



Post Office Box 2000, Decatur, Alabama 35609-2000

September 12, 2022

10 CFR 50.73
10 CFR 50.4(a)

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

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

Subject: **Licensee Event Report 50-259/2022-002-00 – High Pressure Coolant Injection System Declared Inoperable Due to a Corroded Actuator**

The enclosed Licensee Event Report provides the details of the inoperability of the Browns Ferry Nuclear Plant, Unit 1, High Pressure Coolant Injection System due to a corroded actuator. The Tennessee Valley Authority is submitting this report in accordance with Title 10 of the Code of Federal Regulations 50.73(a)(2)(v)(D), as any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

There will be a supplement to this Licensee Event Report to provide additional time to complete the root cause evaluation.

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

Respectfully,

A handwritten signature in black ink, appearing to read 'Manu Sivaraman', is written over a white background.

Manu Sivaraman
Site Vice President

Enclosure: Licensee Event Report 50-259/2022-002-00 – High Pressure Coolant Injection System Declared Inoperable Due to a Corroded Actuator

U.S. Nuclear Regulatory Commission

Page 2

September 12, 2022

cc (w/ Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

NRC Project Manager - Browns Ferry Nuclear Plant



LICENSEE EVENT REPORT (LER)

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1. Facility Name Browns Ferry Nuclear Plant, Unit 1	2. Docket Number 05000259	3. Page 1 OF 6
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4. Title
High Pressure Coolant Injection System Declared Inoperable Due to a Corroded Actuator

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
07	12	2022	2022	- 002 -	00	09	12	2022	N/A	05000 N/A
									Facility Name	Docket Number
									N/A	05000 N/A

9. Operating Mode 1	10. Power Level 97
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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 type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" 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
TBD	BJ	FCV	T147	Y	N/A	N/A	N/A	N/A	N/A

14. Supplemental Report Expected) <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)	15. Expected Submission Date	Month	Day	Year
		11	09	2022

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

On July 12, 2022, during a routine surveillance test, the Browns Ferry Nuclear Plant (BFN), Unit 1, high pressure coolant injection (HPCI) turbine control (governor) valve did not open as expected. Upon investigation, it was discovered that the electro-governor remote hydraulic actuator (EGR) had internal corrosion, which resulted in binding of the pilot plunger and associated pilot bushing and a subsequent failure to supply a hydraulic open signal to the governor valve.

The resulting inoperability of the single-train HPCI system would have prevented HPCI from fulfilling its safety function to mitigate the consequences of an accident.

The causal analysis and corrective actions will be reported later in a supplement to this LER.



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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Browns Ferry Nuclear Plant, Unit 1	05000-259	2022	- 002	- 00

NARRATIVE

I. Plant Operating Conditions before the Event

At the time of discovery, Browns Ferry Nuclear Plant (BFN) Unit 1 was in Mode 1 at approximately 97 percent power.

II. Description of Event

A. Event Summary

On July 12, 2022, when assistant unit operators (AUOs) locally started the high pressure coolant injection (HPCI) [BJ] auxiliary oil pump [P], HPCI control valve 1-FCV-073-0019 (governor valve) [FCV] did not open as expected during the prerequisite startup checks for BFN, Unit 1 HPCI Flowrate surveillance test 1-SR-3.5.1.7. Subsequent troubleshooting identified that with the turbine at rest, and the auxiliary oil pump running, the electro-governor remote hydraulic actuator (EGR) [SM] did not immediately supply a hydraulic signal that would open the governor valve. Operations personnel declared HPCI inoperable and entered Technical Specification (TS) 3.5.1, "Emergency Core Cooling System (ECCS) - Operating," Condition C and verified that reactor core isolation cooling (RCIC) [BN] was operable as required.

Upon investigation, it was discovered that the EGR had internal corrosion which resulted in binding of the pilot plunger and associated pilot bushing and a subsequent failure to supply a hydraulic open signal to the governor valve. The resulting inoperability of the single-train HPCI system would have prevented HPCI from fulfilling its safety function that would be needed to mitigate the consequences of an accident. HPCI was returned to standby readiness and was declared operable on July 15, 2022 at 0915 CDT, thus exiting TS 3.5.1 Condition C.

The Tennessee Valley Authority (TVA) is submitting this report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(v)(D), as any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

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 structures, systems, or components (SSCs) whose inoperability contributed to this event.



