your energy partner
OPPD
Omaha Public Power District
444 South 16th Street Mall
Omaha, NE 68102-2247

LIC-13-0113
October 23, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Reference: 1. Docket No. 50-285
2. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), dated July 2, 2013 (LIC 13-0093)

Subject: Licensee Event Report 2013-010, Revision 1, for the Fort Calhoun Station

Please find attached Licensee Event Report 2013-010, Revision 1. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(v)(B) and (D), and 10 CFR 50.73(a)(2)(vii). There are no new commitments being made in this letter.

If you should have any questions, please contact Terrence W. Simpkin, Manager, Site Regulatory Assurance, at (402) 533-6263.

Sincerely,

Louis P. Cortopassi
Site Vice President and CNO

LPC/epm

Attachment
c: M. L. Depas, NRC Regional Administrator, Region IV
J. M. Sebrosky, NRC Senior Project Manager
J. C. Kirkland, NRC Senior Resident Inspector
L. E. Wilkins, NRC Project Manager

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

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 Section (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 reverse for required number of digits/characters for each block)

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Fort Calhoun Station	05000285	1 OF 4

4. TITLE

HPSI Pump Flow Imbalance

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
5	3	2013	2013	010 -	1	10	23	2013	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

5

10. POWER LEVEL

0

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)*
Erick Matzke	402-533-6855

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

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 May 03, 2013, at approximately 1759 CST, station personnel identified that the high pressure safety injection (HPSI) pump injection flows to the reactor coolant system were not balanced in accordance with the Fort Calhoun Station (FCS) Updated Safety Analysis Report. When discovered, FCS was shutdown with fuel removed from the vessel.

The cause of the event was determined to be the emergency core cooling system pre-operational testing (1972) to balance HPSI system flow and record loop injection valve positions was not adequately translated into design documents. This resulted in the periodic flow balance requirements not being sustained. It was also identified that engineers had limited understanding of HPSI system flow balance design and unclear or incomplete HPSI design basis documents inhibited understanding of the reason for HPSI flow balance.

HPSI flow to the reactor coolant loops has been balanced and a testing procedure will be developed to periodically verify that HPSI injection flow into the four reactor coolant loops remains balanced.

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NARRATIVE

BACKGROUND

Fort Calhoun Station (FCS) is a two-loop reactor coolant system of Combustion Engineering design. The safety injection system includes three high pressure and two low pressure safety injection pumps, four safety injection tanks, one safety injection and refueling water storage tank, and interconnecting piping.

The FCS Updated Safety Analysis Report (USAR) Section 14.15.5.2, Loss of Coolant Accident, states that high pressure safety injection (HPSI) system flow was modeled to be evenly distributed to the four cold legs. Section 6.2.3.3, High-Pressure Safety Injection Pumps, states that the HPSI pumps inject borated water at high pressure into the reactor coolant system during emergency conditions. The pumps were sized to ensure that following the rapid depressurization of the reactor coolant system and re-covering of the core by the safety injection tanks, one HPSI pump will keep the core covered at the start of recirculation, assuming 25 percent spillage. The HPSI design evaluation in Section 6.2.4.4 of the USAR goes on to state that the design basis and system requirements during a DBA are met with the operation of three of the four safety injection tanks delivering borated water to the core and with one high pressure injection pump delivering 75 percent of its rated flow to the core and one low-pressure injection pump delivering approximately 75 percent of its rated flow to the core for large pipe breaks.

EVENT DESCRIPTION

On May 03, 2013, at approximately 1759 CST, station personnel identified that the HPSI pump injection flows to the reactor coolant system were not balanced in accordance with the FCS USAR method for small break loss of coolant analysis (LOCA). This condition was identified during system troubleshooting associated with a HPSI pump runout issue reported in LER 2013-003. An injection flow variation of 60 gpm between reactor coolant loop 1A and reactor coolant loop 2A was measured. The flow rate was expected to vary by approximately 10 gpm between loops. This variation is based on the HPSI analytical flow model with each loop injection valve having a flow coefficient (Cv) of 13. Evaluation of the data indicated the flow to each of the four cold legs does not meet the description in USAR Section 14.15.5.2 and the condition was entered into the station's corrective action program as Condition Report 2013-09949. When discovered, FCS was shutdown with fuel removed from the vessel.

