CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9803100346 DOC.DATE: 98/03/05 NOTARIZED: NO DOCKET #
FACIL:50-389 St. Lucie Plant, Unit 2, Florida Power & Light Co. 05000389
AUTH.NAME AUTHOR AFFILIATION
FREHAFER,K.W. Florida Power & Light Co.
STALL,J.A. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 98-001-00:on 980206,high/low pressure shutdown cooling interface outside appen R design bases occurred.Caused by personnel error.Addl guidance was provided to engineering dept personnel.W/980305 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 9
TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD2-3 PD	1	1	GLEAVES,W	1	1
INTERNAL:	ACRS	1	1	AEOD/SPD/RAB	2	2
	AEOD/SPD/RRAB	1	1	FILE CENTER	1	1
	NRR/DE/ECGB	1	1	NRR/DE/EELB	1	1
	NRR/DE/EMEB	1	1	NRR/DRCH/HHFB	1	1
	NRR/DRCH/HICB	1	1	NRR/DRCH/HOLB	1	1
	NRR/DRCH/HQMB	1	1	NRR/DRPM/PECB	1	1
	NRR/DSSA/SPLB	1	1	NRR/DSSA/SRXB	1	1
	RES/DET/EIB	1	1	RGN2 FILE 01	1	1
EXTERNAL:	L ST LOBBY WARD	1	1	LITCO BRYCE,J H	1	1
	NOAC POORE,W.	1	1	NOAC QUEENER,DS	1	1
	NRC PDR	1	1	NUDOCS FULL TXT	1	1
	LA	1	1			
	OGC	1	1			

C A T E G O R Y 1 D O C U M E N T

NOTE TO ALL "RIDS" RECIPIENTS:
PLEASE HELP US TO REDUCE WASTE. TO HAVE YOUR NAME OR ORGANIZATION REMOVED FROM DISTRIBUTION LISTS OR REDUCE THE NUMBER OF COPIES RECEIVED BY YOU OR YOUR ORGANIZATION, CONTACT THE DOCUMENT CONTROL DESK (DCD) ON EXTENSION 415-2083

FULL TEXT CONVERSION REQUIRED
TOTAL NUMBER OF COPIES REQUIRED: LTTR ~~25~~ 27 ENCL ~~25~~ 27

Florida Power & Light Company, 6351 S. Ocean Drive, Jensen Beach, FL 34957

March 5, 1998

L-98-066
10 CFR 50.73

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

Re: St. Lucie Unit 2
Docket No. 50-389
Reportable Event: 98-001
Date of Event: February 6, 1998
High/Low Pressure Shutdown Cooling
Interface Outside Appendix R Design Bases

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73.

Very truly yours,

J. A. Stall
Vice President
St. Lucie Plant

JAS/EJW/KWF

Attachment

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

Add LA 1 1
OGC 1 1

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
ST LUCIE UNIT 2	05000389	1 OF 8

TITLE (4)

High/Low Pressure Shutdown Cooling Interface Outside Appendix R Design Bases

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
2	6	98	98	-- 001 --	0	3	5	98	n/a	05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	100	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	X 50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
K. W. Frehafer, Licensing Engineer	(561) 468-4284

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
A	BP	n/a	n/a	n/a					

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On February 6, 1998, Unit 2 was in Mode 1 at 100 percent reactor power. While performing an on-going 10 CFR 50 Appendix R fire protection safe shutdown review, Engineering identified a portion of the low pressure safety injection system which does not meet Appendix R requirements. The issue involves the potential for a primary system high pressure/low pressure interface condition as a result of multiple fire induced three phase hot short cable faults.

The cause for the identified condition has been determined to be personnel error during the preparation and issuance of a plant modification that was not properly evaluated against the design basis requirements established during original plant design for primary system high/low pressure interfaces. A postulated fire could could result in a fire induced high pressure/low pressure interface between the reactor coolant and shutdown cooling systems due to the spurious opening of multiple valves via the unlikely multiple hot short cable fault failure mode.

Florida Power and Light established a 30 minute roving fire watch in the Unit 2 reactor auxiliary building which includes the subject fire areas as a compensatory measure. Additional corrective actions include fire breach permits, training, and a future modification to eliminate the potential high/low pressure interface condition.

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL	REVISION	
ST LUCIE UNIT 2	05000389	98	-- 001 --	0	2 OF 8

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

DESCRIPTION OF THE EVENT

On February 6, 1998, Unit 2 was in Mode 1 at 100 percent reactor power. Engineering notified Operations of a finding during an on-going fire protection safe shutdown review which identified a portion of the low pressure safety injection [EIIS:BP] (LPSI) system which does not meet Appendix R fire protection design requirements. The issue pertained to the potential for a primary system high pressure/low pressure interface condition as a result of fire induced cable faults. As stated in the updated final safety analysis (UFSAR), Appendix 9.5A, the design of the primary systems ensures that a fire induced loss of coolant accident (LOCA) cannot result from a single fire which opens multiple valves in series at a high/low pressure interface.

