licensee stated that all cables in the cable spreading room are coated with a fire retardant coating. The licensee also stated that although redundant safety-related cables and equipment may be damaged by a fire, the units can be placed in a hot shutdown condition and necessary repairs and/or replacement be made to bring the units to a cold shutdown condition.

The additional information submitted by the licensee has been previously evaluated and the licensee informed that it does not meet our concerns.

The licensee has not demonstrated that adequate protection features have been provided for cables and equipment or redundant systems important to achieving safe shutdown conditions to ensure that at least one means of achieving such conditions survives postulated fires.

In order to meet the requirements of Section III.G. of Proposed Appendix R to 10 CFR to Part 50, the licensee should provide the following:

1. An automatic water suppression system in the room;

2. A booster hose station in the room; and,

3. Access doors from the cable spreading area to the turbine building to have 1-1/2 hour rating.

To meet our fire protection guidelines, alternate shutdown capability should be provided when safe shutdown cannot be ensured by barriers and detection and suppression systems because of the exposure of redundant safe shutdown equipment, cabling or components in a single fire area, to an exposure fire, or fire suppression activities, or rupture or inadequate operation of fire suppression systems.

To meet Section III, Paragraph G. of the proposed Appendix R to 10 CFR Part 50, the licensee should provide an alternate shutdown capability independent of this area. The alternate shutdown system should meet the requirements of Section L, Paragraph III of proposed Appendix R to 10 CFR Part 50."

<u>FPL RESPONSE</u>

A low flow capacity nozzle was installed prior to October 30, 1980 in the area immediately outside the cable spreading room. The length of the hose at this station is sufficient to reach all areas inside the cable spreading room. The design and implementation package for 1-1/2 hour fire rated doors between the cable spreading room and the turbine building has been completed. They are currently scheduled to be installed.
Attached (see Attachment 1) are the safe shutdown evaluations for the auxiliary building hallway and the cable spreading room. As indicated previously, these evaluations were preformed assuming <u>total</u> loss of cable functions. Total loss of all cable functions, however, is not considered credible based on the design basis fire considerations for this area (see Section 8.5.2.41 of our fire protection report) and a number of inherent design features at the facility. These features include those identified for the auxiliary building hallway. In addition, combustibles are not stored in the cable spreading room and there is no equipment in the cable spreading room which requires major sources of combustibles for operation or maintenance. We believe that the items we have implemented in conjunction with the features described above ensure that fire-induced cable function loss cannot occur in the cable spreading room. Even with the incredible assumption that total loss of cable functions has occurred, we have demonstrated the capability to bring the plant to cold shutdown.

ATTACHMENT 1

SAFE SHUTDOWN EVALUATIONS
FOR THE AUXILIARY BUILDING
HALLWAY AND CABLE SPREADING
ROOM

(Attachment to FPL letter of June 9, 1980
Number L-80-174)

SAFE SHUTDOWN EVALUATIONS FOR THE AUXILIARY BUILDING HALLWAY AND CABLE SPREADING ROOM

Recent NRC correspondence has requested a demonstration of safe shutdown assuming loss of cable function in the Auxiliary Building Hallway or the Cable Spreading Room and provide what is called a "task/manpower" evaluation to demonstrate that it can be accomplished. This evaluation was conducted in the following manner:

A. Determine the time restraints wherein operator action is required based on safe shutdown plant parameters.

B. Determine if it is possible to control plant parameters assuming loss of cable function.

C. Determine if the task or control methods of item B and the operator or manpower time restraints of item A are appropriate to assure safe shutdown.

Therefore, if it is estimated that it would take an operator some 4 or 5 minutes to perform a control function and he has, say, 8-10 hours to complete it, no further evaluation was required. Also, current plant emergency procedures were used during this evaluation. These procedures have been reviewed and approved in accordance with the license and are demonstrated/performed on a regular basis.

Reactivity Control For Maintaining Hot Safe Conditions

The reactivity control system assures safe subcritical core conditions following reactor trip and during all phases of unit heatup and cooldown operations. The reactivity control system consists of two independent reactivity control subsystems; the rod cluster control (RCC) assemblies and boric acid injection via the charging system. The RCC assemblies are divided into two categories comprising control and shutdown rod groups. Following an equilibrium xenon full power trip with the reactor coolant system (RCS) maintained at hot conditions, excess shutdown/subcritical margins for full RCC insertion at beginning and end of cycle are:

	*BOC POST TRIP EXCESS SHUTDOWN	*EOC POST TRIP EXCESS SHUTDOWN
Unit 3	-4.20% Δ k/k	-4.07% Δ k/k
Unit 4	-3.74% Δ k/k	-3.56% Δ k/k

*Unit 3 & 4 are for seventh and sixth cycles respectively.

