

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1) Sequoyah Nuclear Plant (SQN) Unit 1

DOCKET NUMBER (2) 05000327

PAGE (3) 1 OF 13

TITLE (4)

Failure to Properly Perform Surveillance Testing on the Containment Air Return Fan Start Logic, the Blackout and Auto Sequencing of the Station Fire Pumps, and Three Functions of the Solid State Protection System.

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 NAME	DOCKET NUMBER
3	22	97	97	--	008 -- 01	12	15	97	Sequoah, Unit 2	05000328
OPERATING MODE (9) 1 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)										
POWER LEVEL (10)		100	20.2203(a)(1)			20.2203(a)(3)(i)			X 50.73(a)(2)(i)	50.73(a)(2)(viii)
			20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)	50.73(a)(2)(ix)
			20.2203(a)(2)(iii)			20.2203(a)(4)			50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(iv)			50.36(c)(1)			50.73(a)(2)(v)	OTHER
						50.36(c)(2)			50.73(a)(2)(vii)	Specify in Abstract below or in NRC Form 368A

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
J. Bajraszewski, Licensing Engineer	(423) 843-7749

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPPDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPPDS
N/A						N/A				

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 pages, i.e., approximately 15 single-spaced typewritten lines) (16)

On March 22, 1997, it was determined that surveillance testing of the blackout and auto sequencing timer circuit for the station fire pumps and the containment air return fan auto start signal circuitry may not have been tested correctly. The testing method for the blackout and auto sequencing timer bypassed the blackout auto sequencing circuit so that it was not properly tested. The surveillance instruction for the containment air return fan failed to ensure that the contacts would function properly. The root cause of the identified conditions was determined to be inadequate surveillance instructions. Testing was performed to ensure that the circuits were performing properly. The surveillance instruction for testing the fire pump logic was revised to remove the option to use the handswitch in the main control room. The surveillance instruction for testing of the containment air return fans logic was revised to include steps to require testing of the containment air return fans SSPS contacts each outage. On November 19, 1997, plant personnel determined that the solid state protection system (SSPS) surveillance testing was inadequate for three SSPS functions. The root cause of the condition was a design deficiency in the Westinghouse semi-automatic tester. This resulted in the failure to test all possible parallel logic inputs. The applicable technical specification action was entered, both trains of each unit were tested, and testing found the three SSPS functions operable. Applicable procedures were revised to properly test parallel SSPS inputs.

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I. PLANT CONDITIONS

Issue No. 1

Unit 1 was in Mode 4 and Unit 2 was in Mode 1 at approximately 100 percent.

Issue No. 2

Units 1 and 2 were in power operation at approximately 100 percent.

II. DESCRIPTION OF EVENT

A. Event

Issue No. 1

On March 22, 1997, it was determined that surveillance testing of the blackout and auto sequencing timer circuit for the station fire pumps (EIIS Code KF) and the containment air return fan (EIIS Code BK) auto start signal circuitry may not have been tested correctly. The method specified in the surveillance instruction for testing of the blackout and auto sequencing timer circuit for the station fire pumps allows an option to either depress and hold the pushbutton for the fire pump start or turn and hold the handswitch until the fire pump starts. The handswitch method bypasses the blackout auto sequencing circuit so that it is not tested when this option is used.

The surveillance instruction used to verify that the containment air return fans starts on an auto start signal simulated the auto start signal by placing a jumper in the motor control center of the fan. The jumper simulated the closure of the solid state protection system (SSPS) (EIIS Code JG) contacts of a phase B containment isolation signal. The surveillance instruction failed to ensure that the contacts would function properly.

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Issue No. 2

On November 19, 1997, plant personnel determined that current solid state protection system (SSPS) (EIIS Code JG) surveillance testing was inadequate for three functions. The three functions affected were:

- 1) P-10 Source Range Block (automatic block of the nuclear instrumentation system [NIS] source range reactor trip).
- 2) Feedwater isolation steam generator high-high level.
- 3) Feedwater isolation on safety injection.

