TENNESSEE VALLEY AUTHORITY

6N 38A Lookout Place

August 23, 1989

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

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET NO. 50-327 - FACILITY OPERATING LICENSE DPR-77 - LICENSEE EVENT REPORT (LER) 50-327/87030, REVISION 2

The enclosed LER is revised to provide additional information on completed corrective actions concerning a blown fuse in the emergency start circuits that resulted in spurious emergency diesel generator starts on two occasions. This event was reported in accordance with 10 CFR 50.73, paragraph a.2.iv, and 10 CFR 21.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. R. Bynum, Vice President
Nuclear Power Production

Enclosure
cc (Enclosure):
Regional Administration
U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region II
101 Marietta Street, Suite 2900
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INPO Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

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

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NRC Form 366
(9-83)

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

LICENSEE EVENT REPORT (LER)

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Sequoyah, Unit 1	0 5 0 0 0 3 2 7	1 OF 0 5

TITLE (4)
Blown Fuse In Emergency Start Circuits Result In Spurious Emergency Diesel Generator Starts On Two Occasions

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	2 0	8 7	8 7	0 3 0	0 2	0 8	2 3	8 9	Sequoyah, Unit 2	0 5 0 0 0 3 2 8
										0 5 0 0 0

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 1 0 0	20.402(b)	20.405(c)	XX 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)	XX OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	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)	10 CFR 21 Report

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
G. A. Hipp, Compliance Licensing Engineer	6 1 5 8 4 3 - 7 7 6 6

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	
B	E B	F U	L 2 2 3	N							
B	E B	F U	L 2 2 3	N							

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)

This LER is revised to provide additional information on completed corrective actions. On June 20, 1987, at 0055 EST, all four standby diesel generators (D/Gs) started due to a blown fuse in a remote emergency start circuitry for 2A-A D/G. The blown fuse (FLAS-5, Lot No. 3) caused loss of voltage to the 2A-A remote emergency start circuitry. Standby D/Gs 1A-A, 1B-B, 2A-A, and 2B-B started as required. On July 4, 1987, at 1212 EST, all four standby D/Gs started due to a blown fuse in 125V DC Vital Battery Board II, Circuit C-16. The blown fuse (FLAS-5, Lot No.2) caused loss of power to the logic relay panel for 1B-B D/G. Upon loss of voltage to the 1B-B D/G remote emergency start circuitry, standby D/Gs 1A-A, 1B-B, 2A-A, and 2B-B started as required. For both events described above, no damage occurred to the D/Gs, and none of the D/Gs loaded because a degraded voltage condition did not exist on the 6.9 kV shutdown boards. TVA has contracted with Littlefuse Inc. to supply 15,000 FLAS-5 fuses. Approximately 3,200 out of 3,702 (delivered) fuses were installed in March and April 1987, 1,683 of which were from Lots 2 and 3. As of July 13, 1987, 69 FLAS-5 fuse failures have occurred. Of these, 67 failed fuses were supplied in Lots 2 and 3. The lot number of the remaining two failed fuses could not be determined. A telephone conversation held with the vendor on June 29, 1987, revealed that changes had been made in both solder material and soldering process subsequent to manufacturing Lot Nos. 2 and 3 of FLAS-5 fuses as improvements in the production process. TVA was not informed of this change. The vendor also indicated that due to the change, later production runs are expected to be more reliable. All FLAS-5 Lot Nos. 2 and 3 belonging to standby D/G circuits have been identified and were changed out with FLAS-5, Lot No. 6, on July 11, 1987. The remaining fuses of Lot No. 2 and 3 have been changed out with subsequent lots of FLAS-5 fuses.

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

DESCRIPTION OF EVENT

This LER is revised to provide additional information on completed corrective actions.

This LER addresses two events of engineered safety feature (ESF) actuations of the onsite emergency diesel generators (D/Gs) as a result of blown fuses in the emergency start logic for this equipment. There was no actual loss of offsite power availability during either of these events. The standby D/Gs (EIIS Code EK) are common equipment for units 1 and 2.

