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Timothy P. Cleary
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Sequoyah Nuclear Plant

May 22, 2009

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

10 CFR 50.73

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2 - DOCKET NOS. 50-327 AND 50-328 - FACILITY OPERATING LICENSE DPR-77 AND DPR-79 - LICENSEE EVENT REPORT (LER) 50-327 AND 50-328/2009-003-00

The enclosed LER provides details concerning a condition where Sequoyah Units 1 and 2 received an automatic reactor trip because of loss of power to two reactor coolant pumps on each unit. The loss of power condition was caused by a differential relay actuation that resulted from a fault on Common Station Service Transformer D.

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A), a condition that resulted in automatic actuation of the reactor protection system.

Sincerely,

Timothy P. Cleary

Enclosure
cc: See page 2

Enclosure
cc (Enclosure):

INPO Records Center
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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Sequoyah Nuclear Plant (SQN) Unit 1	05000327	1 OF 6

4. TITLE:
Units 1 and 2 Reactor Trip on Reactor Coolant Pump (RCP) Buses Undervoltage

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	26	2009	2009	- 003 -	00	05	22	2009	SQN Unit 2	05000328
									FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE
1

10. POWER LEVEL
96

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER *(Include Area Code)*
Norm Thomas	423-843-7749

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	EA	NSBU		Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On March 26, 2009 at 0452 Eastern daylight time (EDT), Sequoyah Units 1 and 2 received an automatic reactor trip on reactor coolant pump (RCP) buses undervoltage. A loss of Common Station Service Transformer (CSST) C caused a loss of power to two unit boards on each unit that feed RCPs. CSST C is supplied by the same switchyard power circuit breakers (PCB) as CSST D. CSSTs C and D were deenergized as a result of a differential relay actuation caused by a faulted bus on CSST D. The differential relays actuated as designed to clear a fault and protect CSSTs C and D, as well as the rest of the offsite power switchyard. CSST B continued to supply offsite power to the Train B safety-related shutdown boards for both units. The emergency diesel generators started and powered the Train A safety-related shutdown boards for both units. Both units were stabilized in hot standby (Mode 3). CSST C was isolated from CSST D and reenergized from the switchyard PCBs. Offsite power was then restored to the Train A safety-related shutdown boards for both units. The cause of the bus fault was determined to be degraded bus bar insulation and water intrusion into the CSST D secondary bus duct. Corrective actions include replacement of a section of the CSST D bus and inspection of the other CSSTs and cooling tower transformers (CTT). Repairs to degraded insulation of CSST C, CTT A, and CTT B were made as a result of the inspections.

LICENSEE EVENT REPORT (LER)

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Sequoyah Nuclear Plant (SQN) Unit 1	05000327	2009 --	003 --	00	2 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

I. PLANT CONDITION(S)

Units 1 was operating at 96 percent power and Unit 2 was operating at 100 percent power.

II. DESCRIPTION OF EVENT

A. Event:

On March 26, 2009 at 0452 Eastern daylight time (EDT), Sequoyah Units 1 and 2 received an automatic reactor trip on reactor coolant pump (RCP) buses undervoltage (EIIS code EA). A loss of Common Station Service Transformer (CSST) C (EIIS code EA) caused a loss of power to two unit boards that feed RCPs (EIIS code AB) on each unit. CSST C is supplied by the same switchyard power circuit breakers (EIIS code FK) as CSST D. CSST C was lost because the switchyard power circuit breakers tripped as a result of a differential relay actuation on CSST D. CSST D experienced a secondary side bus phase to phase fault. The differential relays actuated as designed to clear the fault and protect CSSTs C and D, as well as the rest of the offsite power switchyard. CSST B continued to supply offsite power to the Train B safety-related shutdown boards for both units. The emergency diesel generators (DGs) (EIIS code EK) started and powered the Train A safety-related shutdown boards (EIIS code EB) for both units. All three auxiliary feedwater pumps (EIIS code BA) on each unit started automatically and supplied the steam generators (SGs) as designed. Decay heat was removed via forced circulation of the reactor coolant system (RCS) by two RCPs, with steam relief through the SG atmospheric relief valves (EIIS code SB). Both units were stabilized in hot standby (Mode 3). CSST C was isolated from CSST D and reenergized from the switchyard power circuit breakers (PCBs). Offsite power was restored to the Train A safety-related shutdown boards for both units.

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

None.

C. Dates and Approximate Times of Major Occurrences:

Date	Description
March 26, 2009 at 0452 EDT	Units 1 and 2 reactor trip caused by loss of CSSTs C and D. Following the trip, the Unit 1 and 2 RCS temperature was controlled by SG atmospheric relief valves. An auxiliary building isolation (ABI) was received on each unit as a result of the loss of power to a radiation monitor. All four DGs started as a result of the loss of power. DGs 1A and 2A connected to their respective shutdown boards.

LICENSEE EVENT REPORT (LER)

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Sequoyah Nuclear Plant (SQN) Unit 1	05000327	2009 --	003 --	00	3 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

