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Nuclear LLC

10CFR50.73

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NOV 30 2016

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-001

Hope Creek Generating Station Unit 1
Renewed Facility Operating License No. NPF-57
Docket No. 50-354

Subject: Licensee Event Report 2016-002-01, High Pressure Coolant Injection System Inoperable.

In accordance with the requirements of 10 CFR 50.73(a)(2)(v)(D), and 10 CFR 50.73 (a)(2)(i)(B), PSEG Nuclear LLC is submitting the enclosed Licensee Event Report (LER) Number 2016-002-01, High Pressure Coolant Injection System Inoperable.

If you have any questions or require additional information, please contact Mr. Thomas MacEwen at (856) 339-1097.

There are no regulatory commitments contained in this letter.

Sincerely,

Edward T Casulli
Plant Manager
Hope Creek Generating Station

ttm

Attachment: Licensee Event Report 2016-002-01

cc: Mr. Daniel Dorman, Regional Administrator – Region I, NRC
Ms. Carleen Parker, Project Manager - US NRC
Mr. Justin Hawkins, NRC Senior Resident Inspector – Hope Creek (X24)
Mr. Patrick Mulligan, Manager IV, NJBNE
Mr. Thomas MacEwen, Hope Creek Commitment Tracking Coordinator (H02)
Mr. Lee Marabella - Corporate Commitment Tracking Coordinator (N21)

NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE High Pressure Coolant Injection System Inoperable

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 05000
08	06	2016	2016	- 002	- 01	11	30	2016	FACILITY NAME	DOCKET NUMBER 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)(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)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
100	☐ 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)	X 50.73(a)(2)(i)(B)	X 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMER *(Include Area Code)*
Thomas MacEwen, Lead Compliance Engineer	856-339-1097

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
X	BJ	65	W290	Y					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ■ NO				

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

On August 6, 2016, at 21:34, with the Hope Creek reactor operating at 100% power, the High Pressure Coolant Injection (HPCI) system turbine governor valve did not respond as expected during system surveillance testing. The system was declared inoperable and an 8-hour immediate notification was made under 10 CFR 50.72 (B)(3)(v)(d). Subsequent investigation found that HPCI turbine governor was not functioning due to corrosion products in the governor, preventing movement of the pilot valve. Additional research determined that the turbine governor did not respond properly on July 3, 2016 during the collection of an oil sample. Based on this, the HPCI system was inoperable for a period of 39 days from July 3, 2016, until August 11, 2016, when repairs to the governor were completed. The HPCI system Technical Specification has an allowed outage time of 14 days.

This report is being submitted under 10 CFR 50.73(a)(2)(i)(B), as a condition which is prohibited by the plant's Technical Specifications, and under 10 CFR 50.73(a)(2)(v)(D), as an event or condition that could have prevented the fulfillment of a safety function of systems that are needed to mitigate the consequences of an accident. The cause of the event is the accumulation of corrosion products in the HPCI turbine governor due to excessive moisture content in the HPCI system control oil.

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NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

General Electric – Boiling Water Reactor (BWR/4)
High Pressure Coolant Injection System – EIIS Identifier {BJ/65}*

*Energy Industry Identification System {EIIS} codes and component function identifier codes appear as {SS/CCC}

IDENTIFICATION OF OCCURRENCE

Event Date: 08/06/2016
Discovery Date: 08/06/2016

CONDITIONS PRIOR TO OCCURRENCE

Hope Creek was in Operational Condition 1 at 100 percent rated thermal power (RTP). HPCI System {BJ} surveillance testing was in progress.

DESCRIPTION OF OCCURRRENCE

On August 6, 2016 at 21:34, Hope Creek operators were performing a HPCI system valve actuation functional test. During the test, system valves are verified to reposition to their intended position in response to a HPCI manual initiation signal. The HPCI turbine governor valve FV-4879, did not reposition to the open position as expected, and remained in the full closed position. Operators reviewed the event and subsequently declared the HPCI system inoperable.

Troubleshooting and investigation determined that the HPCI EG-R (Electronic Governor Remote) was not operating properly. The EG-R is a hydro-electrical device that is mounted on the turbine and receives a low pressure oil supply from the turbine oil system. The EG-R ports oil to the remote servo which moves its output shaft accordingly to move a turbine mounted relay valve to control the flow of steam to the turbine. The EG-R was found to contain corrosion products that prevented proper movement of the EG-R internals. This resulted in the turbine governor valve, FV-4879 remaining in the closed position, and would have prevented HPCI system operation.

The HPCI system ensures that the reactor core is not uncovered if there is a small break in the reactor coolant pressure boundary (RCPB) that does not result in rapid depressurization of the reactor vessel.

