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

February 4, 2011

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 50-259/2010-005-00**

The enclosed Licensee Event Report (LER) provides details of a failure to meet the requirements of Browns Ferry Nuclear Plant, Unit 1 Technical Specification 3.4.3 concerning main steam 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 currently completing the investigation and evaluation of this event. Upon completion of these actions, TVA will submit a revised LER. The current scheduled date for submitting the revised LER is April 4, 2011.

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

Enclosure: Licensee Event Report - Unit 1 Main Steam Relief Valves As-Found Setpoints Exceeded Technical Specification Lift Pressure Values

IE22
NRR

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 - Unit 1 Main Steam Relief Valves As-Found Setpoints Exceeded Technical Specification Lift Pressure Values

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SEE ATTACHED

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 10/13/2013

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.

# LICENSEE EVENT REPORT (LER)

| 1. FACILITY NAME | 2. DOCKET NUMBER | 3. PAGE |
|---|---|---|
| Browns Ferry Nuclear Plant Unit 1 | 05000259 | 1 OF 4 |

**4. TITLE**

Main Steam 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 |
| | | | | | | | | | N/A | 05000 |
| 12 | 06 | 2010 | 2010 | - 005 | - 00 | 02 | 04 | 2011 | FACILITY NAME: N/A | DOCKET NUMBER: 05000 |

**9. OPERATING MODE**

1

**10. POWER LEVEL**

100

**11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)***

| | | | |
|---|---|---|---|
| ☐ 20.2201(b) | ☐ 20.2203(a)(3)(i) | ☐ 50.73(a)(2)(i)(C) | ☐ 50.73(a)(2)(vii) |
| ☐ 20.2201(d) | ☐ 20.2203(a)(3)(ii) | ☐ 50.73(a)(2)(ii)(A) | ☐ 50.73(a)(2)(viii)(A) |
| ☐ 20.2203(a)(1) | ☐ 20.2203(a)(4) | ☐ 50.73(a)(2)(ii)(B) | ☐ 50.73(a)(2)(viii)(B) |
| ☐ 20.2203(a)(2)(i) | ☐ 50.36(c)(1)(i)(A) | ☐ 50.73(a)(2)(iii) | ☐ 50.73(a)(2)(ix)(A) |
| ☐ 20.2203(a)(2)(ii) | ☐ 50.36(c)(1)(ii)(A) | ☐ 50.73(a)(2)(iv)(A) | ☐ 50.73(a)(2)(x) |
| ☐ 20.2203(a)(2)(iii) | ☐ 50.36(c)(2) | ☐ 50.73(a)(2)(v)(A) | ☐ 73.71(a)(4) |
| ☐ 20.2203(a)(2)(iv) | ☐ 50.46(a)(3)(ii) | ☐ 50.73(a)(2)(v)(B) | ☐ 73.71(a)(5) |
| ☐ 20.2203(a)(2)(v) | ☐ 50.73(a)(2)(i)(A) | ☐ 50.73(a)(2)(v)(C) | ☐ OTHER |
| ☐ 20.2203(a)(2)(vi) | ☒ 50.73(a)(2)(i)(B) | ☐ 50.73(a)(2)(v)(D) | Specify in Abstract below or in NRC Form 366A |

**12. LICENSEE CONTACT FOR THIS LER**

| FACILITY NAME | TELEPHONE NUMBER *(Include Area Code)* |
|---|---|
| Mike Oliver, Licensing Engineer | 256-729-7874 |

**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**

☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO

**15. EXPECTED SUBMISSION DATE**

| MONTH | DAY | YEAR |
|---|---|---|
| 04 | 04 | 2011 |


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

On December 6, 2010, the Tennessee Valley Authority (TVA) determined during surveillance testing that 3 of the 13 Browns Ferry Nuclear Plant (BFN) Unit 1 Main Steam Relief Valves (MSRVs) mechanically actuated at pressures greater than 3 percent above their Technical Specifications (TS) setpoint and allowance of plus or minus 3 percent. The MSRVs were thus inoperable for an indeterminate period during the previous Cycle 8 period of operation. Unit 1 TS limiting condition for operation (LCO) 3.4.3 requires the safety function of twelve (12) MSRVs to be operable in reactor modes 1, 2, and 3. With one or more required MSRVs 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 3 of the 13 MSRVs actuated above their TS setpoint plus the 3 percent allowance, it is probable that Unit 1 operated outside the TS longer than allowed.

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

NARRATIVE

## I. PLANT CONDITIONS

At the time of discovery, BFN Unit 1 was at approximately 100 percent power (3458 MWT) and unaffected by the event since the Main Steam Relief Valves (MSRVs) had been refurbished and replaced during the recently completed refueling outage.

## II. DESCRIPTION OF EVENT

### A. Event:

On December 6, 2010, TVA determined during surveillance testing that 3 of the 13 BFN Unit 1 MSRVs [SB] mechanically actuated at pressures greater than 3 percent above their TS setpoint and allowance of plus or minus 3 percent. The MSRVs were thus inoperable for an indeterminate period during the previous Cycle 8 period of operation. Unit 1 TS LCO 3.4.3 requires the safety function of twelve (12) MSRVs to be operable in reactor modes 1, 2, and 3. With one or more required MSRVs 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 3 of the 13 MSRVs actuated above their TS setpoint and allowance, it is probable that Unit 1 operated outside the TS longer than allowed.

