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

November 26, 2012

10 CFR 50.73

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

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

Subject: **Licensee Event Report 50-296/2012-003-01**

Reference: Letter from TVA to NRC, "Licensee Event Report 50-296/2012-003-00," dated July 23, 2012.

In the reference letter dated July 23, 2012, the Tennessee Valley Authority (TVA) submitted a Licensee Event Report (LER) containing details of Browns Ferry Nuclear Plant, Unit 3, reactor automatic scram due to de-energization of the Reactor Protection System. Additional analysis was performed and TVA has revised the causal analysis. The TVA is submitting this supplemental report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(iv)(A) and 10 CFR 50.73(a)(2)(iv)(B).

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 50-296/2012-003-01 – Browns Ferry Nuclear Plant, Unit 3, Automatic Reactor Scram Due To De-Energization of Reactor Protection System From Actuation of 3A Unit Station Service Transformer Differential Relay

cc: See Page 2

IE22
NRR

cc (w/ Enclosure):

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

ENCLOSURE

Browns Ferry Nuclear Plant
Unit 3

Licensee Event Report 50-296/2012-003-01

Browns Ferry Nuclear Plant, Unit 3, Automatic Reactor Scram Due To De-Energization of Reactor Protection System From Actuation of 3A Unit Station Service Transformer Differential Relay

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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
Browns Ferry Nuclear Plant (BFN), Unit 3	05000296	1 of 6

4. TITLE: Browns Ferry Nuclear Plant, Units 3, Automatic Reactor Scram Due To De-Energization of Reactor Protection System From Actuation of 3A Unit Station Service Transformer Differential Relay

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
05	22	2012	2012	- 003 -	01	11	26	2012	FACILITY NAME: N/A	DOCKET NUMBER: 05000

9. OPERATING MODE

1

10. POWER LEVEL

19

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)*
Mark Acker, Licensing Engineer	256-729-7533

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 May 22, 2012, at 0249 Central Daylight Time, the BFN, Unit 3, reactor was automatically scrammed due to de-energization of the Reactor Protection System from actuation of the 3A Unit Station Service Transformer (USST) differential relay 387SA, which resulted in a loss of 500 kilovolt (kV) power to BFN, Unit 3. All safety systems responded as expected to the loss of 500kV power. No Emergency Core Cooling System or Reactor Core Isolation Cooling (RCIC) System reactor water level initiation set points were reached. The RCIC System was manually started to control reactor water level. Primary Containment Isolation System initiation signals for groups 1, 2, 3, 6 and 8 were received as expected due to loss of power.

The immediate cause of this event was the 3A USST differential relay was installed with incorrect design calculation settings which resulted in the BFN, Unit 3, scram.

The root cause of this condition was inadequate procedural guidance within NEDP-5, Design Document Reviews, for the types of review required by engineering.

The corrective action to prevent recurrence is to revise NEDP-5, Design Document Reviews, to establish the definition and requirements for each type of review.

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NARRATIVE

I. PLANT CONDITION(S)

At the time of discovery, Browns Ferry Nuclear Plant (BFN), Unit 3, was in Mode 1 at approximately 19 percent rated thermal power following a refueling outage. The Main Turbine [TA] was not operating and BFN, Unit 3, was not synchronized with the grid.

II. DESCRIPTION OF EVENT

A. Event:

On April 7, 2012, BFN, Unit 3, began refueling outage 15. During the refueling outage, Design Change Notice (DCN) 61731 installed, in part, 3A Unit Station Service Transformer (USST) [XFMR] differential relay [RLY] 387SA. The refueling outage ended on May 20, 2012, and BFN, Unit 3, entered Mode 1.

On May 22, 2012, at 0249 Central Daylight Time (CDT), BFN, Unit 3, reactor was automatically scrammed due to de-energization of the Reactor Protection System (RPS) [JC] from actuation of the 3A USST differential relay 387SA, which resulted in a loss of 500 kilovolt (kV) power to BFN, Unit 3. This relay was picked up during a transfer of 4kV Unit Board 3C from alternate power (161kV) to normal power (3A USST). All BFN, Unit 3, diesel generators [DG] successfully started and tied to their respective 4kV Shutdown Boards. Power from the 161kV offsite circuit remained available during the entire event. Subsequently, 500kV power was restored through the alternate feeder breakers [BKR] to all Unit 3 4kV Unit Boards.

