



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

R. D. (Rick) Machon  
Vice President, Browns Ferry Nuclear Plant

May 3, 1996

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

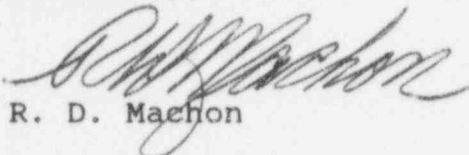
10 CFR 50.73

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 50-259/96003**

The enclosed report provides details concerning the unexpected auto-start of all eight plant emergency diesel generators. This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv) as a condition that resulted in automatic actuation of an engineered safety feature.

Sincerely,



R. D. Machon

Enclosure  
cc: See page 2

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U.S. Nuclear Regulatory Commission

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May 3, 1996

Enclosure

cc (Enclosure):

Mr. Mark S. Lesser, Branch Chief  
U.S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

NRC Resident Inspector  
Browns Ferry Nuclear Plant  
10833 Shaw Road  
Athens, Alabama 35611

Mr. J. F. Williams, Project Manager  
U.S. Nuclear Regulatory Commission  
One White Flint, North  
11555 Rockville Pike  
Rockville, Maryland 20852

**LICENSEE EVENT REPORT (LER)**

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001.

FACILITY NAME (1)

Browns Ferry Nuclear Plant Unit 1

DOCKET NUMBER (2)

05000259

PAGE (3)

1 OF 6

TITLE (4)

All Eight Plant Emergency Diesel Generators Unexpectedly Auto-Started From A Spurious High Drywell Pressure Signal In The Core Spray Logic.

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	DOCKET NUMBER
4	3	96	96	003	00	5	3	96	BFN Unit 2	05000260
									BFN Unit 3	05000296

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
POWER LEVEL (10)	000	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)					
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)					
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71					
		20.2203(a)(2)(ii)	20.2203(a)(4)	X 50.73(a)(2)(iv)	OTHER					
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A					
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)						

LICENSEE CONTACT FOR THIS LER (12)

NAME

Clare S. Hsieh, Compliance Engineer

TELEPHONE NUMBER (Include Area Code)

(205) 729-2635

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).

X NO

EXPECTED SUBMISSION DATE (15)

MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On April 3, 1996, at 1616 hours, with Unit 1 shutdown and defueled, Unit 2 in cold shutdown for a scheduled refueling outage, and Unit 3 operating at 100 percent power, Unit 2 received an unplanned engineered safety feature actuation due to a spurious high drywell pressure signal in the core spray (CS) logic. All eight plant emergency diesel generators (EDG) auto-started, as designed. The EDGs did not tie onto their respective 4kV shutdown boards. Emergency Equipment Cooling Water pumps also started to provide cooling water to the EDGs. Additionally, all four Unit 2 CS pumps and Residual Heat Removal (RHR) pump 2D started. The operator immediately secured the CS pumps and RHR pump 2D. The CS high drywell initiation logic and high drywell pressure initiation signals were reset. The EDGs were shutdown and returned to standby readiness. This event occurred when a fault was introduced into the Emergency Core Cooling System (ECCS) logic while wires were being prepared for termination in an energized ECCS Analog Trip Unit panel. The root cause was inadequate work planning. The job scoping of the workplan did not adequately address the special conditions required to perform work with the panel energized. A problem evaluation report was initiated for this event. TVA will review and enhance the administrative process for reviewing and rescoping of workplans when revisions are made to work with the equipment energized.

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

I. PLANT CONDITIONS

At the time of this event, Unit 1 was shutdown and defueled. Unit 2 was in cold shutdown for a scheduled refueling outage. Unit 3 was operating at 100 percent power.

II. DESCRIPTION OF EVENT

A. Event:

On April 3, 1996, at 1616 hours, Unit 2 received an unplanned engineered safety feature (ESF) [JE] actuation due to a spurious high drywell pressure signal in the core spray (CS) [BG] logic. (This was an invalid signal since no actual high drywell pressure condition existed.) All eight plant emergency diesel generators (EDG) [EK] auto-started, as designed. The EDGs did not tie onto their respective 4kV shutdown boards [EB]. Emergency Equipment Cooling Water (EECW) [BI] pumps B3 and C3 also started to provide cooling water to the EDGs. (EECW pumps A3 and D3 were already in service.)

Additionally, all four Unit 2 CS pumps and residual heat removal (RHR) [BO] pump 2D started. (RHR pump 2B was in service in shutdown cooling mode, and RHR pumps 2A and 2C were tagged to support maintenance activities.) The affected plant systems responded, as expected, except for RHR pump 2D, which started without the required 21 second time delay due to a time delay relay failure. (The failed relay has subsequently been replaced.)

RHR loop II injection valve, which had been throttled for shutdown cooling, received a full open signal. (RHR loop I was tagged out for outage.) The start of RHR pump 2D coupled with fully opening of the throttled RHR injection valve resulted in an increased shutdown cooling flow rate. The Unit Operator [UO] [utility, licensed] immediately secured the CS pumps and RHR pump 2D. At 1621 hours, the operator throttled the RHR loop II shutdown cooling flow.

During this event, the CS injection valves did not open because they were tagged in the closed position with the associated breakers open. No water from any external source was injected into the reactor vessel nor was there a loss of shutdown cooling. At 1651 hours, the operator reset the CS high drywell initiation logic and high drywell pressure initiation signals.

Operations personnel [utility, licensed and nonlicensed] investigating the cause of the auto-start found multiple Analog Trip Units (ATU) high gross failure indications in the Emergency Core Cooling System (ECCS) Division I ATUs panel (2-9-81).

