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10 CFR 50.73

July 10, 2013
JAFP-13-0061

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

SUBJECT: LER: 2012-010-00, "High Pressure Coolant Injection System Inoperable"
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).

There are no commitments contained in this report.

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

Sincerely,

Lawrence Coyle
Site Vice President

LC/CA/mjg

Enclosure(s): JAF LER 2012-010-00

cc: Mr. William Dean
Regional Administrator, Region 1
U.S. Nuclear Regulatory Commission
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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	01 OF 05

4. TITLE
High Pressure Coolant Injection (HPCI) System Inoperable

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
06	07	12	2012	– 010 –	00	07	10	13	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)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Mr. Chris M. 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
E	BJ	ISV	P305	N	___	___	___	___	___

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 June 6, 2012, while the plant was in LCO 3.5.1 Action C.1, High Pressure Coolant Injection (HPCI) inoperable for planned maintenance, during the performance of Motor Operated Valve (MOV) limitorque and as found/as left viper diagnostic testing (for trending, data gathering, preventive maintenance, and corrective maintenance purposes), HPCI Suppression Pool Pump Suction Isolation MOV Valve (23MOV-57) failed to go completely open (it only opened 38%) after being manually closed. Upon discussions with the NRC Resident Inspector, the potential failure of this component of the High Pressure Coolant Injection (HPCI) system (a single train system) to completely open was subsequently determined to be a condition that would have prevented the fulfillment of the safety function of an SSC that mitigates the consequences of an accident and is therefore being reported under 10 CFR 50.73(a)(2)(v)(D). The level of judgment for reporting an event or condition under this criterion is a reasonable expectation of preventing fulfillment of a safety function.

The most probable cause was determined to be high contact resistance on open the limit torque switch most likely due to corrosion on the MOV contacts. Corrective actions included verifying the spring tension and cleaning the torque and limit switch contacts. The valve was then tested and determined to be operating properly.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV N0.	
James A. FitzPatrick Nuclear Power Plant	05000333	2012 –	010	– 00	Page **2** of **5**

NARRATIVE

BACKGROUND

The High Pressure Coolant Injection (HPCI) Motor Operated Valve (MOV) Pump Suction from Suppression Chamber Isolation Valve, is a 16 inch diameter, gate design valve that is normally closed; it is physically located in the HPCI Booster pump suction piping line from the suppression chamber pool, downstream of the HPCI Primary Containment Isolation Valve (PCIV). The piping line that this MOV valve is contained in subsequently ties into the HPCI booster pump suction piping line from the Condensate Storage Tanks (CST). This MOV valve is in the GL 89-10 / GL 96-05 program. The valve is interlocked with both the CST MOV HPCI pump suction valve and the pair of HPCI test MOV valves that discharge back into the CST. The MOV valve performs one safety related function: provide an alternate flow path (in the open position) from the suppression pool to the HPCI booster pump suction on low CST level, on Suppression Pool high level, or when either of the CST tanks manual suction valves are not fully open.

On September 26, 2011 the MOV Suppression Pool Pump Suction Isolation Valve cycle and measure stroke times Valve Test was performed satisfactorily (cycle and measure the stroke times of HPCI isolation containment valves), this complied with its frequency requirement of once every 92 days per the JAF IST Program.

On December 21, 2011 the MOV Suppression Pool Pump Suction Isolation Valve cycle and measure stroke times Valve Test was performed satisfactorily (cycle and measure the stroke times of HPCI isolation containment valves), this complied with its frequency requirement of once every 92 days per the JAF IST Program.

On March 13, 2012 the MOV Suppression Pool Pump Suction Isolation Valve cycle and measure stroke times Valve Test was performed satisfactorily (cycle and measure the stroke times of HPCI isolation containment valves), this complied with its frequency requirement of once every 92 days per the JAF IST Program.

