



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

December 3, 2014

10 CFR 50.73

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

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

Subject: **Licensee Event Report 50-259/2014-004-00**

The enclosed Licensee Event Report provides details of main steam isolation valves leaking in excess of Technical Specification requirements. The Tennessee Valley Authority is submitting this report in accordance with 10 CFR 50.73(a)(2)(i)(B), any operation or condition prohibited by Technical Specifications.

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

Respectfully,

K. J. Polson
Vice President

Enclosure: Licensee Event Report 50-259/2014-004-00 – Main Steam Isolation Valves Leaking in Excess of Technical Specification Requirements

cc (w/ Enclosure):

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

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NRC*

ENCLOSURE

**Browns Ferry Nuclear Plant
Unit 1**

Licensee Event Report 50-259/2014-004-00

**Main Steam Isolation Valves Leaking in Excess of Technical Specification
Requirements**

See Enclosed

NRC FORM 366 (02-2014)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104	EXPIRES 01/31/2017
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 and Information Collections Branch (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 (BFN), Unit 1	2. DOCKET NUMBER 05000259	3. PAGE 1 of 8
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4. TITLE: Main Steam Isolation Valves Leaking in Excess of Technical Specification Requirements

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR		
10	04	2014	2014	- 004	- 00	12	03	2014	N/A	
									05000	
									N/A	
									05000	

9. OPERATING MODE 4	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: <i>(Check all that apply)</i>			
10. POWER LEVEL 000	<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)
	<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 Eric Bates, Licensing Engineer	TELEPHONE NUMBER <i>(Include Area Code)</i> 256-614-7180
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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
E	SB	FCV	W993	Y	X	SB	FCV	W993	Y

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES <i>(If yes, complete 15. EXPECTED SUBMISSION DATE)</i> <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>MONTH</th> <th>DAY</th> <th>YEAR</th> </tr> <tr> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> </table>	MONTH	DAY	YEAR	N/A	N/A	N/A
MONTH	DAY	YEAR						
N/A	N/A	N/A						

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

On October 4, 2014, at approximately 2000 hours Central Daylight Time (CDT), during performance of surveillance procedures for Primary Containment Local Leak Rate Testing of the Main Steam Lines, both the 1B Outboard (OUTBD) Main Steam Isolation Valve (MSIV) and the 1D OUTBD MSIV failed to meet the Technical Specifications (TS) Surveillance Requirement (SR) 3.6.1.3.10 leak rate limit of 100 standard cubic feet per hour (scfh). Both MSIVs were considered to be inoperable for a period of time greater than allowed by TS.

Since both MSIVs failed to meet the leak rate limit, Browns Ferry Nuclear Plant, Unit 1, operated longer than allowed by TS Limiting Condition for Operation (LCO) 3.6.1.3 and the TS LCO 3.0.4 was not met for each applicable Mode change since the last recorded as-found MSIV leak rate test on October 21, 2012, when the leak rates were below the TS leak rate limit.

The causes of the event were inadequate packing for the 1B OUTBD MSIV and non-uniform scale buildup for the 1D OUTBD MSIV.

The corrective actions for these causes are to repack the 1B OUTBD MSIV using an improved packing configuration and to repair the 1D OUTBD MSIV and add the non-uniform scale buildup condition to the valve database for trending.

Based on an analysis of the conditions discovered, it was concluded that this event did not result in any significant safety consequences.

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

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 and Information Collections Branch (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.

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NARRATIVE

I. Plant Operating Conditions Before the Event

At the time of the event, Browns Ferry Nuclear Plant (BFN), Unit 1, was at zero percent power in Mode 4 during a planned shutdown for a refueling outage.