Investigation of the valve failures to determine the root cause is ongoing.

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:

None

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

| | |
|---|---|
| December 2, 2008 | During the Unit 1 Cycle 7 refueling outage, MSRV pilot cartridges tested to meet TS setpoint requirements were installed. |
| October 23, 2010, at 0900 hours | Operations personnel entered a planned Manual Scram in accordance with plant procedures to end Unit 1 Cycle 8 operation. |
| November 23, 2010 | Unit 1 startup from the Cycle 8 refueling outage with refurbished MSRVs set within the TS setpoint requirements. |
| December 6, 2010, at 1052 hours | TVA documents that the as-found lift setpoint for 3 MSRVs exceeded the allowable TS value plus allowance during the Unit 1 Cycle 8 operating cycle in Problem Evaluation Report (PER) 294506. |

### D. Other Systems or Secondary Functions Affected

None

### E. Method of Discovery

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

### F. Operator Actions

None

NARRATIVE

**G. Safety System Responses**

None

## III. CAUSE OF THE EVENT

**A. Immediate Cause**

The immediate cause for this reportable condition is undetectable, out-of-tolerance, high-lift setpoints on 3 of 13 MSRVs, which existed for longer than allowed by the TS.

**B. Root Cause**

TVA is currently completing the root cause analysis for this event.

**C. Contributing Factors**

Any contributing causes will be identified as part of the event evaluation.

## 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. The as-found MSRV lift setpoints following Unit 1 Cycle 8 operation are summarized in the following table.

**Unit 1 Cycle 8 As-Found Lift Setpoints(1)**

| Valve Position | Serial Number | MSRV TS Setpoint | 1st test / dev. | 2nd test / dev. | 3rd test / dev. |
|---|---|---|---|---|---|
| 1-PCV-001-0004 | 1068 | 1155 | 1191 / 3.1% | 1155 / 0.0% | 1160 / 0.4% |
| 1-PCV-001-0005 | 1075 | 1145 | 1158 / 1.1% | 1159 / 1.2% | 1166 / 1.8% |
| 1-PCV-001-0018 | 1018 | 1145 | 1160 / 1.3% | 1136 / -0.8% | 1151 / 0.5% |
| 1-PCV-001-0019 | 1059 | 1135 | 1103 / -2.8% | 1102 / -2.9% | 1107 / -2.5% |
| 1-PCV-001-0022 | 1028 | 1145 | 1153 / 0.7% | 1150 / 0.4% | 1147 / 0.2% |
| 1-PCV-001-0023 | 1033 | 1135 | 1312 / 15.6% | 1150 / 1.3% | 1148 / 1.1% |
| 1-PCV-001-0030 | 1076 | 1145 | 1150 / 0.4% | 1142 / -0.3% | 1143 / -0.2% |
| 1-PCV-001-0031 | 1267 | 1135 | 1137 / 0.2% | 1143 / 0.7% | 1147 / 1.1% |
| 1-PCV-001-0034 | 1020 | 1135 | 1133 / -0.2% | 1133 / -0.2% | 1132 / -0.3% |
| 1-PCV-001-0041 | 1085 | 1155 | 1167 / 1.0% | 1143 / -1.0% | 1142 / -1.1% |
| 1-PCV-001-0042 | 1027 | 1155 | 1239 / 7.3% | 1177 / 1.9% | 1178 / 2.0% |
| 1-PCV-001-0179 | 1032 | 1155 | 1166 / 1.0% | 1164 / 0.8% | 1167 / 1.0% |
| 1-PCV-001-0180 | 1016 | 1155 | 1150 / -0.4% | 1150 / -0.4% | 1159 / 0.3% |

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

The BFN MSRVs 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 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 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.

As corrective action and recurrence control from previous, similar events, the discs installed for Unit between the valve seat and disc1 Cycle 8 operation were coated with platinum to mitigate corrosion bonding between the pilot disc and seat.

## V. ASSESSMENT OF SAFETY CONSEQUENCES

The reactor vendor, General Electric Nuclear Energy (GENE), has completed an analysis of the safety consequences of this event by comparing it to the safety consequences resulting from the Unit 1 Cycle 7 MSRV test failures. The results of this analysis show that the safety consequences of this event were not significant. TVA is evaluating this analysis and will provide the results of this evaluation in the revision to this LER.

## VI. CORRECTIVE ACTIONS

TVA is currently completing the root cause analysis and developing associated corrective actions for this event.

### A. Immediate Corrective Actions

All 13 MSRV pilot cartridges were replaced during the Unit 1 Cycle 8 refueling outage. Prior to installation in the unit, each of the replacement cartridges demonstrated a lift setpoint within the TS requirements during bench testing.

### B. Corrective Actions to Prevent Recurrence

Because the root cause of this event is incomplete, corrective actions will be provided in a revision to this LER.

## VII. ADDITIONAL INFORMATION

### A. Failed Components

None

### B. PREVIOUS LERS ON SIMILAR EVENTS

TVA has submitted previous reports on similar events at BFN. LERs 50-259/2008-003-00, 50-260/2009-003-00, and 50-296/2010-001-00 are the most recent LERs. The previous LER for Unit 1 reported probable inoperability of 10 of 13 MSRVs during Cycle 7 operation. Discussion of the effectiveness of corrective actions from these previous events will be provided in a revision to this LER.

### C. Additional Information

The corrective action document for this report is PER 294506.

### 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