During SSPS testing, the Memories switch of the semi-automatic tester is placed in different positions to test various SSPS functions. For each of the three functions identified above, external hard wire connections provide parallel inputs to the universal logic card that processes that particular function. Function operation requires a two out of three input logic for function actuation. The semi-automatic test equipment provides a ground to one of three inputs (simulating an input) and an input signal to a common point on the parallel connection. This results in a two out of three input logic without each path of the parallel configuration being tested. Theoretically, one of the two parallel paths could fail and the failure would not have been identified during testing. The inadequate testing condition has existed since initial installation of SSPS.

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

None.

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C. Dates and Approximate Times of Major Occurrences

Issue No. 1

- | | |
|--|--|
| October 3, 1991 | The surveillance instruction used for testing of the blackout and auto sequencing timer circuit for the station fire pumps was revised to allow the use of the fire pump start handswitch in the main control room. |
| January 10, 1996 | NRC issued GL 96-01, Testing of Safety-Related Logic Circuits. |
| April 18, 1996 | TVA provides NRC with a response to the GL. |
| March 22, 1997 | Review of procedures for compliance with guidelines set forth in NRC GL 96-01 identified a potential problem with testing of the blackout and auto sequencing timer circuit for the station fire pumps. The review also identified that the SSPS contacts for the auto start signal on the containment air return fans may not have been tested to ensure that the contacts were functioning properly. |
| March 24, 1997 at approximately 0356 Eastern standard time (EST) | During performance of the surveillance instruction on 1A-A diesel generator (D/G), as a precautionary measure, the fire-pump start push button was used which properly tested the fire-pump start logic circuit. The circuit was determined to be acceptable. |
| March 25, 1997 at 1735 EST | It was determined that the response time test for SSPS satisfied the |

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logic testing for the SSPS contact for starting the containment air return fans 1A-A, 1B-B, and 2A-A. The logic for containment air return fan 2B-B had not been tested within the required frequency. Limiting condition for operation (LCO) 3.6.5.6 action was entered.

March 25, 1997
at 1830 EST

It was confirmed that previous testing performed by utilizing the MCR handswitch for testing of the fire pump start logic was inadequate for D/G 1B-B, 2A-A and 2B-B. D/G 1A-A had already been tested using the push button. LCOs 3.8.1.2 and 4.0.3 were entered on both units.

March 25, 1997
at 2218 EST

A special test procedure was prepared and performed for D/G 1B-B, 2A-A and 2B-B utilizing the fire-pump common start logic circuit. The test determined the circuits were acceptable. LCOs 3.8.1.2 and 4.0.3 were exited on both units.

March 27, 1997
at 0025 EST

A special test procedure was prepared and performed for testing the 2B-B containment air return fan SSPS contact. The test determined the circuits were acceptable and LCO 3.6.5.6 was exited.

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Issue No. 2

November 17, 1997 INPO nuclear network entry (OE8636) was released to the industry. The network entry provided details of inadequate SSPS testing as identified by Duke Energy Corporation. The TVA Nuclear Experience Review Program distributed OE8636 for applicability review.

November 19, 1997 at 1115 EST Units 1 and 2 entered Technical Specification Surveillance Requirement (SR) 4.0.3 for failure to perform monthly surveillance testing for source range block P-10, feedwater isolation on high-high steam generator level, and feedwater isolation on safety injection.

November 19, 1997 at 1659 EST Testing was completed for Unit 1 SSPS Trains A and B. Testing found the functions operable. Unit 1 exited SR 4.0.3.

November 19, 1997 at 1714 EST Testing was completed for Unit 2 SSPS Trains A and B. Testing found the functions operable. Unit 2 exited SR 4.0.3.

D. Other Systems or Secondary Functions Affected

None.

