



Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089

February 4, 2019

L-PI-19-003
10 CFR 50, Appendix H

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

Prairie Island Nuclear Generating Plant, Units 1 and 2
Docket Nos. 50-282 and 50-306
Renewed Facility Operating License Nos. DPR-42 and DPR-60

Request for Revision to Reactor Vessel Material Surveillance Capsule Removal
Schedule for Prairie Island Nuclear Generating Plant (PINGP)

Pursuant to 10 CFR 50 Appendix H, "Reactor Vessel Material Surveillance Program Requirements," Section III.B.3, and License Renewal License Condition 2.C.(8)(c) of PINGP Unit 1 and Unit 2 renewed facility operating licenses, Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), hereby requests NRC approval for a revision to the PINGP Unit 1 and Unit 2 reactor vessel material surveillance capsule removal schedules. The details of the proposed schedule are included in the enclosure to this letter. Based on the evaluation in the enclosure to this letter, NSPM concludes that the proposed removal schedule meets the requirements of American Society for Testing and Materials (ASTM) E 185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels."

NSPM requests approval of the revised schedule by March 18, 2020, to allow removal of surveillance capsules beginning with PINGP Unit 1 refueling outage 1R32 in 2020.

Summary of Commitments

This letter contains no new commitment and no change to an existing commitment.

If there are any questions or if additional information is needed, please contact Mr. Jeff Kivi at 612-330-5788.

A handwritten signature in black ink, appearing to read "Scott Sharp". The signature is fluid and cursive, with a large initial "S" and a long, sweeping underline.

Scott Sharp
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC

ENCLOSURE 1

PROPOSED REVISION TO THE PRAIRIE ISLAND REACTOR VESSEL MATERIAL SURVEILLANCE CAPSULE REMOVAL SCHEDULE

1.0 BACKGROUND

Appendix H to 10 CFR 50, "Reactor Vessel Material Surveillance Program Requirements," (Reference 1) describes reactor vessel material surveillance program requirements. Paragraph (III)(B)(3) of Reference 1 states that a proposed material removal schedule must be submitted with a technical justification as per 10 CFR 50.4, and approved prior to implementation. Prairie Island Nuclear Generating Plant (PINGP) Unit 1 and Unit 2 renewed facility operating licenses License Renewal License Condition 2.C.(8)(c) also states that any changes to the capsule removal schedule, including spare capsules, must be approved by the NRC prior to implementation.

The design of the reactor vessel surveillance program and the removal schedule must meet the requirements of the edition of American Society for Testing and Materials (ASTM) standard ASTM E 185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," that was current on the issue date of the American Society of Mechanical Engineers (ASME) Code to which the reactor vessel was purchased. The applicable ASTM E 185 version for PINGP, Unit 1 and Unit 2, is ASTM E 185-70. In addition, to the extent practicable, the test procedures and reporting requirements for each capsule removal must comply with ASTM E 185-82 (Reference 2). Tables 1 and 2, which were obtained from the PINGP Pressure and Temperature Limits Report, show the current removal schedule for the PINGP, Unit 1 and Unit 2, respectively, reactor vessel surveillance capsules.

Table 1
Current Unit 1 Reactor Vessel Material Surveillance Capsule Removal Schedule

| Capsule | Capsule Location (degree) | Lead Factor ^(a) | Withdrawal EFPY ^(b) | Fluence ^(a) (n/cm ² , E> 1.0 MeV) |
|---------|---------------------------|----------------------------|--------------------------------|---|
| V | 77 | 2.94 | 1.34 | 5.630 E18 ^(c) |
| P | 247 | 1.72 | 4.60 | 1.318 E19 ^(c) |
| R | 257 | 2.99 | 8.56 | 4.478 E19 ^(c) |
| S | 57 | 1.77 | 18.12 | 4.017 E19 ^(c) |
| T | 67 | 1.89 | Standby | --- |
| N | 237 | 1.77 | Standby | --- |

Reactor Vessel Material Surveillance Capsule Removal Schedule Revision

Table 2
Current Unit 2 Reactor Vessel Material Surveillance Capsule Removal Schedule

| Capsule | Capsule Location (degree) | Lead Factor ^(d) | Withdrawal EFPY ^(b) | Fluence ^(d) (n/cm ² , E> 1.0 MeV) |
|---------|---------------------------|----------------------------|--------------------------------|---|
| V | 77 | 2.95 | 1.39 | 6.206 E18 ^(c) |
| T | 67 | 1.75 | 4.00 | 1.199 E19 ^(c) |
| R | 257 | 2.99 | 8.81 | 4.376 E19 ^(c) |
| P | 247 | 1.84 | 17.24 | 4.165 E19 ^(c) |
| N | 237 | 1.72 | Standby | --- |
| S | 57 | 1.72 | Standby | --- |

Notes for Table 1 and Table 2:

- (a) Updated in Capsule S dosimetry analysis.
- (b) Effective Full Power Years (EFPY) from plant startup.
- (c) Plant specific evaluation.
- (d) Updated in Capsule P dosimetry analysis.

