NEXTera ENERGY SEABROOK

March 22, 2011

SBK-L-11054
Docket No. 50-443

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Seabrook Station
Response to Request for Additional Information
NextEra Energy Seabrook License Renewal Application
Request for Additional Information – Set 10

References:

1. NextEra Energy Seabrook, LLC letter SBK-L-10077, "Seabrook Station Application for Renewed Operating License," May 25, 2010. (Accession Number ML101590099)

2. NRC Letter "Request for Additional Information Related to the Review of the Seabrook Station License Renewal Application (TAC NO. ME4028) – Request for Additional Information Set 10," February 24, 2011. (Accession Number ML110260266)

3. NextEra Energy Seabrook, LLC letter SBK-L-11002, "Response to Request for Additional Information NextEra Energy Seabrook License Renewal Application Aging Management Programs – Set 4," January 13, 2011. (Accession Number ML110140809)

In Reference 1, NextEra Energy Seabrook, LLC (NextEra) submitted an application for a renewed facility operating license for Seabrook Station Unit 1 in accordance with the Code of Federal Regulations, Title 10, Parts 50, 51, and 54.

In Reference 2, the NRC requested additional information in order to complete its review of the License Renewal Application (LRA). Enclosure 1 contains NextEra's response to the request for additional information and associated changes made to the LRA. For clarity, deleted LRA text is highlighted by strikethroughs and inserted texts highlighted by bold italics.

Based on discussion with the Staff, NextEra Energy Seabrook has made changes to LRA Appendix B – Aging Management Programs, which are contained in Enclosure 2 of this letter.

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In Reference 3, NextEra Energy Seabrook provided a response to RAI B.2.1.10-2. Based on discussions with the staff and recognizing that the EPRI Steam Generator Management Program study and resolution of SG divider plate crack growth is still under development, NextEra Energy Seabrook is revising the previous response to RAI B.2.1.10-2 and associated commitment number 55 as shown in Enclosure 3. There are no other new or revised regulatory commitments contained in this letter.

Enclosure 4 provides a revised LRA Appendix A - Final Safety Report Supplement Table A.3, License Renewal Commitment List, updated to reflect the license renewal commitment changes made in NextEra Energy Seabrook correspondence to date.

If there are any questions or additional information is needed, please contact Mr. Richard R. Cliche, License Renewal Project Manager, at (603) 773-7003.

If you have any questions regarding this correspondence, please contact Mr. Michael O'Keefe, Licensing Manager, at (603) 773-7745.

Sincerely,

NextEra Energy Seabrook, LLC.

Paul O. Freeman
Site Vice President

Enclosures:

Enclosure 1- Response to Request for Additional Information Seabrook Station License Renewal Application Aging Management Programs and Associated LRA Changes

Enclosure 2- Changes to LRA Appendix B – Aging Management Programs

Enclosure 3- Revised NextEra Energy Seabrook Response to RAI B.2.1.10-2

Enclosure 4- LRA Appendix A - Final Safety Report Supplement Table A.3, License Renewal Commitment List, updated to reflect the license renewal commitment changes made in NextEra Seabrook correspondence to date.

cc:

| | |
|---|---|
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NEXTera ENERGY SEABROOK

I, Paul O. Freeman, Site Vice President of NextEra Energy Seabrook, LLC hereby affirm that the information and statements contained within are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

Sworn and Subscribed

Before me this

22 day of March, 2011

Paul O. Freeman
Site Vice President

SHIRLEY SWEENEY
MY COMMISSION EXPIRES NOV. 18, 2014
NOTARY PUBLIC
NEW HAMPSHIRE

Notary Public

**<u>Enclosure 1 to SBK-L-11054</u>**

**Response to Request for Additional Information**

**Seabrook Station License Renewal Application**

**Set 10 and Associated LRA Changes**

**Request for Additional Information (RAI) 3.2.2.2.4.2-1**

Background:

SRP-LR Section 3.2.2.2.4, item 2, is associated with SRP-LR Table 3.2.1, item 3.2.1-10, and states that reduction of heat transfer due to fouling could occur for stainless steel heat exchanger tubes exposed to treated water. The SRP-LR also states that the existing program relies on control of water chemistry to manage reduction of heat transfer due to fouling but since control of water chemistry may have been inadequate, the effectiveness of the chemistry control program should be verified to ensure that reduction of heat transfer due to fouling is not occurring. SRP-LR Table 3.2-1, item 3.2.1-10, states that it applies to both BWRs and PWRs, and cites related item EP-34, which corresponds to GALL items V.A-16 for PWR containment spray system heat exchanger tubes and V.D2-13 for BWR emergency core cooling system heat exchanger tubes. Although the SRP-LR and the GALL Report list the environment as treated water, the basis for including GALL item EP-34, as documented in NUREG-1833, was a precedent established in the R.E. Ginna SER, NUREG-1786. The environment specifically noted in the Ginna SER was "treated water -borated," and as such, the applicable environment for this item is not strictly limited to treated water, and also includes treated borated water.

LRA Section 3.2.2.2.4, item 2, states that item 3.2.1-10 is not applicable to Seabrook, and that there are no stainless steel heat exchanger tubes exposed to treated water in the ESF systems. However, the staff noted that LRA Section 3.2 includes several systems with heat exchanger tubes exposed to treated borated water with an intended function of heat transfer that do not indicate that reduction in heat transfer due to fouling is an aging effect being managed.

Issue:

It is not clear to the staff why LRA Section 3.2.2.2.4, item 2, and LRA Table 3.2.1, item 3.2.1-10, state that this item is not applicable, given that NUREG-1833 states that the item is applicable to both BWR and PWR heat exchanger tubes exposed to treated water and treated borated water. It is also not clear to the staff why several heat exchanger items in LRA Section 3.2 specify an intended function of heat transfer, but do not indicate that reduction in heat transfer due to fouling is an aging effect being managed.

Request:

1) Provide the technical bases for the determination that LRA Section 3.2.2.2.4, item 2, which is associated with LRA Table 3.2-1, item 3.2.1-10, is not applicable to Seabrook. If it is determined to be applicable, provide the information regarding how Seabrook intends to meet the further evaluation criteria specified in the corresponding SRP-LR section.

2) For the line items in LRA Section 3.2 which have an intended function specified as "heat transfer," provide the technical bases for not managing reduction in heat transfer due to fouling as an aging effect.