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There were no surveillances or tests in progress that would have caused these indications. However, a digital feedwater modification workplan (WP) was being performed in panel 2-9-81, and at the time of the event, an electrician [contractor] was preparing wires for termination at the back of this panel.

A problem evaluation report (PER) was initiated for this event. At 1710 hours, Unit 1/2 EDGs were shutdown and returned to standby readiness. At approximately 1721 hours, EECW pumps B3 and C3 were secured, and the Unit 3 EDGs was placed in standby readiness.

The event is reportable pursuant to 10 CFR 50.73(a)(2)(iv) as a condition that resulted in automatic actuation of an ESF.

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

None.

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

December 14, 1995                      Digital feedwater modification WP (W25841-038), involving lifting, relanding, deleting, and installing internal wiring in panel 2-9-81, was approved.

March 12, 1996                          WP Number W25841-038 revised to work the panel energized in support of required surveillances testing.

March 16, 1996                          WP Number W25841-038 authorized for work in panel 2-9-81.

April 3, 1996,  
    at 1616 hours                      All eight plant EDGs unexpectedly auto-started. EECW, CS, and RHR pumps started. The operator immediately secured the CS and RHR pumps.

    at 1651 hours                      CS high drywell initiation logic and high drywell pressure initiation signals reset. TVA initiated a PER for this event.

    at 1710 hours                      Unit 1/2 EDGs shutdown and returned to standby readiness.

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at 1721 hours

EECW pumps secured. Unit 3 EDGs placed in standby readiness.

at 1805 hours

TVA made a 4-hour non-emergency notification to NRC in accordance with 10 CFR 50.72(b)(2)(ii).

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

None.

**E. Method of Discovery:**

This condition was discovered when the UO in the control room received indications and alarms [ALM] that all eight plant EDGs had auto-started.

**F. Operator Actions:**

The UO secured the Unit 2 CS pumps and RHR pump 2D. The operator verified that the initiation of the ESF was invalid. The Operations personnel went to the Unit 2 Auxiliary Instrument Room to investigate the cause of the EDGs auto-start.

**G. Safety System Responses:**

All safety systems responded as designed except for RHR pump 2D, which started immediately without the required time delay.

**III. CAUSE OF THE EVENT**

**A. Immediate Cause:**

This event occurred when an electrician [contractor] introduced a fault into the ECCS logic while preparing wires for termination in panel 2-9-81. The fault caused a spurious high drywell pressure signal in the logic, which in combination with the existing low reactor pressure condition in Unit 2 resulted in the ESF actuation.

**B. Root Cause:**

The root cause was inadequate work planning. The job scoping for the digital feedwater modification WP (W25841-038) did not adequately address the special conditions required to perform work with the panel energized. (W25841-038 was originally approved to be worked with panel 2-9-81 deenergized. It was subsequently revised to work with the panel energized in support of surveillances testing.) As a result, the electrician was not sufficiently aware of the impact of his actions on potential safety system actuations.

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The electrician [contractor] had removed insulation from several wires in panel 2-9-81, and the stripped wires were in the process of being taped when the ESF actuation occurred. Some of these wires with bare ends were found dangling in close proximity to the ATU terminals and grounds. One or more wires inadvertently came in contact with different wiring points on the ATUs while working in the panel.

**IV. ANALYSIS OF THE EVENT**

In this event, plant safety systems and associated components performed as designed. Operations personnel promptly identified that the source of the ESF actuation was from the ECCS Division I ATUs panel and took appropriate corrective actions to restore the plant systems to standby readiness. This event did not affect the health and safety of plant personnel and the public.

The event was caused by one or more wires coming in contact with panel components and/or ground, and an electrical fault was introduced into the ECCS logic. This was shown by the fact that the primary containment was open, with the reactor in the refueling mode, when a high drywell pressure signal initiated the event.

TVA's analysis of the event indicates four types of faults that could have caused the ATUs to fail high. They are as follows: (1) cable capacitive discharge due to grounding of the externally induced voltage, (2) grounding of the ATU power (24VDC) supply +/- leg, (3) shorting across the ATU power (24VDC) supply terminals, and (4) shorting of ATU power (24VDC) supply + leg to ATU signal path. Any one or combination of these faults caused the ATUs to drive high.

**V. CORRECTIVE ACTIONS**

**A. Immediate Corrective Actions:**

Operations personnel immediately secured RHR pump 2D and the Unit 2 CS pumps. The EDGs were shutdown and returned to standby readiness in accordance with operating procedures. Work in panel 2-9-81 was halted. A PER was generated to document this event.

**B. Corrective Actions to Prevent Recurrence:**

Since the testing which required the panel to be energized was completed, the remainder of the work in panel 2-9-81 was completed with the panel deenergized. Similar work in panel 2-9-82 (ECCS Division II ATUs) was performed with the panel deenergized without any additional ESF actuations.

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

TVA will enhance the administrative process for reviewing and rescoping of WPs when revisions are made to work with the equipment energized. TVA will review the process for other enhancements, if deemed necessary and prudent by the reviewer.<sup>1</sup>

VI. ADDITIONAL INFORMATION

A. Failed Components:

None.

B. Previous LERs on Similar Events:

There have been several LERs written to document unplanned EDG auto-starts. However, none of these LERs occurred as a result of modifications work in ATU panels. Most of the inadvertent ESF actuations were the result of making unplanned electrical contacts while testing initiation logic circuits.

VII. COMMITMENTS

None.

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

<sup>1</sup> These actions are enhancements. They are not regulatory requirements.