FPL

October 4, 2016

L-2016-182
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: 2016-002-00
Date of Event: August 5, 2016
Safety Injection Check Valve Leakage Exceeding Technical Specification Limits and Allowed Outage Time Resulted in Operation Prohibited by Technical Specifications

The attached Licensee Event Report 2016-002-00 is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Sincerely,

Christopher R. Costanzo

Christopher R. Costanzo
Site Vice President
St. Lucie Plant

CRC/rcs

Attachment

cc: NRC Region II Administrator
St. Lucie Plant NRC Senior Resident Inspector

IE22
NRR

NRC FORM 366 (06-2016) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@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
St. Lucie Unit 1	05000335	1 OF 4

4. TITLE

Safety Injection Check Valve Leakage Exceeding Technical Specification Limits and Allowed Outage Time Resulted in Operation Prohibited by Technical Specifications

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
08	05	2016	2016	002	00	10	04	2016	NA	
									FACILITY NAME: NA	DOCKET NUMBER

9. OPERATING MODE

4

10. POWER LEVEL

0%

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)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
	☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Richard Sciscente – Principal Engineer, Licensing	772-467-7156

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURE	REPORTABLE TO EPIX
B	AB	ISV	A585	YES					

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 August 5, 2016, during Unit 1 restart following a maintenance outage, operators observed excessive seat leakage past a Reactor Coolant System (RCS) pressure isolation check valve. The flow path was promptly identified and isolated. A leak test was planned and performed at higher RCS pressure to quantify the leakage. The seat leak test at normal operating pressure was halted when an appropriate differential pressure was not achieved for testing. As a result, V3217, Safety Injection Loop 1A2 Check Valve, was declared inoperable, and Unit 1 was placed in Mode 5 COLD SHUTDOWN to complete repairs. The leakage past V3217 was caused by inadequate maintenance practices and procedures that did not ensure V3217 was within acceptable tolerances and correctly assembled in 2013.

Corrective actions include revisions to procedures for check valve maintenance, check valve trending and check valve preventive maintenance.

This event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications. Since this condition was identified with Unit 1 in HOT STANDBY prior to reactor startup, the leaking check valve had no direct nuclear safety significance or impact to the environment.

This event had no effect on the health and safety of the public.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
St. Lucie Unit 1	05000335	2016	- 002 -	00

NARRATIVE

Description of the Event

On August 5, 2016, Unit 1 was in Mode 5 and in the process of restarting following a maintenance outage. On August 5, 2016, Unit 1 entered Mode 4 at 0943, Operators were conducting activities to cool down the shutdown cooling system after removing the system from service. With Unit 1 in Mode 4, Operators observed the Reactor Coolant System (RCS) [AB] Pressurizer level lowering when opening of HCV-3618, Safety Injection Loop 1A2 Check Valve Leakage Isolation Valve, as part of the procedure for system restoration. Based on the lowering Pressurizer level, operators closed HCV-3618. This action arrested the Pressurizer level reduction by isolating the internally leaking check valve V3217 [ISV:AB] and stopping RCS leakage to the Refueling Water Tank (RWT). The flow path was promptly identified and isolated prior to any alarms or automatic system actuations.

Procedural guidance to quantify the seat leakage required establishing a differential pressure which did not exist at current conditions. A seat leakage test was planned when RCS pressure could be established to meet the required conditions. Unit 1 entered Mode 3 on August 6, 2016. On August 7, 2016 with the RCS at the normal operating pressure 2250 psia, test personnel were unable to achieve an appropriate differential pressure to allow the performance of a seat leak test of V3217, and the seat leak test was halted.

On August 7, 2016, at 1600, V3217 was declared inoperable, and Unit 1 entered The Technical Specification action statement (TSAS) 3.4.6.2.e, RCS pressure isolation valve leakage. The action statement required that leakage be reduced to within limits within 4 hours or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours. During the allowed 4 hours, a second attempt was made to leak check V3217, but the required differential pressure could not be achieved.

Unit 1 entered Mode 4 on August 8, 2016, at 0233, and entered Mode 5 on August 8, 2016, at 2003. Unit 1 remained in Mode 5 until repairs to V3217 were completed.

Cause

The internal leakage past V3217 was caused by inadequate contractor maintenance practices and procedures that did not ensure V3217 was within acceptable tolerances and correctly assembled. It was identified that maintenance performed in 2013 incorrectly assembled internal valve bushings, and bushing spacers were not installed per the design. This resulted in excessive internal wear and misalignment.

A second root cause identified that V3217 is susceptible to accelerated wear if differential pressure is not maintained across the seat. This was not recognized and incorporated into the overall valve maintenance strategy.

