



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

MAR 14 1994

U.S. Nuclear Regulatory Commission 10 CFR 50.73
ATTN: Document Control Desk
Washington, D.C. 20555


Dear Sir:

BROWNS FERRY NUCLEAR PLANT (BFN) UNITS 1, 2, AND 3 - DOCKET NOS. 50-259, 260, AND 296 - FACILITY OPERATING LICENSE DPR-33, 52, AND 68 - LICENSEE EVENT REPORT 50-260/94001

The enclosed report provides details concerning a loss of instrumentation input logic for the plant's Division II Emergency Core Cooling Systems (ECCS) caused by a blown fuse to the ECCS Division II, Analog Trip Unit (ATU) Inverter. The blown fuse resulted from a failed ATU Inverter control card.

The report is submitted pursuant to 10 CFR 50.73(a)(2)(i)(B), 50.73(a)(2)(v), and 50.73(a)(2)(vii).

Sincerely,



Site Vice President

Enclosure
cc: See page 2

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U.S. Nuclear Regulatory Commission
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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNRB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Browns Ferry Nuclear Plant (BFN) Unit 2	DOCKET NUMBER (2) 05000260	PAGE (3) 1 of 6
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TITLE (4) Entry into Technical Specification 1.C.1 due to a loss of Emergency Core Cooling Systems (ECCS) Division II instrumentation resulting from a blown fuse.

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME N/A	DOCKET NUMBER
02	14	94	94	001	00	03	14	94	FACILITY NAME N/A	DOCKET NUMBER

OPERATING MODE (9) N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
POWER LEVEL (10) 100	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)						
	20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)						
	20.405(a)(1)(ii)	50.36(c)(2)	X 50.73(a)(2)(vii)	OTHER						
	20.405(a)(1)(iii)	X 50.73(a)(2)(i)(B)	50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)						
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)							
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)								

LICENSEE CONTACT FOR THIS LER (12)

NAME James W. Davenport, Regulatory Licensing Engineer	TELEPHONE NUMBER (Include Area Code) (205) 729-2690
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS
X	AD	FU	N431	N					
X	AD	INVT	N431	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On February 14, 1994, at 0929 hours CST, with Unit 2 at approximately 100 percent power, Control Room operators received alarms that indicated a loss of Unit 2, Division II Emergency Core Cooling Systems (ECCS) instrumentation. ECCS provides adequate cooling to the reactor core under abnormal and accident conditions utilizing various diverse and redundant cooling systems. The operators declared Division II of ECCS instrumentation inoperable, resulting in all ECCS being declared inoperable, and entered Technical Specification (TS) 1.C.1 (i.e., Standard TS 3.0.3) which requires that the unit be placed in Hot Standby within six hours and Cold Shutdown within 30 hours.

Operators initiated troubleshooting which found that a fuse had blown on the Division II Analog Trip Unit (ATU) Inverter. Further investigation identified the root cause of the event to be a failed ATU Inverter control card. The fuse and control card were replaced. The affected systems were returned to service. Operators exited TS 1.C.1 at 1226 hours CST before having to initiate actions to achieve Hot Standby. TVA sent the removed ATU Inverter control card to the manufacturer for further analysis.

This event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as any operation or condition prohibited by the plant's TS due to the entry into TS 1.C.1. Additionally, this event is reportable in accordance with 10 CFR 50.73(a)(2)(v) and 10 CFR 50.73(a)(2)(vii).

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Browns Ferry Unit 2	05000260	94	001	00	2 of 6

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

I. PLANT CONDITIONS

Unit 2 was at approximately 100 percent power (3287 megawatts thermal). Units 1 and 3 were shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event

On February 14, 1994 at 0929 hours CST, Control Room operators received alarms indicating a loss Division II Instrumentation for the plant's Emergency Core Cooling Systems (ECCS). Level and/or pressure input signals were lost to the instrumentation logic for the following ECCS subsystems:

- * High Pressure Coolant Injection (HPCI) [BJ]
- * Core Spray (CS), Division II [BG]
- * Residual Heat Removal (RHR), Division II [BO]
- * Anticipated Transient Without Scram (ATWS), Division II [JC]
- * Automatic Depressurization System (ADS), Division II [JC]
- * HPCI (Flow Controller) [BJ]

ECCS Division I instrumentation remained operable and was available for initiation of both divisions of the affected systems with the exception of HPCI, which had also lost power to its flow controller. The event did not require plant operators to take any actions other than initiation of troubleshooting activities.

Plant operators declared the subsystems or division of subsystems inoperable. Because there was no single TS Limiting Conditions for Operation (LCO) which enveloped the event, plant operators entered Technical Specification (TS) 1.C.1 (i.e., Standard TS 3.0.3). TS 1.C.1 requires the unit be placed in Hot Standby within six hours and Cold Shutdown within 30 hours.

Plant maintenance personnel conducted troubleshooting of the ECCS Division II Instrumentation logic. TVA determined that the event was initiated when a direct current (DC) input fuse [FU] on the ECCS Division II, Analog Trip Unit (ATU) Inverter [INVT] cleared causing a loss of input logic signals from the affected systems to the control room instrumentation.

The ATU Inverter internal components were visually inspected using vendor manual recommendations to determine the cause of the fuse failure. There were no discrepancies identified. However, during post maintenance testing of the fuse replacement, TVA determined that the ATU Inverter control card should also be replaced.