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E. Method of Discovery**Issue No. 1**

The conditions were identified during review of surveillance instructions for compliance with guidelines set forth in NRC GL-96-01.

Issue No. 2

The condition was identified by site Engineering personnel during review of a nuclear network operational experience entry that detailed the discovery of inadequate SSPS testing at Duke Energy Corporation's Catawba and McGuire Nuclear Stations.

F. Operator Actions

Main Control room personnel entered the appropriate technical specification LCOs.

G. Safety System Responses

No safety system responses were required for the conditions identified in this LER.

III. CAUSE OF THE EVENT**A. Immediate Cause****Issue No. 1**

The immediate cause of both of the identified conditions was an inadequate surveillance instruction. The surveillance instruction that tested the fire pump logic contained steps that allowed the operator to use the handswitch which bypasses the blackout auto sequencing logic circuit. The surveillance for testing of the containment air return fan logic failed to ensure that the required SSPS contacts were functioning properly.

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Issue No. 2

The immediate cause of the condition was the failure to perform adequate surveillance testing on three functions of SSPS to ensure that the logic circuits were functioning properly.

B. Root CauseIssue No. 1

The root cause of the identified conditions was determined to be inadequate surveillance instructions.

In October 1991 the surveillance instruction for testing the fire pump logic was revised to allow the fire pump to be started by either [a] Depress and hold the fire pump start pushbutton until fire pump sequences on, or [b] turn and hold the fire pump start handswitch in the start position until the fire pump sequences on. Using option [b] defeats the load sequence logic during the performance of the surveillance. When the surveillance was changed to allow the use of the handswitch the technical evaluation of the change was not adequate.

The surveillance instruction for testing the containment air return fan logic failed to ensure that the required SSPS contacts were functioning properly. The SSPS response time testing surveillance instruction normally tests the SSPS contacts on alternate refueling outages for each train.

Issue No. 2

The root cause was a design deficiency in the Westinghouse semi-automatic tester. This resulted in the failure to test all possible parallel SSPS logic inputs. The system was designed with a semi-automatic tester because of SSPS complexity. This tester was

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used to test SSPS logic functions to ensure compliance with plant technical specifications.

C. Contributing Factors

None

IV. ANALYSIS OF THE EVENT**Issue No. 1**

The D/Gs function as the onsite standby alternating current (AC) power source. The safety function of the standby power system is to supply power to permit functioning of components and systems required to assure that (1) fuel design limits and reactor coolant pressure boundary design conditions are not exceeded due to anticipated operational occurrences, and (2) the core is cooled and vital functions are maintained in the event of postulated accidents subject to loss of the preferred power system and subject to any single failure in the standby power system. An undetected failure of the sequencer logic could result in the fire pump being tied to the D/G concurrent with other auto-connecting loads such that the D/G may overload and subsequently fail. The sequencer logic was correctly tested and found to be functioning properly.

The containment air return fans are designed to return air from upper containment to the lower compartments following a design basis accident. Air from these fans is then circulated through the ice condenser and back to upper containment. The containment air return fans auto start on a phase B containment isolation signal after a 10 minute delay. The surveillance instruction did not ensure that the SSPS contacts would function given an auto start signal. However, as part of the SSPS response time testing the contacts were being tested in alternate refueling outages. During the last Unit 1 refueling outage both containment air return fans 1A-A and 1B-B were tested. During the last Unit 2 refueling outage, the 2A-A containment air return fan was tested. The containment

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containment air return fan 2B-B contact was not tested in the last outage and was out of frequency. A special test was performed, demonstrating that the containment air return fan 2B-B SSPS contact would function properly.

Issue No. 2

Operability of the reactor protection and engineered safety features (ESF) instrumentation system ensure that the associated ESF action and/or reactor trip will be initiated when the parameter monitored by each channel or combination of channels reaches its setpoint. Operability of these systems is required to provide the overall reliability, redundancy, and diversity assumed available in the facility design for the protection and mitigation of accident and transient conditions.

