



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

July 28, 2011

10 CFR 50.73

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

Browns Ferry Nuclear Plant, Unit 2
Facility Operating License No. DPR-52
NRC Docket No. 50-260

Subject: Licensee Event Report 50-260/2009-003-01

The enclosed Licensee Event Report (LER) provides additional details of a failure to meet the requirements of the Technical Specifications Limiting Conditions for Operation 3.4.3 concerning the safety/relief valve 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 submitting this revision to provide updated and corrected technical and editorial information.

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

Respectfully,

A handwritten signature in black ink, appearing to read "K. J. Polson".

K. J. Polson
Vice President

**Enclosure: Licensee Event Report - Safety/Relief Valves As-Found Setpoint Exceeded
Technical Specification Lift Pressure**

cc (w/ Enclosure):

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

Handwritten initials in black ink, possibly "JEA" or "JEA/NR", with a stylized flourish.

ENCLOSURE

**Browns Ferry Nuclear Plant
Unit 2**

**Licensee Event Report - Safety/Relief Valves As-Found Setpoint Exceeded Technical
Specification Lift Pressure**

See Attached

NRC FORM 366 (10-2010)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104		EXPIRES 10/31/2013					
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 2				2. DOCKET NUMBER 05000260		3. PAGE 1 of 5					
4. TITLE: Safety/Relief Valve As-Found Setpoint Exceeded Technical Specification Lift Pressure											
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	
06	08	2009	2009	- 003	- 01	07	28	2011	N/A	05000	
9. OPERATING MODE <div style="text-align: center; font-size: 1.2em;">4</div>			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: <i>(Check all that apply)</i>								
10. POWER LEVEL <div style="text-align: center; font-size: 1.2em;">000</div>			<div style="display: flex; flex-wrap: wrap;"> <div style="width: 25%;"><input type="checkbox"/> 20.2201(b)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(3)(i)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(i)(C)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(vii)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2201(d)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(3)(ii)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(ii)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(viii)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(1)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(4)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(ii)(B)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(viii)(B)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(2)(i)</div> <div style="width: 25%;"><input type="checkbox"/> 50.36(c)(1)(i)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(iii)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(ix)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(2)(ii)</div> <div style="width: 25%;"><input type="checkbox"/> 50.36(c)(1)(ii)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(iv)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(x)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(2)(iii)</div> <div style="width: 25%;"><input type="checkbox"/> 50.36(c)(2)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(v)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 73.71(a)(4)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(2)(iv)</div> <div style="width: 25%;"><input type="checkbox"/> 50.46(a)(3)(ii)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(v)(B)</div> <div style="width: 25%;"><input type="checkbox"/> 73.71(a)(5)</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(2)(v)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(i)(A)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(v)(C)</div> <div style="width: 25%;"><input type="checkbox"/> OTHER</div> <div style="width: 25%;"><input type="checkbox"/> 20.2203(a)(2)(vi)</div> <div style="width: 25%;"><input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)</div> <div style="width: 25%;"><input type="checkbox"/> 50.73(a)(2)(v)(D)</div> </div>								
Specify in Abstract below or in NRC Form 366A											
12. LICENSEE CONTACT FOR THIS LER											
FACILITY NAME Eric Bates, Licensing Engineer								TELEPHONE NUMBER (Include Area Code) 256-614-7180			
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	SB	RV	T020	Y							
14. SUPPLEMENTAL REPORT EXPECTED						15. EXPECTED SUBMISSION DATE					
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE)						<input checked="" type="checkbox"/> NO			MONTH	DAY	YEAR
									N/A	N/A	N/A
ABSTRACT <i>(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)</i>											
<p>On June 8, 2009, the Tennessee Valley Authority (TVA) determined, as a result of laboratory surveillance testing, 7 of 13 Browns Ferry Nuclear Plant Unit 2 Safety/Relief Valves (S/RVs) mechanically actuated at pressures greater than 3 percent above their Technical Specifications (TS) setpoint. The S/RVs were thus inoperable for an indeterminate period during Cycle 15 period of operation. Unit 2 TS Limiting Condition for Operation 3.4.3 requires the safety function of twelve (12) S/RVs to be operable in reactor modes 1, 2, and 3. With one or more required S/RVs inoperable, the unit is required to be placed in Mode 3 (Hot Shutdown) within 12 hours and in Mode 4 (Cold Shutdown) within 36 hours. Since 7 of 13 S/RVs actuated above their TS setpoint plus the 3 percent allowance, it is probable that Unit 2 operated longer than allowed by the TS.</p> <p>Therefore, 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.</p>											