The reactivity worth associated with complete decay of pretrip full power equilibrium Xenon is +2.57 and +2.60% Δ k/k for Unit 3 and 4 respectively. Therefore, the minimum available subcritical margin for BOC and EOC are -1.63% Δ k/k and -1.57% Δ k/k for Unit 3 and -1.14% Δ k/k and -0.96% Δ k/k for Unit 4. Hence post trip subcritical conditions for maintaining long term RCS hot conditions are assured via full RCC insertion and is independent of off-site power availability.

Boron addition via the charging pumps is available from two independent boric acid solution sources. The primary boron injection flow path to the charging pumps is established from the discharge of one of the boric acid transfer pumps, each of which can be aligned to take suction from any of the three boric acid storage tanks containing a minimum of 20,000 ppm boron solution. The secondary or backup boric acid addition source is the charging pump direct gravity feed line from the refueling water storage tank (RWST), which contains a minimum of 1950 ppm boron solution. In addition, system provisions exist for aligning either unit's RWST to the suction of either unit's charging pumps by equalizing heads in the tanks using the SI suction header.

Two independent boration paths are available from the discharge of any one of the three available charging pumps. Flow to the loop "A" cold leg and/or the loop "C" hot leg is available in addition to charging flow to the reactor coolant pump seals. As indicated above, the boron addition portion of the reactivity control system is not required in order to maintain the unit in the hot condition and its function, therefore, is not required following loss of off-site power.

Steam Generator Heat Removal For Maintaining Hot Safe Conditions

Following reactor trip or a unit runback, steam generator heat removal is accomplished by the condensate/main feedwater system throttled back to the steam generator no load condition with steam relief to the condenser via four turbine bypass valves. One train, i.e., one condensate pump and one main feedwater pump is sufficient to meet steam generator heat removal requirements. Condenser hotwell makeup can be obtained from the condensate storage tank which is supplied from the water treatment plant. Steam generator heat removal under hot RCS conditions can be accommodated for a prolonged period of time.

In the event that turbine bypass, condenser vacuum or condensate/feedwater pump capabilities are unavailable, steam generator heat removal is maintained by the auxiliary feedwater system with steam relief via the three atmospheric dump valves (located upstream of their respective main steam isolation valves). Auxiliary feedwater is provided by three turbine driven auxiliary feedwater pumps, each with a nominal pumping capacity of 600 gpm. Any single turbine driven pump is capable of supplying the post trip requirements of either unit. One turbine driven pump is also capable of supplying the auxiliary feedwater requirements of both units 19.2 minutes following full power trip of both units.

Steam supply to the auxiliary feedwater pump turbines is provided via motor operated valves on each of the Unit 3 or 4 steam generators upstream of their respective main steam isolation valves (MSIV's). Steam flow from any one of the six steam generator supply valves is sufficient to provide rated auxiliary feedwater pump flow for both units. In addition, a manual cross tie to the Units 3 and 4 main steam header (downstream of the MSIV's) and a manual cross tie to the fossil Unit 1 and 2 desuperheated steam header are available to supply the auxiliary feedwater pump turbines.

The auxiliary feedwater pumps are normally aligned to take suction from the Unit 3 and 4 condensate storage tanks and discharge to the Unit 3 and 4 steam generators. If additional Unit 3 or Unit 4 condensate storage tank inventory is desired, it can be provided from the water treatment plant or the primary water storage tank. The availability of makeup allows the unit(s) to be maintained at hot conditions for a prolonged period of time.

In the event that loss of off-site power occurs with the unit(s) at hot shutdown or the unit(s) trips because of loss of off-site power, all auxiliary steam supply valves and pump discharge valves operate automatically and receive their control and power form the DC and vital AC buses. A single failure of either DC or vital AC bus will not prevent the auxiliary feedwater system from meeting its design flow requirements.

Following a loss of off-site power the water inventory from the condensate storage tanks is the only immediately available source to the auxiliary feedwater system. Each condensate storage tank has a design capacity of 250,000 gallons. The minimum allowable inventory in a condensate storage

tank associated with an operating unit is 185,000 gallons, which is sufficient for 15 hours at hot conditions and subsequent cooldown to the residual heat removal operating window, or 23 hours at hot RCS conditions.

