
Timothy C. Peter
Site Vice President– JAF

JAFP-21-0096
October 22, 2021

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: 2021-001, Inadequate Protection Devices for DC Motor Field Shunt
Cables Through Separate Fire Areas

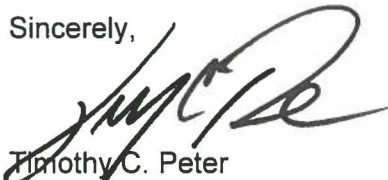
Dear Sir or Madam:

This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(B).

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: 2021-001, Inadequate Protection Devices for DC Motor Field Shunt
Cables Through Separate Fire Areas

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 4
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4. Title
Inadequate Protection Devices for DC Motor Field Shunt Cables Through Separate Fire Areas

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
08	24	2021	2021	001	00	10	22	2021	N/A	N/A
									Facility Name	Docket Number
									N/A	N/A

9. Operating Mode 1	10. Power Level 100
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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 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 checked="" 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
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13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacture	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS

14. Supplemental Report Expected

<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission date)	15. Expected Submission Date	Month	Day	Year
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Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

During an extent of condition review for unprotected circuits, the James A. FitzPatrick Nuclear Power Plant (JAF) staff identified three cables for which a postulated fire event could potentially short circuit and cause secondary cable damage. The main circuit breakers in the motor control center compartment do not provide adequate protection of the shunt field circuit cable. This condition affects the DC motors to 27MOV-123, torus exhaust isolation bypass valve, 23MOV-14, HPCI turbine steam inlet isolation valve, and 23MOV-24, HPCI full flow test return to condensate storage isolation valve. The cables for these circuits are routed thru fire areas in South Cable Tunnel, Reactor Building Eastside, and Reactor Building West Crescent; where safe shutdown equipment could be affected by this condition.

The cause of the condition is that the original plant design, prior to 10 CFR 50 Appendix R, did not include overcurrent protection for DC motor shunt field cables in all applicable Safe Shutdown Analysis circumstances. Compensatory actions were established for the affected Fire Zones and modifications were completed for the affected circuits.



**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	– 001	– 00

NARRATIVE

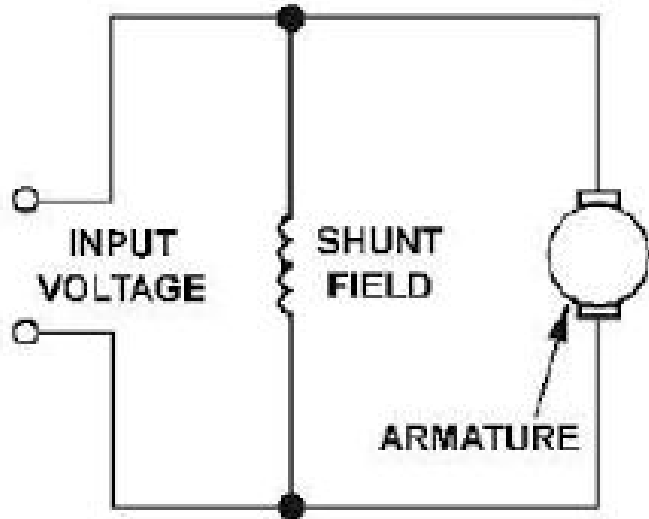
Background

The James A. FitzPatrick Nuclear Power Plant (JAF) 10 CFR 50 Appendix R Safe Shutdown Analysis is based on the occurrence of a single fire. The only failures that are considered are those directly attributable to the fire, and spurious operations that can be postulated to occur as a result of the fire. No other concurrent failures are assumed to occur (i.e., single failure).

Fire areas are established to meet the separation requirements of Section III.G of Appendix R for safe shutdown systems. The fire areas at JAF are further sub-divided into fire zones.

It is postulated that a fire in one fire area could cause a short-circuit, cause overcurrent and overheat cables, then produce secondary damage to adjacent cables in other fire areas where the cables are routed. Fuses in electrical circuits prevent this type of propagation. Secondary cable failures are outside the assumptions of the 10 CFR 50 Appendix R Safe Shutdown Analysis.

In a direct current (DC) shunt motor, the armature and field (shunt) windings are connected in parallel. The shunt (field) windings of a DC shunt motor are made of smaller gauge wire, but they have many more turns than a series-wound DC motor. The high number of turns allows a strong magnetic field to be generated, but the smaller gauge wires provide a high resistance and limit the current flowing through the shunt coil.



