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

April 26, 2010

10 CFR 50.73

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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 50-260/2010-001-00**

The enclosed Licensee Event Report provides details of a condition prohibited by technical specifications when two emergency core cooling systems, Loops I and II of the Residual Heat Removal System Low Pressure Coolant Injection System, became inoperable. The Tennessee Valley Authority is submitting this report in accordance with 10 CFR 50.73(a)(2)(i)(B), as any operation or condition 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 S. T. Day, Acting Site Licensing and Industry Affairs Manager, at (256) 729-2636.

Respectfully,

James J. Randich FOR
R. J. Polson
Vice President

cc: See page 2

IE22
NRR

STD:MWO:LAJ
Enclosure
bcc (Enclosure):

G. P. Arent, EQB 1B-WBN
T. E. Cribbe, LP 4K-C
D. E. Jernigan, LP 3R-C
L. A. Jones, SAB 2B-BFN
R. M. Krich, LP 3R-C
J. H. McCarthy, NAB 1A-BFN
K. J. Polson, NAB 2A-BFN
J. J. Randich, POB 2C-BFN
P. D. Swafford, LP 3R-C
L. E. Thibault, LP 3R-C
E. J. Vigluicci, WT 6A-K
INPO: LEREvents@inpo.org
NSRB Support, LP 5M-C
EDMS, WT CA–K

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010
LICENSEE EVENT REPORT (LER) (See reverse for required number of	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 Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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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4. TITLE: Condition Prohibited By Technical Specifications When Two Emergency Core Cooling Systems, Loops I and II of the Residual Heat Removal System Low Pressure Coolant Injection System, Became Inoperable

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 N/A	DOCKET NUMBER N/A
02	25	2010	2010	- 001	- 00	04	26	2010	FACILITY NAME N/A	DOCKET NUMBER N/A

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
1	☐ 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)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
100	☐ 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

NAME	TELEPHONE NUMBER *(Include Area Code)*
Mike Oliver, Licensing Engineer	256-729-7874

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

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO		N/A	N/A	N/A

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

Back leakage through Emergency Core Cooling System (ECCS) Residual Heat Removal (RHR) Loop II low pressure coolant injection (LPCI) valves resulted in the water in the pipe upstream of the inboard valve to be at an elevated temperature with respect to ambient conditions. To prevent voiding in the piping, monitoring with trigger points/actions were established. RHR Loop I was inoperable for scheduled maintenance. On February 25, 2010, at 1840 hours Central Standard Time, a trigger point was met, and Operations personnel entered Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.0.3 based on entry into TS LCO 3.5.1 Condition H when RHR Loops I and II were inoperable.

Operations personnel began lowering reactor power at 1935 hours because the conditions requiring entry into TS LCO 3.0.3 could not be corrected within an hour. TS LCOs were exited at 2000 hours when RHR Loop II system pressure was restored to ensure that the piping would remain filled. At 2320 hours, reactor power was returned to 100 percent.

The cause of this event is aged components and lack of preventive maintenance activities on valve internals.

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

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A) (17)*

I. PLANT CONDITION(S)

At the time of discovery, Browns Ferry Nuclear (BFN) Plant Units 1, 2, and 3 were at approximately 100 percent power.

II. DESCRIPTION OF EVENT

A. Event:

On February 25, 2010, at 1840 hours Central Standard Time (CST) Operations personnel entered Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.0.3 based on entry into TS LCO 3.5.1 Action Condition H, "Two or more low pressure ECCS injection/spray subsystems inoperable for reasons other than Condition A," when both Emergency Core Cooling System (ECCS) Residual Heat Removal (RHR) [BO] Loop I and Loop II were inoperable.

Operations personnel began lowering reactor power using recirculation flow at 1935 hours because the conditions requiring entry into TS LCO 3.0.3 could not be corrected within an hour. TS LCOs 3.0.3 and 3.5.1 Condition H were exited at 2000 hours when RHR Loop II system pressure was raised using an alternate keep fill flow path to ensure that the Low Pressure Coolant Injection (LPCI) piping would remain filled. At 2320 hours, reactor power was returned to 100 percent.

