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

April 20, 2009

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop: OWFN, P1-35
Washington, D. C. 20555-0001

10 CFR 50.73

Dear Sir:

TENNESSEE VALLEY AUTHORITY - BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 2 - DOCKET 50-260 - FACILITY OPERATING LICENSE DPR - 52 - LICENSEE EVENT REPORT (LER) 50-260/2009-001-00

The enclosed report provides details of a manual reactor scram following stator cooling water equipment failure. TVA is reporting this in accordance with 10 CFR 50.73(a)(2)(iv)(A), as an event that resulted in a manual or automatic actuation of the systems listed in paragraph 10 CFR 50.73(a)(2)(iv)(B) (i.e., Reactor Protection System including reactor scram or trip, and general containment isolation signals affecting containment isolation valves in more than one system).

There are no commitments contained in this letter.

Sincerely,

James J. Randich FOR

R. G. West
Site Vice President, BFN
cc: See page 2

IE22
NRR

Enclosure
cc (Enclosure):

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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010

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.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Unit 2	05000260	1 of 5

4. TITLE: Manual Reactor Scram Following Stator Cooling Water Equipment Failure

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
									None	N/A
02	16	2009	2009	- 001 -	00	04	20	2009	FACILITY NAME: None	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)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER *(Include Area Code)*
Steve Austin, Licensing Engineer	256-729-2070

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

☐ 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 February 16, 2009, at 0513:47 hours Central Standard Time (CST), the Unit 2 reactor was manually scrammed and the turbine tripped in response to excessive stator cooling water temperature and initiation of the automatic turbine trip timer. At 0506 hours CST, operations received a stator cooling water abnormal alarm. Operations dispatched an auxiliary unit operator to the stator cooling water skid to investigate the alarm. At approximately 0512 hours CST, the idle stator cooling water pump was started. At 0513 hours, operations received alarms indicating the stator cooling water outlet temperature had exceeded the high temperature setpoint of 174 degrees F and the automatic turbine trip timer started. As required by Alarm Response Procedure, ARP-9-8A, Operations manually scrammed the reactor and tripped the turbine at 0513:47 hours CST. The root cause of this event was inadequate design of the stator cooling water system. In this event, the temperature controller and TCV-35-54 is a single point failure that led to the manual scram. The stator cooling water temperature control valve, TCV-35-54, is a proportioning valve that directs water flow through the stator cooling water heat exchangers. When the TCV is in the open position, flow bypasses the stator cooling water heat exchangers. In contrast, when the TCV is in the closed position, water flows through the stator cooling water heat exchangers. When the temperature controller failed, TCV-35-54 repositioned to the open position bypassing the heat exchangers. To prevent recurrence of this event, TVA's plans include design and install a temperature controlled solenoid that will vent the actuator air supply to TCV-35-54. Also, install a hand wheel to allow manual control of TCV-35-54.

NARRATIVE

I. PLANT CONDITION(S)

Prior to the event, Units 1, 2, and 3 were in operating in Mode 1 at 100 percent thermal power (approximately 3458 megawatts thermal). Units 1 and 3 were unaffected by the event.

II. DESCRIPTION OF EVENT

A. Event:

On February 16, 2009, at 0513:47 hours Central Standard Time (CST), the Unit 2 reactor was manually scrammed and the turbine tripped in response to excessive stator cooling water temperature [TJ], and initiation of the automatic turbine trip timer.

At 0506 hours CST, operations received a stator cooling water abnormal alarm. Operations dispatched an auxiliary unit operator to the stator cooling water skid to investigate the alarm. At approximately 0512 hours CST, the idle stator cooling water pump was started. At 0513 hours, operations received alarms indicating the stator cooling water outlet temperature had exceeded the high temperature setpoint of 174 degrees F and the automatic turbine trip timer started. As required by Alarm Response Procedure, ARP-9-8A, Operations manually scrammed the reactor and tripped the turbine at 0513:47 hours CST.

During the event, all automatic functions resulting from the scram occurred as expected. The main turbine generator [TA] tripped. All control rods [AA] inserted. The primary containment isolation system (PCIS) [JE] isolations: Group 2 (residual heat removal (RHR) system [BO] shutdown cooling), Group 3 (reactor water cleanup (RWCU)) [CE], System Group 6 (ventilation), and Group 8 (traversing incore probe (TIP)) [IG] were received along with the auto start of the control room emergency ventilation (CREV) [VI] system and the three standby gas treatment (SGT) [BH] system trains. As a result of the low reactor water level and high reactor pressure, Operations briefly entered Emergency Operating Instruction, (2-EOI-001) Reactor Pressure Vessel Control.

The 2-AOI-100-1, Reactor Scram, actions were completed as required. Operations reset the reactor scram by 0522 hours CST. By approximately 0540 hours CST, operations reset the PCIS actuations and secured the SGT and CREV systems.

TVA is submitting this report in accordance with 10 CFR 50.73(a)(2)(iv)(A). An event that resulted in a manual or automatic actuation of the systems listed in paragraph 10 CFR 50.73(a)(2)(iv)(B) (i.e., reactor protection system including reactor scram or trip, and general containment isolation signals affecting containment isolation valves in more than one system).

