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NLS2015111
November 5, 2015

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

Subject: Licensee Event Report No. 2015-001-01
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Dear Sir or Madam:

The purpose of this correspondence is to forward Licensee Event Report 2015-001-01.

There are no new commitments contained in this letter.

Sincerely,

Oscar A. Limpias
Vice President Nuclear-
Chief Nuclear Officer

/jo

Attachment: Licensee Event Report 2015-001-01

cc: Regional Administrator w/attachment
USNRC - Region IV

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

Senior Resident Inspector w/attachment
USNRC - CNS

SRAB Administrator w/attachment

NPG Distribution w/attachment

INPO Records Center w/attachment
via ICES entry

SORC Chairman w/attachment

CNS Records w/attachment

IE22
NRR

COOPER NUCLEAR STATION
P.O. Box 98 / Brownville, NE 68321-0098
***Telephone:** (402) 825-3811 / **Fax:** (402) 825-5211*
www.nppd.com

NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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, 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.

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE

Valve Test Failures Result in a Condition Prohibited by Technical Specifications and a 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
										05000
01	26	2015	2015	- 001 -	01	11	05	2015	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
100	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
	☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMER (Include Area Code)
Jim Shaw, Licensing Manager	(402) 825-2788

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	SB	RV	T020	N					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO				

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

On January 26 and February 11, 2015, five of eight Target Rock safety relief valve (SRV) pilot valve assemblies, removed during Refueling Outage 28, failed to lift within Technical Specification (TS) lift setpoint requirements. The pressure setpoint of the first failed pilot assembly is 1090 psig; the SRV pilot assembly lifted at 1124 psig. The pressure setpoint of the second failed pilot assembly is 1100 psig; the SRV pilot assembly lifted at 1192 psig. The pressure setpoint of the third failed pilot assembly is 1090 psig; the SRV pilot assembly lifted at 1267.7 psig. The pressure setpoint of the fourth failed pilot assembly is 1100 psig; the SRV pilot assembly lifted at 1139 psig. The pressure setpoint of the fifth failed pilot assembly is 1090 psig; the SRV pilot assembly lifted at 1138 psig. Two subsequent lifts were performed for all failed SRV pilot assemblies and the results were within the TS pressure setpoint tolerances.

Initially, the probable cause was corrosion bonding with time being a possible exacerbating factor. Upon further investigation and testing, it has been determined that the direct cause of the failures is corrosion bonding.

Although the TS related to the set point lift pressures of the SRV pilot valve assemblies were exceeded, an analysis of this event indicates that the design basis pressures to ensure safety of the reactor vessel and its pressure related appurtenances were not challenged. Public safety was not at risk. Safety to plant personnel and plant equipment were not at risk.

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NARRATIVE

PLANT STATUS

Cooper Nuclear Station (CNS) was in Mode 1, Power Operation, at 100 percent power, when the event was discovered; i.e., January 26, 2015.

BACKGROUND

The pressure relief system includes three American Society of Mechanical Engineers code safety valves (SV) [EIIS: SB] and eight safety relief valves (SRV) [EIIS: RV], all of which are located on the main steam lines [EIIS: SB] within the drywell [EIIS: NH], between the reactor vessel [EIIS: RPV] and the first main steam isolation valve [EIIS: ISV]. The SVs provide protection against over pressurization of the nuclear system and discharge directly into the interior space of the drywell. The SRVs discharge to the suppression pool and provide three main functions: overpressure relief operation to limit the pressure rise and prevent safety valve opening, overpressure safety operation to prevent nuclear system over pressurization, and depressurization operation (opened automatically or manually) as part of the emergency core cooling system [EIIS: BJ, BM, BO].

Technical Specification (TS) Limiting Condition for Operation 3.4.3 requires the safety function of seven SRVs and three SVs to be operable. The nominal set pressure and tolerances for these valves are established in CNS TS Surveillance Requirements (SR) 3.4.3.1.