II. Description of Events

A. Event:

On October 4, 2014, at approximately 2000 hours Central Daylight Time (CDT), during the performance of surveillance procedures 1-SR-3.6.1.3.10 (B-OUTBD), Primary Containment Local Leak Rate Test Main Steam Line B Outboard: Penetration X-7B and 1-SR-3.6.1.3.10 (D-OUTBD), Primary Containment Local Leak Rate Test Main Steam Line D Outboard: Penetration X-7D, the 1B Outboard Main Steam Isolation Valve (MSIV) [SB] (1-FCV-001-0027) and the 1D Outboard MSIV (1-FCV-001-0052) failed to meet the Technical Specification (TS) Surveillance Requirement (SR) 3.6.1.3.10 leak rate limit of 100 standard cubic feet per hour (scfh).

BFN, Unit 1, TS Limiting Condition for Operation (LCO) 3.6.1.3 requires each primary containment isolation valve, except reactor building-to-suppression chamber vacuum breakers, to be operable in reactor Modes 1, 2, and 3 and when associated instrumentation is required to be operable per LCO 3.3.6.1, "Primary Containment Isolation Instrumentation." With one or more penetration flow paths with MSIV leakage not within limits, Required Action D.1 requires leakage rate to be restored to within limit in 4 hours. If the leakage rate cannot be restored to within limit in 4 hours, Required Actions E.1 and E.2 require the unit to be placed in Mode 3 in 12 hours and in Mode 4 in 36 hours. Also, TS LCO 3.0.4 prohibits Mode changes when a LCO is not met except under certain conditions that were not applicable to this event.

Since both MSIVs failed to meet the TS SR leak rate limit and no specific time of failure could be determined, BFN, Unit 1, operated longer than allowed by the TS 3.3.6.1 with an inoperable MSIV. In addition, due to the MSIVs failing to meet the leak rate limit and no specific time of failure could be determined, TS LCO 3.0.4 was not met for each applicable Mode change since the last recorded as-found MSIV leak rate test on October 21, 2012, when the leak rate was below the TS leak rate limit.

B. Status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event:

The 1B Outboard MSIV and the 1D Outboard MSIV both failed their as-found local leak rate test (LLRT). There were no other structures, components, or systems that were inoperable at the start of this event that contributed to the event.

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C. Dates and Approximate Times of Occurrences:

- November 22, 2008

This date represents the last time the 1B Outboard MSIV was repacked prior to this event.
- October 21, 2012

The 1B Outboard MSIV and 1D Outboard MSIV as-found leak rates were recorded as 29.2 scfh and 31.6 scfh, respectively. These leak rates were below the required TS limit of 100 scfh.
- October 4, 2014

During the performance of surveillance procedures 1-SR-3.6.1.3.10 (B-OUTBD) and 1-SR-3.6.1.3.10 (D-OUTBD), the 1B Outboard MSIV and the 1D Outboard MSIV as-found leak rates were 114.7 scfh and 158.7 scfh, respectively. These leak rates were above the required TS limit of 100 scfh.
- October 24, 2014

Refurbishing of the 1D Outboard MSIV to remove the non-uniform scale buildup was completed.
- October 24, 2014

Repacking of the 1B Outboard MSIV with an improved packing configuration was completed.
- October 24, 2014

Leak rate tests for the 1B Outboard MSIV and 1D Outboard MSIV were completed satisfactorily. The as-left combined leak rate for the 1B Outboard MSIV was 28.8 scfh and the as-left combined leak rate for 1D Outboard MSIV was 2.2 scfh.

D. Manufacturer and model number (or other identification) of each component that failed during the event:

The failed components were MSIVs 1-FCV-001-0027 and 1-FCV-001-0052. Both components were manufactured by Weir Valves & Controls, with a manufacturer model number of 20851-H-26.

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E. Other systems or secondary functions affected:

There were no other systems or secondary functions affected by this event.

F. Method of discovery of each component or system failure or procedural error:

The condition was discovered during the performance of local leak rate surveillance procedures 1-SR-3.6.1.3.10 (B-OUTBD) and 1-SR-3.6.1.3.10 (D-OUTBD) for the 1B Outboard MSIV and the 1D Outboard MSIV, respectively.

