



Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379-2000

Ken Powers  
Vice President, Sequoyah Nuclear Plant

May 3, 1994

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

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET  
NO. 50-327 - FACILITY OPERATING LICENSE DPR-77 - LICENSEE EVENT REPORT  
(LER) 50-327/94005

The enclosed LER provides details concerning inadvertent feedwater  
isolations that occurred during the preparation for unit start-up. These  
events are being reported in accordance with 10 CFR 50.73(a)(2)(iv) as  
automatic engineered safety feature actuations.

Sincerely,

Ken Powers

Enclosure  
cc: See page 2

100012  
9405100139 940503  
PDR ADDCK 05000327  
S PDR

JE22

U.S. Nuclear Regulatory Commission  
Page 2  
May 3, 1994

cc (Enclosure):

INPO Records Center  
Institute of Nuclear Power Operations  
700 Galleria Parkway  
Atlanta, Georgia 30339-5957

Mr. D. E. LaBarge, Project Manager  
U.S. Nuclear Regulatory Commission  
One White Flint, North  
11555 Rockville Pike  
Rockville, Maryland 20852-2739

NRC Resident Inspector  
Sequoyah Nuclear Plant  
2600 Igou Ferry Road  
Soddy-Daisy, Tennessee 37379-3624

Regional Administrator  
U.S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323-2711

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Sequoyah Nuclear Plant (SQN), Unit 1 DOCKET NUMBER (2) PAGE (3)  
050003 27 10F 07

TITLE (4)

Inadvertent Feedwater Isolations (FWIs) During Preparation for Unit Start-up

EVENT DAY (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)					
			SEQUENTIAL	REVISION				FACILITY NAMES			DOCKET NUMBER(S)			
MONTH	DAY	YEAR	NUMBER	NUMBER	MONTH	DAY	YEAR							
0	4	03	9	4	0	0	5	0	0	05	03	9	4	050003

OPERATING MODE | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:

(9) | 3 | (Check one or more of the following)(11)

POWER	LEVEL	(10)	0	0	0	20.402(b)	20.405(c)	XX	50.73(a)(2)(iv)	73.71(b)
						20.405(a)(1)(i)	50.36(c)(1)		50.73(a)(2)(v)	73.71(c)
						20.405(a)(1)(ii)	50.36(c)(2)		50.73(a)(2)(vii)	OTHER (Specify in
						20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	Abstract below and in
						20.405(a)(1)(iv)	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)	Text, NRC Form 366A)
						20.405(a)(1)(v)	50.73(a)(2)(iii)		50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME | TELEPHONE NUMBER  
J. Bajraszewski, Compliance Licensing | AREA CODE |  
6 | 1 | 5 | 8 | 4 | 3 | - | 7 | 7 | 4 | 9

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	A	A	B	K	R	W	1	2	1	Y	

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED MONTH DAY YEAR

SUBMISSION

DATE (15)

YES (If yes, complete EXPECTED SUBMISSION DATE) | X | NO

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

On April 3, 1994, at 1024 and 1840 Eastern daylight time (EDT) and on April 9, 1994, at 0239 EDT with Unit 1 in hot standby (Mode 3), inadvertent FWIs occurred. The first event occurred during troubleshooting activities with the reactor trip breaker (RTB) auxiliary contacts as a result of personnel's failure to follow the work instruction. The involved individuals were counseled on the requirements to follow work document instruction steps. The second event occurred upon closure of the RTBs in the preparation for rod-drop testing. The subsequent testing and inspection of the breaker did not confirm the root cause of the spurious FWI. Test instrumentation data indicated that the signal may have been created by voltage spikes during movement of the auxiliary switch rotary contacts as the breaker traveled to the closed position. The third event occurred during observation of the RTB after one of the two RTBs failed to close. While explaining an observed difference between two breaker-locking levers, an individual inadvertently moved the locking lever on the closed breaker. This resulted in the breaker traveling to the open position and the initiation of an FWI. The cause of the event was personnel error. The appropriate disciplinary action was taken with the involved individual. Both RTBs were replaced. The replacement breakers were inspected, tested, and placed in service.

**LICENSEE EVENT REPORT (LER)**  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)										PAGE (3)			
Sequoyah Nuclear Plant (SQN), Unit 1			SEQUENTIAL		REVISION										
		YEAR	NUMBER		NUMBER										
	05000312794--005--0002OF07														

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

**I. PLANT CONDITIONS**

Unit 1 was in hot standby, Mode 3, for the three events.

