NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Sequoyah, Unit 2	0 5 0 0 0 3 2 8	1 OF 0 8

TITLE (4): Inadequate Configuration Control Caused Two Auxiliary Feedwater Flow Paths To Be Inoperable Resulting In Noncompliance With Technical Specification 3.7.1.2

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 NAMES	DOCKET NUMBER(S)
0 6	1 1	8 8	8 8	0 2 6	0 1	0 8	1 8	8 8		0 5 0 0 0
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OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
3	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10): 0 0 0	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
	20.405(a)(1)(ii)	50.38(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iii)	XX 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Don Siska J. L. Long, Plant Operations Review Staff	AREA CODE: 6 1 5 — 8 7 0 - 7 2 5 4

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)	XX NO				

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

This LER is being revised to provide additional information regarding the corrective actions TVA is taking to prevent recurrence of this event. On June 11, 1988, with unit 2 in mode 3 (hot standby) Operations personnel attempted to stroke level control valve 2-LCV-3-172 from the main control room (MCR) and discovered that the handswitch used to manipulate the subject valve in the manual mode would not operate the valve. Instead, manipulating the handswitch for 2-LCV-3-172 allowed 2-LCV-3-175 to modulate. As a result, Operations personnel declared both valves inoperable and entered action statement (a) of Limiting Condition for Operation (LCO) 3.7.1.2. An investigation into this event revealed that two wires in the valves' control circuits had been crossed. Further investigation could not determine the precise work activity that crossed the two wires; however, it was determined that this incorrect wiring configuration had most likely been in place since at least November 5, 1987. This condition was caused by the failure to comply with established configuration control requirements during the performance of response time testing. TVA believes that the wires were lifted without being uniquely identified and, as a result, were improperly reterminated. As immediate corrective action, the wires were connected to their proper terminals and the valves were verified to be operable in all possible combinations of AUTO and MANUAL handswitch positions. To prevent recurrence, TVA will review this event with personnel from Electrical Maintenance (EM), Instrument Maintenance (IM), and Modifications who may be required to lift wires associated with safety-related equipment. In addition, TVA has reviewed the applicable configuration control procedures and determined that adequate guidance exists in this area for both EM and IM personnel. An enhancement to the procedures controlling SQN modifications and testing will ensure that Modifications and testing personnel will have adequate guidance in this area

IE22
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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Sequoyah, Unit 2	0 5 0 0 0 3 2 8	8 8	— 0 2 6	— 0 1	0 2 OF 0 8

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

DESCRIPTION OF EVENT

This LER is being revised to provide additional information regarding the corrective actions TVA is taking to prevent recurrence of this event.

On June 11, 1988, with unit 2 in mode 3 (0 percent power, 2235 psig, 533 degrees F), Sequoyah Nuclear Plant (SQN) Operations personnel were performing Surveillance Instruction (SI)-166.6, "Testing of Category 'A' and 'B' Valves After Maintenance or Upon Release from a Hold Order," on steam generator (EIIS Code SB) number 3 level control valve 2-LCV-3-172. This LCV controls the auxiliary feedwater (AFW) (EIIS Code BA) flow from the turbine-driven AFW pump to the number 3 steam generator. SI-166.6 was being performed as a postmaintenance test to verify the operability of 2-LCV-3-172 following the completion of Work Request (WR) B261181. This WR had been written to investigate and correct the problem in which the subject valve did not fully close following the unit 2 reactor trip on June 6, 1988 (reference LER SQRO-50-328/88027). During the performance of SI-166.6, it was discovered that the handswitch used to manipulate 2-LCV-3-172 in the manual mode would not operate the valve. Instead, manipulating the handswitch for 2-LCV-3-172 allowed 2-LCV-3-175 to modulate. 2-LCV-3-175 controls the AFW flow from the turbine-driven AFW pump to the number 4 steam generator. At this time, approximately 0520 EDT on June 11, 1988, Operations personnel entered action statement (a) of Limiting Condition for Operation (LCO) 3.7.1.2. This LCO was applicable because two of the four flow paths associated with the turbine-driven AFW pump were inoperable. As a result, Operations personnel had 72 hours to restore the subject LCVs to operable status before a plant cooldown to hot shutdown (mode 4) conditions had to be initiated.

