Tennessee Valley Authority, Post Office Box 2000, Soddy Daisy, Tennessee 37384-2000

January 22, 2016

10 CFR 50.73

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

Sequoyah Nuclear Plant, Unit 1
Renewed Facility Operating License No. DPR-77
NRC Docket No. 50-327

Subject: **Licensee Event Report 50-327/2015-004-00, "Manual Reactor Trip due to Main Steam Isolation Valve Drifting in the Closed Direction"**

The enclosed Licensee Event Report (LER) provides details concerning a manual reactor trip following a main steam isolation valve drifting in the closed direction. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A), as an event that resulted in a manual or automatic actuation of the Reactor Protection System and the Auxiliary Feedwater System. This condition had no impact on Unit 2. A supplement to this LER is planned for March 20, 2016, that includes the results of the associated root cause analysis.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Mr. Mike McBrearty, Sequoyah Site Licensing Manager, at (423) 843-7088.

Respectfully,

FOR Christopher J. Schwarz
Site Vice President
Sequoyah Nuclear Plant

Enclosure: Licensee Event Report 50-327/2015-004-00
cc: NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Sequoyah Nuclear Plant

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NRC FORM 366 (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@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 Page 2 for required number of digits/characters for each block)

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4. TITLE

Manual Reactor Trip due to Main Steam Isolation Valve Drifting in the Closed Direction

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
11	23	2015	2015	004	00	01	22	2016	NA	
									FACILITY NAME: NA	DOCKET NUMBER

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
100	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Scott Travis Bowman	423-843-6910

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

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO		03	20	2016

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

On November 23, 2015, at 0844 Eastern Standard Time, Sequoyah Nuclear Plant (SQN) Unit 1 reactor was manually tripped due to plant parameters indicating that the Loop 3 Main Steam Isolation Valve (MSIV) had started drifting in the closed direction. Prior to the reactor trip, the open light indication on the main control board for the Loop 3 MSIV was noted to be extinguished. The light bulb was replaced with no change in indication. At the same time, the Post Accident Monitoring panel indicator for the Loop 3 MSIV displayed full open; however, within two to three minutes, the panel provided dual indication. Subsequently, Operators noted that the reactor coolant system temperature and Loop 3 Steam Generator (SG) pressure were both rising, and the Loop 3 SG flow was lowering. These indications confirmed the Loop 3 MSIV was drifting closed. Following the reactor trip, all plant safety systems operated as designed, all control rods fully inserted, and auxiliary feedwater automatically initiated from the feedwater isolation signal, as expected. Troubleshooting identified a loose termination associated with the Loop 3 MSIV handswitch that would result in a slow loss of air pressure and cause the MSIV to slowly drift in the closed direction. A root cause evaluation is ongoing, and the root cause and the associated corrective actions will be provided in a revision to this LER. SQN Unit 2 was unaffected by this event.

NRC FORM 366A (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Sequoyah Nuclear Plant Unit 1	05000327	2015	- 004	- 00

NARRATIVE

I. Plant Operating Conditions Before the Event

At the time of the event, Sequoyah Nuclear Plant (SQN) Unit 1 reactor was operating at 100 percent rated thermal power (RTP). The condition described in this LER did not impact SQN Unit 2.

II. Description of Events

A. Event:

On November 23, 2015, at 0844 Eastern Standard Time (EST), SQN Unit 1 reactor was manually tripped due to plant parameters indicating that Loop 3 Main Steam Isolation Valve (MSIV) [EIIS Code SB] [EIIS Code ISV] had started drifting in the closed direction. Prior to the reactor trip, the open light indication [EIIS Code IL], on the main control room (MCR) panel for the MSIV was noted to be extinguished. The light bulb was replaced with no change in indication. At the same time, the Post Accident Monitoring (PAM) indicator for the MSIV displayed full open; however, within two to three minutes dual indication (mid-position) was provided. Subsequently, operators noted that the reactor coolant system (RCS) [EIIS Code AB] temperature and Loop 3 Steam Generator (SG) [EIIS Code SG] pressure were both slowly rising, and the Loop 3 SG flow was slowly lowering. These indications confirmed the Loop 3 MSIV was slowly drifting closed. Operators placed the handswitch [EIIS Code HS] for the MSIV in the open position for approximately 5 seconds. This resulted in no apparent affect. Operators manually tripped the reactor per procedure.

