



Nebraska Public Power District

"Always there when you need us"

10 CFR 50.73

NLS2024013
March 4, 2024

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

Subject: Licensee Event Report No. 2024-001-00
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Dear Sir or Madam:

The purpose of this correspondence is to forward Licensee Event Report 2024-001-00.

This letter does not contain regulatory commitments.

Sincerely,

Khalil Dia
Site Vice President

/bk

Attachment: Licensee Event Report 2024-001-00

cc: Regional Administrator w/attachment USNRC - Region IV	NPG Distribution w/attachment
Cooper Project Manager w/attachment USNRC - NRR Plant Licensing Branch IV	INPO Records Center w/attachment via IRIS entry
Senior Resident Inspector w/attachment USNRC - CNS	SORC Chairman w/attachment
SRAB Administrator w/attachment	CNS Records w/attachment

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)
(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://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 email to Infocollcts.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; email: oir_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: Cooper Nuclear Station
2. Docket Number: 298
3. Page: 1 of 5
Selected: 050, 052

4. Title: Inoperable Turbine Stop Valve Limit Switch Causes Condition Prohibited by Technical Specifications

Table with 4 main columns: 5. Event Date, 6. LER Number, 7. Report Date, 8. Other Facilities Involved. Includes sub-columns for Month, Day, Year, Sequential Number, Revision No., and Power Level.

9. Operating Mode: 1
10. Power Level: 100

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

Grid of checkboxes for 10 CFR Part 20, 50, and 73 sub-sections. Includes 10 CFR Part 21 and 73 sub-sections.

OTHER (Specify here, in abstract, or NRC 366A).

12. Licensee Contact for this LER

Licensee Contact: Linda Dewhirst, Regulatory Affairs and Compliance Manager
Phone Number: (402) 825-5416

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

Table with 10 columns: Cause, System, Component, Manufacturer, Reportable to IRIS, Cause, System, Component, Manufacturer, Reportable to IRIS. Row 1: D, JC, 33, N007, Y.

14. Supplemental Report Expected: No
15. Expected Submission Date: Month, Day, Year

16. Abstract (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

During the performance of surveillance testing on January 3, 2024, turbine stop valve (TSV)-1 open limit switch, MS-LMS-SVOS1(1), failed to actuate. This failure prevented actuation of the Reactor Protection System (RPS) scram logic for channel A1. At 0400, Operations declared TSV-1 limit switch inoperable and entered the applicable Technical Specifications (TS) Limiting Condition for Operation (LCO) 12-hour action statement to place the RPS channel in trip and inserting a half-scam.

A pre-planned contingency power reduction was initiated to replace the limit switch. When the switch linkage was disassembled for replacement, the arm was found loose and not fully engaged onto the limit switch shaft. The switch was replaced, and Operations exited the TS LCO action statement at 0249 on January 4, 2024.

The cause of the failure was due to looseness in the limit switch linkage that attached to the limit switch cam. This prevented proper engagement to actuate the limit switch when it was exercised for testing.

There were no safety consequences as a result of this event.



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://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 email to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; email: oira_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 Cooper Nuclear Station	2. DOCKET NUMBER 05000-298	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
		2024	001	00

NARRATIVE

PLANT STATUS

Cooper Nuclear Station (CNS) was in Mode 1, Power Operation, at 100 percent power at the time of the event on January 3, 2024.

BACKGROUND

The Reactor Protection System (RPS) [EIIS:JC] provides timely protection against the onset and consequences of conditions that threaten the integrity of the fuel barrier and the reactor coolant pressure boundary. The RPS limits the uncontrolled release of radioactive material from the fuel and reactor coolant pressure boundary by terminating excessive temperature and pressure increases through the initiation of an automatic scram.

The RPS includes sensors, relays [EIIS:RLY], bypass circuits, and switches that are necessary to cause initiation of a reactor [EIIS:RPV] scram. The input parameters to the scram logic are from instrumentation that monitors reactor vessel water level, reactor vessel pressure, neutron flux, main steam line isolation valve position, turbine control valve fast closure, turbine stop valve (TSV) position, drywell pressure, and scram discharge volume water level.