Approximately 10 hours after the loss of off-site power the water treatment system can be loaded on the vital bus as per procedural steps provided in the "Blackout Operation" Emergency Procedure for Units 3 and 4. This will allow up to 200 gpm makeup to each condensate storage tank whereas only 125 gpm per unit is required to maintain steam generator level after 10 hours. Operation in this manner will allow the unit(s) to be maintained in the "blackout" hot condition until off-site power is restored. In addition, a primary water pump may be loaded on the vital bus, which would allow the unit(s) primary water storage tank (a design capacity of 160,000 gallons each) to be pumped to either or both condensate storage tanks.

Pressurizer Heater Control for Maintaining Hot Safe Conditions

Following reactor trip pressurizer heater capability is required in order to maintain the unit at approximately 2200 psig pressure, which is normally associated with hot RCS conditions. Loss of total pressurizer heater function is not considered a likely event since the two heater backup groups are powered by train A and train B 480 V load centers.

While it is preferred to have pressurizer heater capability to maintain RCS pressure in the post trip condition, it is not a safety requirement nor is it required following loss of off-site power. RCS pressure can be allowed to drift slowly downward until diesel generator loads are sufficiently low to allow the "A" backup group to be energized. (If both diesel generators have started and are operating properly, sufficient load capability exists to reload the backup group immediately). If it were postulated that pressurizer heater function cannot be reestablished, this would not preclude RCS cooldown to RHR levels following the addition of adequate boron solution to accommodate RCS cooldown.

Component Cooling for Maintaining Hot Safe Conditions

The component cooling water (CCW) system has three 100% pumps and three 50% heat exchangers and is normally operated with one pump and two CCW heat exchangers in service during full power operation. Two of the pumps are powered by train "A" and one by train "B" 4160 V switchgear. In addition,

there is a normally isolated 8 inch crossover line between the Unit 3 and 4 component cooling water systems. This cross tie between units can provide sufficient heat removal capability to maintain a unit at hot shutdown until its normal CCW flow is reestablished. Following a loss of off-site power at least one CCW pump and one intake cooling water pump per unit will be loaded on the diesels, which assures required CCW flow to post trip components. Availability of the 8 inch CCW cross tie between units is not affected by loss of off-site power.

Electrical Power Supply For Maintaining Hot Safe Conditions

Following reactor trip, normal off-site power is provided by the Unit 3 and 4 start up transformers via the 240 kv switchyard. The loss of power to the Unit 3 startup transformer results in the loss of the Unit 3 "B" train 4160 V switchgear only since the "A" train has an alternate feed from the Unit 4 startup transformer, which could be made available to service Unit 3 "A" train requirements. Under these conditions both diesel generators would start. The diesels can supply the vital portions of the Unit 3 "A" and/or "B" trains. If the Unit 4 startup transformer is lost, the consequences are the same. Hence a loss of one of the startup transformers would not preclude maintaining both units at hot conditions for a prolonged period of time.

A total loss of off-site power caused by grid upset or loss of transmission lines could result in interruption of off-site power to Turkey Point station. Transmission/grid difficulties of this nature occurring coincident with an event such as a design basis fire is unlikely. However, assuming total loss of off-site power, Turkey Point Unit 3 and 4 diesel generators would start and pick up train "A" and "B" vital loads for both units. Units 3 and 4 are also designed to accommodate the starting failure of one diesel generator and still maintain safe hot conditions. As indicated earlier the water treatment system can be loaded onto the vital bus which will allow Units 3 and 4 to be maintained at the "blackout" hot condition until off-site power is restored to the 240 kv switchyard.

In addition to the above electrical provisions and those normally followed by the system load dispatchers, there are two other on-site methods available for restoring power to the 240 kv switchyard. The Turkey Point 1 and 2 oil fired units have the design capability for black startup following

a total loss of off-site power. As required, fossil Unit 1 and 2 2500 KW "Black Start" diesels (five available) can be started following the loss of off-site power. Unit 1 and 2 auxiliary loads are carried by the black start diesels as required to support sequential restart of the units. Following Unit 1 and/or 2 startup, the associated main generator can be aligned to restore power to the nuclear Unit 3 and 4 240 kv switchyard.

The second on-site method for restoring power to the Unit 3 and 4 240 kv switchyard is conducted using the five Unit 1 and 2 black start diesels, which can accept load in one minute in the dead-line mode and in ten minutes in the normal or peaking mode. The black start diesels can be alignd to energize the Unit 1 and 2 240 kv switchyard via the Unit 1 and 2 startup transformer. (The Unit 1 and 2 switchyard is normally aligned to the Unit 3 and 4 switchyard.) Thus plant operations personnel can make available to the nuclear units fossil unit power sources.

