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10 CFR 50 Appendix H

PNP 2019-026

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ATTN: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Subject: Proposed Revision to Palisades Nuclear Plant Reactor Vessel Surveillance Capsule Withdrawal Schedule

Palisades Nuclear Plant  
NRC Docket No. 50-255  
Renewed Facility Operating License No. DPR-20

- References:
1. Entergy Nuclear Operations, Inc. letter, "Updated Palisades Reactor Vessel Pressurized Thermal Shock Evaluation," (ADAMS Accession Number ML110060692), December 20, 2010
  2. NRC letter, "Updated Reactor Pressure Vessel Pressurized Thermal Shock Evaluation for Palisades Nuclear Plant," (ADAMS Accession Number ML112870050), December 7, 2011

In accordance with Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," paragraph III.B.3, Entergy Nuclear Operations, Inc. (Entergy) requests Nuclear Regulatory Commission (NRC) approval of the enclosed proposed revision to the reactor vessel (RV) surveillance capsule withdrawal schedule for the Palisades Nuclear Plant (PNP).

PNP Renewed Facility Operating License (RFOL) condition 2.J. states the following:

"All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation. All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the NRC, as required by 10 CFR Part 50, Appendix H."

This revision of the RV surveillance capsule withdrawal schedule for PNP is necessary due to updated projected maximum RV fluence values for the 60-year licensing period. These updated

fluence values were provided in support of a submittal concerning 10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events," in Reference 1, which was reviewed by the NRC in Reference 2.

The proposed revision to the surveillance capsule withdrawal schedule meets the requirements of 10 CFR 50, Appendix H, and ASTM E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels."

The enclosure to this letter provides the proposed revision to the surveillance capsule withdrawal schedule and a justification for the change.

This letter contains no new regulatory commitments.

Entergy requests approval of the proposed capsule withdrawal schedule revision by December 31, 2019.

If there are any questions concerning this letter, or additional information is required, please contact Jim Miksa at 269-764-2945.

Respectfully,



Jeffery A. Hardy

JAH/jse

Enclosure: Proposed Revision to Palisades Nuclear Plant Reactor Vessel Surveillance Capsule Withdrawal Schedule

cc: Administrator, Region III, USNRC  
Project Manager, Palisades, USNRC  
Resident Inspector, Palisades USNRC

## ENCLOSURE

### **Proposed Revision to Palisades Nuclear Plant Reactor Vessel Surveillance Capsule Withdrawal Schedule**

#### **Introduction**

In accordance with Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," paragraph III.B.3, Entergy Nuclear Operations, Inc. (Entergy) requests Nuclear Regulatory Commission (NRC) approval of a proposed revision to the reactor vessel (RV) surveillance capsule withdrawal schedule for surveillance capsule W-80 at Palisades Nuclear Plant (PNP).

PNP Renewed Facility Operating License (RFOL) condition 2.J. states the following:

"All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation. All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the NRC, as required by 10 CFR Part 50, Appendix H."

This revision of the RV surveillance capsule withdrawal schedule for PNP is necessary due to updated projected maximum fluence values for the RV at end-of-life-extended (EOLE). The updated fluence values were provided in support of a submittal concerning 10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events," in Reference 1, which was reviewed by the NRC in Reference 2.

#### **Background**

Regulation 10 CFR 50, Appendix H, requires nuclear power plant licensees to implement reactor vessel surveillance programs to "monitor changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline region . . . which result from exposure of these materials to neutron irradiation and the thermal environment." 10 CFR 50, Appendix H, Section III.B.1 states, in part, that the design of the surveillance program and the withdrawal schedule must meet the requirements of the edition of the ASTM E 185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," that is current on the issue date of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code to which the RV was purchased. The rule permits the use of later editions of ASTM E 185, but including only those editions through 1982 (i.e., through ASTM E 185-82).

NRC Administrative Letter 97-04, "NRC Staff Approval for Changes to 10 CFR Part 50, Appendix H, Reactor Vessel Surveillance Specimen Withdrawal Schedules," dated September 30, 1997, specifies that changes to reactor vessel surveillance capsule withdrawal schedules that conform to the applicable ASTM standard require only NRC verification of such conformance, whereas changes that do not conform to ASTM E 185 require approval by the license amendment process.

