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SUBJECT: Summarizes conclusions of review re accident sequence precursor program precursor.

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FPL

September 3, 1996

L-96-218
10 CFR 50.4

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

RE: St. Lucie Unit 2
Docket No. 50-389
Comments on the Preliminary
Accident Sequence Precursor Analysis

On August 2, 1996, the NRC issued the subject preliminary analysis for comment. The report documented the accident sequence precursor (ASP) program review of an operational condition which was discovered at St. Lucie Unit 2 on November 20, 1995, and reported in Licensee Event Report (LER) 95-005. The subject preliminary ASP analysis assesses the estimated conditional core damage probability (CCDP) associated with the failure of the 2A emergency diesel generator (EDG) due to loose relay sockets. It was determined that the 2B EDG was also subject to the same failure mode and thus there was an increased potential for common cause failure of the 2A and 2B EDGs. Although this failure was discovered during Mode 6 operation, it was concluded that the failure could have occurred with the unit in Mode 1. Since the 2A EDG had completed its previous surveillance, the failure exposure period was assumed to be one-half ($\frac{1}{2}$) of the surveillance interval (15 days or 360 hours).

The NRC concluded that the CCDP for the 360 hour exposure to the 2A EDG failure and the increased common cause failure potential, is approximately $1.7E-05$. This is greater than the precursor screening criteria of $1.0E-06$. Based on the NRC evaluation, the dominant contributor to the total CCDP involves a station blackout, a power operated relief valve (PORV) challenge with a successful re-closure, and a reactor coolant pump (RCP) seal loss of coolant accident (LOCA).

Florida Power & Light Company (FPL) appreciates the opportunity to review the draft ASP analysis. The following summarizes the conclusions of our review:

1. The NRC evaluation did not give credit for recovery of emergency power to Unit 2 following a blackout via the blackout crosstie.

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2. The probability of a reactor coolant pump (RCP) seal loss of coolant accident (LOCA) used by the NRC is overestimated for Byron-Jackson four (4) stage seals.
3. The estimated CCDF and change in core damage probability (CDP) is less than the $1E-06$ precursor screening criteria. The FPL estimate is $6.3E-07$ to $7.0E-07$ versus the NRC estimate of $1.7E-05$.

The attachment to this letter provides specific comments regarding the ASP analysis for this event. Please contact us if there are any questions.

Very truly yours,



J. A. Stall
Vice President
St. Lucie Plant

JAS/GRM

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

FPL has reviewed the preliminary ASP analysis and has concluded that the CCDP and the change in CDP is less than that estimated by the NRC, and should be below the NRC precursor screening value of $1.0E-06$. The following are specific comments regarding the preliminary accident precursor analysis:

- (1) The NRC evaluation does not give credit for the capability to tie a diesel generator from Unit 1 to Unit 2 via the blackout crosstie. Use of the blackout crosstie was covered in the emergency operating procedures in place during the time that the Unit 2 EDGs experienced the relay socket problems. The crosstie failure probability is approximately $9E-02$ (including hardware failures, operator failure to align crosstie, and unavailability of crosstie).
- (2) The St. Lucie Unit 2 reactor coolant pumps (RCP), by design and field experience, are not susceptible to seal failure resulting from loss of seal cooling water if the pumps are idle. The RCPs are equipped with Byron-Jackson (BJ) four series-arranged face seals, each of which is designed for 2500 psig. If the pumps are not running, the component cooling water to the RCP seals is not required to ensure (1) integrity of the reactor coolant pressure boundary, (2) the capability to shutdown the reactor and maintain it in a safe shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR 100 (Ref.: Unit 2 FSAR). FPL has conducted a test of RCP seals under simulated loss of AC power conditions at full temperature and pressure. Loss of AC power would result in loss of component cooling water to the seals. After approximately 50 hours at coolant conditions of 550° F and 2250 psig, the RCP seal cartridge still performed satisfactory with the pump shaft idle. Although some seal damage was observed during the post-test inspection, the maximum seal leakage during the test was only 16 gph. The high reliability of the RCP seal design used is also evidenced by the fact that no failures leading to significantly large leakages have occurred at CE plants with BJ pumps throughout their operating history (NUREG/CR-4948).