Since initial startup, several changes have been made to the HPSI system which affected the flow balance. The HPSI injection valve limit switches used to balance flow were removed in 1977 to increase injection flow. Between 1993 and 2005, a valve disc was replaced with an incorrect part and two of the original Velan valves were replaced with Anchor-Darling valves with different Cv values. Poor quality parts from the vendor resulted in significant rework of the valves during these replacements. There was no record found showing post-maintenance or post modification testing to confirm the replacement disc or valves had the correct Cv value and that flow was balanced. Testing after these replacements only consisted of MOVATS and valve stroke exercise testing.

This report is being submitted pursuant to 10 CFR 50.73(a)(2)(v): any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to (B) remove residual heat and (D) mitigate the consequences of an accident, and 10 CFR 50.73(a)(2)(vii): any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable

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NARRATIVE

in a single system designed to: (B) remove residual heat or (D) mitigate the consequences of an accident.

CONCLUSION

The cause of the event was determined to be the emergency core cooling system pre-operational testing (1972) to balance HPSI system flow and record loop injection valve positions was not adequately translated into design documents. This resulted in the flow balance requirements not being sustained. It was also identified that engineers had limited understanding of HPSI system flow balance design and unclear or incomplete HPSI design basis documents inhibited understanding of the reason for HPSI flow balance.

CORRECTIVE ACTIONS

The balancing of the HPSI injection flow to the reactor coolant loops has been completed (CR 2013-09949-014 AI August 22, 2013).

Develop and implement a functional test to periodically verify that HPSI flow into the four RCS loops is balanced, meets pump flow operability criteria, and satisfies accident analysis assumptions.

Revise SDBD-SI-HP-132, High Pressure Safety Injection to provide the description of how HPSI system injection flow is balanced to satisfy USAR accident analyses requirements.

Validate that calculation FC08254, “HPSI Pump Maximum and Minimum Flow - SI-2A, SI-2B and SI-2C,” provides description of how HPSI system injection flow is balanced to satisfy USAR accident analyses requirements.

SAFETY SIGNIFICANCE

The FCS safety analysis assumes balanced injection flow from HPSI so that following the rapid depressurization of the reactor coolant system and re-covering of the core by the safety injection tanks, one HPSI pump will keep the core covered at the start of recirculation, assuming 25 percent spillage. During a LOCA, two HPSI pumps are automatically actuated and an additional HPSI pump may be manually started from the control room if needed to provide additional flow. The emergency core cooling system (ECCS) is composed of overlapping and redundant systems including two low pressure safety injection pumps and four safety injection tanks which provide borated water to each of the reactor coolant system loops.

Under worst case accident conditions, the HPSI system flow rates to the RCS loops could have been imbalanced resulting in less than 75% of the minimum required HPSI flow being injected into the reactor vessel. Insufficient HPSI injection flow into the reactor vessel could result in fuel overheating and damage.

