Enclosure 7 to SBK-L-15073

Non-Proprietary Class 3 Westinghouse Report (PWROG-15023-NP, Revision 1) Seabrook Station Unit 1 Summary Report For the Fuel Design/Fuel Management Assessments to Demonstrate MRP-227-A Applicability

(Non-Proprietary)

PRESSURIZED WATER REACTOR OWNERS GROUP

PWROG-15023-NP
Revision 1

WESTINGHOUSE NON-PROPRIETARY CLASS 3

Seabrook Station Unit 1 Summary Report for the Fuel Design / Fuel Management Assessments to Demonstrate MRP-227-A Applicability

Materials Committee

PA-MSC-0983, Revision 1, Task 7

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PWROG-15023-NP
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Seabrook Station Unit 1 Summary Report for the Fuel Design / Fuel Management Assessments to Demonstrate MRP-227-A Applicability

PA-MSC-0983, Revision 1, Task 70983, Revision 1, Task 7

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1 MRP 2013-025 Guidance Text Demonstrating MRP-227-A Applicability for Seabrook Unit 1 Reactor Internals Aging Management Fuel Design / Fuel Management Assessments

In Request for Additional Information (RAI) LRA Appendix B-1 [1], the U.S. Nuclear Regulatory Commission (NRC) advised NextEra Energy Seabrook, LLC that the Applicant/Licensee Action Items (A/LAIs) for MRP-227-A would need to be resolved as part of the staff's review of the Aging Management Program (AMP) for the Reactor Vessel Internals (RVI) as part of the License Renewal Application (LRA) for Seabrook Station Unit 1.

> **RAI LRA Appendix B-1 – Aging Management of Reactor Vessel Internals:**
>
> *The staff requests that the applicant provide either an LRA amendment or an update that includes updated AMP and AMR items for the PWR RVI components at the Seabrook Station that are based on the guidance in LR-ISG-2011-04, including responses to applicable Applicant/License Actions Items identified in the staff's SE for MRP-227 dated December 16, 2011.*

The NRC staff indicated [2] that information provided by the industry to the NRC staff demonstrated that the MRP-227-A Inspection and Evaluation (I&E) Guidelines are applicable for the range of conditions expected at the currently operating Westinghouse and Combustion Engineering-deigned plants in the United States. As a result of technical discussions with the NRC staff, the basis for a plant to respond to the NRC's RAI to demonstrate compliance with MRP-227-A for originally licensed and uprated conditions was determined to be satisfied with plant-specific responses to the following two questions [2 and 3]:

1. Does the plant have non-weld or bolting austenitic stainless steel (SS) components with 20 percent cold work or greater, and, if so, do the affected components have operating stresses greater than 30 ksi? (If both conditions are true, additional components may need to be screened in for stress corrosion cracking, SCC).

2. Does the plant have atypical fuel deign or fuel management that could render the assumptions of MRP-227-A, regarding core loading/core design, non-representative for that plant?

1.1 Seabrook Unit 1 Evaluation for Question 2

Westinghouse has evaluated the Seabrook Station Unit 1 (NAH) reactor internals components with regard to fuel designs and fuel management according to industry guideline MRP 2013-025 [4].

Seabrook Unit 1 has not utilized atypical fuel design or fuel management that could make the assumptions of MRP-227-A regarding core loading/core design non-representative for that unit, including power changes/uprates that have occurred over the operating lifetime of the unit. This conclusion is based on comparisons of the Seabrook Unit 1 core geometry and operating characteristics with the MRP-227-A applicability guidelines for Westinghouse-designed reactors specified in MRP 2013-025 [4].

Specifically, the following comparisons with the MRP-227-A applicability guidelines in MRP 2013-025 [4] were established for the key reactor internals components at Seabrook Unit 1.

1.1.1 Components Located Beyond the Outer Radius of the Reactor Core

Guideline 1 - The reactor has been operated with out-in fuel management for thirty effective full-power years or less and all future operation will use low leakage fuel management.

Comparison - Seabrook Unit 1 initiated low leakage fuel management strategy in the fourth fuel cycle following 2.99 effective full-power years (EFPY) of operation and has been implementing low leakage core designs since that time. There are no current plans to return to out-in fuel management.

Guideline 2 - For operation going forward the average power density of the reactor core (as defined in MRP 2013-025 [4]) shall remain less than 124 W/cm^3.

Comparison - For the last six operating fuel cycles (Cycles 12 through 17), Seabrook Unit 1 has been operating at a rated power level of 3648 MWt. For the 193 fuel assembly Seabrook Unit 1 core geometry, the 3648 MWt power level corresponds to a core power density of 111.8 W/cm^3. This level of power generation is also representative of anticipated future operation.

Guideline 3 - For operation going forward, the nuclear heat generation rate figure of merit (HGR-FOM) (as defined in MRP 2013-025 [4]) shall not exceed 68 W/cm^3.

Comparison - For the last six operating fuel cycles at Seabrook Unit 1, the HGR-FOM at key baffle locations has ranged between [ ]^{a,c}. This range of HGR-FOM is representative of anticipated future operation.

1.1.2 Components Located Above the Reactor Core

Guideline 1 - Considering the entire operating lifetime of the reactor, the average power density of the core (as defined in MRP 2013-025 [4]) shall remain less than 124 W/cm^3 for a period of more than two effective full-power years.

Comparison - Over the operating lifetime of the Seabrook Unit 1 reactor, the rated core power level, including power uprates, has varied between 3411 MWt and 3648 MWt. This variation of rated power level corresponds to a power density range of 104.5 W/cm^3 to 111.8 W/cm^3.

Guideline 2 - Considering the entire operating lifetime of the reactor, the distance between the top of the active fuel stack and the bottom of the upper core plate (UCP) shall not be less than 12.2 inches for a period of more than two effective full-power years.

Comparison - For the Seabrook Unit 1 reactor internals and fuel assembly geometry, the nominal distance between the top of the active fuel stack and the bottom of the upper core plate (UCP) averaged over the first 17 fuel cycles of operation was [ ]^{a,c}. During that period of time the nominal distance between the UCP and the top of the active fuel was not less than 12.2 inches for an operating period of more than two effective full-power years.

1.1.3 Components Located Below the Reactor Core

Based on the discussion provided in MRP 2013-025 [4], plant-specific applicability of MRP-227-A for components located below the reactor core with no further evaluation required is demonstrated by meeting the MRP-227-A, Section 2.4 criteria.

2 References

1. U.S. NRC Letter, "Request for Additional Information Related to the Review of the Seabrook Station License Renewal Application – Set 21 (TAC NO. ME4028)," April 25, 2014 (NRC ADAMS Accession No. ML14101A324)

2. U.S. NRC Presentation, "Status of MRP-227-A Action Items 1 and 7," June 5, 2013. (NRC ADAMS Accession No. ML13154A152)

3. U.S. NRC Letter, "Summary of February 25, 2013 Telecom with the Electric Power Research Institute and Westinghouse Electric Company," March 15, 2013. (NRC ADAMS Accession No. ML13067A262)

4. EPRI Letter, MRP 2013-025, "MRP-227-A Applicability Template Guideline," October 14, 2013.