The original design of the Unit 2 shutdown cooling (SDC) system suction piping and associated motor-operated valves [EIIS:BP:MO:ISV] (MOVs) is shown in Figure 1. As indicated, the SDC system suction piping consists of two separate suction lines with one originating at the 2A RCS hot leg and the other originating at the 2B RCS hot leg. Each shutdown cooling suction line includes two normally locked closed (via keylock switches) MOVs in series which are powered from separate safety related electrical busses [EIIS:EK] . The SDC suction line associated with RCS loop 2A includes V3480 (B train power) and V3481 (A train power) while the RCS loop 2B SDC suction line includes V3652 (A train power) and V3651 (B train power). In addition, a crosstie line is provided between these four SDC suction line MOVs. The SDC suction crosstie line includes MOV V3545 that was originally in a normally locked closed position (via keylock switch). V3545 is powered from the AB electrical bus. The AB bus can be powered from either the A or the B safety related electrical bus. The design of the SDC suction piping and isolation valves complies with the design requirements of General Design Criteria (GDC) 34 and Branch Technical Position (BTP) RSB 5-1 in that at least one train of shutdown cooling can be placed in service under the most limiting single failure condition. For the initiation of shutdown cooling, the most limiting single failure is the loss of one electrical bus. The shutdown cooling crosstie valve, V3545, originally had to be opened to perform this SDC function. Since V3545 can be powered from either the A or B electrical bus, GDC 34 design requirements were met.

For the purposes of providing protection from a fire induced LOCA, UFSAR Appendix 9.5A states that the combination of physical protection, system design and fire protection provisions provides assurance that no single fire can cause a LOCA. With respect to the shutdown cooling system, the UFSAR originally stated that where the cables for the redundant isolation valves are located in the same fire area, one train of isolation valve cables are protected in that area. With respect to cables located outside containment, the power cables for the A train powered valves, V3652 and V3481, are routed in Fire Area A (Fire Zones 22 (A Electrical Penetration Room), 51* (A Penetration Room Extension) and 37 (A Switchgear Room)). The power cables for the B train powered valves, V3480 and V3651, are routed in Fire Areas C (Fire Zone 34 (B Switchgear Room) and I (Fire Zones 23 (B Electrical Penetration Room) and 51W (Cable Loft)). Therefore, a fire in Fire Area A could cause spurious opening of both V3652 and V3481. Likewise, a fire in Fire Areas C or I could cause spurious opening of both V3480 and V3651. However, with V3545

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL	REVISION	
ST LUCIE UNIT 2	05000389	98	-- 001	-- 0	3 OF 8

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

DESCRIPTION OF THE EVENT (cont'd)

normally closed and the cables protected, V3545 was not susceptible to fire induced faults that could cause the valve to spuriously open. As a result, high/low pressure system interface protection was provided by the original design of the SDC system piping and valve arrangement.

During a subsequent design review of safety related MOVs, it was discovered that V3545 was potentially susceptible to the phenomenon of pressure locking. That is, if one of the upstream SDC system isolation valves leaked, V3545 would be susceptible to valve bonnet pressurization which could potentially prevent the valve from being opened when required. The inability to open V3545 would violate the design requirements of GDC 34 and BTP RSB 5-1. To eliminate this potential failure mode, plant change modification (PCM) 168-295 was prepared to change the normal position of V3545 to "Locked Open" (see Figure 2). PCM 168-295 was implemented in December 1995. Included in the PCM was an evaluation of the design change on the fire program safe shutdown capability.

The PCM correctly identified that the combination of the five SDC system suction isolation valves must function as a high/low pressure interface boundary between the RCS and lower pressure shutdown cooling system piping. However, the PCM erroneously credited the removal of power from V3480, V3481, V3651, and V3652 as being sufficient to prevent spurious operation as a result of a fire. With the modified SDC system configuration, a fire in Fire Areas A (C or I) could cause spurious opening of V3652 (V3480) and V3481 (V3651). With V3545 normally open, a high/low pressure interface concern could exist between the RCS and lower pressure SDC system piping. This revised plant configuration has been determined to place Unit 2 outside of its original design basis with respect to providing protection against fire induced LOCAs.

Enhanced compensatory actions were established for the subject Fire Areas A (Fire Zones 22, 51* and 37), C (Fire Zone 34) and I (Fire Zone 23 and 51W). The enhanced compensatory actions implemented include the establishment of a 30 minute roving fire watch in the Unit 2 RAB which includes the subject Fire Areas A, C, and I. FPL concludes that there are sufficient design features and compensatory actions in place to provide a reasonable assurance of safety in the interim period until permanent corrective actions can be implemented to correct the subject design deficiency.

