

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9411080235      DOC. DATE: 94/11/02      NOTARIZED: NO      DOCKET #  
 FACIL: 50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co.      05000335  
 AUTH. NAME      AUTHOR AFFILIATION  
 SNYDER, M.J.      Florida Power & Light Co.  
 SAGER, D.A.      Florida Power & Light Co.  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 94-006-00: on 941023, confirmed that stated relief valve for ECCS could lift under certain accident conditions & result in sump inventory in excess of design basis into RAB. Relief valve path in IRS isolated. W/941102 ltr.

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November 2, 1994

L-94-276  
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: 94-006  
Date of Event: October 23, 1994  
Containment Integrity Outside of FSAR Assumptions  
Under Limited Circumstances due to Design Error

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,

A handwritten signature in dark ink, appearing to read "D. A. Sager".

D. A. Sager  
Vice President  
St. Lucie Plant

DAS/md

Attachment

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

080056

9411080235 941102  
PDR ADOCK 05000335  
S PDR

Handwritten initials or a signature in dark ink, possibly "TE" or similar, with a vertical line below it.

**LICENSEE EVENT REPORT (LER)**

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNB 7714), 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.

FACILITY NAME (1) <b>St. Lucie Unit 1</b>	DOCKET NUMBER (2) <b>05000335</b>	PAGE (3) <b>1 OF 6</b>
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TITLE (4) **Containment integrity outside of FSAR assumptions under limited circumstances due to design error.**

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
10	23	94	94	006	0	11	2	94	N/A	
									N/A	

OPERATING MODE (9) <b>1</b>	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
POWER LEVEL (10) <b>100</b>	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)						
	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)						
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> OTHER						
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)						
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							
<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)								

LICENSEE CONTACT FOR THIS LER (12)

NAME <b>Michael J. Snyder, Shift Technical Advisor</b>	TELEPHONE NUMBER (Include Area Code) <b>(407) 465-3550</b>
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS
N/A	---	----	---	---					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input checked="" type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE).	<input type="checkbox"/> NO	<b>11</b>	<b>30</b>				

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

On October 20, 1994, Unit 1 was in mode 1 and operating at 100% steady state power. Differential pressure testing of a motor operated valve resulted in the lifting of a suction supply header relief valve for the Emergency Core Cooling System (ECCS). On 23 October, an engineering evaluation confirmed that this relief valve could lift under certain accident conditions and result in sump inventory loss in excess of design basis into the Reactor Auxiliary Building.

The root cause of the deficiency was design error in the Iodine Removal System. A common header in that system permitted cross train pressurization of an idle Containment Spray pump, pressurization of the ECCS suction header and the potential to lift the relief valve on that header. This design deficiency had existed since the Iodine Removal System was installed in 1978.

Corrective actions include: 1) The relief valve path in the Iodine Removal system was isolated. 2) FPL Engineering evaluated the effects of increased pressure in the ECCS suction header with satisfactory results. 3) The two reliefs were then disabled. 4) A satisfactory leak check test of the ECCS suction header system was performed. 5) An assessment of the safety consequences is being performed. 6) A Unit 1 and 2 design review indicated no other similar problems in the ECCS design. 7) A long term design solution will be implemented prior to restart from the current refueling outage.

NRC FORM 366A (5-92)

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNB 7714), 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.

FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)			PAGE (3)
St. Lucie Unit 1		05000335		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 6
				94	--006--	0	

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

DESCRIPTION OF THE EVENT

On 20 October, 1994, at 1700 hours Unit 1 was at 100% power steady state operations. Immediately after successful performance of a B train High Pressure Safety Injection pump (EIIS:BQ) motor operated valve (V3662) differential pressure test as required by NRC Generic Letter 89-10, utility maintenance personnel noted water pooling to a floor drain in the pipe tunnel in the Reactor Auxiliary Building (EIIS:NS). The source of the water was found to be from a reseated A train relief valve SR-07-1A, located on the 1A Emergency Core Cooling (ECCS) (EIIS:BP) suction piping. Health Physics personnel determined that the water was from the Refueling Water Tank.