Shortly after entering LCO 3.7.1.2, WRs B290386 and B784373 were initiated to identify the cause of the 2-LCV-3-172/-175 interaction and to determine if the same condition existed for valves 2-LCV-3-173 and -174 (turbine-driven AFW flow to steam generators 2 and 1, respectively). The investigation performed under WR B290386 determined that the wires between terminals 7 and 9 of relay TDPA (turbine-driven pump running) and terminals 4 and 10 of terminal board TB112 (all components are located in electrical panel 2-L-11A) were crossed (see Figure 1). That is, wire 3FS2, which should have been connected to terminal 7 of relay TDPA, was found to be connected to terminal 9. Similarly, wire 4SF2, which should have been connected to terminal 9 of relay TDPA, was found to be connected to terminal 7. As a result, whenever one of the valves was in the automatic mode, manual operation of the other valve (using the handswitch in the main control room) would cause the valve in the automatic mode to modulate while the valve in the manual mode would remain closed. This deviation was corrected by switching wires 3FS2 and 4SF2 at terminals 7 and 9 of relay TDPA. Proper operation of both 2-LCV-3-172 and -175 was then verified by operating the valves in all possible combinations of "AUTO" and "MANUAL" handswitch positions.

At approximately 1304 on June 12, 1988, following verification that both 2-LCV-3-172 and -175 were capable of performing their intended function, LCO 3.7.1.2 was exited. Investigation of valves 2-LCV-3-173 and -174 (in accordance with WR B784373) revealed that the wiring for these valves was correct. The correct wiring was verified by checking the output voltage of the TDPB relay terminals for various handswitch positions and by performing the same valve/handswitch manipulations described above for 2-LCV-3-172 and-175. To determine how long the above condition existed for the subject valves (and how it may have occurred), an investigation into SQN's modification, maintenance, and testing activities was conducted. In the modification area, all workplans which were implemented since 1985 and which could have affected 2-LCV-3-172, -173, -174, or -175 were reviewed. Workplans in progress for unit 1 that relate to system 3 (i.e., auxiliary and main feedwater) valves were also reviewed to determine if any unit 1 work could have affected unit 2 valves. In addition to a review of the workplans, TVA reviewed a listing of engineering change notices (ECNs) and design change notices (DCNs) that modified system 3 components and cable and/or conduit lines. These reviews, in conjunction with conversations with Modifications personnel, did not identify any activity that affected the terminals where the wires were crossed.

In the maintenance area, WR listings back to 1985 were reviewed for any work which could have lifted the subject wires. During this review, WRs which may have necessitated SIs to be run as postmaintenance tests were also considered. The latter review was an attempt to identify manual stroking of one valve while the other valve was in the automatic mode and, as a result, determine if the problem described herein did or did not exist when the SI was performed. No WRs that called for the lifting of the subject wires were identified. In addition, although at least one SI performance was identified that could have manually stroked one valve while the other was in the automatic mode, the actual handswitch positions were not documented; hence, it was impossible to determine the exact handswitch positions during the SI. As a result, no WR or WR-generated SI could be identified that (1) affected the terminals where the wires were crossed or (2) provided a specific time when the condition was known to exist.

In the testing area, special test instructions (STIs) performed on the AFW system and SIs that affected the turbine-driven AFW pump were reviewed. The STI review did not identify any activity that could have resulted in crossing the subject wires. Several SI performances were identified that stroked the subject valves, and these SIs were reviewed primarily to determine if the performances identified the handswitch position of the valves (i.e., to determine if one valve was in auto while the other valve was in manual). Unfortunately, only the handswitch position of the valve being stroked could be determined. However, one SI was identified that required the subject wires to be lifted.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Sequoyah, Unit 2	0 5 0 0 0 3 2 8	8 8	— 0 2 6	— 0 1	0 4 OF 0 8