NARRATIVE

Analysis of the Event

The increased internal leakage past V3217 resulted in the RCS pressure isolation valve initially being declared inoperable on August 7, 2016 at 1600. Since the internal seat leakage was not reduced to within limits, Technical Specifications allow 40 hours for the Unit to be in Mode 5, COLD SHUTDOWN. As a result of the internal inspection and known operational at-power conditions, the period of concern was from the initial achievement of Mode 4 on August 5, 2016 at 0943 to the declaration of entry into the Technical Specification action statement and entry into Mode 5 on August 8, 2016 at 2003. This time period exceeded the allowed 40 hours, making this event reportable pursuant to 10 CFR 50.73(a)(2)(i)(B), Operation or Condition Prohibited by Technical Specifications.

As a result of internal leakage with V3217, the upstream Safety Injection piping had been maintained near RCS system pressures for the majority of the SL1-25 and SL1-26 operating cycles, but had been successfully tested during each cycle with less than 1 gpm leakage prior to the maintenance outage. FPL performed an internal valve inspection after the unsuccessful test following a maintenance outage. A review of previous valve maintenance and testing history concluded that cumulative internal valve wear had occurred within the valve due in part to inadequate assembly tolerances introduced in 2013 and a lack of differential pressure. This wear was sufficient to cause acceptable leakage up to the point where the last forward flow through the valve was established with shutdown cooling flow, on August 5, 2016 during a plant shutdown for maintenance. Cumulatively, the disc seat wear and increased clearances allowed the disc to progressively move lower in the valve seat until shutdown cooling flow moved the disc off its remaining seat. The disc inside the seating surface is convex in shape. This convex shape would help to keep the disc seated until the valve was opened by flow. The flow induced opening of the disc caused the disc to drop due to the cumulative wear of the internal parts. The disc seating surface and the valve body seating surface did not subsequently align resulting in leakage exceeding Technical Specification limits.

Safety Significance

This condition was mitigated by the downstream RCS pressure isolation valves in series with V3217 satisfactorily performing their isolation function during the period described.

Safety injection system pressure isolation check valves leakage of reactor coolant through the safety injection system isolation check valves (V3217, V3227, V3237 and V3247) can be detected by an associated pressure increase on the low pressure side of the check valves. Pressure indicator alarm instruments (PIA-3319, 3329, 3339 and 3349) on the control board monitor system pressure. Safety injection system isolation check valves outside the containment (V3113, V3114, V3123, V3124, V3133, V3134, V3143 and V3144) are also periodically tested in accordance with the plant Technical Specifications, in order to reduce the probability of reactor coolant system leakage into the high and low pressure safety injection system pipe lines. These valves are within the scope of Generic Letter 87-06, "Periodic Verification of Leak Tight Integrity of Pressure Isolation Valves."

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St. Lucie Unit 1	05000335	2016	- 002 -	00

NARRATIVE

The Conditional Core Damage Probability (CCDP) and Conditional Large Early Release Probability (CLERP) values were evaluated for the stated event and were found to be below the thresholds of 1.0E-6 and 1.0E-7 for CCDP and CLERP, respectively. Therefore, it is concluded that the risk impact of the stated event is not risk-significant. The reactor remained shut down during the period of concern. V3217 is one of four different piping branches for Safety Injection. Internal valve leakage does not impact this safety function. Redundant, in-series check valves to V3217 remained operable during the period of concern. Given the short period where Technical Specification time limits were exceeded, the health and safety of the public were not affected by this event.

Immediate Corrective Actions

V3217 was disassembled and repaired prior to unit restart using improved procedure guidance and vendor input. New components were installed including the valve disc, hinge pins, bushings and gaskets. The valve body seat was refurbished. A post maintenance test indicated zero leakage.

Corrective Actions to Prevent Recurrence

The corrective actions listed below have been entered into the site corrective action program. Any changes to the actions will be managed under the corrective action program.

1. New time based preventive maintenance is being developed for safety injection loop pressure isolation valves consistent with EPRI PMB Guidance for Critical, Low duty cycle, Mild service (CLM) check valves.
2. The Maintenance Strategy for safety injection loop pressure isolation valves is being revised to reflect that mild service condition requires the valve to be closed with differential pressure.
3. The station's maintenance procedure for Atwood-Morrill swing check valves is being revised to incorporate industry best practices described in the EPRI Check Value Maintenance Guide for assembly procedures (section 5.1.3 of EPRI Guide), seat inspection (section 7.4.7 of EPRI Guide), excessive clearance checks (section 7.4.8 of EPRI Guide) and refurbishment (section 7.4.9 of EPRI Guide).

Failed Component

Unit 1 V3217 is an Atwood & Morrill Company, 12-inch, swinging disc, inclined seat type check valve.

Manufacturer

Atwood & Morrill Company

Previous Occurrence

No previous similar LERs.