After the reactor trip, it was noted that all three lights on the MCR panel for the MSIV (closed, 10 percent closed, and open) illuminated followed by an immediate return to full open indication. Additionally, PAM indication confirmed the MSIV was full open.

Troubleshooting identified a loose nut on a termination for the handswitch associated with the Loop 3 MSIV. The loose nut on the terminal could cause intermittent power through the circuit, which could cause flickering indicator lights and intermittent power to the solenoid. The loss of a single source of power to the solenoid could cut off the air supply to the MSIV, but not completely open the vent. This could result in a slow loss of air pressure and cause the Loop 3 MSIV to slowly drift in the closed position.

All plant safety related equipment operated as designed, all control rods fully inserted, and auxiliary feedwater (AFW) [EIIS Code BA] automatically initiated from the feedwater isolation signal, as expected. No complications were experienced during the reactor trip.

This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A), as an event that resulted in a manual or automatic actuation of the Reactor Protection System and the Auxiliary Feedwater System.

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B. Status of structures, components, or systems that were inoperable at the start of the event and contributed to the event:

There were no inoperable structures, components, or systems that contributed to this event.

C. Dates and approximate times of occurrences:

On November 23, 2015, at 0815 EST, operators noted the open light indicator on the MCR panel for the Loop 3 MSIV was extinguished while the PAM panel indicator for the MSIV indicated the valve was full open. Within minutes, the PAM panel indicated the MSIV was in mid-position. Operators noted the RCS temperature and Loop 3 SG pressure were both slowly rising, and the Loop 3 SG flow was slowly lowering. These indications confirmed the Loop 3 MSIV was slowly drifting closed. At 0844, the Unit 1 reactor was manually tripped.

Dates and Times	Description
November 23, 2015 at 0815 EST	The MCR open light indication for the Loop 3 MSIV was noted to be extinguished. The PAM indicator for the Loop 3 MSIV indicated the valve was full open.
November 23, 2015 at 0817 EST	The MCR indicating bulb was changed with no positive results.
November 23, 2015 at 0821 EST	Associated fuse panels were verified to have no deficiencies. The PAM panel indicated the MSIV was in mid-position.
November 23, 2015 at 0826 EST	Both indicator lights on the MCR panel for the MSIV began to flicker in unison. The following diverse plant indications confirmed that the MSIV was slowly drifting closed: RCS temperature slowly rising, Loop 3 SG pressure slowly rising, Loop 3 SG flow slowly lowering, and The PAM panel indicated the MSIV was in mid-position.
November 23, 2015 at 0830 EST	The MCR operator gave the MSIV an open signal with the MCR handswitch with no apparent affect.
November 23, 2015 at 0844 EST	Unit 1 reactor was manually tripped per procedure.

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November 23, 2015 at 0845 EST	All three light indicators for the MSIV on the MCR panel were illuminated followed by an immediate return to only full open indication. Coincidently, the indicator for the MSIV on the PAM panel indicated the valve was full open.

D. Manufacturer and model number of each component that failed during the event:

The root cause for this event is still under investigation. When the final investigation is completed a supplement to this LER will be provided.

E. Other systems or secondary functions affected:

There were no other systems or functions affected by this event.

F. Method of discovery of each component or system failure or procedural error:

Operators observed open light indication for the Loop 3 MSIV on the MCR panel was extinguished while PAM indication initially showed full open. Approximately two to three minutes later, the PAM panel displayed dual indication. Subsequently, operators noted that the RCS temperature and Loop 3 SG pressure were both slowly rising, and the Loop 3 SG flow was slowly lowering. These indications confirmed the Loop 3 MSIV was slowly drifting closed.

G. The failure mode, mechanism, and effect of each failed component, if known:

The root cause for this event is still under investigation. When the final investigation is completed a supplement to this LER will be provided.