Reactivity Control Function Required for Cold Conditions

As indicated earlier, sufficient subcritical margin is obtained for both BOC and EOC core conditions from the full RCC portion of the reactivity control system to maintain the unit(s) in the hot condition indefinitely. Prior to initiating cooldown, the RCS is borated to a boron concentration level that assures sufficient subcritical margin when the unit ultimately reaches cold conditions.

Conservative values of Unit 3 and 4 post trip reactor coolant boron concentrations for BOC and EOC would be around 810 ppm and 50 ppm respectively. Conservative values for the required RCS boron concentrations to assure sufficient subcritical margin at cold RCS conditions would be approximately 1162 ppm and 691 ppm at BOC and EOC respectively.

Boration of the reactor coolant system (as discussed earlier), prior to RCS cooldown is provided by the charging system in conjunction with letdown to the chemical volume and control system (CVCS) in order to maintain pressurizer level. Normal letdown flow from the reactor coolant system is 60 gpm. It is routed through the regenerative heat exchanger, one letdown orifice and through the non-regenerative heat exchanger to the volume control tank (VCT) or holdup tanks. Maximum letdown capability via this path is 120 gpm and is achieved by placing another letdown orifice into service.

If CCW is out of service to the non-regenerative heat exchanger letdown is diverted directly to the VCT or if there is a high level in the VCT, flow is diverted to the holdup tanks. Charging flow to the regenerative heat exchanger is balanced with RCS letdown flow in order to achieve the proper temperature drop prior to going through the letdown orifice(s). If letdown via this path were required under emergency conditions and charging flow was not available to the regenerative heat exchanger, the letdown line outside of containment could be isolated causing letdown flow to be relieved to the pressurizer relief tank via the letdown line safety valve.

A second normally available letdown path of 9 gpm is from the reactor coolant pump seal water return line to the VCT via the seal water heat exchanger. An additional 15 gpm excess letdown line is also available for letdown flow, which is directed through the excess letdown heat exchanger to the seal water return line. If CCW is unavailable to the seal water and excess letdown heat

exchanger, excess letdown could be diverted to the reactor coolant drain tank and seal water return or bypass flow could be relieved to the pressurizer relief tank via the seal water return line safety valve.

All letdown line flow paths require instrument air for the required valving operations. However, since the unit(s) can be maintained in a safe hot condition for extended periods, sufficient time exists for reestablishing the instrument air system or to execute manual operations to restore necessary letdown line flow. The compressor(s) may be loaded on the diesels.

The times required to borate the RCS prior to initiating cooldown have been analyzed the various charging and letdown path combinations:

	BOC CONDITIONS (HOURS)	EOC CONDITIONS (HOURS)
2 BTP's, 2 CP's 2 Orifices	0.13	0.23
1 BTP, 1 CP, 1 Orifice	0.26	0.45
1 BTP, 1 CP Balanced for excess letdown and RCP sealwater return	0.64	1.1
2 CP's from RWST, 2 Orifices to PRT	2.6	2.9
1 CP from RWST 1 Orifice to PRT	5.1	5.7
1 CP from RWST Balanced for excess letdown and sealwater return	12.8	14.2

Key:
CP = charging pump
BTP = boric acid transfer pump
RWST = refueling water storage tank
PRT - pressurizer relief tank

Since long term hot conditions can be maintained for either unit, sufficient time is available for even the worst case boration conditions.

The operator has an alternate means to borate prior to initiation of cooldown. He may elect to maintain hot RCS temperature and allow RCS pressure to fall to approximately 1300 psig and then inject the 20,000 ppm boron

solution contents of the boron injection tank (BIT) using the safety injection system. For this method of boration, RCS pressure would normally be reduced by turning off the pressurizer heaters. He also has the option of allowing the pressurizer to vent to the pressurizer relief tank.

All equipment necessary to achieve the above mentioned boration combinations can be powered by the unit vital buses thus, their availability is not affected by loss of off-site power.

Moderator Shrink Make-Up Required During Cooldown

Following proper boration of the reactor coolant system to required cold shutdown concentrations, the charging system also provides reactor coolant system makeup to accomodate RCS shrink during cooldown. Two independent sources of makeup water are available to the suction of the three charging pumps. The normally used water source is obtained from the primary water storage tank via the primary water pumps. The second independent source is the RWST gravity feed line. If the unit were in the station blackout condition, the makeup source from the RWST would be used since the primary water system pumps are powered from a non-vital power source.

