

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
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MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS.
REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE
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COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION
AND 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.

FACILITY NAME (1)

Sequoyah Nuclear Plant (SQN) Unit 1

DOCKET NUMBER (2)

05000327

PAGE (3)

1 OF 7

TITLE (4)

Failure of the 480-Volt Shutdown Board 1A1-A Alternate Feeder Breaker Results in a Unit 1 Reactor Trip on a Low-
Low Steam Generator Water Level.

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
05	19	1998	1998	-- 001	-- 00	06	18	1998	FACILITY NAME NA	DOCKET NUMBER 05000
OPERATING		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER		100	20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(iii)	50.73(a)(2)(x)
			20.2203(a)(2)(ii)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(iii)			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

J. W. Proffitt, Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

(423) 843-6651

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
D	EA	BKR	W123	N/A	N/A				

SUPPLEMENTAL REPORT EXPECTED (14)

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

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

On May 19, 1998, with Unit 1 operating at 100 percent power, at 1043 Eastern daylight time (EDT), an automatic reactor trip occurred. During the performance of a relay functional test for 480-volt Shutdown Board 1A1-A, supply power was transferred from the normal feeder breaker to the alternate feeder breaker. The alternate feeder breaker failed, initiating a loss of Instrument Power Board 1-I and de-energizing Channel I reactor protection racks. The loss of Instrument Power Board 1-I caused a loss of power to the steam flow instrumentation, resulting in a closure of the feedwater regulator valves. The loss of feedwater caused a low-low steam generator level and subsequent reactor trip. The cause of the event was the failure of the alternate feeder breaker to the 1A1-A 480-volt shutdown board. The C phase of the alternate feeder breaker did not close properly resulting in arcing. The 480-volt shutdown board was inspected and no damage was identified. The normal feeder breaker was placed in service and the 480-volt shutdown board was returned to operation.

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

I. PLANT CONDITIONS

Unit 1 was in power operation at approximately 100 percent.

II. DESCRIPTION OF EVENT**A. Event**

On May 19, 1998, at 1043 Eastern daylight time (EDT), an automatic reactor trip occurred. During the performance of a relay functional test for 480-volt Shutdown Board 1A1-A [EIIS Code ED], supply power was transferred from the normal feeder breaker to the alternate feeder breaker. The alternate feeder breaker failed, initiating a loss of Instrument Power Board 1-I [EIIS Code EF] and de-energizing Channel I reactor protection racks [EIIS Code JC]. The loss of Instrument Power Board 1-I caused a loss of power to the steam flow instrumentation resulting in a closure of the feedwater regulating valves [EIIS Code SJ]. The loss of feedwater caused a low-low steam generator (SG) level and subsequent reactor trip.

The loss of 480-volt Shutdown Board 1A1-A caused a voltage transient tripping Vital Inverter 1-I. The voltage transient cleared the inverter bridge fuses. The loss of the inverter resulted in a loss of several A-train components.

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

None.

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C. Dates and Approximate Times of Major OccurrencesTIMELINE

May 19, 1998, at 0845 EDT	A prejob brief for performance of functional tests on 480-volt Shutdown Board 1A1-A normal and alternate feeder breakers was conducted.
May 19, 1998, at 1030 EDT (Approximately)	The performance of the relay functional test of 480-volt Shutdown Board 1A1-A began.
May 19, 1998, at 1041 EDT	480-volt Shutdown Board 1A1-A failed due to undervoltage.
May 19, 1998, at 1041 EDT	120-volt AC Vital Inverter 1-I abnormal alarm was received in the control room.
May 19, 1998, at 1043 EDT	SG Loop 1 low-low level initiated a reactor trip and turbine trip.
May 19, 1998, at 1108 EDT	Vital Instrument Board 1-I was restored.
May 19, 1998, at 1343 EDT	Notification to NRC per 10 CFR 50.72(b)(ii) for the reactor trip.

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

A low-low SG level alarm on Loop 1, reactor trip, and other alarms were annunciated in the control room.

