



L-2019-193
10 CFR 50.73

NOV 05 2019

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

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 2019-002-00
Date of Event: September 7, 2019
Reactor Coolant Pump Motor Ground Results in Reactor Coolant Pump Trip and Subsequent Automatic Reactor Trip

Licensee Event Report 2019-002 is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Respectfully,

Daniel DeBoer
Site Director
St. Lucie Plant

DD/kp

Attachment

cc: St. Lucie NRC Senior Resident Inspector
St. Lucie NRC Program Manager



LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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.

1. FACILITY NAME

St. Lucie Unit 1

2. DOCKET NUMBER

05000335

3. PAGE

1 OF 3

4. TITLE

Reactor Coolant Pump Motor Ground Results in Reactor Coolant Pump Trip and Subsequent Automatic Reactor Trip

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
9	7	2019	2019	- 002	- 00	11	5	2019	n/a	05000
									n/a	05000
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
1			☐ 20.2201(b)			☐ 20.2203(a)(3)(i)			☐ 50.73(a)(2)(ii)(A)	
			☐ 20.2201(d)			☐ 20.2203(a)(3)(ii)			☐ 50.73(a)(2)(ii)(B)	
			☐ 20.2203(a)(1)			☐ 20.2203(a)(4)			☐ 50.73(a)(2)(iii)	
			☐ 20.2203(a)(2)(i)			☐ 50.36(c)(1)(i)(A)			☒ 50.73(a)(2)(iv)(A)	
10. POWER LEVEL			☐ 20.2203(a)(2)(ii)			☐ 50.36(c)(1)(ii)(A)			☐ 50.73(a)(2)(v)(A)	
			☐ 20.2203(a)(2)(iii)			☐ 50.36(c)(2)			☐ 50.73(a)(2)(v)(B)	
			☐ 20.2203(a)(2)(iv)			☐ 50.46(a)(3)(ii)			☐ 50.73(a)(2)(v)(C)	
			☐ 20.2203(a)(2)(v)			☐ 50.73(a)(2)(i)(A)			☐ 50.73(a)(2)(v)(D)	
			☐ 20.2203(a)(2)(vi)			☐ 50.73(a)(2)(i)(B)			☐ 50.73(a)(2)(vii)	
						☐ 50.73(a)(2)(i)(C)			☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT

Kathy Paez, Senior Engineering Analyst

TELEPHONE NUMBER (Include Area Code)

(772) 467-7504

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO ICES	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO ICES
B	AB	MO	A180	Y					

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 September 7, 2019, St. Lucie was in Mode 1 at 100 percent reactor power. At 0824 the Unit 1 Reactor tripped automatically on a low Reactor Coolant System flow actuation of the Reactor Protection System. The trip was uncomplicated and all safety systems responded as designed. The plant was stabilized in Mode 3 with decay heat removal via the main feedwater system and condenser steam bypass system.

The direct cause was an electrical fault in the 1A1 Reactor Coolant Pump (RCP) motor. The electrical fault was initiated after a cooling water pipe for the 1A1 RCP motor's upper bearing failed and the leaking water entered the motor enclosure. The root cause evaluation determined there were inadequate technical controls over the use of generic reuse specifications and engineering quality instructions during a 2010 modification of RCP motor cooling water piping.

The 1A1 RCP motor was replaced, and post maintenance testing was successfully completed. St. Lucie Unit 1 was returned to service on September 21, 2019.

Automatic reactor trips are analyzed events in the Updated Final Safety Analysis Report (UFSAR). The trip and post trip actions were uncomplicated. Therefore, this event had no impact on the health and safety of the public.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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1. FACILITY NAME	2. DOCKET	6. LER NUMBER		
St. Lucie Unit 1	05000335	YEAR	SEQUENTIAL NUMBER	REV NO.
		2019	- 002	- 00

NARRATIVEDescription

On September 7, 2019, St. Lucie was in Mode 1 at 100 percent reactor power. At 0824 the reactor automatically tripped on a low reactor coolant system (RCS) [EIS:AB] flow actuation of the Reactor Protection System (RPS). The low RCS flow actuation was initiated due to a trip of the 1A1 Reactor Coolant Pump (RCP) motor [EIS:MO].

The reactor trip was uncomplicated and all systems responded as required. The unit was stabilized in Mode 3 with decay heat removal accomplished with the main feedwater system and main condenser steam bypass system.