G. The failure mode, mechanism, and effect of each failed component, if known:

The 1B Outboard MSIV experienced a packing leak that was due to inadequate packing and which resulted in a leakage rate in excess of the TS Limits.

The 1D Outboard MSIV experienced a seal leak that was due to non-uniform scale buildup between the valve seat and plug and which resulted in a leakage rate in excess of the TS Limits.

H. Operator Actions:

There were no Operator actions for this identified condition.

I. Automatically and manually initiated safety system responses:

There were no safety system responses for this identified condition.

III. Cause of the Event

A. The cause of each component or system failure or personnel error, if known:

Cause for 1B Outboard MSIV Component Failure

The cause for the 1B Outboard MSIV (1-FCV-001-0027) leakage exceeding the TS limit was a packing leak.

Cause for 1D Outboard MSIV Component Failure

The cause of the 1D Outboard MSIV (1-FCV-001-0052), Main Steam Line D Outboard Isolation Valve failure to meet technical specification allowable leakage rate was non-uniform scale buildup due to mineral deposits left by steam.

B. The cause(s) and circumstances for each human performance related root cause:

There was not a human performance related cause.

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IV. Analysis of the Event

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

On October 4, 2014, at approximately 2000 hours CDT, during the performance of surveillance procedures 1-SR-3.6.1.3.10 (B-OUTBD), Primary Containment Local Leak Rate Test Main Steam Line B Outboard: Penetration X-7B and 1-SR-3.6.1.3.10 (D-OUTBD), Primary Containment Local Leak Rate Test Main Steam Line D Outboard: Penetration X-7D, the 1B Outboard MSIV (1-FCV-001-0027) and the 1D Outboard MSIV (1-FCV-001-0052) failed to meet the TS leak rate limit of 100 scfh.

MSIV Packing Leak

The 1B Outboard MSIV did not have any recent maintenance performed that could have contributed to the packing leak. It was determined from a previous unrelated BFN event (LER 50-296/2012-002-00) that, over time, the packing preload is lost due to packing relaxation and that the valve packing program implemented when the 1B Outboard MSIV was repacked in 2008, did not give adequate guidance on when to reconsolidate and re-torque the valve packing or when to repack the valve. Therefore, the valve packing program was determined to be inadequate and an improved packing plan was subsequently implemented.

Extent of Condition for Packing Leak

The extent of condition applies to any valve that could result in a steam leak due to a degraded packing. The extent of condition was addressed by previously identifying the population of valves that could exhibit this condition and incorporating them into the improved BFN valve packing program.

Non-Uniform Scale Buildup

The 1D Outboard MSIV had non-uniform scale buildup. Scale and oxide buildup is a common age related degradation mechanism in a valve. This degradation occurs slowly in a steam system since the source of the minerals is the very small amount of carryover from the boiler. Scale and oxide buildup also tends to occur in a uniform manner, in that it tends to coat all surfaces relatively equally. It is unusual to find a scale buildup concentrated in a specific area. A cause for the non-uniform buildup on this valve was unable to be determined. Chemistry reports for Unit 1 Cycle 10 were reviewed for any abnormal chemistry parameters. None were noted.

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Extent of Condition for Non-Uniform Scale Buildup

All normally open LLRT valves required to seal on the valve seat to satisfy LLRT requirements are vulnerable to process deposits affecting the quality of the seating. Internal inspection and repair of the valves is condition based and only performed if a LLRT failure is identified. Since all TS LLRT valves are tested every outage and repaired based on the results, the extent of condition is bounded by the LLRT program testing requirements. There are no open extent of condition actions associated with this failure.

V. Assessment of Safety Consequences

The as-found leak rate for the 1B Outboard MSIV was 114.7 scfh. The 1B Outboard MSIV leakage was noted as coming out of the packing of the MSIV. The as-found leak rate for the 1D Outboard MSIV was 158.7 scfh. The 1D Outboard MSIV leakage was due to a non-uniform scale buildup between the valve seat and plug. Both as-found leak rates exceed the TS Limit of 100 scfh.

