

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9705200337 DOC. DATE: 97/05/13 NOTARIZED: NO DOCKET #
 FACIL: 30-335 St. Lucie Plant, Unit 1, Florida Power & Light Co. 05000335
 AUTH. NAME AUTHOR AFFILIATION
 BENKEN, E.J. Florida Power & Light Co.
 STALL, J.A. Florida Power & Light Co.
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 97-005-00: on 970419, reactor was shutdown due to reactor coolant pressure boundary leakage. Repairs to RCPB was completed & 1a SDC train was restored to svc. W/970513 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 8
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:

	RECIPIENT		COPIES		RECIPIENT		COPIES	
	ID CODE/NAME		LTR	ENCL	ID CODE/NAME		LTR	ENCL
	PD2-3 PD		1	1	WIENS, L.		1	1
INTERNAL:	ACRS		1	1	AEOD/SPD/RRAB		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	LITCC BRYCE, J H		1	1
	NOAC POORE, W.		1	1	NOAC QUEENER, DS		1	1
	NRC PDR		1	1	NUDOCS FULL TXT		1	1

NOTE TO ALL "RIDS" RECIPIENTS:
 PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK,
 ROOM OWFN 5D-5 (EXT. 415-2083) TO ELIMINATE YOUR NAME FROM
 DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

FULL TEXT CONVERSION REQUIRED
 TOTAL NUMBER OF COPIES REQUIRED: LTR 25 ENCL 25

C
A
T
E
G
O
R
Y

1

D
O
C
U
M
E
N
T





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

May 13, 1997

L-97-130
10 CFR 50.73

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

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 97-005
Date of Event: April 19, 1997
Reactor Shutdown Required by Technical Specifications
Due to Reactor Coolant Pressure Boundary Leakage

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

Very truly yours,

J. A. Stall
Vice President
St. Lucie Plant

JAS/EJB

Attachment

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

///

ISLL

9705200337 970513
PDR ADDCK 05000335
S PDR

200004



LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 60.0 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 (7-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20565-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) ST LUCIE UNIT 1	DOCKET NUMBER (2) 05000335	PAGE (3) 1 OF 7
---	--	-------------------------------

TITLE (4)
Reactor Shutdown Required by Technical Specifications due to Reactor Coolant Pressure Boundary Leakage

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
04	19	97	97	005	00	05	13	97	N/A	
									FACILITY NAME	DOCKET NUMBER
									N/A	
									FACILITY NAME	DOCKET NUMBER
									N/A	

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
	20.2201(b)		20.2203(a)(2)(v)	<input checked="" type="checkbox"/>	50.73(a)(2)(i)	50.73(a)(2)(viii)				
POWER LEVEL (10) 100	20.2203(a)(1)		20.2203(a)(3)(i)		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)					
	20.2203(a)(2)(iii)		50.38(c)(1)		50.73(a)(2)(v)	OTHER				
	20.2203(a)(2)(iv)		50.38(c)(2)		50.73(a)(2)(vii)	Specify in Abstract below or in NRC Form 368A				

LICENSEE CONTACT FOR THIS LER (12)

NAME Edwin J. Benken, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) (561) 467 - 7156
--	---

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
B	BP	VTV	N/A	N					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)		
YES (If yes, complete EXPECTED SUBMISSION DATE).	<input checked="" type="checkbox"/>	NO		MONTH	DAY	YEAR

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

On April 18, 1997, St. Lucie Unit 1 was operating in Mode 1 at 100 percent reactor power. Leakage from a one inch line on a safety injection (SI) pipe vent was identified and subsequently determined to be reactor coolant pressure boundary (RCPB) leakage. The leakage was restricted to Safety Injection Tank 1B2 inventory, and no reactor coolant leakage resulted. A reactor shutdown was initiated on April 19, 1997, and was completed in accordance with Technical Specification requirements. The Unit was placed in Mode 5 on April 20, 1997, to implement repairs. During the plant cooldown, shutdown cooling (SDC) train 1A was declared inoperable and the redundant train was used to complete the cooldown. The RCPB leakage was repaired and the Unit was subsequently returned to Mode 1 operation on April 23, 1997.

The plant shutdown was required by Technical Specifications due to the presence of pressure boundary leakage. The failure mechanism associated with the pressure boundary leakage was determined to be hot cracking of a socket weld associated with the SI vent line. The hot cracking was caused by weld contamination. The inoperability of the 1A SDC train was due to the misalignment of a minimum flow recirculation line, and the presence of gas voids in the high points of the 1A SDC suction line.