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

SI-247.100A/B, "Response Time Testing of Engineered Safety Features Equipment Actuation (Train A/B)," requires the performance of Instrument Maintenance Instruction (IMI)-99 RT611A/B, "Response Time Testing Engineered Safety Feature Actuation - Slave Relay K611." The subject IMI, which is performed on one train of engineered safety feature (ESF) equipment during each refueling outage, lifts the wires from terminals 7 and 9 of relays TDPA and TDPB at the same time, and is performed to verify the proper response time of ESF equipment associated with slave relay K611. This IMI has been performed at least seven times since 1982, and all of these performances have had the potential for crossing the subject wires. Further investigation of previous IMI-99 RT611A/B performances determined that the wires had most likely been crossed since at least November 5, 1987. The test directors log from the November 5, 1987 performance noted that the wire on terminal 7 of relay TDPA had a piece of black tape attached to it before it was lifted. Based on discussions with Instrument Maintenance (IM) personnel, the piece of black tape was still attached to the wire leading to terminal 7 during the January 21, 1988 performance of the IMI. Performance of WR B290386 to correct the interaction between 2-LCV-3-172 and -175, which was worked on June 11, 1988, also identified the wire on terminal 7 of relay TDPA to be tagged with a piece of black tape. This configuration was determined to be incorrect. Craft personnel subsequently corrected the situation by connecting the wire with the black tape on it to terminal 9 and connecting the other wire to terminal 7. As described previously, reconnecting the subject wires in the proper configuration returned 2-LCV-3-172 and -175 to operable status. Thus, although TVA cannot identify the precise activity that caused the subject wires to be crossed, it is apparent that the subject wires have been configured incorrectly since at least November 5, 1987. TVA also investigated the possibility that the subject wires had been crossed at terminals 4 and 10 of TB112 rather than at relay TDPA. Although a visual inspection of TB112 indicated that some activity had affected these terminals (i.e., the torque paint had been broken at all the TB112 terminals), no specific activity could be identified which would have crossed the wires at these terminals.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Sequoyah, Unit 2	0 5 0 0 0 3 2 8	8 8	— 0 2 8	— 0 1	0 5 OF 0 8

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

CAUSE OF EVENT

The immediate cause of the interaction between 2-LCV-3-172 and -175 was an incorrect wiring configuration. The crossing of wires 3FS2 and 4SF2 completed the circuit from handswitch 2-HS-3-172A to solenoid valve 2-LSV-3-175, and from handswitch 2-HS-3-175A to solenoid valve 2-LSV-3-172 (see Figure 1). Thus, with both valves in the automatic mode, the associated solenoid valves remained energized and both valves remained closed. However, when 2-HS-3-172A was placed in MANUAL, the circuit to solenoid valve 2-LSV-3-175 was opened and the subject valve lost power. Deenergizing 2-LSV-3-175 then allowed 2-LCV-3-175 to modulate; however, since the circuit through 2-HS-3-175A to solenoid valve 2-LSV-3-172 remained energized, 2-LCV-3-172 remained closed. The incorrect wiring configuration would also have allowed 2-LCV-3-172 to modulate if handswitch 2-HS-3-175A was switched to MANUAL while 2-LCV-3-172 remained in the automatic mode. The root cause of this event was the failure to comply with established configuration control requirements. Although the specific work activity that caused this event could not be determined, TVA believes that the failure to uniquely identify the wires that were lifted during a performance of IMI-99 RT611A/B (before November 5, 1987) resulted in wires 3FS2 and 4SF2 being improperly reterminated. IMI-134, "Configuration Control of Instrument Maintenance Activities," requires wire lifts to be recorded in sufficient detail to uniquely identify each wire. In addition, when the configuration is returned to normal (i.e., when the wires are reconnected) a second person verification is required to ensure it is properly performed. If these configuration control requirements were satisfied during all previous performances of IMI-99 RT611A/B, TVA does not believe this event would have occurred.

ANALYSIS OF EVENT

This event is being reported in accordance with 10 CFR 50.73, paragraph a.2.i.b, as an operation prohibited by TSs.

Operations personnel declared the turbine-driven AFW pump inoperable and entered LCO 3.7.1.2 when 2-LCV-3-172 could not be stroked from the main control room. During the interval in which the turbine-driven AFW pump was considered to be inoperable, both motor-driven AFW pumps were operable. Since each motor-driven pump can deliver 100 percent of the AFW necessary to mitigate the consequences of an accident, adequate AFW was available at all times during this event. In addition to the motor-driven AFW pumps, TVA has determined that the crossing of wires 3FS2 and 4SF2 did not have an adverse impact on the ability of the turbine-driven AFW pump to perform its intended function. Following an AFW actuation signal and subsequent start of the turbine-driven AFW pump, contacts associated with the improperly terminated wires on relay TDFA would open (see Figure 1) and solenoid valves 2-LSV-3-172 and -175 would deenergize.

Deenergizing these solenoid valves would then allow level control valves 2-LCV-3-172 and -175 to modulate, as designed, to control steam generator level. In addition to automatic level control, plant operators could reset the accident signal on either (or both) valve(s) and manually control the steam generator level by ramping the subject valves open or close. Thus, as long as the turbine-driven AFW pump was running, plant operators could have maintained steam generator level in either the manual or automatic mode. Hence, there were no safety consequences associated with this event.

