



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

March 27, 2008

L-2008-068
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: 2008-001-00
Date of Event: January 29, 2008
RCP 2B1 Upper Seal Cavity Line Leak

The attached Licensee Event Report 2008-001-00 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 black ink, appearing to read 'Gordon L. Johnston', written over a circular stamp or mark.

Gordon L. Johnston
Site Vice President
St. Lucie Plant

GLJ/dlc

Attachment

JE22
NRR

NRC FORM 366 (9-2007)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB: NO. 3150-0104		EXPIRES: 08/31/2010												
LICENSEE EVENT REPORT (LER)										Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.									
1. FACILITY NAME					2. DOCKET NUMBER					3. PAGE									
St. Lucie Unit 2					05000389					1 OF 3									
4. TITLE																			
RCP 2B1 Upper Seal Cavity Line Leak																			
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED										
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME		DOCKET NUMBER								
01	29	2008	2008	001	00	03	27	2008	FACILITY NAME		DOCKET NUMBER								
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)																
1			<input type="checkbox"/> 20.2201(b)		<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> 50.73(a)(2)(vii)										
10. POWER LEVEL 100%			<input type="checkbox"/> 20.2201(d)		<input type="checkbox"/> 20.2203(a)(3)(ii)		<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)										
			<input type="checkbox"/> 20.2203(a)(1)		<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)										
			<input type="checkbox"/> 20.2203(a)(2)(i)		<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)										
			<input type="checkbox"/> 20.2203(a)(2)(ii)		<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)										
			<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)										
			<input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)										
			<input type="checkbox"/> 20.2203(a)(2)(v)		<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> OTHER										
			<input type="checkbox"/> 20.2203(a)(2)(vi)		<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(v)(D)		Specify in Abstract below or in NRC Form 366A										
12. LICENSEE CONTACT FOR THIS LER																			
NAME							TELEPHONE NUMBER (Include Area Code)												
Donald L. Cecchett - Licensing Engineer							772-467-7155												
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT																			
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX.										
B	AB	PSF	N/A	YES															
14. SUPPLEMENTAL REPORT EXPECTED							15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR								
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE)							<input checked="" type="checkbox"/> NO.												
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)																			
<p>On January 29, 2008 at 0325, St. Lucie Unit 2 was in Mode 1 at 100% power when the reactor was down powered and manually tripped in accordance with plant procedures as a result of an increasing unidentified reactor coolant system (RCS) leak rate. Subsequent investigation of the leak identified the 2B1 reactor coolant pump (RCP) [EIIS:AB:P] to be leaking at the socket weld in the 3/4 inch upper seal cavity pressure transmitter line. Repairs were made and the unit was returned to power.</p> <p>A root cause was completed and determined that a synergistic effect of four separate causes: localized abnormal chemistry conditions, line resonance vibration levels, inherent stress concentration effects of socket welds, and elevated RCP vibration levels all contributed to causing the through wall crack.</p> <p>Corrective actions identified beyond the immediate weld repair includes a forensic evaluation of additional socket welds, flushing of Unit 2 RCP instrument sensing lines during future outages, evaluation of replacing pipe spools with flex hoses and performance of pipe vibration analysis of Unit 2 RCP lines. There was no adverse impact on the health and safety of the public.</p>																			

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
St. Lucie Unit 2	05000389	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	Page 2 of 3
		2008	- 001	- 00	

NARRATIVE

Description of the Event

On January 29, 2008 at 0200, Unit 2 control room personnel completed the daily RCS leak rate calculation. Results showed that the RCS leak rate was 0.20 gpm. Investigation into additional reactor containment building indicators showed that the reactor sump level had increased, containment particulate radiation levels had increased and the RCP 2B1 showed controlled bleedoff flow to the 2B1 RCP had decrease. At 0250, a second RCS leak rate calculation was completed showing a 0.22 gpm RCS leak rate. At 0325 on January 29, 2008, St. Lucie Unit 2 commenced downpower as directed by plant procedures and manually tripped the reactor at 0531.

