Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

February 21, 2001

L-2001-025
10 CFR 50.90

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Re: St. Lucie Unit 2
Docket No. 50-389
Proposed License Amendment
EDG Risk Informed AOT Extension
Response to Second Request for Additional Information

By letter L-99-228 dated November 17, 1999, Florida Power & Light Company (FPL) requested amendments to the Facility Operating Licenses for St. Lucie Units 1 and 2. The proposed license amendments (PLA) would increase the emergency diesel generator (EDG) allowed outage time (AOT) from the current 72-hour action statement to an action statement of 14 days for a single inoperable EDG. By letter L-2000-112 dated June 14, 2000, FPL provided a response to the NRC request for additional information dated March 1, 2000. FPL letter L-2000-157, dated November 13, 2000, provided the results of an analysis of the alternate AC capabilities of the Unit 1 EDGs to support a station blackout of Unit 2 during the extended EDG AOT. FPL letter L-2000-250 dated December 4, 2000 provided a partial response to NRC supplemental RAI request 9 for Unit 2.

During a conference call on July 6, 2000, among FPL, NRC Project Management, NRC Electrical Engineering Branch, and NRC PSA Branch personnel, the PSA staff added information request 9 to the previous information request. This additional information request related to the fire risk assessments for the cable spreading rooms and control rooms. In L-2000-250, FPL committed to provide the results of the Unit 2 cable spreading room and control room fire risk analysis under separate cover.

FPL met with the NRC Project Management and NRC PSA Branch personnel at the NRC White Flint Offices on October 24, 2000 to discuss the fire risk assessments for Unit 1. The PSA Branch added an additional information request 10 to the previous information requests. In addition, FPL was requested to commit to additional Tier 2 restrictions prior to and during the extended AOT EDG maintenance.

A001

FPL commits to incorporate the following Unit 2 fire protection Tier 2 restrictions into the administrative procedures for implementing the configuration risk management program (CRMP) and the on-line risk monitor (OLRM).

> *During Modes 1, 2, and 3, if a Unit 2 EDG is to be removed from service for maintenance for a period scheduled to exceed 72 hours the following actions will be completed:*
> - *conduct a plant fire protection walkdown of the areas that could impact EDG availability, offsite power availability, or the ability to use the station blackout crosstie prior to entering the extended AOT;*
> - *perform a thermographic examination of high risk potential ignition sources in the cable spreading room and the control room prior to entering the extended AOT;*
> - *restrict planned hot work in the cable spreading room and control room during the extended AOT; and*
> - *establish a continuous fire watch in the cable spreading room when in the extended AOT.*

The responses to NRC supplemental RAI request 9 for the Unit 2 cable spreading room and control room fire risk analysis and RAI request 10 for Unit 2 are attached.

In accordance with 10 CFR 50.91 (b)(1), a copy of this regulatory response is being forwarded to the State Designee for the State of Florida.

Please contact us if there are any questions about this submittal.

Very truly yours,

Rajiv S. Kundalkar
Vice President
St. Lucie Plant

RSK/GRM

Attachment

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant
Mr. William A. Passetti, Florida Department of Health and Rehabilitative Services

STATE OF FLORIDA)
) ss.
COUNTY OF ST. LUCIE)

Rajiv S. Kundalkar being first duly sworn, deposes and says:

That he is Vice President, St. Lucie Plant, for the Nuclear Division of Florida Power & Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

Rajiv S. Kundalkar

STATE OF FLORIDA

COUNTY OF ST. LUCIE

Sworn to and subscribed before me

this 21 day of Feb., 2001
by Rajiv S. Kundalkar, who is personally known to me.

Name of Notary Public State of Florida

Leslie J. Whitwell
MY COMMISSION # CC646183 EXPIRES
May 12, 2001
BONDED THRU TROY FAIN INSURANCE, INC.

(Print, type or stamp Commissioned Name of Notary Public)

Request for Additional Information
Related to the Amendment of the Technical Specifications
for the Emergency Diesel Generators
St. Lucie Units 1 and 2

NRC Request 9:

Your submittal indicated that it was "judged" any potential risk impact of the proposed change due to internal fires would be "very small." Later, there was a small discussion on your off-normal operating procedures in response to fire; however, no further specific discussions were provided to justify the conclusion that the risk impact of the change would be small. Meanwhile, your IPEEE submittal estimated that the core damage frequency (CDF) due to fire was 1.9E-4/yr, which was significantly higher than the CDF due to internal initiating events. There were three rooms that were screened in for detailed evaluations, which include control rooms, cable spreading rooms, and 'B' switchgear room. Please justify your conclusion by describing your technical basis for the judgment that the risk impact due to fire would be very small in terms of risk measures, i.e., change in CDF and incremental condition core damage probability (ICCDP) for a single 14-day outage, used in Regulatory Guides (RG) 1.174 and RG 1.177.

Response 9 for Unit 2 Cable Spreading Room and Control Room:

The St. Lucie probabilistic safety assessment (PSA) models used to calculate the estimated internal events risk impact of the proposed allow outage time (AOT) extension do not include an assessment of the potential risk due to internal fires. The following provides a scoping estimate of the impact on the fire risk due to the proposed AOT change. Note that the fire risk is only estimated for the preventative maintenance (PM) case since this would provide the greatest exposure to unavailability that might extend beyond the present 72-hour AOT. Figure 1 is a diagram of the St. Lucie Plant electrical distribution system showing the station blackout crosstie arrangement.