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Following replacement of the control card, the appropriate testing was performed and the test results were acceptable. Operators declared the ECCS Division II operable and exited TS 1.C.1 at 1226 hours CST on February 14, 1994, before having to initiate actions required to achieve Hot Standby.

TVA determined this event to be reportable pursuant to 10 CFR 50.73(a)(i)(B) as a condition prohibited by TS due to entry into TS 1.C.1. This event was also determined to be reportable in accordance with 10 CFR 50.73(a)(2)(v) as an event that alone could have prevented the fulfillment of structures or systems required to mitigate the consequences of an accident due to HPCI system being declared inoperable. Additionally, this event is reportable in accordance with 10 CFR 50.73(a)(2)(vii) as any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems.

This event was also reported to NRC, via the Emergency Notification System as a condition that was outside the design basis of the plant (i.e., 10 CFR 50.72(b)(a)(ii)(B)). However, further evaluation determined that this event did not meet that reporting criteria. Further explanation is provided in Section IV of this report.

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

None.

C. Dates and Approximate Times of Major Occurrences:

February 14, 1994 at 0929 CST	Division II ECCS Instrumentation lost due to blown ATU Inverter fuse.
1033 CST	A one-hour notification was made to NRC in accordance with 10 CFR 50.72(b)(2)(ii)(B). (Note: Notification was attempted at 1018 hours CST. However, due to difficulties with the Federal Telecommunications System a commercial line was utilized.)
1108 CST	Fuse replaced in Division II ECCS ATU Inverter.

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1130 CST TVA determined that ATU Inverter control card should be replaced.

1226 CST Division II ECCS ATU Inverter repaired, Post Maintenance Testing completed and LCO exited.

D. Other Systems or Secondary Functions Affected:

None.

E. Method of Discovery:

This event was promptly discovered at 0929 hours CST on February 14, 1994 when Control Room alarms indicated ECCS Division II instrumentation problems. Primary among the alarms received was the ECCS Analog Trip Unit Trouble Alarm.

F. Operator Actions:

There were no TS safety system initiations required of Control Room operators. The steps taken to identify the problem, and initiate maintenance actions were appropriate.

G. Safety System Responses:

None Required.

III. CAUSE OF THE EVENT

A. Immediate Cause:

The immediate cause of the event was a blown fuse in the ECCS Division II, ATU Inverter.

B. Root Cause:

Verbal information from the manufacturer's failure analysis indicates the root cause of the event to be a failure of the ECCS Division II, ATU Inverter control card.

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C. Contributing Factors:

None.

IV. ANALYSIS OF THE EVENT

A blown fuse on the ECCS Division II, ATU Inverter caused a loss of level and/or pressure input signals from the HPCI, CS, RHR, ATWS, and ADS to their respective instrumentation logic systems.

This event did not result in a condition outside the plant's design basis for the following reasons:

- This event resulted from a power supply failure to the instrumentation logic for the ECCS Division II. However, Division I instruments remained operable during the event and were available to Control Room operators for initiation of both divisions of ECCS.
- The BFN Final Safety Analysis Report (FSAR), Section 6.5.1, states in part that, "... the reliability and redundancy of the controls and instrumentation for the Emergency Core Cooling Systems shows that no failure of a single initiating sensor either prevents or falsely starts the initiation of these cooling systems. No single control failure prevents the combined cooling systems from providing the core with adequate cooling."
- The event did not result in any plant transient described in the BFN FSAR, Chapter 14 accident analyses.

Therefore, based on the above, this event did not result in a condition outside the design basis of the plant nor did it adversely affect the health and safety of plant personnel or the public.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

The blown fuse was replaced in the ECCS Division II ATU Inverter. The ATU Inverter control card was also replaced as a result of anomalies with the Inverter output voltage and frequency that were observed when power was restored to the Inverter.

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B. Corrective Actions to Prevent Recurrence:

TVA has shipped the Inverter control card to the manufacturer for further analysis as to the cause of the failure. TVA requested the manufacturer to provide guidance for any additional maintenance, Preventive Maintenance (PM) or other corrective action regarding the Inverter control card.

It should be noted that the vendor manual does not identify either of the failed components (fuse and Inverter control card) to be age susceptible. Further, the vendor manual does not specify any PM or periodic testing for these components. Additionally, there have been no other reportable events of a similar failure. Therefore, TVA considers that there are no further corrective actions warranted, at this time, to prevent recurrence of the event.

VI. ADDITIONAL INFORMATION

A. Failed Components:

- * Fuse (FU1), Part No. A025F060, Manufactured by Carbone-Ferraz
- * Inverter Control Card (PC1), Part No. 2033002, Manufactured by HDR Power Systems, Inc.

B. Previous LERs on Similar Events:

TVA has reviewed previous BFN LERs to determine if similar events have occurred. LERs have been written as a result of fuse failures; however, no incident has occurred with the same root cause.

VII. Commitments

TVA will have the manufacturer perform a failure analysis of the ECCS Division II, Inverter control card to determine if additional maintenance and/or other corrective action is required. This action will be completed by June 1, 1994.

Energy Industry Identification System (EIIIS) system and component codes are identified in the text with brackets (e.g., [XX]).