2.0 PROPOSED REVISION TO REMOVAL SCHEDULE

Table 3 and Table 4 provide the proposed revision to the reactor vessel surveillance capsule removal schedules for Unit 1 and Unit 2, respectively. The proposed removal schedule satisfies the requirements of ASTM E185-70 (the version in place when the reactor vessels were purchased) and ASTM E185-82. Therefore, the removal schedule satisfies the requirements of Appendix H to 10 CFR Part 50. See Section 3.0, below, for additional details.

Table 3
Proposed Unit 1 Reactor Vessel Material Surveillance Capsule Removal Schedule

| Capsule | Capsule Location (degree) | Lead Factor | Withdrawal EFPY ^(b) | Fluence (n/cm ² , E> 1.0 MeV) |
|---------|---------------------------|-------------|--------------------------------|--|
| V | 77 | 2.94 | 1.34 | 5.630 E18 ^(a) |
| P | 247 | 1.72 | 4.60 | 1.318 E19 ^(a) |
| R | 257 | 2.99 | 8.56 | 4.478 E19 ^(a) |
| S | 57 | 1.77 | 18.12 | 4.017 E19 ^(a) |
| T | 67 | 1.89 | Standby | --- |
| N | 237 | 1.77 | 39.90 to 43.60 | 7.54 E19 to 8.11E19 |

Note that a previous attempt to remove Unit 1 Capsule T was not successful and NSPM considers Capsule T to be stuck.

Table 4
Proposed Unit 2 Reactor Vessel Material Surveillance Capsule Removal Schedule

| Capsule | Capsule Location (degree) | Lead Factor | Withdrawal EFPY ^(b) | Fluence (n/cm ² , E> 1.0 MeV) |
|---------|---------------------------|-------------|--------------------------------|--|
| V | 77 | 2.95 | 1.39 | 6.206 E18 ^(d) |
| T | 67 | 1.75 | 4.00 | 1.199 E19 ^(d) |
| R | 257 | 2.99 | 8.81 | 4.376 E19 ^(d) |
| P | 247 | 1.84 | 17.24 | 4.165 E19 ^(d) |
| N | 237 | 1.72 | 40.59 to 44.29 | 7.32 E19 to 7.88 E19 |
| S | 57 | 1.72 | Standby | --- |

Notes for Table 3 and Table 4:

- (a) Updated in Capsule S dosimetry analysis.
- (b) Effective Full Power Years (EFPY) from plant startup.
- (c) Not used.
- (d) Updated in Capsule P dosimetry analysis.

3.0 TECHNICAL JUSTIFICATION

The NRC issued PINGP Unit 1 and Unit 2 renewed facility operating licenses on June 27, 2011. As a result of the extending the operating life of PINGP Unit 1 and Unit 2 to 60 years, the PINGP reactor vessels will be subjected to additional neutron fluence. NSPM proposes to withdraw Capsule N from Unit 1 and Capsule N from Unit 2 in accordance with Reference 2. The remaining spare capsules (one per unit) will remain in the reactor vessels.

The proposed surveillance capsule removal schedule is based on the requirements specified in Reference 2, Section 7.6. Six surveillance capsules were installed in each unit at PINGP. Four capsules have been removed per the established removal schedule. The last capsule to be removed from Unit 1 was Capsule S at 18.12 EFPY and the last capsule removed from Unit 2 was Capsule P at 17.24 EFPY. Guidance from Reference 4, section XI.M31, "Reactor Vessel Surveillance," was used to determine capsule withdrawals after 40 years of operation.

In accordance with the requirements of Reference 2, Section 7.6.2, NSPM proposes to remove one of the remaining capsules from each unit when its neutron fluence exposure exceeds the new peak end-of-life (EOL) 54 EFPY vessel fluence¹, but prior to exceeding twice that fluence exposure. The maximum reactor vessel fluence at 54 EFPY is projected to be 5.162 E19 n/cm² (E>1.0 MeV) for Unit 1 and 5.196 E19 n/cm² (E>1.0 MeV) for Unit 2. Twice that fluence exposure is 1.032 E20 n/cm² for Unit 1 and 1.039 E20 n/cm² for Unit 2. An evaluation conducted by NSPM concluded that in order

¹ The 60-year vessel fluence is 54 effective full-power years (EFPY). I.E., 60 years operation with an assumed 90% capacity factor.

Reactor Vessel Material Surveillance Capsule Removal Schedule Revision

to meet these fluence requirements and industry adopted guidelines of Reference 3, a capsule may be removed for testing in one of the following refueling outages (years):

| <u>Unit 1</u> | <u>Unit 2</u> |
|---------------|---------------|
| 1R32 (2020) | 2R32 (2021) |
| 1R33 (2022) | 2R33 (2023) |
| 1R34 (2024) | 2R34 (2025) |

After capsule removal, the surveillance specimens will be tested in accordance with the requirements of References 1, 2, and 3. The results of materials testing, fluence analysis, and effective full power years (EFPY) from startup are used to predict the effects of neutron embrittlement through the end of extended life.

4.0 REFERENCES

1. Appendix H to 10 CFR 50, "Reactor Vessel Material Surveillance Program Requirements."
2. ASTM E185-82, Annual Book of ASTM Standards, Section 12, Volume 12.02, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels."
3. EPRI TR-1022871, "Materials Reliability Program: Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines (MRP-326)."
4. NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Revision 2.