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

August 02, 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 50-296/2010-003-01**

The enclosed Licensee Event Report revision provides details of a failure to meet the requirements of Technical Specification 3.6.1.3 concerning primary containment isolation excess flow check 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.

This supplement provides the recovery plan for long-term corrective actions.

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,

James J Randich FOR

K. J. Polson
Vice President

Enclosure
cc (w/ Enclosure):

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

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NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010

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 infocollects@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)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Nuclear Plant Unit 3	05000296	1 of 6

4. TITLE: Multiple Test Failures of Excess Flow Check Valves

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	N/A
03	26	2010	2010	- 003 -	01	08	02	2010	FACILITY NAME: N/A	DOCKET NUMBER: N/A

9. OPERATING MODE

4

10. POWER LEVEL

0

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

NAME	TELEPHONE NUMBER *(Include Area Code)*
Eric Bates, Licensing Engineer	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

14. SUPPLEMENTAL REPORT EXPECTED

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

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
NA	NA	NA

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

On March 26, 2010, it was determined that 5 of 15 Excess Flow Check Valves (EFCVs) tested following Unit 3 Cycle 14 operation failed to meet Technical Specifications (TS) Surveillance Requirement (SR) 3.6.1.3.8, which requires verification that a representative sample of reactor instrumentation line EFCVs actuate to the isolation position on a simulated instrument line break signal. With the existence of multiple failures, multiple EFCVs may have been inoperable during Cycle 14 operation.

TS Limiting Condition for Operation 3.6.1.3 requires that each Primary Containment Isolation Valve be operable in reactor Modes 1, 2, and 3, and when the associated instrumentation is required to be operable. Given the multiple failures of EFCVs, it is likely that Unit 3 did not comply with the applicable Required Actions and associated Completion Times of TS 3.6.1.3 Action C.

This supplement updates the failure cause based on completion of the actions taken in accordance with the implementation of the Maintenance Rule, 10 CFR 50.65. While the exact cause remains indeterminate, the test methodology is an error likely methodology that has been determined to be the most likely cause, with inexperienced test personnel and excessive noise in the surrounding area possibly contributing to false test failures of EFCVs. The corrective action will revise the test procedures to ensure a quantitative method and acceptance criteria are used to determine the operability of the valves.

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 and 2 were at approximately 100 percent power (3458 MWT) and unaffected by the event. Unit 3 was in a refueling outage.

II. DESCRIPTION OF EVENT

A. Event:

On March 26, 2010, the Tennessee Valley Authority (TVA) determined that 5 of 15 Excess Flow Check Valves [CKV] (EFCVs) tested following Unit 3 Cycle 14 operation failed to meet the acceptance criteria of Technical Specifications (TS) Surveillance Requirement (SR) 3.6.1.3.8. SR 3.6.1.3.8 requires verification, on a 24 month frequency, that a representative sample of reactor instrumentation line EFCVs actuates to the isolation position on a simulated instrument line break signal. With the existence of multiple failures, more than one EFCV may have been inoperable during Cycle 14 operation.

BFN Unit 3 TS Limiting Condition for Operation (LCO) 3.6.1.3 requires that each Primary Containment Isolation Valve (PCIV) be operable in reactor Modes 1, 2, and 3, and when the associated instrumentation is required to be operable per LCO 3.3.6.1, "Primary Containment Isolation Instrumentation." If the multiple EFCV failures had been identified in an applicable Mode, the unit would have been in Condition C of TS 3.6.1.3. TS 3.6.1.3 Required Action C.1 requires the affected penetration flow path to be isolated by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange within 12 hours for EFCVs. TS 3.6.1.3 Required Action C.2 requires verification that the affected penetration flow path is isolated once per 31 days. If Condition C Required Actions and associated Completion Times are not met, then Condition E is entered and requires the unit be in Mode 3 (Hot Shutdown) within 12 hours and in Mode 4 (Cold Shutdown) within 36 hours. Given the multiple failures of EFCVs, it is likely that these failures occurred when the unit was in an applicable Mode and that BFN Unit 3 failed to comply with the Required Actions and associated Completion Times defined in TS 3.6.1.3.