Cause of the Event

A root cause evaluation was completed and concluded that a synergistic effect of four separate causes involving: localized abnormal chemistry conditions, line resonance vibration levels, inherent stress concentration effects of socket welds and elevated RCP vibration levels in all combinations caused the through wall crack.

Analysis of the Event

This event is reportable under 10 CFR 50.73(a)(2)(ii)(A), as any event or condition that resulted in a manual or automatic reactor trip.

Analysis of Safety Significance

The upper seal cavity line provides pressure indication of the RCP seal for confirmation of seal performance. Leakage from this line is limited by the pressure breakdown tubes which would only allow 1.3 gpm maximum from the RCS. Failure analysis performed on the cracked weld concluded there was evidence of corrosion at the crack initiation point at the weld root, with subsequent propagation through the throat of the weld. The failure mechanism was low stress high cycle fatigue caused by vibration induced cyclic loading.

The RCP leak was discovered during daily RCS leak rate calculations. If the leak had not been discovered at that time, normal RCS leak rate monitoring would have discovered the increased leakage long before a significant degradation of the piping had occurred. Experience has demonstrated that with this weld failure mechanism, there is ample time from the discovery of increased RCS leakage to allow a controlled shutdown to cold shutdown conditions without challenging the emergency core cooling system (ECCS) or small break loss-of-coolant accident analysis (SBLOCA).

Although stainless steel components are not susceptible to boric acid corrosion, the spray from the cracked weld deposited wet boric acid onto the external surfaces of numerous carbon and low alloy steel components, including pressure retaining bolting. Inspection of the affected areas revealed only minor surface corrosion with no measurable material degradation or wastage. The inspection results were consistent with the expected corrosion rates provided in the industry guidelines for the specific leak parameters such as temperature and boric acid concentration.

Based on the above, the safety consequences of the event are judged to be low and there was no adverse impact on the health and safety of the public.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
St. Lucie Unit 2	05000389	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	Page 3 of 3
		2008	- 001	- 00	

NARRATIVE

Corrective Actions

The corrective actions and supporting actions are entered into the site corrective action program. Any changes to the proposed actions will be managed under the commitment management change program.

Completed Corrective Actions:

Repaired cracked socket weld by replacing the controlled bleedoff as well as the upper and middle seal cavity piping spool pieces for all four RCPs with 2:1 taper socket welds.

Long Term Corrective Actions

1. Forensic metallurgical evaluations of selected socket weld fittings on RCP seal lines to address environmental issues.
2. Establish long term RCP pump and coupling maintenance practices to reduce vibration.
3. Actions to be performed on the Unit 1 RCP sensing lines during the upcoming refueling outage include: chemical analysis of water samples, replacement of the flanged spools connected to the pump seals consistent with Unit 2 criteria, utilization of 2:1 taper socket weld design or butt weld and flushing of certain lines to achieve normal levels (<50 ppb) of corrosive contaminants (chlorides, fluorides and sulfates) in each of the eight lines.

Similar Events

There have been (3) three similar failure events at PSL Unit 2 involving cracked RCP seal lines: 1) Inside diameter initiated low stress high cycle fatigue of the 2B1 RCP lower seal injection line socket weld; 2) outside diameter initiated low stress high cycle fatigue of the 2B2 RCP seal injection vendor J groove weld; 3) inside diameter initiated environmental assisted cracking under cyclic loading. While each of these events involved a different failure mechanism, vibration loading was a common key contributor.

A search of the INPO Operating Experience database, Industry Owner Groups, and other Utilities identified multiple plant events involving RCP seal injection line with cracked welds relating to vibration, environmental, water chemistry, and weld material, which each independently or collectively contributed to these types of events within the nuclear industry.

Failed Components

RCP 2B1 Upper Seal Cavity piping $\frac{3}{4}$ inch schedule 160 304 SS piping socket weld at flange.