



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

December 22, 2010

10 CFR 50.73

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

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

Subject: Licensee Event Report 50-259/2010-003, Revision 0

The enclosed Licensee Event Report (LER) provides details of a failure of a low pressure coolant injection flow control valve and the resulting failure to meet the requirements of Browns Ferry Nuclear Plant, Unit 1 Technical Specification 3.5.1 concerning low pressure coolant injection operability.

The Tennessee Valley Authority (TVA) is submitting this report in accordance with 10 CFR 50.73(a)(2)(i)(B), as any operation or condition prohibited by the plant's Technical Specifications.

TVA is currently completing the investigation and evaluation for this event. Upon completion of these actions, TVA will submit a revised LER.

There are no new regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact J. E. Emens, Jr., Site Nuclear Licensing Manager, at (256) 729-2636.

Respectfully,

K. J. Polson
Vice President

for K.J. Polson

Enclosure: Licensee Event Report - Failure of a Low Pressure Coolant Injection Flow Control Valve

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NRK*

U.S. Nuclear Regulatory Commission
Page 2
December 22, 2011

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 - Failure of a Low Pressure Coolant Injection Flow Control Valve

SEE ATTACHED

LICENSEE EVENT REPORT (LER)

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 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.

1. FACILITY NAME Browns Ferry Nuclear Plant Unit 1	2. DOCKET NUMBER 05000259	3. PAGE 1 OF 6
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4. TITLE
Failure of a Low Pressure Coolant Injection Flow Control 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
10	23	2010	2010	003	00	12	22	2010	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000

9. OPERATING MODE 3	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 0	<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 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 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 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 Mike Oliver, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) 256-729-7874
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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
B	BO	FCV	W030	Y					

14. SUPPLEMENTAL REPORT EXPECTED <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
		03	22	2011

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

On October 23, 2010, during a refueling outage for Browns Ferry Nuclear Plant (BFN) Unit 1, the Tennessee Valley Authority (TVA) discovered that a Residual Heat Removal (RHR) Loop II low pressure coolant injection (LPCI) flow control valve failed to open while attempting to establish shutdown cooling while in Mode 3. Operations personnel declared RHR Loop II inoperable for ECCS and placed RHR Loop I in service for shutdown cooling.

Unit 1 Technical Specification (TS) limiting condition for operation (LCO) 3.5.1, Emergency Core Cooling System (ECCS) - Operating, requires both RHR loops of LPCI to be operable in reactor Modes 1, 2, and 3. Investigation of the valve failure is incomplete and ongoing, and TVA has not determined the duration of the valve's inoperability. However, based on information available at this time, RHR Loop II appears to have been inoperable for a period longer than the 7 days allowed by TS 3.5.1.

TVA is currently completing the investigation and evaluation for this event. Upon completion of these actions, TVA will submit a revised LER.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Browns Ferry Nuclear Plant Unit 1	05000259	YEAR	SEQUENTIAL NUMBER	REV NO.	2 OF 6
		2010	- 003	- 00	

NARRATIVE

I. PLANT CONDITION(S)

At the time of discovery, Browns Ferry Nuclear (BFN) Plant Unit 1 was at 0 percent power (Mode 3) and in a refueling outage.

II. DESCRIPTION OF EVENT

A. Event:

On October 23, 2010, the Residual Heat Removal (RHR) [BO] Loop II low pressure coolant injection (LPCI) flow control valve, 1-FCV-074-066, failed to open while attempting to place RHR Loop II in shutdown cooling. Control Room lights indicated the valve to be open, but no flow was indicated for RHR Loop II with the associated 1B RHR pump in service. RHR Loop I was then successfully placed in service for shutdown cooling.

Investigation of the event determined that the disc for valve 1-FCV-074-066 had become separated from the stem and wedged into the seat, preventing shutdown cooling flow.

Unit 1 Technical Specification (TS) limiting condition for operation (LCO) 3.5.1 requires both RHR loops of LPCI to be operable in reactor Modes 1, 2, and 3. At the time of discovery, the reactor was in Mode 3. Operations personnel declared RHR Loop II inoperable for the LPCI function of the Emergency Core Cooling System (ECCS) and entered TS LCO 3.5.1 Condition A with a required action to restore RHR Loop II to operable status within 7 days. With RHR Loop I operable, two RHR shutdown cooling subsystems remained operable and TS LCO 3.4.7 for RHR Shutdown Cooling System - Hot Shutdown was met.