**NextEra Energy Seabrook Response:**

1) In the Seabrook Station LRA, the "treated borated water" environment is different than the "treated water" environment. The descriptions of these environments however, are consistent with Section IX.D of NUREG-1801 (Selected Definitions & Use of Terms for Describing and Standardizing – Environments). NUREG-1801 describes "treated water" and "treated borated water" as follows:

   *Treated Water:*
   *"Treated water is demineralized water, which is the base water for all clean systems. Depending on the system, this demineralized water may require additional processing. Treated water could be deaerated and include corrosion inhibitors, biocides, or some combination of these treatments. Unlike the PWR reactor coolant environment (treated borated water), the BWR reactor coolant environment (i.e., treated water) does not contain boron, a recognized corrosion inhibitor."*

   *Treated Borated Water:*
   *"Borated (PWR) water in a controlled water system. Referenced elsewhere as borated (PWR) water."*

   None of the heat exchanger tubes in Section 3.2 of the Seabrook Station LRA (Engineered Safety Features) are exposed to treated water. The Containment Building Spray heat exchanger tubes (CBS-E-16A and 16B) and Residual Heat Removal heat exchanger tubes (RH-E-9A and 9B) have an internal environment of treated borated water and an external environment of closed-cycle cooling water. Reduction of heat transfer was applied to the tube side exposed to closed-cycle cooling water but not to the tube side exposed to treated borated water. The technical basis for this determination is provided in response to item 2.

   LRA Section 3.2.2.2.4, item 2, which is associated with LRA Table 3.2.1, item 3.2.1-10, was determined not to be applicable to Seabrook Station since none of the ESF heat exchanger tubes are exposed to treated water. This determination is consistent with the guidance provided in NUREG-1800 Rev. 1, NUREG-1801 Rev 1, and NUREG-1833 as follows.

   a) NUREG-1800 Rev. 1, page 3.2-1, line item 10, limits the environment to treated water as shown below.

| Table 3.2-1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL Report | | | | | | |
|---|---|---|---|---|---|---|
| **ID** | **Type** | **Component** | **Aging Effect/Mechanism** | **Aging Management Programs** | **Further Evaluation Recommended** | **Related Generic Item** |
| 10 | BWR/ PWR | Stainless steel heat exchanger tubes exposed to <u>treated water</u> | Reduction of heat transfer due to fouling | Water Chemistry and One-Time Inspection | Yes, detection of aging effects is to be evaluated (See subsection 3.2.2.2.4.2) | EP-34 |

b) NUREG-1801 Rev 1, page V A-4, line item V.A-16, also limits the environment to treated water as shown below.

| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
|---|---|---|---|---|---|---|---|
| V.A-16 (EP-34) | V.A. | Heat exchanger tubes | Stainless steel | <u>Treated water</u> | Reduction of heat transfer/ fouling | Chapter XI.M2, "Water Chemistry" The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

c) NUREG 1800 Rev 0 did not have a 3.X.1 line item for reduction of heat transfer due to fouling. Rather, the general direction was that procedures for monitoring heat exchanger performance would effectively manage the aging effects applicable to heat transfer. This was stated in NUREG-1800 Rev 0 (Reference NUREG-1800 Rev 0, Table 2.1-3, page 2.1-15) as follows:

"*Both the pressure boundary and heat transfer functions for heat exchangers should be considered because heat transfer may be a primary safety function of these components. There may be a unique aging effect associated with different materials in the heat exchanger parts that are associated with the heat transfer function and not the pressure boundary function. The staff would expect that the programs that effectively manage aging effects of the pressure boundary function can, in conjunction with the procedures for monitoring heat exchanger performance, effectively manage aging effects applicable to the heat transfer function (Ref. 10).*"

NUREG-1833 provides the technical basis for the changes that constitute Rev 1 to NUREG-1801 and Rev 1 to NUREG-1800. Page 48 of NUREG-1833, Table II.A, provides the new AMR line items that were added based on new "MEAP" combinations relevant to the mechanical systems. The first line item on page 48 was added to age manage reduction of heat transfer in stainless steel heat exchangers

exposed to treated water (not treated borated water). This line item makes no mention that it is applicable to both treated water and treated borated water environments. The applicable NUREG-1833 line item is shown below.

| **Table II.A New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("A" for Auxiliary, "E" for Engineered Safety Features, "R" for Reactor Coolant, and "S" for Steam and Power Conversion)** | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Structure and/or Component** | **Material** | **Environment** | **Aging Effect/ Mechanism** | **AMP** | **Precedent and Technical Basis for New Line-Item** |
| AP-62 EP-34 SP-40 | Heat exchanger tubes | Stainless Steel | Treated water | Reduction of heat transfer/ fouling | Chapter XI.M2, "Water Chemistry" The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | An approved precedent exists for adding this material, environment, aging effect, and program combination to the GALL Report. As shown in Ginna SER Section 3.3.2.4.3.2, the Staff has accepted the position that stainless steel in a treated water environment exhibits a reduction of heat transfer and that control of water chemistry provides reasonable assurance that the component's intended functions will be maintained within the CLB for the period of extended operation. Implementation of AMP XI.M2, as augmented by AMP XI.M32, provides reasonable assurance that the component's intended functions will be maintained within the CLB for the extended period of operation. |

Since none of the new line items listed above addresses treated borated water and the NUREG-1833 precedent and technical basis discussion does not address treated borated water, there would be no reason to question the validity of NUREG-1800 Rev 1, NUREG-1801 Rev 1, or the associated NUREG-1833 justification for the new line items by relying on the Ginna SER to reinterpret the NRC guidance. Additionally, there is no evidence that Ginna's inclusion of reduction of heat transfer as a potential aging effect for stainless steel heat exchanger tubes in treated borated water was based on operating experience. If the decision was based on actual operating experience, then it would have been identified as a new aging effect not previously identified in the industry and clarified in NUREG-1801 Rev 2, which was issued in December of 2010.

In the Seabrook Station LRA, and as per the guidance provided in NUREG-1801 Rev 1 and NUREG-1800 Rev 1, reduction of heat transfer has been applied as a potential aging effect for stainless steel heat exchanger tubes exposed to "treated water" but not to "treated borated water" (Reference LRA Table 3.4.2-6, on page 3.4-78 for an example). Therefore, the LRA is consistent with the regulatory guidance.

