



**Nebraska Public Power District**

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10 CFR 50.73

NLS2024014  
March 4, 2024

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

Subject: Licensee Event Report No. 2024-002-00  
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Dear Sir or Madam:

The purpose of this correspondence is to forward Licensee Event Report 2024-002-00.

This letter does not contain regulatory commitments.

Sincerely,

Khalil Dia  
Site Vice President

/bk

Attachment: Licensee Event Report 2024-002-00

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)

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1. Facility Name Cooper Nuclear Station	<input checked="" type="checkbox"/> 050	2. Docket Number 298	3. Page 1 of 4
	<input type="checkbox"/> 052		

4. Title  
Technical Specifications Prohibited Condition for Inoperable Service Water Booster Pump

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved		
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year			
08	27	2022	2024	002	00	03	04	2024			

9. Operating Mode 1	10. Power Level 081
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11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

10 CFR Part 20	10 CFR Part 50	10 CFR Part 50	10 CFR Part 70	10 CFR Part 73
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<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)(i)	<input type="checkbox"/> 50.36(c)(1)(ii)(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)(1)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.36(c)(2)	<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"/> 20.2203(a)(4)	<input type="checkbox"/> 50.36(c)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2203(a)(2)(ii)	10 CFR Part 21	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.77(a)(1)
<input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(v)		<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	

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 (Include area code) (402) 825-5416
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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
D	BO	P	B580	Y	B	BO	SEAL	B580	Y

14. Supplemental Report Expected <input checked="" type="checkbox"/> No	15. Expected Submission Date <input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)	Month	Day	Year
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16. Abstract (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

On August 27, 2022, Residual Heat Removal Service Water Booster pump 'D' (SW-P-BPD) outboard pump bearing temperature reached the high warning temperature alarm. Upon investigation of the alarm, a three drops per minute oil leak was observed on the pump inboard, radial bearing. At 2120 hours, Operations declared SW-P-BPD inoperable and entered the applicable Technical Specification Limiting Condition for Operation.

The pump bearing oil leakage was repaired and both inboard and outboard booster pump bearings replaced. SW-P-BPD was declared operable at 1614 on September 1, 2022.

The cause of the pump inboard bearing oil leakage was a fabrication issue by the original pump manufacturer. The cause of the pump thrust bearing elevated temperature was that the maintenance procedure used for the previous pump rebuild in July 2022 was not as detailed in accordance with the original manufacturer's recommendations with respect to installation of the pump thrust bearing.

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



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

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1. FACILITY NAME  Cooper Nuclear Station	2. DOCKET NUMBER  05000-298	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
		2024	002	00

**NARRATIVE**

**PLANT STATUS**

At the time of the event on August 27, 2022, Cooper Nuclear Station (CNS) was in Mode 1, Power Operation, at 81 percent power for end-of-cycle power coast down.

**BACKGROUND**

The Residual Heat Removal [EIS:BO] Service Water Booster (RHRSWB) system is designed to provide cooling water for the Residual Heat Removal system (RHR) heat exchangers [EIS:HX], required for a safe reactor shutdown following a Design Basis Accident or transient. The RHRSWB system is operated whenever the RHR heat exchangers are required to operate in the shutdown cooling or suppression pool cooling mode.

The system is initiated manually from the Control Room. If operating during a loss of coolant accident (LOCA), the system is automatically tripped to allow the diesel generators [EIS:DG] to automatically power only that equipment necessary to reflood the core.

The RHRSWB system removes heat from the suppression pool via the RHR system to limit the suppression pool temperature and primary containment [EIS:NH] pressure following a LOCA. This ensures that the primary containment can perform its function of limiting the release of radioactive materials to the environment following a LOCA.

The RHRSWB system consists of two independent and redundant subsystems. Each subsystem is made up of a header, two pumps [EIS:P], a suction source, valves, piping, heat exchanger, and associated instrumentation. Two RHRSWB pumps per subsystem are required to be operable to satisfy the requirements of Technical Specifications (TS), Limiting Condition for Operation (LCO) 3.7.1.

**EVENT DESCRIPTION**

RHRSWB pump 'D' (SW-P-BPD) was removed from service at 0202 hours on July 27, 2022, and was replaced as part of routine preventive maintenance. SW-P-BPD was restored to operable status after this replacement at 0333 hours on July 29, 2022.

On August 27, 2022, at approximately 1330 hours, SW-P-BPD was placed in service to support SW chemical injection to control zebra mussels within the SW system. At approximately 1942 hours, a high thrust bearing temperature alarm was received on the Plant Management Information System (PMIS). While investigating the condition, a separate oil leak of three drops per minute (dpm) was observed on the pump inboard radial bearing, and a one dpm oil leak observed on the pump outboard thrust bearing. Due to the excessive oil leakage of the pump inboard bearing and pump outboard bearing high temperature, Operations declared SW-P-BPD inoperable at 2120 hours and entered TS LCO 3.7.1, Condition A, Required Action A.1, to restore SW-P-BPD to operable status within 30 days.



