Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

September 19, 2016

10 CFR 50.73

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

Browns Ferry Nuclear Plant, Unit 1
Renewed Facility Operating License No. DPR-33
NRC Docket No. 50-259

Subject: **Licensee Event Report 50-259/2016-002-00**

The enclosed Licensee Event Report provides details of the failure of the Browns Ferry Nuclear Plant, Unit 1, High Pressure Coolant Injection Steam Line Primary Containment Inboard Isolation Valve. The Tennessee Valley Authority is submitting this report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications, and 10 CFR 50.73(a)(2)(v)(D), as 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 new regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact J. L. Paul, Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

S. M. Bono
Site Vice President

Enclosure: Licensee Event Report 50-259/2016-002-00 – High Pressure Coolant Injection Safety System Functional Failure due to Inoperability of Primary Containment Isolation Valve

cc (w/ Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

ENCLOSURE

Browns Ferry Nuclear Plant
Unit 1

Licensee Event Report 50-259/2016-002-00

High Pressure Coolant Injection Safety System Functional Failure due to Inoperability of Primary Containment Isolation Valve

---

See Enclosed

NRC FORM 366 (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Nuclear Plant (BFN), Unit 1	05000259	1 OF 8

4. TITLE

High Pressure Coolant Injection Safety System Functional Failure due to Inoperability of Primary Containment Isolation Valve

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	20	2016	2016	- 002 -	00	09	19	2016	N/A	N/A
									FACILITY NAME N/A	DOCKET NUMBER N/A

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)	☐ 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)
10. POWER LEVEL	☐ 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)
100	☐ 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

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Justin Garner, Licensing Engineer	(256) 729-7955

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	FCV	A391	Y	N/A	N/A	N/A	N/A	N/A

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

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

On July 18, 2016, the Unit 1 High Pressure Coolant Injection (HPCI) System was removed from service for a scheduled maintenance outage. In support of maintenance activities, the HPCI steam line inboard primary containment isolation valve (PCIV) was placed in the closed position. Following the maintenance outage, warmup of the HPCI System commenced on July 20. During this evolution, unexpected system pressure conditions and responses were encountered that indicated the PCIV was not open. Failure to open the valve resulted in the inability to restore HPCI System operability and a reportable safety system functional failure. Because the valve is a PCIV located inside primary containment, the station planned and manually shutdown the reactor on July 26 for troubleshooting and corrective maintenance. A local leak rate test determined the PCIV function was ineffective, and disassembly of the valve found the valve stem severed. Following repair, the PCIV functions and HPCI System were declared operable on July 31 and August 1, respectively. Unit 1 was returned to full power on August 4.

The cause of this event was a tensile failure of the valve stem. The cause analysis concluded that the failure occurred on April 20, 2016, when the valve was stroked for in-service testing. Based on this the PCIV was inoperable longer than allowed by Technical Specifications. Corrective actions include valve repair, procedure revisions to provide additional margin to prevent back-seating, revision of guidance for high speed valve open limit switch settings, and evaluation of the extent of condition population. The safety significance of this event was determined to be low.

NRC FORM 366A (11-2015) 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 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) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000259	2016	- 002	- 00

NARRATIVE

I. Plant Operating Conditions Before the Event

At the time of discovery, Browns Ferry Nuclear Plant (BFN), Unit 1, was operating in Mode 1 at approximately 100 percent rated thermal power. BFN, Units 2 and 3, were unaffected by this event.

A. Event:

On July 18, 2016, the Unit 1 High Pressure Coolant Injection (HPCI)[BJ] system was removed from service for scheduled maintenance. Unit 1 HPCI Steam Line Inboard Isolation Valve 1-FCV-073-0002 [FCV] was cycled closed and tagged for isolation on the HPCI System, and Technical Specification (TS) Limiting Conditions for Operation (LCO) 3.5.1 Condition C, HPCI System Inoperable, Required Actions were entered.

Following the maintenance activity, Operations personnel commenced the warm-up of the HPCI System at 0250 Central Daylight Time (CDT) on July 20, 2016. The HPCI Steam Line Bypass Valve (1-FCV-073-81) was cycled; however, there was no change in indicated steam pressure. When 1-FCV-073-0003, HPCI Steam Line Outboard Isolation Valve, was approximately 30 percent open, only 65 pounds per square inch gauge (psig) of steam pressure was present in the steam line as indicated on pressure indicator 1-PI-73-4A [PI]. The Integrated Computer System (ICS)[JA] indicated 49 psig during the same time period. The lack of response in steam pressure with 1-FCV-073-0003 partially open was an indication that 1-FCV-073-0002 was not open. Based on this, the discovery date is July 20, 2016. 1-FCV-073-0002 was declared inoperable for its primary containment isolation valve function, and TS 3.6.1.3 LCO Condition A, one primary containment isolation valve (PCIV) inoperable, Required Actions, were entered.