Event Description

On August 24, 2021, an extent of condition evaluation from the condition reported by LER: 2020-002, identified three additional circuits, vulnerable to a potential hot short condition impacting secondary fire areas.

The three circuits identified are associated with DC Motors with field shunt cables that transverse multiple fire areas. The feeder breaker protects the armature cables but the smaller 12 AWG (American Wire Gauge) field shunt cables are inadequately protected by the feeder breaker. In the event of a fire-induced hot short, the potential exists, based on the available fault current, cable size, and characteristics of the protective device, for the shunt cable to be overheated.

This situation has the potential to cause secondary cable failures that are outside the assumptions of the 10 CFR 50 Appendix R Safe Shutdown Analysis. This condition was reported to the NRC on August 24, 2021 (ENS 55427) per 10 CFR 50.72(b)(3)(ii)(B). The required actions of the Technical Requirement Manual (TRM) 3.7.M, Fire Barrier Penetrations, were established for the affected fire areas.



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Event Analysis

This condition identified the smaller gauge cables connected to the DC motor shunt field. The cables connected to the armature and series field are of sufficient size to be protected by a 40 or 70 ampere (A) breaker at the Motor Control Center (MCC) and the control circuits are protected by 15 A fuses in series with the breaker.

The 12 AWG shunt field cables were evaluated using the guidance of NUREG-1805 and NUREG/CR-5384. For thermoset insulated cable failures to impact adjacent cables, the temperature that the conductor reaches at given specified current, for a specified time duration, needs to be conducive to this type of damage propagation. At higher fault currents, the DC motor breaker would likely trip prior to cable ignition. However, under some fault current circumstances, the evaluation discovered that these 12 AWG cables are vulnerable to this type of failure. The evaluation further identified that the vulnerable cables were within common enclosures with other equipment cables required for safe shutdown in secondary fire areas.

The following DC motor field shunt cables may impact credited safe shutdown equipment for fires initiated in the following areas:

Cable	Equipment	Noncompliant Fire Area
1PCPARK107	71BMCC-1 to 27MOV-123 Torus exhaust isolation valves 27AOV-117 and 27AOV-118 outbound bypass valve	09 – Reactor Building Eastside 11 – South Cable Tunnel
1HPIBBK006	71BMCC-2 to 23MOV-14 HPCI turbine steam inlet isolation valve	18 – Reactor Building West Crescent
1HPIBBK024	71BMCC-4 to 23MOV-24 HPCI Full Flow test return to condensate storage downstream isolation valve	18 – Reactor Building West Crescent

Since the degree of separation for redundant safe shutdown trains is lacking, the event is reportable as an unanalyzed condition that significantly degraded plant safety. Therefore, this report is being submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B), a condition that resulted in the plant being in an unanalyzed condition that significantly degraded plant safety.

Cause

The overcurrent protection is not sufficient in all applicable DC shunt field cables which can impact the 10 CFR 50 Appendix R Safe Shutdown Analysis. This condition has existed since original plant design.



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Similar Events

FitzPatrick, LER: 2013-003-00, Unfused DC Ammeter Circuits Result in Unanalyzed Condition, JAFP-13-0158, dated December 26, 2013.

FitzPatrick, LER: 2020-002-00, Unanalyzed Condition due to Unprotected Control Circuits Running through Multiple Fire Areas, JAFP-20-0032, dated April 14, 2020.

Corrective Actions

Compensatory actions for the affected fire areas were established in accordance with TRM 3.7.M. Modifications to add protective devices (i.e, fuses) to the affected circuits was completed in October 2021 (Engineering Change (EC) 634899).

Other DC Motor shunt field cables that were evaluated to not affect safe shutdown analysis are being addressed in the corrective action process (IR 04442380).

An extent of condition review for alternating current (AC) circuits will be conducted.

Safety Significance

Nuclear safety – There were no actual consequences caused by this condition. The potential consequence of a hot short condition is for a fire damage in one fire area to damage other cables in more than one fire area. This may cause a loss of safe shutdown capability outside the analysis of the Safe Shutdown Analysis. The risk of fire damage is mitigated by fire protection equipment and the availability of Fire Brigade members trained to respond to fire accident scenarios.

References

JAF Issue Report IR 04442380, August 24, 2021

JAF-RPT-FPS-01975, Revision 5, 10CFR50 Appendix R Safe Shutdown Analysis Report (SSAR)