



Tennessee Valley Authority, Sequoyah Nuclear Plant, P.O. Box 2000, Soddy Daisy, Tennessee 37384

February 27, 2017

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 50-327/2016-009-00, Manual Reactor Trip During Startup Due to a Control Rod Misalignment

The enclosed licensee event report provides details concerning a manual reactor trip during startup due to a control rod misalignment. 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 Auxiliary Feedwater System.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Mr. Michael McBrearty, Site Licensing Manager, at (423) 843-7170.

Respectfully,

A handwritten signature in black ink, appearing to read 'Gregory A. Boerschig', written over a horizontal line.

Gregory A. Boerschig
Site Vice President (interim)
Sequoyah Nuclear Plant

Enclosure: Licensee Event Report 50-327/2016-009-00

cc: NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Sequoyah Nuclear Plant



LICENSEE EVENT REPORT (LER)

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 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.

1. FACILITY NAME Sequoyah Nuclear Plant Unit 1	2. DOCKET NUMBER 05000327	3. PAGE 1 OF 5
--	-------------------------------------	--------------------------

4. TITLE
Manual Reactor Trip During Startup Due to a Control Rod Misalignment

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
12	30	2016	2016	- 009	- 00	02	27	2017	NA	05000
									FACILITY NAME	DOCKET NUMBER
									NA	05000

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

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT Jon Johnson	TELEPHONE NUMBER (Include Area Code) 423-843-8129
---------------------------------	--

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 <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

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

On December 30, 2016, at 1307 Eastern Standard Time (EST), with Unit 1 undergoing a reactor startup, control room operators initiated a manual reactor trip due to a control rod misalignment on control rod, H-6. At the time of the event, the reactor was subcritical. The manual reactor trip was initiated because control rod, H-6, did not respond when rods were being withdrawn. All systems functioned as expected following the trip, with all control rods fully inserting into the core.

The apparent cause was the site did not incorporate Westinghouse operating experience (OE) associated with mechanical binding of a stationary gripper into site procedures. As a result, site procedures did not have a method to ensure the stationary grippers were not bound during initial rod movement. No hardware concerns existed. Unit 1 was returned to service on December 31, 2016, with no anomalies occurring during startup.

Corrective actions include revisions to site procedures to incorporate OE and provide guidance for shutting down the reactor versus a reactor trip. These actions are being tracked in the site's corrective action program. There were no safety consequences as a result of the event.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Sequoyah Nuclear Plant Unit 1	05000327	2016	- 009	- 00

NARRATIVE

I. Plant Operating Conditions Before the Event

At the time of the event, Sequoyah Nuclear Plant (SQN) Unit 1 was in Mode 3 following a refueling outage (U1R21). No inoperable systems, structures, or components contributed to this event.

II. Description of Event

A. Event Summary:

On December 30, 2016, at 1302 Eastern Standard Time (EST), SQN Unit 1 was undergoing a reactor startup by withdrawing control rods [EIS: AA, ROD] for an approach to criticality following a refueling outage. Unit 1 was not critical at the time the manual reactor trip was initiated. During rod withdrawal, operators monitored both the group step counter position indications and rod position indicator (RPI) indications. At 1305, operators observed that control rod, H-6, did not move on withdrawal of associated Control Bank A. Operators verified both indications did not respond to the rod withdrawal demand. Operators entered Abnormal Operating Procedure (AOP)-C.01, Rod Control Malfunctions. At 1307, operators initiated a manual reactor trip. Unit 1 was maintained in Mode 3.

Following the reactor trip, all plant safety related equipment operated as designed, and all control rods fully inserted. Auxiliary feedwater (AFW) [EIS: BA] was already supplying feedwater to the Steam Generators (SG) [EIS: SG] however, a feedwater isolation signal occurred, as expected due to plant conditions. No complications were experienced during the reactor trip.

