

TENNESSEE VALLEY AUTHORITY

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November 16, 1990

U.S. Nuclear Regulatory Commission
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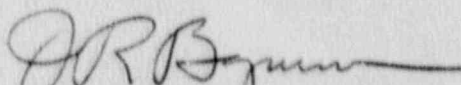
Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET NO. 50-327-
FACILITY OPERATING LICENSE DPR-77 - LICENSEE EVENT REPORT (LER) 50-327/90027

The enclosed LER provides details concerning an entry into Limiting Condition for Operation (LCO) 3.0.3 when more than one vital inverter and vital battery charger were declared inoperable because of the lack of selective coordination between the instrument power primary fuse isolator and 480-volt feeder breakers that service the Train 'A' Vital Inverters and Vital Battery Chargers. 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 of the design basis of the plant.

Very truly yours,

TENNESSEE VALLEY AUTHORITY



J. R. Bynum, Vice President
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Enclosure

cc (Enclosure):

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Sequoyah Nuclear Plant, Unit 1 DOCKET NUMBER (2) 050003 PAGE (3) 2710606

TITLE (4) Entry into Limiting Condition for Operation (LCO) 3.0.3 because of a lack of selective coordination for the feeder breakers associated with the Train 'A' Vital Inverters and Vital Battery Chargers.

EVENT DAY (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)			
MONTH	DAY	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		MONTH	DAY	YEAR	FACILITY NAMES			DOCKET NUMBER (5)
10	17	90	027	00		11	16	90				050003

OPERATING MODE (9) 4 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following)(11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> OTHER (Specify in
<input type="checkbox"/> 20.405(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	Abstract below and in
<input type="checkbox"/> 20.405(a)(1)(iv)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	Text, NRC Form 366A)
<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Russell R. Thompson Compliance Licensing Engineer TELEPHONE NUMBER 615843-7470

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

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

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO DATE (15) _____

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

On October 17, 1990, at 1606 Eastern daylight time (EDT), with Unit 1 operating in hot shutdown, Limiting Condition for Operation (LCO) 3.0.3 was entered. LCOs 3.8.2.1 and 3.8.2.3 could not be satisfied when more than one vital inverter and one vital battery charger were declared inoperable. The Train 'A' Vital Inverters and Vital Battery Chargers were declared inoperable because of the lack of selective coordination between the instrument power primary fuse isolators (IPPFIs) and the 480-volt (V) feeder breakers that service Vital Inverters 1-I and 2-I, 1-III and 2-III. Revisions to the SQN selective coordination calculations were made during the extended SQN shutdown, however, identified deficiencies were not captured in documents tracking ongoing corrective actions. This is attributed to personnel oversight on the part of the individual who identified the selective coordination deficiencies. Immediate corrective actions were initiated and modifications were issued to provide breakers that would coordinate with the IPPFIs. Field work and testing was completed within the next 12 hours and at 0530 EDT, on October 18, 1990, the LCOs were exited. Reviews of restart-era calculations and 1E to non-1E electrical interfaces will be conducted to verify that deficiencies have been properly dispositioned.

LICENSEE EVENT REPORT (LER)

TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	NUMBER	REVISION NUMBER			
		1	2	3	4	5	6
Sequoyah Nuclear Plant Unit 1	0150000327	1990	027	00	00	02	06

