



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

May 1, 2013

10 CFR 50.73

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

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

Subject: **Licensee Event Report 50-260/2013-001-00**

The enclosed Licensee Event Report provides details of an inoperable stop-check valve resulting in a condition prohibited by Technical Specifications and leading to a reactor shutdown required by Technical Specifications. The Tennessee Valley Authority is submitting this report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(i)(A) and 10 CFR 50.73(a)(2)(i)(B).

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

Respectfully,

K. J. Polson
Vice President

Enclosure: Licensee Event Report 50-260/2013-001-00 – Inoperable Stop-Check Valve
Results in Condition Prohibited by Technical Specifications and Reactor
Shutdown Required by Technical Specifications

cc (w/ Enclosure):

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

IE22
NRR

ENCLOSURE

**Browns Ferry Nuclear Plant
Unit 2**

Licensee Event Report 50-260/2013-001-00

**Inoperable Stop-Check Valve Results in Condition Prohibited by Technical
Specifications and Reactor Shutdown Required by Technical Specifications**

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 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.

1. FACILITY NAME

Browns Ferry Nuclear Plant, Unit 2

2. DOCKET NUMBER

05000260

3. PAGE

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4. TITLE: Inoperable Stop-Check Valve Results in Condition Prohibited by Technical Specifications and Reactor Shutdown Required by Technical Specifications

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
03	02	2013	2013	- 001	- 00	05	01	2013	N/A	05000
									N/A	05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
1	<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)
10. POWER LEVEL	<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 checked="" 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

Mark Acker, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

256-729-7533

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	BN	HCV	W030	Y					

14. SUPPLEMENTAL REPORT EXPECTED

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

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
N/A	N/A	N/A

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

On March 2, 2013, radiography results for the Browns Ferry Nuclear Plant (BFN), Unit 2, Reactor Core Isolation Cooling (RCIC) system stop-check valve, 2-HCV-071-0014, showed the valve to be in the fully open position; therefore, not meeting its function as a primary containment isolation valve. The RCIC Steam Line Outboard Isolation valve, 2-FCV-071-0003, was closed and deactivated to meet Technical Specification (TS) 3.6.1.3 for Primary Containment Isolation. This caused the RCIC system to become inoperable. The TS 3.5.3 requires the RCIC system to be returned to service within 14 days. Because valve 2-HCV-071-0014 is unisolable to primary containment, a unit shutdown was required to perform repairs. Actions to initiate reactor shutdown began on March 14, 2013, at 0800 Central Daylight Time.

The root cause of this condition is valve 2-HCV-071-0014 was improperly classified as a Run-to-Failure hand valve when it should have been classified as a Critical check valve.

The corrective action to prevent recurrence is to submit preventive maintenance change requests to open, inspect, clean, and replace valve disc, dashpot, and stem, as necessary, for RCIC Turbine Exhaust Hand Control Valves, RCIC Vacuum Pump Discharge Shutoff Valves, and High Pressure Coolant Injection Turbine Exhaust Valves.

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NARRATIVE

I. Plant Operating Condition Before the Event

On March 2, 2013, at 0300 Central Standard Time (CST), Browns Ferry Nuclear Plant (BFN), Unit 2, was in Mode 1 at 88 percent rated thermal power.

II. Description of Events

A. Event:

On March 2, 2013, radiography results for the BFN, Unit 2, Reactor Core Isolation Cooling (RCIC) [BN] system turbine exhaust stop-check valve [HCV], 2-HCV-071-0014, showed the valve to be in the fully open position; therefore, not meeting the acceptance criteria of Surveillance Instruction 2-SI-3.2.3, Testing ASME Section XI Check Valves. This stop-check valve is one of two Primary Containment Isolation Valves (PCIVs) connecting the RCIC system directly to primary containment [NH]. A Past Operability Evaluation (POE) determined that valve 2-HCV-071-0014 should be considered inoperable from March 27, 2011, until March 15, 2013, at 0310 Central Daylight Time (CDT), when BFN, Unit 2, entered Mode 4.

BFN, Unit 2, Technical Specification (TS) Limiting Condition for Operation (LCO) 3.6.1.3, Primary Containment Isolation Valves (PCIVs), requires each PCIV, except reactor building-to-suppression chamber vacuum breakers, to be Operable in Modes 1, 2, and 3. Because a PCIV in the RCIC system was determined to be inoperable, TS 3.6.1.3 Required Action A.1 requires the RCIC system to be isolated within 4 hours to prevent flow through the RCIC turbine exhaust check valve. Based on the results of the POE, check valve 2-HCV-071-0014 was inoperable for longer than allowed by the TS. The RCIC Steam Line Outboard Isolation valve [FCV], 2-FCV-071-0003, was closed and deactivated to meet TS 3.6.1.3 Required Action A.1 on March 2, 2013, at 0525 CST.