The proposed change in the withdrawal schedule for surveillance capsule W-80 complies with 10 CFR 50, Appendix H, and ASTM E 185-82, which is the applicable standard for PNP in accordance with PNP RFOL condition 2.J. Therefore, in accordance with the guidance of

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**Proposed Revision to Palisades Nuclear Plant  
Reactor Vessel Surveillance Capsule Withdrawal Schedule**

Administrative Letter 97-04, a license amendment is not required for this proposed surveillance capsule withdrawal schedule change.

**Current Capsule Withdrawal Schedule**

The current RV surveillance capsule withdrawal schedule is shown below. The withdrawal schedule for surveillance capsule W-80 was approved in Reference 3, and is reflected in PNP Final Safety Analysis Report Table 4-20, "Reactor Vessel Surveillance Coupon Removal Schedule." The current surveillance capsule W-80 withdrawal schedule was based on a projected maximum RV fluence of  $2.998 \times 10^{19}$  n/cm<sup>2</sup> at EOLE.

<b>Withdrawal Sequence</b>	<b>Capsule</b>	<b>Removal Time (Effective Full Power Years, EFPY)</b>	<b>Capsule Fluence x 10<sup>19</sup> (neutrons per square centimeter, n/cm<sup>2</sup>)</b>
First	A-240	2.26	4.01
Second	W-290	5.21	0.926
	T-330	5.21	
Third	W-110	9.95	1.66
Fourth	W-100	16.93	2.1
Fifth	W-80	~ 31.96	~ 3.06
	W-280	Reserved for future use	
	W-260	Reserved for future use	
	T-150	Reserved for future use	

**Proposed Capsule Withdrawal Schedule**

The proposed withdrawal schedule for surveillance capsule W-80 is shown below, and is based on an updated projected maximum RV fluence of  $3.429 \times 10^{19}$  n/cm<sup>2</sup> at EOLE. The proposed capsule W-80 withdrawal schedule would meet ASTM E 185-82 capsule withdrawal requirements.

<b>Withdrawal Sequence</b>	<b>Capsule</b>	<b>Removal Time (EFPY)</b>	<b>Capsule Fluence x 10<sup>19</sup> (n/cm<sup>2</sup>)</b>
First	A-240	2.26	4.01
Second	W-290	5.21	0.926
	T-330	5.21	
Third	W-110	9.95	1.66
Fourth	W-100	16.93	2.1
Fifth	W-80	~ 35.2	~ 3.65
	W-280	Reserved for future use	
	W-260	Reserved for future use	
	T-150	Reserved for future use	

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### Proposed Revision to Palisades Nuclear Plant Reactor Vessel Surveillance Capsule Withdrawal Schedule

#### Justification

Per PNP RFOL condition 2.J., ASTM E 185-82 is the applicable standard for PNP.

ASTM E 185-82, Table 1, "Minimum Recommended Number of Surveillance Capsules and Their Withdrawal Schedule," requires that either a minimum of three, four, or five surveillance capsules be removed from the RV. The number of capsules removed is based on the projected nil ductility reference temperature shift ( $\Delta RT_{NDT}$ ) of the limiting material at the clad-vessel interface location of the RV at the end-of-life. ASTM E 185-82 establishes the criteria for determining the minimum number of capsules that are to be removed in accordance with a withdrawal schedule and the number of capsules that are to be tested. For plants with projected  $\Delta RT_{NDT}$  above 200°F (111 °C), five surveillance capsules are required to be removed from the RV and the first four capsules are required to be tested.

Since PNP has a limiting  $\Delta RT_{NDT}$  value greater than 200°F, a minimum of five surveillance capsules must be withdrawn. To date, four PNP capsules have been removed and tested. Entergy is proposing a change in the withdrawal schedule for the fifth, and final, surveillance capsule (i.e., capsule W-80).