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 2	05000260	2009	-- 003	-- 01	2 of 5

NARRATIVE

I. PLANT CONDITION(S)

At the time of discovery, Browns Ferry Nuclear Plant (BFN) Unit 2 was in Mode 4 (Cold Shutdown) and unaffected by the event since all 13 of the Safety/Relief Valves [SB] (S/RVs) had been refurbished during the Cycle 15 refueling outage. Unit 1 and Unit 3 were at 100 percent power (3458 Megawatts thermal) and unaffected by the event.

II. DESCRIPTION OF EVENT

A. Event

On June 8, 2009, the Tennessee Valley Authority (TVA) determined, as a result of offsite laboratory surveillance testing, that 7 of 13 BFN Unit 2 S/RVs mechanically actuated at pressures greater than the allowed 3 percent above their Technical Specifications (TS) setpoint. The S/RVs were thus inoperable for an indeterminate period during Cycle 15 period of operation. Unit 2 TS Limiting Condition for Operation 3.4.3 requires the safety function of twelve (12) S/RVs to be operable in reactor modes 1, 2, and 3. With one or more required S/RVs inoperable, the unit is required to be placed in Mode 3 (Hot Shutdown) within 12 hours and in Mode 4 (Cold Shutdown) within 36 hours. Since 7 of 13 S/RVs actuated above their TS setpoint plus the 3 percent allowance, it is probable that Unit 2 operated longer than allowed by the TS.

Therefore, 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

There were no inoperable structures, components, or systems that contributed to the event.

C. Dates and Approximate Times of Major Occurrences

February - April 2007	S/RV pilot cartridges with TS required setpoints were installed on Unit 2 during the Cycle 14 refueling outage.
April 25, 2009	Unit 2 Cycle 15 operation is concluded and the refueling outage is commenced.
June 8, 2009	TVA determined that the as-found lift setpoint in 7 S/RVs exceeded the allowable TS limit during Cycle 15.

D. Other Systems or Secondary Functions Affected

There were no other systems or secondary functions affected.

E. Method of Discovery

The out-of-tolerance lift setpoints were identified during the performance of Surveillance Procedure O-SR-3.4.3.1.B, Bench Test Relief Valves As-Found, at the test facilities of Wyle Laboratories, Huntsville, Alabama.

F. Operator Actions

There were no operator actions.

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NARRATIVE**G. Safety System Responses**

There were no safety system responses.

III. CAUSE OF THE EVENT**A. Immediate Cause**

The immediate cause for this event is undetectable, out-of-tolerance, high-lift setpoints on 7 of 13 S/RVs, which existed longer than allowed by the TS.

B. Root Cause

The root cause of the S/RVs exceeding the setpoint lift tolerance is corrosion bonding between the disc and seat while the valve is in service, which is a generic industry issue.

C. Contributing Factors

There were no contributing factors.

IV. ANALYSIS OF THE EVENT

The condition being reported is the operation of Unit 2 in a manner prohibited by the plant's TS. The as-found S/RV lift setpoints following Unit 2 Cycle 15 operation are summarized in the following table.

Unit 2 Cycle 15 As-Found Lift Setpoints ⁽¹⁾					
Valve Position	Serial Number	MSRV TS Setpoint	1 st Test/Dev.	2 nd Test/Dev.	3 rd Test/Dev.
2-PCV-001-0004	1026	1155	1201/4.0%	1178/2.0%	1172/1.5%
2-PCV-001-0005	1061	1145	1181/3.1%	1175/2.6%	1179/3.0%
2-PCV-001-0018	1021	1145	1237/8.0%	1178/2.9%	1176/2.7%
2-PCV-001-0019	1060	1135	1137/0.2%	1136/0.1%	1135/0.0%
2-PCV-001-0022 ⁽²⁾	1065	1145	N/A	N/A	N/A
2-PCV-001-0023	1031	1135	1155/1.8%	1154/1.7%	1152/1.5%
2-PCV-001-0030	1130	1145	1174/2.5%	1157/1.0%	1149/0.3%
2-PCV-001-0031	1072	1135	1271/12.0%	1158/2.0%	1152/1.5%
2-PCV-001-0034	1063	1135	1163/2.5%	1167/2.8%	1151/1.4%
2-PCV-001-0041	1071	1155	1262/9.3%	1185/2.6%	1174/1.6%
2-PCV-001-0042	1073	1155	1145/-0.9%	1172/1.5%	1152/-0.3%
2-PCV-001-0179	1014	1155	1164/0.78%	1170/1.3%	1158/0.3%
2-PCV-001-0180	1029	1155	1254/8.6%	1179/2.1%	1174/1.6%

