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Michael J. Colomb
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JAFP-11-0133
November 15, 2011

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

SUBJECT: LER: 2010-005-01, High Pressure Coolant Injection System Declared Inoperable due to Power Supply Degradation
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

Dear Sir or Madam:

This report is submitted as a revision to LER: 2010-005 in accordance with 10 CFR 50.73(a)(2)(v)(B), "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to remove residual heat;" and, 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the plant's Technical Specifications."

There is no commitment contained in this report.

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

Sincerely,

Michael J. Colomb
Site Vice President

MJC/JP/mh

Enclosure: JAF LER: 2010-005-01, High Pressure Coolant Injection System Declared Inoperable Due to Power Supply Degradation

cc:
USNRC, Region 1
USNRC, Resident Inspector
USNRC, Project Directorate
INPO

Document Components:
001 Transmittal Letter with Enclosure

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

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

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
James A. FitzPatrick Nuclear Power Plant	05000333	1 OF 5

4. TITLE

High Pressure Coolant Injection System Declared Inoperable Due to Power Supply Degradation

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
10	23	2010	2010	– 005 –	01	11	15	2011	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

Mode 01

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. Joseph Pechacek, 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
X	BJ	INVT	T248	Y					

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 October 23, 2010, at 0023, with the plant operating in Mode 1, at 100%, operators noticed an acrid odor coming from the High Pressure Coolant Injection (HPCI) Instrument Power Inverter (23INV-79) in the control room. Closer inspection revealed discoloration on the outside of the casing for 23INV-79. The HPCI system was immediately declared Inoperable and Technical Specification Limiting Condition for Operating 3.5.1, Condition C was entered.

An Apparent Cause Evaluation determined that the most probable cause of the HPCI Inverter degradation was age related degradation of an internal transformer. The immediate corrective action was to replace the failed inverter with a new model. The HPCI system was restored to Operable status at 2054, on October 23, 2010. Future corrective actions include replacing similar inverters in other systems.

This event is reportable pursuant to 10 CFR 50.73(a)(2)(v)(B), "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to remove residual heat." It was discovered, after this event, that the Reactor Core Isolation Cooling (RCIC) System was also Inoperable for the period October 16, 2010 to January 8, 2011; therefore, this event is being reported under 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the plant's Technical Specifications."

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
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NARRATIVE

EVENT DESCRIPTION:

On October 23, 2010, at 0023, with the plant operating in Mode 1, at 100% power, Operations personnel identified an acrid odor coming from 23INV-79, High Pressure Coolant Injection (HPCI) [EIIS Identifier: BJ] Turbine Control and Instrument Power Inverter located in the control room. Further investigation identified what appeared to be discoloration or a 'burned' spot on the inverter cover. Based on these indications, the capability of the HPCI Inverter to perform its safety function was considered to be indeterminate so the inverter was de-energized, the HPCI system declared Inoperable, and Technical Specification (TS) Limiting Condition for Operation (LCO) 3.5.1 Condition C was entered. All other Emergency Core Cooling Systems were verified to be Operable. An 8-hour report (EN# 46355) to the NRC, in accordance with 10 CFR 50.72(b)(3)(v), was made via the Emergency Notification System at 0254, on October 23, 2010.

An Engineering Change (Equivalent Change EC-25564) was prepared and approved for replacing the degraded inverter with a new inverter. The new replacement inverter was successfully returned to service upon completion of post-maintenance testing activities. On October 23, 2010, at 2054, the HPCI system was declared Operable.

This event is reportable pursuant to 10 CFR 50.73(a)(2)(v)(B), “Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to remove residual heat.”

In January 2011, it was determined that the Reactor Core Isolation Cooling (RCIC) System [BN] was Inoperable for the period October 16, 2010 to January 8, 2011; therefore, this event is also being reported under 10 CFR 50.73(a)(2)(i)(B), “Any operation or condition which was prohibited by the plant's Technical Specifications.”

BACKGROUND:

The High Pressure Coolant Injection System is comprised of various components which include pumps, valves, piping, and instrumentation. The function of the HPCI system is to ensure that the reactor is adequately cooled to limit fuel clad temperature in the event of a small break loss of coolant accident (LOCA) which does not result in rapid depressurization of the reactor vessel. The HPCI system permits the plant to be shutdown while maintaining sufficient reactor vessel water inventory until the reactor vessel pressure is low enough to allow the Low Pressure Coolant Injection (LPCI) System [BO] or Core Spray (CS) System [BM] to maintain core cooling.

23INV-79, HPCI Turbine Control & Instrument Power Inverter provides essential power to flow indicating controller 23FIC-108 and other related essential devices for control of the HPCI injection rate.

EVENT ANALYSIS:

During James A. FitzPatrick’s 2010 refueling outage, 23INV-79 failed and was replaced October 10, 2010, with a similar refurbished unit. Thirteen days later, this newly installed refurbished unit, exhibited signs of degradation resulting in the event described in this LER. The cause of the inverter degradation was a degraded internal transformer. An Apparent Cause Evaluation was performed by the Engineering Department to further evaluate the degraded inverter.

There were no signs of the transformer casing being subject to severe physical damage. However, there were minor scrapes on the inverter casing and the mounting brace was skewed due to torsional stresses. Although physical damage is not considered the apparent cause, since the effects of physical damage tend to manifest earlier than thirteen days, it may have been a contributing factor.

