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November 1, 2012
JAFP-12-0138

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: LER: 2012-003, High Pressure Coolant Injection System Inoperable Due to Air in Flow Element Sensing Line
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

Dear Sir or Madam:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(v)(D), "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident."

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Chris Adner, Licensing Manager, at (315) 349-6766.

Sincerely,

Chris Adner per Telecon by Brian Sullivan
for MJC

Michael J. Colomb
Site Vice President

MC/CA/jo

Enclosure(s): JAF LER 2012-003, High Pressure Coolant Injection System Inoperable Due to Air in Flow Element Sensing Line

cc: USNRC, Region 1
USNRC, Project Directorate
USNRC Resident Inspector
INPO Records Center (ICES)

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 Records and FOIA/Privacy Service 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
James A. FitzPatrick Nuclear Power Plant	05000333	1 OF 4

4. TITLE

High Pressure Coolant Injection System Inoperable Due to Air in Flow Element Sensing Line

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
									N/A	05000
09	02	12	2012	– 003 –	00	11	01	12	FACILITY NAME N/A	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)*
Mr. Chris Adner, Licensing Manager	(315) 349-6766

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 September 2, 2012, with the James A. FitzPatrick Nuclear Power Plant (JAF) running at 100% power, the High Pressure Coolant Injection (HPCI) System was declared inoperable. This condition was caused by air in the instrument sensing line for the HPCI main pump discharge flow element (23FE-80) causing a false flow indication while HPCI was in standby. An apparent cause evaluation determined that a portion of the sensing line was improperly sloped preventing the line from self venting. This configuration is contrary to design requirements. During a HPCI maintenance activity, the main suction piping was drained in the vicinity of the flow element. Due to the improper slope of the sensing line, a portion of the instrument line was also drained creating an air void. This air void remained in the sensing line during the filling and venting of the suction piping post maintenance.

This condition is reportable in accordance with 10 CFR 50.73(a)(2)(v)(D), as any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident. Immediate corrective actions were to fill and vent the instrument lines using a revised procedure that provided instructions to perform a pressurized back flush.

NARRATIVE

BACKGROUND

On August 30, 2012, the High Pressure Coolant Injection (HPCI) System [EIIS System Identifier: BJ] was declared inoperable due to the failure of HPCI booster pump P-1B recirculation pressure control valve (23PCV-50) [EIIS Component Identifier: PCV] (See JAF LER 2012-002-00). In order to complete repairs on 23PCV-50, the HPCI suction piping had to be drained. This uncovered and drained a small section of the sensing line in the vicinity of HPCI main pump discharge flow element (23FE-80) [EIIS Component Identifier: PDI].

Following completion of these maintenance activities, the HPCI discharge piping was filled and vented in accordance with OP-15, "High Pressure Coolant Injection", section G.9, "Fill and Vent HPCI Suction Piping from Condensate Storage Tanks (CST)". In addition, 23FE-80 sensing lines were vented by instrumentation and control (I&C) technicians in accordance with IMP-G42, "Instrument Venting/Filling". This procedure vents in the downward direction from the higher elevation flow element to the lower elevation flow instrument, using the CSTs as the pressure source. No air was noted from the system vents, however, I&C technicians reported air venting from the instrument lines. At 1434 on September 2, 2012, ST-4N, "HPCI Quickstart, Inservice and Transient Monitoring Test (IST)," was completed satisfactory thereby demonstrating HPCI operability.

EVENT DESCRIPTION & ANALYSIS

At 2257, on September 2, 2012, with the HPCI system in standby, a step change of approximately 700 gallons per minute (gpm) was noted on HPCI flow indicating controller, 23FI-108-1 with a corresponding step change of 665 gpm noted on computer point EPIC-A-1257. Under these conditions, the HPCI system would not have achieved its design flow rate while in automatic and was therefore declared inoperable. Troubleshooting, interviews, and engineering evaluation determined that the step change on the flow indicating controller and EPIC computer point was due to air in the instrument sensing lines.

As previously discussed, the instrument sensing lines were vented by I&C personnel following maintenance of 23PCV-50. Since the instrument lines were not drained during this activity, they should have remained full of water. The instrument lines were designed to have a positive slope (upwards towards the pipe), any air in the instrument line would be dispersed back up into HPCI piping. However, it was noted during walkdowns that the instrument lines were not properly sloped in the positive direction.

