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

March 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 50-296/2012-001-00**

The enclosed Licensee Event Report (LER) provides details of an annunciator panel power supply fire that occurred in the Browns Ferry Nuclear Plant, Unit 3, Control Room on January 26, 2012. The circumstances of this event did not cause an entry into emergency action levels and did not cause a significant hampering of the Operations crew that was on duty. Therefore, the Tennessee Valley Authority (TVA) is submitting this report as a voluntary LER.

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,

S. BONO
by direction

K. J. Polson
Vice President

Enclosure: Licensee Event Report 50-296/2012-001-00 - Annunciator Panel Power Supply Fire in Unit 3 Control Room.

cc (w/ Enclosure):

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

IE22
NRR

ENCLOSURE

Browns Ferry Nuclear Plant, Unit 3

Licensee Event Report 50-296/2012-001-00
Annunciator Panel Power Supply
Fire in Unit 3 Control Room

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)

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4. TITLE: Annunciator Panel Power Supply Fire in Unit 3 Control Room

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
									XX	05000
01	26	2012	2012	- 001 -	00	03	26	2012	FACILITY NAME: XX	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)	Voluntary

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Paul A. Herrmann III, Licensing Program Manager	256-729-7479

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	IB	JX	T076	N					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
XX	XX	XX

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

On January 26, 2012, at 1908 hours Central Standard Time (CST) Browns Ferry Nuclear Plant (BFN), Unit 3, was in Mode 1 at 100 percent power. Operations personnel in the BFN, Unit 3, Control Room, smelled smoke and observed a flame coming from the bottom of a power supply located in an annunciator panel. Operations personnel opened a breaker, which resulted in the fire being extinguished at 1918 CST. The loss of some annunciator alarms and indications resulted when the breaker was opened. Operations personnel were able to monitor compensatory indications. There was no loss of assessment capability. The event did not result in any entry to a required emergency action level, such as declaring a Notification of Unusual Event (NOUE).

The cause of the event was a failed power supply. An overcurrent was caused by an aged capacitor that had not received preventative maintenance to address its service life. A corrective action was initiated to replace the affected power supplies.

Previous similar events addressed the failure of an annunciator module in March, 2008; the failure of a power supply in May 2008; and a failed power supply in an annunciator panel in July 2009.

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NARRATIVE

I. PLANT CONDITION(S)

At the time of the event, Browns Ferry Nuclear Plant (BFN), Unit 3, was in Mode 1 and at 100 percent power.

II. Narrative

A. Event

At 1908 hours CDT, on January 26, 2012, Unit 3 Operations personnel called Fire Operations (fire brigade) concerning a fire in an annunciator panel [IB] [PL]. The lower power supply [JX] was on fire and a small flame was visible from the bottom power supply. The burning power supply was located in Annunciator Panel 3-XA-55-5A. Fire Operations arrived. The Unit 3 Unit Supervisor (US) directed that a breaker (Breaker 138) [BKR] was to be opened. Opening the breaker extinguished the fire. At 1918 hours the fire event was ended. Damage was confined to two power supplies and cards inside the panel.

The Shift Manager (SM) determined that entry into Radiological Emergency Plan (REP) classification 8.3-U, Loss of Assessment Capability, was not warranted. Classification 8.3-U addresses an unplanned loss of most or all safety system annunciators or indicators, which results in a significant loss of plant assessment capability for greater than 15 minutes and compensatory non-alarming safety systems are available, such as Safety Parameter Display System (SPDS) and Integrated Computer System (ICS). For this event, only a small number of alarms were affected. Operations personnel were able to monitor compensatory indications from the alarm response procedure (3-ARP-9-5A for Panel 9-5). Operations personnel ensured that there was no loss of assessment capability. As a result, there was no increased risk that a degraded plant condition could go undetected.

The SM also determined that entry into REP classification 6.4-U1 concerning a confirmed fire in any plant area not extinguished within 15 minutes was not warranted. In addition, REP classification 6.4-A for an ALERT condition to address the fires that potentially affect one or more redundant trains of safety systems or structures containing safety systems was determined to be not warranted. Entry was not warranted due to the short duration of the fire (less than 15 minutes) and that there was no damage or potential damage to safety systems or any fire or explosion affecting safety system performance.

Work was completed on January 27, 2012, to replace both power supplies and restore the associated annunciator panel.

This event was determined not to meet the level of significant hampering described in regulatory guidance and a voluntary licensee event report is being submitted since the event may be of generic interest or concern.

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NARRATIVE

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

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

C. Dates and Approximate Times of Major Occurrences:

January 26, 2012, at 1908 hours CDT	Unit 3 Operations personnel called Fire Operations (Fire Ops) for a fire in the Control Room due to smelling smoke and observing a small fire.
January 26, 2012, at 1908 hours CDT	Unit 3 Operations personnel determined that the source of the smoke was a burning power supply on Annunciator Panel 3-XA-55-5A.
January 26, 2012, at 1913 hours CDT	Fire Ops arrives in Control Room.
January 26, 2012, at 1914 hours CDT	Unit 3 Unit Supervisor (US) directed that Breaker 138 was to be opened.
January 26, 2012, at 1918 hours CDT	Fire confirmed to be extinguished.
January 26, 2012, at 1943 hours CDT	Increased monitoring for parameters affected by the loss of annunciators implemented.
January 27, 2012, at 0145 hours CDT	Power supplies replacement begins for Panel 3-9-5, Annunciator 3-XA-55-5A.
January 27, 2012, at 0230 hours CDT	After completion of preventative maintenance testing, annunciators are restored and increased monitoring for affected parameters is terminated.

