



Ernest J. Kapopoulos, Jr.
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Harris Nuclear Plant
Progress Energy Carolinas, Inc.

June 20, 2012
Serial: HNP-12-066

10 CFR 50.73

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Shearon Harris Nuclear Power Plant, Unit 1
Docket No. 50-400 / Renewed Facility Operating License No. NPF-63

Subject: Licensee Event Report 2012-001-00

Ladies and Gentlemen:

Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc., submits the enclosed Licensee Event Report (LER) 2012-001-00 in accordance with 10 CFR 50.73. This report describes a condition where unexpected long-term corrosion of valve piston rings caused delayed closing of Main Steam Isolation Valves. This LER is submitted within 60 days following discovery of the condition in accordance with 10 CFR 50.73(a).

This document contains no regulatory commitments. Please refer any questions regarding this submittal to Dave Corlett at (919) 362-3137.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Ernest J. Kapopoulos, Jr.', written in a cursive style.

Enclosure: LER 2012-001-00

cc: Mr. J. D. Austin, NRC Sr. Resident Inspector, HNP
Ms. A. T. Billoch Colón, NRC Project Manager, HNP
Mr. V. M. McCree, NRC Regional Administrator, Region II

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013
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 Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet 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)

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

1. FACILITY NAME Shearon Harris Nuclear Power Plant, Unit 1	2. DOCKET NUMBER 05000400	3. PAGE 1 of 4
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4. TITLE
Delayed Closure of Main Steam Isolation Valves Due To Corrosion

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	21	2012	2012 - 001 - 00			06	20	2012	None	
									FACILITY NAME	DOCKET NUMBER
									None	

9. OPERATING MODE 4	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)									
	<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 000	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input 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 checked="" 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 checked="" type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER							
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A							

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME John Caves, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) 919.362.2406
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	SB	ISV	Rockwell Int / Flow Control Div / Edward Valve	Y					

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

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

At 5:00 AM on April 21, 2012, Harris Nuclear Plant (HNP) was in a refueling outage, in Mode 4 (Hot Shutdown), cooling down to cold shutdown. During a surveillance test, two Main Steam Isolation Valves (MSIVs) did not close with acceptable stroke times. The two valves were declared INOPERABLE resulting in entry into Technical Specification (TS) 3.0.3. The plant continued to cool down as planned, entered Mode 5 (Cold Shutdown) at 11:27 AM, and exited TS 3.0.3. Troubleshooting revealed high friction within all three MSIVs with the root cause being unexpected long-term corrosion of the valve piston rings. Primary contributing causes were that the MSIVs were not properly categorized in the Air Operated Valve Program, and opportunities to identify potential valve degradation were not recognized. Corrective actions to prevent recurrence include replacing the valve piston rings with upgraded rings made of a material less susceptible to corrosion and implementing a diagnostic testing program on the MSIVs.

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NARRATIVE

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

Event Description

At 5:00 AM on April 21, 2012, Harris Nuclear Plant (HNP) was in a refueling outage, in Mode 4 (Hot Shutdown), cooling down to cold shutdown. Reactor Coolant System temperature was approximately 340 degrees F and pressure was approximately 345 pounds per square inch. Operations Surveillance Test 1046, *MAIN STEAM ISOLATION VALVE (MSIV) OPERABILITY TEST QUARTERLY INTERVAL MODE 3 TO 5*, was being performed as scheduled to demonstrate the operability of each Main Steam Isolation Valve [ISV] per Technical Specification (TS) Surveillance Requirement 4.7.1.5 and the Inservice Testing (IST) Program. The test acceptance criterion is MSIV closing time of less than five seconds. During the test, MSIVs 1MS-82 ('B' Steam Generator) and 1MS-84 ('C' Steam Generator) closed in approximately 1 hour and 14 minutes and 4 hours and 37 minutes respectively. 1MS-80 ('A' Steam Generator MSIV) closed within five seconds as designed. The two valves were declared INOPERABLE resulting in entry into TS 3.0.3. The plant continued to cool down as planned, entered Mode 5 (Cold Shutdown) at 11:27 AM, and exited TS 3.0.3. The planned shutdown and cooldown was not significantly complicated by the delayed closure of the two MSIVs, and no other equipment issues complicated the response to the delayed closure of the two MSIVs.