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

(2) Valve failed to lift at 1300 psig test pressure.

The BFN S/RVs are Target Rock Model 7567F two-stage S/RVs. The valve is a leak tolerant valve; however, it exhibits significant in-service setpoint drift because of corrosion bonding between the valve seat and pilot disc. 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 installed in an operating environment typical of a boiling water reactor, the steam exposed surfaces can oxidize, forming a surface corrosion film. This corrosion film forms

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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. Reactor vessel overpressure evaluation performed for Unit 2 using the Unit 2 Cycle 15 Reload American Society of Mechanical Engineers (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 2 Cycle 15 S/RVs realized a peak reactor vessel pressure of 1347 psig in the vessel lower plenum and a maximum steam dome pressure of 1316 psig. The anticipated transient without scram overpressure analyses performed using the limiting Unit 2 event resulted in a peak vessel pressure of 1474 psig in the vessel lower plenum and a maximum steam dome pressure of 1455 psig which demonstrates compliance with the ASME Service Level C Limit of 1500 psig. Therefore, the pressure relief safety objective of the S/RVs was satisfied during the operating cycle.

BFN has previously installed an electronic logic which automatically opens the S/RVs as appropriate during pressurization transients. The electronic logic, although not safety related, utilizes high-quality instrumentation that has proven to be very reliable. During a pressure transient event in the relief mode, safety grade pressure sensors actuate the S/RVs. When the relief mode is actuated, the setpoint spring preload is removed from the pilot disc, and full differential pressure is then present across the pilot disk. This electronic logic largely negates the impact on safety presented by this condition.

Therefore, TVA concluded that there was no significant reduction in the health and safety of the public for this event.

VI. CORRECTIVE ACTIONS - The corrective actions are being managed by TVA's corrective action program.

A. Immediate Corrective Actions

All S/RV pilot cartridges were replaced during the Unit 2 Cycle 15 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

Industry experience has demonstrated that the use of platinum coating on the S/RV pilot valve discs helps mitigate corrosion bonding and associated setpoint drift problems. The S/RV pilot cartridges replaced during the Unit 2 Cycle 15 refueling outage include platinum coated pilot discs, with the exception of 2-PCV-001-0023. A cartridge with a platinum coated disc was unavailable for this S/RV, so a pilot assembly without platinum coating was installed for 2-PCV-001-0023.

VII. ADDITIONAL INFORMATION

A. Failed Components

The failed components were the 7 S/RVs.

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B. PREVIOUS LERs or SIMILAR EVENTS

TVA has submitted previous reports on similar events at BFN: LERs 50-259/2008-003-00, 50-260/2007-002-00, and 50-296/2008-002-00.

C. Additional Information

Problem Evaluation Report (PER) 175990 documents the results from Unit 2 Cycle 15 for the S/RVs. However, PER 175990 corrective actions taken state that all S/RVs were platinum coated for Unit 2 Cycle 16. This statement was incorrect. S/RV 2-PCV-001-0023 initially had a platinum coated cartridge until troubleshooting exhausted all spares. BFN then installed a pilot assembly without platinum coating. PER 372047 documents the non-platinum coated pilot assembly that was installed during Unit 2 Cycle 15 refueling outage that actuated above its TS setpoint plus the 3 percent allowance.

D. Safety System Functional Failure Consideration:

This event is not a safety system function failure according to NEI 99-02.

E. Scram With Complications Consideration:

This event was not a complicated scram according to NEI 99-02.

VIII. COMMITMENTS

There were no commitments.