A third source of RCS makeup water for both units can be made available from the spent fuel pools via the spent fuel pool cooling pumps. Spent fuel cooling pump discharge can be aligned to the CVCS letdown return line upstream of the volume control tank divert valve or to the downstream side of the reactor coolant filter. Either of these two flow paths can provide makeup water to the volume control tank. With a spent fuel pool capacity of approximately 7800 gal/ft, less than 4 feet of spent fuel pool inventory from a pool is required to accommodate moderator shrinkage for its unit. This minor reduction in spent fuel pool inventory will have no appreciable affect on spent fuel cooling or shielding requirements.

If it were postulated that none of the three charging pumps are available, safety injection (SI) via the boron injection tank (BIT) can be used to provide precooldown boration and reactor makeup. As discussed above, the RCS pressure would be reduced to approximately 1300 psig and SI flow through the BIT would provide adequate cold shutdown concentration boration. Following proper boration, RCS cooldown using secondary steam generator heat removal is initiated with the SI system providing RCS makeup as needed to accommodate RCS shrinkage. The SI pump(s) is powered by a vital bus(es) and

its operation therefore is unaffected by loss of off-site power.

Steam Generator Heat Removal For Unit Cooldown

As discussed earlier, steam generator heat removal during RCS cooldown will be conducted with the condensate/main feedwater system. In the event of condensate/main feedwater system malfunction or if off-site power is not available, steam generator heat removal during RCS cooldown will be provided by the auxiliary feedwater system with steam relief via the atmospheric dump valves. Steam generator heat removal is secured following servicing of the residual heat removal system.

Component Cooling Requirements For Cold Conditions

The heat load on the CCW and intake cooling water (ICW) systems during RCS cooldown is approximately the same as that required to maintain hot conditions . Thus the minimum required components and CCW unit cross tie capabilities discussed earlier are also applicable during this phase of RCS cooldown.

Residual Heat Removal (RHR) For Maintaining Cold Conditions

Following RCS cooldown and depressurization using steam generator heat removal, the residual heat removal system can be placed in service at 350°F with RCS pressure at or below 465 psig (normally placed in service about 450 psig, system designed for 600 psig). RHR heat removal capability is dependent upon available RHR, CCW and ICW equipment. The following equipment combinations and heat removal capabilities are sufficient to match core decay heat within 8 hours after shutdown.

	HEAT REMOVAL RATE (Btu/hr)
2 ICWP's, 2 CCWP's 3 CCWHX's, 2 RHRP's	3.4×10^8
1 ICWP, 1 CCWP 2 CCWHX's, 2 RHRP's	2.1×10^8
1 ICWP, 1 CCWP 2 CCWHX's, 1 RHRP	1.8×10^8

KEY: ICWP's = ICW pumps
CCWP's = CCW pumps
CCHX's = CCW heat exchangers
RHRHX's = RHR heat exchangers
RHRP's = RHR pumps

All equipment necessary to achieve the above RHR heat removal combinations is powered by the unit vital buses and is therefore available under loss of off-site power conditions. After placing the RHR system into service, the operator can elect to continue the RCS cooldown to cold refueling conditions or maintain the RCS at any desired temperature below 350°F.

Auxiliary Building Hallway

The normal shutdown cable functions in the Auxiliary Building Hallway are shown in Table 1. Loss of these cable functions would require various off-normal operator actions in order to maintain safe plant conditions. Sufficient control room personnel are immediately available to perform the required hot shutdown and boration actions in a timely manner. A summary of necessary actions follows:

Maintain Hot Shutdown Conditions

A. Dispatch one member of control room staff to the Unit 3 Load Center Room and place Unit 3 charging pump switches in remote.

B. Dispatch a second member of control room staff to the Unit 3 charging pump room, via outside entrance from Boric Acid Storage Tank Room, and establish manual charging pump control.

C. From control room, verify that a sufficient number of auxiliary feedwater steam supply valves are open.

D. From the control room, start an additional Unit 4 component cooling water pump and verify Unit 3 component cooling water pump operation.

F. Use the 4C steam generator level to infer and maintain level in the 4A and 4B steam generators.

Boration of Reactor Coolant System

A. In the event that all four Boric acid transfer pumps are in operable, initiate boration using the refueling water storage tank source as discussed earlier.