NUREG/CR-4948 provides estimates for the frequency of RCP seal LOCA core damage sequences initiated by loss of component cooling water (CCW). For a CE plant with BJ RCP seals, this frequency is estimated as negligible (ϵ). Although the ϵ frequency estimate would include the potential for loss of CCW in addition to a seal failure probability, it is evidence that the seal failure probability is not significant and should be much lower than for Westinghouse seals.

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Based on the above discussion, it is concluded that RCP seal LOCAs will not occur at St. Lucie Unit 2 during station blackout conditions.

Below are two evaluations which take into consideration the above discussions regarding use of the blackout crosstie and the RCP seal LOCA probability:

- (a) Table 1 provides an estimate of the change in the CDP if the blackout crosstie (failure probability of 9E-02) is credited in the LOOP sequences and if no RCP seal LOCA is assumed following a blackout:

Table 1							
EVENT TREE NAME	SEQUENCE NAME	CCDP		CDP		IMPORTANCE (CHANGE IN CDP)	
		W/O XTIE & W/ NRC SEAL LOCA PROB.	W/ XTIE & NO SEAL LOCA	W/O XTIE & W/ NRC SEAL LOCA PROB.	W/ XTIE & NO SEAL LOCA	W/O XTIE & W/ NRC SEAL LOCA PROB.	W /XTIE & NO SEAL LOCA
LOOP	39	9.2E-06	0	3.9E-07	0	W/O XTIE & W/ NRC SEAL LOCA PROB.	W /XTIE & NO SEAL LOCA
LOOP	41	3.6E-06	3.2E-07	3.3E-07	3.0E-08		
LOOP	32	3.5E-06	3.2E-07	1.4E-07	1.3E-08		
LOOP	40	3.1E-07	2.8E-8	1.8E-09	1.6E-10		
SGTR	05	2.4E-07	2.4E-07	2.4E-07	2.4E-07		
TOTALS		1.7E-05	9.1E-07	1.1E-6	2.8E-07	1.6E-05	6.3E-07

(b) Table 2 provides an estimate of the change in the CDP if the blackout crosstie (failure probability $9E-02$) is credited in the LOOP sequences and the RCP seal LOCA probability is conservatively assumed to be an order of magnitude below the NRC value ($4.8E-03$ instead of $4.8E-02$):

Table 2							
EVENT TREE NAME	SEQUENCE NAME	CCDP		CDP		IMPORTANCE (CHANGE IN CDP)	
		W/O XTIE & W/ NRC SEAL LOCA PROB.	W/ XTIE & LOWER SEAL LOCA PROB.	W/O XTIE & W/ NRC SEAL LOCA PROB.	W/ XTIE & LOWER SEAL LOCA PROB.	W/O XTIE & W/ NRC SEAL LOCA PROB.	W/ XTIE & LOWER SEAL LOCA PROB.
LOOP	39	9.2E-06	8.3E-08	3.9E-07	3.5E-09		
LOOP	41	3.6E-06	3.2E-07	3.3E-07	3.0E-08		
LOOP	32	3.5E-06	3.2E-07	1.4E-07	1.3E-08		
LOOP	40	3.1E-07	2.8E-8	1.8E-09	1.6E-10		
SGTR	05	2.4E-07	2.4E-07	2.4E-07	2.4E-07		
TOTALS		1.7E-05	9.9E-07	1.1E-6	2.9E-07	1.6E-05	7.0E-07

The above evaluations credit the blackout crosstie between St. Lucie Unit 1 and Unit 2, and credit a RCP seal LOCA probability which more closely represents the design and operational history of the Byron-Jackson (BJ) four stage RCP seals. Therefore, it is concluded that the CCDP and change in CDP assuming the unavailability of the 2A EDG and an increased common cause failure probability for the Unit 2 EDGs is less than the precursor screening value of $1E-06$.

FPL Recommendations

It is recommended that the blackout crosstie capability be incorporated in the CCDP calculations. It is also recommended that the RCP seal LOCA probability be set to "0", or at least an order of magnitude lower than was used in the preliminary accident precursor report due to the proven performance of BJ seals for loss of seal cooling scenarios with the RCPs idle.