



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

January 31, 2012

10 CFR 50.73

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

Browns Ferry Nuclear Plant, Unit 1  
Facility Operating License No. DPR-33  
NRC Docket No. 50-259

Subject: **Licensee Event Report 50-259/2011-009-01**

Reference: Letter from TVA to NRC, "Licensee Event Report 50-259/2011-009-00,"  
dated December 5, 2011

On December 5, 2011, the Tennessee Valley Authority (TVA) submitted Revision 0 to Licensee Event Report (LER) 50-259/2011-009. In Revision 0, TVA indicated that it would provide additional details upon completion of the causal analysis of the as-found undervoltage trip for the reactor protection system 1A1 relay that did not meet acceptance criteria during several surveillances. TVA is submitting this supplemental LER in accordance with 10 CFR 50.73(a)(2)(i)(B), any operation or condition 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. E. Emens, Jr., Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

K. J. Polson  
Vice President

Enclosure: Licensee Event Report 259/2011-009-01 - As-Found Undervoltage Trip  
for the Reactor Protection System 1A1 Relay that Did Not Meet  
Acceptance Criteria During Several Surveillances

cc: See Page 2

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NRR

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cc (w/ Enclosure):

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

**ENCLOSURE**

**Browns Ferry Nuclear Plant  
Unit 1**

**Licensee Event Report 259/2011-009-01**

**As-Found Undervoltage Trip for the Reactor Protection System 1A1 Relay that Did  
Not Meet Acceptance Criteria During Several Surveillances**

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**See Attached**

## 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](mailto: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 1

## 2. DOCKET NUMBER

05000259

## 3. PAGE

1 of 7

## 4. TITLE: As-Found Undervoltage Trip for the Reactor Protection System 1A1 Relay that Did Not Meet Acceptance Criteria During Several Surveillances

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
10	06	11	2011	- 009	- 01	01	31	2012	N/A	05000
									N/A	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)

- |   |   |   |   |
|---|---|---|---|
| <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) |
| <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 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

Eric Bates, Licensing Engineer

## TELEPHONE NUMBER (Include Area Code)

256-614-7180

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
E	JC	RLY	X000	N					

## 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 6, 2011, while performing a functional evaluation on the reactor protection system (RPS) 1A1 relay undervoltage trips, Browns Ferry Nuclear Plant determined that the as-found undervoltage trip for the RPS 1A1 relay was less than the required acceptance criteria during several Technical Specification (TS) Surveillances performed from April 2007 to August 2011. Therefore, the RPS 1A1 relay was inoperable for an indeterminate period of time between these surveillances.

The root cause of this event was determined to be the surveillance test program does not provide specific instructions for past operability reviews when out of TS conditions are corrected during surveillances.

The corrective action to prevent recurrence is to revise the Surveillance Test Program procedure.

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		2011	-- 009	-- 01	

**NARRATIVE**

**I. PLANT CONDITION(S)**

At the time of discovery, Browns Ferry Nuclear Plant (BFN) Unit 1 was at approximately 100 percent power and unaffected by the event.

**II. DESCRIPTION OF EVENT**

**A. Event**

On October 6, 2011, while performing a functional evaluation (FE) on the Reactor Protection System (RPS) [JC] 1A1 relay [RLY] undervoltage trips, BFN determined that the as-found undervoltage trip for the RPS 1A1 relay was less than the required acceptance criteria (AC) during several Technical Specification (TS) Surveillances. The FE indicates, based on a review of equipment history and the cause of the failure, that the RPS 1A1 relay was considered unreliable from April 30, 2007, to October 5, 2011. As a result, for the purposes of this report, the RPS 1A1 relay is treated as being inoperable from April 30, 2007, to October 5, 2011. BFN Unit 1 TS Limiting Condition for Operation (LCO) 3.3.8.2 requires that two RPS electric power monitoring assemblies be operable in Modes 1, 2, and 3; and in Modes 4 and 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies for each inservice RPS motor generator (MG) [MG] set or alternate power supply [JX]. If one or both inservice power supplies with one electric power monitoring assembly were inoperable, the associated inservice power supply(s) are required to be removed from service in 72 hours. If this TS 3.3.8.2 Required Action is not met within 72 hours, the unit is required to be in Mode 3 within 12 hours and in Mode 4 within 36 hours. Also, 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 the as-found undervoltage trip for the RPS 1A1 relay was less than the required AC during several TS surveillances, it is probable that BFN Unit 1 operated with an inoperable RPS electrical power monitoring assembly longer than allowed by the TS. In addition, due to the RPS 1A1 relay condition, TS LCO 3.0.4 was not met for each applicable Mode change and for any control rod withdrawn from a core cell containing one or more fuel assemblies in Modes 4 or 5 that occurred since April 2007.