In response to the inability of the 1-FCV-073-0002 valve to open, Unit 1 was shutdown on July 26, 2016, for a Maintenance Outage. There were no TS LCO Condition Required Actions that required a reactor shutdown. Initial troubleshooting was conducted by attempting to operate the valve manually. During this troubleshooting effort, it was identified that the stem was rotating. Stem rotation is indicative of a valve internal failure. Disassembly of the valve was performed, and it was determined that the stem was severed at a location just above the stem back-seat. The disc was located in the seat area and appeared to be fully seated. Although the disc was fully seated, the as-found local leak rate test (LLRT) determined valve leakage exceeded equipment capability prior to valve disassembly.

On July 31, 2016, at 1948, following verification that all maintenance activities were complete and all post maintenance tests were satisfied for 1-FCV-073-0002, Operations personnel declared the PCIV function for 1-FCV-73-0002 operable and exited TS LCO 3.6.1.3 Condition A.

On August 1, 2016, at 0010, following completion of warming the Unit 1 HPCI steam lines, verification of no leaks and all maintenance complete, and verification that Unit 1 HPCI surveillances were within periodicity, Operations personnel declared HPCI operable and exited TS LCO 3.5.1 Condition C.

NRC FORM 366A (11-2015) 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 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) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000259	2016	- 002	- 00

NARRATIVE

On August 4, 2016, at 0418, BFN Unit 1 was returned to 100 percent power.

The event date was determined in the cause analysis, which concluded that the valve stem severed on April 20, 2016, when the valve was stroked for in-service test (IST) timing.

II. Description of Events

A. Status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event:

No inoperable systems, structures, or components contributed to this event.

B. Dates and approximate times of occurrences:

April 20, 2016 at 0104 CDT	1-FCV-073-0002 was cycled closed and opened per 1-SR-3.6.1.3.5(HPCI) for quarterly IST stroke time testing. Subsequent investigation determined failure of the PCIV occurred during this testing.
July 18, 2016, at 0300 CDT	Unit 1 HPCI System 1-FCV-073-002 was cycled closed and tagged for scheduled maintenance on the HPCI System. Entered TS 3.5.1 LCO Condition C, HPCI System Inoperable, Required Actions.
July 20, 2016, at 1245 CDT	During HPCI System restoration, steam line pressure could not be attained, and 1-FCV-073-0002 was declared inoperable for its primary containment isolation valve function. Entered TS 3.6.1.3 LCO Condition A, one PCIV inoperable, Required Actions.
July 20, 2016, at 1933 CDT	Completed NRC 8-hr notification EN 52113 in accordance with 10 CFR 50.72(b)(3)(v)(D), Accident Mitigation.
July 26, 2016, at 0800 CDT	Unit 1 Operations personnel inserted a Manual Reactor Scram due to planned maintenance outage. All systems responded as expected.
July 31, 2016, at 1948 CDT	Verified all maintenance complete and PMTs satisfied for 1-FCV-073-0002. Declared PCIV function for 1-FCV-73-0002 operable and exited TS LCO 3.6.1.3 Condition A.
August 1, 2016, 0010 CDT	Completed warming U1 HPCI steam lines. Verified no leaks and verified all maintenance complete. Verified U1 HPCI surveillances are within periodicity. Declared HPCI operable and exited TS LCO 3.5.1 Condition C.
August 4, 2016, 0414 CDT	Unit 1 returned to 100 percent power.

NRC FORM 366A U.S. NUCLEAR REGULATORY COMMISSION
(11-2015)

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

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000259	2016	- 002	- 00

NARRATIVE

C. Manufacturer and model number (or other identification) of each component that failed during the event:

The 1-FCV-073-0002, HPCI steam line inboard isolation valve, is a 10 inch, Anchor/Darling (A/D), Class 900, pressure seal, double disc gate valve. The manufacturer part number is 900C WEOS. The vendor part number is FCV23-15.

D. Other systems or secondary functions affected:

There were no other systems or secondary systems affected.

E. Method of discovery of each component or system failure or procedural error:

On July, 20 2016, when 1-FCV-073-0003 was approximately 30 percent open, only 65 psig of steam pressure was present in the steam line as indicated on pressure indicator 1-PI-73-4A. ICS indicated 49 psig steam pressure during the same time period. The lack of response in steam pressure with 1-FCV-073-0003 partially open was an indication that 1-FCV-073-0002 had failed closed.

F. The failure mode, mechanism, and effect of each failed component, if known:

The failure mode identified for the 1-FCV-073-0002, HPCI Steam Line Inboard Isolation Valve, is a tensile failure of the valve stem during loading from the back-seat.

