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

December 3, 2013

10 CFR 50.73

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 50-259/2013-006-00**

The enclosed Licensee Event Report provides details of an event which resulted in the 1B Standby Liquid Control pump being inoperable for longer than allowed by the 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)(B).

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. J. Polson
Vice President

Enclosure: Licensee Event Report 50-259/2013-006-00 – 1B Standby Liquid Control Pump Inoperable For Longer Than Allowed By The 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 1

Licensee Event Report 50-259/2013-006-00

1B Standby Liquid Control Pump Inoperable For Longer Than Allowed By The Technical Specifications

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See Enclosed

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 10/31/2013

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.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE: 1B Standby Liquid Control Pump Inoperable For Longer Than Allowed By The 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	05000
10	04	2013	2013	006	00	12	03	2013	FACILITY NAME: N/A	DOCKET NUMBER: 05000

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
X	BR	BKR	G080	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 October 4, 2013, Browns Ferry Nuclear Plant (BFN) discovered, by performing a past operability evaluation, that the 1B Standby Liquid Control (SLC) pump was inoperable from December 1, 2012, at approximately 0145 hours Central Standard Time (CST) to February 14, 2013 at approximately 0625 hours CST.

On February 13, 2013, during performance of surveillance instruction 1-SI-4.4.A.1, Standby Liquid Control Pump Functional Test, an Assistant Unit Operator manually tripped the 1B SLC pump motor breaker when no water was observed flowing through the 1B SLC pump and the 1B SLC pump motor was producing a loud humming noise.

The root cause was determined to be an undetected crack in a 1B SLC pump motor breaker's phase arc chute that fatigued over time, broke apart, and inadvertently insulated the contacts. The 1B SLC pump was considered inoperable when the plant entered the mode of applicability on December 1, 2012, at approximately 0145 hours CST.

The corrective actions to prevent recurrence are: (1) revise procedures to include enhanced arc chute inspection to ensure sustainability, and (2) implement BFN, Units 1, 2, and 3, Engineering Change Packages to replace applicable safety related GE AK breakers.

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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 100 percent power.

II. Description of Events

A. Event:

On February 13, 2013, during the performance of 1-SI-4.4.A.1, Standby Liquid Control Pump Functional Test, the 1B SLC pump ran for approximately 25 seconds before water flow stopped. An Assistant Unit Operator (AUO) then turned the 1B SLC pump off in the field by tripping the pump breaker [BKR]. Operations personnel had previously declared the 1B SLC inoperable for the performance of surveillance instruction 1-SI-4.4.A.1.

On February 14, 2013, at approximately 0625 hours CST, after successful repair and performance of surveillance instruction 1-SI-4.4.A.1, Operations personnel declared 1B SLC pump Operable and exited Technical Specifications (TS) Limiting Conditions for Operation (LCO) 3.1.7 Condition A, one SLC subsystem inoperable.

On October 4, 2013, BFN discovered, by performing a past operability evaluation, that the 1B Standby Liquid Control (SLC) [BR] pump [P] was inoperable from December 1, 2012, at approximately 0145 hours Central Standard Time (CST) to February 14, 2013 at approximately 0625 hours CST.

It was determined from the past operability evaluation that the last successful performance of the functional test of the 1B SLC pump was on November 20, 2012, during a refueling outage. BFN, Unit 1, entered the applicability of TS LCO 3.1.7, Standby Liquid Control (SLC) System, on December 1, 2012, without the required SLC subsystem being Operable contrary to the requirements of TS LCO 3.0.4. TS LCO 3.0.4 prohibits entering the mode of applicability when a LCO is not met, except when certain conditions exist that were not applicable to this event.

In addition, during the period from December 1, 2012 to February 14, 2013, when the 1B SLC pump was inoperable, the 1A SLC pump was also concurrently inoperable. From February 12, 2013, to February 13, 2013, the 1A SLC pump was inoperable and TS 3.1.7 Condition B was entered. The associated TS 3.1.7 Required Action B.1, that requires one of the two SLC subsystems to be restored to Operable status within 8 hours, was satisfied within the required 8 hour Completion Time.