BFN, Unit 2, TS LCO 3.5.3, RCIC System, requires the RCIC system to be Operable in Mode 1 and in Modes 2 and 3 when the reactor steam dome pressure is greater than 150 pounds per square inch gauge (psig). Closing the RCIC Steam Line Outboard Isolation valve, 2-FCV-071-0003, resulted in the RCIC system being inoperable. The TS 3.5.3 Required Action A.2 requires the RCIC system to be returned to service within 14 days. Because valve 2-HCV-071-0014 is unisolable to primary containment, a unit shutdown was required to perform repairs. The TS 3.5.3 Required Action B required that BFN, Unit 2, be in Mode 3 by 1725 CDT, on March 16, 2013, and less than 150 psig by 1725 CDT, on March 17, 2013.

Actions to initiate reactor shutdown began on March 14, 2013, at 0800 CDT. On March 14, 2013, at 2203 CDT, BFN, Unit 2, entered Mode 3, and on March 15, 2013, at 0310 CDT, BFN, Unit 2, entered Mode 4.

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

Stop-check valve 2-HCV-071-0014 was unable to perform its function as a PCIV because it was stuck in the open position.

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NARRATIVE**C. Dates and approximate times of occurrences:**

March 2, 2013, at 0300 CST,	Radiography results for 2-HCV-071-0014 showed the valve to be in the fully open position.
March 2, 2013, at 0525 CST,	BFN, Unit 2, RCIC system removed from service.
March 14, 2013, at 0800 CDT,	Operations began taking actions to shutdown BFN, Unit 2.
March 14, 2013, at 2203 CDT,	BFN, Unit 2, entered Mode 3.
March 15, 2013, at 0310 CDT,	BFN, Unit 2, entered Mode 4.

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

The failed component was stop-check valve 2-HCV-071-0014. The component was a model 5312WE-8IN Stop-Check Valve, manufactured by the Walworth Company.

E. Other systems or secondary functions affected:

Valve 2-HCV-071-0014 is one of two PCIVs connecting RCIC directly to primary containment. Containment was isolated by closing the second PCIV resulting in the RCIC system being unable to perform its safety function.

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

On March 2, 2013, radiography results for the BFN, Unit 2, RCIC system stop-check valve, 2-HCV-071-0014, showed the valve to be in the fully open position.

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

The disk of valve 2-HCV-071-0014 was stuck in the open position. This configuration resulted 2-HCV-071-0014 being unable to perform its function as a PCIV.

H. Operator actions:

Operations declared 2-HCV-071-0014 inoperable and closed RCIC Steam Line Outboard Isolation valve, 2-FCV-071-0003, to isolate primary containment, resulting in the RCIC system becoming inoperable. The RCIC system was unable to be repaired in the LCO window; therefore, Operations shutdown BFN, Unit 2, as required by TS.

I. Automatically and manually initiated safety system responses:

There were no safety system responses.

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III. Cause of the event

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

The direct cause of the valve's failure is not definitively known; however, the most likely causes of the component failing in the open position is the valve disc weight may be lighter than vendor design requirements, and the finish on disc travel guide male component, bore of valve dashpot [DPT], and stem outer diameter are excessively rough due to scoring as a result of general wear from process debris and condensing steam. Corrective actions are in place to procure the design valve disc weight, design finish on the disc travel guide male component, bore of valve dashpot, and stem outside diameter from the vendor.

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

The root cause of this condition is valve 2-HCV-071-0014 was improperly classified as a Run-to-Failure hand valve when it should have been classified as a Critical check valve; therefore, internal inspection and internal parts refurbishment or replacement was not performed.

There are two contributing factors.

1. The Corrective Action Program (CAP) processes for problem screening did not ensure adequate cause evaluations when stop-check valve 2-HCV-071-0014 was discovered stuck in the open position in 2002 and 2005 resulting in corrective actions that did not prevent problem recurrence.
2. Technical Manual for Manually Operated Valves Model 5312 for Units 1 and 2 contains insufficient information to identify valve degradation due to wear and/or diagnose reasons for valve disc sticking in the open position.

IV. Analysis of the event:

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)(i)(A), as the completion of any nuclear plant shutdown required by the plant's Technical Specifications, and 10 CFR 50.73(a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications.