**II. DESCRIPTION OF EVENT**

**A. Events**

**Event No. 1**

On April 3, 1994, at 1024 Eastern daylight time (EDT), an inadvertent feedwater isolation (FWI) occurred. The event occurred during the performance of troubleshooting activities associated with the reactor trip breaker (RTB) (EIIS Code AA) auxiliary contacts. During testing of the contacts for voltage and resistance, the mechanics connected the test equipment to the wrong set of contacts, resulting in the initiation of an FWI signal. The engineered safety feature actuation was discussed between the control room operators and the mechanics, and the control room operators determined that the actuation was addressed by work document precautionary notes. Because the potential for an FWI actuation was identified in the work document, it was determined that the event was not required to be called in to NRC (event notification under 10 CFR 50.72). After the troubleshooting of the RTB subsequent to Event No. 2, reportability was reevaluated and it was determined that the FWI inadvertently actuated by the mechanics was reportable. The confusion associated with event reportability stemmed from the belief that the precautionary note contained in the procedure implied that the FWI actuation was part of a preplanned sequence of events.

**Event No. 2**

On April 3, 1994, at 1840 EDT, an inadvertent FWI occurred. The event occurred upon closure of the RTBs (EIIS Code AA) in preparation for rod (EIIS Code AA)-drop testing. As the RTBs traveled closed, a spurious FWI signal was generated by one of the two RTBs.

**Event No. 3**

On April 9, 1994, at 0239 EDT, an inadvertent FWI occurred. The event occurred during observation of the RTBs (EIIS Code AA) after one of the two RTBs failed to close. Before the event, the control room operator attempted to close the RTBs in the preparation for rod-drop testing. When the operator initiated RTB closure, one of the two RTBs failed to close. Operations personnel proceeded to the breaker compartment area to examine the breakers. While explaining an observed difference between the two breaker-locking levers, an individual inadvertently moved the locking lever on the closed breaker. This resulted in the breaker traveling to the open position and the initiation of an FWI.

**LICENSEE EVENT REPORT (LER)**  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
Sequoyah Nuclear Plant (SQN), Unit 1		SEQUENTIAL	REVISION
	YEAR	NUMBER	NUMBER
	0500032794	005	03 OF 07

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

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

Event No. 1

During routine testing of RTB "A" contacts, it was identified that a high resistance existed on the breaker's auxiliary contact that is an input to the P-4 logic of the solid-state protection system. The breaker was removed from its compartment for troubleshooting to determine the cause of the high resistance. The breaker contacts were cleaned, tested, and found to be acceptable.

Event No. 2

By the use of alarm data, it was determined that a spurious FWI signal was initiated by RTB "A" as it traveled to the closed position. Subsequent to the event, troubleshooting was performed to determine the cause for the spurious FWI. The breaker was repeatedly cycled with test instrumentation connected to critical locations of the breaker and the control circuit. No anomalies were identified. The "A" breaker was replaced.

Event No. 3

After troubleshooting and replacement of the "A" RTB for Event No. 2 and testing of the replacement breaker, the main control room operator initiated breaker closure with the main control room handswitch. RTB "B" did not close. It could not be determined why RTB "B" failed to close. The inspection of the "B" breaker did not identify any failed components. The "B" breaker was replaced.

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

April 2, 1994 at 0120 EDT	RTB "A" failed breaker-contact testing on an auxiliary contact. The breaker was removed from the compartment for troubleshooting.
April 3, 1994 at 1024 EDT	During troubleshooting, mechanics were in the process of taking breaker contact voltage and resistance readings. An FWI was inadvertently initiated by the mechanics.
April 3, 1994 at 1750 EDT	RTB "A" was reinstalled in its compartment and was returned to service.
April 3, 1994 at 1840 EDT	The RTBs were closed. Breaker closure initiated a spurious FWI.

LICENSEE EVENT REPORT (LER)

TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)										PAGE (3)					
		SEQUENTIAL				REVISION											
		YEAR		NUMBER		NUMBER		NUMBER									
Sequoyah Nuclear Plant (SQN), Unit 1																	
	050003 27	94	--	0	0	5	--	0	0	0	4	OF	0	7			

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

April 9, 1994  
at 0227 EDT

The control room operator attempted to close the RTBs. RTB "B" did not close. An assistant shift operations supervisor (ASOS) and an assistant unit operator were sent to the RTB area to look for obvious reasons for the failure of Breaker "B" to close.

April 9, 1994  
at 0239 EDT

The ASOS inadvertently moved the locking lever on RTB "A" while explaining an observed difference between RTB "A" and "B" locking levers. RTB "A" tripped open. The opening of the breaker initiated an FWI as designed.

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

In each event, various annunciators alarmed on the main control room panels. The control room operators determined that an FWI occurred.

F. Operator Actions

In each event, no operator actions were required in response to the FWIs. Operations personnel reestablished long-cycle feedwater operation after the FWI signal was cleared.

G. Safety System Response

No safety system responses were required for the events. The equipment receiving the FWI signal responded as designed.

III. CAUSE OF EVENT

A. Immediate Cause

Event No. 1

The immediate cause of the FWI signal was that test equipment was connected to the wrong set of contacts.

Event No. 2

The immediate cause of the FWI was a spurious signal during the closure of the RTBs.