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On August 28, 2022, SW-P-BPD was placed in service for troubleshooting. Validation of the outboard bearing high temperature condition included obtaining vibration data, an oil sample, and thermography. The thermography reading confirmed the abnormal temperature condition was valid. The oil was black with evidence of degradation having occurred. Further offsite analysis confirmed the oil contained elevated particulate levels and contained visible debris. Subsequent discussions with maintenance personnel and review of the maintenance history and manufacturer's recommendations contained in the associated vendor manual revealed that during the July 2022 pump replacement activity, the thrust bearing locknut was overtightened resulting in more pre-loading of the bearing. That pre-load added to the thrust load during subsequent SW-P-BPD operations resulting in further degradation of the load-bearing surfaces of the bearing causing the bearing's elevated temperatures. Maintenance history and PMIS data was searched back to 1993 with no previous instances of elevated outboard thrust bearing temperature found.

Further investigation of the inboard bearing oil leak involved disassembly and inspection of the pump. The oil leakage was identified from where the pump shaft protrudes through the inboard bearing cover. The original manufacturer, Byron Jackson (Flowserve), was contacted to review photographs of the cover. A discrepancy was identified with configuration of the labyrinth seal drain path. The as-machined configuration did not allow the outer groove to drain back to the oil reservoir because the angled drain slot was machined incorrectly. This discrepancy was due to an error introduced when the associated fabrication drawings were updated in 2012, just prior to manufacture of the pump. This improper fabrication of the angled drain slot in the inboard bearing cover labyrinth seal caused the oil leak. The other three installed RHRSWBPs were also procured under the same contract as SW-P-BPD. No oil leakage was observed from these pumps.

Corrective maintenance was performed to replace both the inboard and outboard pump bearings and the inboard bearing cover with one that was machined prior to the manufacturer's 2012 drawing update. At 1614 hours on September 1, 2022, following successful post-work testing and an approximate 12-hour pump run, SW-P-BPD was declared operable and TS LCO 3.7.1, Condition A, was exited.

**BASIS FOR REPORT**

On January 4, 2024, CNS Licensing personnel discovered that a back-end review of the causal report for this equipment condition was required but had not been completed. This condition was entered into the station's corrective action program. A review was completed and concluded there was firm evidence that SW-P-BPD was inoperable for greater than the completion time permitted by TS (30 days) based on the operating conditions of the thrust bearing in combination with the expected environmental conditions during a design basis event.

Based on this information, SW-P-BPD was inoperable from July 27, 2022, until September 1, 2022, for a total duration of 36 days. TS LCO 3.7.1, Condition A, one RHRSWB pump inoperable, applies which has a completion time of 30 days. Based on exceeding the TS completion time, this event is reportable under 10 CFR 50.73(a)(2)(i)(B) as any operation or condition which was prohibited by TS.



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**SAFETY SIGNIFICANCE**

There were no safety consequences as a result of this event. The RHRSWB system is designed with sufficient redundancy so that no single active system component failure nor any single active component failure in any other plant system can prevent it from achieving its safety objective. Two independent loops are provided, each capable of full design capacity with only one pump available. During the time of SW-P-BPD inoperability, RHRSWB pump 'B' was operable or the Division 1 RHRSWB subsystem (pumps 'A' and 'C') was operable. The operability of one of these two options maintained the safety function for the duration when SW-P-BPD was inoperable. As such, there was no loss of safety function.

**CAUSE**

This event involved two separate, unrelated SW-P-BPD equipment issues and separate causal factors were determined for each.

The cause of the elevated outboard bearing temperature was the maintenance procedure used for pump rebuild was not as detailed in accordance with the original manufacturer's recommendations for installation of the pump thrust bearing; specifically, the tightening of the thrust bearing locknut.

The cause of the inboard bearing oil leak was a fabrication issue by the pump original manufacturer.

**CORRECTIVE ACTIONS**

As discussed above, maintenance personnel repaired the pump thrust bearing and bearing oil leakage. Other corrective actions taken were:

- Revised the maintenance procedure for RHRSWB pump overhaul/replacement to add guidance for ensuring thrust bearing installation is in accordance with vendor recommendations.
- Revised the maintenance procedure for RHRSWB pump overhaul/replacement to add guidance for inspection of the labyrinth bearing seals to verify the drain path is configured in accordance with manufacturer design requirements.

These actions are complete.

**PREVIOUS EVENTS**

There have been no events reported in the past three years related to the RHRSWB system.