Description and Cause of Failures

The MSIVs are manufactured by Rockwell International / Flow Control Division / Edward Valve, Model 32-1612 GJMPTY. Troubleshooting performed revealed high friction on all three MSIVs. Disassembly of the valves revealed that most of the piston rings were locked tight in their mating grooves. Corrosion of the piston rings resulted in them expanding or "growing" while in service. The increased size of the piston rings resulted in them becoming locked in their grooves with the end gaps being completely closed up. This prevented them from sliding in their grooves, expanding and contracting as necessary to follow the valve bore, as the valve was opened and closed. This ultimately resulted in the 'B' and 'C' MSIVs locking up until the force of the actuator springs eventually broke the valve piston-disk assembly loose from the valve body bore and allowed the valves to close. The metallurgical examination of the removed piston rings confirmed this mechanism. The valve vendor, Flowserve, concurred with this conclusion. The time at which the MSIVs became INOPERABLE is not known.

The root cause was determined to be unexpected long-term corrosion of the valve piston rings. This led to the piston rings expanding in size so they could no longer slide in their associated grooves, causing high internal valve friction, resulting in the piston-disk assembly locking up in the valve body bore. The Cause Code was *Original Design Less Than Adequate*. The primary contributing causes were that the MSIVs were not properly categorized in the Air Operated Valve Program, and that opportunities to identify potential valve degradation were not recognized.

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Safety Consequences

The actual safety consequence at the time of the delayed closure of the two MSIVs was negligible. The reactor was in Mode 4 with all control rods fully inserted. No other conditions significantly affected the event, so there was no safety consequence at the time of the delayed closure of the MSIVs. Had an accident occurred in Mode 4 (the as-found condition), the impact of delayed closing of the MSIVs would have been less than full power operation due to reduced radiological release, lower risk of excessive cooldown rate, and lower motive force for any thermal-hydraulic transient. Other systems needed to shutdown the reactor, maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident were not affected by the condition and remained available.

The two events that would be most significantly affected by the MSIV delayed closure are Main Steam Line Break (MSLB) and Steam Generator Tube Rupture (SGTR). Major MSLBs and SGTRs are considered American Nuclear Society (ANS) Condition IV events. Condition IV events are limiting faults which are not expected to occur, but could result in offsite dose approaching regulatory limits. MSIVs are intended to mitigate the impact of a MSLB by limiting the number of affected steam generators which reduces excess cooldown. Delayed closure of the three MSIVs during a SGTR could increase the radiological inventory release, and potentially increase challenges with steam generator overfill. The consequences of design basis accidents can be more significant than described in the Final Safety Analysis Report if the conservative assumptions of the event analysis are coupled with equipment challenges such as delayed closing of multiple MSIVs.

Corrective Actions

Completed Corrective Actions

- Replaced the valve piston rings with upgraded rings made of a material less susceptible to corrosion.
- Reviewed HNP AOV Program Category 1 and Category 2 valves to determine if others contain cast iron piston rings. (Extent of Cause).
- Reviewed other AOV Category 2 Valves to determine required actions. (Extent of Condition).

Planned Corrective Actions

- Implement diagnostic testing program on the MSIVs, including post maintenance testing.
- Reclassify the MSIVs to be Category 1 in the Air Operated Valve Program.

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Previous Similar Events

The 'B' MSIV did not shut within the IST stroke time limits on October 1, 2009. The condition report associated with that event investigated the lack of intervention after low stroke-time margin was discovered in a previous outage, but the cause of the degradation in stroke time was not addressed in the investigation. This may be a missed opportunity for taking actions that could have prevented the most recent condition.

The 'B' MSIV did not shut within the IST stroke time limits on Nov. 15, 2009, as reported in LER 2010-002-01. The condition in 2009 was due to two solenoid operated shuttle valves (SOVs) not fully realigning to vent air after deenergizing. Because the delayed closing of the two MSIVs in 2012 was caused by a different mechanism, the corrective actions from the November 2009 event would not be expected to have prevented this recurrence.

Commitments

This report contains no regulatory commitments.