Corrective Actions Include: 1) Repairs were completed to the RCPB and the 1A SDC train was restored to service. 2) Additional analysis was performed to confirm the failure mechanism for the affected socket weld. 3) Weld testing is being performed to evaluate for potential improvements. 4) The 1A SDC train was restored to operation following venting and inspection. 5) SDC system venting procedures are being revised to include additional frequency and temperature requirements.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL	REVISION	
ST. LUCIE UNIT 1	05000335	97	-- 005	-- 00	2 OF 7

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

DESCRIPTION OF THE EVENT

On April 17, 1997, St. Lucie Unit 1 was operating in Mode 1 at 100 percent reactor power. At 1037, a High Pressure Safety Injection (HPSI) Pump [EIS:BQ:P] was started and inventory was added to the Safety Injection Tanks (SIT) in accordance with normal operating procedures. Following the SIT fill evolution, operators noted that the 1B2 SIT [EIS:BP:TK] level was slowly decreasing. The rate of inventory loss in the SIT was observed to be approximately 2.5 percent over a 6 hour period. Additionally, operators noticed an increase in reactor cavity leakage from approximately 0.2 gpm to 0.45 gpm. Based on the indicated increase in reactor cavity leakage, a reactor coolant system (RCS) [EIS:AB] inventory balance was performed to evaluate and quantify RCS leakage. The inventory balance determined that no change in RCS leakage rate had occurred and values were consistent with those determined prior to filling the SITs. An investigation was initiated to determine the source of the indicated increase in reactor cavity leakage.

On April 18, 1997, while conducting a containment inspection to identify the source of the leakage, water was observed in the area of the 1B2 SIT pipe trench. To minimize radiological exposure, a robotic camera was deployed to determine the source of the leakage, which appeared to originate from the vicinity of vent valve V-3815 [EIS:BP:VTV]. This vent valve is located within the reactor containment building (RCB) on the 1B2 safety injection pipe, upstream of the 1B2 safety injection loop check valve (Refer to Figure 1). A sample of leakage was obtained and analyzed, which indicated a boron concentration in the sample of 2915 parts per million (ppm). RCS boron concentration at the time was approximately 840 ppm.

A reduction in reactor power was initiated at 2020 on April 18, 1997, to allow personnel to access V-3815 and characterize the source of the leakage. At 0150 on April 19, 1997, with the reactor in Mode 2 at approximately 10⁻⁴ percent power, a containment entry was made to inspect V-3815. The inspection revealed a failure of the socket weld joining the one inch vent line for V-3815 to the socket in the safety injection loop line. This was determined to be reactor coolant pressure boundary (RCPB) leakage, in accordance with 10 CFR 50.2, and the action statement for Technical Specification (TS) 3.4.6.2 was entered at 0217 hours. Action Statement 3.4.6.2.a, specifies, "With any PRESSURE BOUNDARY LEAKAGE, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours."

A reactor shutdown was commenced and St. Lucie Unit 1 entered Mode 3 (Hot Standby) at 0228 on April 19, 1997. A Notification of Unusual Event was made to the State of Florida at 0229 and to the USNRC at 0245, in accordance with the requirements of the St. Lucie Emergency Plan for events involving RCS pressure boundary leakage. The Unit entered Mode 4 at 1405 and the 1B shutdown cooling (SDC) train [EIS:BP] was placed in service at 2322 hours on April 19, 1997. Operators attempted, but were unable, to place the 1A SDC train in service due to a decrease in pressurizer [EIS:AB:PZR] level when the suction valves for the 1A SDC train were opened. The 1A SDC train was subsequently declared inoperable, and the plant cooldown was continued using the 1B SDC train. Unit 1 entered Mode 5 on April 20, 1997, at 0315 and the Unusual Event was terminated at that time.

Following repair of the affected weld on the 1B2 safety injection line and restoration of the 1A SDC train, St. Lucie Unit 1 returned to Mode 1 power operation at 0153 on April 23, 1997.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
ST. LUCIE UNIT 1	05000335	YEAR	SEQUENTIAL	REVISION	3 OF 7
		97	-- 005	-- 00	

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

CAUSE OF THE EVENT

The reactor shut down was completed in accordance with TS requirements for RCS leakage involving the reactor coolant pressure boundary. The RCPB leakage originated from a socket weld on a one inch vent line to V-3815, located on the 1B2 safety injection header. While only 1B2 safety injection tank volume was affected, and no reactor coolant inventory was lost as a result of the leak, the site of the leakage is classified as reactor coolant pressure boundary, as further discussed in this report.

Failure analysis of the affected weld on the vent line to V-3815 was performed following the event. The analysis concluded that the initiating failure mechanism was hot cracking of the weld due to contamination. Boric acid residue is considered to be the most likely cause of this contamination.