Cause of the Event

A Component Cooling Water (CCW) return line failed at a pipe joint [EIS:CC:PSF] with the 1A1 RCP upper bearing oil cooler. The resulting water leak initiated a ground in the 1A1 RCP motor and a subsequent trip of the RCP and an automatic reactor trip.

The root cause evaluation determined that there was inadequate technical control for a modification of RCP motor cooling water piping. A Fleet motor repair specification was used to manage a 2010 1A1 RCP motor replacement and refurbishment project that included modifications to the motor cooling water piping. However, the repair specification is not intended for such modifications and is not adequate to describe all applicable design, installation and inspection requirements that are addressed by the appropriate engineering quality instructions. This resulted in inadequate installation by the vendor performing refurbishment.

Analysis of the Event

This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A) as any event or condition that resulted in the automatic operation of the reactor protection system.

The RCP motor suffered an electrical fault after water intrusion into the stator from the through-wall break of a ½" pipe nipple for the CCW piping supplying cooling water to the motor's upper bearing oil cooler. The pipe nipple failure was the result of fatigue damage leading to the progressive weakening of material under cyclic loading.

The CCW piping is subject to some levels of normal vibration from the RCP motor and pump. The piping design is specified to conform with ANSI B31.1 which requires consideration of vibration in the design of piping and supports. From inspection of the motor, it was determined that the piping for the upper bearing oil cooler was not adequately supported. A vent valve and blind flange for the return line were located on an unsupported length of cantilevered piping to the oil cooler connection that failed.

The CCW piping leak occurred on the top of the RCP motor enclosure. The RCP motor has a drip proof enclosure design specified to conform with NEMA MG-1 which requires that drops of liquid striking the enclosure not interfere with operation of the motor. During the motor refurbishment, two unsealed penetrations were opened through the top plate of the enclosure to accommodate the modification of CCW piping to the upper bearing oil cooler. The modification affected the motors conformance with NEMA MG-1. The two open pipe penetrations through the top of the enclosure provided a path to the RCP upper annulus above the stator air intake.

Metallurgical testing was performed and determined the leakage from the failed connection was caused by fatigue damage to the pipe nipple produced by bending under a variable load vector, which was likely due to vibratory loading. No material or manufacturing defects were observed in either of the components in the connection.

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NARRATIVE

An extent of condition review of potentially susceptible cooling water piping as identified in the root cause evaluation has been performed for all motors except Unit 2 RCP motors with no findings. The extent of condition of Unit 2 RCP cooling water piping will be performed in the next Unit 2 refueling outage.

Safety Significance

The Reactor Coolant Pump trip initiated a Reactor Coolant System low flow actuation in the Reactor Protection System resulting in an automatic reactor trip, which is an analyzed event in the Updated Final Safety Analysis Report (UFSAR). All control element assemblies (CEAs) fully inserted into the core and the trip was uncomplicated with all safety functions satisfied. The plant was stabilized in Mode 3 hot standby conditions.

The event did not impact the environment and there were no radiological or security related implications. Therefore, this event had no impact on the health and safety of the public.

Corrective Actions

1. The 1A1 RCP motor was replaced.
2. An extent of condition review of potentially susceptible cooling water piping as identified in the root cause evaluation has been performed for all motors except Unit 2 RCP motors with no findings.

The following planned corrective actions are being tracked in the St. Lucie Corrective Action Program (CAP):

1. Revise specification, SPEC-E-008, FPL FLEET MOTOR REPAIR/REFURBISHMENT/ REWIND REQUIREMENTS SPECIFICATION, to clarify that Appendix A, MOTOR REPAIR REQUIREMENTS FORM, is not intended, and shall not be used, to contract for work or services beyond the defined scope in the specification (i.e., code piping work, cabling work, engineering design services, shall not be performed). Scope beyond that defined in SPEC-E-008 shall be contracted under a separate specification, scope of work, or purchase document developed by qualified individuals using the applicable governing FPL procedures.
2. Seal penetrations in the Unit 1 and Unit 2 RCP motor enclosures to restore NEMA MG-1 drip proof ratings.
3. Perform extent of condition review of Unit 2 RCP cooling water piping configurations during the next Unit 2 refueling outage.

Failed Components Identified

Tags: MOTOR, RCP

Manufacturer: Allis Chalmers

Model No.: ANVWG (6500)

Similar Events

None