CAUSE OF THE EVENT

The cause for the identified condition has been determined to be personnel error during the preparation and issuance of PCM 168-295. The impact of the modification was not properly evaluated against the design basis requirements established during original plant design for primary system high/low pressure interfaces. The engineers involved credited the fact that with

CAUSE OF THE EVENT (cont'd)

power removed from the SDC suction isolation MOVs, they would not be susceptible to fire induced cable failure modes that could cause spurious valve opening. This justification, although consistent with the design basis originally established for inside containment cables, was incorrect for cables located outside containment. A contributing factor was the lack of detail contained in the original Unit 2 Safe Shutdown Analysis with respect to cable failure mode assumptions and methodology.

ANALYSIS OF THE EVENT

A condition is considered reportable under 10 CFR 50.72/73 if it results in the nuclear power plant being operated outside its design basis. As stated in the Unit 2 UFSAR, Appendix 9.5A, Section 6.0, design provisions have been provided that preclude the potential for a fire induced LOCA. Analyses had originally been performed and cable protection provided which protected the lower pressure SDC system piping from the higher pressure RCS. However, PCM 168-295 modified the design of the shutdown cooling system suction piping such that the potential for a high/low pressure system interface could exist as a result of a single fire. As a result, Unit 2 is considered outside of its original design basis with respect to high/low pressure interface protection. As such, this condition has been determined to be reportable under 10 CFR 50.72(a)(2)(ii)B. This condition does not apply to St. Lucie Unit 1 because the SDC system configuration is different than the Unit 2 configuration in that Unit 1 has no crosstie valve.

ASSESSMENT OF SAFETY SIGNIFICANCE

To address safety significance, a review of the subject cable failure mode and fire detection and suppression capabilities in the affected fire zones was performed. With respect to the potential cable failure mode, it is important to note that the power cables of at least two shutdown cooling suction MOVs of the same power train would have to fail such that each valve was spuriously energized and would open. All five SDC suction MOVs are powered from three phase 480V safety related power supplies. The current plant design has the breakers for all five valves "Off" which removes power. In addition, the power supply breakers for valves V3480, V3481, V3651, and V3652 are locked in the "Off" position to further preclude their inadvertent energization. For the valves to spuriously become energized and open would require all three phases of the valves power cable to become exposed as result of a fire and come in contact with the exposed conductors of another energized 480V power cable. All three phases of the energized power cable would have to contact the appropriate three phases of the SDC MOV power cables to power the valve motor and rotate it in the correct direction to cause the valve to open. This is essentially a low probability failure mode, however, it is considered in the high/low pressure interface design to preclude the potential for fire induced LOCAs.

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

ASSESSMENT OF SAFETY SIGNIFICANCE (cont'd)

With regards to the fire detection and suppression capabilities, Table 1 lists the detection and suppression systems available in the subject Fire Areas/Fire Zones. As shown in the table, detection capability is provided for all affected areas and suppression or local fire fighting capability is available. These features further minimize the potential for a fire of sufficient magnitude to cause the fire induced cable faults required to cause spurious opening of multiple shutdown cooling system isolation valves.

FPL concludes that the existing condition had no significant impact on the health and safety of the public. The possibility of a fire induced LOCA was highly unlikely, based on the incredible cable failure mode in conjunction with the detection and suppression or local fire fighting capability provided for all affected areas.

CORRECTIVE ACTIONS

A complete review of the Unit 1 and 2 Safe Shutdown Analyses (SSA) is currently being performed. Included in the SSA review scope is a review of all potential high/low pressure interface concerns. As such, any potential generic issues concerning high/low pressure interfaces will be dispositioned as part of this continuing effort. Specific corrective actions include the following:

1. Unit 2 Operations personnel were advised of this condition via a night order and are aware of the susceptibility to a primary system high/low pressure interface concern for fires in Fire Areas A (Fire Zones 22, 51* and 37), C (Fire Zone 34) and I (Fire Zone 23 and 51W).

2. The roving fire watch personnel were advised of this condition via a training memo and are sensitive to the potential consequences of a fire in Fire Areas A (Fire Zones 22, 51* and 37), C (Fire Zone 34) and I (Fire Zone 23 and 51W).

3. Additional guidance was provided to Engineering Department personnel with respect to the assumptions contained in the SSA for high/low pressure interfaces. As part of the Unit 1 and 2 SSA validation effort, a cable failure mode methodology document has been developed and is in use. Included in the methodology document are the assumptions to be utilized when evaluating primary system high/low pressure interfaces which is consistent with that originally established for both Unit 1 and 2.

4. Fire Protection has been the subject material covered in the first quarter 1998 engineering support personnel continuing training program. Particular emphasis has been given to the importance of protecting potential high/low pressure interfaces from potential fire induced cable faults.