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

There were no inoperable structures, components, or systems that contributed to this event.

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**NARRATIVE**

**C. Dates and Approximate Times of Major Occurrences**

October 3, 2007	As-found undervoltage trip for the RPS 1A1 relay was less than the required AC during the performance of surveillance 1-SR-3.3.8.2.1(A), RPS Circuit Protector Calibration/Functional Test for 1A1 and 1A2.
September 3, 2008	As-found undervoltage trip for the RPS 1A1 relay was less than the required AC during the performance of 1-SR-3.3.8.2.1(A).
August 5, 2009	As-found undervoltage trip for the RPS 1A1 relay was less than the required AC during the performance of 1-SR-3.3.8.2.1(A).
September 3, 2010	As-found undervoltage trip for the RPS 1A1 relay was less than the required AC during the performance of 1-SR-3.3.8.2.1(A).
February 1, 2011	As-found undervoltage trip for the RPS 1A1 relay was less than the required AC during the performance of 1-SR-3.3.8.2.1(A).
August 7, 2011	As-found undervoltage trip for the RPS 1A1 relay was less than the required AC during the performance of 1-SR-3.3.8.2.1(A).
October 5, 2011	The RPS 1A1 relay was replaced.

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

There were no other systems or secondary functions affected.

**E. Method of Discovery**

The event was discovered during the preparation of the FE for the RPS 1A1 relay undervoltage trips.

**F. Operator Actions**

There were no operator actions.

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### NARRATIVE

#### **G. Safety System Responses**

There were no safety system responses.

### **III. CAUSE OF THE EVENT**

#### **A. Immediate Cause**

The immediate cause of this event was the as-found undervoltage trip for the RPS 1A1 relay was less than the required AC during the performance of several TS surveillances.

#### **B. Root Cause**

The root cause of this event was determined to be the surveillance test program does not provide specific instructions for past operability reviews when out of TS conditions are corrected during surveillances.

#### **C. Contributing Factors**

The contributing factor for this event was determined to be the use of the maintenance management system which failed to communicate critical information. The governing procedure for the maintenance management system does not provide guidance on how to close a work order (WO) properly in the electronic work management program. The maintenance management system procedure will be revised to provide the necessary guidance.

### **IV. ANALYSIS OF THE EVENT**

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

The RPS electric power monitoring system is provided to isolate the RPS bus from the MG set or an alternate power supply in the event of overvoltage, undervoltage, or underfrequency. This system protects the loads connected to the RPS bus against unacceptable voltage and frequency conditions and forms an important part of the primary success path of the essential safety circuits.

This event involves the as-found undervoltage trip of the RPS 1A1 relay. The required TS AC for undervoltage is  $\geq 108.5$  volts. In the event of an undervoltage condition for an extended period of time, the scram solenoids can chatter and potentially lose their pneumatic control capacity, resulting in a loss of a primary scram action.

The past performances of 1-SR-3.3.8.2.1(A) from April 2007 to August 2011 were evaluated as seen in the RPS 1A1 Relay Calibration Data table below.

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**NARRATIVE****RPS 1A1 Relay Calibration Data**

Date	RPS 1A1 Relay As-found	Problem Evaluation Report (PER)
04/30/2007	109.7	N/A
10/03/2007	106.3 <sup>(1)</sup>	131365
03/18/2008	109.7	N/A
09/03/2008	107.79 <sup>(1)</sup>	151812
03/19/2009	110.1	N/A
08/05/2009	107.6 <sup>(1)</sup>	178286
02/04/2010	110.1	N/A
09/03/2010	107.6 <sup>(1)</sup>	248513
02/01/2011	107.2 <sup>(1)</sup>	None
08/07/2011	106.4 <sup>(1)</sup>	413140

(1) These values indicate as-found undervoltage below required AC.