All safety systems responded as expected to the loss of 500kV power. No Emergency Core Cooling System (ECCS) [BJ][BO][BM][SB] or Reactor Core Isolation Cooling (RCIC) System [BN] reactor water level initiation set points were reached. The RCIC System was manually started to control reactor water level. Primary Containment Isolation System (PCIS) [JM] initiation signals for groups 1, 2, 3, 6 and 8 were received as expected due to loss of power. At the time of the scram, the High Pressure Coolant Injection (HPCI) [BJ] system was tagged out for removal of temporary instrumentation following planned maintenance.

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

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

C. Dates and Approximate Times of Major Occurrences:

April 7, 2012	BFN, Unit 3, begins refueling outage 15.
April - May, 2012	3A USST differential relay 387SA installed.
May 20, 2012	BFN, Unit 3, refueling outage 15 ended and BFN, Unit 3, entered Mode 1.

NARRATIVE

May 22, 2012, 0249 CDT	BFN, Unit 3, reactor automatically scrammed due to de-energization of the RPS.
May 22, 2012, 0430 CDT	Offsite power was restored to BFN, Unit 3, 4kV Shutdown Boards.

D. Other Systems or Secondary Functions Affected

There were no other systems or secondary functions affected.

E. Method of Discovery

This condition was identified when BFN, Unit 3, reactor was automatically scrammed due to de-energization of the RPS from actuation of the 3A USST differential relay, which resulted in a loss of 500kV power to BFN, Unit 3.

F. Operator Actions

Operators manually started RCIC to control reactor water level and restored power through the alternate feeder breakers to all BFN, Unit 3, 4kV unit boards.

G. Safety System Responses

All safety systems responded as expected to the loss of 500kV power. All BFN, Unit 3, diesel generators successfully started and tied to their respective 4kV Shutdown Boards. No ECCS or RCIC System reactor water level initiation set points were reached. The RCIC System was manually started to control reactor water level. PCIS initiation signals for groups 1, 2, 3, 6 and 8 were received as expected due to loss of power. At the time of the scram, the HPCI system was tagged out for removal of temporary instrumentation following planned maintenance.

III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause of this issue was the installation of a differential relay for the 3A USST with incorrect design calculation settings.

B. Root Cause

The root cause of this condition was inadequate procedural guidance within NEDP-5, Design Document Reviews, for the types of review required by Engineering.

C. Contributing Factors

This event has three contributing causes. First, risk reviews performed during the creation of DCN 61731 were less than adequate. Second, procedure use and adherence throughout the process of DCN 61731 was inadequate. Finally, Engineering Management, at all levels, failed to ensure the proper use of technical human performance tools in regards to design change reviews due to weak guidance contained in NEDP-5.

NARRATIVE

IV. ANALYSIS OF THE EVENT

TVA is submitting this report in accordance with 10 CFR 50.73(a)(2)(iv)(A), as any event or condition that resulted in manual or automatic actuation of any of the systems listed in 10 CFR 50.73(a)(2)(iv)(B) except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation.

On May 22, 2012, BFN, Unit 3 reactor automatically scrammed due to de-energization of the RPS from actuation of the 3A USST digital differential relay 387SA, which resulted in a loss of 500kV power to BFN, Unit 3. The immediate cause of this issue was a digital differential relay for the 3A USST was installed with incorrect design calculation settings. The incorrect settings were provided by a vendor. TVA Engineering personnel failed to identify this error in their review of the vendor design calculations.

The root cause of this condition was inadequate procedural guidance within NEDP-5, Design Document Reviews, for the types of review required by engineering. In addition, Mechanical Design Standard DS-M18.1.3, Engineering Procurement & Vendor Technical Quality, indicated that Tennessee Valley Authority Nuclear Engineering should not assume the responsibility for detailed checking of vendor information. Actions are being taken to revise these documents (Problem Evaluation Report (PER) 555573).

