



**Nebraska Public Power District**

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NLS2014033  
April 11, 2014

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

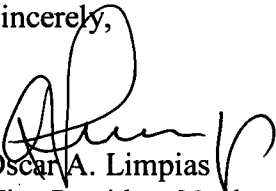
Subject: Licensee Event Report No. 2014-002-00  
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Dear Sir or Madam:

The purpose of this correspondence is to forward Licensee Event Report 2014-002-00.

There are no new commitments contained in this letter.

Sincerely,



Oscar A. Limpias  
Vice President Nuclear-  
Chief Nuclear Officer

/jo

Attachment: Licensee Event Report 2014-002-00

cc: Regional Administrator w/attachment  
USNRC - Region IV

NPG Distribution w/attachment

Cooper Project Manager w/attachment  
USNRC - NRR Project Directorate IV-1

INPO Records Center w/attachment  
via ICES entry

Senior Resident Inspector w/attachment  
USNRC - CNS

SORC Chairman w/attachment

SRAB Administrator w/attachment

CNS Records w/attachment

*IE22  
NRR*



## LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of  
digits/characters for each block)

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](mailto: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

Cooper Nuclear Station

## 2. DOCKET NUMBER

05000 298

## 3. PAGE

1 OF 3

## 4. TITLE

Jacket Water Leak into Emergency Diesel Generator Engine Results in Condition Prohibited by Technical Specifications and Loss of Safety Function

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	07	2013	2014	002	00	04	11	2014	FACILITY NAME	DOCKET NUMBER
										05000
										05000

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

## 12. LICENSEE CONTACT FOR THIS LER

## LICENSEE CONTACT

David W. Van Der Kamp, Licensing Manager

## TELEPHONE NUMBER (Include Area Code)

(402) 825-2904

## 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
B	DG	LNR	C634	Y					

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On October 7, 2013, Diesel Generator (DG) 1 was declared inoperable for the performance of the monthly operability test. During the test, indications of water intrusion into the DG1 lubricating oil system were observed. DG1 remained inoperable during troubleshooting activities. Upon further investigation, a crack in the liner wall was visible near the top of the 1-Left cylinder liner. The liner was removed and sent to Lucius Pitkin, Incorporated, for examination. A new liner was installed and DG1 was declared operable on October 12, 2013.

The root cause of the event was that the subpar mechanical properties of the liner caused the cylinder liner to crack which then allowed jacket water to leak into the engine lubrication oil.

To prevent recurrence of this condition, the test method(s) shall be specified to ensure that liners currently in inventory have sufficient material tensile strength to conform to the given requirements. A report that details the test methods used and the results of testing shall be reviewed prior to any liner from inventory being installed in either DG1 or DG2.

**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 internet e-mail to [Infocollects.Resource@nrc.gov](mailto: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	6. LER NUMBER			3. PAGE
Cooper Nuclear Station	05000 298	YEAR	SEQUENTIAL NUMBER	REV NO.	2 OF 3
		2014	- 002 -	00	

**NARRATIVE****PLANT STATUS**

Cooper Nuclear Station (CNS) was in Mode 1, Power Operations, at 100% power at the time the condition was discovered on October 7, 2013. Diesel Generator (DG) 1 was inoperable for the monthly operability test.

**BACKGROUND**

The purpose of the standby (emergency) Alternating Current (AC) power system [EIS:EK] is to provide a single failure proof source of on-site AC power adequate for maintaining the safe shutdown of the reactor following abnormal operational transients and postulated accidents. This system consists of two independent AC power sources, the Emergency Diesel Generators (EDG) [EIS: DG].

Each DG shall be capable of automatic start at any time and capable of continued operation at rated load, voltage, and frequency until manually stopped.

During normal plant operations both DGs are in standby. A DG starts automatically on a loss of coolant accident signal (i.e., low reactor water level signal or high drywell pressure) or on loss of voltage on a critical bus. The DG automatically connects to its respective bus after off-site power is tripped as a consequence of critical bus loss of voltage or degraded voltage.

CNS Technical Specifications (TS) require that two EDGs be operable when the plant is in Modes 1, 2, or 3, and that one DG be operable when the plant is in Modes 4 or 5.