There were six different performances of 1-SR-3.3.8.2.1(A) that were in violation of the required AC. In each case, the as-found condition was documented in the WO to perform 1-SR-3.3.8.2.1(A), which demonstrates proper use of the procedure and understanding of the expectations regarding out of tolerance conditions. In all cases except for the February 1, 2011 performance of 1-SR-3.3.8.2.1(A), a PER was generated and the control room was notified. The missed PER for the February 1, 2011 performance of 1-SR-3.3.8.2.1(A) has been documented by PER 443793.

During the performance of 1-SR-3.3.8.2.1(A), the RPS 1A1 relay was calibrated within AC on each occasion. When making the operability determination, Operations personnel were not aware of past surveillance performance results that were below the AC prior to the August 7, 2011 performance of 1-SR-3.3.8.2.1(A). There is no evidence that this type of performance data is, or has been, trended for past performances to determine the impact on operability between surveillances.

For this event, the past inoperability began on April 30, 2007, when the RPS 1A1 relay as-found undervoltage trip reading was acceptable, and ended on October 5, 2011, when the RPS 1A1 relay was replaced. This conclusion was based on a review of the equipment history and the cause of the failure documented in the FE.

**Extent of Condition**

The extent of condition includes the relays on BFN Units 1, 2, and 3 for A, B, and C MG sets. Also, the extent of condition includes all surveillances that have failed an AC step that did not result in a component failure. The extent of condition is being addressed by



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**NARRATIVE**

reviewing the 2010 LCO Actions and the 2011 LCO Actions that have been entered for out of tolerance and out of TS compliance conditions that occurred during the performance of surveillances and determine if any past operability issues were missed. If there are any issues discovered, the issues will be documented in the corrective action program.

**Extent of Cause**

The extent of cause includes all preventive maintenance (PM) WOs and surveillances. The extent of cause is being addressed by revising NPG-SPP-06.2, Preventive Maintenance, to require, if an out of tolerance condition exists, the past three (3) performances of the surveillance are to be reviewed to determine if an equipment trend exists. If a trend is discovered, then a new service request (SR) will be required to be initiated in the corrective action program identifying the trend.

**V. ASSESSMENT OF SAFETY CONSEQUENCES**

The RPS provides timely protection against the onset and consequences of conditions that threaten the integrity of the fuel barrier and the nuclear system process barrier. The system is designed such that no single failure can prevent a reactor scram. The RPS includes the MG power supplies with associated control and indicating equipment, sensors, relays, bypass circuitry, and switches that supply a signal to the control rod drive system to cause rapid insertion of the control rods to shut down the reactor. Based on parameters that deviate from normal, the RPS is designed to automatically shutdown the reactor. With one RPS electric power monitoring assembly (RPS 1A1 relay) for an inservice RPS power supply that is inoperable, the remaining operable RPS electric power monitoring assembly will still provide protection to the RPS bus powered components under degraded voltage or frequency conditions.

Therefore, TVA concluded that there was no significant reduction to the health and safety of the public for this event.

**VI. CORRECTIVE ACTIONS** - The corrective actions are being managed by TVA's corrective action program.

**A. Immediate Corrective Actions**

Standing order 174 was issued to establish Operations department expectations when as-found data is found outside of acceptable regulatory guidelines.

**B. Corrective Actions**

The RPS 1A1 relay was replaced.

**C. Corrective Actions to Prevent Recurrence**

Revise procedure NPG-SPP-06.9.2, Surveillance Test Program, to:

1. Add flowchart for generating corrective actions when out of tolerance conditions are discovered for PM WOs.

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2. Require, if an out of tolerance condition exists, the past three (3) performances of the surveillance to be reviewed to determine if an equipment trend exists. If a trend is discovered, then a new SR will be required to be initiated identifying the trend.
3. Instruct Operations to request a past operability review in the event a surveillance performance is found to be not in compliance with its TS required value.

As a result of this procedure change, a change management plan will be required to be developed and implemented in accordance with TVA procedural requirements. This change management plan will identify any training requirements associated with the procedure change.

**VII. ADDITIONAL INFORMATION**

**A. Failed Components**

The failed component was the RPS 1A1 relay (original equipment manufacturer was indeterminate).

**B. Previous Similar Events**

Previous similar events occurred during the earlier performances of 1-SR-3.3.8.2.1(A) that were documented by PERs 131365, 151812, 178286, and 248513.

**C. Additional Information**

The corrective action documents for this report are PERs 413140 and 442914.

**D. Safety System Functional Failure Consideration**

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

**E. Scram With Complications Consideration**

This event did not include a reactor scram.

**VIII. COMMITMENTS**

There are no commitments.