The Fire Induced Vulnerability Evaluation (FIVE) method (Revision 1, September 29, 1993) was selected by FPL to analyze the fire risk for the St. Lucie Units 1 and 2 IPEEE. Six fire compartments were not screened through application of the FIVE methodology. The Unit 2 compartments that were not screened based on the combined factors of fire frequency, alternate train unavailability, automatic or manual suppression, and fire damage modeling include the following:

Compartment F - Unit 2 Control Room Envelope (CR)

Compartment B - Unit 2 Cable Spreading Room (CSR)

Compartment C - Unit 2 'B' Switchgear Room

Offsite power is connected to the safety-related 4kV busses via switchgear located in the turbine building switchgear room. Since offsite power would be affected, the impact of a fire in one of these rooms with an emergency diesel generator (EDG) out-of-service (OOS) has also been evaluated, even though these rooms screened out in the FIVE analysis.

The fire risk associated with the Unit 2 'B' switchgear room and the Unit 2 turbine building switchgear room were submitted by FPL letter L-2000-250 dated December 4, 2000.

Unit 2 Cable Spreading Room and Main Control Room

The following summarizes the engineering information collected and assessments performed to determine the risk increment due to postulated fire events in either the Unit 2 CSR or CR. This assessment found that the AOT extension would result in a CDF increase. A conservative estimate of the cumulative risk increase due to fire initiating events in the Unit 2 CSR and CR is less than 1E-07.

- Engineering Information to Support the Risk Assessment

  The following information was collected to provide input to the risk assessment of the fires in the Unit 2 CSR and CR:

  1. Cabinet characterization in the cable spreading room and control room. For cable spreading room, the following features were identified and recorded:
     - cabinet ventilation (all cabinets have some venting)
     - whether the top is solid, all penetrations are sealed, or used for conduits or not (See Table 1)
     - main function of the equipment associated with the cabinet

  2. The routing of the cables associated with the essential control of offsite power, EDG 2A, EDG 2B, and blackout crosstie (See Table 5).

  3. The relative locations of the trays and cabinets per plant layout drawings and as confirmed in the CSR (See Table 1).

Table 1 Unit 2 Cable Spreading Room Cabinet/Equipment			
Unit 2 CSR Cabinet/Equipment ID	**Distance - cab top to tray top**	**Top solid or pent's sealed**	**Tray Style**
ISOLATION Box 3	39 1/2"	Yes	Solid bottom tray with solid cover
RA-RAB-2	39 1/2"	Yes	Solid bottom tray with solid cover
B2G66	39 1/2"	Yes	Solid bottom tray with solid cover
B2G43	39 1/2"	Yes	Solid bottom tray with solid cover
PP-232 (SB)	27"	Yes	Solid bottom tray with solid cover
PP-223 (SB)	27"	Yes	Solid bottom tray with solid cover
RA-RAB-1	39 1/2"	Yes	Solid bottom tray with solid cover
RA-RAB-10	39 1/2"	Yes	Solid bottom tray with solid cover
120V DC BUS MB	39 1/2"	Yes	Solid bottom tray with solid cover
120V AC INSTR BUS 2MB	39 1/2"	Yes	Solid bottom tray with solid cover
PP-202	39 1/2"	Yes	Solid bottom tray with solid cover
IP-202	37"	Yes	Solid bottom tray with solid cover
PP-202 XFMR	77"	Yes*	Solid bottom tray with solid cover
ISOL BOX 'MB'	34"	Yes	Solid bottom tray with solid cover
PP-239	29"	Yes	Solid bottom tray with solid cover
ISOL BOX MB/MD	11"	Yes	Solid bottom tray with solid cover
125V DC BUS MD	39 1/2"	Yes	Solid bottom tray with solid cover
120V AC INSTR BUS 2MD	81"	Yes	Solid bottom tray with solid cover
PRZR HTR BUS 2B3 XFMR	32 1/2"	No	Solid bottom tray with solid cover
PRZR HTR BUS 2B3	32 1/2"	No	Solid bottom tray with solid cover
CEDMCS CAB 3	Above roof	Yes	Solid bottom tray with solid cover
CEDMCS CAB 1	Above roof	Yes	Solid bottom tray with solid cover
CEDMCS CAB 4	Above roof	Yes	Solid bottom tray with solid cover
CEDMCS CAB 2	Above roof	Yes	Solid bottom tray with solid cover
ISOLATION CAB 5 (SAS)	N/A	Yes	No tray above, adjacent trays have solid bottoms with solid covers
RJ-26-54	36"	Yes	Solid bottom tray with solid cover
B2952	48"	Yes	Solid bottom tray with solid cover
PRZR HTR BUS 2A3 XFMR	29 1/2"	No	Solid bottom tray with solid cover
PRZR HTR BUS 2A3	29 1/2"	No	Solid bottom tray with solid cover
ANN ISOLATION CAB (SA)	21"	Yes	Solid bottom tray with solid cover
REACTOR TRIP SWGR	14"	Yes	Solid bottom tray with solid cover
B2021	63"	Yes	Solid bottom tray with solid cover
480V MCC 2AB	31"	Yes	Solid bottom tray with solid cover
STATIC UPS UNIT CAB	45"	No	Solid bottom tray with solid cover
TG TEMP MON CAB	40"	Yes	Solid bottom tray with solid cover
CONT MON EQUIP CAB	21"	Yes	Solid bottom tray with solid cover
METERING CAB	21"	Yes	Solid bottom tray with solid cover

Table 1 Unit 2 Cable Spreading Room Cabinet/Equipment			
Unit 2 CSR Cabinet/Equipment ID	**Distance - cab top to tray top**	**Top solid or pent's sealed**	**Tray Style**
B2G65	55"	Yes	Solid bottom tray with solid cover
B2E98	55"	Yes	Solid bottom tray with solid cover
PP-233	30"	Yes	Solid bottom tray with solid cover
RA-RAB-12	39 1/2"	Yes	Solid bottom tray with solid cover
ANN ISOL CAB (SAB)	32 1/2"	Yes	Solid bottom tray with solid cover
VITAL AC BUS 2A-1	39"	Yes	Solid bottom tray with solid cover
VITAL AC BUS 2B-1	39"	Yes	Solid bottom tray with solid cover
PP-234 (SAB)	35 1/2"	Yes	Solid bottom tray with solid cover
B2374	36"	Yes	Solid bottom tray with solid cover
PP-234 XFMR	7"	Yes*	Solid bottom tray with solid cover

*The PP transformers have solid tops extending over the side walls. Although there are vent openings on the front and back, these small, low voltage (480/120, not 4160), dry type transformers are judged to be low probability ignition sources (ignition probability for one transformer at St. Lucie is 5.5E-5/yr by the FIVE. methodology). Even though one (PP-234 XFMR) is close to a tray, it is not considered to be a credible propagation source for the third tray up even if it did ignite. (The one cable of interest for PP-234 XFMR is in the third solid bottom/solid top tray up.)