Control Bank A contains four rods. A review of plant data showed that during the withdrawal of Control Bank A, three of the four controls rods began to step out as demanded. Control rod, H-6, did not move. During troubleshooting activities Control Bank A was withdrawn and all four Control Bank A rods indicated correct movement.

An 8-hour non-emergency event notification (EN 52469) was made to the NRC in accordance with 10 CFR 50.72(b)(3)(iv)(A), as any event or condition that results in valid actuation of any of the systems listed in paragraph (b)(3)(iv)(B), except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation. This LER documents the reportable event under 10 CFR 50.73(a)(2)(iv)(A).

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.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Sequoyah Nuclear Plant Unit 1	05000327	2016	- 009	- 00

NARRATIVE

C. Dates and approximate times of occurrences:

Date/Time (EST)	Description
12/30/16, 1302	Unit 1 was in Mode 3 for reactor startup per plant procedure.
12/30/16, 1305	Control Rod, H-6, did not move on withdrawal of Control Bank A. Unit 1 entered AOP-C.01, Rod Control Malfunctions.
12/30/16, 1307	Unit 1 was manually tripped per procedure. Unit 1 remained in Mode 3.

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

There were no components that failed during the event.

E. Other systems or secondary functions affected:

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

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

There was no component or system failure or procedural error.

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

No failure occurred.

H. Operator actions:

During a reactor startup, the operating crew identified a control rod misalignment for control rod, H-6. Control rod H-6 indicated (-) 3.5 steps on RPI and (+) 10.5 steps on the group step counter. Upon recognition of a misaligned control rod, the operating team entered AOP-C.01, Rod Control Malfunctions, and manually tripped the reactor as directed per procedure.

I. Automatically and manually initiated safety system responses:

Following the manual reactor trip, all plant safety systems responded as designed. All controls rods fully inserted as required. Auxiliary feedwater was already in service feeding the steam generators due to plant conditions. A feedwater isolation signal was initiated, as expected.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Sequoyah Nuclear Plant Unit 1	05000327	2016	- 009	- 00

NARRATIVE

III. Cause of the Event

A. Cause of each component or system failure or personnel error:

The apparent cause(s) of the manual reactor trip was determined to be:

During startup, the stationary gripper of control rod H-6 was mechanically bound during initial control rod latching. Westinghouse provided information that this was a known potential issue during initial control rod movement; however, SQN did not incorporate this operating experience (OE) into site procedures. As a result, SQN procedures did not have a method to ensure the stationary grippers were not bound during initial rod movement. This led to a misaligned rod.

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

No human performance issues were identified.

IV. Analysis of the Event:

Prior to the manual reactor trip, SQN Unit 1 was in Mode 3 following a planned refueling outage. Reactor Coolant System (RCS) [EII: AB] pressure and temperature were approximately 2235 pounds per square inch gauge and 548 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 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 during the manual reactor trip and there were no radiation releases due to this event. A probabilistic risk assessment concluded that the conditional core damage probability was 3.13E-06 and the conditional large early release probability was 7.38E-08 as a result of the event.

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

No systems or components failed as a result of the manual reactor trip actuation.

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:



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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 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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Sequoyah Nuclear Plant Unit 1	05000327	2016	- 009	- 00

NARRATIVE

The event occurred with Unit 1 in Mode 3 and was maintained in Mode 3 following the manual reactor trip. The systems and components needed to maintain safe shutdown conditions and remove residual heat, control the release of radioactive material or mitigate the consequences of an accident were not affected.

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.

VI. Corrective Actions

Corrective Actions are being managed by the Tennessee Valley Authority (TVA) corrective action program under Condition Report 1246842.

A. Immediate Corrective Actions:

Initiated troubleshooting activities.

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

Revise site procedures

1. per industry standards to include shutdown actions, vice reactor trip actions, for misaligned control rods.
2. to incorporate industry OE involving mechanically bound control rods.

VII. Previous similar events at the same plant:

None.

VIII. Additional Information

Unit 2 was at 100 percent rated thermal power and remained unaffected by the Unit 1 event.

IX. Commitments:

None.