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John T. Herron
Vice President, Browns Ferry Nuclear Plant

October 20, 2000

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

10 CFR 50.73

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

Docket No. 50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 3 - DOCKET NO. 50-296 - FACILITY OPERATING LICENSE DPR-68 - LICENSEE EVENT REPORT (LER) 50-296/2000-007-00

The enclosed report provides details concerning the inoperability of two low pressure Emergency Core Cooling Systems injection/spray subsytems which occurred during surveillance testing.

This report is submitted in accordance with 10 CFR 50.73 (a)(2)(i)(B), as any operation or condition prohibited by the plant's Technical Specifications.

Sincerely,

for J. T. Herron

John T. Herron

cc: See page 2

IE22

Enclosure
cc (Enclosure):

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NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001
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 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), 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. If 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.

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TITLE (4)
Inoperability of Two ECCS Injection/Spray Subsystems During Surveillance Testing

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
									NA	
09	21	00	2000	007	000	10	20	00	NA	

OPERATING MODE (9): 1
POWER LEVEL (10): 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)(B)		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)		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	TELEPHONE NUMBER (Include Area Code)
Anthony T. Rogers, Nuclear Engineer-Licensing	(256) 729-2977

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
X	BM	FU	G190	Y					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

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

On September 21, 2000, at 1011 hours Central Daylight Time (CDT), with Unit 3 operating at 100 percent power, two Emergency Core Cooling System (ECCS) injection/spray subsystems became inoperable at the same time. This was preceded, at 0846 hours CDT, by entering a 7 day Limiting Condition for Operation (LCO) to perform initiation logic and injection valve opening pressure permissive logic functional testing on Residual Heat Removal (RHR) Loop I. At 1011 hours CDT a spurious fuse clearing caused Core Spray (CS) Loop I logic to become inoperable. In accordance with Technical Specification (TS) 3.5.1, ECCS-Operating, Action H, LCO 3.0.3 was entered immediately since two injection/spray subsystems were inoperable. By 1035 hours CDT, LCO 3.0.3 was exited after the fuse had been replaced and CS Loop I operability was restored. The cause of the fuse clearing was determined to be a short circuit condition. Possible causes were investigated, and even though there was no positive evidence, the most likely cause of the short circuit condition was the result of personnel performing the RHR logic testing in the panel. Following fuse replacement, all normally-energized components in the CS logic chain were inspected to verify their operability and to eliminate the possibility that a component failure resulted in the short circuit. This condition was evaluated and determined to have very little risk significance. Therefore, the safety of the plant, its personnel, and the public were not compromised by this event.

TVA is reporting this event in accordance with 10 CFR 50.73 (a)(2)(i)(B) as any operation or condition prohibited by the plant's TS.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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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 2 and Unit 3 were operating in Mode 1 at 100 percent power. Unit 1 was shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event:

On September 21, 2000, at 1011 hours Central Daylight Time (CDT), with Unit 3 operating at 100 percent power, two Emergency Core Cooling System (ECCS) injection/spray subsystems became inoperable at the same time. This was preceded, at 0846 hours CDT, by entering a 7 day Limiting Condition for Operation (LCO) to perform initiation logic and injection valve opening pressure permissive logic functional testing on Residual Heat Removal (RHR) Loop I. At 1011 hours CDT a spurious fuse clearing caused Core Spray (CS) Loop I logic to become inoperable. In accordance with Technical Specification (TS) 3.5.1, ECCS-Operating, Action H, LCO 3.0.3 was entered immediately since two injection/spray subsystems were inoperable. By 1035 hours CDT, LCO 3.0.3 was exited after the fuse had been replaced and CS Loop I operability was restored.

TVA is reporting this event in accordance with 10 CFR 50.73 (a)(2)(i)(B) as any operation or condition prohibited by the plant's TS.

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

None.

C. Dates and Approximate Times of Major Occurrences:

September 21, 2000, at 0846 hours CDT	Unit 3 entered a 7 day LCO for surveillance testing of RHR Loop I.
September 21, 2000, at 1011 hours CDT	Fuse in CS Loop I Logic cleared, rendering the system inoperable. Entered LCO 3.0.3.
September 21, 2000, at 1035 hours CDT	Fuse replaced in CS Loop I Logic and the system returned to standby readiness. Exited LCO 3.0.3.
September 21, 2000, at 2301 hours CDT	RHR Loop I testing completed satisfactorily. Exited 7 day LCO.