Additionally, ASTM E 185-82 specifies that the final surveillance capsule should be withdrawn after accumulating a neutron fluence ( $E > 1.0$  MeV) of between one and two times the maximum end-of-life RV fluence.

The current withdrawal schedule for PNP RV surveillance capsule W-80 was approved in Reference 3. It was developed to accommodate the 60-year licensing period for PNP, using the guidance of ASME E 185-82. At that time, the projected maximum RV fluence at EOLE was projected to be  $2.998 \times 10^{19}$  n/cm<sup>2</sup>. As a result, W-80 surveillance capsule removal was scheduled at approximately 31.96 EFPY when capsule fluence would reach approximately  $3.06 \times 10^{19}$  n/cm<sup>2</sup>, which was between one and two times the projected maximum RV fluence at EOLE.

The projected RV maximum fluence values at EOLE were later updated and provided in support of a submittal concerning 10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events," in Reference 1. This submittal contained Structural Integrity Associates, Inc. Report Number 1000915.401, Revision 1, "Revised Pressurized Thermal Shock Evaluation for the Palisades Reactor Pressure Vessel," which reported in Table 4, "Calculated Fluence at End of License Renewal Date (March 31, 2031)," a peak RV fluence at EOLE of  $3.429 \times 10^{19}$  n/cm<sup>2</sup>. This submittal was reviewed by the NRC in Reference 2.

Under the current capsule withdrawal schedule, capsule W-80 removal would occur after approximately 31.96 EFPY, with a corresponding capsule fluence of approximately  $3.06 \times 10^{19}$  n/cm<sup>2</sup>. This operating time and fluence would occur after the 1R27 refueling outage, which is planned to commence in the summer of 2020. With the updated projected RV maximum neutron fluence of  $3.429 \times 10^{19}$  n/cm<sup>2</sup> at EOLE, the existing withdrawal schedule to remove W-80 at  $3.06 \times 10^{19}$  n/cm<sup>2</sup> would not meet ASTM E 185-82 requirements, which specify that the final capsule be withdrawn between one and two times the maximum end-of-life RV fluence.

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### **Proposed Revision to Palisades Nuclear Plant Reactor Vessel Surveillance Capsule Withdrawal Schedule**

The proposed withdrawal schedule would meet ASTM E 185-82 capsule withdrawal requirements because it would remove capsule W-80 at approximately 35.2 EFPY with a fluence of approximately  $3.65 \times 10^{19}$  n/cm<sup>2</sup>, which is between one ( $3.429 \times 10^{19}$  n/cm<sup>2</sup>) and two times ( $6.858 \times 10^{19}$  n/cm<sup>2</sup>) the maximum RV neutron fluence at EOLE, as required by ASTM E 185-82. Under current projections, 35.2 EFPY of plant operating time would be reached by the end of fuel cycle 29.

Note that, in Reference 4, pursuant to 10 CFR 50.82(a)(1)(i) and 10 CFR 50.4(b)(8), Entergy certified in a letter to the NRC that it plans to permanently cease power operations at PNP no later than May 31, 2022. This planned permanent shutdown would occur following fuel cycle 28.

### **Conclusion**

The proposed withdrawal schedule for PNP RV surveillance capsule W-80 would comply with the surveillance capsule withdrawal schedule criteria specified in ASTM E185-82, as required by 10 CFR 50 Appendix H.

### **References**

1. Entergy Nuclear Operations, Inc. letter, "Updated Palisades Reactor Vessel Pressurized Thermal Shock Evaluation," (ADAMS Accession Number ML110060692), December 20, 2010
2. NRC letter, "Updated Reactor Pressure Vessel Pressurized Thermal Shock Evaluation for Palisades Nuclear Plant," (ADAMS Accession Number ML112870050), December 7, 2011
3. NRC letter, "Palisades Nuclear Plant – Approval of Proposed Reactor Vessel Surveillance Capsule Withdrawal Schedule," (ADAMS Accession Number ML071640310), August 14, 2007
4. Entergy Nuclear Operations, Inc. letter, PNP 2017-065, "Supplement to Certification of Permanent Cessation of Power Operations," (ADAMS Accession No. ML17292A032), dated October 19, 2017