Risk Assessment Details

The proposed EDG AOT extension results in an increase in time that an EDG may be unavailable to support post fire safe shutdown needs. The issue to be addressed is whether an AOT extension from 3 to 14 days causes an unacceptable fire risk increment. This section of this assessment is focused only on the Unit 2 CSR and CR.

The approach to the assessment relies on the redundancy that is an integral part of the plant design basis. Each of the safety-related electrical distribution buses is provided with an offsite supply and a dedicated onsite EDG. A crosstie to the other unit is also available but not credited in the CSR analysis. Each of these sources is available to support plant system needs following a postulated fire induced plant trip. Assuming a postulated fire event does not impact any of these three power sources, the conditional core damage probability would be dominated by random failures of the mechanical front line systems. Based on this insight, the assessment for the cable spreading room and main control room considered the following general steps.

1. Identify the circuits and equipment located in the two fire areas of interest associated with offsite power and the EDGs
2. Develop a 'target' footprint for the circuits and equipment noting train designations
3. Perform walkdowns of the fire areas to examine potential fire ignition sources and identify critical pinchpoints

4. Develop conservative CDF estimates to bound potential risk increases

Unit 2 Cable Spreading Room

The St. Lucie Unit 2 cable spreading room is configured such that it is better characterized as a combined auxiliary relay and cable spreading room. A review of the existing IPEEE analysis of this room concluded that the analysis was extremely conservative. Table 6 provides the cable spreading room ignition source contributions used for the IPEEE analysis. As allowed by the FIVE methodology used for the St. Lucie IPEEE, the IEEE 383 qualified cables used in Unit 2 are not considered as ignition sources. Additionally, the temperature for cable damage is much higher for IEEE cables than the 425F assumed for Unit 1. As additional conservatism, the fire modeling for Unit 1 is also used for Unit 2, without consideration of the higher damage temperature. This characterization is based on the walkdown that found that the majority of the potential fire ignition sources are completely enclosed and did not present a fire propagation threat. The only fire sources of potential concern were the two pressurizer heater bus transformers, the control element drive control system (CEDMCS) cabinets, which were called regulating group power programmer cabinets on Unit 1, and the static uninterruptible power supply (SUPS) cabinet.

1. Pressurizer Heater Bus Transformers – these are 4kV-460V dry type transformers. A postulated fire involving the transformer windings could generate significant heat. This is especially critical since the enclosure is not sealed. However, a transformer internal failure that would cause such a 'fire event' is likely to also cause upstream electrical overcurrent protective devices to operate and terminate the fire event. However, for conservatism, a fire requiring brigade response to suppress the fire was assumed.

2. CEDMCS Cabinets – these cabinets have small ventilation fans on the upper portion of the front panel door. The lower portion of the front panel door has ventilation louvers. Because of these ventilation openings, a credible fire propagation pathway is considered to exist. Although the ceiling above the cabinets would serve to retard spread to the trays and we do not consider the solid bottom and top covered trays to be credible propagation sources, it is conservatively assumed that these cabinets would damage all trays above them.

3. SUPS Cabinet - this cabinet has openings on top, small top vent fans and vent openings at the bottom of the cabinet. Because of these ventilation openings, a credible fire propagation pathway is considered to exist.

The walkdown also noted other cabinets existed with ventilation screens on their tops or on the sides near the top. However, a screening fire modeling assessment was performed and concluded that the available vertical target spacing precluded target damage. The screening assessments found the critical spacing to be between 5½ feet and 8¾ feet, depending on the estimated heat release rate. Heat rates of 65 BTU/s and 190 BTU/s were considered. The bases for the heat rates used in the analysis were

previously submitted by FPL letter L-2000-250 dated December 4, 2000, Tables 15, 16, 17, and 18. The heat rate that is applicable to any particular area is a function of the cabinet size and combustible loading. With the exception of the CEDMCS and SUPS cabinets, the walkdown found that the 8¾-foot spacing was satisfied for all other ventilated cabinets. Although trays may be located within the 8¾-foot spacing in some instances, the trays did not contain circuits of concern. In addition, the trays had a solid bottom with a continuous solid cover. While this lower tray was considered damaged, it did not represent a fire propagation mechanism. As such, the 8¾-foot required spacing was evaluated on the basis of the next higher tray.

- Pressurizer Heater Bus Transformer Fire

  The evaluation of the pressurizer heater power transformers found a postulated severe fire event could result in damage to overhead cable trays.