Later that same shift, utility licensed operators determined that the relief had lifted during the performance of the valve differential test due to a previously unrecognized pathway for cross train pressurization. The alignment for the test revealed a flow path from the discharge of the 1B Containment Spray pump (EIIS:BE) to the suction of the 1A Containment Spray pump through a common header in the Sodium Hydroxide (NaOH) Spray Additive system (EIIS:BE). A review of plant records showed that during this testing, the maximum pressure at the A ECCS suction piping was 85 psig. The design pressure of the line is 60 psig. The relief setpoint of SR-07-1A and 1B is 60 psig.

On 21 October, FPL Engineering was requested to determine potential adverse effects of overpressurizing the 1A ECCS suction piping and to review the operability concern related to the potential to lift SR-07-1A during a postulated design basis accident.

On 23 October, preliminary results from that review prompted Operations to isolate the NaOH system from the 1B Containment Spray pump and enter its 72 hour Action statement at 1255 hours. At 1915 hours, FPL Engineering completed a calculation which determined that the components whose design pressure had been exceeded were in fact capable of withstanding considerably higher pressures. The suction piping and components, therefore, did not suffer any damage as a result of the event. However, it was concluded that a design basis scenario existed which could result in lifting the relief valve. In the event of a postulated Loss of Coolant Accident (LOCA) concurrent with a Loss of Offsite Power and the failure of one Emergency Diesel Generator (EIIS:EK) to start, SR-07-1A or 1B could open in the idle train, and after a Recirculation Actuation Signal (EIIS:JE) would release containment sump inventory in excess of the Engineered Safeguards equipment external leakage rate of 2 liters per hour. (See Figure One) This would result in a condition outside of the design basis of the Engineered Safeguards systems. This design deficiency had existed since the NaOH system was backfit to Unit 1 in 1978.

On 26 October, Unit 1 exited the 72 hour LCO when the partially disabled Iodine Removal system was fully restored to service. This was done after FPL Engineering had performed a Safety Evaluation which concluded the acceptability of disabling the two relief valves in the ECCS suction headers as an interim measure. After the suction header reliefs were disabled, a leak test on each ECCS header confirmed the acceptability of this mode of operation until the commencement of the Unit 1 refueling outage scheduled to begin five days later.

LICENSEE EVENT REPORT (LER)  
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FACILITY NAME (1)		DOCKET NUMBER (2)	LER NUMBER (6)		PAGE (3)
St. Lucie Unit 1		05000335	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
			94	--006--	0
					3 OF 6

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

CAUSE OF THE EVENT

The root cause of this event was a design deficiency in the NaOH system. Specifically, the backfit of the NaOH system in 1978 did not consider the adverse potential consequences of using a common return header from the discharge of the two Containment Spray pumps to the two NaOH eductors located near the suction of each Containment Spray pump. The discovery of this event occurred during the GL 89-10 differential pressure testing of the 1B Containment Spray pump cross tie connection to the 1B High Pressure Safety Injection pump. Other plant test and surveillance procedures had isolated the NaOH system and therefore had not detected this design deficiency.

ANALYSIS OF EVENT:

The postulated lifting of SR-07-1A or 1B is reportable to the NRC under 10CFR50.73.a.2.ii as "Any event or condition that resulted in the condition of the nuclear power plant, being in a condition that was outside the design basis of the plant." A design basis scenario of concern is a LOCA with a Containment Spray Actuation Signal and a Loss Of Offsite Power LOOP coincident with one Emergency Diesel Generator failing to operate. This would result in cross train pressurization to the non-running ECCS train, and open a suction header relief valve. After a Recirculation Actuation Signal, containment sump inventory release would be in excess of the Engineered Safeguards equipment external leakage rate of 2 liters per hour assumptions (FSAR section 15.4.1). The maximum leakage rate from the relief would be limited by the design flow of the NaOH spray additive system eductor at 128 gallons per minute.