On March 27, 2010, at 0500 hours, surveillance testing in accordance with SR 3.6.1.3.8 was completed satisfactorily after replacing the five failed EFCVs.

On April 3, 2010, the additional EFCV inspections and tests were completed satisfactorily.

On April 8, 2010, BFN Unit 3 began Cycle 15 operation.

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:

May 17, 2008	During the BFN Unit 3 Cycle 13 refueling outage, no EFCVs failed to meet SR 3.6.1.3.8. Unit 3 began Cycle 14 operation.

February 27, 2010	Operations personnel entered a planned Manual Scram in accordance with plant procedures to end Unit 3 Cycle 14 operation and to begin the Unit 3 Cycle 14 refueling outage.
March 26, 2010	TVA determined that multiple EFCVs failed to meet SR 3.6.1.3.8 during testing.
March 27, 2010, at 0500 hours	After replacing the five valves that failed, surveillance testing in accordance with SR 3.6.1.3.8 was completed satisfactorily.
April 3, 2010	Additional EFCV inspections and tests were completed satisfactorily.
April 8, 2010	Unit 3 began Cycle 15 operation.

D. Other Systems or Secondary Functions Affected

None

E. Method of Discovery

The failures were identified during the Unit 3 Cycle 14 refueling outage performance of SR 3.6.1.3.8, which requires verification, on a 24 month frequency, that a representative sample of reactor instrumentation line EFCVs actuate to the isolation position on a simulated instrument line break signal.

F. Operator Actions

None

G. Safety System Responses

None

III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause for this reportable condition is multiple, undetectable failures of EFCVs to perform the required flow check, primary containment isolation function, which existed for longer than allowed by the TS.

B. Root Cause

While the exact cause remains indeterminate, the test methodology is an error likely methodology that has been determined to be the most likely cause, with inexperienced test personnel and excessive noise in the surrounding area possibly contributing to false test failures of EFCVs.

C. Contributing Factors

None

IV. ANALYSIS OF THE EVENT

The condition being reported is the operation of BFN Unit 3 in a manner prohibited by the TS.

Of the 15 EFCVs tested following Unit 3 Cycle 14 operation, five EFCVs failed to pass the acceptance criteria of TS SR 3.6.1.3.8. Upon visual inspection, the cause of two test failures was disk poppet obstruction by small particles. The cause of the other three test failures was indeterminate. No valve components were identified to have failed. The failed EFCVs were replaced.

EFCV actuation is determined by: (a) visual reduction in flow into an open container, which allows for judgment that may not lead to repeatable results, and (b) listening with a stethoscope for audible sound of EFCV closure, which is performed in an area of ambient noise that may result in false-negative results. To pass the acceptance criteria, the test performer uses a listening device to listen for an audible click indicating the valve has closed. This test methodology is an error likely methodology. Inexperienced test personnel and/or excessive noise in the surrounding area could contribute to false test failures of EFCVs. Whereas two of the failed EFCVs were found to have small particles the other three had no obvious anomalies which would have prevented them from performing as designed. Operating experience supports failures being attributed to test methodology and lack of experience of test personnel.

In order to provide reasonable assurance that the overall reliability of the EFCVs is maintained, five other EFCVs (about 10 percent of the tested population) were randomly selected, physically removed from the instrument lines, visually inspected, and tested using equivalent alternate testing methods. One of these valves was mishandled at removal, so two additional valves were inspected and tested. Each of the additional EFCVs was successfully bench tested to meet the TS SR 3.6.1.3.8 acceptance criteria. In addition, the EFCVs that were removed were replaced with new EFCVs that had been bench tested and demonstrated to meet the acceptance criteria of TS SR 3.6.1.3.8.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The safety consequences of a failure of an EFCV associated with an instrument line break are not significant and have been previously evaluated by General Electric (GE) and reviewed and accepted by the NRC for the BFN in support of a revision of the TS SR for EFCVs.

