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

J. L. Wilson
Vice President, Sequoyah Nuclear Plant

March 9, 1992

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

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET NOS. 50-327 and 50-328 - FACILITY OPERATING LICENSE DPR-77 - LICENSEE EVENT REPORT (LER) 50-327/92004

The enclosed LER provides details concerning a lack of selective coordination between the feeder breaker and the load breakers associated with the fifth vital battery. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as an operation prohibited by technical specifications and in accordance with 10 CFR 50.73(a)(2)(ii)(B) as a condition outside the design basis of the plant.

Sincerely,

J. L. Wilson

Enclosure
cc: See page 2

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cc (Enclosure):
INPO Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

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

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

Mr. B. A. Wilson, Project Chief
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

NRC Form 366 (6-89) | U.S. NUCLEAR REGULATORY COMMISSION | Approved OMB No. 3150-0104 Expires 4/30/92

LICENSEE EVENT REPORT (LER)

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Sequoyah Nuclear Plant, Unit 1	0 5 0 0 0 3 2 7	1 OF 0 8

TITLE (4)
Inadequate design results in a lack of selective breaker coordination

EVENT DAY (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 2	0 6	9 2	9 2	0 0 4	0 0	0 3	0 9	9 2	Sequoyah, Unit 2	0 5 0 0 0 3 2 8
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OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following)(11)				
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	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)	XX 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Abstract below and in	
		20.405(a)(1)(iv)	XX 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 (AREA CODE)
J. W. Proffitt, Compliance Licensing	6 1 5 8 4 3 - 6 5 1

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

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

On February 5, 1992, it was determined that there was a potential lack of selective coordination for the fifth vital battery system. This issue was identified during a review of vendor manuals for breakers with an instantaneous trip device. A walkdown was performed to determine the type of breaker installed in the plant. A review of the coordination calculation identified that Breaker 003 on each of the vital battery boards (the point where the fifth vital battery can be connected to the vital battery boards) were not addressed in the calculation. The cause of this issue was determined to be inadequate preparation and review of the coordination calculation. The fifth vital battery was removed from service and a design change was implemented to disable the automatic trip function of the breaker.

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

I. PLANT CONDITIONS

Units 1 and 2 were operating in Mode 1 at approximately 100 and 93 percent reactor thermal power, respectively. Unit 2 is nearing end of life coasting down for the Unit 2 Cycle 5 refueling outage.

II. DESCRIPTION OF EVENTS

A. Event

On February 5, 1992, it was determined that there was a potential lack of selective coordination for the fifth vital battery system (EIIS Code EI). During a review of vendor manuals for identifying amptector type discriminator devices, a discrepancy was noted on the electrical drawing. The drawing showed that Breaker 003, the breaker (EIIS Code BKR) used to connect a vital battery board (EIIS Code BYBD) to the fifth vital battery (EIIS Code BTRY), to be a long- and short-delay type trip breaker. This review was being performed as correction action for Licensee Event Report (LER) 50-237, -328/91026. The vendor data indicated that the breaker trip device is a long delay with instantaneous trip. A walkdown was performed to determine the type breaker trip device installed in the plant. The walkdown revealed that the breaker installed in the plant contained the instantaneous trip. A review of the selective coordination calculation determined that these breakers were not included in the calculation. Therefore, a condition adverse to quality document was initiated to document the deficient condition. The fifth vital battery was determined to be in service for Vital Battery II. Engineering requested that Vital Battery II be expeditiously returned to service because of the potential coordination problem. At approximately 1630 Eastern standard time (EST), Vital Battery II was returned to service and the fifth vital battery was tagged out of service until the issue was resolved. On February 8, 1992, a calculation was completed that confirmed the lack of selective coordination. On February 9, 1992, a design change was implemented to correct the condition.

The fifth vital battery was initially installed and declared operable in January 1985. The design change process did not require a formal calculation to be issued to support the addition of the fifth vital battery. In January 1987, the design baseline verification program identified a potential nonselective coordination problem with the fifth vital battery system in that the selective coordination calculation did not include the fifth vital battery. In February 1988, the selective coordination calculation was revised to address the fifth vital battery. However, the preparers and reviewers of the calculation did not address selective coordination for Breaker 003 on each of the vital battery boards in the revision to the calculation. After issuance of the calculation, the design baseline and verification program item was closed. (See attached sketch for identification of the location of the breakers involved.)

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

None.