Any air that was pushed down during instrument line venting could have worked its way past the negatively sloped areas in the low pressure instrument sensing line, causing a differential pressure (d/p). This d/p would have been sensed by the flow transmitter and converted into a flow signal, which then would have provided indication of HPCI flow to 23FI-108-1. The signal also provides input to EPIC-A-1257 computer point. The accuracy of this loop depends on the instrument lines (both the high and low pressure) being filled with water at all times. Any air trapped in a vertical leg will result in an inaccurate flow signal.

CAUSE OF EVENT

The false flow indication was the result of air in the instrument sensing line creating a d/p across the flow element. The apparent cause for the air void is the improper sloping of the instrument sensing line. This allowed water to drain from the line during maintenance and did not allow the line to self vent when the HPCI suction piping was filled.

A contributor to this event was inadequate procedural guidance for filling and venting the instrument sensing lines. IMP-G42 directs the technician to perform a forward flush by opening the lowest point drain valves, and then use CST water as the pressure source to vent the sensing line to the low point drain. This method of venting can push air bubbles down into the horizontal elevations of the sensing lines where it will not initially impact the instrument reading. After time, the air bubbles can migrate up into the vertical sensing line and become trapped. The trapped air would displace the water in this vertical section of piping creating a d/p across the flow element thus giving a false indication of flow.

EXTENT OF CONDITION

The extent of condition for this event reviewed CR-JAF-2001-00308 evaluation and corrective actions. It was determined that this evaluation was extensive and thorough. It was identified that the reactor core isolation cooling (RCIC) system [EIIS System Identifier: BN] instrumentation is most similar in configuration. Therefore, the extent of condition corrective action is limited to walking down the RCIC flow instrument tubing.

CORRECTIVE ACTIONS

Completed

- Revised IMP-G42 to provide instructions to perform a pressurized back flush.
- Performed multiple fill and vent cycles of the instrument sensing line.
- Verified operability of the HPCI system by satisfactory performance of ST-4N.
- Operators periodically monitor the flow indicator-controller in the control room. No deviations have been identified.

Future Actions

- Perform an evaluation to determine best approach to correct this condition long term; options include relocating the instrument to be adjacent to the flow element or re-slope the instrument sensing lines in accordance with existing design requirements.
- Evaluate the effectiveness of the revised IMP-G42.

ASSESSMENT OF SAFETY CONSEQUENCES

Radiological & Industrial Safety

There were no actual or potential radiological or industrial safety consequences as a result of this condition.

Nuclear Safety

There was no actual nuclear safety consequences associated with this condition. The potential nuclear safety consequences are considered minimal because during this period of HPCI inoperability, the Automatic Depressurization System (ADS), CS, and Low Pressure Coolant Injection (LPCI) systems [EIIS System Identifier: BO] were operable. The ADS in combination with the LPCI and CS systems would ensure adequate core cooling is maintained in the event of HPCI inoperability. Also, even though the RCIC system is not credited for accident analysis, it would have automatically provided makeup water at most reactor operating pressures.

SIMILAR EVENTS

Internal operating experience (OE) was reviewed for similar events relevant to the condition described in this LER. In 2010 during refueling outage 19, a similar event occurred where the HPCI flow indicator-controller indicated 1300 gpm with the system in standby. The corrective action was to vent the instrument and instrument sensing lines. In 2001 two events occurred in which the HPCI flow indicator-controller indicated flow with the system in standby.

The analysis performed in 2001 determined that the incorrect flow indication was caused by trapped air in the instrument sensing lines. Inconsistencies were discovered when the sensing lines were inspected for proper slope. Portions of the line were identified to have negative slope and air would be trapped in the line when the system was drained and refilled. Corrective actions were developed to re-slope the lines, but were ineffective.

External OE was reviewed on the Institute of Nuclear Power Operations (INPO) website. Two examples were found where plants identified incorrect slope on instrument tubing. This resulted in air causing an offset between the instrument readings and the actual parameter. In one example the offset was evaluated to have minimal impact on instrument setpoint or indications. In the second example, maintenance procedures were updated to vent the lines as they were identified.

REFERENCES

- JAF Condition Reports: CR-JAF-2012-05068, CR-JAF-2010-07095, CR-JAF-2001-00308, CR-JAF-2001-00328
- JAF TS 3.5.1, ECCS – Operating
- JAF FSAR 6.4.1 High Pressure Coolant Injection System