The RPS is arranged as two separately powered trip systems (trip system A and trip system B). Each trip system has three logics. Two of the logics (A1, A2; B1, B2) are used to produce automatic trip signals. The input parameters mentioned above are represented by at least one input to each of these logic channels. The remaining logic is used for a manual trip signal. The outputs of the automatic logic channels in a trip system are combined in a "one-out-of-two" logic so that either channel can trip the associated trip system. The tripping of both systems will produce a reactor scram.

The operability of RPS is dependent on the operability of individual instrumentation channel functions specified in Technical Specifications 3.3.1.1, RPS Instrumentation, Table 3.3.1.1-1. For the Turbine Stop Valve-Closure Function (Table 3.3.1.1-1, Function 8), each RPS trip system receives two Turbine Stop Valve-Closure channel inputs from a TSV, each consisting of one position (i.e., limit) switch [EIIS:33] assembly with two contacts, each inputting to a relay. The relays provide a parallel logic input to an RPS trip logic channel. The logic for the Turbine Stop Valve-Closure Function is such that both TSVs must be closed to produce a reactor scram. Single TSV closure will produce a half scram. Four channels of Turbine Stop Valve-Closure Function, with two channels in each trip system, are required to be operable.

EVENT DESCRIPTION

On January 3, 2024, TSV-1 limit switch MS-LMS-SVOS1(1), failed to actuate during surveillance testing. Testing of the limit switch function is required to meet Technical Specifications (TS) Surveillance Requirement 3.3.1.1.9 for Table 3.3.1.1-1, Function 8 – TSV Closure. Failure of limit switch MS-LMS-SVOS1(1) to actuate prevented making up the RPS scram logic for channel A1. The other TSV-1 limit switch, MS-LMS-SVOS1(2),



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://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 email to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; email: oira_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 Cooper Nuclear Station	2. DOCKET NUMBER 05000-298	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
		2024	001	00

actuated as expected. The safety function of the TSV position limit switches is to initiate a reactor scram at the start of TSV closure. Performance of surveillance testing verifies this function is performing properly.

At 0400, Operations declared TSV-1 limit switch inoperable and entered TS Limiting Condition for Operation (LCO) 3.3.1.1, Condition A, Required Action A.2, place associated trip system in trip, with a Completion Time of 12 hours. At 0853, a pre-planned contingency power reduction to approximately 60% was initiated to replace the limit switch. When the switch linkage was disassembled for replacement, the linkage arm was found partially disengaged from the splined cam of the limit switch. This allowed the arm to move without engaging the limit switch due to it being loose. Additionally, during re-assembly, it was identified the linkage roller did not line up correctly with the TSV actuator arm. The shimming on the limit switch was adjusted to correct the alignment.

Both TSV-1 limit switches, MS-LMS-SVOS1(1) and MS-LMS-SVOS1(2), were replaced and Operations exited LCO 3.3.1.1, Condition A, on January 4, 2024, at 0249 hours.

MS-LMS-SVOS1(1) Performance History:

The failed TSV-1 limit switch was previously installed under the normal preventive maintenance (PM) frequency in October 2020 during refueling outage 31. The PM work order replaced both TSV-1 limit switches. Functional testing was conducted during quarterly power reductions the following operating cycle with no issues identified.

In November 2022, during refueling outage 32, MS-LMS-SVOS1(1) was removed to support work on TSV-1 and reinstalled. Online functional testing continued during quarterly power reductions with no issues documented for the 2023 first or second quarter tests.

