



10 CFR 50.73

LG-18-010  
February 6, 2018

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

Limerick Generating Station, Unit 2  
Renewed Facility Operating License No. NPF-85  
NRC Docket No. 50-353

Subject: LER 2018-001-00, HPCI Inoperability due to Discharge Check Valve Failure to Close

Enclosed is a Licensee Event Report (LER) which addresses the inoperability of the High Pressure Coolant Injection (HPCI) system during surveillance testing at Limerick Generating Station (LGS), Unit 2.

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(v)(D), any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

There are no commitments contained in this letter.

If you have any questions, please contact Robert B. Dickinson at (610) 718-3400.

Respectfully,

 F. STURNIOLO

*for* Richard W. Libra  
Vice President – Limerick Generating Station  
Exelon Generation Company, LLC

cc: Administrator Region I, USNRC  
USNRC Senior Resident Inspector, LGS

**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/nureqs/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 Information Services Branch (T-2 F43), 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.

<b>1. FACILITY NAME</b> Limerick Generating Station, Unit 2	<b>2. DOCKET NUMBER</b> 05000353	<b>3. PAGE</b> 1 OF 4
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<b>4. TITLE</b> HPCI Inoperability due to Discharge Check Valve Failure to Close
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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
12	08	17	2018	- 001	- 00	02	06	18	FACILITY NAME	DOCKET NUMBER
<b>9. OPERATING MODE</b>			<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>							
1			<input type="checkbox"/> 20.2201(b)		<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
			<input type="checkbox"/> 20.2201(d)		<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
			<input type="checkbox"/> 20.2203(a)(1)		<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)	
			<input type="checkbox"/> 20.2203(a)(2)(i)		<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)	
10. POWER LEVEL  100			<input type="checkbox"/> 20.2203(a)(2)(ii)		<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)	
			<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)	
			<input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)	
			<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)(D)		<input type="checkbox"/> 73.77(a)(2)(i)	
			<input type="checkbox"/> 20.2203(a)(2)(vi)		<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)	
			<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> OTHER		Specify in Abstract below or in NRC Form 366A			

<b>12. LICENSEE CONTACT FOR THIS LER</b>									
LICENSEE CONTACT Robert B. Dickinson, Manager – Regulatory Assurance								TELEPHONE NUMBER (Include Area Code) (610) 718-3400	

<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	BJ	V	A391	Y	N/A	N/A	N/A	N/A	N/A

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

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

On December 8, 2017, when the Unit 2 High Pressure Coolant Injection (HPCI) System was being secured following a quarterly surveillance test, the Main Control Room (MCR) received indications that the HPCI pump suction piping was pressurizing. The HPCI pump discharge check valve failed to fully close following turbine shutdown causing repeated cycling of the HPCI pump minimum flow bypass valve. The motor operated HPCI pump discharge valve located immediately downstream of the pump discharge check valve was closed to terminate pressurization of the pump suction piping.

With the pump discharge check valve in an indeterminate state and the motor operated pump discharge valve closed, the Unit 2 HPCI System was declared inoperable. This condition is reportable under 10 CFR 50.73(a)(2)(v)(D) as an event that could have prevented fulfillment of a safety function of a system that is needed to mitigate the consequences of an accident. An eight (8) hour Emergency Notification System (ENS) notification (#53108) was completed on December 8, 2017 at 1725 hours.



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

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Limerick Generating Station, Unit 2	05000353	YEAR	SEQUENTIAL NUMBER	REV NO.
		2018	- 001	- 00

**NARRATIVE****I. Unit Conditions Prior to the Event**

Limerick Generating Station (LGS) Unit 2 was operating in Operational Condition (OPCON) 1 at 100 percent power at the time of the event. There were no other structures, systems, or components inoperable at the time of the event that contributed to the event.

**II. Description of the Event**

At approximately 1300 hours on December 8, 2017, when the Unit 2 High Pressure Coolant Injection (HPCI) [EIS: BJ] system was being secured following a quarterly surveillance test, the Main Control Room (MCR) received indications that the HPCI pump suction piping was pressurizing. Failure of the HPCI pump discharge check valve to fully close caused repeated cycling of the HPCI pump minimum flow bypass valve. The motor operated pump discharge valve located immediately downstream of the pump discharge check valve was closed to terminate pressurization of the pump suction piping. With the HPCI pump discharge check valve in an indeterminate state and the motor operated pump discharge valve closed, the Unit 2 HPCI System was declared inoperable.

