TVA

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Timothy P. Cleary
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June 29, 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) UNIT 1 - DOCKET NO. 50-327 - FACILITY OPERATING LICENSE DPR-77 - LICENSEE EVENT REPORT (LER) 50-327/2009-004-00

The enclosed LER provides details concerning a manual reactor trip and automatic engineered safety feature actuation of auxiliary feedwater following the isolation of two strings of intermediate pressure feedwater heaters. 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

Timothy P. Cleary

Enclosure
cc: See page 2

Enclosure
cc (Enclosure):

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NRC FORM 366 (9-2007)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)		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.

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

4. TITLE: Unit 1 Manual Reactor Trip Following Isolation of Two Intermediate Pressure Feedwater Heater Strings

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
04	28	2009	2009	- 004 -	00	06	29	2009	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE: 1

10. POWER LEVEL: 018

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 Specify in Abstract below or in NRC Form 366A
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Donald Sutton	423-843-6539

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
B	SM	TK		N					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO				

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

On April 28, 2009, at 2159 Eastern daylight time, SQN Unit 1 reactor was manually tripped following automatic isolation of two intermediate pressure feedwater heater strings. Prior to the reactor trip, the control room was notified that a moisture separator relief valve (MSR) had lifted. Upon notification of the condition of the valve, Operations personnel entered applicable abnormal operating procedures. Unit power was reduced from 27 percent to approximately 18 percent in an attempt to close the MSR relief valve. Since the reduced power level did not close the valve, the turbine was manually tripped. Following the turbine trip, two intermediate pressure feedwater heater strings automatically isolated. Operations manually tripped the reactor and entered the applicable emergency procedures. The plant safety systems responded as designed. The cause of the MSR valve lifting was determined to be failure of a gland sealing steam check valve to isolate because of foreign material. The cause of the isolation of the intermediate heater strings was determined to be the backflow of inventory from Heater Drain Tank (HDT) No. 3 into the No. 2 heater, which interfered with the ability of No. 2 heater to maintain proper level. As an interim action applicable plant operating procedures have been revised to ensure that when the plant is operating below 50 percent RTP, HDT No. 3 is maintained in full bypass to the condenser. The corrective action will perform a study of the necessary design change options and implement a solution.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION	
Sequoyah Nuclear Plant (SQN) Unit 1	05000327	2009 --	004 --	00	2 OF 6

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

I. PLANT CONDITION(S)

Unit 1 was operating at approximately 27 percent rated thermal power (RTP) during power ascension following the Unit 1 Cycle 16 (U1C16) refueling outage.

II. DESCRIPTION OF EVENT

A. Event:

On April 28, 2009, at 2159 Eastern daylight time (EDT), Sequoyah Unit 1 reactor was manually tripped because of isolation of two intermediate pressure feedwater heater [EIIS Code HX] strings. Prior to the trip, the reactor was at approximately 27 percent RTP during power ascension following the U1C16 refueling outage. At 2110, the main control room (MCR) was notified that a moisture separator relief (MSR) valve [EIIS Code RV] had lifted. After notification of the condition of the MSR valve, Operations personnel entered into the applicable abnormal operating procedures. At 2133, power was reduced to approximately 18 percent in an attempt to close the MSR relief valve. The reduction in power level did not result in closure of the relief valve, so the turbine was tripped at 2149. Since the turbine had been tripped, the heater strings were being monitored. At 2159, A and B intermediate pressure feedwater heater strings isolated and isolation of C was imminent. Operations personnel manually tripped the reactor and entered into the applicable emergency procedures.

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

None.

C. Dates and Approximate Times of Major Occurrences:

Date April 28, 2009 Time	Description
Prior to 2110 EDT	With Unit 1 at approximately 27 percent RTP, Operations personnel identified that the high pressure sealing steam was high (22.4 pounds per square inch absolute [psia] initially and increased to 28 psia). The gland seal steam [EIIS Code SD] supply spillover shutoff flow control valve (FCV) 1-FCV-47-190 was slowly opened to regulate pressure.
2110 EDT	The MCR was notified that the MSR relief valve 1C1 had lifted.

