Nebraska Public Power District

Always there when you need us

NLS2010052
July 27, 2010

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

Subject: Licensee Event Report No. 2009-005-01
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Dear Sir or Madam:

The purpose of this correspondence is to forward Licensee Event Report 2009-005-01.

Sincerely,

FOR DEET Willis

Demetrius L. Willis
General Manager of Plant Operations

/jo

Attachment

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

SORC Chairman w/attachment

CNS Records w/attachment

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

IE22
NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010

Estimated burden per response to comply with this mandatory information collection request: 80 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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 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 reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Cooper Nuclear Station	05000298	1 of 5

4. TITLE
High Pressure Coolant Injection Governor Valve Failure

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
12	21	2009	2009	- 005 -	01	07	27	2010	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE
1

10. POWER LEVEL
100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

☐ 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)(iii)	☐ 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)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 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

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
David W. Van Der Kamp, Licensing Manager	(402) 825-2904

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	BJ	65	W290	Y					

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

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

On December 21, 2009, Cooper Nuclear Station (CNS) Control Room Operators started the High Pressure Coolant Injection (HPCI) auxiliary oil pump to obtain an oil sample for the predictive maintenance oil analysis program. Following the start of the auxiliary oil pump, the HPCI governor valve did not respond as expected. The HPCI auxiliary oil pump was operated a second time and the governor valve did not operate at all. HPCI was declared inoperable at 13:37, Central Standard Time (CST), resulting in entry into Technical Specification Limiting Condition of Operation (LCO) 3.5.1 Condition C, and LCO 3.3.3.2 Condition A.

Offsite analysis found corrosion on internals of the electro-hydraulic governor (EG-R). This bound the EG-R and prohibited positioning the HPCI governor valve. The corrosion originated from particulate introduced during filter change out activities, which induced corrosion in the EG-R internals during standby conditions. CNS replaced the EG-R, flushed the oil system, and revised procedures for HPCI filter change out activities. CNS will identify preventative maintenance and/or design changes to prohibit corrosion.

This event was determined to be reportable as a loss of safety function. Actual nuclear safety significance is minimal as no events occurred which required HPCI to be initiated. HPCI was declared operable at 16:45 CST on December 24, 2009.

PLANT STATUS

Cooper Nuclear Station (CNS) was in Mode 1, Power Operation, at 100% power at the time of discovery.

BACKGROUND

The High Pressure Coolant Injection (HPCI) System (EIIS:BJ) provides protection to the core for the case of a small break in the reactor coolant pressure boundary which does not result in rapid depressurization of the reactor vessel. The HPCI System permits the nuclear plant to be shutdown while maintaining sufficient reactor vessel water inventory until the reactor vessel is depressurized. The HPCI System continues to operate until reactor vessel pressure is below the pressure at which Low Pressure Coolant Injection (EIIS:BO) operation or Core Spray System (EIIS:BM) operation can be used to maintain core cooling.

HPCI consists of a steam turbine assembly (EIIS:TRB) driving a multi-stage booster and main pump assembly (EIIS:P) and system piping, valves, controls and instrumentation. The HPCI turbine is driven by steam from the reactor which is generated by decay and residual heat.

A control governor receives a HPCI flow signal and adjusts the turbine steam control valve so that HPCI design pump discharge flow rate is obtained. The flow signal used for automatic control of the turbine is derived from a differential pressure measurement across a flow element in the HPCI pump discharge pipeline. The governor controls the pressure applied to the hydraulic operator of the turbine control valve, which, in turn, controls the steam flow to the turbine.

Upon receipt of the actuation signal, the auxiliary oil pump starts, providing hydraulic pressure for the turbine stop valve and turbine control valve hydraulic operator. The flow signal will ramp the control governor until rated flow is achieved. As hydraulic oil pressure is developed, the turbine stop valve and the turbine control valve open simultaneously and the turbine accelerates toward the speed setting of the control governor. As HPCI flow increases, the flow signal adjusts the control governor setting so that design flow is maintained.

EVENT DESCRIPTION

On December 21, 2009, in support of obtaining an oil sample for the predictive maintenance oil analysis program, Control Room Operators started the HPCI auxiliary oil pump. Immediately following the start of the auxiliary oil pump, the Control Room Operator observed that the HPCI governor valve did not respond as expected. Expected response is for the valve to open and close due to pressurization of the oil header, and then ramp and stay open in response to the electronic demand signal. However, the Control Room Operator observed the governor valve position indication and noted that the valve opened, closed, and remained closed. The auxiliary oil pump was then operated for a second time and the governor valve did not operate at all.

Consequently, HPCI was declared inoperable at 13:37 Central Standard Time (CST), resulting in entry into Technical Specification Limiting Condition for Operation (LCO) 3.5.1 Condition C, ECCS – Operating, HPCI System inoperable; and LCO 3.3.3.2 Condition A, Alternate Shutdown System, One or more required Functions inoperable; and an 8-hour report to the Nuclear Regulatory Commission Operations Center was made (Event Notification 45584).

