UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

May 23, 2022

Mr. David P. Rhoades
Senior Vice President
Constellation Energy Generation, LLC
President and Chief Nuclear Officer (CNO)
Constellation Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT – PROBLEM IDENTIFICATION AND RESOLUTION INSPECTION REPORT 05000333/2021014

Dear Mr. Rhoades:

On April 28, 2022, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at James A. FitzPatrick Nuclear Power Plant and discussed the results of this inspection with Mr. Timothy Peter, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

One finding of very low safety significance (Green) is documented in this report. This finding involved a violation of NRC requirements. We are treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violation or the significance or severity of the violation documented in this inspection report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at James A. FitzPatrick Nuclear Power Plant.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; and the NRC Resident Inspector at James A. FitzPatrick Nuclear Power Plant.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

Glenn T. Dentel

Digitally signed by Glenn T. Dentel
Date: 2022.05.23 14:51:23 -04'00'

Glenn T. Dentel, Chief
Engineering Branch 2
Division of Operating Reactor Safety

Docket No. 05000333
License No. DPR-59

Enclosure:
As stated

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SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT – PROBLEM IDENTIFICATION AND RESOLUTION INSPECTION REPORT 05000333/2021014 DATED MAY 23, 2022

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number:	05000333
License Number:	DPR-59
Report Number:	05000333/2021014
Enterprise Identifier:	I-2021-014-0003
Licensee:	Constellation Energy Generation, LLC
Facility:	James A. FitzPatrick Nuclear Power Plant
Location:	Oswego, NY
Inspection Dates:	June 21, 2021 to April 28, 2022
Inspectors:	F. Arner, Senior Reactor Analyst E. Dipaolo, Senior Reactor Inspector E. Miller, Senior Resident Inspector
Approved By:	Glenn T. Dentel, Chief Engineering Branch 2 Division of Operating Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a problem identification and resolution inspection at James A. FitzPatrick Nuclear Power Plant, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information.

List of Findings and Violations

Failure to Correct Condition Adverse to Fire Protection Associated with Improperly Protected DC Circuits			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000333/2021014-01 Open/Closed	[P.2] - Evaluation	71152
The inspectors identified a Green non-cited violation (NCV) of the James A. FitzPatrick Nuclear Power Plant (JAF) Renewed Facility Operating License Condition 2.C(3), "Fire Protection," for failure to implement and maintain in effect all provisions of the approved fire protection program (FPP) as described in the Final Safety Analysis Report. Specifically, Constellation identified multiple 125-volt (V) direct current (DC) circuit issues that included circuit protection that were not in accordance with design specifications (i.e., circuit breaker interrupting capacity too high for the associated circuits conductor gauge size), circuit conductor separation issues, and/or equipment internal control panel wire sizing issues. These issues represented potential fire hazards and a potential challenge to the licensing bases Appendix R safe shutdown required strategies and Constellation failed to further evaluate and/or correct the conditions.			

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000333/2021-001-00	LER 2021-001-00 for James A. FitzPatrick Nuclear Power Plant, Inadequate Protection Devices for DC Motor Field Shunt Cables Through Separate Fire Areas	71153	Closed

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

OTHER ACTIVITIES – BASELINE

71152 - Problem Identification and Resolution (PI&R)

Annual Follow-up of Selected Issues (IP Section 02.03) (1 Sample)

The inspectors reviewed the licensee's implementation of its corrective action program related to the following issues:

(1) Corrective Actions Associated with Improperly Protected 125 Volt Direct-Current Circuits Identified in Issue Report (IR) 4259118

71153 - Follow Up of Events and Notices of Enforcement Discretion

Event Report (IP Section 03.02) (1 Sample)

The inspectors evaluated the following licensee event report (LER):

(1) LER 05000333/2021-001-00, Inadequate Protection Devices for DC Motor Field Shunt Cables through Separate Fire Areas (ADAMS Accession No. ML21295A337). The inspection conclusions associated with this LER are documented in this report under Inspection Results section of this report. This LER is closed.