2117 EDT	Operators entered into applicable abnormal operating procedures because of the lifted MSR relief valve.
2133 EDT	Operators attempted to close the MSR valve by reducing power.
2149 EDT	With the power level reduced to approximately 18 percent and the MSR valve not closed, operators initiated a manual turbine trip.
2151 EDT	Following the turbine trip, the MSR 1C1 relief valve closed.
2159 EDT	Following the turbine trip, isolation of intermediate pressure heater strings A and B occurred. Operations initiated a manual reactor trip and entered applicable emergency procedures.

D. Other Systems or Secondary Functions Affected:

No other systems or secondary functions were affected by this event.

E. Method of Discovery:

Operations personnel were notified that a MSR relief valve had lifted.

F. Operator Actions:

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

G. Safety System Responses:

The safety systems performed as designed for the reactor trip. The pressurizer (PZR) inventory level dropped below the cutoff level for the PZR heaters and the heaters automatically shutdown. The auxiliary feedwater started and maintained steam generator (SG) level as expected.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION	
Sequoyah Nuclear Plant (SQN) Unit 1	05000327	2009 --	004 --	00	4 OF 6

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

III. CAUSE OF THE EVENT

A. Immediate Cause:

The cause of the MSR relief valve lifting was the failure of a gland sealing steam check valve [EIIS Code FCV] to isolate as a result of foreign material.

B. Root Cause:

The root cause of this event has been determined to be a design deficiency pertaining to the drain system of the intermediate pressure heaters.

C. Contributing Factor:

Administrative design change weaknesses contributed to an earlier missed opportunity to correct this issue. In 1998, a similar event failed to identify and correct the inventory backflow from heater drain tank (HDT) No. 3 into the No. 2 heater.

IV. ANALYSIS OF THE EVENT

Unit 1 was operating at approximately 27 percent RTP during power ascension following the U1C16 refueling outage. Initial conditions were normal for power ascension. Prior to the event, the reactor coolant system (RCS) [EIIS Code AB] pressure was approximately 2235 pounds per square inch gauge (psig). Following the turbine trip, RCS pressure peaked at 2276 psig and declined to 2235 psig for a short period of time until the reactor trip. The minimum RCS pressure following the reactor trip was approximately 2100 psig, which is well above the pressure that would have initiated a safety injection signal (1870 psig). The RCS minimum temperature following the trip was approximately 530 degrees Fahrenheit and remained within technical specifications (TS) limits. The minimum PZR level following the reactor trip was about 12 percent. The PZR heaters turned off during the event as a result of PZR level falling below 17 percent. The plant response was expected because of the low initial power level and low decay heat as the plant was in power ascension from a refueling outage. No TS safety limits were exceeded and the Updated Final Safety Analysis Report (UFSAR) analysis of this event remained bounding.

The UFSAR states that the plant should be able to withstand a turbine trip up to 50 percent RTP without requiring a reactor trip. During this event, a manual reactor trip was initiated by Operations personnel after isolation of two intermediate pressure heater strings. An existing system design issue whereby HDT No. 3 is designed to be above the elevation of the No. 2 heater allows, under certain conditions, backflow of inventory from HDT No. 3 into the No. 2 heater and may cause a feedwater heater isolation as a result of the high level in the No. 2 heater.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION	
Sequoyah Nuclear Plant (SQN) Unit 1	05000327	2009 --	004 --	00	5 OF 6

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

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:

The applicable plant operating procedures have been changed to ensure that when the plant is operating below 50 percent RTP, HDT No. 3 is maintained in full bypass to the condenser. Corrective actions to reset the MSR relief valve were performed, subsequent actions included the replacement of the gland seal steam check valves.

B. Corrective Actions to Prevent Recurrence:

Perform study of the necessary design change options and implement solution. The selected options will ensure the plant can meet the UFSAR requirement of sustaining a turbine trip without a reactor trip at less than 50 percent RTP.

VII. ADDITIONAL INFORMATION

A. Failed Components:

None.

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.