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SUBJECT: Submits comments on draft safety evaluation on station blackout rule (10CFR50.63),per NRC 901121 request.

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P.O. Box 128, Ft. Pierce, FL 34954-0128

FPL

December 21, 1990
L-90-452
10 CFR 50.63

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

Gentlemen:

Re: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Station Blackout Rule - 10 CFR 50.63

By letter dated November 21, 1990 (J. A. Norris to J. H. Goldberg), the NRC forwarded to Florida Power & Light Company (FPL), for comment, a draft Safety Evaluation on the Station Blackout (SBO) rule (10 CFR 50.63) for St. Lucie Unit 1. FPL strongly desires to resolve SBO for St. Lucie Units 1 and 2 in the same manner notwithstanding the exemption from the rule requirements granted for St. Lucie Unit 2. In this light, FPL provides the following comments.

FPL's approach to transient and emergency events at its nuclear power plants ensures the continued availability of Alternating Current (AC) electrical power. This approach has been an integral part of our nuclear plant operating strategy. The SBO rule permits licensees to implement this strategy in meeting the criteria and requirements of 10 CFR 50.63. FPL is committed to resolve SBO for St. Lucie Units 1 and 2 by use of an alternate AC (AAC) source. FPL proposes to meet the requirements of the SBO rule by preventing a unit blackout or SBO; in that respect, the St. Lucie units will not cope with either event using Direct Current (DC) power, but, rather will recover from a Loss of Offsite Power (LOOP) with the assumed multiple EDG failures by means of a unit to unit AC electrical crosstie. The safety and non-safety related equipment FPL has proposed to load on the single operating Emergency Diesel Generator (EDG) is equipment which is necessary to place both units in safe shutdown (i.e., hot standby).

FPL's comments presented in the attachment to this letter address the following aspects of the NRC's draft Safety Evaluation:

1) The resolution of SBO for St. Lucie Units 1 and 2 using the AAC source approach increases safety margins from that of a Direct Current (DC) coping approach.

2) Electrical loading of the operating EDG for this event

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1/1

includes the AC loads necessary to cope with a LOOP and failure of three EDGs for both units, excluding the following loads, as allowed by criteria embodied in 10 CFR 50.63:

a) Shutdown Cooling (SDC) pumps

b) AC driven Auxiliary Feedwater (AFW) pumps

3) Reactor coolant depletion via seal leakage at the rate assumed in the NRC's Safety Evaluation is not a consideration for either unit.

4) Management of the site operations dictates standardized procedures, training, Technical Specifications, and licensing and design bases for both units on the site. Since the St. Lucie plant operators are licensed to operate both St. Lucie units, different licensing bases, Technical Specifications, and emergency operating procedures for recovering from SBO on either unit will present unnecessary human factors concerns.

Attached are our detailed comments on the above issues as well as other aspects of the staff's draft Safety Evaluation. We appreciate the opportunity to review and comment on this Safety Evaluation.

Very truly yours,

D. A. Sager
Vice President
St. Lucie Plant

DAS/EJW/lef

DAS/PSL #312

cc: Stewart D. Ebneter, Regional Administrator, USNRC, Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

ATTACHMENT

FPL comments on NRC draft Safety Evaluation Station Blackout Rule St. Lucie Units 1 and 2.

FPL strongly desires to resolve 10 CFR 50.63 for both St. Lucie Units 1 and 2 in the same manner (i.e., by means of an alternate AC (AAC) source). FPL has identified several licensing and design concerns with the resolution of 10 CFR 50.63 in the staff's draft Safety Evaluation (SE), as detailed below.

1) Introduction

FPL's compliance with 10 CFR 50.63, "Loss of all alternating current power", and the guidance provided by Regulatory Guide 1.155 and NUMARC 87-00 are aimed at meeting 10^{-5} per reactor year as an acceptable frequency for core damage contribution from sequences initiated by a station loss of offsite power (LOOP)[1] as established by the NRC. Resolution of Station Blackout (SBO) for St. Lucie Units 1 and 2 consists of plant enhancements and modifications which will result in reduced frequency of core damage from a unit or station blackout event to less than 10^{-5} per reactor year.