The cause analysis concluded that the valve stem severed on April 20, 2016, during opening of the valve. The location of the crack, the strong evidence of back-seating damage on the stem, and the apparent misalignment of the stem with the bonnet backseat indicate that the fracture was caused by a high peak tensile stress due to tension and bending when the stem was inadvertently back-seated.

G. Operator actions:

In response to the inability of Operations personnel to open and restore a steam flow path to HPCI following a maintenance outage on July 20, 2016, a troubleshooting/corrective maintenance outage was planned. Unit 1 Operations personnel inserted a manual reactor scram, and Unit 1 was shutdown on July 26, 2016, for this outage.

H. Automatically and manually initiated safety system responses:

There were no automatic safety system responses associated with this event. Because the HPCI System was inoperable at the time of discovery and primary containment isolation had been established, there were no manual safety system responses associated with this event.

III. Cause of the event

A. The cause of each component or system failure or personnel error, if known:

The direct cause of this event was a tensile failure of the HPCI Steam Line Inboard Isolation Valve stem.

NRC FORM 366A (11-2015) 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 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) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000259	2016	- 002	- 00

NARRATIVE

The root cause was determined to be associated with the design change process. The guidance in NPG-SPP-09.3.1, Guidelines for Preparation of Design Inputs and Change Impact Screen, was inadequate to ensure that the 1-FCV-073-0002 valve could be operated from the Main Control Room under all plant operating conditions without the valve stem interacting with the back-seat.

Three contributing causes were as follows:

1. Inadequate guidance was provided in General Specification G-50 for setting open limit switch on high speed valves.
2. Mechanical Design Standard DS-M18.2.21 does not consider potential for bending stresses in the valve stem induced by back-seating.
3. IST Program personnel elected not to incorporate guidelines from NUREG 1482 for deferral of testing to refuel outage.

B. The cause(s) and circumstances for each human performance related root cause:

No human performance related cause was identified.

IV. Analysis of the event:

The Tennessee Valley Authority (TVA) is submitting this report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications, and 10 CFR 50.73(a)(2)(v)(D), as 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.

An investigation determined that the valve stem failed in a single tensile failure mode. In order for this failure mode to occur, the valve stem had to fail in the open direction. Therefore, the failure could not have occurred in July as the last time the valve was operated in the open direction was on April 20, 2016, during performance of the HPCI system motor-operated valve (MOV) operability surveillance [1-SR-3.6.1.3.5(HPCI)]. Following completion of the surveillance, the HPCI main and booster pump set developed head and flow rate test at rated reactor pressure (1-SR-3.5.1.7) was performed. The valve was determined to have failed on April 20, 2016; however, due to valve conditions, including packing load and frictional forces induced from operating conditions, the 1-FCV-073-0002 partially closed when the demand to close was provided for maintenance on July 18, 2016. Because the PCIV was inoperable longer than required by TS, a violation of TS LCO 3.6.1.3 is reportable.

The safety function of HPCI is to assure that the reactor is adequately cooled to limit fuel cladding temperature in the event of a small break in the nuclear system and loss of coolant which does not result in rapid depressurization of the reactor vessel. The function of PCIVs, in combination with other accident mitigation systems is to limit fission product release during and following postulated Design Basis Accidents (DBAs) to within limits. Primary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for DBA. Because of the valve was unable to be opened, the HPCI System was inoperable in a mode of applicability, and a safety system functional failure is reportable.

NRC FORM 366A (11-2015) 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 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) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000259	2016	- 002	- 00

NARRATIVE

V. Assessment of Safety Consequences

This event resulted in additional, unplanned inoperability and unavailability of the single train of the BFN, Unit 1, HPCI system. This resulted in the inability of the HPCI system to perform its safety function, for mitigation of the consequences of an accident, longer than the planned system outage duration. In the event of an emergency, the RCIC system remained operable, and all other ECCS and ADS systems were available during this event to facilitate core cooling. Therefore, during the time period that the HPCI system was inoperable, sufficient systems were available to provide the required safety function of accident mitigation. The preliminary risk evaluation results indicate that the safety significance of this event was low.

With respect to primary containment isolation requirements, the 1-FCV-073-0002 was not capable to perform its isolation function since April 20, 2016. During the time period that the valve was inoperable, 1-FCV-073-0003 and 1-FCV-073-0081 were available to provide the required safety functions of primary containment isolation. The preliminary risk evaluation results indicate that the safety significance of this event was low.

The risk evaluations are being finalized, and the LER will be revised if final results differ from preliminary results.