Occurrence Number One

At 0055 EST on June 20, 1987, with unit 1 in mode 5 (0 percent power, 4 psig, 130 degrees F) and unit 2 in mode 5 (0 percent power, 260 psig, 124 degrees F), a blown FLAS-5 fuse (IEEE Code FU) TVA fuse identifier ($2\text{-}FU_2\text{-}202\text{-}SC5\text{-}A$) caused a loss of voltage in a logic relay panel for shutdown board 2A-A (EIIS Code EB). The logic relay actuation caused D/Gs 1A-A, 1B-B, 2A-A, and 2B-B to start. No modification or maintenance activities related to D/Gs circuitry were in progress that could have contributed to this event. None of the D/Gs tied onto their shutdown boards since voltage was not actually lost on any of the boards.

Operations personnel in the main control room (MCR) responded to the alarms and annunciators and verified that the shutdown board had not lost power. The D/Gs were returned to their normal standby mode in less than 30 minutes.

Occurrence Number Two

At 1212 EST on July 4, 1987, with unit 1 in mode 5 (0 percent power, 4 psig, 125 degrees F) and unit 2 in mode 5 (0 percent power, 0 psig, 128 degrees F), D/Gs (EIIS Code EK) started when a blown FLAS-5 fuse (IEEE code FU) TVA fuse identifier ($0\text{-}FU_2\text{-}250\text{-}KFC16\text{-}E$) in a 125V DC Vital Battery Board II (EIIS Code EJ), Circuit C-16, removed power from remote emergency start circuitry. Upon loss of voltage to the remote emergency start logic relay panel for shutdown board 1B-B (EIIS Code EB), standby D/Gs 1A-A, 1B-B, 2A-A, and 2B-B started. No modification or maintenance activities related to D/Gs circuits were in progress that could have contributed to this event. The D/Gs were not loaded because a degraded voltage condition did not exist on the 6.9 kV shutdown boards (EIIS Code EB).

Operations personnel in the MCR responded to the alarms and annunciators and verified that the shutdown board had not lost power. The D/Gs were returned to their normal standby mode in less than 60 minutes.

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

CAUSE OF EVENT

Both events were caused by a blown fuse in the D/G emergency start circuit logic relay. An engineering review of these events indicates that a contributing cause of the blown fuse is probably a defective fuse. Because of the suspect fuse from the June 20 event, a telephone conversation was held with the Littlefuse Inc., (manufacturer of the FLAS-5 fuses) (IEEE Code L223) on June 29, 1987, which revealed that changes had been made in both solder material and soldering process subsequent to manufacturing Lot Nos. 2 and 3 of FLAS-5 fuses as improvements in the production process.

ANALYSIS OF EVENTS

The above described events involve an ESF actuation and is therefore reported under 10 CFR 50.73, paragraph a.2.iv. This report also meets the requirements of 10 CFR 21 concerning the failed fuses.

All four D/Gs were operable at the time of both events. These D/Gs started and went to rated speed as required. If in the event offsite power was lost, the D/Gs would have aligned to the shutdown boards and supplied adequate power to equipment to maintain both units in cold shutdown.

Operation in a mode greater than mode 5 for either unit requires all four D/Gs to be operable. Loss of one train of D/Gs is within the accident analysis of the plant such that one train of power would have been available to mitigate the consequences of an accident. Loss of offsite power with either unit at power would have resulted in no increase to the consequences of the accident as the D/Gs would have performed their intended function even with the blown fuse.

CORRECTIVE ACTIONS

Littlefuse Inc., indicated that due to changes made to both solder material and soldering process, FLAS-5 fuses of later production runs are expected to be more reliable. All FLAS-5 Lot Nos. 2 and 3 belonging to standby D/G circuits have been identified and were changed out with FLAS-5, Lot No. 6, on July 11, 1987.

Shipments of FLAS-5 Lot Nos. 10 and 11 were received during the month of August 1987. All FLAS-5 Lot Nos. 2 and 3 fuses have been replaced during the month of October 1987. Shipment of FLAS-5 Lot No. 12 was received during the month of September 1987 and is maintained as a stock material. It should be noted that failure of FLAS-5 fuses of Lots 4, 6, 10, and 11 has not occurred (similar to failure of fuses of Lots 2 and 3), since their installation.

In 1987, TVA completed testing of FLAS-5 fuses of Lots 4, 6, 10, 11, and 12. Those test results predicted an 80-month average expected life and a 23-month minimum expected life of these fuses based on an estimated ambient temperature of 104 degrees F.