As already indicated, the units can be maintained in the hot shutdown mode for days if desired. This would allow sufficient time to repair some or most ot the damaged circuits listed in Table 1. At a minimum; (1) one control room level channel from the 4A and 4B steam generators should be repaired or duplicated outside the control room and (2) residuel heat removal pump control circuits should be repaired or bypassed at the 4160V switchgear before cooldown of the reactor coolant system begins.

Reactor coolant system cooldown should proceed using currently established plant procedures with the assistance of Table 1. As procedures call for the positioning of valves that may not be operable, control room personnel can be dispatched to make the valve adjustments manually. Valve operation in support of entering into the residual heat removal mode would be conducted in the same manner. Once the units are on residual heat removal cooling, reactor coolant system temperatures can be maintained at these levels or the units could be cooled down to cold refueling conditions.

In conclusion, the Units can be brought to the safe shutdown condition even assuming loss of all shutdown related cables in the Auxiliary Building Hallway.

Cable Spreading Room

The normal shutdown cable functions in the Cable Spreading Room are shown in Table 2. It is noted that these functions are limited to control and instrument cables only and that pump motor power cables, valve motor power cables, etc. are located outside of the Cable Spreading Room. Loss of function of these instrument and control cables would require plant staff to leave the control room and maintain the units in the hot safe conditions from various

locations throughout the plant. Since control cable damage in the spreading room could affect the power operation of important equipment such as cooling water pumps, heaters, etc., it would also be necessary to isolate the important shutdown circuits from the remote control locations. Positioning of control room personnel for performing circuit isolation and control of important equipment is shown in Table 3.

Following completion of the switching and operator positioning at the remote locations, important/required hot shutdown functions can be performed. In the event that remote pressurizer level and steam generator level instrumentation is lost it may be necessary to start the safety injection pumps from the 4160V switchgear. With the safety injection pumps aligned to the reactor coolant system, increased auxiliary feedwater/steam dump generator cooling would allow the pressurizer to fill. With the reactor coolant system in the solid condition (at or near the shutoff head pressure of the safety injection pumps) and steam generator heat removal established, the units can be maintained in this condition for a prolonged period of time. It is also noted that the filling of the pressurizer and make-up for reactor coolant system shrinkage also provides required shutdown boration since the safety injection pumps flow through the boron injection tank.

Cooldown to the residual heat removal mode would not be conducted until (as a minimum); (1) at least one level and pressure channel of remote instrumentation for the pressurizer and steam generators is repaired or duplicated, (2) normal reactor coolant system volume control via the charging and chemical volume and control system is re-established and (3) residual heat removal pump control circuits should be repaired or bypassed at the 4160V switchgear.

Reactor coolant system cooldown should proceed using currently established plant procedures with the assistance of Tables 2 and 3. As procedures call for positioning of inoperable valves, personnel can be dispatched to make valve adjustments manually. Once on residual heat removal cooling, reactor coolant

system conditions can be maintained or cooldown to refueling conditions can be conducted.

In conclusion, sufficient capability exists to bring the units to safe shutdown conditions in the event that Cable Spreading Room cables are damaged.

TABLE 1

SHUTDOWN RELATED CABLE FUNCTIONS IN THE AUXILIARY HALLWAY AT THE 18' ELEVATION

(C) Charging pumps 3A, 3B & 3C

(C) Component cooling water pump 4C

(P) Boric acid transfer pumps 3A, 3B, 4A & 4B

(P) Auxiliary feedwater pump steam supply valves (MOV-3-1405, MOV-4-1405)

(P) Boric acid injection stop valves (MOV-3-350, MOV-4-350)

(P) Volume control tank isolation valve (MOV-3-115C, MOV-4-115C)

(P) Auxiliary/Radwaste building exhaust and supply fans 3A, 3B, 3A-V10, 3B-V11

(C) RHR pumps 3A, 3B, 4A & 4B

(P) Accumulator stop valves (MOV-3-865C, MOV-4-865A)

(P) Cold leg safety injection valves (MOV-3-843A, MOV-3-843B, MOV-4-843A)

(P) Feedwater isolation valves (MOV-3-1408, MOV-4-1408)

(P) Residual heat exchanger cooling water isolation valves (MOV-3-749A, MOV-3-749B, MOV-4-749A)

(P) Refueling water stop valve (MOV-3-862A)

(P) RHR to RCS isolation valves (MOV-3-744A, MOV-4-744A)