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.

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NARRATIVE

C. Dates and approximate times of occurrences:

November 20, 2012	Operations personnel successfully completed 1-SI-4.4.A.1.
December 1, 2012, at 0145 hours CST	BFN, Unit 1, entered Mode 2.
February 13, 2013, at 1420 hours CST	Operations personnel declared the 1B SLC subsystem inoperable during the performance of surveillance instruction 1-SI-4.4.A.1.
February 13, 2013, at 1550 hours CST	During the performance of surveillance instruction 1-SI-4.4.A1, the water flow stopped from the 1B SLC pump.
February 14, 2013, at 0625 hours CST	After successful repair and performance of surveillance instruction 1-SI-4.4.A.1, Operations personnel declared 1B SLC pump Operable and exited TS LCO 3.1.7 Condition A.
October 4, 2013	Operations personnel accepted the past operability evaluation.

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

The component that failed was a General Electric (GE) Type 480V AK breaker 1-BKR-063-0006B.

E. Other systems or secondary functions affected:

There were no other systems or secondary functions affected.

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

During performance of surveillance instruction 1-SI-4.4.A.1, the 1B SLC pump failed.

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

The 1B SLC pump motor [MO] breaker 'A' phase arc chute was found to be discolored with a piece broken off. The broken section of the arc chute fell into the 'A' phase contacts. This prevented contact closure between the contacts for one phase on the 1B SLC pump motor breaker and its matching contacts on the 1B SLC pump motor breaker cubicle.

H. Operator actions:

The 1B SLC pump motor breaker was manually tripped by an AUO.

NARRATIVE

I. Automatically and manually initiated safety system responses:

There were no automatically or manually initiated safety system responses for this event.

III. Cause of the event

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

Direct Cause

The direct cause of the 1B SLC pump motor breaker requiring to be manually tripped during surveillance instruction 1-SI-4.4.A.1 was a piece of nonconductive foreign material. The nonconductive foreign material prevented contact closure between the contacts for one phase on the 1B SLC pump motor breaker and its matching contacts on the 1B SLC pump motor breaker cubicle.

Root Cause

The root cause was determined to be an undetected crack in the 1B SLC pump motor breaker's 'A' phase arc chute that fatigued over time.

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

There were no human performance related root causes for this event.

IV. Analysis of the event:

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 which was prohibited by the plant's TS.

After inspection of the 1B SLC pump breaker, the 'A' phase arc chute revealed it was discolored and damaged. The broken section of the 'A' phase arc chute was removed, breaker cleaned, and the 'A' phase arc chute replaced. The 1B SLC pump motor breaker was reinstalled and the performance of surveillance instruction 1-SI-4.4.A.1 was completed satisfactorily on February 14, 2013. Prior to the 1B SLC pump motor breaker failure, the last successful performance of surveillance instruction 1-SI-4.4.A.1 was performed on November 20, 2012.

The root cause analysis for the 1B SLC pump motor breaker failure determined that the direct cause was nonconductive foreign material which broke off of the 'A' phase arc chute. This nonconductive foreign material became wedged between the contacts for one phase on the 1B SLC pump motor breaker and its matching contacts on the 1B SLC pump motor breaker cubicle which prohibited the 1B SLC pump motor from being supplied by its required three phase power. The blocked contacts only allowed single phase power to be supplied to the 1B SLC pump motor.

Although the 1B SLC pump motor breaker had been refurbished in 2004, the phase arc chutes are only visually inspected, i.e., inspection of the corona, cracks, chips, broke fins, and extensive burning or corrosion in the arc chutes. The phase arc chutes are not

replaced during the refurbishment process unless a defect is identified. Since the 1B SLC pump motor breaker was scrapped and involved personnel offered little information, an investigation to determine how the crack was initiated yielded no results.

The vendor stated that visual inspections were adequate to detect a crack and there was no need to conduct inspections using any form of magnification. The arc chutes are visually inspected through the preventive maintenance program. The initial visual inspection occurred on April 26, 2005. The last visual inspection was completed in August 2009. It did not reveal any cracks. It is suspected that a hairline crack went undetected and propagated over time during quarterly operation of the 1B SLC pump motor breaker during 1B SLC pump testing.