INSPECTION RESULTS

Failure to Correct Condition Adverse to Fire Protection Associated with Improperly Protected DC Circuits			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000333/2021014-01 Open/Closed	[P.2] - Evaluation	71152
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interrupting capacity too high for the associated circuits conductor gauge size), circuit conductor separation issues, and/or equipment internal control panel wire sizing issues. These issues represented potential fire hazards and a potential challenge to the licensing bases Appendix R safe shutdown required strategies and Constellation failed to further evaluate and/or correct the conditions.

Description: On April 20, 2020, the NRC issued NCV 05000333/2020011-01, "Unprotected Direct Current Control Circuits Running through Multiple Fire Areas." Constellation identified that the non-safety-related 125V DC control circuits for four balance of plant pumps were not provided with overcurrent protection, such as fuses. Cables for these control circuits were routed in safety-related cable trays with safety-related cables through several fire areas. The as-built design of the associated circuits was contrary to 10 CFR Part 50, Appendix R, III G.1 requirements. Fire protection features shall be provided for structures, systems, and components important to safe shutdown and those features shall be capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions is free of fire damage. Specifically, Constellation did not provide a fire protection feature, such as a fuse, for the circuits that were the subject of the NCV. A fire-induced short in these circuits in one area could have resulted in damaging adjacent cables or equipment in a separate fire area that were necessary to achieve and maintain hot shutdown conditions. The JAF 10 CFR Part 50 Appendix R Safe Shutdown Analysis was 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 could be postulated to occur as a result of the fire. No other failures were assumed to occur (i.e., single failure). Additionally, since these unfused control cables shared a common enclosure with other safe shutdown cables, a potential concern was a condition where the hot short condition (excessive current) causes overheating of the cables that could damage adjacent safe shutdown cables.

Constellation entered this issue into their corrective action program as IR 4259118, initiated corrective actions to further evaluate the extent-of-condition on the plant's 125V DC system, and corrected the condition by adding fuses to protect the associated circuits (Engineering Changes 630221, 630218, 630220, and 630219).

The inspectors reviewed Constellation's actions to address any potential extent-of-condition associated with other 125V DC system circuits. Constellation conducted an extent-of-condition and documented the results in IR 4259118, Assignment 6. Constellation identified multiple 125V DC circuits that contained one or a combination of the following potential fire hazard issues: 1) circuits were not properly protected in accordance with design specifications (i.e., circuit breaker interrupting capacity too high for the associated circuit conductor gauge size); 2) circuits contained conductor separation issues; and/or 3) circuits had equipment internal control panel wiring sizing issues (i.e., panel circuit contained wiring that was of insufficient gauge for the possible short circuit current available). Constellation performed an independent review of the circuit issues and documented those results in Assignment 16 of IR 4259118. The independent review confirmed and refined the results of the extent-of-condition (i.e., Assignment 6). In total, Constellation concluded that 55 circuits in the 125V DC system contained single or multiple issues that represented potential fire hazards. Assignments 6 and 16 of IR 4259118 were both closed on May 31, 2020, with no further action taken by Constellation.

The inspectors concluded that the issues identified in the extent-of-condition were potentially contrary to 10 CFR Part 50, Appendix R, III G.1. As such, these issues represented conditions adverse to fire protection and warranted further evaluation and/or corrective action.

However, Constellation did not initiate any additional evaluation of the extent-of-condition until questioned by the inspectors on June 25, 2021.

Corrective Actions: Constellation issued Standing Order 25-008 on July 1, 2021, that implemented appropriate compensatory measures (e.g., fire watches, verification of detection, etc.). Constellation completed detailed analyses of the circuit issues in question. This included detailed electrical circuit design reviews and evaluations of vulnerable circuits with respect to Appendix R safe shutdown capability. As a result, three circuits were identified that could cause secondary cable damage during a postulated fire event. Modifications to add protective devices (i.e., fuses) to the affected circuits were completed in October 2021. Constellation documented the unanalyzed condition in LER 05000333/2021-001-00, Inadequate Protection Devices for DC Motor Field Shunt Cables Through Separate Fire Areas, dated October 22, 2021.