  A postulated fire involving the transformer for heater bus 2A3 could result in loss of Train 'A' AC power from both offsite sources and the EDG as well as other Train 'A' plant system equipment. The Train 'B' AC power from offsite sources and the associated EDG are not affected. In addition, circuits for other Train 'B' plant system equipment are also unaffected. For this fire scenario, any incremental CDF increase would be due to the CCDP change based on the Train 'B' EDG availability given the AOT extension. The ICCDP due to this fire scenario is conservatively estimated as follows. Although it would be appropriate to credit the automatic sprinkler system in the Unit 2 CSR, this assessment does not credit the sprinkler system.

  $$ICCDP = 7.90E-3 \; x \; \frac{1}{20} \; x \; 0.20 \; x \; \frac{14}{365} \; x \; 0.10 \; x \; 1.0E-2 \; = \; 3.03E-9$$

  where:

  7.90E-3 = plant-wide transformer fire frequency – FIVE

  20 = assume a total of 20 transformers in the plant

  0.20 = severity factor

  14 = extended AOT

  365 = days per year

  0.10 = fire brigade fails to suppress fire before target damage occurs

  1.0E-2 = CCDP assuming Train 'B' equipment only, offsite power available, but no EDG due to AOT

  A postulated fire involving the transformer for heater bus 2B3 could result in loss of Train 'B' AC power from the EDG as well as other Train 'B' plant system equipment. Train 'B' power from offsite sources would not be affected. The Train 'A' AC power from offsite sources and the associated EDG are not affected.

In addition, circuits for other Train 'A' plant system equipment are also unaffected. For this fire scenario, any incremental CDF increase would be due to the CCDP change based on the Train 'A' EDG availability. The CDF change due to this fire scenario is conservatively estimated in the same fashion as above and yields the same CDF increment.

The cumulative ICCDP due to the 14-day EDG AOT based on the postulated transformer fires is conservatively estimated to be 6.06E-9.

- Control Element Drive Mechanism Control System (CEDMCS) Cabinets

The evaluation of the CEDMCS cabinets found a postulated severe fire event could result in damage to overhead cable trays. In addition, these cabinets are located directly beneath the main control board section containing the controls for both trains of AC power and both EDGs. This area constitutes a critical pinchpoint.

A postulated severe fire involving these cabinets which propagates to overhead cable trays would require operator action outside of the main control room to restore AC power. This action would involve recovery of the Train 'A' power supply system in accordance with the Appendix R related station procedures. For this fire scenario, any incremental CDF increase would be due to the CCDP change based on the Train 'A' EDG availability. The Train 'B' EDG AOT has no impact since the fire is postulated to have damaged the circuits, and recovery from outside the area is not available. The ICCDP due to this fire scenario is conservatively estimated as follows. The assessment does not credit the automatic sprinkler system.

$$ICCDP = 3.20E-3 \; x \; \frac{10}{80} \; x \; 0.20 \; x \; \frac{14}{365} \; x \; 0.10 \; x \; 0.10 \; = \; 3.07E-8 .$$

where:

3.20E-3 = electrical cabinet fires in cable spreading room – FIVE

10 = cabinets of interest assigned a weighting factor of 10

80 = cumulative weighting factor for total scope of cabinets in room

0.20 = severity factor

14 = extended AOT

365 = days per year

0.10 = fire brigade fails to suppress fire before target damage occurs

0.10 = CCDP assuming Train 'B' equipment only, recovery of offsite power via operator action, and no EDG

The 0.10 CCDP is based on credit for operator actions outside the main control room to restore offsite power. No other actions outside the main control room are credited in this scenario. In this scenario, the main control room remains manned. The CDF increment due to the 14-day EDG AOT based on the electrical cabinet fires is conservatively estimated to be 3.07E-8/yr.

- SUPS Cabinet

The evaluation of the SUPS cabinets found a postulated severe fire event could result in damage to overhead cable trays. The only circuits of interest affect both EDGs. However, postulated fires in this area do not affect offsite power. The ICCDP due to this fire scenario is conservatively estimated as follows. The assessment does not credit the automatic sprinkler system.

$$ICCDP = 3.20E-3 \; x \; \frac{1}{80} \; x \; 0.20 \; x \; \frac{14}{365} \; x \; 0.10 \; x 1.0E-2 \; = \; 3.07E-10 \, .$$

where:

3.20E-3 = electrical cabinet fires in cable spreading room – FIVE

1 = cabinets of interest assigned a weighting factor of 10

80 = Cumulative weighting factor for total scope of cabinets in room

0.20 = Severity factor

14 = Extended AOT

365 = Days per year

0.10 = Fire brigade fails to suppress fire before target damage occurs

1.0E-2 = CCDP assuming Train 'B' equipment only, offsite power available, but no EDG due to fire

- Cumulative CDF Increment for Unit 2 Cable Spreading Room

Based on the conservative assessment presented above, the ICCDP for the Unit 1 cable spreading room is:

6.06E-9 + 3.07E-8 + 3.07E-10 = 3.71E-8.

Unit 2 Main Control Room

A review of the existing IPEEE analysis of the control room also concluded that the analysis was extremely conservative. Table 7 provides the control room ignition source contributions used for the IPEEE analysis. The revised assessment for the main control room is similar to that presented for the cable spreading room. Fire scenarios were defined for those fire events that affect offsite power and/or the EDGs. A walkdown of the main control board determined that internal barriers exist to separate it into subsections. These internal barriers extend the full height and depth of the control board and extend into the apron area. Given this configuration, a number of fire scenarios are applicable.

1. A nonsevere fire in the control board sections containing AC power controls. This fire is assumed to cause localized damage to the extent defined by the internal barriers.
2. A severe fire occurs in any of the cabinets in the main control room. Failure to suppress this fire within a fixed time period is assumed to cause control room abandonment due to habitability and visibility concerns.

The main control room board containing controls associated with AC power was determined to have a linear length weighting factor of 2. The entire scope of control room boards and cabinets was determined to have a cumulative length weighting factor of 90.

The internal barriers in the electrical control section of the main control board effectively divided the section into three subsections. One subsection contained the controls for the Train 'A' safety-related portion of the system. Another subsection contained the controls for the Train 'B' safety-related portion of the system. Each of these subsections was assigned a weighting factor of 0.5. The third subsection contained the controls for the nonsafety-related buses and the common bus which forms the connection to the opposite unit for offsite supply. This third subsection was assigned a weighting factor of 1.