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F. Operator Actions

The control room operators responded to the alarms and diagnosed the plant conditions. During the transient, the reactor coolant system (RCS) temperature decreased to 540 degrees F. As a result of the RCS cooldown, operators initiated an emergency boration into the RCS and took manual control of auxiliary feedwater (AFW) in accordance with plant procedures. The operators responded as prescribed by procedures and took the actions necessary to stabilize the unit in a safe condition and maintain the unit in hot standby, Mode 3.

G. Safety System Responses

The plant safety systems and plant parameters responded as expected with the loss of a vital inverter. The AFW pumps started as designed, however, the 1A-A motor-driven AFW pump did not supply water to the associated SGs because the loss of the inverter caused the pump discharge valve not to open. The AFW system supplied sufficient water flow to the SGs. Additionally, the letdown isolation valve closed as a result of the loss of the inverter. The letdown isolation resulted in the centrifugal charging pump (CCP) suction automatically realigning to the refueling water storage tank (RWST) on a low volume control tank level. Charging flow from the RWST to the RCS contributed to the RCS cooldown. Also, pressurizer level and pressure initially increased due to the letdown isolation until the pressurizer power operated relief valves opened. Operator action restored RCS temperature and pressurizer level and pressure. Operators stabilized the unit in a safe condition.

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III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause of the event was the loss of Instrument Power Board 1-I. The loss of the instrument power board caused a loss of power to the steam flow instrumentation, resulting in a closure of the feedwater regulator valves. The loss of feedwater caused a low-low SG level and subsequent reactor trip.

B. Root Cause

The root cause of the event was the failure of the alternate feeder breaker to the 1A1-A 480-volt shutdown board. The C phase of the alternate feeder breaker did not close properly resulting in arcing. The cause of the breaker failure has been determined to be inadequate vendor manual guidance resulting in an inadequate breaker maintenance procedure. The vendor manual does not address whether the closing springs should be charged or not charged when checking contact compression. This resulted in inadequate contact adjustment.

The failure of the breaker caused Vital Inverter 1-I to malfunction and cleared the inverter bridge fuses. This resulted in a loss of power to Vital Board 1-I causing the closure of the feedwater regulator valves. The loss of feedwater caused a low-low SG level and subsequent reactor trip.

C. Contributing Factors

None.

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IV. ANALYSIS OF THE EVENT

During the transient, the RCS temperature decreased to 540 degrees F. This resulted in a main feedwater isolation on low-low T_{ave} . A contributing factor to the RCS cooldown was the introduction of charging flow from the RWST. As a result of the RCS cooldown, operators initiated an emergency boration into the RCS in accordance with plant procedures. In addition, the operators took manual control of AFW, in accordance with plant procedures, because of the RCS temperature decreasing to 540 degrees F. The unit was stabilized in Mode 3. Technical specification and Final Safety Analysis Report (FSAR) limits were not challenged.

Plant responses during and after the unit trip were bounded by the responses described in the FSAR. Therefore, this event did not adversely affect the health or safety of plant personnel or the general public.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

- The 480-volt shutdown board was inspected and no damage was identified.
- The normal feeder breaker was returned to service and the 480-volt shutdown board was returned to operation.
- Power to the reactor protection system racks was restored.
- The vital inverter fuses were replaced.
- Vital Instrument Board 1-I was restored.

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B. Corrective Actions to Prevent Recurrence

- The maintenance procedure will be revised by June 30, 1998, to address charging of the closing springs when checking contact compression.
- The other DS-532 breakers will be inspected for similar conditions identified on the failed breaker. This activity will be performed as the associated breakers are removed from service for other maintenance activities.¹
- A new feeder breaker is being procured and will be installed following delivery.¹

VI. ADDITIONAL INFORMATION**A. Failed Components**

Alternate Feeder Breaker 1A1-A 480-volt shutdown board is a Westinghouse Model No. DS-532 breaker.

B. Previous LERs on Similar Events

A review of previously reported occurrences identified no previously reported events associated with a breaker failure causing the loss of a vital inverter.

C. Additional Information

None.

VII. COMMITMENTS

The maintenance procedure will be revised by June 30, 1998, to address charging of the closing springs when checking contact compression.

¹ TVA does not consider this corrective action a regulatory commitment. TVA's corrective action program will track completion of the action.