On March 2, 2013, radiography results for the BFN, Unit 2, RCIC system turbine exhaust stop-check valve, 2-HCV-071-0014, showed the valve to be stuck in the fully open position. This stop-check valve is one of two PCIVs connecting the RCIC system directly to primary containment. The POE determined that valve 2-HCV-071-0014 was inoperable from March 27, 2011, until March 15, 2013, at 0310 CDT, when BFN, Unit 2, entered Mode 4.

BFN, Unit 2, LCO 3.0.4 prohibits Mode changes when an LCO is not met except under certain conditions that were not applicable to this event. Since it was not recognized that

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a PCIV was inoperable from March 27, 2011, to March 15, 2013, until the POE was completed, BFN, Unit 2, changed Modes in violation of LCO 3.0.4 on multiple occasions.

Valve 2-HCV-071-0014 has two Maintenance Rule functions, one associated with the RCIC system and one associated with primary containment isolation. TVA procedures state that a Run-To-Failure classification is defined as a component with acceptable risks and consequences of failure without any predictive or preventive maintenance being performed and the component should be operated until corrective maintenance is required. This classification influences the scope and frequency of preventive maintenance on the component.

RCIC Turbine Exhaust Hand-Control Valve, 2-HCV-071-0014, is classified as Run-To-Failure. This classification is incorrect because the failure of stop-check valves to open is a Maintenance Rule Risk Significant function.

The improper classification of 2-HCV-071-0014 as a Run-to-Failure hand valve when it should have been classified as a Critical check valve is the root cause of this event. As a result, internal inspection and internal parts refurbishment or replacement was not performed leading to the valve becoming stuck in the open position. Corrective actions have been taken to change the reliability classification of the RCIC Turbine Exhaust stop-check valves from run-to-failure to critical (Problem Evaluation Report (PER) 691891).

On March 21, 2005, radiography results showed valve 2-HCV-071-0014 was stuck in a partially open position. PER 79167 was written to address this issue. The corrective actions were ineffective in identifying and correcting the cause for 2-HCV-071-0014 sticking open. The radiography performed on 2-HCV-071-0014 on March 2, 2013, served as an effectiveness review of the corrective maintenance performed under Work Order (WO) 05-713361-000 and Level C PER 79167 to prevent recurrence of the valve sticking open. With vendor concurrence, WO 05-713361-000 machined the female threads in the bore of the valve disc away to remove the assumed interference between the bore of the valve disc and the valve stem. It cannot be determined if the PER 79167 cause analysis considered other potential causes because the cause evaluation for a Level C PER was not required to be well documented when the PER was dispositioned. In October 2002, WO 02-009107-000 identified 2-HCV-071-0014 to be in the open position. A PER was not generated to document this condition. Inadequate CAP processes and procedures at the time of these events contributed to this event.

Technical Manual for Manually Operated Valves Model 5312 for Units 1 and 2 contains insufficient information to identify valve degradation due to wear and/or diagnose reasons for valve disc sticking in the open position. The specific information that is missing is: interfacing dimensions and tolerances between critical internal valve parts, finish specification for internal metal components where friction between these components could impede movement of parts, and design valve disc weight with tolerances. This issue was determined to be a contributing factor to this event.

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NARRATIVEExtent of Condition

The extent of condition evaluation identified eight additional stop-check valves in the Check Valve Condition Monitoring Plan potentially subject to the same failure mode as 2-HCV-071-0014. The extent of condition was limited to the Appendix J and Condition Monitoring Plan check valves because this scope addresses check valves that have safety-related, Appendix R, regulatory and/or other risk significant functions. Corrective actions are in place to procure spare parts, perform initial inspection and replacement of internal parts, and setup internal inspection preventive maintenance for the RCIC Turbine Exhaust Hand Control Valves and High Pressure Coolant Injection (HPCI) [BJ] Turbine Exhaust Valves. Additionally, corrective actions are in place to disassemble and inspect the internal parts of the RCIC Vacuum Pump Discharge Shutoff Valves for scoring or otherwise damaged surfaces between moving metal-to-metal interfaces that could impede valve disc movement and replace parts as necessary.

Extent of Cause

The scope of the extent of cause evaluation is limited to valves that could have been improperly classified as a Run-to-Failure check valve resulting in entry into any unplanned TS action statements. The RCIC Turbine Exhaust Hand Control Valves, RCIC Vacuum Pump Discharge Shutoff Valves, and HPCI Turbine Exhaust Valves were identified as meeting these criteria. Corrective Actions are in place to correct the location identification and descriptions of these valves and to submit Preventive Maintenance Change Requests (PMCRs) to open, inspect, clean, and replace valve disc, dashpot, and stem, as necessary.