2) The Seabrook Station's determination that reduction of heat transfer is not an aging effect in treated borated water environment is based on plant and industry operating experience. Seabrook Station is not aware of any fouling in treated borated water environment leading to reduction of heat transfer in stainless steel heat exchanger tubes. This conclusion is consistent with NUREG-1801 Rev 1. NUREG-1801 Rev 1 does not identify reduction of heat transfer as an aging effect for stainless steel heat exchanger tubes in treated borated water environment.

Further clarification is provided below:

- NUREG-1801, Section IX.D, Selected Definitions & Use of Terms for Describing and Standardizing – Environments, describes treated water as *"Treated water is demineralized water, which is the base water for all clean systems. Depending on the system, this demineralized water may require additional processing. Treated water could be deaerated and include corrosion inhibitors, biocides, or some combination of these treatments. Unlike the PWR reactor coolant environment (treated borated water), the BWR reactor coolant environment (i.e., treated water) does not contain boron, a recognized corrosion inhibitor."*

- NUREG-1801, Section IX.F, Selected Definitions & Use of Terms for Describing and Standardizing Aging Mechanisms, describes fouling as *"An accumulation of deposits. This term includes accumulation and growth of aquatic organisms on a submerged metal surface and also includes the accumulation of deposits, usually inorganic, on heat exchanger tubing. Biofouling as a subset of fouling can be caused by either macroorganisms (such as barnacles, Asian clams, zebra mussels, and others found in fresh and salt water) or micro-organisms, e.g., algae. Fouling can also be categorized as particulate fouling (sediment, silt, dust, and corrosion products), marine biofouling, or macrofouling, e.g., peeled coatings, debris, etc."*

- NUREG-1 801, XI.M2 Water Chemistry, Element 4, Detection of Aging Effects, states *"This is a mitigation program and does not provide for detection of any aging effects. In certain cases as identified in the GALL Report, inspection of select components is to be undertaken to verify the effectiveness of the chemistry control program and to ensure that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation."*

Fouling of the stainless steel heat exchanger tubes on the treated borated water side would only occur through the buildup of corrosion products. Since the Seabrook Station's treated borated water contains boron, a corrosion inhibitor, corrosion product

build up resulting in reduction of heat transfer in treated borated water environment is not a credible aging effect/mechanism. This is further validated by NUREG-1801 Rev 1, line items V.A-27, and V.D1-30 (NUREG-1800, Table 3.2-1, items 48 and 49), which state that Water Chemistry Program alone (for PWR primary water) is adequate for managing loss of material in stainless steel components exposed to treated borated water indicating that corrosion is not expected to occur in stainless steel components exposed to treated borated water. In the absence of corrosion, corrosion product build up will not occur.

Since NUREG-1800 and NUREG-1801 allow the use of the Water Chemistry Program alone for corrosion control in treated borated water environment, then a verification of the effectiveness of the Water Chemistry Program to mitigate the aging effect of reduction of heat transfer due to fouling is not required. Additionally, since reduction of heat transfer in treated borated water is not identified as a potential aging effect, no line items for reduction of heat transfer in treated borated water appear in the LRA.

A review of NUREG-1801 Rev 2, which was published in December 2010, also confirms that reduction of heat transfer for stainless steel heat exchanger tubes in treated borated water is not an applicable aging effect requiring management for the period of extended operation. Therefore, management of this aging effect is not needed to provide reasonable assurance that stainless steel heat exchanger tubes in the treated borated water environment will perform such that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Seabrook Station's conclusion is consistent with NUREG-1801 Rev 1 and Rev 2, as well as the NRC staff conclusions as stated in Beaver Valley Final SER (Section 3.2.2.3.2) [Accession Number ML093020275] and Prairie Island SER (Section 3.2.2.2.4) [Accession Number ML092890209].

**Request for Additional Information (RAI) 3.3-1**

Background:

Stress corrosion cracking of stainless steels is known to occur in outdoor air containing atmospheric chlorides. Locations near the coast will have a higher concentration of chloride aerosol particles and have a higher susceptibility for stress corrosion cracking. The LRA states that stainless steel components exposed to outdoor-air will be susceptible to loss of material, but does not identify stress corrosion cracking as an applicable aging effect.

Issue:

Because the Seabrook Station is within five miles of a saltwater coastline, it is expected that the stainless steel exposed to outdoor-air will be exposed to higher levels of chlorides. It is not clear to the staff why cracking due to stress corrosion cracking has not been identified as an applicable aging effect for the stainless steel components exposed to outdoor-air.

Request:

Provide additional information on why atmospheric chloride induced stress corrosion cracking is not considered to be an applicable aging effect for stainless steel components exposed to outdoor-air. If it is determined that stress corrosion cracking is an applicable aging affect, provide additional information on how it will be managed.

**NextEra Energy Seabrook Response:**

In response to this RAI, stress corrosion cracking has been added as an aging mechanism for stainless steel components exposed to air-outdoor environment. The LRA is revised as follows:

1. In Section 3.2.2.1.2, on page 3.2-3, added a new bullet before the 1st bullet in the Aging Effects Requiring Management section as follows:

    - ***Cracking***

2. In Table 3.2.2-2, on page 3.2-50, added a new row after the 3rd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Piping and Fittings*** | ***Leakage Boundary (Spatial)*** | ***Stainless Steel*** | ***Air-Outdoor (External)*** | ***Cracking*** | ***External Surfaces Monitoring Program*** | ***None*** | ***None*** | ***G*** |

3. In Section 3.3.2.1.9, on page 3.3-18, added a new bullet before the 1st bullet in the Aging Effects Requiring Management section as follows:

    - ***Cracking***

4. In Table 3.3.2-9, on page 3.3-233, added a new row after the 4th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Filter Element*** | ***Filter*** | ***Stainless Steel*** | ***Air-Outdoor (Internal/External)*** | ***Cracking*** | ***External Surfaces Monitoring Program*** | ***None*** | ***None*** | ***G*** |

5. In Table 3.3.2-9, on page 3.3-241, added a new row after the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Instrumentation Element* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (Internal)* | *Cracking* | *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program* | *None* | *None* | *G* |