During the course of reviewing Constellation's actions to evaluate and correct the 125V DC circuit design deficiencies, the inspectors identified the following problems: 1) Although Constellation's preliminary analysis indicated that at least 3 circuits adversely impacted compliance with the safe shutdown required strategies and, therefore, represented an unanalyzed condition, Constellation did not separately enter the issue into the corrective action program and report the issue in accordance with 10 CFR 50.72 until inspectors questioned the timeliness of Constellation's actions on August 23, 2021; 2) Actions to address or resolve circuit design deficiencies that were determined to not represent Appendix R compliance issues were not planned or established until October 7, 2021 (IR 4442380, Assignment 36), after the inspectors questioned Constellation's plan to address the deficiencies; and 3) Actions to evaluate the original extent-of-condition with respect to potential circuit internal control panel wiring sizing issues were not planned by Constellation until November 2, 2021 (IR 4442380, Assignment 37), after the inspectors questioned why the potential issues were not apparently addressed in Constellation's analysis of the circuit issues. The additional analysis performed as a result of 3) above resulted in unnecessary delays in assessing the issue and determining the final significance of the finding.

A semi-annual trend associated with FitzPatrick not adhering to corrective action program requirements to document, track, and implement actions was documented in the fourth quarter 2021 NRC Integrated Inspection Report 05000333/2021004 (ADAMS Accession No. ML22027A362). As a result, the station wrote IR 4443511 to address the developing trend. The inspectors noted that the corrective action program problems discussed above were similar in nature to the examples discussed in the semi-annual trend.

Corrective Action References: IRs 4259118, 4433055, 4442380, 4443761, 4461436 and 4461448.

Performance Assessment:

Performance Deficiency: The failure to evaluate and/or correct a condition adverse to fire protection was a performance deficiency that was within Constellation's ability to foresee and correct. Specifically, Constellation identified multiple 125V DC circuit issues that included circuit protection that was not in accordance with design specifications, circuit conductor separation issues, and/or equipment internal control panel circuit wiring sizing issues. These issues represented potential fire hazards and a potential challenge to the licensing bases Appendix R safe shutdown required strategies. Constellation failed to further evaluate and/or correct these adverse conditions which could challenge the credited safe shutdown equipment.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Protection Against External Factors attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the reliability of the associated safe shutdown cables was not ensured for fires in fire areas that they were routed through. In addition, this finding is more than minor because it was similar to Example 3.e of IMC 0612, Appendix E, "Examples of Minor Issues." Specifically, the resulting condition was unacceptable, and the licensee had to perform a modification or maintenance to correct the condition.

Significance: The inspectors assessed the significance of the finding using Appendix F, "Fire Protection and Post-Fire Safe Shutdown Significance Determination Process (SDP)." Appendix F was determined to be applicable because the finding was associated with the ability to reach and maintain safe shutdown conditions in the event of a fire. The inspectors screened the issue in accordance with Figure F.1, "Phase 1 Flow Chart." A low degradation rating could not be assigned in accordance with step 1.3.1. Therefore, the inspectors determined that in accordance with step 1.4.7-C, the finding adversely affected the ability to reach and maintain hot shutdown using the credited safe shutdown success path.

In accordance with step 1.5 of Appendix F, the Region I senior reactor analyst (SRA) noted that Constellation had developed a fire probabilistic risk assessment (PRA) model, which was utilized to provide a best estimate assessment of the impact of the performance deficiency. The finding was associated with a potential failure mechanism caused by overheating of inadequately protected circuit cables. This overheating has the potential to damage these unprotected cables and other cables routed in common enclosures (cable trays, conduits, panels, etc.). This would create the potential for a fire in one area to damage cables located in a different fire area or fire zone, which could impact the equipment credited for fire safe shutdown and invalidate credited safe shutdown methods. Constellation's engineering evaluations identified the specific cables of concern relative to the lack of inappropriate cable protection, the routing of these cables, the fire safe shutdown cables routed in their common enclosures, the associated safe shutdown equipment, and the impacted fire areas. The output of this analysis was used to assess the increased risk from the degraded safe shutdown strategies.