V. Assessment of Safety Consequences

A POE was performed and concludes that 2-HCV-071-0014 was inoperable from March 27, 2011, at 0328 CDT, until BFN, Unit 2, was in Mode 4 on March 15, 2013, at 0310 CDT. With 2-HCV-071-0014 stuck in the open position, this valve could not perform its function as a primary containment isolation valve. However, the POE concluded that 2-CKV-071-0580, RCIC Turbine Exhaust Check valve, remained capable of isolating the penetration.

According to the POE, the first opening of 2-HCV-071-0014 following the radiography performed on February 06, 2011, is assumed to be the start of the inoperability of this valve. This assumption is conservative with respect to the actual time the valve stuck in the open position, which is unknown and cannot be positively determined.

The RCIC system injection function was not lost by the failure of 2-HCV-071-0014. With the 2-HCV-071-0014 in the open position, the RCIC system was capable of injecting and meeting its mission time. The RCIC system function was made unavailable when the RCIC Steam Line Outboard Isolation Valve, 2-FCV-071-0003, was closed to comply with TSs for isolating primary containment.

Based on this analysis, this condition is of low safety significance and there was no significant reduction to the health and safety of the public.

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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:

With 2-HCV-071-0014 stuck in the open position, this valve could not perform its function as a primary containment isolation valve. However, 2-CKV-071-0580, RCIC Turbine Exhaust Check valve, remained capable of isolating the penetration.

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 BFN, Unit 2, was shut down.

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

The POE concluded that 2-HCV-071-0014 was inoperable from March 27, 2011, at 0328 CDT, until BFN, Unit 2, was in Mode 4 on March 15, 2013, at 0310 CDT. With 2-HCV-071-0014 being stuck in the open position, this valve could not perform its function as a primary containment isolation valve.

VI. Corrective Actions

Corrective Actions are being managed by TVA's corrective action program under PER 696534.

A. Immediate Corrective Actions:

1. Check valve 2-HCV-071-0014 was declared inoperable after failing radiography.
2. The RCIC Steam Line Outboard Isolation valve, 2-FCV-071-0003, was closed and deactivated.
3. Check Valve 2-HCV-071-0014 was dogged closed (with the valve stem and handwheel).
4. The BFN, Unit 2, reactor shutdown as required by BFN, Unit 2, TSs.
5. The internal parts of 2-HCV-071-0014 were cleaned and the valve's disk was replaced with a spare.

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

The root cause of this event will be addressed by submitting PMCRs to open, inspect, clean, and replace valve disc, dashpot, and stem, as necessary, for RCIC Turbine Exhaust Hand Control Valves, RCIC Vacuum Pump Discharge Shutoff Valves, and HPCI Turbine Exhaust Valves. PER corrective actions 691891-001

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and 691891-002 changed the reliability classification of the RCIC Turbine Exhaust stop-check valves from run-to-failure to critical.

The first contributing cause was addressed by previous PER corrective actions 495782-008 and 537869-001. These corrective actions revised fleet corrective action procedure NPG-SPP-03.1.4, Corrective Action Program Screening and Oversight, to include additional guidance for assigning PER Classification Levels, and to define when Level B PERs require an Upper Tier Apparent Cause Evaluation (ACE) or a Lower Tier ACE.

The second contributing cause will be addressed by revising the Walworth Technical Manual for Manually Operated Valves Model 5312 WE in accordance with NPG-SPP-09.20, Vendor Manual Control.

VII. Additional Information:

A. Previous similar events at the same plant:

A search of BFN Licensee Event Reports (LERs) for Units 1, 2, and 3 for the last several years did not identify any similar events.

A search was performed on the BFN corrective action program. Similar PERs related to the condition reported in this LER are PERs 79167 and 689932.

The corrective actions in PER 79167 were ineffective in identifying and correcting the cause for 2-HCV-071-0014 sticking open because the cause of the condition was incorrectly identified as interference caused by female threads in the bore of the valve disc.

B. Additional Information:

There is no additional information.

C. Safety System Functional Failure Consideration:

In accordance with Nuclear Energy Institute (NEI) 99-02, this condition is not considered a safety system functional failure.

D. Scram with Complications Consideration:

This event did not result in an unplanned scram with complications.

VIII. COMMITMENTS

There are no commitments.