During TSV-1 limit switch functional testing on August 19, 2023, MS-LMS-SVOS1(1) was slow to actuate. At the time, it was determined the delayed response was due to the method of testing and that the switch lever was not fully actuated far enough to change state of the limit switch. The station operator performing the test noted that while actuating the switch, they had to reposition their body to get full engagement. When they repositioned, the switch did actuate to drop out the associated relays. An additional test was performed by a different individual to ensure the switch was fully actuated and testing was completed successfully. TSV-1 limit switch MS-LMS-SVOS1(2) performed as expected. During the testing, both limit switches on TSV-2 actuated correctly.

TSV-1 limit switch testing was again performed on November 18, 2023. During this testing, limit switch MS-LMS-SVOS1(1) did not change state. The switch lever mechanism was held for approximately five minutes with no change. MS-LMS-SVOS1(2) actuated as expected. As a result of this testing, Maintenance personnel visually inspected the switch and Engineering personnel evaluated the condition. An additional test was performed with a scope recorder connected to the associated relays to assist with diagnostics. During this test, the relays performed as expected. Based on the successful test, visual inspections, and experience from previous switch failure, it was again suspected the initial test failure was associated with how the testing was



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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://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 email to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; email: oir_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 Cooper Nuclear Station	2. DOCKET NUMBER 05000-298	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
		2024	001	00

performed; by not fully engaging the switch mechanism causing it to change state. During the testing, both limit switches on TSV-2 actuated correctly.

The functional testing performed on January 3, 2024, was done at an increased frequency (from quarterly to a 6-week interval) based on previous test performance of limit switch MS-LMS-SVOS1(1) and industry operating experience that identified the potential for grease hardening in the switch mechanism. Results from subsequent lab analysis performed on the failed limit switch ruled out grease hardening as a potential failure mode.

The switch linkage arm looseness that was identified following MS-LMS-SVOS1(1) failure on January 3, 2024, was not identified during the previous inspection on November 18, 2023. It cannot be determined if the looseness was present at that time. Linkage arm looseness can only be observed by looking for a gap on the top side of the switch and linkage. The engagement of the linkage on to the cam cannot be seen since the linkage covers the cam. The testing method of manually cycling the limit switch has been performed at CNS for over 20 years as an acceptable practice with consistent good responses.

The installed limit switches for TSV-1 and TSV-2 are Namco, series EA740.

BASIS FOR REPORT

Based on performance history of limit switch MS-LMS-SVOS1(1), the TSV-1 was inoperable back to the date of the initial failed surveillance, i.e., on August 19, 2023. As such, this event is reportable under 10 CFR 50.73(a)(2)(i)(B) – Any operation or condition which was prohibited by TS.

SAFETY SIGNIFICANCE

There were no safety consequences as a result of this event. The failure to actuate was only experienced on one TSV-1 limit switch MS-LMS-SVOS1(1). During the time the TSV-1 closure function was inoperable for this failure, there was no failure of the other limit switch for TSV-1, nor was there any failure of the two limit switches for TSV-2. Therefore, a closure of TSV-1 would still have generated a half scram signal on RPS channel A2 and a normal half scram would have been generated from both Channels B1 and B2 for TSV-2 closure.

CAUSES

The mechanistic cause for the failure of the limit switch to actuate during testing was due to the assembly and alignment of the linkage mechanism not having full engagement on the splined cam.

A contributing cause was that the installation guidance did not contain the necessary vendor manual information to ensure consistency for tightening linkage to the cam shaft. The guidance also did not have detail for aligning the linkage to the actuator which allowed it to disengage from the spline adaptor and prevented the limit switch from actuating.



LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://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 email to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; email: oira_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 Cooper Nuclear Station	2. DOCKET NUMBER 05000-298	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
		2024	001	00

CORRECTIVE ACTIONS

MS-LMS-SVOS1(1) was replaced using additional vendor guidance and detail to perform shimming for proper alignment.

CNS will also update the associated maintenance plans to include additional instruction on tightening limit switches, shimming as necessary for alignment, and to manually stroke the linkage.

PREVIOUS EVENTS

There have been no previous events in the last three years regarding TSV limit switch failures other than that discussed in the Event Description section of this report.