The SRVs installed at CNS are Target Rock Model 7567F, two-stage, pilot-actuated valves with pilot assemblies comprised of Stellite 21 pilot discs and Stellite 6B pilot body seats. The pilot assemblies had been in continuous service since installation in Refueling Outage (RE) 27.

Corrosion bonding occurs when the protective oxide layers of the seat and disc break down and allow a crevice corrosion process to develop between the seat and disc. The seat is machined and then lapped with the disc to create a tight fit with one another. During the material removal process (machining) on both the seat and disc, the protective oxide layer that provides corrosion protection is removed. Because the SRV pilot valves are then assembled, the oxide layer is not given sufficient time to reestablish itself naturally, and no external process, such as pickling, is done to ensure that the oxide layer is reestablished to its full extent without any breaks or discontinuities. When the SRV pilot valves are assembled, the seat and disc are jammed together and air cannot reach the surfaces, therefore the full benefits of the oxide layer of the anti-corrosion material is diminished.

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EVENT DESCRIPTION

On January 26 and February 11, 2015, three complete SRVs and five SRV pilot assemblies, removed during RE28 in the Fall of 2014, were as-found tested at National Technical Systems Laboratories, formerly Wyle Laboratories.

The pressure setpoint for SRV pilot assembly serial number 385 is 1090 psig. The TS SR 3.4.3.1 as-found limit of acceptance is 1090 +/- 3%. The first actual lift pressure of this SRV pilot assembly was recorded as 1124 psig, 3.119% above the pressure setpoint. For informational purposes, the technicians performed a second and third lift. The results were 1087 psig and 1087 psig, both within 3% of the pressure setpoint.

The pressure setpoint for SRV pilot assembly serial number 386 is 1100 psig. The TS SR 3.4.3.1 as-found limit of acceptance is 1100 +/- 3%. The first actual lift pressure of SRV number 386 was 1192 psig, 8.36% above the pressure setpoint. A second and third lift was performed and the results were 1108 psig and 1112 psig, both within 3% of the pressure setpoint.

The pressure setpoint for SRV pilot assembly serial number 1242 is 1090 psig. The TS SR 3.4.3.1 as-found limit of acceptance is 1090 +/- 3%. The first actual lift pressure of this SRV pilot assembly was recorded as 1267.7 psig, 16.24% above the pressure setpoint. The results of a second and third lift were 1091 psig and 1090 psig, both meeting the pressure setpoint.

After this failure, testing was halted in order to verify testing accuracy. Testing was found to be the same as used in years past, and testing resumed on February 10 and February 11 for the remaining five SRVs.

The TS SR 3.4.3.1 as-found limit of acceptance for SRV pilot assembly serial number 1243 is 1100 psig +/- 3%. The first actual lift pressure of this SRV pilot assembly was recorded as 1139 psig, 3.545% above the pressure point. For informational purposes, a second and third lift was performed. The results were 1112 psig and 1105 psig, both meeting the pressure setpoint.

SRV pilot assembly serial number 1241 was tested. The TS SR 3.4.3.1 as-found limit of acceptance is 1090 psig +/- 3%. The first actual lift pressure of this SRV pilot assembly was recorded as 1138 psig, 4.404% above the pressure point. A second and third lift was performed. The results were 1106 and 1092 psig, both meeting the pressure setpoint.

BASIS FOR REPORT

CNS is reporting this event as an operation or condition prohibited by plant TS per 10 CFR 50.73(a)(2)(i)(B), and also as a condition that could have prevented the fulfillment of the safety function of structures or systems as defined under 10 CFR 50.73(a)(2)(v).

An existing engineering analysis demonstrated that the reactor vessel would not be challenged during an overpressure event. In addition, a new analysis determined that the existing Minimum Critical Power Ratio

(MCPR) operating limit would have protected the MCPR safety limit in the event of an anticipated operational occurrence. As such, this event will not be counted as a Safety System Functional Failure for the Nuclear Regulatory Commission performance indicator since no loss of safety function occurred.