There were no other electrical equipment deficiencies downstream of the inverter concurrent with the HPCI Inverter degradation; therefore, anomalies external to the inverter did not contribute to this event.

The degraded Topaz inverter was supplied to JAF in February 1973. A detailed installation history and time-in-service is not available. Based on available information, the inverter's transformer is assumed to be an original subcomponent and would, therefore, be approximately 37 years old. According to Electric Power Research Institute (EPRI) EL-5036, Volume 2, Power Transformers, the typical life expectancy of an energized and loaded transformer is between 30 - 40 years. Considering the age and approximate usage, the transformer was likely reaching its end-of-life which led to its degradation.

Subsequent to this event and the initial event report, it was determined that 13MOV-131, RCIC Steam Admission Isolation Valve, had loose connections which resulted in an intermittent open circuit which could cause the motor operator to stop prior to fully opening 13MOV-131. Due to the intermittent nature of the problem it is possible that RCIC might have failed to operate as designed under accident conditions. Therefore, it was concluded that RCIC was Inoperable during the period from October 16, 2010 to January 8, 2011. That event was reported under LER 2011-001, specific details may be found under that report.

The discovery that RCIC was Inoperable during the period concurrent with HPCI means that the Technical Specification requirements of TS LCO 3.5.1 Condition C were not met. Therefore, TS LCO 3.5.1 Condition G should have been entered. Since that wasn't done, this event was a condition prohibited by Technical Specifications. Specifically, the plant was not in Mode 3 within 12 hours and the reactor steam dome pressure was not ≤ 150 psig within 36 hours. Licensee Event Report (LER) 2010-005 is revised to include an additional reporting criterion of 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the plant's Technical Specifications."

CAUSE OF EVENT:

The Apparent Cause of the HPCI Inverter degradation was age related degradation of a transformer internal to the HPCI Inverter. Although not specifically ruled out as the cause of the transformer degradation, the physical damage to the transformer mounting brace, possibly caused by torsional stresses, may have contributed to the degradation.

EXTENT OF CONDITION:

The Apparent Cause Evaluation identified additional applications for this type of inverter. The replacement of these inverters will be scheduled in accordance with the work management process:

Part ID	Description	Replacement
13INV-152	RCIC Instrument 09-4 Power Inverter	Pending: WO 257775
13INV-801B	RCIC Instrument 09-21 Power Inverter	Pending: WO 257776
06INV-1A	Feedwater System Power Inverter	Pending: WO 257777
06INV-1B	Feedwater System Power Inverter	Pending: WO 257778

FAILED COMPONENT IDENTIFICATION:

FitzPatrick Component ID: 23INV-79
Noun Name: High Pressure Coolant Injection System Instrument Power Supply Inverter
Manufacturer / Supplier: Topaz Electronics / General Electric
Model: N250-GWR-125-60-115
GE Purchase Part Numbers: 145C3027P001
NPRDS manufacturer Code: T248 / G080

CORRECTIVE ACTIONS:

Completed Actions:

1. Replaced 23INV-79 on 10/23/10.

Open Actions:

1. Replace 13INV-152 and 13INV-801B.
2. Replace 06INV-1A and 06INV-1B.

ASSESSMENT OF SAFETY CONSEQUENCES:

Actual Consequences

There were no actual industrial, radiological, or nuclear safety consequences during or as a result of the described period of HPCI inoperability.

Potential Consequences

Since the HPCI system passed all of its surveillance tests preceding the event it is presumed Operable prior to the occurrence of this event. Therefore, past operability is not a concern.

The Reactor Core Isolation Cooling System [BN] was not Operable as a source of high pressure injection during this period. However, while the automatic operation of the RCIC system was affected by the deficiency identified in LER 2011-01, the system was available for use. Procedures and training address manual opening of 13MOV-131 in the control room; or, if unsuccessful, manual opening 13MOV-131. In addition, even though 13MOV-131 did not fully open during the two surveillance tests, it did open enough such that the minimum required flow was achieved within the required period of time. Therefore, the potential consequences of the RCIC system being Inoperable during this period were minimized.

The safety significance of the condition was minimal based on the Automatic Depressurization System [SB], the Low Pressure Coolant Injection System, and the Core Spray System being available as emergency core cooling systems. Additionally, the HPCI system was Inoperable for a period of 20 hours 31 minutes. This period is well within the TS LCO 3.5.1.C Completion Time of 14 days.

SIMILAR EVENTS:

A review of JAF LERs identified only one LER related to 23INV-79 inverter degradation. This previous inverter failure was documented in LER 1996-008. That failure was caused by a shorted capacitor and is, therefore, not similar to the event described in this LER.

In addition, the corrective action program database was reviewed for condition reports associated with inverters supplied under the original or replacement GE Purchase Part Number. Of the identified condition reports none were related to transformer degradation. There were, however, capacitor and transistor age related failures.

REFERENCES:

1. Apparent Cause Evaluation Report: 23INV-79 Degradation (CR-JAF-2010-07341)
2. EPRI Report EL-5036, Power Transformers
3. JAF Updated Final Safety Analysis Report: Section 6.4.1, High Pressure Coolant Injection System
4. LER: 2011-01, Reactor Core Isolation Cooling System Inoperable Longer Than Allowed by Technical Specifications
5. Apparent Cause Evaluation Report: 13MOV-131 Failed to Fully Open (CR-JAF-2011-00123)