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NLS2007042
May 23, 2007

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

Subject: Licensee Event Report No. 2007-001-01
Cooper Nuclear Station, NRC Docket 50-298, DPR-46

Dear Sir or Madam:

The purpose of this correspondence is to forward Licensee Event Report 2007-001-01.

Sincerely,

Michael J. Colomb
General Manager of Plant Operations

/jf

Enclosure

cc: Regional Administrator w/enclosure
USNRC - Region IV

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

Senior Resident Inspector w/enclosure
USNRC - CNS

SRAB Administrator w/enclosure

NPG Distribution w/enclosure

INPO Records Center w/enclosure

SORC Administrator w/enclosure

CNS Records w/enclosure

COOPER NUCLEAR STATION
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IE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2007

Estimated burden per response to comply with this mandatory information collection request: 50 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 4

4. TITLE
High Pressure Coolant Injection Inverter Circuit Failure Results in Loss of Safety Function

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
02	07	2007	2007	- 001 -	01	05	23	2007	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)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☒ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☒ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Paul V. Fleming, Licensing Manager	(402) 825-2774

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	INVT	T248	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)*

Between 0430 and 0457 Central Standard Time (CST) on February 7, 2007 High Pressure Coolant Injection (HPCI) inverter circuit failure alarms were received intermittently indicating a loss of the inverter output. HPCI was in a standby status at the time of the alarms. The loss of inverter output was confirmed by the HPCI flow controller output lowering to approximately 30% and returning to 100% upon alarm reset. The power indicating light on the inverter was observed to go off on the last alarm, returning when the alarm was reset.

HPCI was declared inoperable at 0430 resulting in entry into Technical Specification Limiting Condition for Operation 3.5.1 Condition C, HPCI System inoperable and 3.5.1 Condition D, HPCI System inoperable AND Condition A entered. Condition A was previously entered for Core Spray System Loop A, which was inoperable for planned maintenance. The failure was the result of an intermittent open circuit caused by corrosion which resulted from solder flux residue remaining on copper conductors during the manufacturing process. The inverter was replaced and HPCI was declared operable at 1602 on February 7, 2007. This LER also satisfies the reporting requirements of 10 CFR 21.

PLANT STATUS

Cooper Nuclear Station (CNS) was in Mode 1 at 100% steady state power at the time of the identified condition.

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 and system piping, valve, controls and instrumentation. The HPCI turbine is driven by steam from the reactor which is generated by decay and residual heat. The steam is extracted from main steam line "C" (EIIS:SB) upstream of the main steam line isolation valves (EIIS:ISV).

The HPCI inverter (HPCI-IVTR-119) (EIIS:INVT) (Topaz model N250-GW-125-60-115) provides power to HPCI flow control components. The inverter receives 125 VDC input power and converts it to 115 VAC output power.

EVENT DESCRIPTION

On February 7, 2007 the plant was in mode 1 at 100% steady state power. HPCI inverter circuit failure alarms were received intermittently between 0430 and 0457 CST indicating a loss of the inverter output. HPCI was in a standby status at the time of the alarms. The loss of inverter output was confirmed by the HPCI flow controller output lowering to approximately 30% and returning to 100% upon alarm reset. The power indicating light on the inverter was observed to go off on the last alarm, returning when the alarm was reset.

HPCI was declared inoperable at 0430 resulting in entry into Technical Specification Limiting Condition for Operation 3.5.1 Condition C, HPCI System inoperable and 3.5.1 Condition D, HPCI System inoperable AND Condition A entered. Condition A was previously entered for Core Spray System Loop A, which was inoperable for planned maintenance. An eight hour Non-Emergency report was made (Event Notification 43151). HPCI was declared operable at 1602 on February 7, 2007.

The inverter remained in service for eight hours with no additional alarms while a replacement work order was created. Troubleshooting included verifying that the inverter had power, performing thermography on the DC input fuses (EIIS:FU), and inspecting the associated wiring and wiring connections. The negative input fuse indicated an end-to-end temperature differential of eight degrees Fahrenheit. Voltage drop across the fuses was slightly higher than expected.

The inverter was replaced with a calibrated warehouse spare. The fuses were also replaced as a precaution. HPCI was subsequently declared operable. The removed inverter was energized on the bench for 24 hours with no abnormalities noted. A calibration was completed and all measurements taken were within specified tolerances.

The inverter was then sent to a third party vendor for failure analysis. The vendor identified a broken wire on the ground return for the driver sensing board. The broken wire was determined to be the result of corrosion due to solder flux residual remaining from the manufacturing process. The intermittent nature of the inverter failure observed by the Control Room staff was attributed to the 90 VDC voltage potential which developed across the broken solder connection. This voltage potential apparently caused minor arcing and re-soldering with the wire breaking during shipping. The vendor validated the condition by replacing the broken wire with a switch. The open condition would cause the inverter output to drop and the inverter would re-start when the switch was closed.

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." This LER also satisfies the reporting requirements of 10 CFR 21.

SAFETY SIGNIFICANCE

This condition is not risk significant. The incremental change in core damage probability is estimated below the industry accepted risk significant thresholds due to the short unavailability of the function during the event. The intermittent failure of the inverter would not have prevented effective HPCI core cooling function as needed to respond to an accident or transient. In addition, post-event bench testing confirmed functionality of the inverter for a minimum 24-hour period following the initial intermittent failure.

The observed condition was self-correcting which limits the exposure to the unavailability period. The total unavailability as observed from plant instrumentation was much less than 15 minutes before full functionality was restored. The impact of this limited duration of HPCI unavailability is considered negligible. Therefore, the CNS risk incurred as described by the probabilistic risk assessment model using the average case baseline reliability of components and equipment is much less than 1E-06 change in core damage frequency.

The condition did not challenge a fuel, reactor coolant pressure, primary containment, or secondary containment boundary. The condition did not impact the plant's ability to safely shutdown or maintain the reactor in a safe shutdown condition. The risk incurred is below the threshold for regulatory significance.

CAUSE

An intermittent open circuit caused by corrosion which resulted from solder flux residue remaining on copper conductors during the manufacturing process.

CORRECTIVE ACTION

The following corrective actions are documented and being tracked in the CNS corrective action program:

1. Inspect the installed HPCI and Reactor Core Isolation Cooling (RCIC) inverter internal soldering terminations for indications of corrosion, loose terminations and residual solder flux material from manufacturing.
2. Create a preventive maintenance item to replace the HPCI, RCIC, and Reactor Feed Control inverters with new/rebuilt inverters on a 10-year frequency.

PREVIOUS EVENTS

There have been no reportable events identified in the past five years related to inverter failures due to corrosion or inadequately soldered connections.

ATTACHMENT 3 LIST OF REGULATORY COMMITMENTS©

Correspondence Number: NLS2007042

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		