Within one hour of the determination of RHR Loop II inoperability, Unit 1 entered Mode 4. Since TS LCO 3.5.1, ECCS - Operating, is not applicable in Mode 4, Operations personnel exited TS LCO 3.5.1 Condition A. TS LCO 3.5.2, ECCS - Shutdown, became applicable and requires two low pressure ECCS injection/spray subsystems to be operable. At that time, Unit 1 had both Core Spray (CS) [BM] subsystems operable and one RHR subsystem operable for ECCS. Note that RHR Loop I was operable for LPCI in accordance with TS LCO 3.5.2, which states that one LPCI subsystem may be considered operable during alignment and operation for decay heat removal if capable of being realigned and not otherwise inoperable.

Investigation of the valve failure is incomplete and ongoing, and TVA has not determined the duration of the valve's inoperability. However, based on information available at this time, RHR Loop II appears to have been inoperable for a period longer than the 7 days allowed by TS 3.5.1.

TVA is submitting this report in accordance with 10 CFR 50.73(a)(2)(i)(B), as any operation or condition prohibited by the plant's Technical Specifications.

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

RHR Loop II LPCI flow control valve 1-FCV-074-066.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
Browns Ferry Nuclear Plant Unit 1	05000259	2010	- 003	- 00	4 OF 6

NARRATIVE

B. Root Cause:

TVA is currently completing the root cause analysis for this event; therefore, the following information is considered preliminary. Valve 1-FCV-074-066 is physically located in the RHR LPCI Loop II flow path and is normally in the open position for the passive safety-related function of the valve. The valve is used to throttle shutdown cooling flow and is closed to divert flow from the LPCI flow path when containment cooling is desired. There are six of these type valves, two per unit with one in each loop of LPCI.

In 1975, Engineering Change Notices (ECNs) L1473 (BFN 1 and 2) and L1217 (BFN 3) were developed to implement a disc modification to eliminate excessive vibration experienced at low flow and high pressure drop conditions. This modification affected one valve per unit and removed the existing discs from the 24-inch pressure seal angle valves and replaced them with V-notch discs supplied by the original equipment manufacturer, the Walworth Company. In addition, a disc locking key was placed through the skirt into the keyway machined into the stem to prevent independent rotation between skirt, disc, and stem. This change was performed to support a test to ascertain if this modification would be successful in reducing vibration while maintaining the system performance characteristics and to assist in controlling the reactor cool-down rate. In 1978 ECN L2107 was issued to implement the change on the remaining three valves on all three units.

Valve 1-FCV-074-066 was refurbished in 2006 prior to the restart of Unit 1 after an extended outage. The design change noted in the ECNs above was not incorporated into this valve, apparently because the ECNs failed to update vendor drawings and provide detail for the field modifications. Therefore, the preliminary root cause of this event was inadequate configuration control.

IV. ANALYSIS OF THE EVENT

TVA is currently completing the analysis for this event; therefore, the following information is considered preliminary. The condition being reported is the operation of Unit 1 in a manner prohibited by TS.

1-FCV-074-066 is normally in the open position for the passive safety-related function of the valve. The valve is used to throttle shutdown cooling flow and is closed to divert flow from the LPCI flow path when containment cooling is desired. The valve was found to be failed closed while attempting to establish shutdown cooling during the Unit 1 Cycle 8 refueling outage. Operations personnel secured RHR Loop II shutdown cooling and established shutdown cooling using RHR Loop I in accordance with 1-OI-74.

Following preliminary investigations, the failed valve was reworked and tested, and RHR Loop II was returned to service.