CORRECTIVE ACTION

As immediate corrective action, wires 3FS2 and 4SF2 were reterminated at their proper terminals in accordance with WR B290386. Following verification that 2-LCV-3-172 and -175 were capable of performing their intended function, LCO 3.7.1.2 was exited.

To prevent recurrence of this event, TVA will review this event with SQN personnel from Electrical Maintenance (EM), Instrument Maintenance (IM), and Modifications who may be required to lift wires associated with safety-related equipment. This review will stress the importance of properly labeling unidentified wires before they are lifted to ensure they are reterminated properly. Following this event, TVA reviewed the applicable configuration control procedures in place at SQN and determined that adequate guidance exists for EM and IM personnel to ensure that wire lifts are properly reterminated. Specifically, MI-6.20, "Configuration Control During Maintenance Activities," and IMI-134, "Configuration Control of Instrument Maintenance Activities," both require wire lifts to be recorded in sufficient detail to uniquely identify each wire. When the wires are subsequently reconnected, a second person verification is required to ensure it is properly performed. In addition to the above described procedures, SQN standard Practice SQM-66, "Post Maintenance Testing," provides guidelines for the testing of plant equipment following the performance of Maintenance activites. The post maintenance testing required by SQM-66 will provide further assurance that wire lifts have been properly reterminated.

To ensure that adequate guidance is provided for Modifications personnel, TVA will enhance Administrative Instruction (AI)-19, Part IV, "Plant Modifications: After Licensing," and Part VI, "Modifications: Permanent Design Change Control Program," to require Modifications personnel to record wire lifts in sufficient detail to ensure that each wire can be uniquely identified and, subsequently, properly reconnected. To ensure proper retermination of wire lifts during testing activities, TVA will revise SI-1, "Surveillance Program," STI-1," Special Test Instructions" and SQN Standard Practice SQA-137, "Unit Restart Test Program," to include a similar requirement. This action will ensure that as each SI, STI, or Restart Test Instruction (RTI) is revised (or a new one is written), it will contain the steps necessary to ensure wire lifts are properly reterminated.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Sequoyah, Unit 2	0 5 0 0 0 3 2 8	8 8	— 0 2 8	— 0 1	0 7 OF 0 8

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

To preclude the possibility of crossing wires 3SF2 and 4SF2 during future performances of IMI-99 RT611A/B, TVA will revise these procedures. These revisions will require the wires at terminals 7 and 9 of relays TDPA and TDPB to be permanently identified or, alternatively, will require lifting of wires at the output cable terminal block where they already have unique identifiers. In addition to the IMI revision, TVA will perform testing of unit 1 valves 1-LCV-3-172, -173, -174 and -175. This testing will ensure that each valve will function properly when it is in the manual mode, it's associated trained valve is in the automatic mode, and the unit 1 turbine-driven AFW pump is not running.

ADDITIONAL INFORMATION

There has been one previously reported occurrence where inadequate configuration control was identified as a root cause - LER SQRO-50-328/88014.

COMMITMENTS

1. TVA will review this event with SQN personnel from Electrical Maintenance (EM), Instrument Maintenance (IM), and Modifications who may be required to lift wires associated with safety-related equipment. This review will be completed by August 31, 1988.

2. TVA will enhance AI-19, Parts IV and VI, to require Modifications personnel to record wire lifts in sufficient detail to ensure that each wire can be uniquely identified and properly reconnected. This enhancement will be completed by September 30, 1988.

3. TVA will revise SI-1, SPI-1, and SQA-137 to include a requirement similar to (2) above. These revisions will be completed by February 20, 1989.

4. TVA will revise IMI-99 RT611A/B to either (a) require that the wires at terminal 7 and 9 of relays TDPA and TDPB be permanently identified, or (b) require lifting of wires at the output cable terminal block where they are already uniquely identified. These revisions will be completed by February 20, 1989.

5. TVA will test unit 1 level control valves 1-FCV-3-172, -173, -174, and -175 to ensure that each valve functions properly. These tests will be completed by September 30, 1988.

