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

July 31, 2014

10 CFR 50.73

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

Browns Ferry Nuclear Plant, Unit 3
Renewed Facility Operating License No. DPR-68
NRC Docket No. 50-296

Subject: **Licensee Event Report 50-296/2014-003-00**

The enclosed Licensee Event Report provides details of the inoperability of a Browns Ferry Nuclear Plant, Unit 3, Primary Containment Isolation Valve. 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)(B), as any operation 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 J. L. Paul, Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

S. BONO
FOR K. POLSON

K. J. Polson
Site Vice President

Enclosure: Licensee Event Report 50-296/2014-003-00 – Primary Containment Isolation Valve Inoperable for Longer than Allowed 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 3

Licensee Event Report 50-296/2014-003-00

Primary Containment Isolation Valve Inoperable for Longer than Allowed by Technical Specifications

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See Enclosed

NRC FORM 366 (01-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 01/31/2017

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, 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.

LICENSEE EVENT REPORT (LER)

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4. TITLE: Primary Containment Isolation Valve Inoperable for Longer than Allowed 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
									N/A	N/A
06	02	2014	2014	003	00	07	31	2014	FACILITY NAME N/A	DOCKET NUMBER N/A

9. OPERATING MODE

1

10. POWER LEVEL

100

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

FACILITY 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
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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 June 2, 2014, during performance of the Reactor High Pressure Calibration surveillance, the Residual Heat Removal (RHR) Shutdown Cooling (SDC) Inboard Suction Valve Isolation relay failed to energize preventing automatic closure of the RHR SDC Inboard Suction Valve. On three occasions, the inability of this valve to close automatically upon receipt of the Primary Containment Isolation System signal resulted in a violation of the Browns Ferry Nuclear Plant, Unit 3, Technical Specifications. The Shutdown Cooling Mode of the Residual Heat Removal System was unaffected by this condition.

The cause of the event was relay wires had been lifted and incorrectly landed due to a human performance error at an indeterminate time between a successful post maintenance test (PMT) on March 07, 2014, and the time the condition was corrected by re-landing the wires according to plant drawings on June 6, 2014.

The corrective action to reduce likelihood of recurrence is to develop and deliver a case study to the Maintenance, Modifications, and Operations departments based on the details of this event.

I. Plant Operating Conditions Before the Event

Browns Ferry Nuclear Plant (BFN), Unit 3, was in Mode 1 at approximately 100 percent power.

II. Description of Events

A. Event:

On June 2, 2014, at 0430 Central Daylight Time (CDT), the Residual Heat Removal (RHR) [BO] Shutdown Cooling (SDC) Inboard Suction Valve Isolation relay [RLY] failed to actuate during performance of the Reactor High Pressure Calibration surveillance. This prevented automatic closure of the RHR SDC Inboard Suction Valve [FCV]. The RHR SDC Inboard Suction Valve is the inboard Primary Containment Isolation Valve (PCIV) [ISV]. Upon initial inspection of the relay, the Unit 3 Unit Supervisor discovered two wires labeled 14 were landed on terminal 12. Improper wiring of the RHR SDC Inboard Suction Valve Isolation relay disabled automatic closure of the RHR SDC Inboard Suction Valve upon receipt of a Primary Containment Isolation System (PCIS) Group 2 isolation signal. The RHR SDC Outboard Suction Valve (Outboard PCIV) maintained capability to isolate the penetration flowpath, reducing the safety significance of the event. The primary containment flowpath would have isolated on an actual isolation signal and the ability of operations to close the RHR SDC Inboard Suction Valve using the remote handswitch was unaffected. On June 6, 2014, Electrical Maintenance corrected the wire terminations per work instructions, returning functionality of the relay.

The RHR SDC Inboard Suction Valve Isolation relay had been replaced March 2, 2014, during the Unit 3 refueling outage16. On March 7, 2014, satisfactory functioning of the relay was confirmed by a post maintenance test (PMT). Between the date of the satisfactory PMT and the failed surveillance on June 2, 2014, no approved plant process documentation was found that directed the relay leads to be lifted. After analyzing the possible scenarios it was determined that the relay wires were most probably lifted and incorrectly landed after the PMT was performed on March 7, 2014.

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

NARRATIVE

C. Dates and approximate times of occurrences:

March 2, 2014	The RHR SDC Inboard Suction Valve Isolation relay was replaced during the Unit 3 refueling outage16.
March 7, 2014	Satisfactory functioning of the RHR SDC Inboard Suction Valve Isolation relay was confirmed by Post Maintenance Test.
June 2, 2014, at 0430 CDT	The RHR SDC Inboard Suction Valve Isolation relay failed to actuate during performance of the Reactor High Pressure Calibration surveillance.
June 6, 2014	Electrical Maintenance corrected the wire terminations per work instructions, returning functionality of the relay.

