



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION III  
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LISLE, ILLINOIS 60532-4352

June 26, 2018

Mr. Charles Arnone  
Vice President, Operations  
Entergy Nuclear Operations, Inc.  
Palisades Nuclear Plant  
27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

**SUBJECT: PALISADES NUCLEAR PLANT—NRC TRIENNIAL FIRE PROTECTION  
INSPECTION REPORT 05000255/2018011**

Dear Mr. Arnone:

On May 14, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed a Triennial Fire Protection Inspection at your Palisades Nuclear Plant. The NRC inspectors discussed the results of this inspection with Mr. Charles Arnone and other members of your staff. The results of this inspection are documented in the enclosed report.

Based on the results of this inspection, the NRC has identified two issues that were evaluated under the risk significance determination process as having very low safety significance (Green) and one unresolved item. The NRC has also determined that two violations are associated with these issues. Because the licensee initiated condition reports to address the issues, these violations are being treated as a Non-Cited Violations (NCVs), consistent with Section 2.3.2 of the Enforcement Policy. The NCVs are described in the subject inspection report.

If you contest the violations or significance of the NCVs, 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 III; the Director, Office of Enforcement; and the NRC resident inspector at the Palisades Nuclear Plant.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement 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 III; and the NRC resident inspector at the Palisades Nuclear Plant.

This letter 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*, Part 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

***/RA Mark Jeffers Acting for/***

Robert C Daley, Chief  
Engineering Branch 3  
Division of Reactor Safety

Docket Nos. 50-255; 72-007  
License No. DPR-20

Enclosure:  
IR 05000255/2018011

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Letter to Charles Arnone from Robert C. Daley dated June 26, 2018

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INSPECTION REPORT 05000255/2018011

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-255; 72-007  
License No: DPR-20

Report No: 05000255/2018011

Enterprise Identifier: I-2018-011-0005

Licensee: Entergy Nuclear Operations, Inc.

Facility: Palisades Nuclear Plant

Location: Covert, MI

Dates: March 5, 2018, through May 14, 2018

Inspectors: A. Shaikh, Senior Inspector (Lead)  
B. Jose, Senior Inspector  
D. Szwarc, Senior Inspector

Approved by: R. Daley, Chief  
Engineering Branch 3  
Division of Reactor Safety

Enclosure

## SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring licensee’s performance by conducting a Triennial Fire Protection at Palisades Nuclear 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. The NRC and self-revealed findings, violations, and additional items are summarized in the table below. Licensee-identified Non-Cited Violations (NCVs) are documented under inspection results.

### List of Findings and Violations

Failure to Maintain Adequate Fire Protection System Functional Test Procedure			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green Finding NCV 05000255/2018011-01 Open/Closed	NONE	IP71111.05XT Fire Protection Inspection Requirements
The inspectors identified a finding of very-low safety significance and associated violation of Technical Specification 5.4.1, “Procedures,” for the licensee’s failure to maintain fire protection system functional test procedure. Specifically, the licensee failed to maintain Procedure RO-52, “Fire Suppression Water System Functional Test and Fire Pump Capacity Test,” by failing to include appropriate acceptance criteria in the procedure to demonstrate fire protection system functionality.			

Failure to Implement Guidance and Strategies for B.5.b Event	IP71111.05XT
Finding and Violation associated with B.5.b Mitigating Strategies is documented in Official Use Only Inspection Report 05000255/2018415	

### Additional Tracking Items

Unresolved Item (Open)	Failure to Set Action Levels to Ensure that the Assumptions in the Engineering Analysis Remain Valid NCV 05000255/2018011-02	IP71111.05XT
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## 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.

## REACTOR SAFETY

### 71111.05XT—Fire Protection—National Fire Protection Association (NFPA) 805 (Triennial)

The inspectors evaluated the following from March 5, 2018, to May 14, 2018.