6. There are no stainless steel piping and fittings in air-outdoor (external) in the Control Building Air Handling system. This AMR line item was inadvertently added to the LRA. Therefore, as part of the response to this RAI, in Table 3.3.2-9, on page 3.3-242, the last row is deleted as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ~~Piping And Fittings~~ | ~~Leakage Boundary (Spatial)~~ | ~~Stainless Steel~~ | ~~Air-Outdoor (External)~~ | ~~Loss of Material~~ | ~~External Surfaces Monitoring Program~~ | ~~None~~ | ~~None~~ | ~~G~~ |

7. In Table 3.3.2-9, on page 3.3-243, added a new row before the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Piping And Fittings* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (Internal)* | *Cracking* | *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program* | *None* | *None* | *G* |

8. In Table 3.3.2-9, on page 3.3-248, added a new row after the 4th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (Internal)* | *Cracking* | *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program* | *None* | *None* | *G* |

9. In Section 3.3.2.1.17, on page 3.3-30, added a new bullet before the 1st bullet in the Aging Effects Requiring Management section as follows:

   - ***Cracking***

10. In Table 3.3.2-17,on page 3.3-324, added a new row before the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Bolting* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *Bolting Integrity Program* | *None* | *None* | *G* |

11. In Table 3.3.2-17, on page 3.3-326, added a new row after the 2nd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *External Surfaces Monitoring Program* | *None* | *None* | *G* |

12. In Section 3.3.2.1.40, on page 3.3-60, added a new bullet before the 1st bullet in the Aging Effects Requiring Management section as follows:

- *Cracking*

13. In Table 3.3.2-40, on page 3.3-492, added a new row after the 2nd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Bolting* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *Bolting Integrity Program* | *None* | *None* | *G* |

14. In Table 3.3.2-40, on page 3.3-492, added a new row after the 6th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Expansion Joint* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *External Surfaces Monitoring Program* | *None* | *None* | *G* |

15. In Table 3.3.2-40, on page 3.3-493, added a new row after the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Filter Housing* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *External Surfaces Monitoring Program* | *None* | *None* | *G* |

16. In Table 3.3.2-40, on page 3.3-493, added a new row after the 9th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Piping and Fittings* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *External Surfaces Monitoring Program* | *None* | *None* | *G* |

17. In Table 3.3.2-40, on page 3.3-494, added a new row after the 9th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *External Surfaces Monitoring Program* | *None* | *None* | *G* |

18. In Table 3.4.2-5, on page 3.4-73, added a new row after the 9th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Tank* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (External)* | *Cracking* | *External Surfaces Monitoring Program* | *None* | *None* | *G* |

19. In Table 3.4.2-7, on page 3.4-92, added a new row after the 2nd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Orifice* | *Leakage Boundary (Spatial)*<br><br>*Pressure Boundary*<br><br>*Throttle* | *Stainless Steel* | *Air-Outdoor (Internal)* | *Cracking* | *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program* | *None* | *None* | *G* |

20. In Table 3.4.2-7, on page 3.4-96, added a new row after the 6th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Pressure Boundary* | *Stainless Steel* | *Air-Outdoor (Internal)* | *Cracking* | *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program* | *None* | *None* | *G* |

21. In Section B.2.1.25, on page B-140, the 3rd full paragraph is revised as follows:

The program will be used to detect cracking due to stress corrosion cracking in a limited number of stainless steel components exposed to steam, ~~or~~ diesel exhaust, ***or air-outdoor***. The Auxiliary Heating Steam System has some stainless steel components in steam while the Diesel Generator and Fire Protection systems have some stainless steel components with an internal environment of diesel exhaust. ***The Control Building Air Handling System (CBA) and Main Steam System (MS) have some stainless steel components exposed to air-outdoor.*** The inspection techniques utilized to detect this aging effect will be either visual inspection with a magnified resolution as described in 10 CFR 50.55a (b)(2)(xxi)(A) or an ultrasonic inspection method. The inspections will be performed by qualified personnel using proven techniques in accordance with Seabrook Station procedures and processes.

22. In Section B.2.1.25, on pages B-142, the 3rd paragraph of the justification for exception #2, is revised as follows:

"The program will be used to detect cracking due to stress corrosion cracking in a limited number of stainless steel components exposed to steam, ~~or~~ diesel exhaust, ***or air-outdoor***. The Auxiliary Steam Heating System has some stainless steel components in steam while the Diesel Generator Fire Protection systems have some stainless steel components with an internal environment of diesel exhaust. ***The Control Building Air Handling System (CBA) and Main Steam System (MS) have some stainless steel components exposed to air-outdoor.*** The inspection techniques utilized to detect this aging effect will be either visual inspection with a magnified resolution as described in 10 CFR 50.55a(b)(2)(xxi)(A) or an ultrasonic inspection method. Note that NUREG 1801 Section XI.M32 "One Time Inspection"

recommends the use of an enhanced VT-1 visual inspection or ultrasonic inspection technique as an acceptable means to detect cracking due to stress corrosion cracking. The inspections will be performed by qualified personnel using proven techniques in accordance with Seabrook Station procedures and processes."

23. In Section B.2.1.24, on page B-132, the 1st sentence of the 1st paragraph is revised as follows:

    "The Seabrook Station External Surfaces Monitoring Program is an existing program that manages the aging effects of (a) hardening and loss of strength due to elastomer degradation, (b) reduction of heat transfer due to fouling, (c) loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion and due to fouling, ~~and~~ (d) loss of material due to wear~~;~~***, and (e) cracking due to stress corrosion cracking***; through visual inspection and non-visual tactile inspections of external surfaces.

24. In Section B.2.1.24, on page B-133, the following is added to the section titled "Examples of inspection parameters include:"

    ***k. leakage for detection of cracks on the external surfaces of stainless steel components exposed to air-outdoor***

25. In Section B.2.1.24, on page B-134, the following paragraph is added after the 6th paragraph as follows:

    ***The program also inspects for cracking due to stress corrosion cracking of stainless steel components exposed to air-outdoor environment.***

26. In Section B.2.1.24, on page 136, the 1st paragraph is revised as follows:

    Seabrook Station includes the additional aging effects of hardening and loss of strength, reduction of heat transfer, ***cracking due to stress corrosion cracking,*** and loss of material due to galvanic corrosion and wear.