- Nonsevere Fires

  A postulated nonsevere fire involving that portion of the main control board containing controls for the safety-related power system would result in complete loss of control room control for that portion. In the case of the Train 'A' controls, existing Appendix R related design features provide provisions for recovery from outside the main control room.

  If the fire involved the Train 'A' section, post fire response would rely on the Train 'B' power with the potential for operator recovery of the Train 'A' power. The

recovery of Train 'A' power would involve operator actions outside the main control room in accordance with existing Appendix R related station procedures. If the fire involved the Train 'B' section, post fire response would rely on the Train 'A' power alone. Actions outside the main control room are not needed in this case. Therefore, the postulated fire involving the Train 'B' section is expected to yield the greater CDF impact. This is because the fire would disable Train 'B' with no available recovery. Train 'A' would rely solely on offsite power based on an assumed EDG AOT event. If the fire was assumed to be in the Train 'A' section, the resultant scenario would be similar, but the CCDP would be lower since recovery of the Train 'A' power from outside the main control room can be credited. The ICCDP due to this fire scenario is conservatively estimated as follows.

$$ICCDP = 9.50E-3 \; x \; \frac{1}{90} \; x \; 1.0 \; x \; \frac{14}{365} \; x \; 1.0E-2 \; = \; 4.05E-8 .$$

where:

9.50E-3 =	electrical cabinet fires in main control room – FIVE
1 =	sum of weighting factors for two subsections
90 =	cumulative weighting factor for total scope of cabinets in room
1.0 =	a severity factor of 0.80 would normally be applicable for that fraction of fires assumed to be nonsevere. However, a value of 1.0 is used to account for that fraction of fires assumed to be severe, but is suppressed in time to prevent control room abandonment.
14 =	extended AOT
365 =	days per year
1.0E-2 =	CCDP assuming Train 'B' equipment only, offsite power available, but no EDG

A postulated nonsevere fire involving that portion of the main control board containing the controls for the nonsafety-related buses and the 'AB' bus also needs to be considered. The 'AB' bus forms the connection to the opposite unit (blackout crosstie). In this case, the fire does not disable either safety-related train of AC power. Instead, it disables the power feed from the opposite unit. Each safety-related bus is reduced to having one offsite power supply since the fire disables the blackout crosstie. The CDF change due to this fire scenario is conservatively estimated in the same fashion as shown above except the CCDP is assumed to be 1.0E-3. This CCDP is based on the assumption that the only fire induced impacts are a plant trip and loss of the blackout crosstie.

$$ICCDP = 9.50E-3 \; x \; \frac{1}{90} \; x \; 0.80 \; x \; \frac{14}{365} \; x \; 1.0E-3 \; = \; 3.24E-9.$$

The cumulative ICCDP due to the 14-day EDG AOT based on the postulated nonsevere main control board fires is conservatively estimated to be:

4.05E-8 + 3.24E-9 = 4.37E-8.

- Severe Fires

A postulated severe fire involving any of the main control room control boards or cabinets presents a threat to habitability. A postulated severe control room fire that is not suppressed within a relatively short period of time will require abandonment of the main control room. This abandonment would be forced due to habitability and visibility concerns. Completion of required post fire safe shutdown actions would be performed by the plant operators using controls outside the main control room in accordance with existing Appendix R related station procedures. The probability for failure to manually suppress a severe fire is obtained from NSAC-181 and is based on available time for suppression. The manual suppression failure probability is 1.6E-2 and 3.4E-3 for 10 and 15 minutes, respectively. The ICCDP due to this fire scenario is conservatively estimated as follows.

$$ICCDP = 9.50E-3 \; x \; 0.20 \; x \; \frac{14}{365} \; x \; 7.38E-3 \; x \; 2.5E-2 \; = \; 1.34E-8 .$$

where:

9.50E-3 =	electrical cabinet fires in main control room – FIVE
0.20 =	severity factor
14 =	extended AOT
365 =	days per year
7.38E-3 =	log based average of 10 and 15 minute suppression failure
2.5E-2 =	change in CCDP assuming Train 'A' equipment only, recovery of offsite power via operator action, and no EDG. See discussion below.

The calculation presented above differs from that performed for the other scenarios. In this calculation, the CCDP value is the change (increase) given the unavailability of the Train 'A' EDG due to an AOT. The baseline CCDP assuming no EDG AOT is some value that is not developed in this evaluation. However, this value would be the sum of the human reliability event (failure probability of operator actions) given the scope of actions outside the main control room plus

the random failure probability of the safe shutdown equipment. The EDG AOT does not affect the human reliability. However, the random failure probability is expected to increase since the EDG is unavailable due to the AOT. A conservative estimate of the increase is 5.0E-2. Assuming the baseline CCDP is half-human reliability and half-random failure events, the net increment in CCDP due to the EDG AOT event is 2.5E-2.

The analysis for the postulated severe fire event would typically also address a fire that is successfully suppressed. In this case, the resultant scenario has a CCDP that is the same as for the nonsevere event. This is because successful suppression is assumed to prevent propagation of the fire to an adjacent panel compartment. However, the analysis for the nonsevere fires is already incorporated into this scenario by using a severity factor of 1.0. Refer to the prior discussion of nonsevere fires for further details.

The ICCDP due to the 14-day EDG AOT based on the postulated severe main control board fires is conservatively estimated to be 1.34E-8.

Cumulative CDF Increment for Unit 2 Main Control Room

Based on the conservative assessment presented above, the ICCDP for the main control room is:

$$4.37E\text{-}8 + 1.34E\text{-}8 = 5.71E\text{-}8.$$

Total Unit 2 cable spreading room and main control room CDF increment due to AOT

Based on the conservative estimates presented in the prior sections, the cumulative Unit 2 cable spreading room and control room ICCDP due to the increase of the EDG AOT from 3 to 14 days is:

$$3.71E\text{-}8 + 5.71E\text{-}8 = 9.42E\text{-}8.$$

Change in average Unit 2 CDF and LERF:

Tables 2 and 3 provide the results of the Unit 2 evaluation of the change in average fire-related CDF and LERF based on the proposed EDG total out-of-service.

