



Sequoyah Nuclear Plant, Post Office Box 2000, Soddy Daisy, Tennessee 37384

December 15, 2022

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 50-327/2022-002-00, Turbine Trip Function Inoperable
Due to Slow to Close Turbine Throttle Valve**

The enclosed licensee event report provides details concerning a slow to close turbine throttle valve that impacted the turbine trip function's response time to trip. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(v), as an event or condition that could have prevented the fulfillment of a safety function of structures or systems that are needed to: (D) mitigate the consequences of an accident.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact Mr. Rick Medina, Site Licensing Manager, at (423) 843-8129.

Respectfully,

Marshall, Thomas B.

Digitally signed by Marshall,
Thomas B.
Date: 2022.12.15 07:05:00 -05'00'

Thomas Marshall
Site Vice President
Sequoyah Nuclear Plant

Enclosure: Licensee Event Report 50-327/2022-002-00

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



LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollections.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk aid: oina_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name Sequoyah Nuclear Plant Unit 1	2. Docket Number 05000327	3. Page 1 OF 6
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4. Title
Turbine Trip Function Inoperable Due to Slow to Close Turbine Throttle Valve

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
10	22	2022	2022	- 002 -	00	12	15	2022	NA	05000
									Facility Name	Docket Number
									NA	05000

9. Operating Mode

1

10. Power Level

024

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

☐ Other (Specify here, in Abstract, or in NRC 366A).

12. Licensee Contact for this LER

Licensee Contact

Scott Bowman

Phone Number (Include Area Code)

423.843.6910

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable To IRIS	Cause	System	Component	Manufacturer	Reportable To IRIS
X	SB	FCV	W120	Y	N/A	N/A	N/A	N/A	N/A

14. Supplemental Report Expected

☒ No ☐ Yes (If yes, complete 15. Expected Submission Date)

15. Expected Submission Date

Month	Day	Year
N/A	N/A	N/A

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On October 22, 2022, at 0003 eastern daylight time, during power descension for the upcoming Unit 1 refueling outage, main control room operators initiated a manual turbine trip in accordance with operating procedures. At this time, Main Steam Throttle Valve 2 (TV-2), associated with the high-pressure turbine and turbine trip function failed to close. The valve remained open until 0250 when it closed on its own. The closure took less than 1 second to travel from full open to full closed with no actions taken by Operations or Maintenance personnel, to induce a closure. During the event, steam dumps assumed the remaining steam load from the turbine, as seen by a rise in steam dump demand. Based on the rise in steam dump demand, reduction to 0 megawatts electric, and all other turbine valves verified closed, the turbine was determined to be tripped. TV-2 was inoperable from October 22, 2022, at 0003 until 0013 when the unit exited the Mode of Applicability.

Visual inspections were performed during valve disassembly. There were no visual indications as to why the valve failed to close during the turbine trip. Pending completion of requested failure analysis, the most likely cause of valve failure is mechanical binding of one or more valve components. The valve and the associated actuator were replaced to correct the condition. Once the failure analysis is obtained, new actions will be initiated in the corrective action program to address the likelihood of future similar events, if required.

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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Sequoyah Nuclear Plant Unit 1	05000-327	2022	- 002	- 00

NARRATIVE**I. Plant Operating Conditions Before the Event**

At the time of the event, Sequoyah Nuclear Plant (SQN) Unit 1 was in Mode 1 at approximately 24 percent rated thermal power preparing for a refueling outage.

II. Description of Event**A. Event Summary:**

On October 22, 2022, at 0003 eastern daylight time (EDT), during power descension for the upcoming refueling outage, main control room (MCR) operators initiated a manual turbine trip in accordance with operating procedures. At this time, Main Steam [EIS: SB] Throttle Valve-2 (TV-2) [EIS: FCV], associated with the high-pressure turbine [EIS: TRB] and turbine trip [EIS: JJ] function failed to close. The valve remained open until 0250 when it closed on its own. The closure took less than 1 second to travel from full open to full closed with no actions taken by Operations or Maintenance personnel, to induce a closure. During the event, steam dumps assumed the remaining steam load from the turbine, as seen by a rise in steam dump demand. Based on the rise in steam dump demand, reduction to 0 megawatts electric, and all other turbine valves verified closed, the turbine was determined to be tripped.

After the turbine trip was initiated, the turbine coasted down as expected, and when requested, the main steam isolation valves (MSIVs) closed as expected with no challenges. This demonstrated that neither turbine governor valve functionality nor MSIV operability was challenged concurrently with the inoperability of TV-2.

TV-2 and the associated actuator were replaced during the refueling outage.

A past operability evaluation (POE) determined TV-2 was inoperable from October 22, 2022, at 0003 until 0013 when the unit exited the Mode of Applicability. The POE determined the turbine trip function requires four out of four throttle valves to close, and with TV-2 inoperable, the turbine trip function would not have been performed within the required 2.5 seconds (per the Final Safety Analysis Report (FSAR)). Therefore, Surveillance Requirement 3.3.2.9 (Verify ESFAS [Engineered Safety Feature Actuation System] RESPONSE TIMES are within limit) would not have been met. This constitutes an event or condition that could have prevented the fulfillment of a safety function necessary to mitigate the consequences of an accident, which is reportable under 10 CFR 50.73(a)(2)(v)(D).