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

Description of Event

On October 17, 1990, at 1606 Eastern daylight time (EDT), with Unit 1 in Mode 4 (0 percent power, reactor coolant system [RCS] pressure at 342 pounds per square inch gauge [psig], and RCS temperature at 209 degrees Fahrenheit [F]), and Unit 2 in Mode 5 (0 percent power, RCS pressure at 0 psig, and RCS temperature at 95 degrees F), Unit 1 entered Limiting Condition for Operation (LCO) 3.0.3 when it was determined that the 480-volt (V) feeder breakers (EIIS Code ED) for the Train 'A' Vital Inverters (EIIS Code EF) and Vital Battery Chargers (EIIS Code EJ) were not selectively coordinated with the corresponding instrument power primary fuse isolators (IPPFIs). Selective coordination between 1E and non-1E circuits is required when the circuits share a common power supply, and prevents the interruption of 1E power due to a fault in the non-1E circuit. The configuration of these components is shown on SQN Updated Final Safety Analysis Report (UFSAR), Figures 8.1.2-1a and 8.1.2-2. LCOs 3.8.2.1 and 3.8.2.3 require the full complement of Unit 1 and Unit 2 6900V and 480V Shutdown Boards, 120V Vital Instrument Power Board channels, and 125V Vital Battery channels to be operable for a unit in Modes 1, 2, 3, or 4. Action provisions are contained in the event that one vital inverter or vital battery charger is inoperable. LCOs 3.8.2.2 and 3.8.2.4 require only one train of the electrical distribution system described above to be operable for a unit in Modes 5 or 6. Because two battery chargers and four inverters were considered inoperable, the actions of LCOs 3.8.2.1 and 3.8.2.3 could not be complied with for Unit 1, and LCO 3.0.3 was entered at 1606 EDT, on October 17, 1990.

An activity was in planning on October 17, 1990, to allow cleaning of the 6900V Shutdown Boards and 480V Shutdown Boards. In order to do this, it would be necessary for the vital inverters and vital battery chargers to be transferred to their alternate feeds. Nuclear Engineering (NE) was in the process of preparing a quality design change notice (QDCN) to address operability of boards when connected to alternate feeders, when it was noted that the alternate feeder breaker did not selectively coordinate with the IPPFI for the particular channel under review. In completing the research on this fact, it was then discovered that in accordance with the design drawings the normal feeder breaker as well did not selectively coordinate. A field inspection of the 480V Shutdown Board Breakers, specifically Compartment 10A of Boards 1A1-A and 2A1-A, confirmed protective device settings such that the breakers would not coordinate. For any fault on the load side of the IPPFI, sufficient fault current would be generated such that both the fuse and the breaker may open upon seeing the fault current. Fault current at this point would be in excess of 20,000 amps.

Upon concluding that this condition existed, Electrical Engineering notified Work Control and the shift operations supervisor. The facts were reviewed and it was concluded that Inverters 1-I, 1-III, 2-I, and 2-III and Vital Battery Chargers 1 and 3 were considered inoperable. LCOs 3.8.2.1, 3.8.2.3, and 3.0.3 were entered accordingly for Unit 1.

The IPPFIs were installed during the extended SQN shutdown in accordance with Engineering Change Notice (ECN) 6746 (issued in August 1986) to provide qualified separation between the non-1E 120V Instrument Power Distribution Panels and the 1E low-voltage distribution system.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)						PAGE (3)						
		SEQUENTIAL		REVISION		YEAR	NUMBER	NUMBER						
		NUMBER	NUMBER	NUMBER	NUMBER									
Sequoyah Nuclear Plant Unit 1	0150000327	9	0	--	0	2	7	--	0	0	0	3	0	6

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

Description of Event (Continued)

In January 1987, an in-process revision to Calculation SQN APPR-1, "Analysis of AC/DC Instrument and Control Power Systems to Identify Associated Circuits - 10 CFR 50, Appendix R," identified that selective coordination did not exist for the 1B and 2B 120V Instrument Power Distribution Panels. The design baseline verification program (DBVP) identified in February 1987 that selective coordination calculations had not been performed in support of ECN 6746. This deficiency was tracked as DBVP Punchlist Item 9019 and Condition Adverse to Quality Report (CAQR) SQP870267. CAQR SQT870476, Revision 1, was initiated in April 1987 to document and track the resolution of the selective coordination problem on the 1B and 2B panels.