#### Fire Protection Inspection Requirements (3 Samples)

The inspectors evaluated Fire Protection Program implementation in the following selected areas:

- (1) Fire Area 3, 1-D Switchgear Room
- (2) Fire Area 5, 1-1 Emergency Diesel Generator Room
- (3) Fire Area 28, West Engineering Safeguards Room

#### B.5.b Inspection Activities (2 Samples)

The inspectors evaluated feasibility of the following B.5.b Mitigating Strategies:

- (1) Makeup to Safety Injection Recirculation Water Tank
- (2) Spent Fuel Pool Spray Capability

## INSPECTION RESULTS

### 71111.05XT—Fire Protection—NFPA 805 (Triennial)

Failure to Maintain Adequate Fire Protection System Functional Test Procedure			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green Finding NCV 05000255/2018011-01 Open/Closed	NONE	IP71111.05XT Fire Protection Inspection Requirements
<u>Introduction:</u> The inspectors identified a finding of very-low safety significance and associated violation of Technical Specification 5.4, "Procedures," for the licensee's failure to maintain fire protection system functional test procedure. Specifically, the licensee failed to maintain Procedure RO-52, "Fire Suppression Water System Functional Test and Fire Pump Capacity			

Test”, by failing to include appropriate acceptance criteria in the procedure to demonstrate fire protection system functionality.

Description: Procedure RO-52 is implemented to ensure that the fire pumps have sufficient capacity to meet fire suppression system demands for the most hydraulically demanding fire suppression loads at Palisades. The most demanding fire suppression load at Palisades is the start-up transformer deluge system which required a fire pump discharge flow of 1869.1 gpm and pump discharge pressure of 85.6 psig to ensure adequate sprinkler coverage over deluge system per Calculations EA-FPP-96-024, “System Hydraulic Analysis for Start-up Transformers,” and EA-FPS-2001-01, “Calculation of Fire Suppression System Flow Rate and Pressure Requirements.” Calculation EA-FPP-96-024 was performed in 1998 and Calculation EA-FPS-2001-01 was performed in 2004. Both calculations assumed a coefficient of friction (C-factor) of 120 for the buried fire protection piping that delivers fire suppression water from the pump discharge to various suppression loads throughout the plant. The fire pump discharge flow of 1869.1 gpm at a discharge pressure of 85.6 psig requirement for the start-up transformer deluge system was incorporated into the acceptance criteria of Procedure RO-52 under Section 6.0. The inspectors questioned the appropriateness of this acceptance criteria given the age of the piping system which degrades over time because the calculations that determined this acceptance criteria assumed new piping and used a new piping nominal C-factor of 120. The licensee responded to the inspectors’ questions by performing an evaluation that used results from the most recent flow tests and developed a system head loss correlation that accounts for current piping degradation that could be scaled to the flow conditions of the hydraulic model used in Calculations EA-FPP-96-024 and EA-FPS-2001-01. Based on the results of this evaluation, the licensee determined that the pressure required at the discharge of the fire pumps needs to be greater than the current acceptance criteria of 85.6 psig in order to deliver sufficient flow to the start-up transformer deluge system sprinklers. Therefore, the inspectors determined that the current acceptance criteria in Section 6.0 of RO-52 was not adequate to ensure functionality of the fire pumps to meet fire suppression requirements.

Corrective Action(s): The licensee entered the NRC inspectors’ concern into its Corrective Action Program (CAP). As part of immediate corrective actions, the licensee compared the fire pumps’ most recent performance curves to this new acceptance criteria of greater than 85.6 psig and determined that the fire pumps would maintain functionality. The licensee also intends to revise Procedure RO-52 to include this new acceptance criteria and include instructions to re-calculate acceptance criteria using next test’s recorded flow measurements to account for any further piping degradation and to ensure that the acceptance criteria is always bounded by the most limiting fire suppression load.

Corrective Action Reference: Condition Report (CR) PLP-2018-01673

Performance Assessment:

Performance Deficiency: The licensee’s failure to include appropriate acceptance criteria in Procedure RO-52 to ensure functionality of the fire suppression water system was a performance deficiency.

Screening: The inspectors determined the performance deficiency was more-than-minor, and therefore, a finding, because it adversely affected the Procedure Quality attribute of the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences

(i.e., core damage). Specifically, the failure to include appropriate acceptance criteria into Procedure RO-52, resulted in a deficient procedure that could have resulted in the acceptance of degraded fire pump performance and subsequently, adversely impacted the functionality of the fire suppression system.

**Significance:** The inspectors assessed the significance of the finding in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," Table 2. The inspectors determined the finding affected the Mitigating Systems cornerstone. The finding degraded fire protection defense-in-depth strategies, and the inspectors determined, using Table 3, that it could be evaluated using Appendix F, "Fire Protection Significance Determination Process." The inspectors screened the finding using IMC 0609, Appendix F, Attachment 1, "Part 1: Fire Protection SDP Phase 1 Worksheet," dated September 20, 2013. The inspectors answered "yes" to Question 1.4.2 G, "Would the affected fixed fire suppression system still be able to suppress a fire such that no additional equipment important to safety would be affected by a fire?" in Task 1.4.2 of IMC 0609, Appendix F. Therefore, the inspectors determined that the finding screened as having very-low safety significance (Green).