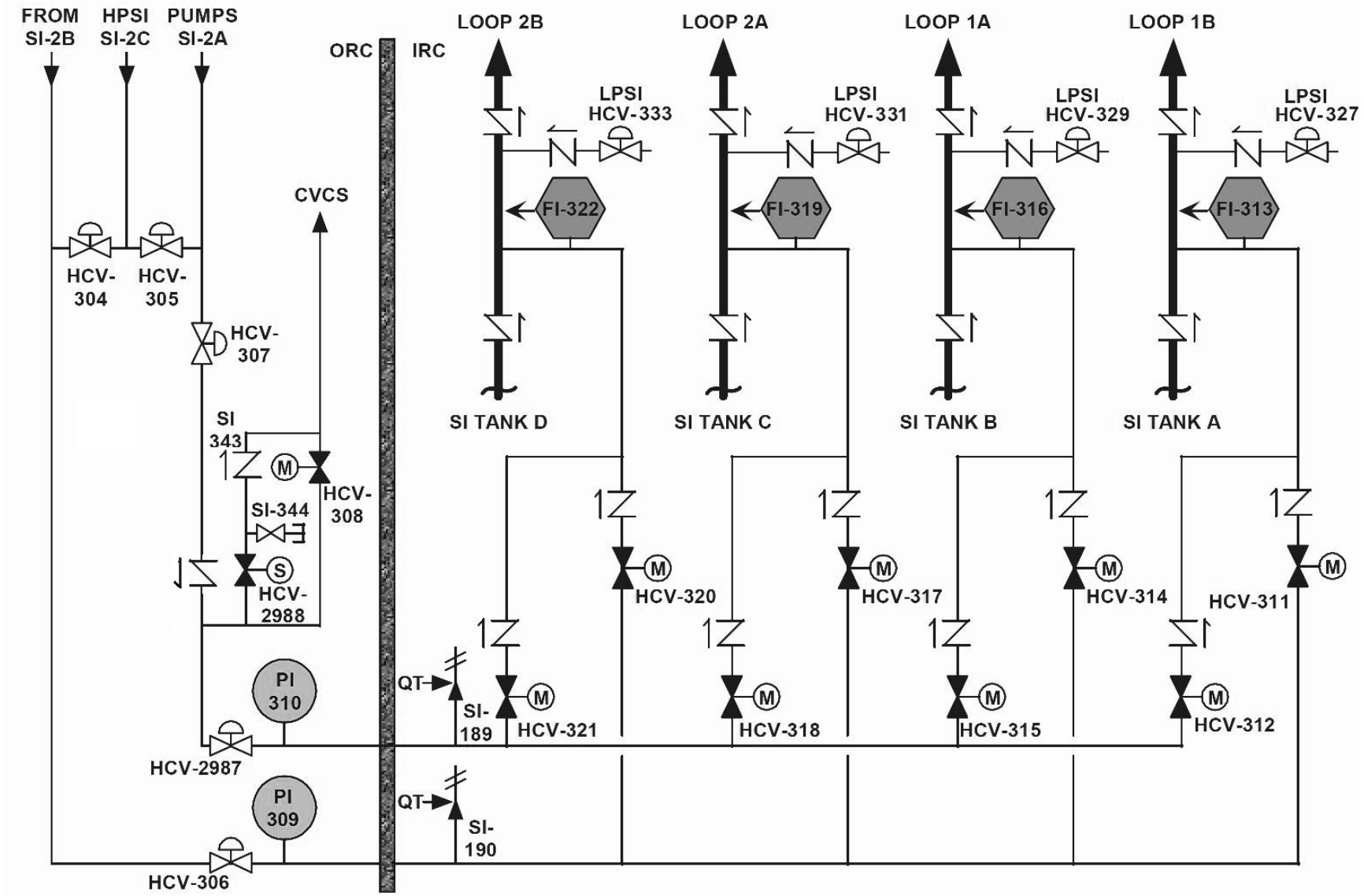
SAFETY SYSTEM FUNCTIONAL FAILURE

This does represent a safety system functional failure in accordance with NEI 99-02, Revision 6.

PREVIOUS EVENTS

The station has not previously reported issues with imbalanced HPSI flow.

HPSI Header and Loop Diagram



High Pressure Safety Injection Pump Discharge Cross Connect Valves (HCV-304, HCV-305)

High Pressure Safety Injection Discharge Header Isolation Valves (HCV-306, HCV-307, HCV-2987)

High Pressure Safety Injection Discharge Header Isolation Valves (HCV-311, HCV-312, HCV-314, HCV-315, HCV-317, HCV-318, HCV-320, HCV-321)