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

No inoperable structures, components, or systems contributed to this event.

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C. Dates and approximate times of occurrences:

Date/Time (EDT)	Description
10/22/22, 0003	MCR operators initiated a turbine trip. TV-2 remained full open.
0013	MCR operators performed a manual reactor trip for the refueling outage. As expected, this induced a feedwater isolation satisfying Technical Specification (TS) Table 3.3.2-1, Function 5.b, Footnote (i) for exiting the Mode of Applicability.
0250	TV-2 closed taking less than 1 second.
10/31/22	TV-2 and the associated actuator were replaced during refueling outage.

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

The failed component was a flow control valve, double plug, manufactured by Westinghouse Electric Corporation, part number: 725J732, serial number: TD 75588-19.

E. Other systems or secondary functions affected:

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

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

MCR operators identified the valve failed to close through MCR indication. This was confirmed locally by an operator.

G. Failure mode, mechanism, and effect of each failed component:

The most likely failure mode was mechanical binding caused by thermal expansion.

H. Operator actions:

MCR operators identified the valve failed to close through MCR indication. After verifying the turbine was tripped, MCR operators continued to conduct a plant shutdown in accordance with plant procedures

I. Automatically and manually initiated safety system responses:

None.

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III. Cause of the Event**A. Cause of each component or system failure or personnel error:**

Visual inspections were performed during valve disassembly. There were no visual indications as to why the valve failed to close during the turbine trip. Pending completion of requested failure analysis, the most likely cause of valve failure is mechanical binding of one or more valve components.

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

There were no human performance related causes.

IV. Analysis of the Event:

The primary functions of the Turbine Trip and Feedwater Isolation signals are to prevent damage to the turbine due to water in the steam lines, and to stop the excessive flow of feedwater into the steam generators (SGs). These Functions are necessary to mitigate the effects of a high-water level in the SGs, which could result in carryover of water into the steam lines and excessive cooldown of the primary system. Turbine Trip and Feedwater Isolation functions must be operable in Modes 1, 2, and 3 except when all main feedwater (MFW) isolation valves (MFIVs), MFW regulation valves (MFRVs), and associated MFRV bypass valves are closed or isolated by a closed manual valve when the MFW System is in operation and the turbine generator may be in operation. Turbine Trip and Feedwater Isolation is also initiated by all Functions that initiate a Safety Injection (SI) signal.

Turbine trip is a required part of ESFAS as outlined in TS 3.3.2. The response time testing requirement for turbine trip is 2.5 seconds per the FSAR. TS 3.3.2 requires that the throttle valves close in 1.1 seconds (SR 3.3.2.9) so that, when combined with the other trip logic in a turbine trip signal, the overall response time testing requirement is met. The turbine trip function requires four-out-of-four throttle valves to close.

During the period of inoperability, the main turbine governor valves were closed and thus also functioning to remove steam flow from the main turbine. These valves function as a series valve to the throttle valves and receive the same trip signal that is supplied to the throttle valves. These valves are not response time tested, but at the time of this event, were all functioning correctly which includes tripping closed in a similar time to the throttle valves' design time. Additionally, there was no challenge with the Feedwater Isolation function or MSIVs. With the MSIVs available, the capability existed to mitigate a cooldown event by isolating all steam supplied from the reactor to the secondary plant.

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V. Assessment of Safety Consequences

There were no actual safety consequences because of this event. After the turbine trip was initiated, the turbine coasted down as expected, and when requested, the MSIVs closed with no challenges. This demonstrated that neither turbine governor valve functionality nor MSIV operability was challenged concurrently with the inoperability of TV-2. A probabilistic risk assessment determined that increase to risk for Core Damage Frequency or Large Early Release Frequency was considered negligible.

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

With TV-2 inoperable, there were additional methods to stop steam flow to the main turbine, closure of the main turbine governor valves, and another, closure of the MSIVs.

- 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:

The event did not occur when the reactor was shut down.

- 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:

TV-2 was inoperable from October 22, 2022, at 0003 until 0013 when the unit exited the Mode of Applicability.

VI. Corrective Actions

The event was entered into the Tennessee Valley Authority Corrective Action Program (CAP) under Condition Report 1811241.

- A. Immediate Corrective Actions:

TV-2 and the associated actuator were replaced during refueling outage.

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

The valve and the associated actuator were replaced to correct the condition. Once the failure analysis is obtained, new actions will be initiated in the corrective action program to address the likelihood of future similar events, if required.



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VII. Previous Similar Events at the Same Site:

LER 2-2021-002 documented an event on Unit 2 where during testing a turbine throttle valve failed to close within response time limits. This event was classified as a human performance event and not due to component or system failure. These two events are associated with turbine throttle valve closure times; however, the underlying causes are not the same.

VIII. Additional Information

There is no additional information.

IX. Commitments:

There are no commitments.