C. Date and Approximate Time of Major Occurrences

1.	November 1, 1982	Design change issued to add the fifth vital battery.
2.	January 1985	Installation of the fifth vital battery completed and the fifth vital battery declared operable.
3.	February 1987	Design baseline and verification program identifies potential nonselective problem with fifth vital battery.
4.	February 1988	Selective coordination calculation issued to address fifth vital battery. However, calculations did not address Breaker 003 on each vital battery board.
5.	February 3, 1992	A discrepancy between the vendor manual and electrical drawing was identified indicating a difference with Breaker 003 trip device.
6.	February 5, 1992 at 0430 EST	A walkdown was performed and identified the installed configuration of an instantaneous trip on the breaker.
7.	February 5, 1992 at 0800 EST	Engineering notified the plant of a potential coordination problem and requested the plant to determine if the fifth vital battery was in service.
8.	February 5, 1992	The selective coordination calculation was reviewed and it was determined that Breaker 003 was not addressed. A condition adverse to quality document was initiated.
9.	February 5, 1992	The fifth vital battery was confirmed to be in service for Vital Battery II. Nuclear Engineering requested that the plant expeditiously return Vital Battery II to service.

10. February 5, 1992 at approximately 1630 EST — The fifth vital battery was removed from service and tagged out of service to prevent it from being used until the coordination issue was resolved.

11. February 8, 1992 — The coordination calculation was issued confirming the lack of selective coordination. A design change was issued to resolve breaker coordination problem by disabling the automatic trip capability.

12. February 9, 1992 at 1400 EST — A design change was implemented and the administrative hold on the use of the fifth vital battery was released.

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

This lack of selective breaker coordination was identified as a result of corrective actions for LER 50-327/91026. A review of vendor manuals for breakers with instantaneous trip devices was being performed when this condition was discovered.

F. Operator Actions

After being notified of the potential selective coordination problem, Vital Battery II was returned to service and the fifth vital battery was removed from and tagged out of service.

G. Safety System Response

Not applicable - no safety system responses were required.

III. CAUSE OF EVENT

A. Immediate Cause

The immediate cause of this condition was determined to be an inadequate design control process resulting in an inadequate original design for the addition of the fifth vital battery.

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B. Root Cause

The root cause of this condition was determined to be inadequate preparation and review of the selective coordination calculation in resolving the design baseline and verification program issue.

C. Contributing Factors

Factors that could have contributed to the inadequate calculation included a lack of knowledge of the control power system on the part of the preparer and reviewer of the calculation; no self-checking lists were prepared to ensure each aspect of the calculation was covered; walkdowns were not performed since there was no modification involved; and Breaker 003 was not properly identified in the design criteria.

IV. ANALYSIS OF EVENT

The fifth vital battery distribution system is designed and constructed to provide continued operation in the event Vital Battery I, II, III, and IV should become disabled or removed from service for any reason (testing, maintenance, etc.). The fifth vital battery may be substituted for any of the other four batteries with no impact on the reliability of the 125 volts (V) direct current (dc) vital battery system.

Circuit Breaker 003 in each of the 125V vital battery boards had a long-instantaneous type overcurrent protection device. This device was set at 400 percent on the instantaneous setting. The long delay setting is not of concern since it was set at 110 percent of the 800 amperes (amps) nominal breaker rating, or 880 amps. The maximum continuous current is documented in calculation SQN-CPS-034 R3 as less than 500 amps. The limiting potential scenario for consideration is that a single failure in addition to Breaker 003 tripping due to a faulted load results in a loss of two battery boards. Three of the four boards are required to achieve and maintain safe shutdown. This evaluation considered the following events: loss of offsite power; station blackout; 10 CFR 50 Appendix R fire, and a seismic event. The seismic event is considered to be worst case because of the possibility of losing more than one battery board.

The instantaneous setting of 400 percent allows Circuit Breaker 003 to trip instantaneously when the current exceeds four times the trip unit rating. For this case, the instantaneous region begins when fault currents exceed 3200 amps. Coordination is assured for all fault magnitudes less than this value.

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The fault current available at the battery boards when connected to the fifth vital battery is less than 15000 amps. In general, calculations for determining fault levels do not take into consideration any connection resistance, protective device resistance, or fault resistance. Hence, these determinations of fault levels are considered to be conservative. This is especially true for systems in which the fault currents are driven by low voltage fault sources, such as a battery.

Therefore, based on engineering judgement it is considered likely that the energy required to release Breaker 003 would have been greater than that required for the load breakers. Since a large majority of the cables that leave the battery are accounted for in the coordination probability, it is unlikely that any event (fire, failed component, etc.) outside the battery room could affect the battery board sufficiently to cause circuit Breaker 003 to trip as well as safety-related circuits from the other boards. Further, a review of the trip characteristics curve for this circuit breaker indicates that as much as 0.05 seconds of sustained current may be required in order to trip the breaker. The down stream circuit breakers and fuses will trip at currents of this magnitude in as little as .01 seconds. It is not known that in the event of a fault if Circuit Breaker 003 would or would not trip.