When initial testing was performed, leakage was only tested through the outboard valves. This resulted in the maximum leakage rate. However, each Main Steam Line (MSL) is provided with two valves in series. At a later date, the MSIVs were tested by performing a combined leakage test where the inboard and outboard valves in each line were tested at the same time. This testing is performed by pressurizing between the inboard and outboard MSIVs and results in a measured leak rate that is a combination of the inboard and outboard MSIV leakage rates for that steam line.

The as-found leak rate data from the above testing indicated that the inboard valve leak rates were 0.0 scfh per BFN Unit 1 Refueling Outage 10 surveillance procedures 1-SR-3.6.1.3.10 and 1-SR-3.6.1.1.1(OPT-A). Therefore, 1B Inboard MSIV (1-FCV-001-0026) was available to perform the same function as the 1B Outboard MSIV (1-FCV-001-0027) and the 1D Inboard MSIV (1-FCV-001-0051) was available to perform the same function as the 1D Outboard MSIV (1-FCV-001-0052). Based on these test results, there was no loss of safety-function.

In addition to the above analysis, a Probability Risk Assessment (PRA) was performed to determine the impact on the Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) for BFN Unit 1. The PRA indicated that containment boundary leakage has no impact on the CDF of any of the units at BFN given that containment leakage is only a concern after core damage has occurred. The size of the leakage noted in the PERs (940890 and 940915), does not constitute a large containment failure as defined in the definition of LERF. Therefore, this condition listed in the above PERs has no impact on the LERF at BFN.

Based on the above analysis, the TVA concluded that this event did not result in any significant safety consequences.

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A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event:

The 1B Inboard MSIV (1-FCV-001-0026) was available to perform the same function as the 1B Outboard MSIV (1-FCV-001-0027) and the 1D Inboard MSIV (1-FCV-001-0051) was available to perform the same function as the 1D Outboard MSIV (1-FCV-001-0052).

B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident:

The reactor was in shutdown at the time the condition was identified. The 1B Inboard MSIV and 1D Inboard MSIV were available to control the release of radioactive material, or mitigate the consequences of an accident for the 1B Outboard MSIV and 1D Outboard MSIV, respectively.

C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service:

This event did not result in the inoperability of a safety system.

VI. Corrective Actions

Corrective Actions are being managed by TVA's corrective action program under Problem Evaluation Reports (PERs) 940890, 940915, and 957088.

A. Corrective Actions:

Corrective Action for Packing Leak

The corrective action for the packing leak are to repack the 1B OUTBD MSIV using an improved packing configuration.

Corrective Action for Non-Uniform Scale Buildup

The corrective action for the non-uniform scale buildup in the 1D OUTBD MSIV is to repair the valve and add this condition to the valve database for trending.

**LICENSEE EVENT REPORT (LER)
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VII. ADDITIONAL INFORMATION

A. Previous Similar Events:

A search of BFN LERs for Units 1, 2, and 3 for approximately the past five years identified a previous similar condition in LER 50-296/2012-002-00 for a packing leak. No LERs were found for the non-uniform scale buildup.

A search was performed on the BFN corrective action program. The search identified PERs 473637 and 533052 as being similar to the condition identified in this LER for the packing leak and no PERs for the non-uniform scale buildup.

The corrective actions associated with the above LER and PER would not have prevented the packing leak condition as the MSIV maintenance is condition based and the valve is not disassembled unless repair is necessary.

B. Additional Information:

There is no additional information.

C. Safety System Functional Failure Consideration:

In accordance with NUREG-1022, this event is not considered a safety system functional failure because redundant TS components (MSIV Inboard Valves) were operable and could have performed the required safety function.

D. Scram With Complications Consideration:

This condition did not include a reactor scram.

VIII. Commitments

There are no commitments.