On June 4, 2012, the MOV Suppression Pool Pump Suction Isolation Valve is successfully stroked as part of the HPCI drain down steps and tag out for the upcoming HPCI LCO. Based on this, it can be concluded that the valve was not inoperable for a period of time longer than permitted by the technical specifications, and thus a violation of 10 CFR 50.73(a)(2)(i)(B) did not occur.

At 1810 hours on June 5, 2012, plant status log denotes: reactor power 100%; LCO 3.5.1 Condition C.1, HPCI inoperable for maintenance; RCIC verified and protected.

On June 6, 2012, the night shift crew manually opened the suction from the suppression pool isolation MOV valve from full close to back seat. The valve actuator was then lifted and the Torque Thrust Cell (TTC) was installed in addition to other testing equipment in preparation of the next shift's MOV viper diagnostic testing.

On June 6, 2012, during the performance of the MOV Limitorque and "as found/as left" Viper Diagnostic testing by the day shift crew, the Suppression Chamber Pump Suction Isolation Valve failed to go completely open after being manually opened (the prior shift) and manually closed (during this testing evolution). Electrical workers verified the spring tension and then cleaned the contacts of the torque and limit switches. They then electrically stroked the valve 15 times satisfactorily. This event was documented in JAF-CR-2012-03298.

On April 2, 2013, (as documented in JAF-CR-2013-01768) following several discussions with the NRC resident inspector, and a review of engineering concerns raised in a CAP corrective action, it was concluded by James A. FitzPatrick Nuclear Power Plant (JAFNPP) management that the determination of the event that occurred on June 6, 2012 as not being a reportable condition was non-conservative.

While the suppression chamber pump suction isolation MOV valve was demonstrated as being able to open sufficiently enough (38% open) during diagnostic testing, data gathering and preventive maintenance to permit 100% flow from the suppression pool (with a negligible effect on the net positive suction head available (NPSHa) from the Torus Suppression Chamber pool) its potential inability to go completely open during a postulated design basis accident (DBA) would have prevented the interlocked CST tank's pump suction isolation MOV valve from automatically closing. The NRC resident inspector questioned if this condition had the potential for creating a drain down condition in the CST tanks that could either subsequently introduce air into the suction side piping of the HPCI Booster pump which might then cause cavitation in the pump, and then cause the HPCI Booster pump to bind and be unable to restart, and/or if this valve lineup could potentially

cause the torus suppression chamber pool to exceed its high level limit during the DBA because with the CST in a potential drain configuration, the water from the CST would potentially displace the water in the suppression chamber when the HPCI pump was not running.

The HPCI is a single train system, and the loss of the single train would prevent the fulfillment of the safety function of that system and is reportable even though the plant technical specifications may allow such a condition to exist for a limited period of time. Therefore the condition should have been reported under 10 CFR 50.73 (a)(2)(v)(D) as a condition that could have prevented the fulfillment of the safety function of a SSC that mitigates the consequences of an accident. The level of judgment for reporting an event or condition under this criterion is a reasonable expectation of preventing fulfillment of a safety function.

EVENT DESCRIPTION

On June 6, 2012, while the HPCI system was declared inoperable for testing, during the performance of the MOV Limitorque and the “as found/as left” Viper Diagnostic testing for trending, data gathering, preventive maintenance, and corrective maintenance purposes (This test procedure specifically stated that it is not intended as a test to challenge the SSC to perform its intended design safety function) the Suppression Chamber Pump Suction Isolation Valve failed to go completely open after being manually stroked open and then manually closed. The maintenance crew had noted that the open torque switch was open on high resistance. When the maintenance crew attempted to electrically stroke the valve back open, it did not fully open. The valve stopped when the open torque switch bypass opened. At this point, the valve was only 38% open. The open torque switch bypass is set above 35%. This type of gate valve can achieve full flow (with minimal effect on piping differential pressure (D/P) losses) when it is only 25% to 35% open. The open torque bypass switch is therefore set above 35% to permit full flow so that the valve can still perform its intended design safety function if it does not go full open.