V. Assessment of Safety Consequences

The SLC System is a standby system designed to bring the reactor from full power to a cold, Xenon free, shutdown condition, assuming none of the withdrawn control rods can be inserted. It operates by injecting a Boron-10 solution into the Reactor Coolant System. The SLC System may also be manually aligned as an alternate source of high-pressure makeup water to the reactor. The SLC System is not intended to be a backup for the reactor scram function, i.e., it is not designed to rapidly insert negative reactivity when a safety setpoint is exceeded. The SLC System is used to control Suppression Pool pH in the event of a Loss of Coolant Accident combined with High Radiation in the Drywell or Suppression Chamber.

Based on the presence of the nonconductive foreign material, the 1B SLC pump would not have been able to perform its design function. The 1B SLC subsystem is assumed to have been inoperable from the last surveillance on the 1B SLC pump motor breaker, which was successfully performed on November 20, 2012.

A probabilistic risk assessment (PRA) evaluation was performed to assess the safety significance of the 1B SLC pump being inoperable from December 1, 2012, at approximately 0145 hours CST to February 14, 2013, at approximately 0625 hours CST. The PRA evaluation also determined that both subsystems of SLC were unavailable from February 13, 2013, at approximately 0632 hours CST until February 13, 2013, at approximately 1318 hours CST. The analysis evaluated the cumulative risk when the SLC subsystem(s) were considered unavailable. The PRA evaluation concluded that the incremental Conditional Core Damage Probability (ICCDP) was 4.73E-7 and the Incremental Conditional Large Early Release Probability (ICLERP) was 3.10E-8, which concludes that this event had low safety 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 SLC system consists of two 100 percent capacity positive displacement pumps. With the loss of one pump, the alternate pump would fulfill the design function of the SLC system for the required mission time. There was one period of time when the 1A SLC pump was unavailable from February 13, 2013, at approximately 0632 hours CST until February 13, 2013, at approximately 1318 hours CST.

NARRATIVE

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:

The BFN, Unit 1, was not shut down during this event.

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 1B SLC pump was determined to be inoperable from December 1, 2012, at approximately 0145 hours to February 14, 2013, at approximately 0625 hours. This period of inoperability started when BFN, Unit 1, was placed into Mode 2 after refueling outage 9 to February 14, 2013, at approximately 0625 hours when Operations personnel declared 1B SLC pump Operable and exited TS LCO 3.1.7 Condition A.

VI. Corrective Actions

Corrective Actions are being managed by TVA's corrective action program under Problem Evaluation Reports 681667 and 791685.

Immediate Corrective Actions

The 1B SLC pump motor breaker was racked out and disassembled for troubleshooting. During the troubleshooting of the 1B SLC pump motor breaker, the 'A' phase arc chute was found to be discolored with a piece broken off. The broken pieces were removed, breaker cleaned, the 'A' phase arc chute replaced, and the 1B SLC pump motor breaker was returned to service.

Corrective Actions to Prevent Recurrence or to Reduce Probability of Similar Events Occurring in the Future

1. Revise procedures to include enhanced arc chute inspection to ensure sustainability.
2. Implement BFN, Units 1, 2, and 3, Engineering Change Packages to replace applicable safety related GE AK breakers.

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 five years identified LER 50-296/2013-002-00, A Subsystem of the Standby Liquid Control System was Inoperable Longer than Allowed by the Plant's Technical Specifications. This LER identified a similar condition concerning the inoperability of the 3B SLC pump motor breaker that was discovered when the pump failed to start. The reason for the breaker failure and the corrective actions reported in LER 50-296/2013-002-00 do not directly relate to this event and would not have prevented this event from occurring.

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A search was performed on the BFN corrective action program. There were no corrective action program documents that were similar to this event.

B. Additional Information:

There is no additional information.

C. Safety System Functional Failure Consideration:

In accordance with Nuclear Energy Institute 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.