It was further determined through engineering evaluation that the action taken was conservative when actual keep fill system pressures were applied and that margin to actual void formation in the piping had been maintained. Based on this information, there would not have been a failure of the system to complete its safety function. In view of the fact that RHR Loop II remained functional, this event is not reportable under 10 CFR 50.73(a)(2)(ii)(B), (unanalyzed condition), or 10 CFR 50.73(a)(2)(v)(B) (removal of residual heat) and (D) (mitigate the consequences of an accident).

The Tennessee Valley Authority (TVA) is submitting this report in accordance with 10 CFR 50.73(a)(2)(i)(B), as any operation or condition prohibited by the plant's TS.

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

None

C. Dates and Approximate Times of Major Occurrences:

February 5, 2010	To address potential adverse consequences of void formation in the RHR LPCI piping due to leaking RHR Loop II valves, an Operational-Decision Making Issue (ODMI) 210437 was issued to support operability using upstream piping temperature monitoring and action value.
February 20, 2010	Weekly In-Service Inspection (ISI) per the ODMI confirmed RHR Loop II LPCI piping full and free of voids using ultrasonic testing (UT).
February 24, 2010, at 2026 hours CST	RHR Loop I inoperable for planned maintenance. Operations personnel entered TS LCO 3.5.1 ECCS

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	- Operating Condition A, "One low pressure ECCS injection/spray subsystem inoperable."
February 25, 2010, at 1027 hours CST	Operations personnel noted an ODMI trigger point for RHR Loop II had been reached (this is an early notification based on current temperature and requests a trend by engineering personnel).
February 25, 2010, at 1840 hours CST	Browns Ferry personnel determined that ODMI action value could not be met. RHR Loop II was declared inoperable and entry into TS LCO 3.0.3 was made based on entry into TS LCO 3.5.1 ECCS - Operating Condition H, "Two or more low pressure ECCS injection/spray subsystems inoperable for reasons other than Condition A."
February 25, 2010, at 1935 hours CST	In accordance with TS LCO 3.0.3, Operations personnel began lowering reactor power using reactor recirculation flow.
February 25, 2010, at 2000 hours CST	Following ODMI guidance, Operations personnel increased RHR Loop II system pressure to ensure that the LPCI piping would remain filled by using a higher pressure, alternate keep fill flow path, TS LCO 3.0.3 was exited. Operations personnel began raising reactor power from 95 percent.
February 25, 2010, at 2320 hours CST	Reactor power returned to 100 percent.
February 26, 2010, at 0407 hours CST	RHR Loop I returned to operable status.
February 26, 2010, at 0510 hours CST	ISI UT confirms RHR Loop II LPCI piping full and free of voids.

D. **Other Systems or Secondary Functions Affected**

None

E. **Method of Discovery**

The inoperability was discovered during routine Operations personnel monitoring of the RHR Loop II LPCI piping temperature using a thermocouple attached to an uninsulated portion of the affected piping with remote indication per Problem Identification Report (PER) 210437, ODMI 210437, "Leakage Past Loop II RHR Testable Check Valve and Inboard Injection Valve Resulting in Possible Voiding of Discharge Piping."

F. **Operator Actions**

In accordance with ODMI guidance and Operating Instruction 2-OI-74, "RHR System," Operations personnel aligned the Unit 2 ECCS keep fill from the Pressure Suppression Chamber (PSC) head tank to the Condensate Storage and Supply System (CS&S) to raise the system pressure to ensure that no steam voiding occurred in the Loop II LPCI piping. This action placed Loop II in an acceptable condition with respect to the applicable ODMI 210437

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A) (17)*

trigger point and action. Further, Operations personnel restored RHR Loop I to operable status by completion of work and clearance release.

G. **Safety System Responses**

None

III. CAUSE OF THE EVENT

A. **Immediate Cause**

The immediate cause for the inoperable RHR Loop II was increased leakage past the LPCI isolation valves, 2-CKV-074-0068, RHR Loop II Check Valve, and 2-FCV-074-0067, RHR Loop II LPCI Inboard Valve.