**Cross Cutting:** The finding did not have a cross-cutting aspect associated with it because it was not reflective of current plant performance.

**Enforcement:**

**Violation:** Technical Specification 5.4.1 requires, in part, that, "Written procedures shall be established, implemented, and maintained covering the activities referenced below:

- The applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978; and
- Regulatory Guide 1.33, Revision 2, Appendix A, 1978 Section 8 (b)(1)(h) identifies procedure for Fire Protection System Functional Test as an applicable procedure.

Contrary to the above, from 1998 to May 14, 2018, the licensee failed to maintain Procedure RO-52, "Fire Suppression Water System Functional Test and Fire Pump Capacity Test," by failing to include appropriate acceptance criteria in the procedure to demonstrate Fire Protection System Functionality.

**Disposition:** This violation is being treated as a NCV, consistent with Section 2.3.2 of the Enforcement Policy.

Failure to Implement Guidance and Strategies for B.5.b Event	IP71111.05XT
Finding and Violation associated with B.5.b Mitigating Strategies is documented in Official Use Only Inspection Report 05000255/2018415	



Licensee Identified Non-Cited Violation	IP71111.05XT
<p>This violation of very-low safety significant was identified by the licensee and has been entered into the licensee corrective action program and is being treated as a NCV, consistent with Section 2.3.2 of the Enforcement Policy.</p>	
<p><u>Enforcement:</u></p> <p>Violation: License condition 2.C(3) requires the licensee to implement and maintain in effect all provisions of the approved Fire Protection Program that complies with Title 10 of the <i>Code of Federal Regulations</i> (CFR), Part 50.48(a) and 10 CFR 50.48(c), “NFPA Standard NFPA 805,” as approved in the Safety Evaluation Report (SER) dated February 27, 2015. Section 2.4.3.3 of NFPA 805 states, in part, that the Probabilistic Safety Assessment (PSA) [Probabilistic Risk Assessment (PRA)] approach, methods, and data shall be based on the as-built and as-operated and maintained plant, and reflect the operating experience at the plant.</p> <p>Contrary to the above, from February 27, 2015, until May 14, 2018, the licensee failed to base the PSA (PRA) approach, methods, and data on the as-built and as-operated and maintained plant. Specifically, the licensee’s PSA (PRA) model/analysis credited the suppression system located in the cable spreading room to suppress a type 2 fire scenarios, whereas the actual room contained numerous obstructions by the stacked cable trays located near the ceiling that interfered with the water spray pattern discharged from the sprinklers from providing adequate water density pattern to suppress a fire in areas below the cable trays which contained electrical panels.</p> <p>Significance/Severity Level: The performance deficiency was determined to be more-than-minor, and therefore, a finding because the performance deficiency, if left uncorrected, would have the potential to lead to a more significant safety concern. Specifically, the licensee’s failure to correctly model/analyze the as-built condition of the suppression system located in the cable spreading room in the PRA could potentially affect the risk associated with a fire in the room and could result in inappropriately screening out the effects of other changes associated with the fire area. The finding was of very-low safety significance (Green). While there may be a change to the plant’s baseline risk as a result of this issue, this is a fire modeling issue only; no physical plant fire protection feature was altered by the fire PRA model. Therefore, there was no increase in actual core damage risk to the physical plant.</p> <p>Corrective Action Reference: The licensee documented this issue in their CAP as CR-PLP-2018-00236.</p>	

