



Post Office Box 2000, Decatur, Alabama 35609-2000

August 20, 2021

10 CFR 50.73

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

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

Subject: Licensee Event Report 50-260/2021-001-01

Reference: Letter from TVA to NRC, "Licensee Event Report 50-260/2021-001-00," dated June 21, 2021 (ML21172A305).

The enclosed Licensee Event Report (LER) provides additional details of a Main Steam Isolation Valve that was inoperable for longer than allowed by plant Technical Specifications (TS) Limiting Conditions of Operability. The Tennessee Valley Authority is submitting this report in accordance with Title 10 of the Code of Federal Regulations 50.73(a)(2)(i)(B), as any operation or condition which was 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 Christopher L. Vaughn, Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

A handwritten signature in black ink, appearing to read 'M. Rasmussen', with a stylized flourish at the end.

Matthew Rasmussen
Site Vice President

Enclosure: Licensee Event Report 50-260/2021-001-01 – Inoperability of a TS-required Main Steam Isolation Valve

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cc (w/ Enclosure):

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

ENCLOSURE

**Browns Ferry Nuclear Plant
Unit 2**

Licensee Event Report 50-260/2021-001-01

Inoperability of a TS-required Main Steam Isolation Valve

See Enclosed



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 the FOIA, Library, and Information Collections Branch T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: oir_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name Browns Ferry Nuclear Plant, Unit 2	2. Docket Number 05000260	3. Page 1 OF 6
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4. Title
Inoperability of a TS-required Main Steam Isolation Valve

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	Docket Number
04	22	2021	2021	001	01	08	20	2021	N/A	N/A
									Facility Name	Docket Number
									N/A	N/A

9. Operating Mode 1	10. Power Level 17
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11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

<input type="checkbox"/> 10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<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)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

OTHER (Specify here, in abstract, or NRC 366A).

12. Licensee Contact for this LER

Licensee Contact Ryan Coons, Licensing Engineer	Phone Number (Include area code) 256-729-2070
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13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS
X	JM	FSV	A613	Y	N/A	N/A	N/A	N/A	N/A

14. Supplemental Report Expected)			15. Expected Submission Date		
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)		Month	Day	Year
			N/A	N/A	N/A

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On June 5, 2021, Control Room Operators closed the Main Steam Line C Valves to support the installation of a Temporary Modification. However, the C Inboard Main Steam Isolation Valve (MSIV) [FCV; JM] unexpectedly re-opened after closure. The C Inboard MSIV was declared inoperable upon discovering this condition, since the valve would be unable to close upon receiving a valid PCIS signal. Troubleshooting identified a ground on the C Inboard MSIV's DC solenoid/wiring [FSV] which caused the DC solenoid to remain energized. The wiring to the valve was modified, and the valve was subsequently declared operable.

A Past Operability Evaluation (POE) initially identified an earlier time-of-failure on April 22, 2021, when an Assistant Unit Operator identified a -150 VDC ground on Battery Board [BYBD] 3 [EI] during one of their rounds.

The cause of this event was a grounding issue which prevented the de-energization of the DC solenoid which maintains C Inboard MSIV in an open position. This condition persisted because troubleshooting personnel did not fully understand and address the impact of DC grounds and their effects on DC coils. The DC solenoid input wires were lifted and a tagout/clearance was placed to maintain the solenoid in a de-energized state, so that the C Inboard MSIV would close on demand. Although removal of the 250 VDC control power from the solenoid does not conform with BFN UFSAR Chapter 4.6, all TS functions are maintained, and the C Inboard MSIV is capable of meeting all of its required safety functions. The installed TMOD will mitigate adverse effects until the condition can be permanently addressed during the next refueling or maintenance outage.



**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 the FOIA, Library, and Information Collections Branch (T-6 A10M), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: oir_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 2	05000-260	2021	- 001	- 01

NARRATIVE

I. Plant Operating Conditions Before the Event

At the time of the ground's discovery, Browns Ferry Nuclear Plant (BFN), Unit 2 was in Mode 1 at approximately 17 percent power.

II. Description of Event

A. Event Summary

On June 5, 2021, Control Room Operators closed the Main Steam Line (MSL) C Valves to support the installation of a Temporary Modification (TMOD) BFN-2-2021-001-002. However, the C Inboard Main Steam Isolation Valve (MSIV) (BFN-2-FCV-001-0037) [FCV; JM] unexpectedly re-opened after closure. The C Inboard MSIV was declared inoperable upon discovering this condition, since the valve would be unable to close upon receiving a valid PCIS signal.

Troubleshooting identified a ground on the C Inboard MSIV's DC solenoid/wiring (2-FSV-001-0037B) [FSV] which caused the DC solenoid to remain energized. The C Inboard MSIV was declared operable upon the completion of compensatory maintenance.

A Past Operability Evaluation (POE) initially identified a potential for an earlier time-of-failure on April 22, 2021, when an Assistant Unit Operator (AUO) identified a -150 VDC ground on Battery Board [BYBD] 3 [EI] during one of their rounds.

The Tennessee Valley Authority (TVA) is submitting this report in accordance with Title 10 of the Code of Federal Regulations 50.73(a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications (TS).

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

There were no systems, structures, or components that were inoperable at the start of the event and that contributed to the event.



