



February 5, 2013

10 CFR 50 Appendix H

SBK-L-13013

Docket No. 50-443

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

Seabrook Station

Revision to Reactor Vessel Surveillance Capsule Withdrawal Schedule

References:

1. *Materials Reliability Program: Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines (MRP-326)*. EPRI, Palo Alto, CA: 2011. 1022872

Pursuant to 10 CFR 50, Appendix H, III.C.3, NextEra Energy Seabrook, LLC (NextEra) is requesting Nuclear Regulatory Commission (NRC) review and approval of the enclosed revision to the surveillance capsule removal schedule for Seabrook Station Unit 1. The proposed reactor vessel surveillance capsule removal schedule was developed to implement recommendations for Seabrook Unit 1 in *MRP-326, Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines*. MRP-326 addresses the need for reactor vessel property data at fluence values representative of 60 years of operation and beyond for Seabrook Unit 1 and the industry. The requested change to the Appendix H program for Seabrook Station Unit 1 satisfies 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, and is consistent with the guidance of NUREG-1801, Rev. 2, *Generic Aging Lessons Learned*.

A similar type request was submitted by Omaha Public Power District for Fort Calhoun Station, Unit 1 [ML12040A317].

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments. Seabrook Station submitted a 60-year (55EFPY) license renewal application in May 2010. The proposed reactor vessel surveillance capsule removal schedule change conforms to the Reactor Vessel Surveillance Program enhancements identified in the Appendix B – Aging Management Programs of the License Renewal Application.

Should you have any questions regarding this letter, please contact me at (603) 773-7745.

Sincerely,

NextEra Energy Seabrook, LLC



Michael O'Keefe
Licensing Manager

Enclosure

cc: NRC Region I Administrator
J. G. Lamb, NRC Project Manager, Project Directorate I-2
NRC Senior Resident Inspector

Mr. Christopher M. Pope, Director Homeland Security and Emergency Management
New Hampshire Department of Safety
Division of Homeland Security and Emergency Management
Bureau of Emergency Management
33 Hazen Drive
Concord, NH 03305

John Giarrusso, Jr., Nuclear Preparedness Manager
The Commonwealth of Massachusetts
Emergency Management Agency
400 Worcester Road
Framingham, MA 01702-5399

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I. Background

Appendix H to 10 CFR Part 50 describes reactor vessel 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 50.4, and approved prior to implementation.

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* [Enclosure Reference 1]. The purpose of the CRVSP is to increase the fluence levels of future surveillance capsules at withdrawal while maintaining compliance with 10 CFR 50 Appendix H and consistent with the guidance of NUREG-1801, Rev. 2, GALL Report. The CRVSP will help generate high fluence PWR surveillance data in support of extended life operations.

II. Current Program / Withdrawal Schedule

Six surveillance capsules containing beltline materials fabricated from ASME SA-533 Grade B Class 1 (low Cu) and Linde 91 flux (low Cu) were inserted in the Seabrook Station reactor prior to initial start-up. Half of the six surveillance capsules (U, Y and V) have been removed and tested [Enclosure References 2 and 3]. Table 1 shows the currently approved withdrawal schedule for the Seabrook Station reactor vessel surveillance capsules. At present Capsule X is planned to be removed and tested at the end of cycle 16 (21 EFPY) at a projected fluence of 4.74×10^{19} n/cm².

III. Requested Changes to Program / Withdrawal Schedule

Table 2 provides the proposed revision to the reactor vessel surveillance capsule withdrawal schedule. The revised schedule is based on the recommendations for Seabrook Station in MRP-326 and reflects updated fluence information from the surveillance capsule (Capsule V) removed in 2005 and recent calculated neutron fluence projections derived in WCAP-17441-NP [Enclosure Reference 4]. As shown below in Section IV, the proposed withdrawal schedule satisfies the requirements of ASTM E 185-79, the version that was current at the time the reactor vessels were designed. Therefore, the withdrawal schedule satisfies the requirements of Appendix H to 10 CFR Part 50.

IV. Justification

The Seabrook Station reactor vessel was designed to the 1972 edition of the American Society of Mechanical Engineers Code. American Society for Testing and Materials E 185-79 was the current standard when the surveillance program was designed. As stated in the Seabrook Station Updated Final Safety Analysis Report, the reactor vessel surveillance program meets the requirements of ASTM E 185-79.

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The guidance provided in ASTM E 185-82 is consistent with, but more specific than, the guidance provided in earlier editions, including ASTM E 185-79 to which the Seabrook Station reactor vessel surveillance program is required to conform. Therefore, compliance with the ASTM E185-82 withdrawal schedule guidance ensures compliance with ASTM E 185-79 withdrawal schedule guidance.