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

None.

C. Dates and Approximate Times of Major Occurrences:

February 16, 2009	0513:47 hours CST	Unit 2 reactor manually scrammed.
February 16, 2009	0845 hours CST	TVA made a four hour non-emergency report per 10 CFR 50.72(b)(2)(iv)(B) and an eight hour non-emergency report per 10 CFR 50.72(b)(3)(iv)(A).

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

The operations crew received main control room alarms indicating the stator cooling water temperature was abnormal. They also received control room alarm indicating the automatic turbine trip timer had started.

F. Operator Actions

Operations personnel responded to the event according to applicable plant procedures. They initiated the manual scram as required by the alarm response procedure, Turbine Trip Timer Initiated, ARP-9-8A. Following the manual scram, operations entered AOI-100-1, Reactor Scram.

G. Safety System Responses

The RPS logic responded to the reactor scram. All control rods inserted. The PCIS isolations Group 2 (RHR system shutdown cooling), Group 3 (RWCU system), Group 6 (ventilation), and Group 8 (TIP) isolation were received as expected, due to the lowering of the reactor water level, along with the auto start of the CREV system and the three SGT system trains. Emergency core cooling system actuation was not required.

III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause for the event was the failure of the controller for temperature control valve TCV-35-54. The initial investigation found the controller unresponsive.

B. Root Cause

The root cause of this event was inadequate design of the stator cooling water system. The system contains single failure points that can potentially result in a generator trip and subsequent reactor scram. In this event, the temperature controller and TCV-35-54 is the single point failure that required the manual scram.

C. Contributing Factors

Failure to recognize that the installation of a mechanical stop on the stator cooling water temperature control valve for protection against actuator spring failure on the temperature control valve was not an adequate solution for plant conditions that existed at the time of the scram.

NARRATIVE

IV. ANALYSIS OF THE EVENT

The stator cooling water temperature control valve, TCV-35-54, is a proportioning valve that regulates water flow through the stator cooling water heat exchangers. When the TCV is in the open position, flow bypasses the stator cooling water heat exchangers. In contrast, when the TCV is in the closed position, all of the cooling water flows through the heat exchangers. When the temperature controller failed, TCV-35-54 repositioned to the open position bypassing the heat exchangers.

In April of 2001, TVA installed a mechanical stop on the temperature control valve to limit the valve travel in the open position. The stop was set 1/8 inch above the midpoint of the valve travel. In March of 2003, the stop was adjusted to 3/8 inch above the midpoint of the valve travel. This adjustment increased the minimum stator cooling water temperature which at the time, was approximately 10 degrees too low. The investigation into the event determined that the correct mechanical stop position is dependent on many factors, the temperature of the raw cooling water [NG] being the most significant. Regular adjustment of the stop position would be necessary to provide protection against TCV and controller failure. TCV-35-54 was against the mechanical stop following the scram.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The safety consequences of this event were not significant. The manual scram was not complicated. BFN analysis includes a manual scram of the reactor from 100 percent power. During and following the manual scram, all safety systems operated as required. The operator actions taken in response to the failure of the stator cooling water system and the scram were appropriate. These actions included the verification that the reactor had shutdown, the expected system isolations and indications had occurred, and subsequent restoration of these systems to normal pre-scram alignment.

PCIS groups 2, 3, 6, and 8 isolations were as expected. Although the Emergency Core Cooling Systems were available, none were required. No main steam relief valves [SB] actuated. The turbine bypass valves [JI] maintained reactor pressure. The main condenser remained available for heat rejection. Reactor water level was recovered and maintained by the reactor feed water [SJ] and condensate [SG] systems. Therefore, TVA concludes that the event did not affect the health and safety of the public.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

TVA disassembled and inspected TCV-35-54 and did not identify any valve damage. A functional check of the temperature controller was performed. Prior to restart of Unit 2, TCV-35-54 was calibrated. A new position for the mechanical stop on TCV-35-54, 1/4 inch above the midpoint position, was established.

BFN revised the alarm response procedure for a failed temperature control valve or failed temperature controller. Added steps to isolate the air supply to the temperature control valve. This will direct maximum stator cooling water flow to the system heat exchangers. The revision also included moving the step to commence reduction of generator output to immediately following verification of a valid temperature alarm.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
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NARRATIVE

B. Corrective Actions to Prevent Recurrence [1]

To prevent recurrence of this event, TVA plans to design and install a temperature controlled solenoid that will vent the air supply to the actuator on TCV-35-54. TVA also plans to design and install a hand wheel to allow manual control of TCV-35-54.

VII. ADDITIONAL INFORMATION

A. Failed Components

None.

B. Previous LERs on Similar Events

None.

C. Additional Information

Corrective action document PER 163680.

D. Safety System Functional Failure Consideration:

This event is not a safety system functional failure in accordance with NEI 99-02.

E. Loss of Normal Heat Removal Consideration:

This event was not a complicated scram according to NEI 99-02.

VIII. COMMITMENTS

None.

[1] TVA does not consider these corrective actions as regulatory requirements. TVA will track the completion of these actions in the Corrective Action Program.