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

No component failures were identified that occurred during the event.

E. Other systems or secondary functions affected:

There were no other systems or secondary systems affected.

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

On June 2, 2014, at 0430 CDT, the Shutdown Cooling Inboard Suction Valve Isolation relay failed to actuate during performance of the Reactor High Pressure Calibration surveillance.

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

There were no failed components related to this event; however, the RHR SDC Inboard Suction Valve Isolation relay failed to actuate due to improperly landed wires.

H. Operator actions:

At time of discovery, the Unit 3 Unit Supervisor entered Technical Specification Section 3.3.6.1.A, which Required Action A.1 requires placing the channel in trip within 12 hours.

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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III. Cause of the event

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

The most likely cause of this event involves inappropriate manipulation of the RHR SDC Inboard Suction Valve Isolation relay leads by individuals intending to perform scheduled work on another component. Once the leads were lifted the performers realized the error and re-landed the leads incorrectly. As long as the two wires were landed together the connection to ground would be intact and the RHR SYS I Logic Power Failure alarm would not be sealed in. Also no alarm would be received if a jumper was installed. If this event occurred while other relays were being tested in the outage, receiving the alarm would not be unusual and would be attributed to the ongoing work in the Auxiliary Instrument Room. Although no one self-reported such an error, this type of error most closely matches the evidence collected during the investigation and is the most likely cause of the event and thus is the apparent cause.

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

The relay wires being landed on the wrong terminal is a human performance event. However, the exact time and nature of the error or the type of individuals involved could not be determined. Between the date of the PMT and the failed surveillance, no approved plant process documentation was found that directed the relay leads to be lifted.

IV. Analysis of the event:

On June 2, 2014, during performance of the Reactor High Pressure Calibration surveillance, the RHR SDC Inboard Suction Valve Isolation relay failed to energize. The relay's failure to energize, preventing automatic closure of the RHR SDC Inboard Suction Valve. The inability to close automatically upon receipt of a Primary Containment Isolation System Group 2 isolation signal is a Technical Specifications (TS) violation.

In cases where both the RHR SDC Inboard Suction Valve and the RHR SDC Outboard Suction Valve were open, the affected penetration flowpath was not isolated. A review of the timeline between relay replacement and discovery identified that the RHR SDC Inboard Suction Valve and the RHR SDC Outboard Suction Valve were both in the open position for greater than one hour on three occasions (to support shutdown cooling operations) as summarized below.

- March 10, 2014, at 0500 CDT to March 13, 2014, at 0903 CDT - a total of 76.05 hours (Mode 5 / Mode 4)
- March 13, 2014, at 2218 CDT to March 17, 2014, at 0034 CDT - a total of 74.27 hours (Mode 4)
- May 7, 2014, at 0138 CDT to May 7, 2014, at 1846 CDT - a total of 17.13 hours (Mode 3)

The requirements for Primary Containment Isolation Instrumentation are in TS section 3.3.6.1. TS Limiting Condition for Operation (LCO) 3.3.6.1 states that the primary

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containment isolation instrumentation for each Function in Table 3.3.6.1-1 shall be OPERABLE.

At time of discovery, the Unit 3 Unit Supervisor entered TS Section 3.3.6.1.A, which Required Action A.1 requires placing the channel in trip within 12 hours for Functions 6.b and 6.c and 24 hours for Function 6.a.

TS Table 3.3.6.1-1 notes that Function 6.a (High Reactor Steam Dome Pressure) and Function 6.c (High Drywell Pressure) are applicable in Modes 1, 2, and 3. On two of the three occasions listed above, the reactor was in Mode 4 or Mode 5. In the third occasion, the reactor was in Mode 3. Therefore, Functions 6.a and 6.c were applicable during the time period from 0138 CDT to 1846 CDT on May 7, 2014. During this time period, Required Action F.1 to isolate the affected penetration flowpath was not met, and the subsequent Required Actions of Condition G are to be in Mode 3 within 12 hours and Mode 4 within 36 hours. As the reactor was in Mode 3 when the Condition was entered, and the Condition was exited within 36 hours, the TS requirements were met for Functions 6.a and 6.c.

For Function 6.b (Low Reactor Vessel Water Level - Level 3), Required Action A.1 is to place the channel in trip in 12 hours. When this was not met, Condition C required entering the referenced condition in Table 3.3.6.1-1. Table 3.3.6.1-1 notes that Function 6.b is applicable in Modes 3, 4, and 5, and the referenced condition is Condition I. The Required Actions for Condition I are (I.1) to immediately initiate action to restore the channel to operable status or (I.2) to immediately initiate action to isolate the RHR Shutdown Cooling System. As the wiring error was not identified between March 7, 2014, and June 2, 2014, no actions were initiated to restore the channel to operable or maintain the RHR Shutdown Cooling System isolated during this time period.