The SRA reviewed Constellation's evaluation of the degraded condition documented in JF-SDP-003, Revision 0, "Results for Significance Determination Process Evaluation." The SRA noted that within the analysis any potential hot short or damage to one of the "target" or affected circuits, depending on the location and lack of adequate circuit protection, would result in assumed damage to any cable routed in a common raceway. This, in effect, assumes all cables are adjacent to the inadequately protected faulted circuit. In fact, there may be numerous cables located within a raceway with unknown distances between safe shutdown cables and the faulted cable. The SRA considered the assumption that all cables are adjacent to the unfused circuit was appropriate to encapsulate other uncertainties relative to the effects of potential fire damage. Constellation's assumption that all cables within the same enclosure are damaged was referred as a "toaster wire condition," essentially failing the adjacent cables. The SRA noted the SDP evaluation targeted the risk increase in fire areas or fire zones where the condition could potentially adversely impact a safe shutdown strategy.

The SRA independently validated a sample of the key assumptions with the core damage sequences within the evaluation, such as fire ignition frequencies for the dominant fire zones,

fire severity factors, and non-suppression probabilities. Additionally, the SRA reviewed NUREG-7150, Volume 2 and NUREG/CR 6850 guidance, and determined that the SDP evaluation had used best estimate referenced values for potential circuit failures.

The SRA noted one of the dominant core damage sequences was a transient induced severe fire in CT-3 or the south cable tunnel, (fire area 11) which results in a full room failure. The fire area 11 safe shutdown strategy consists of safety relief valves, “A” train low pressure coolant injection (LPCI) along with “A” train of core spray for reactor water injection, and “A” train of residual heat removal (RHR) and “A” RHR service water. The postulated scenario is a room fire which hits the target nonconforming cable associated with 27MOV-123, torus exhaust isolation bypass valve. The sequence is a loss of low-pressure injection. High pressure coolant injection is failed due to the fire location and reactor core isolation cooling is failed because of the “toaster wire” common enclosure circuit failure assumption. Reactor pressure depressurization is successful, however, “B” core spray and RHR are failed due to their cables being located within the fire area. The “A” core spray fails because of the “toaster wire” effect from the nonconforming circuit. The “toaster wire” condition also results in a fire induced hot short on the “A” RHR minimum flow valve in the closed position which is assumed to fail “A” LPCI and “A” RHR torus cooling.

The SRA noted Constellation’s review appropriately used a maximum exposure time of one year, which was consistent with the Risk Assessment of Operational Events Handbook (RASP) PRA guidance. The conditional increase in core damage frequency (CDF) was calculated to be 1.5E-7/yr or of very low safety significance (Green). The evaluation also considered the impact on the increase in large early release frequency due to the condition. This was determined to have an increase less than 1E-7 per year, or very low safety significance (Green). The SRA determined there was likely some conservatism with the evaluation as the PRA fire model had not included recent plant modifications for the hardened containment vent system and severe accident water mitigation strategies.

Consistent with IMC 0609, Appendix F, steps 1.5.1-A and B, the SRA determined that Constellation had a Fire PRA model capable of determining a best estimate risk impact for the issue. Constellation used this model to determine an estimated CDF risk increase relative to the impact on the safe shutdown strategies. The SRA determined that Constellation’s risk evaluation was reasonable and accepts its result as a representative assessment of this findings risk, which is of very low safety significance (Green).

Cross-Cutting Aspect: P.2 - Evaluation: The organization thoroughly evaluates issues to ensure that resolutions address causes and extent of conditions commensurate with their safety significance. Specifically, Constellation identified DC circuit/circuit breaker protection issues that were adverse to design specifications and did conduct any further evaluation of the issues in the corrective action program until prompted by the inspectors.