Following repair of the pump discharge check valve, satisfactory post-maintenance testing, and surveillance testing, the Unit 2 HPCI system was declared operable at 1140 hours on December 11, 2017.

This condition is reportable under 10 CFR 50.73(a)(2)(v)(D) as an event that could have prevented fulfillment of a safety function of a system that is needed to mitigate the consequences of an accident. An eight (8) hour Emergency Notification System (ENS) notification (#53108) was completed at 1725 hours on December 8, 2017.

**III. Analysis of the Event**

Inspection of the Unit 2 HPCI pump discharge check valve identified that the disc was stuck in the full open position. Repeated contact between the disc and sides of the valve body over time resulted in wear of the disc and the formation of notches in the side of the valve body. During the December 8, 2017 surveillance test, the disc became lodged in the notches and prevented disc closure when the system was secured. Normal wear of the valve internal parts and the formation of the notches in the valve body are both time dependent failure modes that occurred over the life of the valve.

**IV. Safety Significance**

The HPCI pump discharge piping includes a pump discharge check valve upstream of the system keep fill connections from the Condensate Transfer and the Safeguard Piping Fill systems. The check valve maintains the HPCI pump discharge piping filled with water above the elevation of normal Condensate Storage Tank (CST) water level. The pump discharge check valve performs an active safety function in the open direction to provide an injection flow path for the HPCI pump and a

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**NARRATIVE**

non-safety related function in the closed direction to support discharge piping keep fill. With the pump discharge check valve stuck open, the potential exists that voided piping could prevent the fulfillment of the HPCI system safety function.

There was no actual safety consequence associated with this event. The potential safety consequence of this event was the potential for voided piping to prevent the fulfillment of the HPCI system safety function. The reactor core isolation cooling (RCIC) system and low-pressure Emergency Core Cooling Systems (ECCS) remained operable during the period when the HPCI system was rendered inoperable.

**V. Cause of the Event**

Based on the valve design (lack of disc backstop), the as-found condition of the valve on December 8, 2017 and the operating and maintenance history, the apparent cause of the valve failure was unexpected wear over time of the valve disc and formation of the notches in the valve body. The degradation was a time dependent failure mode that occurred over the life of the valve. The lack of disc backstop contributed to wear of the valve that ultimately resulted in failure of the valve to close following the December 8, 2017 surveillance test.

**VI. Corrective Actions Completed/Planned**

Maintenance was performed in accordance with the approved Anchor Darling procedure. A new valve disc, hinge pin, disc stud washer and cotter pin were installed. In-body maintenance also included removal of the notches from the valve body. In-body fit-up activities also included verification that the disc could not be wedged in the open position regardless of disc arm lateral position (i.e., centered, hard left/right).

The following actions are in place or are planned:

- Establish Preventive Maintenance (PM) for periodic disassembly/inspection
- Review the feasibility of installing a disc backstop for the affected check valve family
- Perform extent of condition review for check valves in similar applications

**VII. Previous Similar Occurrences**

A similar occurrence was identified on May 6, 2015, when the HPCI Pump Comprehensive test was terminated 80 minutes into the turbine surveillance test due to receipt of a turbine low oil pressure alarm. The MCR received indications that the HPCI pump suction piping was pressurizing. Failure of the HPCI pump discharge check valve to fully close following turbine shutdown resulted in Condensate Transfer pressurizing the HPCI pump suction piping and causing repeated cycling of the HPCI pump minimum flow bypass valve. The motor operated pump discharge valve was closed to terminate pressurization of the pump suction piping. The system remained in this alignment until the turbine was restarted to complete the remainder of the Pump Comprehensive test after the low oil pressure alarm issue was resolved. Following turbine shutdown at the completion of the Pump



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**NARRATIVE**

Comprehensive test, the pump discharge check valve closed as expected. The affected check valve exhibited proper operation through ten surveillance tests between the May 2015 event and the December 2017 event.

**VIII. Component Data**

System: BJ High Pressure Coolant Injection System  
Component: Valve  
Component number: 055-2F005  
Manufacturer: Flowserve  
Model number: 1783-3 DWG  
Serial number: 1426-02A