
Timothy C. Peter
Site Vice President– JAF

JAFP-22-0001
January 14, 2022

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

James A. FitzPatrick Nuclear Power Plant
Renewed Facility Operating License No. DPR-059
NRC Docket No. 50-333

Subject: LER: 2021-002, Automatic High Pressure Coolant Injection (HPCI)
System Function Prevented by Control Circuit Relay Failure

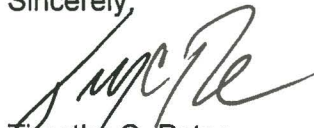
Dear Sir or Madam:

This report is being submitted pursuant to 10 CFR 50.73(a)(2)(v)(D).

There are no new regulatory commitments contained in this report.

Questions concerning this report may be addressed to Mr. Richard Sullivan, Regulatory Assurance Manager, at (315) 349-6562.

Sincerely,



Timothy C. Peter
Site Vice President

TCP/RS/mh

Enclosure: LER: 2021-002, Automatic High Pressure Coolant Injection (HPCI)
System Function Prevented by Control Circuit Relay Failure

cc: USNRC, Region I Administrator
USNRC, Project Manager
USNRC, Resident Inspector
INPO Records Center (IRIS)



LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)

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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, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollections.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk all: oira_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name

James A. FitzPatrick Nuclear Power Plant

2. Docket Number

05000333

3. Page

1 OF 3

4. Title

Automatic High Pressure Coolant Injection (HPCI) System Function Prevented by Control Circuit Relay Failure

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	Docket Number
11	18	2021	2021	002	00	01	14	2022	N/A	N/A
									N/A	N/A

9. Operating Mode

1

10. Power Level

100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

<input type="checkbox"/> 10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

OTHER (Specify in Abstract below or in NRC Form 366A).

12. Licensee Contact for this LER

Licensee Contact

Mr. Richard Sullivan, Regulatory Assurance Manager

Telephone Number (Include Area Code)

315-349-6562

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS
B	BJ	RLY	G080	Y					

14. Supplemental Report Expected

No Yes (If yes, complete 15. Expected Submission date)

15. Expected Submission Date

Month: Day: Year:

Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On November 18, 2021, during a simulated actuation test of High Pressure Coolant Injection (HPCI), 23MOV-19, HPCI Pump Discharge to Reactor Inboard Isolation Valve, failed to open. This was caused by a failure of the valve's control logic circuit relay 23A-K54 to actuate. An investigation identified contacts 3-7 were intermittently not closing. The failure of the contacts to close was due to binding between the associated spring leave and the contact carrier channel sidewall. The binding was due to dimensional issues that caused chaffing on the sidewall of the contact carrier channel. This chaffing worsened over time until binding started to occur intermittently within 23A-K54.

The condition of this relay could have prevented the automatic actuation of HPCI and is reportable per 10 CFR 50.73(a)(2)(v)(D). Manual actuation of HPCI remained unaffected by this condition; therefore, the system remained available.

Relay 23A-K54 was replaced and HPCI was restored to Operable on November 19, 2021.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
James A. FitzPatrick Nuclear Power Plant	05000 – 333	2021	– 002	– 00

NARRATIVE

Background

The High Pressure Coolant Injection (HPCI) System [EIS Identifier: BJ] at James A. FitzPatrick Nuclear Power Plant (JAF) is a part of the Emergency Core Cooling System (ECCS); HPCI provides and maintains an adequate coolant inventory inside the Reactor Pressure Vessel [RPV] to prevent damage to the reactor core under postulated accident scenarios. The system is comprised of various components which include pumps, valves, piping, and instrumentation. The HPCI System is required to actuate automatically to perform their design functions but it may be initiated manually. Automatic initiation occurs for conditions of Reactor Vessel Water Level – “Low Low” (Level 2) or Drywell Pressure – “High” (Level 8).

The Technical Specification (TS) Surveillance Requirement (SR) 3.5.1.10 ensures HPCI actuates on an actual or simulated automatic initiation signal by verifying initiation logic will cause the system to operate as designed, including actuation of the system throughout its emergency operating sequence, automatic pump startup and actuation of all automatic valves to their required positions. This Surveillance also verifies that the HPCI System will automatically restart on an RPV low water level signal received subsequent to an RPV high water level trip.