Unresolved Item (Open)	Failure to Set Action Levels to Ensure that the Assumptions in the Engineering Analysis Remain Valid NCV 05000255/2018011-02	IP71111.05XT
<p>Description: The inspectors reviewed a sample of equipment located in the fire areas selected for inspection to determine if the licensee had established a proper method of monitoring that equipment as required by NFPA 805, Section 2.6. Section 2.6 of NFPA 805 required that, "A monitoring program shall be established to ensure that the availability and reliability of the fire protection systems and features are maintained and to assess the performance of the fire protection program in meeting the performance criteria. Monitoring shall ensure that the assumptions in the engineering analysis remain valid." The licensee utilized Procedure EN-DC-357, "NFPA 805 Monitoring Program," Revision 2, to ensure that, "the assumptions in the NFPA 805 engineering analyses remain valid by executing an effective and ongoing monitoring program."</p> <p>The inspectors selected the high pressure air compressor (C-6B) and high pressure safety injection pump (P-66B), both of which were located in the West Safeguards Room. The licensee considered these components to be high-safety significant (HSS) structures, systems, or components (SSCs). The licensee chose to monitor the unavailability of these components utilizing the Maintenance Rule (10 CFR 50.65).</p> <p>The licensee set the Maintenance Rule allowable unavailability action level threshold for the high pressure air compressor at 5E-2 (5 percent) whereas they assumed in their fire PRA an unavailability of 9.86E-3 (approximately 1 percent). For the high pressure safety injection pump the licensee set the Maintenance Rule allowable unavailability at 1.5E-2 (1.5 percent) whereas they assumed in their fire PRA an unavailability of 6.32E-3 (approximately 0.6 percent). The inspectors believed that by relying on the less conservative action level thresholds in the Maintenance Rule the licensee failed to ensure that the assumptions in the engineering analysis (fire PRA) remained valid.</p> <p>The licensee stated in Procedure EN-DC-357, Section 1.0, "Purpose," that, "The NFPA 805 Monitoring Program ensures that the assumptions in the NFPA 805 engineering analyses remain valid by executing an effective and ongoing monitoring program." Under Section 3.0, "Definitions," the licensee defined, "Action Level Threshold," as, "When establishing the action level threshold for reliability and availability, the action level should be no lower than the Fire Probabilistic Safety Analysis [also called fire PRA] assumptions." The licensee stated in Section 5.3.3(c) that, "If HSS SSCs have been identified in using the Maintenance Rule guidelines, the associated SSC specific performance criteria may be established as in the Maintenance Rule, provided the criteria are consistent with the Fire Probabilistic safety Analysis assumptions..."</p> <p>The inspectors believed that Procedure EN-DC-357 required the licensee set the action level thresholds no lower than the fire PRA assumptions. Procedure section 5.3.4(b)(1) required that HSS equipment that is not sufficiently tracked in the Maintenance Rule be added to the NFPA 805 Monitoring Database. The licensee did not add the high pressure air compressor and the high pressure safety injection pump into the NFPA 805 Monitoring Database. In the SER 2015-2-27 dated February 27, 2015, in which the staff approved the licensee NFPA 805 License Amendment Request, the staff noted that the licensee will develop an NFPA 805 Monitoring Program consistent with Frequently Asked Question (FAQ) 10-0059. The staff also noted that the stated development of the Monitoring Program would include a review of existing surveillance, inspection, testing, compensatory measures, and oversight</p>		

processes for adequacy. The staff concluded in SER 2015-2-27 that since the final values for availability and reliability, as well as the performance criteria for the SSCs being monitored, have not been established for the Monitoring Program as of the date of this SER, completion of the licensee's NFPA 805 Monitoring Program is an implementation item. Furthermore, the staff concluded that there is reasonable assurance that the licensee will develop a Monitoring Program that meets the requirements specified in Sections 2.6.1, 2.6.2, and 2.6.3 of NFPA 805

Section 2.6 of NFPA 805 stated in part that, "Monitoring shall ensure that the assumptions in the engineering analysis remain valid." The licensee interpreted this statement to mean that utilizing the existing Maintenance Rule unavailability values is consistent with its commitment in SER 2015-2-27 and would allow the site to appropriately monitor the availability and reliability of fire protection systems and features. The licensee also performed sensitivity studies on the differences in the unavailability values of fire protection systems and features between the Maintenance Rule criteria and the fire PRA values and determined that they were not risk-significant.

The inspectors questioned the appropriateness of the licensee's interpretation of "assumptions" as described in Section 2.6 of NFPA 805 above. The inspectors believed that the licensee should monitor the unavailability of fire protection systems and features utilizing the same values as those documented in the fire PRA associated with the NFPA 805 License Amendment Request.

The licensee further stated that they were waiting for guidance from the NRC's Office of Nuclear Reactor Regulation and the industry who were working on revising guidance in FAQ 10-0059, "NFPA 805 Monitoring," to determine if they needed to change their approach. That guidance document was in the process of being revised during the inspection. The inspectors needed to determine if the licensee's approach to monitoring the availability and reliability of the fire protection systems and features using the Maintenance Rule monitoring values in order to ensure that the assumptions in the engineering analysis remained valid was an acceptable approach.