Sometime before the issuance of Revision 7, the sections of Calculation SQN APPR-1 that identified and discussed the 120V Instrument Power Distribution Panel selective coordination problem were amended to also identify the lack of selective coordination for the 1A and 2A panels. However, identification of the 1A and 2A panel problems was not made in CAQR SQT870476, Revision 1, which was being used to track the required corrective actions. Revision 7 of SQN APPR-1, identifying problems with the four distribution panels, was issued on May 16, 1987, with a note in the revision log that CAQR SQT870476, Revision 1 was tracking necessary corrective actions. CAQR SQT870476, Revision 1, which identified only the 1B and 2B panels, completed management review on May 20, 1987.

CAQR SQP870267 was closed in July 1987 based on Calculation SQN APPR-1, Revision 7, determining the selective coordination criteria for the distribution panels. Field work to resolve the selective coordination problems identified in CAQR SQT870476, Revision 1 (panels 1B and 2B) was completed in December 1987. Based on completion of the field work, CAQR SQT870476, Revision 1, was closed in January 1988.

Cause of Event

The cause of this event has been determined to be inadequate corrective action because of an inappropriate personnel action. Specifically, changes were made to Calculation SQN APPR-1 noting deficiencies for the 1A and 2A panels without properly noting the deficiencies in CAQR SQT870476, Revision 1, which was utilized to resolve the selective coordination issue in 1987. These actions are attributed to oversight on the part of the responsible engineer. It could not be determined why this omission occurred as the individual involved is no longer employed by TVA.

From the review of this event it appears that some time after the applicable sheets of Calculation SQN APPR-1 had been prepared and checked, it was discovered that a problem might exist on Train 'A' and the requirements for 120V Instrument Power Distribution Panels 1A and 2A were added. It is suspected that this was done after the CAQR revision was initiated on April 17, 1987. Therefore, when the calculation was presented for approval, it appeared that all four instrument power distribution panels were required, and the miscoordination problem with the applicable 480V shutdown board breaker had been documented in the CAQR, and thus the calculation was approved.

LICENSEE EVENT REPORT (LER)

TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Sequoyah Nuclear Plant Unit 1	05000327	90	027	00	04	06

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

Cause of Event (Continued)

(Again, recreating the events is difficult because the individual involved is no longer employed by TVA.) When the CAQR was sent to the site to be dispositioned, it only documented that the problem existed on Distribution Panels 1B and 2B. Therefore, the field work as implemented remedied only half of the problem identified in the calculation. Closure of the CAQR was based on the problem as stated in the CAQR.

Analysis of the Event

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 of the design basis of the plant.

A short-circuit condition that occurred anywhere from the load side of the IPPFI down to the 120V Instrument Power Distribution Panel 1A could have caused the 480V Shutdown Board 1A1-A Load Breaker to trip and resulted in a loss of alternating current (AC) power to Vital Battery Charger 1 and Vital Inverters 1-I and 1-III. Likewise, a short-circuit condition that occurred anywhere from the load side of the IPPFI down to the 120V Instrument Power Distribution Panel 2A could have caused the 480V Shutdown Board 2A1-A Load Breaker to trip and resulted in a loss of AC power to Vital Battery Charger 3 and Vital Inverters 2-1 and 2-III.

There would have been no safety consequences from an Appendix R event because the IPPFI, fused disconnect switch, 480-120V transformer, distribution panel, and all interconnecting cables associated with each train (1A, 1B, 2A, 2B) are located in separate rooms from those associated with the other trains. Thus, a single fire would have only caused the loss of a single set (1A, 2A, 1B, or 2B) of Vital Inverters and Vital Battery Chargers, which is an analyzed condition.