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NARRATIVE

C. Dates and approximate times of occurrences

<u>DATE AND APPROXIMATE TIMES</u>	<u>OCCURENCE</u>
July 12, 2022, 0913 CDT	BFN, Unit 1, HPCI is declared inoperable to support a routine flow rate surveillance test.
July 12, 2022, 0917 CDT	AUOs started the HPCI aux oil pump locally, as part of a routine flow rate surveillance test. AUOs verified that the stop valve opened, while the governor valve unexpectedly remained closed and did not move.
July 12, 2022, 0954 CDT	The governor valve opens because of troubleshooting activities, revealing that the EGR was non-functional.
July 15, 2022, 0915 CDT	BFN, Unit 1, HPCI is declared operable following the completion of corrective maintenance and flow rate testing.

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

The failed component was a Terry Steam Turbine Company turbine governor valve, Model CSS.

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

Failure was discovered when the HPCI auxiliary oil pump governor valve did not open as expected during the prerequisite startup checks for a routine surveillance test.

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

The causal analysis will be reported later in a supplement to this LER.

H. Operator actions

There were no operator actions associated with this event.

I. Automatically and manually initiated safety system responses

There were no automatic or manual safety system responses associated with this event.



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NARRATIVE

III. Cause of the event

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

The causal analysis will be reported later in a supplement to this LER.

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

No human performance related causes have been identified.

IV. Analysis of the event

The HPCI system is provided to assure that the reactor is adequately cooled to limit fuel cladding temperature in the event of a small break in the nuclear steam supply system and loss of coolant which does not result in rapid depressurization of the reactor vessel. The HPCI system permits the nuclear plant to be shut down, while maintaining sufficient reactor vessel water inventory until the reactor vessel is depressurized. The HPCI system continues to operate until the reactor vessel pressure is below the pressure at which low pressure coolant injection (LPCI) [BO] operation or core spray system [BM] operation maintains core cooling. Due to the HPCI system's inoperability, it would have been unable to perform its safety function.

Troubleshooting activities began on July 12, 2022, at 0917 CDT, immediately after the governor valve unexpectedly remained closed during a routine flow rate surveillance test. Troubleshooting activities had ruled out mechanical binding, broken governor valve internals, and electrical problems as causes. The only remaining portion of the valve's opening sequence were those operating by hydraulic oil pressure. When the HPCI turbine is at rest with the auxiliary oil pump running, the governor valve normally travels to the open position. However, with the auxiliary oil pump in service, personnel repeatedly physically forced the remote servo piston downward into the open position, and it would spring upward when released, closing the valve. As a result, the internal pilot valve plunger swapped the reporting of governor valve closing and opening signals. Once personnel lightly mechanically agitated the EGR exterior with a rubber mallet, the pilot valve plunger immediately changed states, and the governor valve fully opened as designed.



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NARRATIVE

The governor valve opened on July 12, 2022 at 0954 CDT. This time is being taken as the time of discovery because that is when cognizant individuals were notified that governor valve would have been unable to open upon receiving a valid command signal. The governor valve's equipment history and failure analysis did not indicate that this failure mode existed prior to the time of discovery. Therefore, in accordance with TVA procedure NEDP-27, Post Operability Evaluations, since the surveillance test was in periodicity, it should be assumed that the governor valve failure occurred at the time of its discovery, since there is no firm evidence which indicates otherwise.

V. Assessment of Safety Consequences

This event resulted in inoperability and unavailability of the single train of the BFN, Unit 1, HPCI system resulting in the inability of the HPCI system to perform its safety functions to mitigate the consequences of an accident. In the event of an emergency, the RCIC system remained operable, and all Automatic Depressurization Systems (ADS) were available during this event to facilitate core cooling by low pressure ECCS systems. Based on the above, during the time period that the HPCI system was inoperable, sufficient systems were available to provide the required safety functions to protect the health and safety of the public. There was no significant reduction to the health and safety of the public or plant personnel for this event.

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

During this event, RCIC was verified to be operable by Operations personnel. Additionally, all other ECCS and ADS systems remained operable for the duration of the 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 shutdown.

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

An engineering evaluation has determined that HPCI was inoperable from the time of discovery on July 12, 2022 at 0954 CDT. Once the EGR and remote servo had been replaced and the surveillance successfully performed, the system returned to Operable status on July 15, 2022 at 0915 CDT. The BFN, Unit 1, HPCI system was inoperable for approximately three (3) days.



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NARRATIVE

VI. Corrective Actions

Corrective Actions are being managed by the TVA's corrective action program under Condition Report (CR) 1789217.

A. Immediate Corrective Actions

The EGR and remote servo were promptly replaced.

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

The corrective actions will be reported later in a supplement to this LER.

VII. Previous Similar Events at the Same Site

A search of LERs from BFN, Units 1, 2, and 3 over the last five years identified no similar events.

VIII. Additional Information

There is no additional information.

IX. Commitments

There are no new commitments.