SAFETY SIGNIFICANCE

Although the TS related to the set point lift pressures of the SRV pilot valve assemblies were exceeded, an analysis of this event indicates that the design basis pressures to ensure safety of the reactor vessel and its pressure related appurtenances would not be challenged. Public safety was not at risk. Safety to plant personnel and plant equipment were not at risk.

CAUSE

The direct cause of five of eight SRV pilot valves failing their lift tests is corrosion bonding.

CORRECTIVE ACTIONS

The following corrective actions have been entered into CNS' corrective action program:

1. CNS shall inspect the SRVs during disassembly to ensure there are no indications of binding, vibration, or other mechanical problems that might cause effects similar to that of corrosion bonding.

2. Laboratory work, under the direction of CNS, shall be undertaken to confirm or deny corrosion bonding of the disc and seats as needed. A comparison with previous laboratory findings about SRV pilot valves will be performed to determine, if possible, the role time in-service played in the failures.

3. Based on the results of the inspection and laboratory work, specific findings and corrective action recommendations in the form of a revised root cause investigation report will be completed.

4. If no evidence to refute corrosion bonding is identified, ensure after machining and lapping processes have been completed, that the oxide, passive layer on the seat and disc are fully restored by pickling or an equivalent process.

5. Presuming that no technical reason is discovered to prevent the following, submit to the Nuclear Regulatory Commission a Technical Specification change that requests setpoint changes as noted in EE 10-053; NEDC-33 543P, Revision 0, Class III, DRF 0000-0103-4647, dated February 2010; GE-H NEDC-3362OP, Revision 0, May 2011; and GE-H, report 002N5242-R0, entitled, Cooper Cycle 28 SRV Set Point Study.

PREVIOUS EVENTS

Licensee Event Report (LER) 2011-005-00 – On June 22, 2011, one of eight Target Rock SRV pilot valve assemblies failed to lift within TS lift setpoint requirements. Wyle Laboratories performed this testing. The pressure setpoint of the failed pilot assembly was 1090 +/- 32.7 psig; it lifted at 1199 psig. Two subsequent informational lifts were performed for the SRV pilot assembly and were within the TS pressure setpoint tolerances. The mechanistic cause was the same as reported in previous LERs, pilot disc-to-seat corrosion bonding.

LER 2010-001-00 – On January 12, 2010, two of eight Target Rock SRV pilot valve assemblies failed to lift within TS lift setpoint requirements. Wyle Laboratories performed this testing. The pressure setpoint for the first pilot assembly is 1100 +/- 33.0 psig; the SRV pilot assembly lifted at 1166 psig. The pressure setpoint for the second pilot assembly is 1090 +/- 32.7 psig; it lifted at 1139 psig. Two subsequent informational lifts were performed for both SRV pilot assemblies and were within the TS pressure setpoint tolerances. The mechanistic cause was the same as reported in previous LERs, pilot disc-to-seat corrosion bounding.

LER 2008-002-00 – On July 7 through July 9, 2008, the results of Target Rock SRV test data performed at Wyle Laboratories identified that one of eight SRV pilot assemblies failed as-found pressure setpoint testing. The SRV pilot assembly lifted at 1165 psig, outside its TS setpoint tolerance of 1100 +/- 33.0 psig. The mechanistic cause was pilot disc-to-seat corrosion bounding between the Stellite 21 pilot disc and Stellite 6B pilot body seat to cause the SRV pilot assembly to lift outside its TS setpoint tolerance.

LER 2007-002-00 – On February 28 through March 2, 2007, the results of Target Rock SRV tests performed at Wyle Laboratories identified that one of eight SRV pilot valve assemblies failed to lift within its TS lift setpoint of 1090 +/- 32.7 psig. The failure was a result of sufficient corrosion bonding between the SRV pilot valve assembly Stellite 21 disc and the pilot valve Stellite 6B body seat to cause the SRV pilot valve to lift outside its TS setpoint tolerance.