Planned Closure Action(s): The inspectors will await clarification from the Office of Nuclear Reactor Regulation in order to determine if a performance deficiency exists.

Licensee Action(s): The licensee plans to follow the resolution of FAQ 10-0059, Revision 6, and take the appropriate corrective actions based on the guidance provided in that FAQ.

Corrective Action Reference: CR-PLP-2018-01704

## **EXIT MEETINGS AND DEBRIEFS**

The inspectors confirmed that proprietary information was controlled to protect from public disclosure. No proprietary information was documented in this report.

- On May 14, 2018, the inspector presented the Triennial Fire Protection inspection results to Barbara Dotson and other members of the licensee staff.

## DOCUMENTS REVIEWED

- EA-APR-98-003; Analysis of the Effects of a Fire on the Fire Barrier Penetrations Between Rooms 150/229-232, 272E/232W, 117C/153F; Revision 2
- EGAD-EP-10; Palisades Maintenance Rule Scoping Document; Revision 2
- CR-PLP-2018-01516; Procedure PLP-RPT-15-00002 Discrepancy; 03/27/2018
- CR-PLP-2018-01538; EA-APR-98-002 Not Loaded in Merlin; 03/28/2018
- CR-PLP-2018-01540; Pre-Fire Plan FPP-PE-3 Inaccuracy; 03/28/2018
- CR-PLP-2018-01704; Resolution of Monitoring Program FAQ 10-0059; 04/06/2018
- CR-PLP-2015-1593; Documentation of an NRC Finding during 2015 Triennial Fire Protection Inspection; 04/16/2015
- CR-PLP-2016-04238; Documentation of 3rd Quarter Fire Drill Failure; 09/08/2016
- CR-PLP-2016-05889; Unevaluated Opening in Fire Barrier; 12/13/2016
- CR-PLP-2016-06012; Pre-Fire Plan #42 Deficiency; 12/21/2016
- CR-PLP-2018-0236; Fire Protection Self-Assessment Team Identified (LO-PLPLO-2017-00038); 01/12/2018
- OE-NOE-2016-00396; CR-ANO-2-2016-02946-ACE NFPA 805 Fire Protection Program – Inadequate Component Unavailability and Ignition Frequency; 11/09/2016
- PLDRL-FBT-FIRE DRILL – 16; 3rd Quarter Fire Drill / Shift #3; 09/08/2016
- EN-DC-357; NFPA 805 Monitoring Program; Revision 2
- EN-TQ-125; Fire Brigade Drills; Revision 6
- 52706481 01; FPSP-SI-1 Fire Detection System Outside Containment Functional Test; 06/22/2017
- 52761481 01; Inspect & Test NFPA 805 Portable Lighting Units; 11/22/2017
- PLP-RPT-12-00110; Multiple Spurious Operation (MSO) Identification and Evaluation; Revision 1
- 0247-07-0005-04; Palisades Nuclear Plant Fire Probabilistic Risk Assessment Multiple Spurious Operations Report; Revision 1
- DBD-7.10; Design Basis Document for NFPA 805 Fire Protection Program; Revision 1
- PLP-RPT-12-00053; NFPA Code Conformance Review; Revision 2
- FPIP-4; Fire Protection Systems and Fire Protection Equipment; Revision 39
- EA-APR-95-004; 10CFR50 Appendix R Safe Shutdown Associated Circuits Analysis for Common Power Supply and Common Enclosure; Revision 5
- EA-FPP-12-009; NFPA 805 Circuit Analysis; Revision 1
- E-5, Sh. 5B; Single Line Drawing, 480 V MCCs; Revision 12
- FPIP-4, Fire Protection Implementing Procedure, Revision 39
- WO 52586192, RO-52 Fire Suppression Water System Test, 09/10/2015
- WO 52494769, RO-52 Fire Suppression Water System Test, 09/22/2014
- EA-FPP-96-024, System Hydraulic Analysis for Startup Transformers, Revision 0
- Calculation 0247-07-0005-06, Palisades Nuclear Plant Fire Probabilistic Risk Assessment Fire Scenario Development Report, Revision 1
- EA-FPP-03-001, “Analysis of Combustible Loading at Palisades Nuclear Plant”, Revision 3
- Procedure RO-10, Fire Suppression Water System Flow Test, Revision 11
- Procedure RO-52, Fire Suppression Water System Functional Test and Fire Pump Capacity Test, Revision 33