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

June 14, 2010

L-2010-118
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: 2010-002
Date of Event: April 15, 2010

Unit 2 Manual Reactor Trip Due to Moisture Separator Re-heater Safety Valve Lift

The attached Licensee Event Report 2010-002 is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Respectfully,

for R. Anderson

Richard L. Anderson
Site Vice President
St. Lucie Plant

RLA/dlc

Attachment

IE22
NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

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, NEOB-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.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE
Unit 2 Manual Reactor Trip Due to Moisture Separator Re-heater Safety Valve Lift

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
04	15	2010	2010	- 002	- 00	06	14	2010	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE
1

10. POWER LEVEL
100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 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	SN	PCV	D243	NO					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On April 15, 2010, St. Lucie Unit 2 was operating in Mode 1 at 100% power when the Unit was manually tripped due to premature lifting of the 2B moisture separator re-heater (MSR) safety valve. The Unit initially commenced a rapid down power evolution as a result of the lifting safety valve followed by a manual reactor trip at approximately 95% power. All control element assemblies (CEA) fully inserted on the trip and all systems functioned as designed; the plant was stabilized at normal operating temperature and pressure in Mode 3. A non-emergency notification to the NRC was made due to manual reactor protection system (RPS) actuation and auxiliary feedwater (AFW) system actuation.

The primary root cause of the event was determined to be less than adequate material (LTA) design for the MSR safety valve pilot spring.

Corrective actions included replacement of pilot valve springs for each of the four Unit 1 and 2 MSR safety valves (MSRV) with either new (CR) alloy steel or Inconel springs prior to startup of Unit 2 and ensure that replacement of MSRVs for Unit 1 are procured with appropriate spring materials and drawings to reflect the same.

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NARRATIVE

Description of the Event

On April 15, 2010, St. Lucie Unit 2 was operating in Mode 1 at 100% power when the Unit was manually tripped due to premature lifting of the 2B Moisture Separator Re-heater (MSR) safety valve [EIIS:SN]. The Unit initially commenced a rapid down power evolution as a result of the lifting safety valve followed by a manual reactor trip at approximately 95% power. All control element assemblies (CEA) [EIIS:AA] fully inserted on the trip and all systems functioned as designed; the plant was stabilized at normal operating temperature and pressure in Mode 3. A non-emergency notification to the NRC was made due to manual reactor protection system (RPS)[EIIS:JD] and auxiliary feedwater (AFW) system actuations [EIIS:BA].

Cause of the Event

An investigation of the 2B MSRV failure modes was conducted both onsite and at the Vendor's facility to determine the cause of this event. Vendor disassembly and inspection of the pilot valve identified the pilot valve spring was broken and made of corrosion resistant (CR) alloy steel. All other attributes of the valve were judged to be in good to excellent condition. Visual examination of the failed spring revealed extensive pitting on the outer surface and brittle-like fractures with no evidence of plastic deformation. FPL Metallurgist's review of the spring condition concluded that these features indicated the causative failure mechanism of the high strength alloy steel spring was hydrogen embrittlement. The direct cause of the premature MSRV lift was the failure of the spring in the pilot valve due to corrosion and hydrogen embrittlement induced by long term exposure to a marine atmospheric environment.

Discussions with the Vendor concurred with the assessment of hydrogen embrittlement as the primary cause of pilot valve spring failure. Additionally it was identified that the Vendor has been replacing the alloy steel springs with Inconel since 2008 for applications of 400 degrees F or greater. Currently, based on a business decision, the Vendor is utilizing the Inconel springs in all applications irrespective of temperature. This change in pilot valve spring materials and vulnerability of the (CR) alloy steel pilot valve springs had not previously been communicated to PSL Engineering.

At the request of FPL, a previous expedited refurbishment of the failed valve was completed using a spare pilot valve without an Inconel pilot valve spring. The valve was tested SAT, shipped to PSL, and reinstalled on the 2B MSR which subsequently failed. Investigation has identified that either a replacement of the as-found pilot spring with a new spring or a thorough disassembly and inspection of the spare pilot valve could have identified a degraded spring condition. Thus not refurbishing the valve in accordance with ASME Code requirements was also considered a contributing cause to the valve failure.

Based on a review of the PM Program for the MSR Safety Valves, the program was considered to be less than adequate. The inspection and overhaul program did not provide sufficient detail to ensure an adequate inspection and repair of pilot valves were in accordance with ASME Section VIII requirements, or reference of the National Board Inspection Code (NBIC), Part 3 Repairs and Alterations Section S7-14.3 "Pilot Operated Safety Valves." The LTA organizational focus on the repair and refurbishment of Critical 1 components is also considered a cause in the failure of

NARRATIVE

the spring in the pilot valve as critical 1 components should require an inspection to assess the parts condition and suitability for repair/refurbishment.

Analysis of the Event

In accordance with NUREG 1022, Rev. 2 10 CFR 50.73(a)(2)(iv)(A); any event or condition that resulted in manual or automatic actuation of any of the systems is reportable and requires Licensee Event Report (LER).

Analysis of Safety Significance

The failure mode (broken pilot valve spring) identified for valve 2B is applicable to all eight MSR safety valves for both Unit 1 and 2. The valves were setpoint tested and certified in accordance with the Vendor's program.

Although the cause of the premature MSRV lift was failure of the spring in the pilot valve due to corrosion induced by long term exposure to a marine atmospheric environment, a review of industry and station OE has not identified this as a high probability or a high frequency event.

Given that the MSRs and their safety valves are classified as Non-Nuclear Safety (NNS) components in the secondary plant, and based on the satisfactory inspection of all other valves in the extent of condition population and all plant systems actuated to perform their design safety function, with no radiological events occurring, this event had no impact on the health and safety of the public.

Corrective Actions

The corrective and supporting actions are entered into the Site Correction Action Program (CAP). Any changes to the proposed actions will be managed under CAP.

Corrective Actions

1. All eight safety valves were sent to the Vendor and the pilot valve springs replaced with either Inconel or new CR alloy springs which is an acceptable alternative to Inconel.
2. The replacement MSR safety valves for both units will be procured with pilot valve spring materials that are not susceptible to hydrogen embrittlement and that design drawings reflect the spring materials.
3. PSL Engineering will prepare and track to completion CRNs to insert notes for the design drawings of (existing) MSR safety valves which identify that all future replacements of CR alloy steel pilot valve springs will be with Inconel pilot valve springs.
4. Detailed Engineering requirements (including ASME Code requirements) and documentation content and distribution requirements for refurbishment of the

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MSR safety valves will be incorporated in the stock code information for the MSRs.

5. PSL Engineering (Training) will revise Corporate Nuclear Engineering Procedure ENG-002 to include a module focused upon the importance of procedures and processes for the procurement, storage, inspection, maintenance, testing, repair and refurbishment of Critical Components.

6. PSL Engineering (Mechanical) will revise PMs and stock code information for those Critical 1 and 2 valves with springs subject to hydrogen embrittlement as necessary to address periodic inspection and replacement of the springs to preclude valve failure.

Similar Events

A review of condition reports since 2000 identified no instances of MSR safety valve failures at PSL.

Failed Components

1. 18" x 22" (inlet x outlet) Model 13906/143-1(2) Consolidated Turbine Reheater Pilot Operated Safety Valve Type 13900-2, PSL SC#227760-4, marketed by Dresser Valve.