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Browns Ferry Nuclear Plant, Unit 2	05000-260	2021	- 001	- 01

NARRATIVE

C. Dates and approximate times of occurrences

Dates and Approximate Times (CDT)	Occurrence
April 22, 2021, at 1437	An AUO identified a -150 VDC ground on Battery Board 3 during one of their rounds
April 27, 2021, at 1619	Maintenance activities determined that the ground was on the C Inboard MSIV.
June 5, 2021, at 0505	Control Room Operators discovered that the C Inboard MSIV would not close on a valid PCIS signal. The valve was declared inoperable.
June 5, 2021, at 1013	The C Inboard MSIV was declared operable upon the completion of compensatory maintenance.

D. Manufacturer and model number of each component that failed during the event

The failed component was an Automatic Valve Corporation flow valve solenoid, part number 6910-050.

E. Other systems or secondary functions affected

No other systems or secondary functions were affected.

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

The grounding issue was initially discovered during an AUO walkdown, but its effect of causing C Inboard MSIV inoperability was not discovered until the MSL C Valves were closed to support a TMOD.

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

Each MSIV has two associated solenoids (one AC, and one DC) which maintain the valve in an open position when energized. De-energizing both of these solenoids results closing its associated MSIV for its required PCIS function. With the ground present, the DC solenoid could not be de-energized by PCIS logic or by the operator control switch. Therefore, the C Inboard MSIV was incapable of closing.



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H. Operator actions

No additional operator actions were identified.

I. Automatically and manually initiated safety system responses

No automatic or manual safety systems were initiated as a result of this event.

III. Cause of the event

A. Cause of each component or system failure or personnel error

A grounding issue prevented the de-energization of the DC solenoid which maintains C Inboard MSIV in an open position.

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

This condition persisted because troubleshooting personnel did not fully understand and address the impact of DC grounds and their effects on DC coils. While this was not directly causal to the grounding issue or the violation of Technical Specifications, these human performance concerns allowed the condition to persist.

IV. Analysis of the event

The function of the PCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated Design Basis Accidents (DBAs) to within limits. Primary containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for a DBA.

Troubleshooting identified that a ground present on the C Inboard MSIV's DC solenoid/wiring maintained the DC solenoid energized, and this condition would have prevented the valve from closing on a valid PCIS signal. Therefore, the C Inboard MSIV was inoperable.

TS Limiting Condition for Operation (LCO) 3.6.1.3 requires that Each PCIV, except reactor building-to-suppression chamber vacuum breakers, shall be operable in Modes 1, 2, and 3, and when associated instrumentation is required to be operable per TS LCO 3.3.6.1, "Primary Containment Isolation Instrumentation." TS LCO 3.6.1.3 Condition A requires that, with one or more penetration flow paths with one PCIV inoperable except due to MSIV leakage not within limits, operators must isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured within 8 hours, for the MSL penetrations. Additionally, operators must verify that



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the affected penetration flow path is isolated once per 31 days for isolation devices outside Primary Containment, and prior to entering Mode 2 or 3 from Mode 4, if Primary Containment was de-inerted while in Mode 4, if not performed within the previous 92 days, for isolation devices inside primary containment. Failure to meet these completion times while in Modes 1, 2, or 3 requires entry into TS LCO 3.6.1.3 Condition E, requires entering Mode 3 within 12 hours, and entering Mode 4 within 36 hours.

A POE determined that the MSIV was inoperable from April 22 to June 5, when the TMOD restored MSIV operability. TS LCO 3.6.1.3 was not met during this time, as the Required Actions of TS LCO 3.6.1.3 Conditions A and E were not completed during this interval. Therefore, BFN was in violation of this TS during this time.

V. Assessment of Safety Consequences

A Probabilistic Risk Analysis (PRA) Evaluation was performed to determine the safety significance of inoperability of the C Inboard MSIV. The results were calculated using a conservative duration of 45 days based on the Time of Discovery of April 22, 2021 at 1437 CDT. The evaluation considered the C Outboard MSIV to be considered operable and available.

The dominant internal events results involve random occurrence of a main steamline break, presumed failure of C Inboard MSIV, and the random failure of the C Outboard MSIV. These sequences involve scenarios which could evolve rapidly and which would place the unit outside conditions assumed for PRA success criteria. The dominant fire events results involve significant fires in the control building requiring reactor scram and MSIV closure, presumed failure of the C Inboard MSIV to close and remain closed, and a hot short resulting in the spurious opening / failure to close of the C Outboard MSIV.

PRA modeling of this event by both TVA and Jensen-Hughes concluded that this event had a delta-CDF/ ICCDP of 2.37E-8 and a delta-LERF/ICLERP of 4.93E-8. Therefore, this issue had very low risk significance.

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

The C Outboard MSIV (BFN-2-FCV-001-0038) remained operable throughout this event.

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

This event did not occur when the reactor was shut down.



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

The C Inboard MSIV was inoperable for forty-four (44) days, from April 22, 2021 to June 5, 2021.

VI. Corrective Actions

Corrective Actions for this event are being managed under Condition Reports (CRs) 1689113, 1699014, and 1699015.

A. Immediate Corrective Actions

The DC solenoid input wires were lifted and a tagout/clearance was placed to maintain the solenoid in a de-energized state, so that the C Inboard MSIV would close on demand. Although removal of the 250 VDC control power from the solenoid does not conform with BFN UFSAR Chapter 4.6, all TS functions are maintained, and the C Inboard MSIV is capable of meeting all of its required safety functions.

B. Corrective Actions to Prevent Recurrence or to reduce the probability of similar events occurring in the future

The installed TMOD will mitigate adverse effects until the condition can be permanently addressed during the next refueling or maintenance outage.

VII. Previous Similar Events at the Same Site

A search of BFN LERs and CRs found no previous examples of similar events.

VIII. Additional Information

There is no additional information.

IX. Commitments

There are no new commitments.