TABLE 2
UNIT 2 CHANGE IN AVERAGE FIRE-RELATED CDF BASED ON PROPOSED EDG UNAVAILABILITY

	IGNITION FREQ./YR	EQUIPMENT UNAVAILABILITY	FIRE CDF/YR
'B' SWITCHGEAR ROOM			
BASE	8.73E-03	5.76E-04	5.03E-06
W/PROPOSED T/M	8.73E-03	5.81E-04	5.07E-06
CHANGE IN CDF			4E-08
TURBINE BUILDING SWITCHGEAR ROOM 'A'			
BASE	6.05E-03	2.83E-05	1.71E-07
W/PROPOSED T/M	6.05E-03	3.04E-05	1.84E-07
CHANGE IN CDF			1.30E-08
TURBINE BUILDING SWITCHGEAR ROOM 'B'			
BASE	6.05E-03	4.61E-05	2.79E-07
W/PROPOSED T/M	6.05E-03	5.25E-05	3.18E-07
CHANGE IN CDF			3.90E-08
TOTAL CHANGE IN CDF			9.20E-08

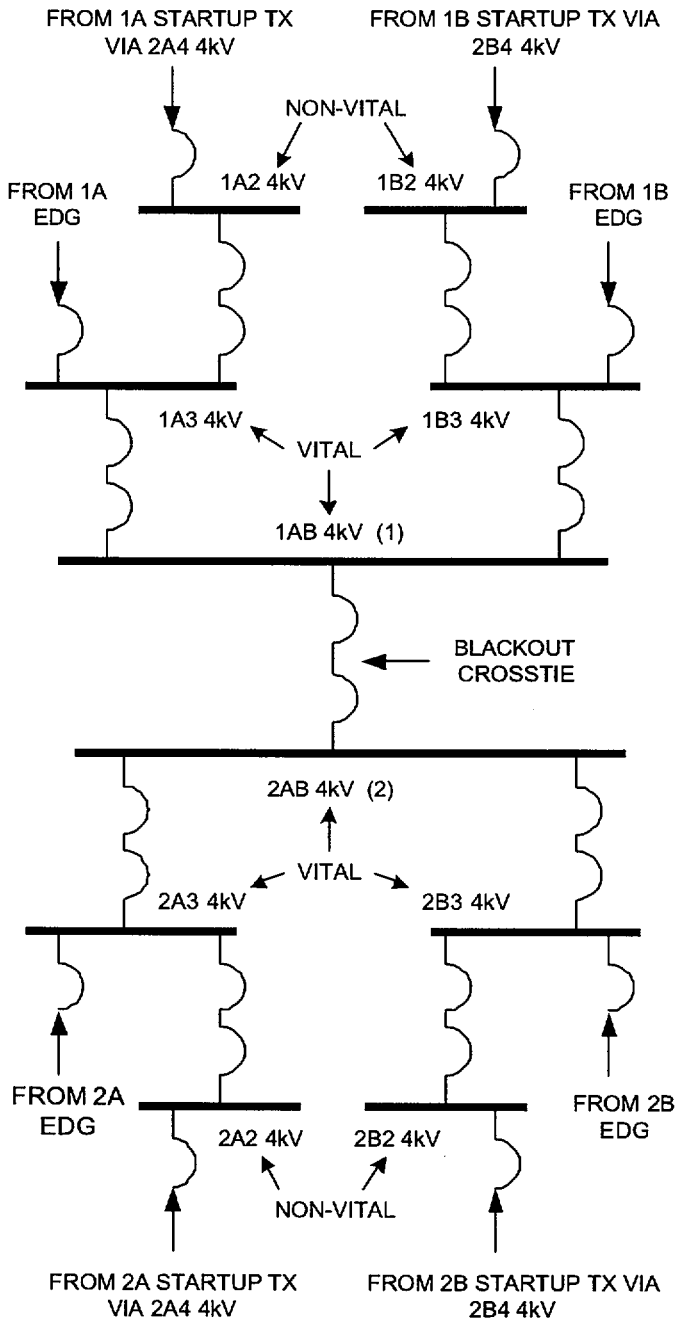
TABLE 3
UNIT 2 CHANGE IN AVERAGE FIRE-RELATED LERF BASED ON PROPOSED EDG UNAVAILABILITY

	BASE LERF	NEW LERF	CHANGE IN LERF
'B' SWGR ROOM	5.67E-06	5.67E-06	<1E-08
TURBINE BLDG SWITCHGEAR ROOM 'A'	5.62E-06	5.62E-06	<1E-08
TURBINE BLDG SWITCHGEAR ROOM 'B'	5.62E-06	5.62E-06	<1E-08
TOTAL	1.69E-05	1.69E-05	<1E-07

TABLE 4 SUMMARY OF UNIT 2 FIRE-RELATED RESULTS				
	ICCDP	ICLERP	CHANGE IN CDF	CHANGE IN LERF
UNIT 2 CABLE SPREADING ROOM	3.71E-8			
UNIT 2 CONTROL ROOM	5.71E-8			
UNIT 2 'B' SWITCHGEAR ROOM (Note 1)	9.47E-08	9.21E-09	4E-08	<1E-08
UNIT 2 'A' TURBINE BUILDING SWITCHGEAR ROOM (Note 1)	2.08E-08	3.84E-10	1.30E-08	<1E-08
UNIT 2 'B' TURBINE BUILDING SWITCHGEAR ROOM (Note 1)	6.11E-08	7.67E-10	3.90E-08	<1E-08
TOTAL (Note 1)	2.71E-07	1.04E-08	9.20E-08	<1E-07
Note 1: The cutsets used were not fully recovered, i.e., recovery actions were only added to the extent necessary to conclude that the impact of the proposed EDG AOT extension is not risk significant. The results are, therefore, judged to be conservative.				