D. Other Systems or Secondary Functions Affected

There were no other systems or secondary functions affected.

E. Method of Discovery

The event was self-revealing to the Operations personnel on duty in the BFN, Unit 3, Control Room.

F. Operator Actions

Operations personnel responded to the fire event in the Unit 3 Control Room, transitioned into appropriate procedures, analyzed the conditions associated with the fire, and closed the breaker, extinguishing the fire.

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NARRATIVE

G. Safety System Responses

No safety systems responses were affected.

III. CAUSE OF THE EVENT

A. Cause

The fire resulted from a failed annunciator power supply on overcurrent due to aging. There was no preventative maintenance program to address expected service life.

B. Extent of Condition

The identified condition affects the annunciator power supplies associated with BFN, Unit 2 and Unit 3. Power supplies that are part of the extent of condition are those manufactured by Technologies Incorporated and either of its two subsidiaries, Statalarm and Lundell. This condition could also extend to those power supplies manufactured by other vendors that contain electrolytic capacitors. It should be noted that these annunciator power supplies were classified as non-critical.

The annunciator power supply system for BFN, Unit 1, was replaced during the restart effort. The power supply design in use at BFN, Unit 1, incorporates new technology, such as an over-temperature shutdown feature that will shutdown the power supply if the temperature is between 203 to 221 degrees Fahrenheit, thus making a fire much less likely. This design also uses redundant power supplies, which makes the failure of an annunciator window panel less likely.

IV. ANALYSIS OF THE EVENT

Gross failure of the power supplies was discovered by a small visible flame in the Unit 3 annunciator panel 3-XA-55-5A. Visual examination determined that the likely cause of the fire was combustion of a resistor on the 140VDC output portion of the lower power supply. The resistor ignited due to prolonged exposure to overcurrent. Evaluation of the power supply circuit indicates that the overcurrent condition was most likely the result of the breakdown of the associated electrolytic capacitor. Capacitors have many layers that breakdown with use. Shorts develop between the layers as they breakdown. As more layers short, current increases through the capacitor. The overcurrent condition created by the capacitor breakdown can exceed the level of current that other circuit components can tolerate. In this case, the overcurrent appears to have melted the windings of the associated transformer as well as to lead to the combustive failure of the resistor. The fire that resulted from the combustion of the resistor burned some of the other components on the power supply. The extent of burn damage to these components was inversely proportional to their distance from the resistor. The heat from the fire also burned the resistors of the upper power supply. The resistors/upper power supply were replaced subsequent to the event.

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EPRI guidelines recommend replacement of electrolytic capacitors every 8 to 10 years. As such, electrolytic capacitors may serve as the limiting component for these power supplies in terms of service length. The 3-XA-55-5A2 (lower) power supply appears to have been installed prior to the original start-up of BFN, Unit 3, in 1977. The BFN, Unit 3, control room annunciator system remained in service through the shutdown and restart of Unit 3, in 1985 and 1995 respectively. Therefore, the maximum in-service age of the 3-XA-55-5A2 power supply components is approximately 34 years.

Related to this event was the lack of completion of previously developed actions to address control room annunciator power supply replacement initiated by PER 391479, which was issued in June 2011. Actions were in progress to establish specific unique identifiers for the existing power supplies associated with control room annunciators for BFN, Units 2 and 3. The establishment of a unique identifier was necessary for an accurate equipment replacement classification and the creation of the necessary preventative maintenance (PM) program actions. The power supplies failed prior to their replacement being scheduled.

V. ASSESSMENT OF SAFETY CONSEQUENCES

As a result of actions performed by Unit 3 Control Room staff in response to the fire, there were no safety consequences. As noted, only a small number of alarms were affected. Unit 3 Control Room personnel were able to monitor compensatory indications. Procedure 3-ARP-9-5A addresses the Alarm response procedure for the affected panel. The measures established resulted in the Operators monitoring the parameters associated with the annunciators' windows as a result of the failed power supply. In addition, there was no loss of assessment capability and there was no increased risk that a degraded plant condition could go undetected.

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

A. Immediate Corrective Actions

1. The US directed a breaker to be opened which extinguished the fire.
2. Operations personnel increased monitoring for parameters affected by the loss of annunciators on the associated panels.

B. Corrective Actions

1. Replaced the damaged power supplies
2. Replace the Units 2 and 3 control room annunciators' power supplies that have been in service for greater than four years.
3. Establish PM requirements to replace the Units 2 and 3 control room annunciators' power supplies on a 10 year frequency.

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NARRATIVE

VII. ADDITIONAL INFORMATION

A. Failed Components

The failed power supply was manufactured by Technologies Incorporated.

B. Previous Similar Events

PER 139700 (March 2008) addressed the failure of annunciator module 2-XA-55-3F power supplies and also indicated the presence of smoke. A call for fire emergency was initiated. The smoke cleared once the associated breaker was opened.

PER 144292 (May 2008) addressed the failure of the 3-XA-55-3C power supplies that was discovered when the associated alarms would not reset. The smell of acrid smoke was observed in the Unit 3 Control Room. Both power supplies were subsequently replaced [WO 08-715793-000].

PER 175558 (July 2009) indicated an "electrical smell" was found to be caused by a failed power supply in annunciator panel 2-XA-055-0006B. The fuses were pulled and WO 09-719081-000 was initiated to replace the power supplies.

C. Additional Information

The Corrective Action Program document for this report is PER 469592.

D. Safety System Functional Failure Consideration:

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

E. Scram With Complications Consideration:

There was no scram associated with his event.

VIII. COMMITMENTS

None