The purpose of the Containment Spray system is to prevent the containment vessel from exceeding its design pressure of 44 psig following a LOCA, assuming a single active or passive failure. The Containment Spray system consists of two redundant trains. The heat removal capacity of either of the two trains is adequate to keep containment pressure and temperature below design values. The Iodine Removal system is a subsystem of the Containment Spray system which is used to remove post-accident Iodine from the containment atmosphere following a LOCA by adding controlled amounts of sodium hydroxide to the containment spray water. This is accomplished by maintaining the containment spray solution pH within specifications to achieve rapid absorption of the radio-iodines and to minimize caustic corrosion of materials and protective coatings within the containment. The purpose of the ECCS suction relief valves, SR-07-1A and 1B, is to provide relief capability between the low pressure suction piping and the higher pressure portion of the suction piping used for shutdown cooling. Low Pressure Safety Injection pump (EIIS:BP) check valves and ECCS suction header relief valves were installed to protect against leakage across motor operated isolation valves or the failure to isolate this portion of the low pressure system prior to initiating shutdown cooling. The ECCS suction header relief valves are one and one-half inch reliefs, with a relieving capacity of 128 gallons per minute at the NaOH eductor design flow rate.

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FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)			PAGE (3)
St. Lucie Unit 1		05000335		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 6
				94	--006--	0	

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

ANALYSIS OF THE EVENT (continued):

FPL Engineering has completed preliminary calculations to show that the Containment Spray system's ability to supply the containment with the design flow rate of at least 2700 gallons per minute was not compromised with the diversion through the idle spray pump's header and out an ECCS suction header relief under the design basis accident of concern. An additional calculation determined that the components whose design pressure had been exceeded during the MOV differential pressure testing on 20 October were capable of withstanding considerably higher pressures and therefore did not suffer any damage as a result of this event.

Leakage from ECCS components during a LOCA and recirculation phase provide a source of fission product leakage external to the containment. All ECCS components containing recirculating sump water are within the controlled ventilation area served by the ECCS area ventilation system. This safety related system processes all leakage from ECCS components through a charcoal filter before release to the atmosphere via the plant vent. Relief valves SR-07-1A and 1B both relieve in a compartment which is served by this ECCS ventilation system. FSAR section 15.4.1.7 describes the assumptions for determining the offsite dose component from ECCS leakage.

CORRECTIVE ACTIONS:

- 1) As an interim measure, Operations isolated one train of the Iodine Removal system to preclude cross connecting the ECCS headers and lifting the suction reliefs.
- 2) FPL Engineering evaluated the effects of overpressurizing the ECCS suction header during this event and found that the components whose design pressure had been exceeded were capable of withstanding considerably higher pressures and had not been overpressurized or suffered damage.
- 3) FPL Engineering performed a Safety Evaluation which determined that the ECCS suction headers could withstand pressurization up to the Containment Spray pump discharge head concurrent with the disabling of the relief valves.
- 4) As an interim measure, the two ECCS suction header relief valves were disabled.
- 5) The Technical Staff performed satisfactory leak testing of the ECCS suction header to a pressure of the head of the Containment Spray pumps.
- 6) Operations fully restored the Iodine Removal system to service within the 72 hour LCO time limit.
- 7) A design review was conducted on the Unit 1 and Unit 2 ECCS piping used during injection and recirculation modes of operation. No other paths for cross flow were identified to be outside the license design basis.

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FACILITY NAME (1)		DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
St. Lucie Unit 1		05000335	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 6
			94	--006--	0	

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CORRECTIVE ACTIONS (continued)

- 8) FPL Engineering is evaluating a long term design solution to the problem described herein. A permanent modification will be accomplished prior to unit restart from the current refueling outage.
- 9) FPL Engineering is performing an assessment of the safety consequences and implications of this design deficiency.
- 10) Lessons learned from this event will be shared on the INPO Nuclear Network.

ADDITIONAL INFORMATION

System Identification:

Iodine Removal System: NaOH System with eductors  
Architect Engineer: Ebasco  
NSSS: Combustion Engineering

Previous Similar Events:

A previous LER at St. Lucie related to design deficiencies which resulted in a condition of the plant being outside of the design assumptions in the FSAR is LER 335-80-27, "Unanalyzed Boron Dilution Transient."