A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event:

During this event, RCIC was verified as operable by operations personnel. Additionally, all other ECCS and ADS systems remained operable. 1-FCV-073-0003 and 1-FCV-073-0081 were available to provide the required primary containment isolation safety functions.

B. For events that occurred when the reactor was shut down, availability of safety-related systems or components:

This event did not occur when the reactor was shut down.

C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from discovery of the failure until the train was returned to service:

The Unit 1 HPCI system was declared inoperable due to placement of clearances to support scheduled maintenance on July 18, 2016, at 0300. On July 20 at 1245 1-FCV-073-0002, HPCI Steam Line Inboard Isolation Valve, was declared inoperable for its PCIV function and sustained HPCI inoperability. Because this valve is located inside primary containment and cannot be isolated at power, the reactor had to be shutdown to perform troubleshooting and corrective maintenance. Operations personnel inserted the manual reactor scram on July 26 at 0800. Once the PCIV function and HPCI System were restored, the HPCI System was declared operable on August 1 at 0010. From the time the HPCI System was declared inoperable until its return to service was approximately 13.88 days, which is less than the TS LCO 3.5.1 Condition C allowed outage time of 14 days.

NRC FORM 366A (11-2015) 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 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) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000259	2016	- 002	- 00

NARRATIVE

VI. Corrective Actions:

Corrective Actions (CA) are being managed by TVA's Corrective Action Program (CAP) under Condition Report (CR) 1193943.

The CAs described below address this condition:

1. Develop and implement guidance, for motor operated valves to accompany the Design Change process that requires consideration of operating conditions on valve coast including inertial and stem rejection forces, in Design Change Procedure NPG-SPP-09.3.1 Section 3.4.4 for valves.
2. Develop and implement modification for valves 1/2/3-FCV-073-0002 to provide additional margin to prevent back-seating.
3. Revise General Specification G-50 to provide guidance for high speed valve open limit switch settings.
4. Revise Mechanical Design Standard DS-M18.2.21 to require consideration for bending due to misalignment when evaluating back-seating.
5. Evaluate remaining extent of condition population: 2/3-FCV-073-0002, DC motor MOVs, non-IST, and IST valves not monitored in the closed direction.

The interim actions below were identified:

1. Adjust packing load on valve 1/2/3-FCV-073-0002 to compensate for coast effect.
2. Ensure 1/2/3-FCV-073-0002 are not electively closed for maintenance.
3. Implement administrative requirement to obtain program engineering and shift manager approval prior to stroking valves 1/2/3-FCV-073-0002 while associated reactor is NOT in Modes 4 or 5 with the exception of casualty response.
4. Modify the IST program to not require quarterly valve stroking of 1/2/3-FCV-073-0002.

VII. Additional Information:

A. Previous Similar Events:

A review of Condition Reports (CRs), Licensee Event Reports (LERs), BFN Self Assessments, INPO ICES database searches, and NRC website searches were conducted. During the course of the investigation, a search of the CR database (Maximo) was conducted for similar and related issues, based on several different parameters. After reviewing the CRs, several BFN CRs were found to be similar to the issue found in CR 1193943, including two CRs (639155 and 658890) from a previous cause evaluation for a similar issue.

CR 639155

On 10/20/2012, the as-found local leak rate test (LLRT) for 1-FCV-073-0002, Unit 1 HPCI Inboard Steam Isolation Valve, significantly exceeded administrative limits. The measured leak rate was 599.8 standard cubic feet per hour (scfh) with an administrative limit of 30 scfh. 1-FCV-073-0002 was subsequently disassembled on 11/06/2012 to investigate the cause for the failure by work order 114039287. This investigation revealed that the valve

NRC FORM 366A (11-2015) 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 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) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000259	2016	- 002	- 00

NARRATIVE

stem to wedge anti-rotation pin (referred to as anti-rotation pin) had broken in several locations and the disc retainer had fallen from the wedge assembly and was found located between the valve discs.

CR 658890

This CR was initiated to document that the event identified by CR 639155 was OE preventable.

B. Additional Information:

There is no additional information.

C. Safety System Functional Failure Consideration:

The 1-FCV-73-0002 valve was not part of the planned maintenance being performed during the scheduled maintenance window on July 18, 2016. Due to additional, unplanned inoperability of the HPCI system resulting from the failure of the valve, this system was unable to perform its safety function while in a mode of applicability.

This event resulted in the inability of the BFN, Unit 1, HPCI system to perform its safety function for mitigation of the consequences of an accident. In accordance with NUREG-1022, this event is considered a safety system functional failure.

D. Scram with Complications Consideration:

Unit 1 was shut down manually by operations in order to correct the condition in a planned Maintenance Outage; however, this event did not result in an automatic reactor scram with complications.

VIII. COMMITMENTS

There are no new commitments.