CAUSE OF EVENT

The cause of the event is that corrosion products were present in the EG-R. The corrosion products were created due to high moisture content in the turbine control oil. The moisture was most likely introduced into the bearing oil via a path from the turbine shaft seals and into the bearing oil at the shaft bearings. Leak-by of the turbine steam admission valve FDHV-F001, allowed a small, continuous supply of steam to leak into the turbine casing and subsequently, to leak out through the turbine shaft seals. Insulation installed around the turbine casing also contributed by trapping steam in the area around the turbine bearings, increasing the rate of moisture intrusion into the oil.

A cause evaluation determined that organizational weaknesses existed in the station process for adverse condition monitoring. The monitoring plan that was developed to prevent and detect moisture intrusion did not adequately establish single point ownership for sampling, or a process to implement the sampling, such as a work order or temporary activity log. In addition, management controls were determined to be insufficient to detect the failure to monitor the adverse condition. Management reviews of data collection were not performed due to overreliance on the monitoring plan to be properly implemented.

NARRATIVE

SAFETY CONSEQUENCES AND IMPLICATIONS

This event resulted in inoperability of the single train HPCI system, resulting in the inability of the HPCI system to perform its required safety function to mitigate the consequences of an accident. The HPCI system is part of the Emergency Core Cooling System (ECCS), and is specifically intended for a small break in the reactor coolant pressure boundary (RCPB) that does not result in rapid depressurization of the reactor vessel.

In the event that the HPCI system fails, the Automatic Depressurization System (ADS) {SB} uses a number of the reactor safety/relief valves to reduce reactor vessel pressure during small or isolated breaks. When reactor vessel pressure is reduced to within the design capability of the low pressure systems (Core Spray {BM} and Low Pressure Coolant Injection {BO}), these systems provide reactor vessel coolant inventory makeup, so that acceptable post-accident reactor core coolant temperatures are maintained.

During the time period between the last successful HPCI test on June 23, 2016 until the condition was discovered on August 6, 2016, the following low pressure ECCS systems were unavailable:

- The A Low Pressure Coolant Injection (LPCI) pump was unavailable from June 30, 2016 at 0210 until July 1, 2016 at 0158 due to planned maintenance.
- The C LPCI pump and A Core Spray subsystem were unavailable from July 4, 2016 at 2200 until July 8, 2016 at 0440, due to planned maintenance on the C EDG.
- The D LPCI pump was unavailable on July 26, 2016, from 0400 to 1702, due to emergent valve maintenance.
- The C LPCI pump and A Core Spray subsystem were unavailable from August 2, 2016 at 1742 until August 4, 2016 at 1230 due to an emergent relay failure associated with the C Vital bus.
- The the C LPCI pump and A Core Spray subsystem were unavailable from August 4, 2016 at 2155 until August 6, 2016 at 0135 due to an emergent failure of the C EDG speed switch.

ECCS logic requires at least one Core Spray subsystem or one LPCI pump be operating in order for the ADS to depressurize the reactor vessel and restore core cooling. At no time during the period of HPCI unavailability was the combination of operable low pressure ECCS pumps less than the required number for ADS system operation.

Based on the above, during the time period that the HPCI system was unavailable, sufficient systems were available to provide the required safety functions needed to protect the health and safety of the public.

SAFETY SYSTEM FUNCTIONAL FAILURE

This condition is a safety system functional failure as defined in NEI 99-02, Revision 7, Regulatory Assessment Performance Indicator Guideline.

PREVIOUS EVENTS

A review of events from the past five years was conducted. Two previous events were identified that had similarity to this event. In November, 2011, elevated moisture was discovered in the HPCI turbine oil at 3517 ppm. Subsequently, an adverse condition monitoring (ACM) plan was created to drain 10 gallons from the HPCI reservoir every other week, and to obtain a weekly oil sample for trending and analysis. This was continued until the moisture content was below 500 ppm. The moisture was attributed to leakage past the FD-HV-F001 HPCI steam admission valve. The valve was repaired in April, 2012 during the 17th refueling outage. The ACM was properly implemented to monitor the oil during the period of concern.

In another event, moisture was detected in the RCIC turbine oil in February, 2015. The moisture was detected by an equipment operator who noted that the RCIC oil level was 1/16 inches higher than normal. When he drained oil from the system, he observed visible water. The RCIC oil system was drained, flushed and refilled. The moisture intrusion was attributed to leakage past the RCIC turbine steam admission valve, FC-HV-F045, and the improper placement of insulation on the turbine casing. Following the RCIC event, the HPCI turbine insulation was inspected and modified to ensure proper clearances around the shaft steam seals.

CORRECTIVE ACTIONS

The HPCI EG-R was replaced.

The HPCI oil system was drained and refilled with new oil.

The insulation around the turbine bearings had been repositioned to reduce the possibility of moisture intrusion in to the HPCI control oil.

The HPCI steam admission valve FD-HV-F001 was repaired in November, 2016, to correct the seat leakage.

The ACM process is being modified to add specific guidance on implementation requirements and management oversight.

Other corrective actions are being tracked in the licensee's Corrective Action Program.

COMMITMENTS

This LER contains no regulatory commitments.