(P) RCS to RHR isolation valves (MOV-3-751, MOV-4-751)

(I) Component cooling water flow 3A, 3B, 4A & 4B

(I) Steam generator level 4A & 4B

(P) Boric acid storage tank heaters A, B & C

(P) Boric acid heat tracing transformers A & B

(P) Unit 3 & 4 emergency lighting panels

(C) = Presence of control cable function

(P) = Presence of power cable function

(I) = Presence of instrument cable function

TABLE 2

SHUTDOWN RELATED CABLE FUNCTIONS IN THE CABLE SPREADING ROOM

(C) Charging pumps 3A, 3B, 3C, 4A, 4B & 4C

(C) Component cooling water pumps 3A, 3B, 3C, 4A, 4B & 4C

(C) Intake cooling water pumps 3A, 3B, 3C, 4A, 4B & 4C

(C) Boric acid transfer pumps 3A, 3B, 4A & 4B

(C) Boric acid injection stop valves (MOV-3-350, MOV-4-350)

(C) Volume control tank isolation valves (MOV-3-115C, MOV-4-115C)

(C) Auxiliary/Radwaste buildings exhaust and supply fans 3A, 3B 3A-V10 & 3B-V11

(C) Pressurizer heater control groups 3A & 4A and backup groups 3A, 3B, 4A & 4B

(C) RHR Pumps 3A, 3B, 4A & 4B

(C) Accumulator stop valves (MOV-3-865A, MOV-3-865B, MOV-3-865C, MOV-4-865A, MOV-4-865B & MOV-4-865C)

(C) Cold leg SI (MOV-3-843A, MOV-3-843B, MOV-4-843A & MOV-4-843B)

(C) Main steam isolation valves (POV-3-2604, POV-3-2605, POV-3-2606, POV-4-2604, POV-4-2605 & POV-4-2606)

(C) Feedwater isolation valves (MOV-3-1407, MOV-3-1408, MOV-3-1409, MOV-4-1407, MOV-4-1408 & MOV-4-1409)

(C) RHR heat exchanger cooling water isolation valves (MOV-3-749A, MOV-3-749B, MOV-4-749A & MOV-4-749B)

(C) Refueling water storage tank stop valves (MOV-3-862A, MOV-3-862B, MOV-4-862A, MOV-4-862B)

(C) RHR to RCS isolation valves (MOV-3-744A, MOV-3-744B, MOV-4-744A & MOV-4-744B)

(C) RCS to RHR isolation (MOV-3-750, MOV-4-750, MOV-3-751, MOV-4-751)

(C) Auxiliary feedwater pump steam supply valves (MOV-3-1403, MOV-3-1404, MOV-3-1405, MOV-4-1403, MOV-4-1404, MOV-4-1405)

(C) Unit 3 & 4 auxiliary feedwater auto start and backup circuits

(C) Auxiliary feedwater pump steam pressure controllers (SV-3706, SV-3707)

(C) Auxiliary feedwater control and backup valves, 3A, 3B, 3C, 4A, 4B & 4C

(I) RCS pressure (PI-3-403, PI-4-403)

(I) RCS temperature (hot let 3A, 3B, 3C, 4A, 4B, 4C; cold leg 3A, 3B, 3C, 4A, 4B, 4C)

TABLE 2 (cont)

(I) Steam generator pressure and level 3A, 3B, 3C, 4A, 4B, 4C

(I) Unit 3 & 4 pressurizer level

(C) 480 V load centers 3A, 3B, 3C, 3D, 4A, 4B, 4C & 4C feeder breakers

(C) Diesel generator breakers (generators #3 & 4; buses 3A, 4A, 3B & 4B)

(C) = Presence of control cable function

(P) = Presence of power cable function

(I) = Presence of instrument cable function

TABLE 3

EXAMPLE OF PLANT STAFF ACTIONS NECESSARY TO CONTROL AND MAINTAIN HOT CONDITIONS FROM REMOTE PLANT LOCATIONS

(1) Nuclear Control Center Operator (1 of 3)

Place Isolation Switches In Remote At The Following Locations:

4160 Volt 4A Switchgear Room Location

480V Load Center 4A
Bus tie to switchgear 4B
Component cooling water pump 4A
480V Load Center 4C
Intake cooling water pump 4A
Emergency diesel generator A
Isolation switch on "A" sequencer panel

4160 Volt 4B Switchgear Room Location

480V Load Center 4B
Component cooling pump 4B
480V Load Center 4D
Intake cooling water pump 4B
Intake cooling water pump 4C
Emergency diesel generator B
Bus tie to 4A switchgear
Isolation switch on "B" sequencer panel