B. **Cause**

TVA has determined that the most probable cause of the back-leakage through 2-CKV-074-0068 and 2-FCV-074-0067 are the age of the components (original equipment) and the absence of preventive maintenance activities on the internals of these valves, which could result in uncorrected wear on the seating surfaces leading to unacceptable leakage and impact to plant operation.

C. **Contributing Factors**

None

IV. ANALYSIS OF THE EVENT

Background: On February 24, 2010, at 2026 hours, Operations personnel entered TS LCO 3.5.1 ECCS - Operating Condition A, "One low pressure ECCS injection/spray subsystem inoperable," for scheduled maintenance on an RHR Loop I room cooler. RHR Loop II LPCI piping had previously been confirmed to be full and free of voids by UT on February 20, 2010.

On February 25, 2010, at 1840 hours, Operations personnel entered TS LCO 3.0.3 based on entry into TS LCO 3.5.1 Action Condition H, "Two or more low pressure ECCS injection/spray subsystems inoperable for reasons other than Condition A," when RHR Loops I and II were inoperable. Loop II was declared inoperable based upon an ODMI pre-determined pressure/temperature value for LPCI piping void formation prevention.

Operations personnel began lowering reactor power using recirculation flow at 1935 hours when the conditions requiring entry into TS LCO 3.0.3 could not be corrected within an hour. TS LCOs 3.0.3 and 3.5.1 Condition H were exited at 2000 hours when RHR Loop II system pressure was raised using an alternate keep fill flow path to ensure that the LPCI piping would remain filled. At 2320 hours, reactor power was returned to 100 percent.

It was further determined through engineering evaluation that the ODMI monitoring value (trigger point) was conservative when actual keep fill system pressures were applied and that margin to actual void formation in the LPCI piping had been maintained. Following use of the alternate keep fill system, an ISI UT confirmed the absence of voids and was documented in the Operations Log at 0510 on February 26, 2010. Based on this information, there would not have been a failure of the system to complete its safety function.

RHR Loop I was returned to operable status at 0407 hours on February 26, 2010.

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V. ASSESSMENT OF SAFETY CONSEQUENCES

Monthly venting surveillances are performed on all Loops of RHR, and there have been no indications of increased temperature (by observance of steam) on the Unit 2 Loop I or on another BFN unit. However, it was determined that the extent of condition includes the LPCI outboard and inboard valves on RHR Loops I and II on all three Units.

The safety consequences of this event were not significant. It was determined that this condition does not compromise the primary containment isolation function or any operational mode of Unit 2 RHR Loop II. TVA concludes that the Unit 2 RHR system is capable of performing its design function for as long as the temperature in the piping is maintained below that prescribed in the ODMI 210437. Further, ISI UT before and after the TS LCO entry confirmed the absence of voids. The condition was also evaluated as being neither degraded nor non-conforming. Therefore, TVA concludes that there was no significant reduction in the protection of the public by this event.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

In accordance with ODMI guidance and Operating Instruction 2-OI-74, RHR System, Operations personnel aligned the Unit 2 ECCS keep fill from the PSC head tank to the CS&S System to raise the system pressure to ensure that no steam voiding occurred in the Loop II LPCI piping. This action placed Loop II in an acceptable condition with respect to the applicable ODMI 210437 trigger point and action.

B. Corrective Actions to Prevent Recurrence

Actions from the causal analysis are, for all three BFN units, 1) to revise the RHR System Monitoring Plan to incorporate taking periodic pipe temperatures of LPCI piping and 2) to initiate PMs to inspect/refurbish the internals of the LPCI check and inboard isolation valves.

VII. ADDITIONAL INFORMATION

A. Failed Components

None

B. PREVIOUS LERS ON SIMILAR EVENTS

None

C. Additional Information

Corrective action documents for this report are PERs 218493 and 210437.

D. Safety System Functional Failure Consideration:

This event is not classified as a safety system functional failure according to NEI 99-02. In view of the fact that RHR Loop II remained functional, this event is not reportable under 10 CFR 50.73(a)(2)(ii)(B), (unanalyzed condition), or 10 CFR 50.73(a)(2)(v)(B) (removal of residual heat) and (D) (mitigate the consequences of an accident).

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E. Scram With Complications Consideration:

This event did not include a reactor scram.

VIII. COMMITMENTS

None