HPCI Pump Discharge to Reactor Inboard Isolation Valve 23MOV-19 is one of the valves that is required to open in order for the system to perform its function.

Event Description

On November 18, 2021, planned testing was performed in accordance with ST-4E, HPCI and SGT Logic System Functional and Simulated Automatic Actuation Test, for SR 3.5.1.10. During the high drywell pressure operation test 23MOV-19 was confirmed to open satisfactorily. During the subsequent RPV low water level operation test 23MOV-19 failed to open.

It was determined that the valve failed to change position due to the valve’s control logic circuit relay, 23A-K54. Troubleshooting determined a high resistance connection between contacts 3-7. Manual cycling of the contacts showed that the contacts were intermittently not closing with a visible air gap.

The intermittent failure of 23A-K54 to actuate is a condition which could have prevented fulfillment of the safety function for the HPCI system. This condition was reported in accordance with 10 CFR 50.72(b)(3)(v)(D) via ENS 55593.

Event Analysis

A failure analysis of 23A-K54 was performed. All contact surfaces appeared to be in very good condition. There was no evidence of arcing, pitting, contamination, corrosion, or tarnishing.

The condition observed during the event was able to be duplicated on 4 of 20 trials. Contacts 3-7 resistance were measured high and an air gap was visible between the mating surfaces. Contacts 3-7 are typically open because the relay is normally energized (fail safe) and closes to open injection valve 23MOV-19. When the contacts did not close the valve did not open. On the instances when Contacts 3-7 was open when expected to be closed the associated spring leave moved during relay pickup and bound in a position that caused the intermittent issue.

The spring leave channels were examined and dimensions were collected for the channel associated with contacts 3-7 and compared to the neighboring channel. The channel for contacts 3-7 is approximately 2.5 to



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4.5 mils more narrow than the other channel, which would explain the tighter fit and potential for binding. In addition, chaffing was evident on the sidewall of the channel for contacts 3-7.

The binding was due to dimensional issues that caused chaffing on the sidewall of the contact carrier channel. This chaffing worsened over time until binding started to occur intermittently within 23A-K54. However, there is no firm evidence that the chaffing would have caused binding or prevented the fulfillment of a safety function prior to time of discovery.

The condition of this relay could have prevented the automatic actuation of HPCI, reportable per 10 CFR 50.73(a)(2)(v)(D). Manual actuation of HPCI remained unaffected by this condition; therefore, the system remained available.

Cause

The failure of 23MOV-19 to open was caused by binding in relay 23A-K54 contacts 3-7. Dimensional issues in the contact spring channel led to tighter fit and intermittent binding.

Similar Events

Condition Report: CR-JAF-2011-05502 dated October 28, 2011: evaluation of General Electric Hatchi (GEH) Part 21 report SC-11-09. The report identified a defect in the same relay model 12HGA11A52F. For FitzPatrick, installed relays were acceptable for continued operation based on physical inspection and testing. The component described by this LER was not part of the population of components identified by SC-11-09 in 2011.

FAILED COMPONENT IDENTIFICATION:

Manufacturer:	General Electric
Manufacturer Model Number:	12HGA11A52F
Manufacturer Code:	G080
Component Code:	RLY
FitzPatrick Component ID:	23A-K54

Corrective Actions

Completed Actions

Relay 23A-K54 was replaced and HPCI was restored to Operable status

Planned Actions

An extent of condition review will be conducted

Safety Significance

Nuclear safety – There were no actual consequences caused by this condition. The potential consequence during a postulated accident scenario is when HPCI cycles and the relay may chaff and bind as described in this LER, if 23MOV-19 automatically actuates multiple times. This risk is minimized because manual operation of HPCI remained unaffected by this condition. In addition, plant operators are trained to control HPCI in order to maintain vessel inventory and minimize HPCI cycling during events.

References

Issue Report - IR 04461845, 23MOV-19 HPCI Injection Valve did not Function during ST-4E, dated November 18, 2021