March 26, 2009 at 0508 EDT	Unit 1 RCS temperature dropped to 528 degrees Fahrenheit following the trip. Emergency boration was established by operations as required by Reactor Trip Response ES-0.1.
March 26, 2009 at approximately 0540 EDT	The loss of power caused the condenser circulation water (CCW) pumps B and C to trip on each unit. The remaining CCW pump A on both units was stopped in accordance with plant procedures. The loss of CCW flow resulted in loss of condenser vacuum on both units.
March 26, 2009 at 0649 EDT	The performance of the offsite power verification surveillance instruction was completed because of loss of one offsite power source. A problem event report was initiated because the offsite power verification was not performed within an hour as required by Technical Specifications (TS) 3.8.1.1.a.
March 26, 2009 at 1034 EDT	While removing the 1B DG from service, the 1B DG tripped on phase imbalance relay. Both units entered TS 3.8.1.1.c for one offsite power and one DG being inoperable. The 1B shutdown board remained energized to offsite power.
March 26, 2009 at 1430 EDT	Because of the abnormal annulus vacuum system alignment following the ABI, Unit 2 containment pressure reached 0.321 pounds per square inch differential (psid). Unit 2 entered TS 3.6.1.4.
March 26, 2009 at 1432 EDT	Train B emergency gas treatment system (EGTS) was placed in service to Unit 2 annulus in order to vent containment pressure. This alignment caused Train B EGTS to be inoperable for Unit 1. Since the normal power supply was inoperable for Train A EGTS, TS 3.0.5 was entered for Unit 1.
March 26, 2009 at 1436 EDT	Unit 2 exited TS 3.6.1.4. Unit 2 containment was vented and containment pressure was less than 0.3 psid.
March 26, 2009 at 1555 EDT	Unit 1 exited TS 3.0.5. Offsite power was restored to the 1A and 2A shutdown boards. Two offsite power sources were verified operable.

D. Other Systems or Secondary Functions Affected:

The main control room and most of the plant was without lighting, except for emergency lighting, until normal electrical board alignment was restored. The Unit 2 hydrogen side seal oil pump was secured because of an oil leak that occurred after the reactor trip. The Unit 2 main generator was depressurized and the seal oil pump was repaired.

E. Method of Discovery:

Switchyard, reactor trip, and blackout sequence alarms were annunciated on the main control room panels.

F. Operator Actions:

The operators promptly diagnosed the plant conditions and took actions as prescribed by plant procedures to stabilize the units in the hot standby condition (Mode 3).

G. Safety System Responses:

Safety systems performed as designed for the reactor trips and loss of power from CSST C . These included auxiliary feedwater auto-start, automatic feedwater isolation, and auto-start of all four DGs. The 1A and 2A DGs connected to and supplied the 1A and 2A shutdown boards as designed and functioned properly.

III. CAUSE OF THE EVENT

A. Immediate Cause:

The cause of the loss of CSST C was determined to be a fault on the secondary side (6900 volt) bus of CSST D.

B. Root Cause:

The cause analysis found that insulating bus sleeve cracking at the bottom support plate, co-incident with water intrusion, caused the bus fault. The CSST D outdoor non-segregated 3 phase bus was designed with Noryl insulating sleeves, Micarta insulating supports, and is maintained inside a bus enclosure. The plant had experienced several days of rain, and there were signs of water tracking into the bus enclosure. It appears that water was able to accumulate at the bottom insulating support plate and then soak into the bus sleeve cracks to create a phase to phase fault.

C. Contributing Factor:

Loads from CSST C would normally auto transfer to the CSST B in a fault condition. However, CSST A loads were already aligned to CSST B, in order to support scheduled maintenance on CSST A in an upcoming outage. This alignment prevented an auto transfer of CSST C loads to CSST B.

IV. ANALYSIS OF THE EVENT

Unit 1: Prior to the event, Unit 1 was coasting down for the Unit 1 Cycle 16 refueling outage scheduled to start on March 29, 2009. The plant was operating at 96 percent power. The minimum RCS pressure following the trip was approximately 1978 pounds per square inch gauge (psig), which is well above the pressure that would have initiated a safety injection signal (1870 psig). The minimum RCS temperature following the trip was approximately 528 degrees Fahrenheit. Emergency boration was required and initiated by Operations. Adequate shutdown margin was maintained. The minimum pressurizer (PZR) level following the reactor trip was about 15 percent, below the availability range for the PZR heaters of 17 percent. The PZR level was below 17 percent for 3 minutes, making the PZR heaters unavailable for that amount of time. No TS limits were exceeded and the Updated Safety Analysis Report (UFSAR) analysis of this event remained bounding. The plant responded as expected for the conditions of the trip.

Unit 2: Unit 2 was operating at approximately 100 percent power prior to the reactor trip. The minimum RCS pressure following the trip was approximately 2025 psig, well above the pressure that would have initiated a safety injection signal (1870 psig). The minimum RCS temperature following the trip was approximately 532 degrees Fahrenheit. Emergency boration was not required and adequate shutdown margin was maintained. The minimum PZR level following reactor trip was about 23 percent, well above the availability range of the PZR heaters. No TS limits were exceeded and the UFSAR analysis of this event remained bounding. The plant responded as expected for the conditions of the trip.

V. ASSESSMENT OF SAFETY CONSEQUENCES

Based on the above “Analysis of The Event,” this event did not adversely affect the health and safety of plant personnel or the general public.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

Corrective actions included replacement of a section of the CSST D bus and duct and inspection of the other CSSTs and cooling tower transformers (CTT).

B. Corrective Actions to Prevent Recurrence:

The other CSST and CTT buses were inspected to identify any degraded bus and to ensure bus enclosures were sealed properly. Degraded bus insulation on CSST C, CTT A, and CTT B was repaired. The preventative maintenance procedures for bus inspections will be enhanced to provide specific bus inspection instructions.

VII. ADDITIONAL INFORMATION

A. Failed Components:

The failed component of this event was a 6900-volt CSST D outdoor non-segregated three phase bus.

B. Previous LERs on Similar Events:

A review of previous reportable events for the past 10 years did not identify any previous similar events.

C. Additional Information:

None.

D. Safety System Functional Failure:

This event did not result in a safety system functional failure in accordance with 10 CFR 50.73(a)(2)(v).

E. Unplanned Scram with Complications:

This condition did not result in an unplanned scram with complications.

VIII. COMMITMENTS

None.