Troubleshooting activities were initiated and no degradation of the electronic control signal was found. However, the electro-hydraulic controller (EG-R) was not properly porting oil to allow positioning of the governor valve. The EG-R and the remote servo were replaced upon this discovery. During the troubleshooting, it was found that the HPCI oil filter north canister had the top portion of the filter voided of oil and corrosion products were found on the canister and element.

Immediate corrective actions, in addition to replacement of the EG-R and associated remote servo, were to inspect the tubing between the EG-R and associated remote servo. The condition of the tubing was found to be acceptable. The HPCI hydraulic oil filter canisters were cleaned and the disposable filters were replaced. The hydraulic oil was circulated through the oil filters for two hours to flush and clean oil in the system.

Interim actions were put in place to perform sampling of the hydraulic oil on the inlet and outlet of the filters, and inspect the filters to ensure that the oil supplied to the hydraulic controls is within acceptable levels of particulate and moisture. Interim actions also include an additional inspection of the currently installed EG-R internals to ensure that corrosion attack is no longer occurring.

Based on the actions completed during troubleshooting activities and compensatory actions put into place, Operations declared the HPCI System operable at 16:45 CST on December 24, 2009.

The EG-R was sent to an offsite laboratory for analysis. The analysis found that the EG-R hydraulic governor had corrosion attack on the internal pilot plunger and the plunger's bushing. The buildup of the corrosion products was in a tight tolerance area and directly resulted in binding of the EG-R. Microscopic analysis of the corrosion found that it had characteristics that would require the areas of the corrosion to be exposed to environments that were void of oil. Because corrosion induced EG-R failures had not occurred in the past, a change analysis was performed. The change analysis found an attributable change in which a March 2009 HPCI oil filter change out maintenance task resulted in the unacceptable introduction of particulate into the oil system. Corrosion was found to be initiated by transport of the particulate in the oil to the EG-R internals. As the particles were trapped, they facilitated corrosion that eventually bound the EG-R and resulted in the failure of the HPCI governor valve to stroke.

BASIS FOR REPORT

The HPCI System is a single train system. This condition is 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." The event was reported as Event Notification Number 45584.

SAFETY SIGNIFICANCE

Industrial and personnel safety were not impacted by this event. Nuclear safety was impacted from the standpoint that the HPCI System is relied upon to mitigate a spectrum of small line break accidents as well as assist in maintaining reactor inventory during the initial stages of a station blackout. The potential for these accidents existed when the governor valve degradation was discovered. Thus, this event is significant from the standpoint of degradation of the credited HPCI System.

Actual nuclear safety significance was minimal from the standpoint that no events occurred that relied upon HPCI initiation. This is a Safety System Functional Failure.

CAUSE

During filter change out of the HPCI oil system in March of 2009, procedural guidance allowed mixing of unfiltered oil with filtered oil, and resulted in particulate being introduced into the oil that was transported to the EG-R. This particulate facilitated corrosion on the EG-R pilot plunger and associated bushing, resulted in binding of the EG-R, and subsequently caused failure of the EG-R to position the HPCI governor valve.

During standby conditions, the oil from the EG-R drains back to the sump, thus exposing the EG-R internals to periods of oil voided conditions, and allowed the corrosion attacks to escalate to the point of EG-R binding.

CORRECTIVE ACTION

To prevent recurrence of this event, CNS will identify areas susceptible to voiding and corrosion within the HPCI oil system and identify preventative maintenance and/or design changes to prohibit corrosion due to voiding. CNS has also revised procedural guidance to prevent the mixing of unfiltered and filtered oil during filter change out activities.

Additional actions include periodic visual inspection of the internals of the installed EG-R, inspection of oil piping and components in the hydraulic control flow path, periodic replacement of the EG-R, routine stroking of the HPCI governor, and engineering evaluation of the as found and as left condition of the EG-R recorded during rebuild.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION	
Cooper Nuclear Station	05000298	2009	- 005	- 01	5 of 5

17. NARRATIVE *(If more space is required, use additional copies of Form 366A)*

PREVIOUS EVENTS

A review of CNS Licensee Event Reports (LER) from 2006 to present revealed that there was one other occurrence related to a loss of safety function due to HPCI being declared inoperable. On February 7, 2007, HPCI inverter circuit failure alarms were received intermittently indicating a loss of the inverter output. The failure was the result of an intermittent open circuit in the inverter caused by corrosion which resulted from solder flux residue remaining on copper conductors during the manufacturing process. The event was reported under LER 2007-001, dated April 5, 2007, with a supplemental report, LER 2007-001-01, submitted on May 23, 2007.

ATTACHMENT 3 LIST OF REGULATORY COMMITMENTS©[4]

Correspondence Number: NLS2010052

The following table identifies those actions committed to by Nebraska Public Power District (NPPD) in this document. Any other actions discussed in the submittal represent intended or planned actions by NPPD. They are described for information only and are not regulatory commitments. Please notify the Licensing Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITMENT NUMBER	COMMITTED DATE OR OUTAGE
None		