27. In Section B.2.1.24, on page 136, the following paragraph is added after the 4th paragraph in section titled "Justification for the Exception" as follows:

    ***The program also inspects for cracking due to stress corrosion cracking of stainless steel components exposed to air-outdoor environment.***

28. In Section A.2.1.24, on page A-14, the 1st paragraph of the program description is revised as follows:

    "The External Surfaces Monitoring Program manages aging effects through visual inspection of external surfaces for evidence of hardening and loss of strength, reduction of heat transfer, ***cracking due to stress corrosion cracking,*** and loss of

material (galvanic, general, crevice and pitting corrosion, and wear). This program consists of periodic inspections of aluminum, Cast Austenitic Stainless Steel (CASS), copper alloy, copper alloy >15% zinc, elastomer, galvanized steel, gray cast iron, nickel alloy, stainless steel and steel components such as piping, piping components, ducting, pipe supports and other components to manage aging effects."

**Request for Additional Information (RAI) 3.3.2.2.2-1**

Background:

SRP-LR Section 3.3.2.2.2 is associated with SRP-LR Table 3.3.1, item 3.3.1-3, and states that reduction of heat transfer due to fouling could occur for stainless steel heat exchanger tubes exposed to treated water. The SRP-LR also states that the existing program relies on control of water chemistry to manage reduction of heat transfer due to fouling, but since control of water chemistry may have been inadequate the effectiveness of the chemistry control program should be verified to ensure that reduction of heat transfer due to fouling is not occurring. SRP-LR Table 3.3.1, item 3.3.1-3, states that this item applies to BWRs and PWRs, and cites related item AP-62, which corresponds to GALL items VII.A4-4 for BWR spent fuel pool cooling and cleanup heat exchanger tubes and VII.E3-6 for reactor water cleanup system heat exchanger tubes for both BWRs and PWRs. Although the SRP-LR and the GALL Report list the environment as treated water, the basis for including GALL item AP-62, as documented in NUREG-1833, was a precedent established in the R.E. Ginna SER, NUREG-1786. The environment specifically noted in the Ginna SER was "treated water -borated," and as such, the applicable environment for this item is not strictly limited to treated water, and also includes treated borated water.

LRA Section 3.3.2.2.2 states that item 3.3.1-3 is not applicable for auxiliary system components at Seabrook, and that this line item is associated with GALL Report item VII.E3-6 which is applicable to BWR reactor water cleanup system heat exchangers. However, the staff noted that LRA Section 3.3 includes several systems with heat exchanger tubes exposed to treated borated water with an intended function of "heat transfer;" that do not indicate that reduction of heat transfer due to fouling is an aging effect being managed.

Issue:

It is not clear to the staff why LRA Section 3.3.2.2.2, which is associated with SRP-LR Table 3.3.1, item 3.3.1-3, states that this item is not applicable, given that NUREG-1833 states that the item is applicable to both BWR and PWR heat exchanger tubes exposed to treated water and treated borated water. It is also not clear to the staff why several heat exchanger items in LRA Section 3.3 specify an intended function of "heat transfer," but do not indicate that reduction in heat transfer due to fouling is an aging effect being managed.

Request:

1) Provide the technical bases for the determination that LRA Section 3.3.2.2.2, which is associated with LRA Table 3.3.1, item 3.3.1-3, is not applicable to Seabrook. If it is determined to be applicable, provide information regarding how Seabrook intends to meet the further evaluation criteria specified in the corresponding SRP-LR section.

2) For the line items in LRA Section 3.3 which have an intended function specified as "heat transfer," provide the technical bases for not managing reduction in heat transfer due to fouling as an aging effect.

**NextEra Energy Seabrook Response:**

1) In the Seabrook Station LRA, the "treated borated water" environment is different than the "treated water" environment. The descriptions of these environments however, are consistent with Section IX.D of NUREG-1801 (Selected Definitions & Use of Terms for Describing and Standardizing – Environments). NUREG-1801 describes "treated water" and "treated borated water" as follows:

   *Treated Water:*
   *"Treated water is demineralized water, which is the base water for all clean systems. Depending on the system, this demineralized water may require additional processing. Treated water could be deaerated and include corrosion inhibitors, biocides, or some combination of these treatments. Unlike the PWR reactor coolant environment (treated borated water), the BWR reactor coolant environment (i.e., treated water) does not contain boron, a recognized corrosion inhibitor."*

   *Treated Borated Water:*
   *"Borated (PWR) water in a controlled water system. Referenced elsewhere as borated (PWR) water."*

   NUREG-1801 Rev 1, Section VII.A4 is for Spent Fuel Pool Cooling and Cleanup Systems in Boiling Water Reactors, which utilizes "treated water". Seabrook Station is a PWR and utilizes "treated borated water" in the Spent Fuel Pool Cooling and Cleanup system. Therefore, Section VII.A4 is not applicable to Seabrook Station. Instead, section VII.A3 was utilized, which specifically addresses Spent Fuel Pool Cooling and Cleanup Systems for Pressurized Water Reactors that utilize treated borated water. Table VII.A3 does not contain any AP-62 associated line items nor does it contain any line items related to reduction of heat transfer.

   Similarly, NUREG-1801 Rev 1, Section VII.E3 is for the Reactor Water Clean-up System in Boiling Water Reactors, which provide for clean-up and particulate removal from the recalculating reactor coolant in the Boiling Water Reactors. Seabrook Station is a Pressurized Water Reactor and does not have a Reactor Water Clean-up System. Therefore, NUREG-1801 line item VII.E3-6, which corresponds to AP-62, is not applicable to Seabrook Station.

None of the stainless steel heat exchanger tubes in Section 3.3 of the Seabrook Station LRA (Auxiliary Systems) are exposed to treated water. Since Seabrook Station identified no material and environment combinations that required reconciliation to line items VII.A4-4 and VII.E3-6, then the summary conclusion provided in LRA Table 3.3.1, item 3, on page 3.3-86, is appropriate as stated.

Although there are no stainless steel heat exchanger tubes exposed to "treated water" in section 3.3 of the LRA (auxiliary Systems), there are stainless steel heat exchanger tubes exposed to "treated borated water" in that section. However, stainless steel heat exchanger tubes in "treated borated water environment" are not susceptible to reduction of heat transfer due to fouling. The technical basis for this determination is provided below in item (2).