The 1A SDC train was declared inoperable when operations personnel observed decreases in pressurizer level while opening the SDC suction isolation valves. Local observations identified that system pressure in the 1A SDC train was fluctuating during attempts to open the valves, and a safety relief valve on the 1A SDC train, V-3483, temporarily lifted as designed in response to the system pressure transient. Subsequent inspection and trouble shooting of flow noises in system piping by operations personnel identified that a manual recirculation isolation valve (V-3204) for the 1A low pressure safety injection (LPSI) pump was not fully shut as required for SDC operation. This resulted in a flow path from the RCS to the refueling water tank (RWT) when the SDC suction valves to the pump were opened, and was the primary cause of the indicated decreases in pressurizer level previously discussed. Upon inspection, the handwheel for V-3204 was found to be difficult to operate and appeared to be closed, however operators using a valve wrench were able to manipulate the valve an additional two turns to the fully closed position. A work order was written to repair the defective valve and preventive maintenance practices are being reviewed to address generic aspects.

System venting and inspections performed following the event determined that the pressure response observed in the 1A SDC train was caused by the presence of gas voids in the high points of the 1A SDC suction piping in conjunction with a partially open LPSI pump recirculation valve. The presence of voids, along with the partially open recirculation valve would provide conditions conducive to steam flashing and pressure fluctuations in the LPSI pump suction line when reactor coolant was initially aligned to the system. Venting of the SDC piping is required to be performed following system use as the result of a similar event in 1995, however the procedures did not specifically require that this be performed at ambient temperature. The completion of venting following the last use of the SDC system may therefore not have been adequate to prevent subsequent degassing (voiding) of reactor coolant in the SDC suction lines. Consequently, procedural inadequacy was a contributing factor by not preventing conditions which were favorable to the formation of the gas voids in the 1A SDC system.

ANALYSIS OF THE EVENT

TS 3.4.6.2 requires that no pressure boundary leakage be present in Modes 1,2,3 and 4. TS Action Statement 3.4.6.2.a, further specifies, "With any PRESSURE BOUNDARY LEAKAGE, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours." St. Lucie Unit 1 was placed in Mode 3, HOT STANDBY at 0228, on April 19 1997, approximately 23 minutes following the identification of RCPB leakage.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1) ST. LUCIE UNIT 1	DOCKET 05000335	LER NUMBER (6)			PAGE (3) 4 OF 7
		YEAR 97 --	SEQUENTIAL 005 --	REVISION 00	

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

ANALYSIS OF THE EVENT (Continued)

The plant entered Mode 5 at 0315 on April 20, 1997, approximately 25 hours after entry into Mode 3. Based on the above, this event is reportable under 10 CFR 50.73 (a) (2) (i) (A), as a completion of a plant shutdown required by the Technical Specifications.

According to the definition provided in the St. Lucie Unit 1 TS, PRESSURE BOUNDARY LEAKAGE is defined as "...leakage (except steam generator tube leakage) through a non-isolable fault in a Reactor Coolant System component body, pipe wall or vessel wall." Additionally, 10 CFR 50.2 defines the "reactor coolant pressure boundary" as follows:

...all those pressure-containing components of boiling or pressurized water-cooled nuclear power reactors such as pressure vessels, piping, pumps and valves, which are:

- (1) Part of the reactor coolant system, or
- (2) Connected to the reactor coolant system, up to and including any and all of the following:
 - (i) The outermost containment isolation valve in system piping which penetrates primary reactor containment,
 - (ii) The second of two valves normally closed during normal reactor operation in system piping which does not penetrate primary reactor containment,
 - (iii) The reactor coolant system safety and relief valves.

During this event, a small amount of inventory from the 1B2 SIT was observed leaking from a weld associated with a one inch vent, V-3815, located on the 1B2 safety injection pipe, upstream of the 1B2 safety injection loop check valve. Per the above definition, this vent is a part of the reactor coolant pressure boundary since it is located on a system connected to the RCS and is within the outermost containment isolation valve in system piping penetrating the primary reactor containment. Additionally, V-3815 is located in the Quality Group A portion of the safety injection system. This Quality Group is described by the St. Lucie Unit 1 Updated Final Safety Analysis Report (UFSAR), Section 3.2, as specifically applying to reactor coolant pressure boundary components.

Analysis of Safety Significance

The St. Lucie Unit 1 TS bases related to RCPB leakage specify that pressure boundary leakage of any magnitude is unacceptable as it may be indicative of impending further pressure boundary failure. Therefore, the presence of any pressure boundary leakage requires that the plant be promptly placed in a cold shutdown (Mode 5) condition. Compliance with the Limiting Conditions for Operation (LCO) as specified in the Technical Specifications assures that the functional capability of equipment required for the safe operation of the plant is maintained. Following the identification of pressure boundary leakage during this event, operators promptly implemented the applicable TS Action requirements.



LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
ST. LUCIE UNIT 1	05000335	YEAR	SEQUENTIAL	REVISION	5 OF 7
		97	-- 005	-- 00	

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

Analysis of Safety Significance - (Continued)

A review of similar documented maintenance weld failures at St. Lucie was performed following the event. Based on available information, it was determined that no significant failure rate existed for this failure mechanism, therefore the socket weld leakage from the vent line for V-3815 is considered to be a random failure. As a result of the RCBP leakage, no loss of reactor coolant system inventory occurred, and the area of leakage was isolated from the RCS by the 1B safety injection header loop check valve (V-3247) [EIS:BP:V]. V-3247 is also addressed by the St. Lucie Unit 1 TS and is required to meet periodic surveillance criteria for leakage which provides added assurance of valve integrity.

Leakage from the 1B2 SIT during the event was limited to approximately one-half gallon per minute and makeup was provided as necessary to maintain the required tank volume. The operability of the 1B2 SIT was not affected by the weld leakage.

With regard to the 1A SDC system, St. Lucie Unit 1 Updated Final Safety Analysis (UFSAR), Section 9.1.5.3.2, states that " No single failure of an active component during residual heat removal will result in a loss of core cooling capability. The reactor coolant system can be brought to refueling temperature using one low pressure safety injection pump and one shutdown cooling heat exchanger." The 1B SDC system remained operational at all times during this event, and was not affected by the inoperability of the 1A SDC train. The 1B SDC train was placed in service to facilitate the RCS cooldown and functioned properly in establishing Mode 5 conditions. The RCS heat removal safety function was maintained at all times during the event.

Following the event, FPL engineering personnel performed a walkdown of the 1A SDC system and reviewed data observed during efforts to place the 1A SDC system in service. Based on the pressures in the system observed during the event, a review of the design and hydrostatic testing for this system, and local inspection, the 1A SDC train was determined to be functional and acceptable for operation.

Based on the above, this event did not adversely affect the protection of the health and safety of the public.

CORRECTIVE ACTIONS

1. Following the identification of the pressure boundary leakage on the 1B2 safety injection header, St. Lucie Unit 1 was placed in Cold Shutdown in accordance with the requirements of plant Technical Specifications.
2. The affected 1B2 safety injection header vent line weld was removed and repairs were implemented. The Unit was returned to Mode 1 power operation on April 23, 1997, following completion of the repairs.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
ST. LUCIE UNIT 1	05000335	YEAR	SEQUENTIAL	REVISION	6 OF 7
		97	-- 005	-- 00	

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

CORRECTIVE ACTION (Continued)

3. An inspection and failure analysis was performed for the failed socket weld associated with V-3815 vent line. The analysis determined that the initiating failure mechanism of the socket weld was hot cracking, due to contamination of the weld. While this failure is considered to be random at St. Lucie, additional testing will be done to evaluate boric acid weld contamination and determine if additional preventive measures are necessary to minimize the potential for recurrence.
4. The 1A SDC train was returned to service following system venting and the realignment of the minimum flow recirculation valve for the 1A LPSI pump. A caution tag was placed on the recirculation valve and a plant work order was initiated to repair and restore the valve to satisfactory operation.
5. Venting of the 1A LPSI pump suction line is currently being performed at an increased frequency and the results will be evaluated to determine if additional changes to venting periodicity are required.
6. To further preclude the possibility of gas formation in the SDC suction lines, St. Lucie Unit 1 and 2 shutdown cooling system procedures are being revised to require that system venting following SDC operation be conducted at ambient temperatures. FPL engineering will review the procedure revisions for incorporation of adequate guidance and corrective actions prior to issue.

ADDITIONAL INFORMATION

Failed Components Identified

1. Component: Safety Injection Pipe 1 inch Vent Line - Socket Weld
Material: Piping - 304/316 stainless steel with ER 308/316 filler material
Socket - 304 stainless steel

Previous Similar Events

- LER - 389/95-001 St. Lucie Unit 2 (2/21/95) - The event describes the failure of a low pressure safety injection (LPSI) pump during a surveillance, due to air binding of the pump. The root cause was attributed to the migration of trapped air in the emergency core cooling system (ECCS) header following maintenance.
- In-house Event 95-09 St. Lucie Unit 1 (2/27/95) - This event involved the lifting of safety relief valve V-3483 at St. Lucie Unit 1 following the initiation of flow from the 1A LPSI pump during SDC operation. The primary cause was pressure spiking in the hot leg suction line due to a rapid increase in system flow rate following LPSI pump start. Gas voiding was considered as a possible contributor. Corrective actions were implemented following the event to minimize transient fluid flow effects.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL	REVISION	
ST. LUCIE UNIT 1	05000335	97	005	00	7 OF 7

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

FIGURE 1

SAFETY INJECTION TANK (SIT 1B2)
(SIMPLIFIED DIAGRAM)