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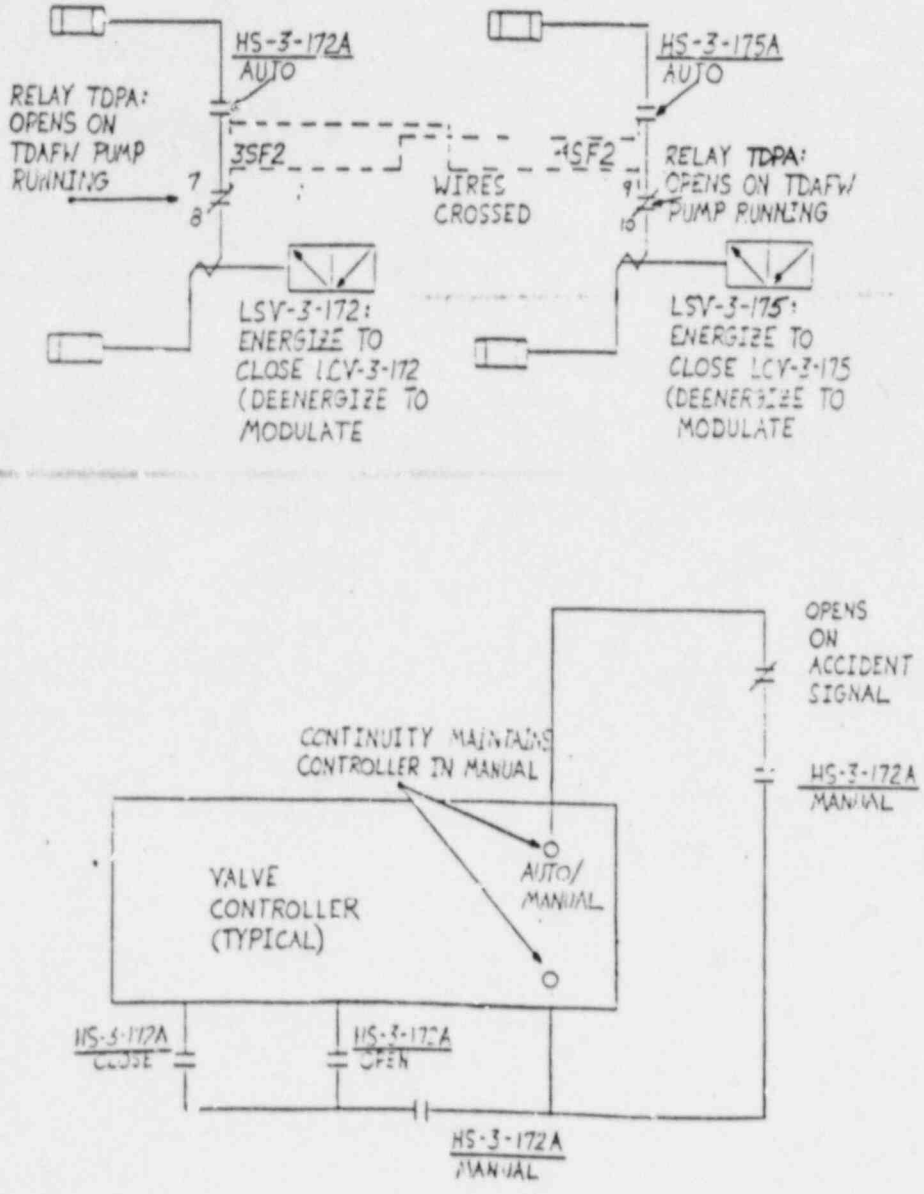
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Sequoyah, Unit 2	0 5 0 0 0 3 2 8	8 8	— 0 2 6	— 0 1	0 8 OF 0 8

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

FIGURE 1



TENNESSEE VALLEY AUTHORITY
Sequoyah Nuclear Plant
Post Office Box 2000
Soddy-Daisy, Tennessee 37379

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 2 - DOCKET NO. 50-328 - FACILITY OPERATING LICENSE DPR-79 - REPORTABLE OCCURRENCE REPORT SQRO-50-328/88026 REVISION 1

The enclosed licensee event report has been revised to provide additional information regarding the corrective action TVA is taking to prevent recurrence of this event. This event was originally reported in accordance with 10 CFR 50.73, paragraph a.2.i.b, on July 7, 1988.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

S. J. Smith
Plant Manager

Enclosure
cc (Enclosure):

J. Nelson Grace, Regional Administrator
U. S. Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, NW
Atlanta, Georgia 30323

Records Center
Institute of Nuclear Power Operations
Suite 1500
1100 Circle 75 Parkway
Atlanta, Georgia 30339

NRC Inspector, Sequoyah Nuclear Plant

IE22
1/1