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)			PAGE (3)
St. Lucie Unit 1		05000335		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 OF 6
				94	---006--	0	

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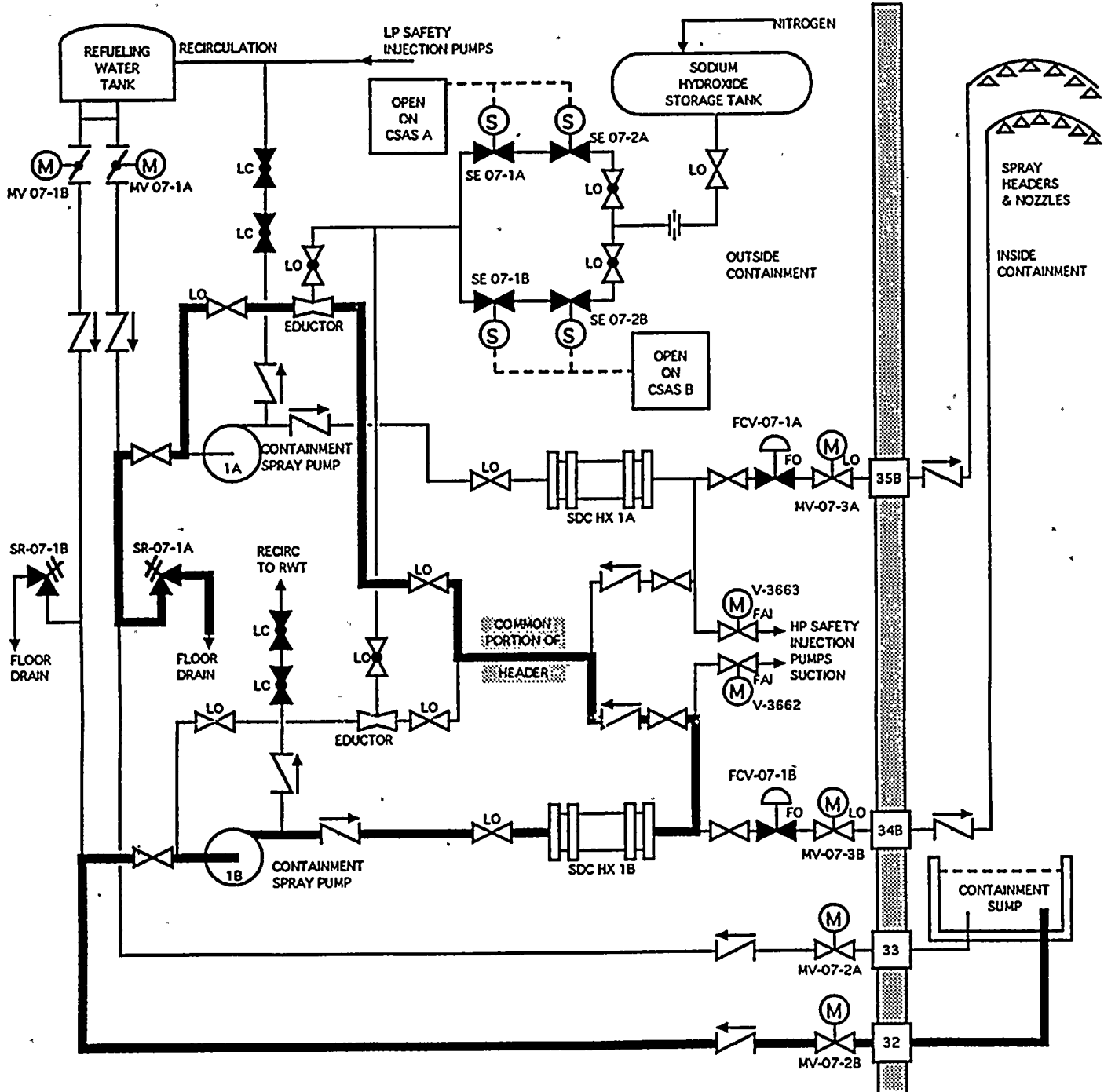


FIGURE ONE- SODIUM HYDROXIDE ADDITION IODINE REMOVAL SYSTEM