D. Other Systems or Secondary Functions Affected:

None.

E. **Method of Discovery:**

The operating crew in the main control room immediately recognized the alarm for the cleared fuse and determined CS Loop I being inoperable requiring that TS LCO 3.0.3 be entered.

F. **Operator Actions:**

Operator actions in response to the event were proper and in accordance with applicable plant procedures.

G. **Safety System Response:**

None required.

III. CAUSE OF THE EVENT

A. **Immediate Cause:**

The immediate cause was clearing of a fuse in CS Loop I logic while RHR Loop I was inoperable for scheduled surveillance testing.

B. **Root Cause:**

The cause of the fuse clearing was a short circuit in the core spray logic. The root cause of the short circuit could not be determined. Possible causes were investigated and even though there was a lack of positive evidence, it was concluded that the most likely cause of the short circuit condition was the result of personnel performing the RHR logic testing in the panel.

C. **Contributing Factors:**

None.

IV. ANALYSIS OF THE EVENT

A task analysis was performed to determine if the performance of the Unit 3 RHR Loop I logic system functional test, 3-SR-3.3.5.1.6(A I), that could have resulted in clearing fuse 14A-F2A in the CS logic circuit. This task analysis consisted of a review of the procedures and drawings, interviews with personnel involved with the RHR logic test, and visual inspection of the test area in the Unit 3 Auxiliary Instrument Room.

At the time the fuse cleared, the RHR logic test was in progress which simulates a low water level signal, and a jumper is placed across contacts 9 and 10 of CS logic relay 14A-K8A to simulate the second low water level signal necessary to complete the logic for RHR initiation. The jumper was installed per the test procedure and the step completed satisfactorily. However, near the time that the jumper was removed, the Unit 3 main control room received annunciator "Core Spray Sys I Logic Pwr Failure", which was subsequently determined to be a result of fuse 14A-F2A clearing.

IV. ANALYSIS OF THE EVENT (continued)

After the test was stopped, the procedure steps were reviewed using the test procedure, the RHR system elementary drawing, and the CS elementary drawing. This review concluded that the procedure steps, as written, should not have resulted in a short circuit which could clear the fuse. The fuse which cleared was part of the CS initiation logic circuit. The electrical current flow through contacts 9 and 10 of relay 14A-K8A (and hence the jumper placed across these contacts) comes from the RHR initiation logic circuit, although the relay is a CS logic relay. Therefore, any postulated surge in current resulting from placing or removing this jumper should be experienced only in the RHR logic circuit. No fuses in the RHR logic circuit cleared during this test.

The procedure steps for this test were compared to the corresponding steps in the Unit 3 RHR Loop II logic test, and the Unit 2 RHR Loop I and II logic tests. This comparison determined that the methodology used for testing this portion of the logic was not unique (i.e., that the other loops of RHR are tested in a similar manner). The performance history of the Unit 3 RHR Loop I logic test was reviewed, and it was verified that the procedure had been successfully performed on September 18, 1998. The revision levels of the 1998 performance was checked against the current revision level, and it was determined that there had been no procedure revisions since the last successful performance which could have resulted in the fuse clearing. The test steps were re-performed after the fuse had been replaced, and the fuse clearing did not recur.

Near the time of the fuse clearing, electricians in the Unit 3 auxiliary instrument room had just removed a jumper which had been across contacts 9 and 10 of relay 14A-K8A. The electricians stated that they observed no arcing in the panel, and that the jumper did not contact any other conductors in the panel aside from the relay contacts noted above. An inspection of the jumper immediately after the event showed no discoloration around the conductor. A visual inspection of the panel showed no indications of burning on any of the relay studs of 14A-K8A. On a bench test, a new ATM-10 fuse was intentionally shorted using a 250 volt DC source and a jumper similar to the one used in the surveillance. Although the 250 volt DC test source was only capable of delivering a maximum of 15 amps, when the test fuse was shorted it cleared immediately, a spark was visible and audible, and a discolored mark remained on the jumper and fuse at the point of the arc.