Enforcement:

Violation: James A. FitzPatrick Nuclear Power Plant Renewed Facility Operating License Condition License Condition 2.C(3), in part, requires that Constellation shall implement and maintain in effect all provisions of the approved FPP as described in the Final Safety Analysis Report for the facility and as approved by the NRC. James A. FitzPatrick Nuclear Power Plant Updated Final Safety Analysis Report Section 9.8.6, Fire Protection Quality Assurance Program, states, in part, that Quality Assurance provisions are established for administrative controls for fire protection within the plant and that activities related to fire protection are performed in accordance with the quality assurance guidance in Branch Technical Position

(BTP) 9.5-1, Appendix A and the NRC's guidance document, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." BTP 9.5-1, Appendix A, dated August 23, 1976, Section C.8, Corrective Action, and “Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance,” dated June 14, 1977, Attachment 6, Section 8, require measures be established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material and non-conformances are promptly identified, reported and corrected.

Contrary to the above, from May 31, 2020, until July 1, 2021, Constellation did not correct a condition adverse to fire protection. Specifically, Constellation identified multiple 125V DC circuit issues that included circuit protection issues that was not in accordance with design specifications, circuit conductor separation issues, and/or equipment internal control panel circuit wiring sizing issues. These issues represented potential fire hazards which could challenge the credited safe shutdown strategies, and, therefore, conditions adverse to fire protection, and Constellation failed to further evaluate and/or correct the conditions. Constellation entered the issue into the corrective action program as IRs 4259118, 4442380, 4433055, 4461436, and 4461448; instituted appropriate compensatory measures (i.e., fire watches); evaluated the affected circuits; and/or planned modifications to correct circuit coordination and separation issues. Because this finding was of very low safety significance (Green) and was entered into Constellation’s corrective action program, the NRC is treating this violation as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. **(NCV 05000333/20210014-01, Failure to Correct Condition Adverse to Fire Protection Associated with Improperly Protected DC Circuits)**

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On April 28, 2022, the inspectors presented the problem identification and resolution results to Mr. Timothy Peter, Site Vice President, and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71152	Calculations	Calculation E-431	Motor Feeder Cable Sizing Calculation for 14P-1A (Core Spray Pump Motor)	0
		E-431	Motor Feeder Cable Sizing Calculation for 14P-1A (Core Spray Pump Motor)	1
	Corrective Action Documents	4259118		
		4276998		
		4295495		
		4319657		
		4442510		
		4442513		
		4442514		
		4442516		
		4455782		
	Corrective Action Documents Resulting from Inspection	4433055		
		4433065		
		4442380		
		4461436		
		4461448		
	Engineering Evaluations	EC 634838	Technical Evaluation of Secondary Fire Appendix R Circuits (Sargent & Lundy)	0
		EC 635656	Technical Evaluation of Secondary Fire Appendix R Panel Wiring (Sargent & Lundy)	0
		Engineering Planning and Management Report P3722-001-001	Evaluation of Appendix R Impacts of Associated Circuits in Common Enclosures	2
		Engineering Planning and Management Report P3722-001-002	Evaluation of Appendix R Impacts of Associated Circuits in Common Enclosure-Secondary Panels	0

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		IR 4442380	DC Hot Short Condition Impacting JAF App R Compliance	
		JF-SDP-003	Results for Significance Determination Process Evaluation for DC Unfused Circuits	0
		Limerick Generating Station, Units 1 and 2 Report #48503	Design Verification Test Report Internal Panel Control Wiring Separation Criteria	09/01/1982
	Miscellaneous	Clarification of NRC Generic Letter 81-12	Fire Protection Rule – Appendix R	03/22/1982
		GDCD	James A. Fitzpatrick Nuclear Power Plant Electrical General Design Criteria	
		JAF-RPT-04-00478	JAF Fire Hazards Analysis	4
		JAF-RPT-FPS-01975	10CFR50 Appendix R Safe Shutdown Analysis Report	5
		NEI 00-01	Guidance for Post Fire Safe Shutdown Circuit Analysis	4
		NRC Generic Letter 81-12	Fire Protection Rule – Appendix R	02/20/1981
		NUREG 1778	Knowledge Base for Post-Fire Safe-Shutdown Analysis, Draft Report for Comment	01/2004
		NUREG-1805	Fire Dynamics Tools (FDTs) – Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program	12/2004
		Operations Standing Order 25-008	Appendix R Compensatory Actions	3
	Procedures	CC-AA-211	Fire Protection Program	9