



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

June 21, 2010

10 CFR 50.73

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

Browns Ferry Nuclear Plant, Unit 3  
Facility Operating License No. DPR-68  
NRC Docket No. 50-296

**Subject: Licensee Event Report 50-296/2010-001-00**

The enclosed Licensee Event Report provides details of a failure to meet the requirements of Browns Ferry Nuclear Plant, Unit 3, Technical Specification 3.4.3 concerning safety relief valve operability. The Tennessee Valley Authority 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.

There are no new regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Dan Williamson, Acting Site Licensing and Industry Affairs Manager, at (256) 729-2636.

Respectfully,

  
K. J. Polson  
Vice President

cc: See page 2

IE22  
MRR

U.S. Nuclear Regulatory Commission  
Page 2  
June 21, 2010

Enclosure  
cc (w/ Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

**LICENSEE EVENT REPORT (LER)**

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

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 Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollect@nrc.gov](mailto:infocollect@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> Browns Ferry Nuclear Plant Unit 3	<b>2. DOCKET NUMBER</b> 05000296	<b>3. PAGE</b> 1 of 5
--	-------------------------------------	--------------------------

**4. TITLE: Safety Relief Valves As-Found Setpoints Exceeded Technical Specification Lift Pressure Values**

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	2010	2010	001	00	06	21	2010	N/A	N/A
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (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)							
<b>10. POWER LEVEL</b>  100	<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 368A								

**12. LICENSEE CONTACT FOR THIS LER**

<b>NAME</b> Mike Oliver, Licensing Engineer	<b>TELEPHONE NUMBER (include Area Code)</b> 256-729-7874
--	---

**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	RV	T020	Y					

**14. SUPPLEMENTAL REPORT EXPECTED**

YES (if yes, complete 15. EXPECTED SUBMISSION DATE)  NO

**15. EXPECTED SUBMISSION DATE**

MONTH	DAY	YEAR
N/A	N/A	N/A

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

On April 20, 2010, the Tennessee Valley Authority (TVA) determined that 8 of the 13 Safety Relief Valves (SRVs), removed from Unit 3 following Cycle 14 operation, mechanically actuated at pressures greater than 3 percent above their Technical Specification (TS) setpoints, and thus, were inoperable. Unit 3 TS Limiting Condition for Operation (LCO) 3.4.3 requires twelve (12) SRVs to be operable in reactor Modes 1, 2, and 3. With one or more required SRVs inoperable, TS 3.4.3 Action A requires the unit to be placed in Mode 3 (hot shutdown) within 12 hours and in Mode 4 (cold shutdown) within 36 hours. Since 8 of the 13 SRVs were found during test to have actuated above their TS setpoints, it is concluded that Unit 3 operated with inoperable SRVs longer than allowed by TS 3.4.3 Action A.

The root cause of the SRV setpoint drift is corrosion-induced bonding between the pilot disc and seating surface.

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.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2010	-- 001	-- 00	2 of 5

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

**I. PLANT CONDITION(S)**

At the time of discovery, Browns Ferry Nuclear Plant (BFN) Units 1, 2, and 3 were at approximately 100 percent power (3458 MWT) and unaffected by the event.

**II. DESCRIPTION OF EVENT**

**A. Event:**

On May 16, 2008 during Unit 3 Cycle 13 refueling outage, SRV pilot cartridges were installed with setpoints in accordance with TS.

On February 27, 2010, operations personnel entered a planned Manual Scram in accordance with plant procedures to end Unit 3 Cycle 14 operation and begin the Unit 3 Cycle 14 refueling outage.

On April 20, 2010, the Tennessee Valley Authority (TVA) determined that 8 of the 13 Safety Relief Valves (SRVs) [SB], removed from Unit 3 following Cycle 14 operation, mechanically actuated at pressures greater than 3 percent above their Technical Specification (TS) setpoints, and thus were inoperable for an unknown time frame during Cycle 14 operation. Unit 3 TS Limiting Condition for Operation (LCO) 3.4.3 requires twelve (12) SRVs to be operable in reactor Modes 1, 2, and 3. With one or more required SRVs inoperable (i.e., less than 12 SRVs are operable), TS 3.4.3 Action A requires the unit to be placed in Mode 3 (hot shutdown) within 12 hours and in Mode 4 (cold shutdown) within 36 hours. Since 8 of the 13 SRVs were found during test to have actuated above their TS setpoints, it is concluded that Unit 3 operated with inoperable SRVs longer than allowed by TS 3.4.3 Action A.

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 TS.

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

None

**C. Dates and Approximate Times of Major Occurrences:**

May 16, 2008, at 0551 hours      During the Unit 3 Cycle 13 refueling outage, SRV pilot cartridges, with setpoints in accordance with TS, were installed. The date and time provided is for satisfactory completion of testing (verification of setpoints in accordance with TS) for Unit 3 Cycle 14 operation.

February 27, 2010, at 0900 hours      Operations personnel entered a planned Manual Scram in accordance with plant procedures to end Unit 3 Cycle 14 operation and begin the Unit 3 Cycle 14 refueling outage.

April 20, 2010, at 1434 hours      TVA determines that the as-found lift setpoints in 8 SRVs exceeded the allowable TS values during the Unit 3 Cycle 14 operating cycle.

**D. Other Systems or Secondary Functions Affected**

None

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2010	-- 001	-- 00	3 of 5

NARRATIVE (if more space is required, use additional copies of NRC Form 366A) (17)

**E. Method of Discovery**

The out-of-tolerance lift setpoints were identified during the performance of BFN Surveillance Procedure 0-SR-3.4.3.1.b, "Bench Test Relief Valves As-Found," at Wyle Laboratories located in Huntsville, Alabama.