The 14A-K8A relay is physically located at shoulder height in the middle of the panel, so it is easy to reach without crouching or stooping in an awkward position. The three terminal strips involved in this event were also closely inspected, with no visible discoloration or any other signs of arcing on any of the terminals. The terminal strip contacts are recessed ¾ inch in the insulating material of the strip, making it unlikely that two adjacent terminals could be inadvertently shorted by an individual working in the panel. However, this could not be totally ruled out as the cause. All wiring in the panel runs through insulated wire chases to protect the wires. No loose or disconnected wires were found in the panel.

The U3 core spray logic was reviewed for possible failed components which may have caused the fuse failure. All components in this logic chain which are by design normally-energized were visually verified to be energized. This eliminated the possibility that a component failure resulted in a short circuit.

IV. ANALYSIS OF THE EVENT (continued)

After the fuse was replaced, the DC current through 14A-F2A was checked to verify that the fuse was not operating near its rated capacity. The current measured was 0.13 amps on Unit 3 (0.14 amps on Unit 2), well within the capacity of the fuse. A thermography scan of the fuse block verified there was no overheating due to bad connections. The scan revealed no abnormal temperatures on the fuse or block. The fuse and block were essentially at room temperature. The failed fuse was returned to the vendor (Gould-Shawmut) for analysis. The fuse contains a single element, with a notched segment which is designed to melt when current through the fuse exceeds the fuse rating. The vendor inspected the failed fuse by x-ray. The x-ray image indicated that the entire notched area of the fuse element was gone, indicating that the fuse cleared when subjected to a short circuit.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The ECCS are designed, in conjunction with the primary and secondary containment, to limit the release of radioactive materials to the environment following a loss of coolant accident (LOCA). The ECCS uses two independent methods (flooding and spraying) to cool the core during a LOCA. The ECCS network consists of the High Pressure Coolant Injection System [BJ], the CS System, the low pressure coolant injection (LPCI) mode of RHR System, and the Automatic Depressurization System [SB]. The CS System is composed of two independent subsystems. Each subsystem consists of two 50% capacity motor driven pumps, a spray sparger above the core, and piping and valves to transfer water from the suppression pool to the sparger. LPCI is an independent operating mode of the RHR System. There are two LPCI subsystems, each consisting of two motor driven pumps and piping and valves to transfer water from the suppression pool to the reactor vessel via the corresponding recirculation loop.

The limiting core/containment cooling configuration assumed for the calculating the effects of a design basis loss of coolant accident (LOCA) is the availability of one CS subsystem and one RHR subsystem consisting of two RHR pumps with associated pumps and heat exchangers.

During this condition, one CS subsystem and one RHR subsystem remained operable. Therefore, this did not result in a failure that would have prevented the fulfillment of the safety function of structures or systems that are needed to shutdown the reactor, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident because the remaining subsystems have sufficient capacity to cool the core during a LOCA.

However, since all ECCS subsystems are designed to ensure that no single active component failure will prevent automatic initiation and successful operation of the minimum required ECCS equipment, TS require entry into LCO 3.0.3.

The condition existed for less than 25 minutes and the NRC Significance Determination Process indicates this condition is of very little risk significance (green). Therefore, the safety of the plant, its personnel, and the public were not compromised by this event.

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

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

Cleared CS Loop I Logic fuse identified and replaced. RHR Logic testing resumed and completed satisfactorily.

B. Corrective Actions to Prevent Recurrence:

Thermography scan of the fuse block verified no unusual temperature conditions exist.

The amperage through the Unit 2 and Unit 3 circuits were measured during normal standby conditions.

VII. ADDITIONAL INFORMATION

A. Failed Components:

Gould-Shawmut Fuse, Model ATM-10.

B. Previous Similar Events:

None.

C. Additional Information:

None.

D. Safety System Functional Failure:

This event did not result in a safety system functional failure as described in NEI 99-02, Revision 0, since this was not an event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to shutdown the reactor, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident because the remaining subsystems have sufficient capacity to cool the core during a LOCA.

VIII. COMMITMENTS

None.