The Advisory Committee on Reactor Safeguards (ACRS), Committee to Review Generic Requirements (CRGR) and NRC staff recognized that some licensees could provide, or may actually have in place, additional diesels, gas turbines or cross-connect options at two-unit sites that could serve as a one-of-four emergency diesel generator (EDG) configuration rather than one-of-two EDG configurations for unit blackout considerations[1]. This recognition led to the "10-minute" alternate AC (AAC) source at multi-unit sites. In fact, the statements of consideration for the rule identified this approach as a "preferred option" to resolve 10 CFR 50.63.

In letters dated April 17, 1989 and March 7, 1990 (L-89-145 and L-90-58, respectively), FPL proposed to add a remote manual electrical intertie to cross-connect electrical buses between St. Lucie Units 1 and 2 such that the reliability of the emergency AC power system configuration after a LOOP is significantly improved. This configuration permits any one of four EDGs to mitigate the effects of a unit blackout at the

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[1]NRC staff responses to questions from Commissioners Asselstine, Bernthal, Roberts and Zech during final rule making decision on "Station Blackout" regulation date November 10, 1985.

site. FPL has shown that one EDG is sufficient to provide all the necessary loads associated with placing both units in hot standby from 100% power for the required blackout duration. Additionally, FPL has performed a preliminary risk assessment which reflects the significant risk reduction gained by the modifications for a postulated SBO event.

2) Increased Safety Margins for AAC Approach.

FPL's preliminary evaluation of risk reduction as a result of the AAC approach demonstrates that the core melt risk from SBO after a LOOP event has been reduced from approximately 7.6×10^{-4} to 2.9×10^{-6} per reactor year. This is directly attributable to the proposed unit-to-unit cross-tie capability of the electrical system resulting in the added availability of two EDGs. The evaluation results in a risk reduction factor in excess of 200. By comparison, in NUREG-1032, "Evaluation of Station Blackout Accidents of Nuclear Power Plants" and in NUREG-1109, "Regulatory Analysis for the Resolution of Unresolved Safety Issue A-44, Station Blackout", the NRC staff reports a risk reduction factor of approximately 2.5 (i.e. 2.1×10^{-5} to 0.8×10^{-5} per reactor year) as the basis for issuance of the SBO rule for units with a 4 hour DC coping capability and one-out-of-two EDG configuration[2].

3) Alternate AC (AAC) Loading

FPL has re-analyzed the emergency diesel generator (EDG) loading for the proposed bus intertie for St. Lucie Units 1 and 2 to meet SBO criteria. This re-analysis results in revised load profiles from those provided to the NRC staff during the October 1989 SBO audit. The proposed electrical loadings for the EDGs to accommodate the SBO event are provided in attached Table 1 for St. Lucie Unit 1 and Table 2 for St. Lucie Unit 2. These loadings are essentially the major LOOP loads listed in the Updated Final Safety Analysis Report (UFSAR) with the following exceptions to account for the requirements of 10 CFR 50.63:

a) The SBO and non-blacked out (NBO) units' loadings do not include the motor driven Auxiliary Feedwater (AFW) pumps. The NBO unit assumes failure of a redundant EDG (i.e., failure of three EDGs after LOOP event at the site) to qualify the fourth EDG as an AAC source. An assumed failure of the turbine driven AFW pump on either the SBO

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[2]Rulemaking Issue Affirmation, SECY-88-22, January 21, 1988.

or NBO unit for this event goes beyond the assumptions required by the regulations; FPL believes that this assumption is new criterion which was not considered in the regulatory analysis for 10 CFR 50.63 nor is it included in Regulatory Guide 1.155.

The regulatory analysis for 10 CFR 50.63 is based on a safety goal limiting the average contribution to core damage from a SBO to about 10^{-5} per reactor year. As a comparison, the NRC staff, in NUREG/CR-4710, "Shutdown Decay Heat Removal Analysis of a Combustion Engineering 2-LOOP PWR" has analyzed a number of failure probabilities for the St. Lucie Plant. The NUREG reports that failure of a turbine driven AFW pump coupled with a common mode failure of 2 EDGs after a LOOP event results in a frequency of occurrence of 8.2×10^{-7} per reactor year. For the postulated SBO event an additional EDG failure must be assumed. This additional failure will further reduce the core damage contribution by a factor of 5×10^{-2}. FPL believes that this is inconsistent with the analyses used to support 10 CFR 50.63 and is therefore, a new regulatory criterion beyond 10 CFR 50.63.