Therefore, Required Action I.2 was not met each time RHR Shutdown Cooling was not isolated and the TS were not met for the three occasions listed in above.

Based on the above analysis, 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)(B), as any operation which was prohibited by the plant's Technical Specifications.

V. Assessment of Safety Consequences

This event resulted in inoperability of the BFN, Unit 3, RHR SDC Inboard Suction Valve and failure to perform its safety function to be able to close automatically upon receipt of a PCIS Group 2 isolation signal. The function of the RHR SDC Inboard Suction Valve Isolation relay is to energize upon receipt of a Group 2 PCIS signal on High Reactor Steam Dome Pressure, High Drywell Pressure, or Low Reactor Water Level. Energizing the RHR SDC Inboard Suction Valve Isolation relay initiates system logic that closes the RHR SDC Inboard Suction Valve and inhibits its opening.

The Shutdown Cooling mode of RHR was not affected by the condition as the automatic closure function is not required for the Shutdown Cooling safety function. The RHR SDC Inboard Suction Valve is required to be open for Shutdown Cooling. The improperly wired relay did not affect the ability of the operator to open or close the valve using the remote hand switch.

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Three Primary Containment Isolation Instrumentation functions (High Reactor Steam Dome Pressure, High Drywell Pressure, and Low Reactor Water Level) for the RHR SDC Inboard Suction Valve were affected by the improper wiring of RHR SDC Inboard Suction Valve Isolation relay. However, in accordance with the RHR operating instruction's Precautions and Limitations, when Reactor Vessel Pressure is greater than atmospheric pressure the RHR SDC Cooling Suction Outboard Valve is required to remain closed with its breaker OFF, except for testing or shutdown cooling operation. This is an Appendix R requirement which minimized the time that the affected penetration flow path (SDC suction line) was not in an isolated condition.

In addition to the above, the RHR SDC Suction Outboard Valve provides redundant primary containment isolation in the affected penetration flow path (SDC suction line). The primary containment isolation instrumentation for automatic closure of the RHR SDC Outboard Suction Valve receives the same three signals as the instrumentation for the RHR SDC Inboard Suction Valve, but the automatic closure of RHR SDC Outboard Suction Valve uses a different relay. Because the wiring error on RHR SDC Inboard Suction Valve Isolation relay did not affect the SDC Outboard Suction Valve Isolation relay, isolation capability of the RHR SDC Outboard Suction Valve was not affected. Therefore, the primary containment flowpath would have isolated on an actual isolation signal.

Based on the discussion above, the safety significance of this event is minimal and the event did not pose a threat to the health and safety of the public or plant personnel.

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 , the RHR SDC Inboard Suction Valve remained closed and the RHR SDC Outboard Suction Valve remained operable as the redundant PCIV.

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.

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:

This event resulted in inoperability of the BFN, Unit 3, RHR SDC Inboard Suction Valve to automatically close for approximately 4 days from discovery of the failure until the relay was rewired and returned to service.

VI. Corrective Actions

Corrective Actions are being managed by TVA's corrective action program under Problem Evaluation Report (PER) 892500.

Immediate Corrective Actions

Performance of the Reactor High Pressure Calibration surveillance was halted.

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A Work Order was executed to corrected wiring of the RHR SDC Inboard Suction Valve Isolation relay.

Reactor High Pressure Calibration surveillance was performed satisfactorily.

Corrective Actions Reduce Probability of Similar Events Occurring in the Future

The corrective action to reduce the likelihood recurrence is to develop and deliver a case study to the Maintenance, Modifications, and Operations departments based on the details of this event.

VII. Additional Information:

A. Previous similar events at the same plant:

A review of relevant TVA Operating Experience including PERs and LERs was conducted based on the initial details known about the event. Typically the search is expanded once the cause has been identified. In this instance, the specific details of the cause was not identified since the exact time and nature of the error or the type of individuals involved could not be determined. However, the relay wires being landed on the wrong terminal is a human performance event. Numerous examples were found regarding wires being landed on the wrong contacts. Generally, the corrective actions were to re-land the wires per the print and administer discipline to the individual(s) involved. However, due to the specific cause of this event being indeterminate, no correlation could be made as to if the learnings from those events would have or should have prevented this event.

B. Additional Information:

There is no additional information.

C. Safety System Functional Failure Consideration:

In accordance with Nuclear Energy Institute (NEI) NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," this event is not considered a safety system functional failure. The RHR SDC Outboard Suction Valve remained available to perform the isolation safety function.

D. Scram with Complications Consideration:

This event did not result in a reactor scram.

VIII. COMMITMENTS

There are no commitments.