2) The Seabrook Station's determination that reduction of heat transfer is not an aging effect in treated borated water environment is based on plant and industry operating experience. Seabrook Station is not aware of any fouling in treated borated water environment leading to reduction of heat transfer in stainless steel heat exchanger tubes. This conclusion is consistent with NUREG-1801 Rev 1. NUREG-1801 Rev 1 does not identify reduction of heat transfer as an aging effect for stainless steel heat exchanger tubes in treated borated water environment.

Further clarification is provided below:

- NUREG-1801, Section IX.D, Selected Definitions & Use of Terms for Describing and Standardizing – Environments, describes treated water as *"Treated water is demineralized water, which is the base water for all clean systems. Depending on the system, this demineralized water may require additional processing. Treated water could be deaerated and include corrosion inhibitors, biocides, or some combination of these treatments. Unlike the PWR reactor coolant environment (treated borated water), the BWR reactor coolant environment (i.e., treated water) does not contain boron, a recognized corrosion inhibitor."*

- NUREG-1801, Section IX.F, Selected Definitions & Use of Terms for Describing and Standardizing Aging Mechanisms, describes fouling as *"An accumulation of deposits. This term includes accumulation and growth of aquatic organisms on a submerged metal surface and also includes the accumulation of deposits, usually inorganic, on heat exchanger tubing. Biofouling as a subset of fouling can be caused by either macroorganisms (such as barnacles, Asian clams, zebra mussels, and others found in fresh and salt water) or micro-organisms, e.g., algae. Fouling can also be categorized as particulate fouling (sediment, silt, dust, and corrosion products), marine biofouling, or macrofouling, e.g., peeled coatings, debris, etc."*

- NUREG-1 801, XI.M2 Water Chemistry, Element 4, Detection of Aging Effects, states *"This is a mitigation program and does not provide for detection of any aging effects. In certain cases as identified in the GALL Report, inspection of select*

*components is to be undertaken to verify the effectiveness of the chemistry control program and to ensure that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation."*

Fouling of the stainless steel heat exchanger tubes on the treated borated water side would only occur through the buildup of corrosion products. Since Seabrook Station's treated borated water contains boron, a corrosion inhibitor, corrosion product build up resulting in reduction of heat transfer in treated borated water environment is not a credible aging effect/mechanism. This is further validated by NUREG-1801 Rev 1, line items VII.A2-1, VII.A3-8, and VII.E1-17 (NUREG-1800, Table 3.3-1, item 91), which states that Water Chemistry Program alone (for PWR primary water) is adequate for managing loss of material in stainless steel components exposed to treated borated water indicating that corrosion is not expected to occur in stainless steel components exposed to treated borated water. In the absence of corrosion, corrosion product build up will not occur.

Since NUREG-1800 and NUREG-1801 allow the use of the Water Chemistry Program alone for corrosion control in treated borated water environment, then a verification of the effectiveness of the Water Chemistry Program to mitigate the aging effect of reduction of heat transfer due to fouling is not required. Additionally, since reduction of heat transfer in treated borated water is not identified as a potential aging effect, no line items for reduction of heat transfer in treated borated water appear in the LRA.

A review of NUREG-1801 Rev 2, which was published in December 2010, also confirms that reduction of heat transfer for stainless steel heat exchanger tubes in treated borated water is not an applicable aging effect requiring management for the period of extended operation. Therefore, management of this aging effect is not needed to provide reasonable assurance that stainless steel heat exchanger tubes in the treated borated water environment will perform such that the intended functions are maintained consistent with the current licensing basis during the period of extended operation.

Seabrook Station's conclusion is consistent with NUREG-1801 Rev 1 and Rev 2, as well as the NRC staff conclusions as stated in Beaver Valley Final SER (Section 3.2.2.3.2) [Accession Number ML093020275] and Prairie Island SER (Section 3.2.2.2.4) [Accession Number ML092890209].

**Request for Additional Information (RAI) 3.3.2.3.37-1**

Background:

Table IX.C of the GALL Report states that copper alloy (>15% Zn) is susceptible to a variety of aging effects and mechanisms, including loss of material due to selective leaching. The GALL AMP XI.M33, "Selective Leaching," recommends visual inspection of selected components that may be susceptible to selective leaching, coupled with either

hardness measurements (where feasible, based on form and configuration) or mechanical examination techniques to manage the loss of material due to selective leaching aging effect. .

LRA supplement 2, dated November 15, 2010, amended the LRA to add line items to manage the loss of preload and loss of material aging effects for copper alloy (>15% Zn) bolting exposed to raw water in the service water system using the Bolting Integrity Program and Buried Piping and Tanks Inspection Program.

Issue:

The applicant's LRA, as amended, does not appear to address loss of material due to selective leaching.

Furthermore, the applicant's Bolting Integrity Program and Buried Piping and Tanks Inspection Program include visual inspections to detect loss of material, but neither program includes the additional hardness measurements or mechanical examination techniques recommended by the GALL Report to manage the loss of material due to selective leaching aging effect.

Request:

State why it is acceptable to manage selective leaching with a visual inspection program, or provide an AMR line item, which credits an AMP that includes inspection techniques, to address loss of material due to selective leaching for copper alloy (>15% Zn) bolting exposed to raw water in the service water system.

**NextEra Energy Seabrook Response:**

In Letter SBK-L-10192, dated November 15, 2010 (LRA Supplement 2), on page 17 of 24 of Enclosure 2, on item 26, a new row is added after the 2nd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Bolting* | *Pressure Boundary* | *Copper Alloy >15% Zn* | *Raw Water (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

**Request for Additional Information (RAI) 3.4.2.3.4-1**

Background:

In LRA Table 3.4.2-4, the applicant stated that copper alloy >15% Zn valve body exposed to condensation (external) is being managed for loss of material by the External Surfaces Monitoring Program. The AMR line item cites generic note G. The applicant's External Surface Monitoring Program does not include activities to manage loss of material due to

selective leaching.

The GALL Report states that "Condensation on the surfaces of systems with temperature below the dew point is considered raw water, due to potential for surface contamination." The GALL Report further states that copper alloys containing greater than 15% zinc exposed to a raw water environment may be susceptible to selective leaching of one of the metal components.

Issue:

It is unclear to the staff why the copper alloy with greater than 15% Zn valve body exposed to condensation is not being managed for selective leaching, given that exposure to condensation could promote accumulation of contaminants and lead to selective leaching.