It must be assumed that during postulated design basis events, the non-1E portion of the circuit would fail in conjunction with a single assumed failure of the 1E Circuit of the opposite train. Subsequent tripping of the 480V shutdown board breaker due to inappropriate coordination would result in the loss of all AC power to both trains of vital battery chargers and vital inverters. The vital power system would still function for up to two hours with power supplied by the vital batteries. This would be sufficient time to restore AC power to at least one train of chargers and inverters. The loss of AC power to the inverters and chargers creates several main control room annunciations, such as "125V DC Vital Charger Failure or Battery Discharge" or "120V AC Vital Inverter Abnormal." Procedures SOI-55-1M1-XA-55-1C (Unit 1) and SOI-55-2M1-XA-55-1C (Unit 2) require the dispatch of operators to investigate the loss of power. Such an investigation would quickly determine that the 480V shutdown board breaker had tripped. The non-1E portion of the circuit could then be isolated by pulling the IPPFI, and AC power would be restored by reclosing the shutdown board breaker. Therefore, the consequences of this event did not jeopardize the health and safety of the public or plant personnel.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		Sequoyah Nuclear Plant Unit 1	015010131217	90	-- 0 2 7 --	0 0	0 5

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

Corrective Actions

When the lack of selective coordination was discovered, the immediate action was to enter the action of LCO 3.0.3. Engineering design output documents and workplans were initiated to transfer the alternate feeder breakers of the Train 'B' Components to the normal feeders of the Train 'A' Components. The modifications and testing were completed and LCO 3.0.3 was exited at 0530 EDT on October 18, 1990.

The personnel oversight that led to this event is considered to be an isolated case. Disciplinary actions or other corrective actions for the individual are not possible because the individual is no longer employed by TVA. To provide an increased level of confidence that other similar oversights have not occurred, a sample of restart-era calculations will be reviewed to verify that noted deficiencies have been properly dispositioned. Additionally, appropriate calculations and drawings will be reviewed to ensure that 1E to non-1E electrical interfaces have been properly dispositioned. This includes revising Calculation SQN APPR-1 to reflect the as-constructed status of these feeder breakers.

Additional Information

A review of past LERs was conducted to determine if similar events had taken place (i.e., revision of calculations without deficiencies being resolved or documented by the corrective action program). None were found, however, there were three LERs that were caused by lack of selective coordination.

LER 50-327/87001 described trip setpoints for air circuit breakers on shutdown boards that were incorrect because of a lack of ampacity calculations. The corrective action was to provide a modification to correct the trip settings. The recurrence control was to provide standards and criteria to ensure similar conditions do not recur. Procedure Method 86-02, "Essential Minimum Set Calculations," was the process by which this would be prevented.

LER 50-327/87045 described an inadequate design control process which resulted in the lack of fuse coordination for portions of the essential raw cooling water (ERCW) system. The cause was attributed to the design control process in place at the time the particular portions of ERCW was upgraded to 1E. The corrective action was to modify the ERCW circuits. Recurrence control was development of the checklist now included in Sequoyah Engineering Procedure (SQEP)-26. This checklist identifies calculations that could be affected by a design change package.

LER 50-327/87061, Revision 0 and Revision 1, described Appendix R Circuits that share common power supplies that lacked selective coordination. The corrective action that was described in CAQR SQT870476, Revision 1. It appears that in preparing the LER, the description of condition and corrective action plan of the CAQR was followed without further review of the calculation. The corrective actions for this event were inadequate as a result of the personnel oversight which led to the CAQR not being revised.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Sequoyah Nuclear Plant Unit 1	01500031212	90	027	00	00	06	06

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

Additional Information (Continued)

An additional corrective action that has been implemented independent of the above LERs is the utilization of independent verification for issuing calculations and design change packages. Independent verification of safety-related items is required by the Nuclear Quality Assurance Plan and was implemented with the new permanent design control process. Independent verification of the issued design packages could be relied upon to have identified the discrepancy between the calculation and the CAQR.

Commitments

1. Calculation SQN APPR-1 will be revised by February 1, 1991, to reflect the as-constructed configuration.
2. A sample of restart-era calculations will be reviewed to verify that noted deficiencies have been dispositioned. This review will be completed by July 1, 1991.
3. Appropriate calculations and drawings will be reviewed by February 1, 1991, to ensure that 1E to non-1E electrical interfaces have been properly dispositioned.

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