CORRECTIVE ACTIONS (cont'd)

5. Breach permits document the current deficiencies associated with the outside containment cables for valves V3480 and V3652. For simplicity, these two MOVs have been identified as having deficient barriers since protection of only the inboard SDC suction MOVs would preclude the potential for a high/low pressure interface concern.

6. Engineering shall scope the appropriate design modification to eliminate the current SDC system high/low pressure interface concern. Potential modifications include providing an alternate cable protection scheme, closing V3545, and providing alternate means to preclude the potential for pressure locking, etc. The associated design package shall be prepared and implemented no later than startup following the Fall 1998 SL2-11 Unit 2 refueling outage.

ADDITIONAL INFORMATION

Failed Components Identified:

None

Past Similar Events:

LER 50-335/98-004, "Emergency Lighting Outside Appendix R Design Bases." Describes event where design error led to inadequate Appendix R emergency lighting.

LER 50-389/97-004, "Incorrect Original Cable Tray Fire Stop Assemblies Outside Appendix R Design Bases." Describes event where initial design was inadequate to meet Appendix R requirements.

LER 50-335, 389/97-007, "RCP Oil Collection System Outside Appendix R Design Bases." Describes event where initial design was inadequate to meet Appendix R requirements.

Table 1

Dectection and Suppression Capabilities in Affected Fire Areas/Zones

FIRE AREA	FIRE ZONE	DETECTION	SUPPRESSION
A	22	Smoke detection with control room alarm	Pre-action automatic fire suppression with control room alarm
A	51*	Smoke detection with control room alarm	Pre-action automatic fire suppression with control room alarm
A	37	Smoke detection with control room alarm	None. Fire extinguishers and hose stations available
C	34	Smoke detection with control room alarm	None. Fire extinguishers and hose stations available
I	23	Smoke detection with control room alarm	Pre-action automatic fire suppression with control room alarm
I	51W	Smoke detection with control room alarm	Pre-action automatic fire suppression with control room alarm

Figure 1

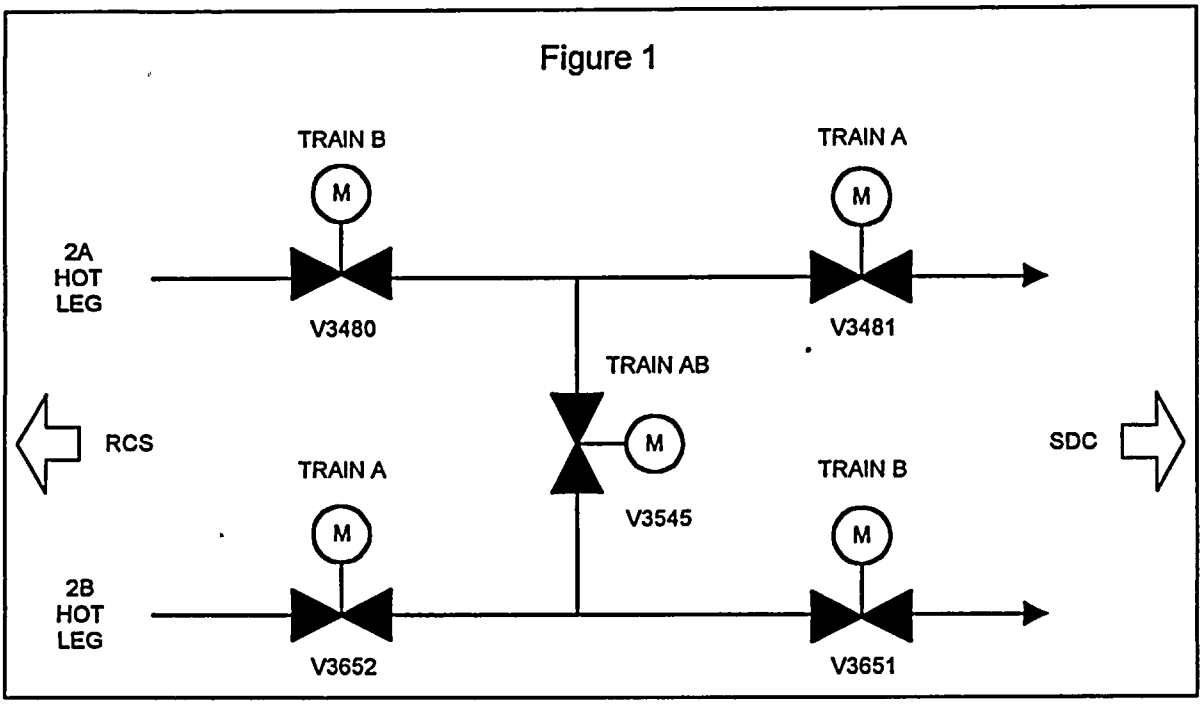

Figure 2