In the event the voltage on the battery board was lost, Operations would know immediately of the failure via annunciation in the main control room. Operations personnel would be dispatched to the affected battery board to investigate. The operator would discover that the breaker was tripped. The faulted branch circuit breaker would also have tripped. The operator could restore voltage to the board by resetting the breaker. Because of the proximity of the battery board rooms to the control room, the time required for operations to discover and correct the problem would be minimal and acceptable to restore required shutdown capability.

In summary, while appropriate performance could not have been assured, it is considered likely through engineering judgement that, the load breakers would have tripped on a fault in advance of the subject breaker, and that operator action could have been taken to restore voltage and required safety function had the breaker tripped.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

1. The fifth vital battery was removed from service.

2. The fifth vital battery was tagged out of service to prevent its use until the coordination issue was resolved.

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3. A design change was implemented to disable the automatic trip function of Breaker 003.

4. The design criteria was revised to address Breaker 003.

B. Actions Taken to Prevent Recurrence

1. Perform a coordination study for the 120V ac and 125V dc safety-related control power systems at Sequoyah to ensure coordination of feeder and related load breakers.

VI. ADDITIONAL INFORMATION

A. Failed Components

None.

B. Previous Similar Events

Several previously-reported events were identified associated with inadequate design and/or design control process and coordination problems. The review concluded that the design and/or design control process has been strengthened to prevent reoccurrence of this type problem. As a result of the corrective actions of the previous coordination issue this condition was identified.

VII. COMMITMENTS

A. Perform a coordination study for the 120V ac and 125V dc safety-related control power systems at Sequoyah to ensure coordination of feeder and related load breakers. This item will be completed by December 24, 1992.

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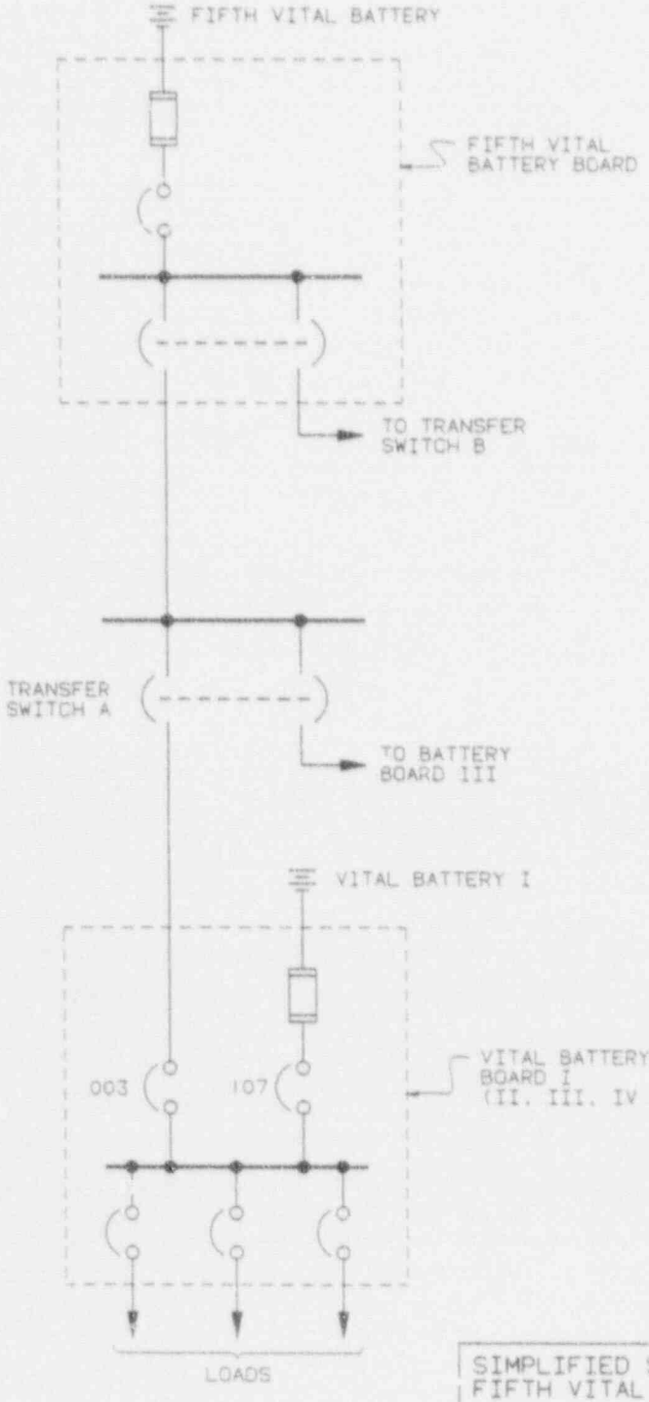
SKETCH



SIMPLIFIED SINGLE LINE FOR FIFTH VITAL BATTERY SERVICE