Request:

Explain why the copper alloy with greater than 15% Zn valve body exposed to condensation (external) is not being managed for selective leaching. If it is determined that selective leaching is an appropriate aging effect/mechanism to be managed, explain what aging management program and inspection method(s) (e.g., hardness measurement, etc.) are to be used to manage the loss of material due to selective leaching (See RAI 3.3.2.3.37-1).

**NextEra Energy Seabrook Response:**

In response to this RAI, selective leaching has been added as an aging mechanism for copper alloy >15% Zn components exposed to internal or external condensation environment. Additionally, as part of the response to this RAI, selective leaching has also been added as an aging mechanism for gray cast iron components exposed to internal or external condensation environment. Accordingly, the following changes have been made to the LRA.

1. In Table 3.3.2-4, on page 3.3-191, added a new row after the 3rd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Leakage Boundary (Spatial)* | *Gray Cast Iron* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

2. In Table 3.3.2-9, on page 3.3-236, added a new row after the 4th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Heat Exchanger Components (CBA-E-228A & B Cooling Coil)* | *Heat Transfer*<br><br>*Pressure Boundary* | *Copper Alloy >15% Zn* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

3. In Table 3.3.2-9, on page 3.3-237, added a new row after the 4th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Heat Exchanger Components (CBA-E-229A & B Cooling Coil Header)*** | ***Leakage Boundary (Spatial)*** | ***Copper Alloy >15% Zn*** | ***Condensation (External)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

4. In Table 3.3.2-9, on page 3.3-247, added a new row after the 3rd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Valve Body*** | ***Leakage Boundary (Spatial)*** | ***Copper Alloy >15% Zn*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

5. In Table 3.3.2-12, on page 3.3-286, added a new row after the 5th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Trap*** | ***Pressure Boundary*** | ***Gray Cast Iron*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

6. In Table 3.3.2-12, on page 3.3-287, added a new row after the 7th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Valve Body*** | ***Pressure Boundary*** | ***Copper Alloy >15% Zn*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

7. In Table 3.3.2-15, on page 3.3-302, added a new row after the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Filter Housing*** | ***Pressure Boundary*** | ***Gray Cast Iron*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

8. In Table 3.3.2.15, on page 3.3-307, added a new row after the 3rd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Piping and Fittings*** | ***Pressure Boundary*** | ***Gray Cast Iron*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

9. In Table 3.3.2-15, on page 3.3-313, added a new row after the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Valve Body*** | ***Pressure Boundary*** | ***Copper Alloy >15% Zn*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

10. In Table 3.3.2-19, on page 3.3-345, added a new row after the 3rd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Valve Body*** | ***Leakage Boundary (Spatial)*** | ***Gray Cast Iron*** | ***Condensation (External)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

11. In Section 3.3.2.1-20, on page 3.3-35, in the Aging Management Programs Section, added a new bullet after the One-Time Inspection Program (B.2.1.20) as follows:

- ***Selective Leaching of Materials Program (B.2.1.21)***

12. In Table 3.3.2-20, on page 3.3-350, added a new row after the 2nd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Filter Housing*** | ***Pressure Boundary*** | ***Gray Cast Iron*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

13. In Table 3.3.2-20, on page 3.3-359, added a new row after the 2nd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Tank*** | ***Pressure Boundary*** | ***Copper Alloy >15% Zn*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

14. In Table 3.3.2-20, on page 3.3-359, added a new row after the 5th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Tank*** | ***Pressure Boundary*** | ***Gray Cast Iron*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

15. In Table 3.3.2-20, on page 3.3-361, added new row after the 6th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ***Trap*** | ***Pressure Boundary*** | ***Gray Cast Iron*** | ***Condensation (Internal)*** | ***Loss of Material*** | ***Selective Leaching of Materials Program*** | ***None*** | ***None*** | ***G*** |

16. In Table 3.3.2-20, on page 3.3-363, added a new row after the 4th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Pressure Boundary* | *Copper Alloy >15% Zn* | *Condensation (Internal)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

17. In Table 3.3.2-36, on page 3.3-457, added a new row after the 5th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Filter Housing* | *Leakage Boundary (Spatial)* | *Gray Cast Iron* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

18. In Table 3.3.2-36, on page 3.3-459, added a new row after the 2nd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Pump Casing* | *Leakage Boundary (Spatial)* | *Gray Cast Iron* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

19. In Table 3.3.2-36, on page 3.3-459, added a new row after the 5th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Leakage Boundary (Spatial)* | *Copper Alloy >15% Zn* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

20. In Table 3.3.2-37, on page 3.3-463, added a new row after the 3rd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Bolting* | *Pressure Boundary* | *Copper Alloy >15% Zn* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

21. In Table 3.3.2-37, on page 3.3-473, added a new row before the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Leakage Boundary (Spatial)*<br><br>*Pressure Boundary* | *Copper Alloy >15% Zn* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

22. In Table 3.3.2-44, on page 3.3-510, added a new row after the 1st row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Leakage Boundary (Spatial)* | *Copper Alloy >15% Zn* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

23. In Table 3.4.2-4, on page 3.4-68, added a new row after the 3rd row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Leakage Boundary (Spatial)* | *Copper Alloy >15% Zn* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

24. In Table 3.4.2-4, on page 3.4-68, added a new row after the 6th row as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Valve Body* | *Leakage Boundary (Spatial)* | *Gray Cast Iron* | *Condensation (External)* | *Loss of Material* | *Selective Leaching of Materials Program* | *None* | *None* | *G* |

25. In Section B.2.1.21, on page B-121, revised the 1st sentence of the 1st paragraph as follows (Please note that this paragraph was previously revised in response to RAI B.2.1.21-2 to add the steam environment. Reference SBK-L-11027 dated February 18, 2011, Enclosure 1, page 2 of 20):

    "The Seabrook Station Selective Leaching of Materials Program is a new program that manages the aging effect of loss of material due to selective leaching in components made of gray cast iron and copper alloys with greater than 15 percent zinc that are exposed to ***condensation***, raw water, brackish water, treated water (including closed cycle cooling and steam), or groundwater environment."

26. In Section A.2.1.21, on page A-13, the 1st paragraph of the program description is revised as follows (Please note that Section A.2.1.21 should have been previously revised to include the steam environment as part of the response to RAI B.2.1.21-2. Reference SBK-L-11027 dated February 18, 2011, Enclosure 1. Therefore, the steam environment is also being added to A.2.1.21 as part of the response to this RAI):

    "The Selective Leaching of Materials Program manages the aging effects of loss of material in components susceptible to selective leaching that are exposed to ***condensation,*** raw water, brackish water, treated water (including closed cycle cooling ***and steam***), or groundwater environment."