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

TVA has completed an evaluation of the ambient temperatures to which FLAS-5 fuses are exposed to determine a more accurate minimum expected life. Based upon an average ambient temperature at the fuse location of 73 degrees F and a fuse temperature rise of 3 degrees F at 1 ampere current flow, the minimum expected fuse life is 106 months. With an initial service date of April 1987, the resulting changeout date is February 1996 for the first of the FLAS-5 fuses delivered.

ADDITIONAL INFORMATION

Previous occurrences of reports as a result of D/G starts - 10 - SQRO-50-327/86045, 86041, 86038, 86026, 86025, 86010, 85045, 85041, 85035, and 84066.

This is the second event where the D/G start was a result of a defective fuse. The previous event was reported by SQRO-50-327/86045 which involve MIS-5 fuses manufactured by Busmann.

Component Identification

Fuse Model No. is FLAS-5 and manufactured by Littlefuse Inc., (IEEE Code L223).

These fuses consist of a fuse wire, a 560-ohm resistor, a spring-loaded indicator pin, and sand-like filler. One end of the spring, the resistor, and the fuse wire are soldered together as shown in Figure A. The solder material used is a eutectic alloy that melts under overcurrent conditions releasing the indicator pin. The fuse rating is 5 amperes.

Nature of Defect or Noncompliance and Cause

TVA has contracted with Littlefuse to supply 15,000 FLAS-5 fuses. Of these fuses, 3,702 have been delivered to Sequoyah Nuclear Plant thus far. They were supplied in four lots numbered 2, 3, 4, and 6. Approximately 3,200 fuses were installed in March and April 1987, 1,683 of which were from Lots 2 and 3.

As of July 13, 1987, 69 FLAS-5 fuse failures have occurred. Of these, 67 failed fuses were supplied in Lots 2 and 3. The lot number of the remaining two failed fuses could not be determined.

When contacted on June 29, 1987, regarding this problem, Littlefuse disclosed that a change in both solder material and the soldering process had been made for Lots 4 and 6. TVA was not informed of this change. The vendor stated that the changes were made to improve production runs, and that they do not consider Lots 2 and 3 to be defective. TVA does not concur with this statement.

TVA still believes that the fuses manufactured in Lots 2 and 3 were defective. Elevated current testing of fuses from all affected lots has been conducted and continues to be conducted to ensure expected life predictions are consistent with actual test data from each lot.

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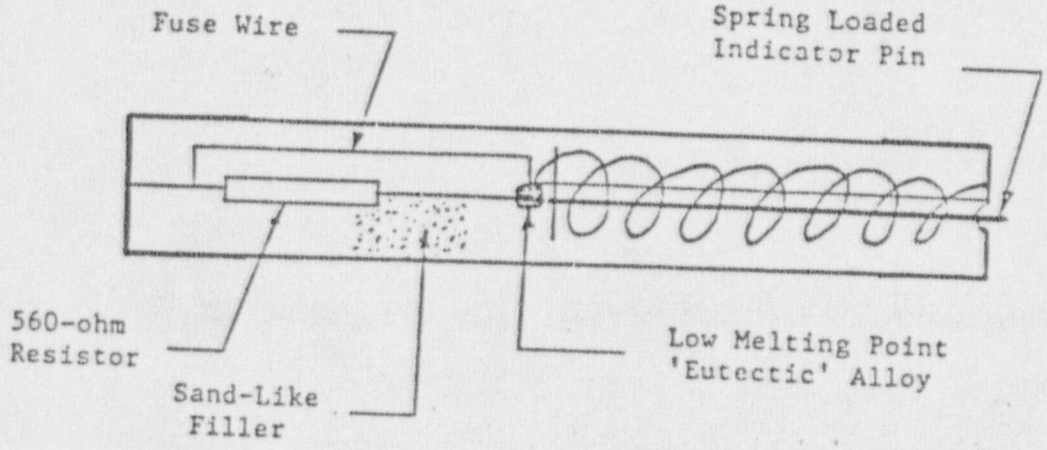
TEXT (If more space is required, use additional NRC Form 366A's) (17)

FIGURE A



FLAS-5 FUSE