H. Operator actions:

After the Loop 3 MSIV was verified to be drifting closed by diverse indications, the operators established trigger values for Loop 3 SG pressure and RCS Tave-Tref mismatch. Once the Loop 3 MSIV showed dual indication on the PAM instrumentation, operators briefed for a potential manual reactor trip. After it was apparent that the Loop 3 MSIV was continuing to close, the operators made the decision to manually trip the reactor. Following the reactor trip, operators entered Emergency Procedure E-0, "Reactor Trip or Safety Injection," and then transitioned from E-0 to Emergency Subprocedure ES-0.1, "Reactor Trip Response." No human performance issues were identified.

I. Automatically and manually initiated safety system responses:

All plant safety related equipment operated as designed, all control rods fully inserted, and AFW automatically initiated from the feedwater isolation signal, as expected.

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III. Cause of the event

A. The cause of each component or system failure or personnel error, if known:

Troubleshooting identified a loose nut on a termination for the handswitch associated with the Loop 3 MSIV. The loose nut on the terminal could cause intermittent power through the circuit, which could cause flickering indicator lights and intermittent power to the solenoid. The loss of a single source of power to the solenoid could cut off the air supply to the MSIV, but not completely open the vent. This could result in a slow loss of air pressure and cause the Loop 3 MSIV to slowly drift in the closed position.

The root cause for this event is still under investigation. When the final investigation is completed a supplement to this LER will be provided.

B. The cause(s) and circumstances for each human performance related root cause:

The root cause for this event is still under investigation. When the final investigation is completed a supplement to this LER will be provided.

IV. Analysis of the event:

Prior to the event, SQN Unit 1 was operating at approximately 100 percent RTP with the RCS pressure and temperature near the nominal value of approximately 2235 pounds per square inch gauge (psig) and approximately 578 degrees Fahrenheit. Both the motor driven and the turbine driven AFW pumps and steam dump valves and the atmospheric relief valves were available.

The plant transient response including reactor power, RCS pressure, RCS temperature, pressurizer level, RCS secondary side pressure, and AFW flow remained within technical specification limits and were bounded by the Updated Final Safety Analysis Report (UFSAR) analysis. Containment pressure, temperature, and radiation levels were unaffected by this transient. SG level changes experienced during this event were bounded by UFSAR analysis. The plant responded as expected for the conditions of the trip.

V. Assessment of Safety Consequences

There were no safety consequences as a result of the event. All safety systems functioned as designed and no complications were experienced. Subsequent investigation determined that the Loop 3 MSIV remained capable of closing during the event and able to perform its safety function.

A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event:

There were no components that failed during this event. There were no other components that could have performed the same function as the Loop 3 MSIV.

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B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident:

This event did not occur when the reactor was shut down. Safety-related systems that were needed to shut down the reactor, maintain safe shutdown conditions, remove residual heat or mitigate the consequences of an accident remained available throughout the event.

C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from discovery of the failure until the train was returned to service:

There was no failure that rendered a train of a safety system inoperable during this event.

VI. Corrective Actions

Corrective Actions are being managed by TVA's corrective action program under Condition Report 1107656.

A. Immediate Corrective Actions:

Troubleshooting of the Loop 3 MSIV handswitch was conducted. The cause of the intermittent electrical signal to the MSIV handswitch was identified and corrected.

B. Corrective Actions to Prevent Recurrence or to reduce probability of similar events occurring in the future:

The root cause for this event is still under investigation. When the final investigation is completed a supplement to this LER will be provided.

VII. Additional Information

A. Previous similar events at the same plant:

A review of previous reportable events for the past three years at SQN identified LER 1-2015-002-00 that identified the root cause for two automatic reactor trips was inadequate standards for multi-wire terminations and verifications associated with work performed in the mid-1990s.

B. Additional Information:

None.

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C. Safety System Functional Failure Consideration:

This event did not result in a safety system functional failure.

D. Scrams with Complications Consideration:

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

VIII. Commitments:

None.