

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Sequoyah, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 3 2 7	PAGE (3) 1 OF 0 4
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1. Advertent Starting Of Fire Pumps During A LOCA Could Degrade The Auxiliary Power System Because Of A Design Error

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 7	2 3	8 7	8 7	0 4 2	0 2	0 5	2 6	8 8	Sequoyah, Unit 2		0 5 0 0 0 3 2 8
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OPERATING MODE (9) 5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)											
POWER LEVEL (10) 0 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 Abstract below and in Text, NRC Form 365A)		
	20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(viii)(A)					
	20.405(a)(1)(iv)			XX 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 Don Siska J. L. Long, Plant Operations Review Staff							TELEPHONE NUMBER 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 NPD'S	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPD'S	

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 revision provides additional information concerning the long-term corrective action TVA has taken to preclude a potential degradation of the auxiliary power system during a loss of coolant accident (LOCA).

A condition adverse to quality report was initiated on April 14, 1987, with both units 1 and 2 in mode 5 (cold shutdown) describing a condition where calculations for the auxiliary electric power system have not included the effect on safety-related equipment of the fire pumps starting and running during a LOCA. The fire pumps are supplied power from the class 1E power system; however, the design basis for Sequoyah Nuclear Plant does not include a LOCA and concurrent fire. During a LOCA, the containment temperature can be high enough to cause the fire pumps to start because of the actuation of the temperature sensors on the fire detection system. Starting the fire pumps concurrent with a LOCA could potentially degrade the auxiliary electric power system voltage and thereby prevent safety-related equipment from performing its intended function.

The root cause of the condition was a design error when the design engineer did not consider the possibility of inadvertently starting the fire pumps during a LOCA. As a compensatory measure during the startup of unit 2, the unit 2 fire pumps were placed under administrative controls such that they could only be manually started, and the unit 1 fire pumps were aligned to start automatically when required. This alignment ensured that if an accident occurred on unit 2, the fire pumps would not degrade the unit 2 portion of the auxiliary power system. As long-term corrective action, TVA will revise the fire pump start logic such that a safety injection signal from a particular unit will inhibit the automatic fire pump start for that unit.

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

DESCRIPTION OF CONDITION

This revision provides additional information concerning the long-term corrective action TVA has taken to preclude a potential degradation of the auxiliary power system during a loss of coolant accident (LOCA).

On April 14, 1987, while both units 1 and 2 were in mode 5 (cold shutdown), internal TVA condition adverse to quality report (CAQR) SQT 870649 was initiated as a result of design reviews performed to ensure adequate calculations existed to support the plant design basis. The subject CAQR describes a condition where calculations for the 1E auxiliary electric power system (EIIS Codes EB and ED) voltage, current, and load expected during LOCA conditions have not included the effect on safety-related equipment of fire pumps (EIIS Code KP) starting and running. The fire pumps are supplied power from the class 1E system; however, the design basis for Sequoyah Nuclear Plant does not include a LOCA and concurrent fire.

The fire protection heat sensors (EIIS Code IC) inside containment are designed to start the fire pumps if they sense temperatures greater than 212 degrees F. Since containment temperature can exceed 240 degrees during a LOCA, there was a potential for the fire pumps to start. Additionally, fire detection sensors (EIIS Code IC) that detect ionized air could also be actuated by LOCA conditions and cause the fire pumps to start. Starting the fire pumps concurrent with a LOCA could potentially degrade the auxiliary electric power system voltage and thereby prevent safety-related equipment from performing its intended function. Also, the potential exists for overloading the emergency diesel generators if a loss of offsite power occurred coincident with the LOCA.

No immediate operator action was required because both units were in mode 5, and there was insufficient energy in the reactor coolant system (EIIS Code AB) for conditions inside containment to reach the actuation setpoint of the detectors. Additionally, even if the fire pumps did start from a valid signal, the automatic safety injection (SI) signal (EIIS Code JE) was blocked in mode 5 thus preventing automatic operation of the SI pumps (EIIS Codes BF and BQ) and valves affected by an SI signal. Containment spray pumps (EIIS Code BE) were also locked out in mode 5. Hence, the auxiliary power system would not have been heavily loaded.