The total ICCDP for each unit, including the conservatively estimated fire risk contribution, is less than 5E-07 and the ICLERP is less than 5E-08. The results are thus below the RG 1.177 specified values and are considered small.

FIGURE 1
Blackout Crosstie Bus Arrangement



(1) 1AB is connected to either 1A3 or 1B3, but not both simultaneously
(2) 2AB is connected to either 2A3 or 2B3, but not both simultaneously

Table 5 - Unit 2 Cable Routing								
SSC	Item #	Cable #	Sys	From	To	Comment	Cable Tray #	Cable Tray Elev
Swgr 2A2 Fdr Bkr (Start-up)	1	20906A	-	RTGB 201	SWGR 2A2-2 4kV	Cntl & Ind	C2321-NA	EL 57'-6
Swgr 2B2 Fdr Bkr (Start-up)	2	20907A	-	RTGB 201	SWGR 2B2-9 4kV	Cntl & Ind	C2322-NB	EL 56'-11
Unit Aux Xfmr 2A2 Bkr	3	20914A	-	RTGB 201	SWGR 2A2-1 4kV	Cntl & Ind	C2321-NA	EL 57'-6
Unit Aux Xfmr 2B2 Bkr	4	20915A	-	RTGB 201	SWGR 2B2-10 4kV	Cntl & Ind	C2322-NB	EL 56'-11
Swgr 2A2 Metering	5	20916A	-	RTGB 201	SWGR 2A2-1 4kV	PTs	C2321-NA	EL 57'-6
Swgr 2B2 Metering	6	20917A	-	RTGB 201	SWGR 2B2-10 4kV	PTs	C2322-NB	EL 56'-11
Swgr 2A2 Fdr To Bus 2A3	7	20934C	-	RTGB 201	SWGR 2A2-9 4kV	Cntl & Ind	C2321-NA	EL 57'-6
Swgr 2A2 Fdr To Bus 2A3	8	20934E	-	SWGR 2A2-9 4kV	B2G64	Cntl	C2321-NA	EL 57'-6
Swgr 2B2 Fdr To Bus 2B3	9	20935C	-	RTGB 201	SWGR 2B2-2 4kV	Cntl & Ind	C2322-NB	EL 56'-11
Swgr 2B2 Fdr To Bus 2B3	10	20935E	-	SWGR 2B2-2 4kV	B2G75	Cntl	C2322-NB	EL 56'-11
Swgr 2A3 Inc Fdr From Bus 2A2	11	20936B	ELEC	RTGB 201	SWGR 2A3-9 4kV	Cntl & Ind	C2323-SA, C2327-SA	EL 55'-0, EL 54'-2
Swgr 2B3 Inc Fdr From Bus 2B2	12	20937B	ELEC	RTGB 201	SWGR 2B3-11 4kV	Cntl & Ind	C2324-SB, C2328-SB	EL 55'-3, EL 54'-5
Swgr 2A3 Fdr To Bus 2AB	13	20938B	ELEC	RTGB 201	SWGR 2A3-8 4kV	Cntl & Ind	C2323-SA, C2327-SA	EL 55'-0, EL 54'-2
Swgr 2B3 Fdr To Bus 2AB	14	20939B	ELEC	RTGB 201	SWGR 2B3-9 4kV	Cntl & Ind	C2324-SB, C2328-SB	EL 55'-3, EL 54'-5
Swgr 2AB Inc Fdr From Bus 2A3	15	20940B	ELEC	RTGB 201	SWGR 2AB-5 4kV	Cntl & Ind	C2522-SAB	EL 56'-11
Swgr 2AB Inc Fdr From Bus 2B3	16	20941B	ELEC	RTGB 201	SWGR 2AB-4 4kV	Cntl & Ind	C2522-SAB	EL 56'-11
EDG 2A Bkr	17	20953C	DG	RTGB 201	SWGR 2A3-11 4kV	Cntl & Ind	C2323-SA, C2327-SA	EL 55'-0, EL 54'-2
EDG 2A Start Circuits	18	20957B	DG	ESC PNL SA	DG 2A EXC CBL	SIAS 'A'	C2327-SA, C2323-SA	EL 54'-2, EL 55'-0
EDG 2A Remote Cntl	19	20958A	DG	RTGB 201	DG 2A EXC CBL	Gov Cntl & Ind	C2323-SA	EL 58'-0 & EL 55'-0
EDG 2B Bkr	20	20963C	DG	RTGB 201	SWGR 2B3-1 4kV	Cntl & Ind	C2324-SB	EL 55'-3
EDG 2B Start Circuits	21	20967B	DG	ESC PNL SB	DG 2B EXC CBL	SIAS 'B'	C2328-SB	EL 54'-5
EDG 2B Remote Cntl	22	20968A	DG	RTGB 201	DG 2B EXC CBL	Gov Cntl & Ind	C2324-SB	EL 55'-3
Swgr 2AB SBO Tie Bkr	23	21297F	-	SWGR 2AB-1 4kV	RTGB 201	Cntl & Ind	C2522-SAB	EL 56'-11

Table 6
UNIT 2 CABLE SPREADING ROOM
IGNITION SOURCES ASSUMED FOR IPEEE ANAYLSIS
COMPARTMENT (FA-B) DESCRIPTION
Fire Compartment Boundaries: FZ-52, CABLE SPREADING ROOM
Inside Fire Area: FA-B, CABLE SPREADING ROOM
COMPARTMENT (FA-B) FIRE IGNITION FREQUENCY