The NRC - approved guidelines from "Combustion Engineering Emergency Procedures Guidelines" CEN-152, Rev. 03, address operator actions for LOOP and SBO events. These guidelines and FPL's procedures generated using these guidelines call for limiting flow to any one steam generator during these events to 150 gpm to minimize the probability of other postulated over-cooling events. The turbine driven AFW pump has greater capacity than the motor driven pumps and is capable of supplying sufficient AFW flow to both steam generators for decay heat removal. FPL's emergency operating procedures, which were developed using the guidance of CEN-152, require the operators to restrict AFW flow by placing the motor driven pump in the recirculation mode for the postulated case where a LOOP event has occurred and three of the four EDGs do not start. Procedures will instruct the operator to:

i) verify flow from the turbine driven AFW pump,

ii) secure flow from the NBO unit's motor driven pump (in accordance with CEN-152 guidance), and

iii) proceed with the 10-minute bus intertie to power the blacked out unit.

Similar actions will take place on the SBO unit. Based on the above, the SBO load evaluation does not require including the motor driven AFW pump.

b) Title 10 CFR 50.63 and NUMARC 87-00 define safe shutdown as hot standby or hot shutdown, as appropriate. For EDG evaluation purposes, FPL intends to maintain both units at hot standby for the eight hour LOOP/SBO duration. For units in hot standby, operating pressures and temperatures prohibit the use and operation of the Shutdown Cooling (SDC) system (i.e., the Low Pressure Safety Injection pumps which are used in non-accident conditions for shutdown decay heat removal).

Pursuant to the design bases of the St. Lucie Units 1 and 2, the SDC system is manually placed into service when the Reactor Coolant System (RCS) pressure is approximately 275 psig, and temperature is less than 325 degrees F. The St. Lucie Units 1 and 2 SBO EDG loading evaluations will not consider mode changes (i.e., to cold shutdown) during the eight hour AAC coping period; therefore, the SDC system will not be used during this time. Based on the above, FPL has not included the SDC pump loads in the EDG load evaluation for SBO.

4) Reactor Coolant Inventory

St. Lucie Units 1 and 2 use AAC for safe shutdown during the postulated SBO event. FPL believes the generic Reactor Coolant Pump (RCP) leakage criterion of 25 gpm per pump (for plants with DC coping), was intended to address units that do not provide cooling to the RCP seals. As AAC plants, St. Lucie Units 1 and 2 will provide cooling water to the RCP seals on the SBO unit shortly after energizing the intertie (i.e., in approximately 10 minutes). As a result, no seal damage is postulated and only normal seal leakoff need be assumed for the RCPs.

With respect to the integrity of St. Lucie Unit 1 and 2 RCP seals following a loss of component cooling, it should be noted that the integrity of the RCP seals of the type used in the St. Lucie Unit 1 and 2 reactor coolant pumps was verified in a qualification test conducted at the pump manufacturer's test facility. This full-scale test simulated all the conditions of temperature, pressure and fluid flow that would be experienced in a LOOP event when seal cooling is interrupted and the pump shaft stopped. It was the goal of the test to identify the effects of loss of cooling to the seals over a four hour period which would represent an extended loss of AC power. After four hours without any cooling water flow, there was no observed increase in seal leakage although the seal temperatures had risen to over 400°F while the system pressure was maintained at 2500 psi. The test was continued for over 50 hours and at no time did seal

leakage exceed 16.1 gallons per hour. This test demonstrated that the RCP seals will maintain their integrity through an extended LOOP event. This test was performed to provide information to resolve the St. Lucie Unit 2 loss of AC power Operating Licensing review and the information is directly applicable to St. Lucie Unit 1 which utilizes identical RCP seals. The test reaffirmed that the RCP seals used in St. Lucie Unit 1 and 2 will withstand the environment associated with a sustained loss of AC power and will not degrade the reactor coolant pressure boundary.