**LICENSEE EVENT REPORT (LER)**  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)	PAGE (3)
Sequoyah Nuclear Plant (SQN), Unit 1		SEQUENTIAL	REVISION
		YEAR	NUMBER
	050032794	005	001

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

Event No. 3

The immediate cause of the FWI signal was the inadvertent opening of the "A" RTB.

B. Root Cause

Event No. 1

The cause for the inadvertent FWI was personnel's failure to follow work document instructions for equipment troubleshooting. The mechanics developed the troubleshooting work instruction and incorrectly believed that steps could be changed during implementation of the troubleshooting instruction. While performing multiple checks of the auxiliary contacts for voltage and resistance, an individual incorrectly connected the test equipment to take measurements from the secondary contacts in the back of the breaker cubicle instead of using the terminal strip as required by the work document. The wrong contacts were connected, resulting in the FWI actuation.

Event No. 2

The cause of the spurious signal was not confirmed. Subsequent to the event, troubleshooting was performed to determine the event's root cause. The spurious signal could not be re-created. The review of test data indicated that the FWI signal may have been initiated by voltage spikes during the movement of the breaker's auxiliary switch rotary contacts as the breaker traveled to the closed position. Discussions with the equipment supplier determined that voltage spikes are not unexpected and are a result of minute surface irregularities of the contacts. The voltage spikes observed during equipment troubleshooting exceeded the voltage and time thresholds of the solid state protection system for logic change. By engineering judgement, it was determined that the movement of the rotary switch could have initiated the event.

Event No. 3

The cause of the equipment failure resulting in RTB "B" failing to close could not be determined. Equipment examination subsequent to the failure did not identify any hardware damage or failed components. The possible causes for the failure of the breaker to close are the failure of the inertia latch to return to its rest position or the sticking of the 52x relay contact linkage in the drop-out position.

The root cause of the tripping of the "A" RTB was personnel error. The involved individual did not perform self-checking while explaining an observed difference between the RTBs. The individual inadvertently moved a sensitive component (breaker-locking lever) within the breaker compartment.



**LICENSEE EVENT REPORT (LER)**  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)			
Sequoyah Nuclear Plant (SQN), Unit 1		SEQUENTIAL		REVISION					
		YEAR	NUMBER	NUMBER					
	05000327	94	--005--	000			6	OF	7

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

C. Contributing Factors

None.

IV. ANALYSIS OF EVENT

When the unit is in power operation, an FWI signal limits the amount of mass in the steam generator in the event of a main steam line break. This limits the energy of a blowdown and prevents the overcooling of the primary system. In the events described in this LER, the FWI had no effect because the main feedwater isolation valves were closed before the FWI signals were initiated. Additionally, the safety functions of the RTBs and FWI logic were verified to perform as designed. At no time was there a threat to the health and safety of plant personnel or the general public.

V. CORRECTIVE ACTION

A. Immediate Corrective Action

No immediate corrective actions were required for the events. Operators promptly diagnosed the plant condition and took actions to restore the affected plant equipment.

B. Corrective Action to Prevent Recurrence

Event No. 1

The involved individuals were counseled on the requirements to follow work document instruction steps.

Event No. 2

The "A" RTB was replaced. The replacement breaker was inspected, tested, verified to operate properly, and placed in service.

The procedures that close the RTBs will be revised to require the FWI reset button to be held in during the closure of the breakers.

Event No. 3

The "B" RTB was replaced. The replacement breaker was inspected, tested, verified to operate properly, and placed in service. The breaker that failed to close was returned to the manufacturer for inspection/evaluation. The inspection results will be reviewed for the need to develop corrective actions.

The appropriate disciplinary action was taken with the involved individual.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)			
		SEQUENTIAL		REVISION					
		YEAR	NUMBER	NUMBER					
Sequoyah Nuclear Plant (SQN), Unit 1	0500032794	--	005	--	000	7	OF	07	

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

## VI. ADDITIONAL INFORMATION

A. Failed Components

Reactor trip breaker, Westinghouse Electric Corporation Breaker Model No. DB-50.

B. Previous Similar Events

Event Nos. 1 and 2

A review of 17 previous FWI event LERs did not identify any similar events where the FWI was initiated as a result of the closure of the RTBs. One event (LER 327/89035) occurred during RTB testing as a result of an inadequate procedure. The corrective action from that event would not have prevented the event described in this LER.

Event No. 3

A review of previous events identified 11 events (LERs 327/84055, 85023, 86025, 86041, 87060, 89013, 90002, 91011, 93003, 328/92011 and 94003) where the risk associated with the activity being performed was not properly evaluated. Each of the events involved activities associated with sensitive equipment. The corrective actions taken for 10 of the events were specific to the individual event and would not have prevented the event described in this LER. The corrective actions taken for LER 327/93003 were of a generic nature to address the activities associated with sensitive equipment. The procedures that were established and the training that was provided as a result of that event should have prevented the event described in this LER.

## VII. COMMITMENT

The procedures that close the reactor trip breakers will be revised by August 22, 1994, to require the FWI reset button to be held in during the closure of the breakers.