Electrical workers verified the spring tension and cleaned the contacts of the torque and limit switches. They then electrically stroked the valve 15 times satisfactorily. No other issues were identified and the valve was determined to be functioning as designed per the acceptance criteria. This event was documented in JAF-CR-2012-03298.

CAUSE OF THE EVENT

The valve failed to open because the open torque switch had high resistance causing the open circuit to break when the open torque switch bypass opened at 38% open of valve travel. Upon inspection by the maintenance crew, the torque and limit switches appeared to be normal. The most probable cause (even though resistance readings were not taken at the time of the failure) that was indicated by the installed diagnostic test equipment showed that the open torque switch had a high resistance. High resistance could have been caused by misaligned switch contacts, foreign material introduced either during the previous surveillance, or in preparation of the HPCI LCO, Limitorque testing or Viper testing setup, faulty diagnostic test equipment, or by oxidation. A Failure Mode Analysis (FMA) was performed and maintenance personnel and engineering personnel were consulted, the conclusion was that the most probable cause was corrosion on the MOV contacts.

EVENT ANALYSIS

Actual Consequences

There were no significant consequences of this event. The event occurred while the plant was in the HPCI LCO for this maintenance evolution; the RCIC was verified operable and protected at the time of the event.

Potential Consequences

As stated previously, discussions with the NRC resident inspector, and in light of existing engineering concerns, JAFNPP management determined there was an additional potential non conservative consequence if the torus suppression chamber pump suction isolation MOV valve did not fully open in that the CST HPCI pump suction MOV valve would not receive its signal to automatically close.

In the above scenario, the NRC resident inspector had postulated (as noted in the first quarter 2013 integrated inspection report, notice of violation (NOV) 2013002-01) that the HPCI pump would then potentially be drawing suction from both the torus suppression chamber pool and the CST simultaneously.

With the CST in this draining down condition a situation would potentially develop in which a vortex would occur in the CST tanks, and subsequently air would eventually become entrained in the HPCI Booster pump suction piping that would cause pump cavitation and then cause the pump to bind so that it would not be able to restart. Additionally, the NRC resident inspector had also postulated (as noted in the first quarter 2013 integrated inspection report, NOV 2013002-01) that with the CST HPCI pump suction valve open, and the HPCI pump not running, water from the CST would potentially displace the water in the torus suppression chamber, causing the high level limit in the suppression chamber pool to be exceeded during the DBA. The resident inspector disregarded operator actions (as noted in the first quarter 2013 integrated inspection report, NOV 2013002-01) to mitigate a low CST tank level, or low suction pressure on the HPCI pump based on an accepted Nuclear Management and Resource Council (NUMARC) industry standard for the level of operator actions that are necessary to restore an inoperable SSC that is out of service for testing. Because the HPCI is a single train system, this potential condition alone, would have conservatively prevented the HPCI system from performing its intended design safety function.

EXTENT OF CONDITION

The FMA determined that the most probable cause was corrosion on the MOV contacts, however, this was not substantiated by the testing maintenance crew who denoted that the torque and limit switches appeared to look normal. High resistance was indicated by the testing equipment, but the actual cause of it could not be conclusively determined. The MOV valve failed to go completely open during testing evolutions that were not designed to challenge its intended safety function. The potential does exist that other MOV valves' torque and limit switches might also have a high resistance and not go completely open (or closed) when required to do so. However, the plant technical specifications set forth requirements that provide adequate assurance that safety related MOV valves will perform their intended design safety functions, and the In-Service Inspection (ISI) of Class I components are performed in accordance with 10 CFR 50.55a (b)(2), together these requirements ensure that the probability of similar conditions occurring in the future have been minimized.

CORRECTIVE ACTIONS

Completed Actions

Electrical workers verified the spring tension and cleaned the contacts of the torque and limit switches. They then stroked the valve 15 times satisfactorily. No other issues were identified; the valve was determined to be functioning as designed per the acceptance criteria of the procedure.

Performed a review to determine if the MOV suppression pool pump suction isolation valve had been successfully stroked as part of the drain down/tag out preparation for the HPCI LCO.