**F. Operator Actions**

None

**G. Safety System Responses**

None

**III. CAUSE OF THE EVENT**

**A. Immediate Cause**

The immediate cause for this condition is an undetectable out-of-tolerance high-lift setpoint drift condition on the SRVs, which existed for longer than allowed by the TS.

**B. Cause**

The root cause of this condition is a generic industry issue, SRV pilot valve disc-seat corrosion bonding. A metal oxide film that develops during normal reactor operation results in a bonding between the seat and the disc and adds resistance to the pressure needed to open the relief valve.

**C. Contributing Factors**

None

**IV. ANALYSIS OF THE EVENT**

The condition being reported is the operation of Unit 3 in a manner prohibited by the TS. The as-found valve lift set points following Unit 3 Cycle 14 operation are summarized in the following table.

Valve Position	Serial Number	SRV TS Setpoint	1st test/dev.	2nd test/dev.	3rd test/dev.
3-PCV-001-0004	1038	1155	1203/4.2%	1168/1.1%	1167/1.0%
3-PCV-001-0005	1017	1145	1170/2.2%	1158/1.1%	1160/1.3%
3-PCV-001-0018	1232	1145	1166/1.8%	1146/0.1%	1157/1.0%
3-PCV-001-0019	1256	1135	1248/10.0%	1133/-0.2%	1137/0.2%
3-PCV-001-0022	1037	1145	1199/4.6%	1155/0.9%	1144/-0.1%
3-PCV-001-0023	1077	1135	1153/1.6%	1142/0.6%	1138/0.3%
3-PCV-001-0030	1253	1145	1181/3.1%	1161/1.4%	1149/0.3%
3-PCV-001-0031	1260	1135	1172/3.3%	1160/2.2%	1154/1.7%
3-PCV-001-0034	1259	1135	1133/-0.2%	1134/-0.1%	1138/0.3%
3-PCV-001-0041	1263	1155	1169/1.2%	1153/-0.2%	1147/-0.7%
3-PCV-001-0042	1039	1155	1200/3.9%	1166/1.0%	1160/0.4%

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2010	-- 001	-- 00	4 of 5

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

Unit 3 Cycle 14 As-Found Lift Setpoints <sup>(1)</sup>					
Valve Position	Serial Number	SRV TS Setpoint	1st test/dev.	2nd test/dev.	3rd test/dev.
3-PCV-001-0179	1019	1155	1244/7.9%	1202/4.1%	1186/2.7%
3-PCV-001-0180	1262	1155	1196/3.5%	1174/1.6%	1164/0.8%

(1) The shaded values indicate test results outside the TS required 3 percent tolerance.

The Unit 3 SRVs are Target Rock Model 7567F two-stage safety/relief valves. The valve is a leak tolerant valve; however, it exhibits significant in-service setpoint drift due to corrosion bonding to the pilot disc to seat. The pilot valve seats are constructed from erosion and wear resistant Stellite 6B. The Stellite alloy develops a hard, metal-oxide corrosion layer on the pilot disc. When placed in an operating environment typical of a Boiling Water Reactor, the steam exposed surfaces can oxidize forming a surface corrosion film. This corrosion forms a bond between the valve seat and disc. The bond adds to the resistance of the setpoint adjustment spring pressure necessary to open the valve and increases the pressure required to actuate the valve. Generally, once the pilot valve is actuated the corrosion bond is broken, the subsequent lift setpoint is within the TS required tolerance.

**V. ASSESSMENT OF SAFETY CONSEQUENCES**

The safety consequences of this event were not significant. A reactor vessel overpressure evaluation performed for Unit 3 using the Unit 3 Cycle 14 Reload ASME Overpressure and Plant Transient Analysis at 3458 MWT demonstrates compliance with the ASME upset limit of 1375 psig for peak vessel pressure and dome pressure Safety Limit of 1325 psig. The evaluation of the as-found data from the Unit 3, Cycle 14, SRVs realized a peak reactor vessel pressure of 1311 psig in the vessel lower plenum and a maximum steam dome pressure of 1277 psig. The anticipated transient without scram overpressure analyses performed using the limiting Unit 3 event resulted in a peak vessel pressure of 1396 psig in the vessel lower plenum, which demonstrates compliance with the ASME Service level C Limit of 1500 psig. As such, the pressure relief safety objective of the SRVs was satisfied during the operating cycle.

TVA has previously installed an electronic logic, which automatically opens the SRVs as appropriate during pressurization transients. The electronic logic, although not safety related utilizes high-quality instrumentation that has proven to be very reliable. This electronic logic largely negates the impact on safety presented by this condition.

Therefore, TVA concludes that there was no significant reduction in the protection of the public by this event.

**VI. CORRECTIVE ACTIONS**

**A. Immediate Corrective Actions**

All SRV pilot cartridges were replaced during the Unit 3, Cycle 14 refueling outage. Prior to installation, each of the replacement cartridges demonstrated a lift setpoint within the TS requirements during bench testing.

**B. Corrective Actions to Prevent Recurrence**

To resolve the setpoint drift problem, TVA has installed platinum coated pilot valves in the discs on the thirteen Unit 3 SRVs.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Browns Ferry Nuclear Plant Unit 3	05000296	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 of 5
		2010	-- 001	-- 00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

**VII. ADDITIONAL INFORMATION**

**A. Failed Components**

None

**B. PREVIOUS LERS ON SIMILAR EVENTS**

There have been previous similar events on Unit 1 (LER 259/2008-003-00) and Unit 2 (LER 260/2009-003-00).

**C. Additional Information**

Corrective action document for this report is PER 226627.

**D. Safety System Functional Failure Consideration:**

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