Load Center Room Location, Unit 4 (south wall)

Charging pumps 4A, 4B, 4C

MCC 4A - North End Location

Normal containment cooler 4C
Place control switch on fast

* Cable Spreading Room Location

Isolation switch, generator #3 lockout relay
Isolation switch, Unit 3 startup transformer lockout relay
Isolation switch, generator #4 lockout relay
Isolation switch, Unit 4 startup transformer lockout relay

DC Switchgear Room Location

Isolation switch, DC emergency bearing oil pump Unit 3, on 125V DC panel A
Isolation switch, DC emergency bearing oil pump Unit 4, on 125V DC panel B

*Note that while it is perfered to isolate these lockout relays it is not absolutely essential since the equipment required for shutdown can be powered from the emergency diesel generators.

TABLE 3 (cont)

(2) Nuclear Watch Engineer

Place Isolation Switches In Remote At The Following Locations:

4160 Volt 3A Switchgear Room Location

480V Load Center 3A
Bus tie to switchgear 3B
Component cooling water pump 3A
480V Load Center 4C
Component cooling pump 3C
Intake cooling water pump 3A
Emergency diesel generator A
Isolation switch on "A" sequencer panel

4160 Volt 3B Switchgear Room Location

480V Load Center 3B
Component cooling pump 3B
480V Load Center 3D
Intake cooling water pump 3B
Intake cooling water pump 3C
Emergency diesel generator B
Bus tie to 3A switchgear
Isolation switch on "B" sequencer panel

Load Center Room Location, Unit 3 (south wall)

Charging pumps 3A, 3B, 3C

MCC 4A - North End Location

Normal containment cooler 3A
Place control switch on fast

Emergency Diesel Generator Building

Diesel generator A control panel
Diesel generator B control panel

(3) Nuclear Turbine Operator

Proceed to the Unit 3 auxiliary feedwater control station and maintain Unit 3 steam generator levels

(4) Nuclear Control Center Operator (1 of 3)

Proceed to the Unit 4 auxiliary feedwater control station and maintain Unit 4 steam generator levels

(5) Nuclear Control Center Operator (1 of 3)

Proceed to Unit 4 charging pump room and maintain pressurizer level as required and perform boration of RCS as directed

(6) Nuclear Operator

Proceed to Unit 3 charging pump room and maintain pressurizer level as required and perform boration of RCS as directed

ATTACHMENT 2

FPL SUMMARY OF THE SANDIA TESTS WITH REGARD TO FLAMEMASTIC 71A

FLORIDA POWER AND LIGHT COMPANY'S

SUMMARY OF THE SANDIA TESTS
WITH REGARD TO
FLAMEMASTIC 71A

The full scale two-tray coating fire tests conducted by Sandia were established to determine if flame propagation would occur between trays as a result of a fire in the bottom tray. The Sandia test method is probably the most severe test method used to date because of the conservative test conditions, e. g. 1.) Open ladder cable trays, 2.) Very low cable fill percent because of figure eighting of cables in order to obtain heat and air venting openings, 3.) Used the worst of the unqualified cables, 4.) Used two 70,000 btu/hr burners and 5.) Both burners aligned to directly impact the coated cables a distance of 4.75 inches away.

In the Flamemastic 71A, non-IEEE 383 cable test, it took 10 minutes to ignite the cables in the bottom tray. Following this, the cables in the bottom tray burned for 26 minutes before self-extinguishing and achieved a maximum temperature of only 1260^{o}F. The cables in the top tray did not short, did not burn, were undamaged and achieved a maximum temperature of only 167^{o} F. In conclusion, the same coating system (Flamemastic 71A), with the same application technique, on cables similar to those at Turkey Point and St. Lucie passed the Sandia test.

Please note that a larger exposure fire than that used in the test would not have caused propagation of flames to the upper tray, but would have only ignited the lower tray sooner.

Further and contrary to the Staff's position, Flamemastic 71A also effectively seals in the combustible inventory associated with the cable insulation. The very severe Sandia fire test of the Flamemastic 71A coated non-IEEE 383 cables discussed above yielded a weight loss of only 7-1/2 pounds. This loss is attributable to burned cable insulation and pyrolized organic binder in the Flamemastic 71A and in total has a heat release equivalent of approximately two changes of street clothing. This small amount of energy spread over the fire areas in question will have an insignificant affect on temperatures.