Following the guidance provided in *MRP-326*, the projected 2x60-year peak Reactor Vessel fluence and year of withdrawal were estimated. The latest Calculated Neutron Fluence and Future Fluence Projections were developed in WCAP-17441-NP. The projected 2x60 year peak Reactor Vessel fluence is 6.14×10^{19} n/cm² which is twice the projected 60-year (55 EFPY) peak fluence of 3.07×10^{19} n/cm², reported in Table 2-3 of WCAP-17441-NP. Using the capsule lead factor and the linear relationship between the reported maximum fluence values and their corresponding EFPY values in WCAP-17441-NP Table 2-3, the EFPY required for Capsule X to reach 6.14×10^{19} n/cm² was calculated to be 26.66. Assuming a 0.95 capacity factor starting in 2005 and the projected removal EFPY of 26.66, Capsule X should reach the specified fluence at the end of cycle 20, which is estimated to be in 2020.

This requested change in the Seabrook Station Reactor Vessel Surveillance Program Capsule Withdrawal Schedule supports the goal of EPRI MRP to coordinate the withdrawal schedules of remaining surveillance capsules so that pressurized water reactor (PWR) high fluence surveillance data is available to develop future Reactor Vessel embrittlement trend curves.

Enclosure References:

- 1) *Materials Reliability Program: Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines (MRP-326)*. EPRI, Palo Alto, CA: 2011. 1022872
- 2) DES-NFQA-98-01 "Analysis of Seabrook Station Unit 1 Reactor Vessel Surveillance Capsules U and Y" May 1998
- 3) WCAP-16526, *Analysis of Capsule V from FPL Energy – Seabrook Unit 1 Reactor Vessel Radiation Surveillance Program*", March 2006 [ML06103000088].
- 4) WCAP-17441-NP, "Seabrook Unit 1 Heatup and Cooldown Limit Curves for Normal Operation" October 2011 [ML12341A095].

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Table 1: Current Seabrook Station Withdrawal Schedule

Surveillance Capsule	Vessel Azimuthal Location (degrees)	Lead Factor ^(a)	Removal Time (EFPY) ^(b)	Removal After Operation of Cycle	Fluence (n/cm ²)
U	58.5	3.96	0.91	1	3.142x10 ^{18(c)}
Y	241	3.74	5.57	5	1.292x10 ^{19(c)}
V	61	3.78	12.39	10	2.669x10 ^{19(c)}
X	238.5	4.11	21 ^(d)	16	4.740x10 ^{19(d)}
W	121.5	4.10	Standby ^(e)	(e)	(e)
Z	301.5	4.10	Standby ^(e)	(e)	(e)

Notes

- (a) Updated in Capsule V dosimetry analysis.
- (b) Effective Full-Power Years (EFPYs) from plant startup.
- (c) Actual plant evaluation calculated fluence
- (d) Estimated removal of Capsule X near 21 EFPYs at End-of-Cycle 16. Capsule fast fluence approaches a factor of 2 times the maximum vessel base metal IR fast fluence at 32 EFPYs.
- (e) Capsules W and Z to be withdrawn within one cycle of the removal of Capsule X. Upon removal, Capsules W and Z to be placed in storage.

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Table 2: Requested Seabrook Station Withdrawal Schedule (Changes shown in **BOLD font**)

Surveillance Capsule	Vessel Azimuthal Location (degrees)	Lead Factor ^(a)	Removal Time (EFPY) ^(b)	Removal After Operation of Cycle	Fluence (n/cm ²)
U	58.5	3.96	0.91	1 (1991)	3.142x10 ^{18(c)}
Y	241	3.74	5.57	5 (1997)	1.292x10 ^{19(c)}
V ^(f)	61	3.78	12.39	10 (2005)	2.669x10 ^{19(c)}
X ^(f)	238.5	4.11	27^(d)	20	6.140x10^{19(d)}
W ^(f)	121.5	4.10	Standby ^(e)	(e)	(e)
Z ^(f)	301.5	4.10	Standby ^(e)	(e)	(e)

Notes

- (a) Updated in Capsule V dosimetry analysis.
- (b) Effective Full-Power Years (EFPYs) from plant startup.
- (c) Actual plant evaluation calculated fluence
- (d) Estimated removal of Capsule X near **27 EFPYs at End-of-Cycle 20**. Capsule fast fluence approaches a factor of 2 times the maximum vessel base metal IR fast fluence at **55 EFPYs**.
- (e) Capsules W and Z to be withdrawn within **three** cycles of the removal of Capsule X. Upon removal, Capsules W and Z to be placed in storage.
- (f) **All pulled (and tested) capsules, unless discarded before August 31, 2000 are to be placed in storage.**