5) Other Comments

a) Station Blackout Duration (Section 2.1)

With respect to the coping assessment, St. Lucie Units 1 and 2 should be evaluated as AAC plants with power available to the shutdown buses within 10 minutes of the onset of an SBO event. Therefore, a coping assessment does not need to be addressed.

b) Alternate AC (AAC) Source (Section 2.2)

The strategy for recovering from an SBO event on both St. Lucie units will involve electric load management (i.e., manual actions outside the Control Room). Trained operators are an important and necessary part of the plant's response to any LOOP and concurrent unit blackout recovery plan. FPL maintains that operators can and will perform load management actions required to maintain the necessary loads for safe shutdown while ensuring the EDG remains within its load rating.

In accordance with the SBO rule, a test will be performed to verify that the AAC power source will be available to power the shutdown buses within 10 minutes of the onset of SBO.

c) Compressed Air (Section 2.3.3)

The air compressors have the capability to be manually loaded on the EDGs. These air compressors are electrically driven, not diesel driven. In addition, the compressors will operate as required (not continuously) to maintain pressure. This equipment is not required to maintain hot standby but has been added as an operator aid.

d) Effects of Loss of Ventilation (Section 2.3.4)

All necessary ventilation equipment will be powered by the AAC Source during an SBO event. Therefore, additional ventilation studies are not required.

e) Scope of Staff Review (Section 2.8)

As discussed in the comments on Section 2.3.4, "Effects of Loss of Ventilation", item f (heating and ventilation calculations) should be deleted.

f) St. Lucie Unit 2 SBO Withstand Capability (Section 3.0)

As discussed above, the EDGs of either Unit 1 or Unit 2 are capable of supplying the SBO loads of both units. Therefore, the EDGs from both Unit 1 and 2 have the capability and capacity to be AAC power sources.

g) Summary and Conclusions (Section 4.0)
Based on comments for the preceding sections, this section should be revised accordingly.

Florida Power and Light

Table 1
St. Lucie Unit 1 Electrical Loadings

		UNIT 1 DESIGNATIONS	PDMD SH.	FLA	HP/KVA	KW	KW
EMERGENCY LIGHTING		MISC. LP'S				125.75	86.85
CLASS 1E POWER PANELS		MISC. PP'S				149.08	109.14
CONTAINMENT FAN COOLERS (2)		1HVS 1A&B OR C&D	16	203	150	123.00	123.00
COMPONENT COOLING WATER PUMPS		1A,1B,1C	4,5	60	450	369.00	369.00
INTAKE COOLING WATER PUMPS		1A,1B,1C	4,5	81	600	451.00	451.00
ICW BUILDING COOLING FANS		-	-	-	-	-	-
CONTROL ROOM A/C		ACC&HVA 3A,B,C	35,36,41	54.4/10.6	40/7.5	42.70	42.70
AUXILIARY BUILDING SUPPLY FANS		1HVS 4A,4B	34,39	72	60	44.20	44.20
ECCS AREA EXHAUST FANS		1HVE 9A,9B	36,42	59,49	50,40	37.83	32.20
REACTOR CAVITY COOLING FANS		1HVS 2A,2B	31,38	26	20	15.46	15.46
REACTOR SUPPORT COOLING FANS		1HVE 3A,3B	31,39	49	40	21.57	21.57
EE ROOM SUPPLY FANS		1HVS 5A,5B	33,39	38	22.1	13.48	13.48
EE ROOM EXHAUST FANS		1HVE 11,12	35,41	10	7.5	4.39	4.39
EE ROOM ROOF VENTS		1RV3,1RV4	32,41	2.5	1.5	1.40	1.40
BATTERY ROOM EXHAUST FANS		1RV1,1RV2	54,53	4.2	.25	0.22	0.22
BATTERY CHARGERS		1A,1B	32,39	90	68KVA	68.00	68.00
UPS INVERTERS		INV. UPS. REC.	44	47.2	20KVA	20.00	20.00
PLANT SECURITY INVERTERS		PL. SEC. INV.	44A	48.6	20KVA	20.00	20.00
PRESSURIZER HTRS. BACKUP BANK	*	B2 OR B5	19	387.50	186	186.00	186.00
INST. AIR (IA) COMPRESSORS	*	1A,1B	35,43A	49	40	36.00	36.00
COOLING FOR IA COMPRESSORS	*	AIR COMP MOTOR	62	11	7.5	6.70	6.70
EDG FUEL TRANSFER PUMPS	*	1A,1B	62	21	5	4.50	4.50
CHARGING PUMPS	*	1A,1B,1C	16	118	100	82.00	82.00
						1693.08	1608.61

