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July 2, 2015

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

Serial No.: 15-314
NLOS/WDC: R0
Docket No.: 50-423
License No.: NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3
REVISION TO REACTOR VESSEL SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE

Dominion Nuclear Connecticut, Inc. (DNC) requests Nuclear Regulatory Commission (NRC) review and approval of the attached revision to the surveillance capsule removal schedule for Millstone Power Station Unit 3 (MPS3). Facility Operating License No. NPF-49 Paragraph 2.C.(9) for MPS3 states in part, "Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation." The proposed reactor vessel surveillance capsule removal schedule was developed to obtain high fluence surveillance data to populate the embrittlement trend curve as described in MRP-326, "Materials Reliability Program: Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines," while continuing to meet 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," dated July 1, 1982.

DNC plans to remove standby Capsule Z from the reactor and reinstall standby Capsule Y into the reactor from the spent fuel pool during the spring 2016 refueling outage. Standby Capsule Z test specimens will be stored at the vendor facility for future testing if needed. Standby Capsule Z dosimeters will be analyzed to maintain the quality and accuracy of the dosimetry analysis. In accordance with 10 CFR 50 Appendix H, paragraph IV.A, DNC will submit the results of the standby Capsule Z dosimetry analysis to the NRC within one year of the capsule withdrawal date.

DNC requests approval of the revision to the capsule withdrawal schedule by January 31, 2016 to support implementation during the spring 2016 outage.

If you should have any questions regarding this submittal, please contact Wanda Craft at (804) 273-4687.

Sincerely,

Mark D. Sartain
Vice President – Nuclear Engineering

A008
NRR

Attachment:

Proposed Revision to the Millstone Power Station Unit 3 Reactor Vessel Surveillance Program

Commitments contained in this letter: None

cc: U.S. Nuclear Regulatory Commission
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ATTACHMENT

PROPOSED REVISION TO THE MILLSTONE POWER STATION UNIT 3 REACTOR VESSEL SURVEILLANCE PROGRAM

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

Proposed Revision to the Millstone Power Station Unit 3, Reactor Vessel Surveillance Program

1. Background

Appendix H to 10 CFR Part 50 describes reactor vessel (RV) material surveillance program requirements. Paragraph (III)(B)(3) of this appendix states that a proposed material withdrawal schedule must be submitted with a technical justification per 10 CFR 50.1, and approved prior to implementation. In addition, the Millstone Power Station Unit 3 (MPS3) Renewed Facility Operating License No. NPF-49 Paragraph 2.C.(9) states in part, "Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation."

The MPS3 surveillance capsule program was originally designed in accordance with ASTM E185-82 and 10 CFR 50 Appendix H. The program consists of the following:

- Three scheduled capsules (already removed and tested) to meet the above requirements for a design life of 54 EFPY.
- Three additional standby capsules.

The contents of the capsules are outlined in MPS3 FSAR Section 5.3.1.6.

Industry has developed a Coordinated PWR Reactor Vessel Surveillance Program (CRVSP), which is documented in *MRP-326, Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines* [Ref. 1]. The purpose of CRVSP is to allow an increase in the fluence levels of future surveillance capsules prior to withdrawal while maintaining compliance with 10 CFR 50 Appendix H. CRVSP will help generate high fluence PWR vessel surveillance data in support of extended life operations.

The MPS3 surveillance capsules are subject to a high lead factor (greater than 4). This creates the potential for standby capsules to no longer meet the requirement of ASTM E185-82, Section 3.1 which states "the [surveillance capsule] tests yield results useful for the evaluation of radiation effects on the reactor vessel." In order to support potential plant operation beyond 60 years, a management strategy is needed to maximize the useful data that can be obtained from the standby capsules.

2. Current Program / Withdrawal Schedule

Prior to initial start-up, six surveillance capsules containing beltline materials fabricated from ASME SA-533 Grade B Class 1 (low copper) and Linde 91 flux (low copper) were inserted in the MPS3 reactor vessel. Three of the six surveillance capsules (U, X and W) have been removed and tested [Refs. 2, 3 and 4]. Table 1

shows the currently approved withdrawal schedule for the MPS3 reactor vessel surveillance capsules. Capsule W was withdrawn and tested after 13.8 effective full power years (EFPY) with accrued fluence of 3.16 x 10^{19} n/cm^2. Standby capsules Y and V were withdrawn after 13.8 EFPY (end of cycle (EOC) 10, October, 2005) and placed into storage. Capsules Y and V have accrued fluence of 2.98 x 10^{19} n/cm^2 and are available for reinsertion.

3. Requested Changes to Program / Withdrawal Schedule

Table 2 provides the proposed revision to the reactor vessel surveillance capsule withdrawal schedule. The revised schedule is proposed to employ Capsule Z to support potential future plant operation of 80 years or more, to continue satisfying the requirements of ASTM E185-82, and to be prepared for potential future implementation of ASTM E185-10. Withdrawal of Capsule Z will preclude the capsule fluence from exceeding two times end-of-life estimated peak reactor vessel fluence. Concurrent reinsertion of Capsule Y will maintain continuous reactor vessel fluence monitoring as required by 10 CFR 50 Appendix H.