This issue identified three SSPS functions that were inadequately tested:

- 1) P-10 (automatic block of the NIS source range reactor trip).
- 2) P-14 (feedwater isolation on a high-high steam generator level).
- 3) Feedwater isolation on a safety injection signal.

Technical specification (Table 4.3-2) requires each train or logic channel for feedwater isolation (automatic actuation logic) to be tested at least every 62 days on a staggered test basis.

The P-10 function is essentially not used because NIS source range reactor trip is manually blocked under administrative control at permissive P-6. Therefore, operability of the P-10 function has no impact to SQN operation.

The function of feedwater isolation on a high-high steam generator level is not a core damage mitigating ESF actuation.

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A feedwater isolation on a safety injection signal occurs concurrently with the P-4 (reactor trip) signal. Therefore, the SSPS configuration for the safety injection feedwater isolation feature was not affected. A two out of three logic could have been obtained (in the unlikely event that one of the two parallel paths had failed) by use of only one safety injection signal input path concurrent with the reactor trip P-4 signal.

Testing of the three functions was performed on each train of each unit as soon as it was determined the condition was applicable to SQN. Testing determined that the functions performed as required.

Based on the testing that was performed ensuring that circuits were functioning properly, the conditions identified in this LER did not adversely affect the health or safety of plant personnel or the general public.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

Upon determination of the conditions the appropriate LCOs were entered.

Issue No. 1

A special test was issued, to properly test the fire-pump auto-connected shutdown loads through the load sequencer for the fire pumps on D/G (1B-B, 2A-A and 2B-B). D/G 1A-A had already been tested using the push button. This was accomplished by starting the fire pumps using the fire pump start push-button instead of the hand switch. Testing determined that each circuit was acceptable.

A special test was prepared and performed to test the SSPS contacts for the 2B-B containment air return fan. The test demonstrated that the SSPS contacts would function properly.

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Issue No. 2

Both trains of each unit were tested. Testing found the three SSPS functions operable.

B. Corrective Actions to Prevent RecurrenceIssue No. 1

The surveillance instruction for testing the fire pump logic was revised to remove the option to use the handswitch in the main control room. The surveillance instruction for testing of the containment air return fans logic was revised to include steps to require testing of the containment air return fans SSPS contacts each outage.

Reviews of surveillance instructions, for adequacy of testing of safety-related logic circuits, as committed in response to NRC GL-96-01 have been completed.

Lessons learned from the conditions identified as a result of the Generic Letter 96-01 review have been added to the appropriate training curriculum. This action was previously committed to in LER 50-327/97003.

Issue No. 2

Applicable procedures were revised to properly test parallel SSPS inputs. Vendor review determined that no other parallel input paths exist.

VI. ADDITIONAL INFORMATION**A. Failed Components**

None

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B. Previous LERs on Similar Events

A review of previous reportable events identified one LER (50-327/94013) that was associated with inadequate testing of essential raw cooling water pump start logic circuitry for safety injection and blackout signals. The cause of that condition was an inadequate revision of the surveillance instruction. The actions taken for that LER did not evaluate the type of deficiencies described in GL 96-01.

Additionally, one LER (50-327/95-012) was identified where SRs associated with the calibration of analog channels, which input to SSPS, may not have been properly tested. The corrective actions of the previous event would not have prevented the condition described by this report.

There have been two previous reportable events that were identified as a result of the GL-96-01 review as reported by LERs 50-327/97001 and 50-327/97003.

C. Additional Information

None.

VII. COMMITMENTS

The surveillance instruction for testing the fire pump logic have been revised to remove the option to use the handswitch in the Main Control Room. The surveillance instruction for testing of the containment air return fans logic have been revised to include steps to require testing of the containment air return fans SSPS contacts each outage. These surveillances were revised by September 26, 1997.

No additional commitments were required as a result of the November 19, 1997, issue.