CAUSE OF CONDITION

The root cause of this condition was a design error. The design engineer realized that a fire concurrent with a LOCA was outside the design basis of the plant, and in fact, high pressure fire protection would be isolated to containment during a LOCA. However, he did not recognize the possibility of inadvertently starting the fire pumps during a LOCA and the subsequent effects of running the fire pumps on the auxiliary power system during a LOCA.

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TEXT (If more space is required, use additional NRC Form 386A's) (17)

ANALYSIS OF CONDITION

This condition is reportable under 10 CFR 50.73, paragraph a.2.ii, as a condition outside the design basis of the plant. When the diesel generator load analysis was performed, it was not realized that the fire pumps could potentially start during a LOCA. It has now been determined that starting the fire pumps during a LOCA can degrade the auxiliary power system when the 1E busses are being supplied from the preferred power supply (offsite power) or from the emergency diesel generators. Additionally, results from emergency diesel generator testing indicate that there is no assurance the diesel generators can support the fire pumps starting and running during a LOCA.

CORRECTIVE ACTION

As stated before, no operator action was necessary when both units were in mode 5. As a compensatory measure during the startup of unit 2, the unit 2 fire pumps were placed under administrative controls such that they could only be started manually (operator action), and the unit 1 fire pumps were aligned to start automatically (fire detection instruments) if required. The fire pumps supply a common header, and only two fire pumps are required to satisfy technical specifications. Thus, this alignment ensured that should an accident occur on unit 2, the fire pumps will not degrade the unit 2 portion of the auxiliary power system. Since unit 1 remained in mode 5 during unit 2 startup, the added load of starting and running the fire pumps did not adversely affect the unit 1 auxiliary power system.

As long-term corrective action, TVA is implementing Engineering Change Notice (ECN) L7154 (unit 2) and ECN L7155 (unit 1). These ECNs revise the fire pump start logic such that an SI signal from a particular unit will inhibit the automatic starting of the fire pumps for that unit (e.g., an SI signal from unit 1 will inhibit the automatic start of the fire pumps 1A and 1B). The field work for ECN L7154 has been completed; hence, the high pressure fire pumps powered from the unit 2 shutdown boards will not automatically start if a LOCA increases the containment temperature above the 212 degrees F setpoint of the inside containment heat sensors. Thus, there will be no degradation of the unit 2 auxiliary power system or overloading of the diesel generators during a postulated LOCA. Implementation of ECN L7155 will be complete before restart (mode 2) of unit 1.

To prevent recurrence of design errors, TVA has implemented a set of Nuclear Engineering Procedures (NEPs) to control the design and change control processes TVA uses at their nuclear plants. Specifically, NEP-3.2, "Design Input;" NEP-5.1, "Design Output;" NEP-5.5, "Engineering Requirements Specifications;" and NEP-6.1, "Change Control," provide the necessary control over the design and design change processes to prevent recurrence of this event.

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

ADDITIONAL INFORMATION

There have been two previously reported occurrences where a design error has resulted in a potential degradation of the auxiliary power system - SQRO-50-327/87001 and 87052.

COMMITMENTS

TVA will complete the installation of ECN L7155 before restart of unit 1.

0597Q

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

May 26, 1988

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

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET NO.
50-327 - FACILITY OPERATING LICENSE DPR-77 - REPORTABLE OCCURRENCE REPORT
SQRO-50-327/87042 REVISION 2

The enclosed revised licensee event report provides additional information relating to the action TVA has taken to correct a condition where inadvertently starting fire pumps during a loss of coolant accident could have degraded the auxiliary power system and overloaded the emergency diesel generators. This event was originally reported in accordance with 10 CFR 50.73, paragraph a.2.ii, on August 18, 1987, and revised on December 22, 1987.

Very truly yours,

TENNESSEE VALLEY AUTHORITY


S. J. Smith
Plant Manager

Enclosure
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