**EVENT DESCRIPTION**

On October 7, 2013, at 09:11, DG1 was declared inoperable for the performance of the monthly operability test and TS Limiting Condition for Operation (LCO) 3.8.1, Condition B, was entered. During the monthly operability test, indications of water intrusion into the DG1 lubricating oil system [EIS:LA] were observed.

Troubleshooting commenced and found the source of water intrusion was the 1-Left cylinder. With the DG1 water jacket pressurized, water was observed running out of the bottom of the 1-Left cylinder liner [EIS:LNR]. Using a borescope through the fuel injector bore in the cylinder head, a crack in the liner wall was visible near the top of the liner.

As directed by TS LCO 3.8.1, Condition B, Required Action B.3.1, a common cause failure analysis was completed for DG2. This analysis found DG2 continued to be operable, as there were no indications of a similar high sodium content in the DG2 lube oil which indicates no leakage of jacket water into the DG2 lube oil.

The cracked liner was removed and shipped to Lucius Pitkin, Incorporated, for metallurgical examination. The examination results provided to CNS in February 2014 found that the tensile strength of the liner in the area of the crack was 15% lower than specification. A slight increase in assembly stresses imposed by the installation of a new cylinder head in October 2011 caused a fatigue crack to initiate in the liner with lower than expected tensile strength. The crack then propagated through the liner wall and allowed the jacket water to leak into the DG1 cylinder.

LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
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**NARRATIVE**

The 1-Left liner was installed in 1997 and a torque specification of 1450 ft-lbf was used to bolt the cylinder head. When a new cylinder head was installed in October 2011, due to an external jacket water leak on the 1-Left cylinder, the 1-Left liner was not replaced, and the same torque specification of 1450 ft-lbf was used to bolt the new cylinder head.

During the time frame from October 2011, when the new cylinder head was installed on the 1-Left cylinder, to the discovery of the leak on October 7, 2013, it was determined that DG1 was inoperable, resulting in a past operation or condition prohibited by Technical Specifications. A search found that from October 2011 to October 2013, DG2 was inoperable during monthly surveillance runs and during performance of annual maintenance on March 12, 2012 and March 12, 2013. As such, a loss of safety function also occurred.

A new 1-Left liner was installed and DG1 was declared operable on October 12, 2013, at 11:04.

**BASIS FOR REPORT**

This event is being reported per 10 CFR 50.73(a)(2)(i)(B) as "any operation or condition which was prohibited by Technical Specifications" and reportable in accordance with 10 CFR 50.73(a)(2)(v) as "any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to ...(D) Mitigate the consequences of an accident."

**SAFETY SIGNIFICANCE**

DG2 was operable and available during the October 7, 2013 thru October 12, 2013 period; therefore, there was no impact to safety.

A conservative estimate for potential initial failure would be October 2011, when the new cylinder head was installed on the 1-Left cylinder. The duration of both DGs being inoperable was short and the exposure window was small; therefore, the potential safety impact was negligible.

This event is a safety system functional failure.

**CAUSE**

The root cause of the event was that the subpar mechanical properties of the liner caused the cylinder liner to crack which then allowed jacket water to leak into the engine lubrication oil.

**CORRECTIVE ACTION**

A common cause analysis was performed on DG2, liners pre-dating Change Evaluation Document 1999-0212 were placed on-hold, and an increase in oil sampling frequency was initiated from quarterly to monthly.

To prevent recurrence of this condition, System Engineering shall specify the test method(s) to ensure that liners currently in inventory have sufficient material tensile strength to conform to the given requirements, and shall oversee testing work that is done to provide that assurance. A report that details the test methods used and the results of testing shall be given to the Corrective Action Review Board for their review prior to any liner from inventory being installed in either DG1 or DG2.

**PREVIOUS EVENTS**

On April 11, 2012, DG1 failed to start after performance of on-line maintenance activities. The failure was due to improper installation of a starting air distributor rotor in October 2011. This was reported under LER 2012-002-00, in accordance with 10 CFR 50.73(a)(2)(i)(B) as "an operation or a condition which was prohibited by Technical Specifications" and also in accordance with 10 CFR 50.73(a)(2)(v) as "any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to ...(D) Mitigate the consequences of an accident."