EFCVs are installed in boiling water reactor instrument lines, which penetrate the primary containment boundary, to limit the release of fluid in the event of an instrument line break. At BFN, EFCVs are not required to close in response to a containment isolation signal and are not postulated to operate under post-Loss-of-Coolant-Accident (LOCA) conditions. At BFN, EFCVs are not needed to mitigate the consequences of an accident because an instrument line break coincident with a design basis LOCA would be of a sufficiently low probability to be outside the design basis.

The radiological consequences evaluated by BFN for an instrument line break do not credit the EFCVs for isolating the break. The evaluation assumes a discharge of reactor water through an instrument line with a 1/4 inch orifice during the detection of the instrument line break and subsequent reactor pressure vessel (RPV) cool down and depressurization sequence. For a

radiological material release directly to the secondary containment with the primary containment initially intact, a failure of an EFCV would be bounded by the Main Steam Line Break analysis of BFN Updated Final Safety Analysis Report, Section 14.6, "Analysis of Design basis Accidents - Uprated."

The operational impact of an EFCV failing to close during the rupture of an instrument line connected to the RPV boundary is based on environmental effects of a steam release in the vicinity of the instrument racks. The environmental impact of the failure of instrument lines connected to the RPV pressure boundary is the released steam into the reactor building. The magnitude of a release through an instrument line would be within the pressure control capacity of reactor building ventilation systems and that the integrity and functional performance of secondary containment following an instrument line break would be met. The BFN analysis confirmed that an instrument line rupture outside primary containment will not result in over pressurizing secondary containment. The separation of instrument lines and equipment in the reactor building is expected to minimize the operational impact of an instrument line break on other equipment due to jet impingement. The BFN analysis assumes plant shutdown and cool down occur after the line break.

Because the failure of an EFCV associated with an instrument line break has been analyzed and its consequences have been found to be radiologically bounded and environmentally manageable, TVA concludes that there was no significant reduction in the protection of the public as a result of this event.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

In an effort to determine the cause of test failure, each of the five EFCVs that did not meet the SR acceptance criteria was physically removed from the instrument line and visually inspected. The EFCVs that failed SR 3.6.1.3.8 were replaced. Post installation, the replacement EFCVs were retested satisfactorily using procedure 3-SR-3.6.1.3.8(3), "Instrument Line Excess Flow Check Valve Operability Test," and were demonstrated to meet the acceptance criteria of TS SR 3.6.1.3.8.

The cause of two test failures was disk poppet obstruction by small particles, and the cause of the other three test failures was indeterminate. No valve components were identified to have failed.

In order to provide reasonable assurance that the overall reliability of the EFCVs is maintained, five other EFCVs (about 10 percent of the tested population) were randomly selected, physically removed from the instrument lines, visually inspected, and tested using equivalent alternate testing methods. One of these valves was mishandled at removal, so two additional valves were inspected and tested. Each of the additional EFCVs was successfully bench tested to meet the acceptance criteria of TS SR 3.6.1.3.8. In addition, the EFCVs that were removed were replaced with new EFCVs that were bench tested and demonstrated to meet the acceptance criteria of TS SR 3.6.1.3.8.

B. Corrective Actions to Prevent Recurrence

In accordance with the implementation of the Maintenance Rule (10 CFR 50.65) the BFN Units 1, 2, and 3 EFCVs have been placed in Maintenance Rule a(1) status. The

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

Maintenance Rule a(1) recovery plan was captured in Problem Evaluation Report (PER) 223215 which includes the following corrective actions:

1. The failed EFCVs were replaced.
2. Revise the test procedures to ensure a quantitative method and acceptance criteria are used to determine the operability of the valves.

VII. ADDITIONAL INFORMATION

A. Failed Components

None

B. PREVIOUS LERS ON SIMILAR EVENTS

None

C. Additional Information

The corrective action document for this report is PER 222850 and 223215.

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