4. Justification

The most recent detailed review of the MPS3 reactor vessel surveillance program was performed and documented in support of the MPS3 stretch power uprate in November 2008. From the recent review, 72 EFPY and 90 EFPY maximum reactor vessel beltline fast neutron fluence was estimated to be 3.57 x 10^{19} n/cm^2 and 4.45 x 10^{19} n/cm^2, respectively. At EOC 17, spring 2016, the fast neutron fluence for Capsule Z at the core midplane is estimated to be 5.37 x 10^{19}n/cm^2. Removal of Capsule Z at EOC 17 will provide capsule fluence that is within one and two times the estimated 80 year life (72 EFPY) and estimated 100 year life (90 EFPY) peak reactor vessel fluence. Reinsertion of Capsule Y at EOC 17 will maintain continuous reactor vessel fluence monitoring as required by 10 CFR 50 Appendix H.

MPS3 Capsule Z is included in MRP-326 Table 4-1 as a potential candidate to support the CRVSP surveillance program. However, Capsule Z was not selected to support the program. Withdrawal of Capsule Z at EOC 17 is consistent with the intent of CRVSP to provide high fluence data of SA-533 Grade B Class 1 with low copper.

References:

1. *Materials Reliability Program: Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines (MRP-326)*. EPRI, Palo Alto, CA: 2011. 1022871
2. WCAP-11878, *Analysis of Capsule U from the Northeast Utilities Service Company Millstone Unit 3 Reactor Vessel Radiation Surveillance Program*, June 1988
3. WCAP-15405, *Analysis of Capsule X from the Northeast Utilities Service Company Millstone Unit 3 Reactor Vessel Radiation Surveillance Program*, May 2000
4. WCAP-16629, *Analysis of Capsule W From The Dominion Nuclear Connecticut Millstone Unit 3 Reactor Vessel Radiation Surveillance Program*, September 2006

Table 1: Current Millstone Unit 3 Reactor Vessel Surveillance Capsule Withdrawal Schedule

CAPSULATE	LOCATION	LEAD FACTOR[a]	REMOVAL TIME (EFPY)[b]	FLUENCE (n/cm2,E>1.0MeV)[a]
U	58.5°	4.31	1.3	4.49×10^{18}[c]
X	238.5°	4.37	8.0	2.21×10^{19}[c]
W	121.5°	4.32	Approx. 14.0	3.76×10^{19}[c, d]
Y[e]	241°	4.11	Standby	
V[e]	61°	4.11	Standby	
Z[e]	301.5°	4.32	Standby	

a. Updated in Capsule X dosimetry analysis.
b. Effective Full Power Years (EFPY) from plant startup.
c. Plant specific evaluation.
d. This projected fluence is not less than once or greater than twice the peak end of license fluence, and is approximately equal to the peak vessel fluence at 54 EFPY.
e. These capsules will be at the approximate 54 EFPY peak surface (i.e., clad/base metal interface) fluence when capsule W is withdrawn.

Table 2: Proposed Millstone Unit 3 Reactor Vessel Surveillance Capsule Withdrawal Schedule

CAPSULE	LOCATION	LEAD FACTOR[a]	REMOVAL TIME (EFPY)[b]	FLUENCE (n/cm2,E>1.0MeV)[a]
U	58.5°	4.06	1.3	4.00×10^{18}[c]
X	238.5°	4.35	8.0	1.98×10^{19}[c]
W	121.5°	4.22	13.8	3.16×10^{19}[c, d]
Y[e][f]	241°	3.98	Standby	Footnote (i)
V[e]	61°	3.98	Standby	
Z[g]	301.5°	4.22	Approx. 23.4	5.37×10^{19}[h]

a. Updated in Capsule W dosimetry analysis.
b. Effective Full Power Years (EFPY) from plant startup.
c. Plant specific evaluation.
d. This fluence is not less than once or greater than twice the peak end of license fluence, and is approximately equal to the peak vessel fluence at 63 EFPY.
e. Capsules Y and V were withdrawn after 13.80 EFPY (EOC 10) and placed into storage after accruing 2.98×10^{19} n/cm^2 fluence.
f. Capsule Y was reinserted into its original location (241°) at EOC 17 (approximately 23.4 EFPY).
g. Capsule Z was withdrawn at approximately 23.4 EFPY (EOC 17) after accruing approximately 5.37×10^{19} n/cm^2 fluence. Dosimetry analysis was performed and the test specimens placed into vendor storage for future testing.
h. This projected fluence is greater than once and less than twice the projected 72 EFPY and 90 EFPY peak vessel fluence.
i. Capsule Y is installed for fluence monitoring during the operating license in accordance with ASTM E 185-82.