Based on preliminary causal information, the possible extent of condition was determined to be limited to the corresponding valve in RHR Loop I of Unit 1, and to the corresponding valves in RHR Loops I and II of Units 2 and 3. Boroscope inspections were performed on the Unit 1 Loop I LPCI flow control valve 1-FCV-074-052 during the refueling outage. The results revealed that the valve internals were properly modified. No signs of fatigue or damage were found. These corresponding valves and associated LPCI RHR Loops on Units 2 and 3 are considered to be operable based upon successful shutdown cooling

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Browns Ferry Nuclear Plant Unit 1	05000259	YEAR	SEQUENTIAL NUMBER	REV NO.	5 OF 6
		2010	- 003	- 00	

NARRATIVE

operation during recent outages and/or monthly venting, which confirm that the valves are in the open, safety-related position. In addition, the valves on Units 2 and 3 have been in service longer than the failed Unit 1 valve.

V. ASSESSMENT OF SAFETY CONSEQUENCES

TVA is currently completing the analysis for this event; therefore, the following information is considered preliminary. The applicable safety-related mode for the RHR system is to provide a flow path for transmission of water supply to the reactor for a mission time up to 30 days for core cooling following initiation. Unit 1 TS LCO 3.5.1 requires both RHR loops of LPCI to be operable for ECCS in reactor Modes 1, 2, and 3. Unit 1 appears to have operated with RHR Loop II inoperable longer than allowed by TS LCO 3.5.1.

Past operability risk analyses associated with this event are ongoing. A specific time of valve failure (i.e., RHR Loop II of LPCI inoperable for ECCS) has not yet been estimated by the root cause analysis investigations. Preliminary indications are that some time between March 13, 2009 (last confirmed successful operation of the valve), and October 23, 2010, could be the most probable time of failure. Actions have been taken to obtain forensic metallurgic testing to assist in this determination; however, this information is not yet available.

Therefore, the assessment of the safety consequences of this event is ongoing and pending the completion of the causal analysis and estimation of the valve failure time.

VI. CORRECTIVE ACTIONS

TVA is currently completing the root cause analysis and developing associated corrective actions for this event; therefore, the following corrective actions may be revised or supplemented in a later revision to this LER.

A. Immediate Corrective Actions:

1. Valve 1-FCV-074-066 was repaired and tested as operable.
2. To address extent of condition of the similar valve on Unit 1 RHR Loop 1, boroscope inspections were performed on Loop I LPCI flow control valve, 1-FCV-074-052, during the refueling outage. The results revealed that the valve internals were properly modified. No signs of fatigue or damage were found.
3. The removed skirt, yoke nut, and stem for valve 1-FCV-074-066 were sent to Westinghouse for metallurgical analysis to validate suspected failure modes and estimate the time of failure. Southwest Research Institute has taken replication samples of the welds for additional verification for suspected failure modes.

B. Corrective Actions to Prevent Recurrence:

An administrative change was issued to update appropriate design documents associated with ECNs L1473, L1217, and L2107 (Problem Evaluation Report (PER) 279911).

C. Additional Corrective Actions:

Ultrasonic examination of the corresponding valves in Units 2 and 3 has been scheduled for the period December 29, 2010, through January 14, 2011. This will provide additional confirmation that these valves have not experienced the same failure as valve 1-FCV-074-066.

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

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Browns Ferry Nuclear Plant Unit 1	05000259	YEAR	SEQUENTIAL NUMBER	REV NO.	6 OF 6
		2010	- 003	- 00	

NARRATIVE

VII. ADDITIONAL INFORMATION

A. Failed Components:

The RHR Loop II LPCI flow control valve, 1-FCV-074-066, was manufactured by the Walworth Company as Part No. 531,543, Drawing No. A-12337-M-1. The valve is a 24-inch cast carbon steel, butt welded, pressure-seal angle globe valve operated by a Limatorque SMB-5T-350 motor operator.

B. Previous LERS or Similar Events:

This information is still under investigation.

C. Additional Information:

The corrective action document for this report is PER 271338. PER 279911 is an associated corrective action document used to document and track the update of the design output of the approved design changes.

D. Safety System Functional Failure Consideration:

Pending completion of the assessment of the safety consequences, the preliminary conclusion is that this event is not a safety system functional failure according to NEI 99-02.

E. Scram With Complications Consideration:

This event did not include a reactor scram.

VIII. COMMITMENTS

None