* USED INTERMITTENTLY - ONLY PRESSURIZER HEATERS INCLUDED IN TOTAL

UNIT 1 EDG RATINGS REF. FLO 8770-305

CONTINUOUS DUTY = 3500 KW

2000 HRS RATING = 3730 KW

7 DAY RATING = 3790 KW

4 HRS RATING = 3860 KW

30 MIN RATING = 3960 KW

U1 MAXIMUM VALUE = 1693.08 KW

U2 MAXIMUM VALUE = 1800.11 KW

COMBINED TOTAL = 3493.19 KW

COMBINED TOTAL = 100 % OF UNIT 1, CONT. RATING

Florida Power and Light

Table 2
St. Lucie Unit 2 Electrical Loadings

		UNIT 2 DESIGNATIONS	PDMD SH.	FLA	HP/KVA	KW	KW
EMERGENCY LIGHTING		MISC. LP'S				84.92	69.43
CLASS 1E POWER PANELS		MISC. PP'S				65.84	54.87
CONTAINMENT FAN COOLERS (2)		2HVS 1A&B OR C&D	102	144	125	141.00	141.00
COMPONENT COOLING WATER PUMPS		2A,2B,2C	4,5	60	450	369.00	369.00
INTAKE COOLING WATER PUMPS		2A,2B,2C	4,5	82.4	600	492.00	492.00
ICW BUILDING COOLING FANS		2HVE 41 A,B	34,39	9.4	7.5	6.70	6.70
CONTROL ROOM A/C		2HVA/ACC-3A,B,C	36,42	68.1,49	55,40	49.40	49.40
AUXILIARY BUILDING SUPPLY FANS		2HVS-4A,4B	111	165	150	112.97	112.97
ECCS AREA EXHAUST FANS		2HVE 9A,9B	31,42	73,65	60	50.81	52.94
REACTOR CAVITY COOLING FANS		2HVS 2A,2B	37	24	20	13.66	13.66
REACTOR SUPPORT COOLING FANS		2HVE 3A,3B	36,39	47	40	21.77	21.77
EE ROOM SUPPLY FANS		2HVS 5A,5B	33,39	115	100	77.17	77.17
EE ROOM EXHAUST FANS		2HVE 11,12	35,41	59	50	41.74	41.74
EE ROOM ROOF VENTS		2RV3,2RV4	32,41	6.59	5	4.46	4.46
BATTERY ROOM EXHAUST FANS		2RV1,2RV2	37A,43B	1.42	0.75	0.67	0.67
BATTERY CHARGERS		2A,2B	32,39	90	68KVA	68.00	68.00
UPS INVERTERS		INV. UPS. REC.	44	18,40	20KVA	20.00	20.00
PLANT SECURITY INVERTERS		VITAL A/C CAB.	44A	60	30KVA	30.00	30.00
PRESSURIZER HTRS. PROP. BANKS	*	P1 OR P2	19	312.5	150KW	150.00	150.00
INST. AIR (IA) COMPRESSORS	*	2A,2B	35,43	75	60	54.00	54.00
COOLING FOR IA COMPRESSORS	*	AIR COMP MOTOR	62	11	7.5	6.80	6.80
EDG FUEL TRANSFER PUMPS	*	2A,2B	62	4	3	2.70	2.70
CHARGING PUMPS	*	2A,2B,2C	16	145	125	102.47	102.47
						1800.11	1775.78

* USED INTERMITTENTLY - ONLY PRESSURIZER HEATERS INCLUDED IN TOTAL

UNIT 2 EDG RATINGS REF. FLO 2998-305

CONTINUOUS DUTY = 3685 KW

2000 HRS RATING = 3935 KW

7 DAY RATING = 3985 KW

4 HRS RATING = 3985 KW

30 MIN RATING = 3985 KW

U1 MAXIMUM VALUE = 1693.08 KW

U2 MAXIMUM VALUE = 1800.11 KW

COMBINED TOTAL = 3493.19 KW

COMBINED TOTAL = 95 % OF UNIT 2, CONT. RATING