STEP 1.1	Selected Plant Location	CSR			PLANT-WIDE	
STEP 1.2	Location Weighting Factor (WFL)	1.00E+00			2.00E+00	
STEP 1.3	Ignition source frequency (fif)	(Fif = Ff * WFLS * WFL				
	Compartment ignition sources	(A)	(B)	WFLS = A/B	Ff	Fif
1.	Electrical Cabinets			1	3.20E-03	3.20E-03
	Plant Wide Ignition Sources	(A)	(C)	WFLS = A/C	Ff	
1. Transients		6	63	9.52E-02	1.3E-03	2.48E-04
2. Welding>Ordinary Combustibles (1/# Compts)		1	63	1.59E-02	3.1E-02	9.84E-04
3. Welding>Cable Fires (1/# Compts)		1	63	1.59E-02	5.1E-03	1.62E-04
4. Transformers		8	145	5.52E-02	7.9E-03	8.72E-04
5. Ventilation Systems			168		9.5E-03	
6. Junction boxes (All Unit 2 Cable is qualified)						**
7. Fire Protection Panels		2	55	3.64E-02	2.4E-03	1.75E-04
8. Miscellaneous Hydrogen Fires			63		3.2E-03	
STEP 1.4	Compartment (FA-B) Fire Frequency (F1) - equals the sum of the Fif values					5.64E-03
** Note:	Typical FPL practice is to use junction boxes as cable pull boxes, not for splices, and all junction boxes are sealed and entered only by conduits. Therefore, these would not propagate if they did ignite and are not considered to be ignition sources.					

Table 7
UNIT 2 CONTROL ROOM
IGNITION SOURCES ASSUMED FOR IPEEE ANALYSIS
Compartment (FA-F) Description
Fire Compartment Boundaries: FZ-42II, FZ-42III (and Control Room FZ-42 I below)

Inside Fire Area: FA-F						
		COMPARTMENT (FA-F) FIRE IGNITION FREQUENCY				
STEP 1.1	Selected Plant Location	RAB			PLANT-WIDE	
STEP 1.2	Location Weighting Factor (WFL)	1.00E+00			2.00E+00	
STEP 1.3	IGNITION SOURCE FREQUENCY (Fif)	(Fif = Ff * WFLS * WFL				
	COMPARTMENT IGNITION SOURCES	(A)	(B)	WFLS = A/B	Ff	Fif
1.	Electrical Cabinets	1	226	4.42E-03	1.90E-02	8.41E-05
2.	Pumps	2	73	2.74E-02	1.90E-02	5.21E-04
	PLANT WIDE IGNITION SOURCES	(A)	(C)	WFLS = A/C	Ff	
1. Transients		9	62	1.45E-01	1.3E-03	3.77E-04
2. Welding>Ordinary Combustibles (1/# Compts)		0.667	62	1.08E-02	3.1E-02	6.67E-04
3. Welding>Cable Fires (1/# Compts)		0.667	62	1.08E-02	5.1E-03	1.10E-04
4. Transformers			145		7.9E-03	
5. Ventilation Systems		5	168	2.98E-02	9.5E-03	5.65E-04
6. Junction boxes (All Unit 2 Cable is qualified)		7.00E+04	1.26E+10	5.55E-06	1.6E-03	1.78E-08
7. Fire Protection Panels			30		2.4E-03	
8. Miscellaneous Hydrogen Fires			62		3.2E-03	
	Sub-total Fif (Fire ignition frequency)					2.32E-03
	FZ-42 I Fif (Fire ignition frequency)					1.06E-02
STEP 1.4	COMPARTMENT (FA-F) FIRE FREQUENCY (F1) - equals the sum of the Fif values					1.29E-02

NRC Request 10:

During the meeting on October 24, 2000, FPL was requested to provide the following information with regard to the fire protection capabilities.

a) *Confirm that there is sufficient hose length in the Unit 1 cable spreading room (CSR) to cover all areas of the room with a hose stream.*

b) *How many other hose stations external to the CSR have sufficient hose length to cover all the areas in the room with a hose stream?*

c) *What is the length of the watch for the continuous fire watch stationed in the CSR?*

d) *How many hot work permits were issued for hot work in the CSR from 1996 to the present?*

e) *Identify how many condition reports (CR) have been written on transient combustible program problems since the CR program was put in place?*

f) *Identify the tier 2 restrictions we will propose to include in the CRMP as mitigating factors to lower the risk of fire in the CSR during the extended AOT period including, as a minimum, the following restrictions:*
   - *significant restrictions on hot work in cable spreading room during extended AOT*
   - *continuous firewatch when in extended AOT*
   - *plant fire protection walkdown prior to entering extended AOT*
   - *thermographic examination of high risk potential ignition sources in cable spreading room and control room*

FPL Response 10:

a) Response provided in L-2000-250 dated December 4, 2000.

b) Response provided in L-2000-250 dated December 4, 2000.

c) Response provided in L-2000-250 dated December 4, 2000.

d) Response provided in L-2000-250 dated December 4, 2000.

e) Response provided in L-2000-250 dated December 4, 2000.

f) FPL commits to incorporate the following Unit 2 fire protection Tier 2 restrictions into the administrative procedures for implementing the configuration risk management program (CRMP) and the on-line risk monitor (OLRM).

During Modes 1, 2, and 3, if a Unit 2 EDG is to be removed from service for maintenance for a period scheduled to exceed 72 hours the following actions will be completed:

- *conduct a plant fire protection walkdown of the areas that could impact EDG availability, offsite power availability, or the ability to use the station blackout crosstie prior to entering the extended AOT;*
- *perform a thermographic examination of high risk potential ignition sources in the cable spreading room and the control room prior to entering the extended AOT;*
- *restrict planned hot work in the cable spreading room and control room during the extended AOT; and*
- *establish a continuous fire watch in the cable spreading room when in the extended AOT.*