A contributing cause to this condition was risk reviews throughout the creation of DCN 61731 were inadequate. As part of the risk reviews, the evaluation of Operating Experience (OE) was inadequate. Had OE been adequately evaluated, the issue of digital differential relays with deficient relay settings causing plant scrams throughout the industry would have been identified, and the risk would have been determined to be high instead of low. Since the risk associated with the DCN was not assessed appropriately, proper barriers were not put in place to ensure issues would not occur. Actions are being taken to revise procedures to ensure quality risk reviews are performed throughout the DCN process (PER 555573).

Procedure use and adherence throughout the creation of DCN 61731 was inadequate. The relay was not tested for integrated plant operation during post modification testing. This is contrary to the requirements in NPG-SPP-06.9.3, Post Modification Testing, for a DCN Test Scoping Document. Actions are in place to emphasize the importance of procedural use and adherence (PER 484548).

Finally, Engineering Management failed to ensure the proper use of technical human performance tools in regards to design change reviews due to weak guidance contained in NEDP-5. Weaknesses were indentified in process requirements and the application of standards. The only remaining barriers to ensure technical rigor are experience, expertise, and additional quality checks. The first line supervisor is expected to provide the appropriate level of quality checks and to follow procedural requirements to consider the experience and expertise of the assigned individual. Actions to address this condition include the creation of a new administrative procedure that provides direction for a consistent approach to augment technical rigor, risk identification, and mitigation of at risk behaviors for technical tasks on risk significant activities (PER 543131).

NARRATIVE

Extent of Condition

The extent of condition is any relay that is defective, including incorrect settings, and exists or may exist in other plant systems. A review of past history throughout TVA regarding incorrect relay settings, as well as digital relays that are defective, was performed. Few failures of newly installed relays have occurred and these failures were documented and corrected. To ensure future problems with defective relays do not go unidentified prior to installation, technical reviews of design calculations and post modification testing of packages prepared by outside organizations that were complete and waiting to be installed were completed. These reviews did not uncover any further errors. In addition, protective relay modifications performed during the past 5 years at BFN will be re-evaluated to verify settings are correct and post modification testing was performed (PER 555573).

Extent of Cause

The extent of cause for this event is limited to the inadequate procedural guidance and expectations pertaining to the design change process. Root Cause Analysis (RCA) 505709 was recently conducted to determine the reason for less than adequate procedures. RCA 505709 determined that management and supervisors are not aligned around a common set of goals and accountability has been ineffectively implemented. To address this issue, BFN is implementing a policy that focuses BFN managers and supervisors on the standards and expectations, including accountability, contained in TVA's Nuclear Operating Model (NOM) and Institute of Nuclear Power Operations (INPO) 09-011, Achieving Excellence in Performance Improvement.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The less than adequate reviews and risk assessments associated with DCN 61731 did reduce defense-in-depth to nuclear safety. Inadequate reviews allowed errors to occur while inadequate risk assessments allowed personnel to become comfortable with the task. These actions eventually resulted in the BFN, Unit 3, scram. However, during the event, all safety systems responded as expected to the loss of 500kV power. All BFN, Unit 3, diesel generators successfully started and tied to their respective 4kV Shutdown Boards. No ECCS or RCIC System reactor water level initiation set points were reached. The RCIC System was manually started to control reactor water level. PCIS initiation signals for groups 1, 2, 3, 6 and 8 were received as expected due to loss of power.

Therefore, this condition is of low safety significance and posed little risk to public health and safety.

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

A. Immediate Corrective Actions

Reviewed design of relay settings and corrected relay setting values.

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NARRATIVE

B. Corrective Actions to Prevent Recurrence

Revise NEDP-5, Design Document Reviews, to establish the definition and requirements for each type of review and to eliminate ambiguous terminology.

VII. ADDITIONAL INFORMATION

A. Failed Components

There were no failed components.

B. Previous Similar Events

A search of BFN LERs for Units 1, 2, and 3, for approximately the past five years did not identify any similar events.

A search was performed on the BFN corrective action program. Similar PER 558183 was identified.

C. Additional Information

The corrective action documents for this report are PERs 484548, 543131, 505709, and 555573.

D. Safety System Functional Failure Consideration:

In accordance with NEI 99-02, this issue is not considered a safety system functional failure.

E. Scram With Complications Consideration:

This reactor scram was uncomplicated in accordance with NEI 99-02.

VIII. COMMITMENTS

There are no commitments.