Initiated a condition report to address the issue that the concerns raised in the corrective action relied upon by the staff in their determination of the NCV was incomplete and possibly incorrect.

Performed an initial review of existing engineering "as-built" design basis HPCI pump and piping calculations of record to determine if the concerns raised in the corrective action relied upon by the staff were actually valid.

Completed engineering analysis of the potential consequences of the concerns raised in the corrective action of the CR that the staff relied upon as the basis of their NCV.

ASSESSMENT OF SAFETY CONSEQUENCES

The HPCI System is not directly simulated in most UFSAR Chapter 14 abnormal transient evaluations because it initiates well after the minimum critical power ratio (MCPR) is reached for these events. The only UFSAR abnormal transient for which the HPCI System is simulated is the inadvertent HPCI injection event.

The NRC resident inspector postulated (as noted in the JAFNPP first quarter 2013 integrated inspection report, NOV 2013002-01) that with the CST HPCI pump suction valve open, and the HPCI pump not running, water from the CST would displace the water in the torus suppression chamber and thus drain the CST tanks and/or cause a high water level to occur in the torus suppression chamber pool. Contrary to this, a subsequent JAFNPP review of the existing "as-built" HPCI design basis concluded that the testable check valves provided in the pump suction piping from both the CST tanks and the torus suppression chamber pool would prevent either water source from displacing the other when the HPCI pump was not

running.

As part of the JAFNPP design basis (as noted in UFSAR section 4.7.5) operator actions are permissible to manually control the swap over for HPCI pump suction from the CST tanks to the torus suppression chamber pool as well as manually operating the HPCI system for RPV pressure control during a SBO event. Under these design basis conditions, the operators would be actively controlling the HPCI pump suction flow paths and would be aware of any drain down condition potentially developing in the CST tanks or a low HPCI pump suction pressure developing in the pump suction piping and would be able to mitigate it.

Before the CST would drain to a level that air could potentially become entrained in the HPCI pump suction piping and subsequently bind the pump, the control room operators would be alerted to this draining down condition by the HPCI CST low level alarm and per the Alarm Response Procedures (ARP) the operators would subsequently initiate actions to refill the CST. Additionally, before the HPCI pump would experience cavitation and subsequently bind and not be able to restart, the control room operators would also be alerted to a HPCI low pump suction pressure alarm. The automated action of this alarm is to trip the HPCI pump turbine so that the HPCI pump would not be damaged. The ARP associated with this alarm, also instruct the operators to verify sufficient water levels in the HPCI pump suction sources.

Therefore based on the above, there were no significant safety consequences of this event.

Radiological & Nuclear Safety

There were no Radiological or Nuclear Safety concerns associated with this event. The HPCI containment isolation valve closure times facilitate compliance with 10 CFR 100 for offsite radiological consequences. The upstream HPCI pump suction line PCIV is able to perform its intended design safety function from either an open or closed position.

Industrial Safety

There were no industrial safety concerns associated with this event. The event did not result in a change to plant status or operation.

SIMILAR EVENTS

A review of the last three years of reportable events did not reveal any previous similar events reported by JAFNPP pertaining to MOV valve failure to fully open or close of systems identified in 10 CFR 50.73(a)(2)(v)(D) that were caused by high resistance contact failures.

REFERENCES

- JAFNPP Condition Report: CR-JAF-2012-03298
- JAFNPP Condition Report: CR-JAF-2012-03825
- JAFNPP Condition Report: CR-JAF-2013-01768
- JAFNPP Condition Report: CR-JAF-2013-02721
- JAFNPP Flow Diagram Drawing FM-25A
- JAFNPP calculation JAF-CALC-07-00032, “Required Level to Prevent Air Entraining Vortices at HPCI & RCIC CST”
- JAFNPP calculation JAF-CALC-MULTI-02831, “Torus Pressure Required to Meet ECCS Pump NPSH Requirements”
- Proto-Power Corporation calculation 98-019, rev D, “ECCS & RCIC Pump Suppression Pool NPSH”