**Request for Additional Information (RAI) B.2.1.3-2 Follow-up**

Background:

RAI B.2.1.3-2, in part, requested the applicant to clarify whether the lubricant, which is used for the installation and removal of the reactor head closure studs, is stable at the operating temperatures of the reactor head closure studs. In its response dated January 13, 2011, the applicant stated that the lubricant (WD-40) has an operating temperature range from -10°F to 200°F in comparison with the operating temperature of the reactor head closure studs which is estimated to approach 500°F. The applicant also stated that according to the

manufacturer of the lubricant, when the lubricant is exposed to the reactor vessel metal temperature at operating condition, it would carbonize.

RG 1.65, which is referenced in the GALL Report, addresses the guidance that lubricants for the stud bolting are permissible provided they are stable at operating temperatures of the reactor head closure stud bolting.

Issue:

The staff noted that the operating temperature range of the applicant's lubricant (-10 to 200 °F) is significantly lower than the operating temperature of the reactor head closure studs that is estimated to approach 500 of by the applicant. The staff also noted that the lubricant carbonizes at the operating temperature of the closure studs. Therefore, the applicant's use of the lubricant is not consistent with the guidance in RG 1.65 that lubricants for the stud bolting are permissible provided they are stable at operating temperatures of the reactor head closure stud bolting.

In addition, the staff finds a concern that the carbonization of the lubricant and accumulation of carbonization by-products on the studs and flange threads degrade the lubrication process of the bolting such that the removal operation of the studs may cause sticking, galling or thread damage of the reactor head closure bolting.

Request:

1) Justify why the use of the lubricant (WD-40), the operating temperature of which is significantly lower than that of the reactor head closure studs, is consistent with the guidance in RG 1.65 and GALL Report that lubricants for the stud bolting are permissible provided they are stable at operating temperatures of the reactor head closure stud bolting, as addressed in LRA Section 8.2.1.3 stating the applicant's implementation of the guidance in RG 1.65 for lubricants.

   In addition, justify the use of the lubricant (WD-40), which has an operating temperature range from -10°F to 200°F, on the reactor head closure studs, which has an operating temperature that is estimated to approach 500°F. If a justification for the use of this lubricant cannot be provided, commit to the use of a lubricant that will remain stable at operating temperatures of the reactor head closure stud bolting.

2) Justify why the carbonization of the lubricant and accumulation of carbonization by-products on the studs and flange threads do not cause sticking, galling or thread damage of the studs and flange threads. As part of the justification, clarify whether the applicants operating experience is in agreement with the justification.

**NextEra Energy Seabrook Response:**

1) The reactor vessel studs are coated with a thin film of a highly adherent, nickel-silver/palladium metallic alloy applied by the PlasmaBond™ process to prevent galling

of the alloy steel studs, nuts and stud hole threads in the reactor vessel flange. No additional lubricant is needed. The PlasmaBond™ coating is stable at the design and operating temperatures of the reactor vessel and is compatible with the stud, nut and vessel flange materials and the operating environment. Prior to initial application, PlasmaBond™ coating was evaluated for both technical and regulatory (10 CFR 50.59) impact. The product was determined acceptable and compliant with RG 1.65 guidelines.

WD-40 was originally developed as part of an effort to create a line of rust-prevention solvents and degreasers for use in the aerospace industry. The final product named for its water displacement (WD) qualities, is still in use today. The manufacturers Website summaries the five basic uses of WD-40 as follows:

WD-40 fulfills five basic functions:

1. CLEANS: WD-40 gets under dirt, grime and grease to clean. It also dissolves adhesives, allowing easy removal of labels, tape and excess bonding material.
2. DISPLACES MOISTURE: Because WD-40 displaces moisture, it quickly dries out electrical systems to eliminate moisture-induced short circuits.
3. PENETRATES: WD-40 loosens rust-to-metal bonds and frees stuck, frozen or rusted metal parts.
4. LUBRICATES: WD-40's lubricating ingredients are widely dispersed and tenaciously held to all moving parts.
5. PROTECTS: WD-40 protects metal surfaces with corrosion-resistant ingredients to shield against moisture and other corrosive elements.

When the reactor vessel studs are removed, WD-40 is used to clean the studs and stud holes. The light coating of WD-40 also protects the exposed areas from surface rust and corrosion that can form while the materials are at ambient temperatures. Once elevated to normal operating temperature of approximately 500°F, a carbonized deposit is left which has no adverse effect on the PlasmaBond™ coating or reactor vessel stud or flange materials. The WD-40 product has been evaluated for use as an expendable product on external surfaces at Seabrook Station with no restrictions. Since WD-40 is not credited as a lubricant in the LRA, there is no intent to be in compliance with RG 1.65.

The PlasmaBond™ coating is provided by Nova Machine Products. Information obtained from the manufacturer indicates that it is important to ensure that the PlasmaBond™ surface is clean (free of debris) and threads show no evidence of damage (shaved areas, missing chips. etc) before assembly. Although Nova Machine Products do not specifically recommend using WD-40, they have indicated that they don't see any issues at all with its use.

In the LRA and in response to RAI B.2.3-2, the Seabrook Station incorrectly referred to WD-40 as a "lubricant". While WD-40 has lubricating properties, its intended use at

Seabrook Station is to clean and protect the reactor vessel studs and stud hole threads against rust and corrosion that can form while the materials are at ambient temperatures. As stated above, the PlasmaBond coating by design does not require use of any additional lubrication during installation or removal of the studs.

2) PlasmaBond™ coating was first applied to the Seabrook reactor vessel studs in October 2000. Use of WD-40 as an expendable product for cleaning and protecting exposed surfaces from surface corrosion while at ambient temperatures, has been a procedural step since initial application of the PlasmaBond™ coating. Seabrook Station has not experienced sticking, galling, or thread damage of the studs or flange threads due to carbonization by-products associated with WD-40. Nova Machine Products has also stated that they know of no issues with the use of WD-40 with regards to galling.

**<u>Enclosure 2 to SBK-L- 11054</u>**

**Changes to LRA Appendix B – Aging Management Programs**

**Description of Changes**

The following changes have been made to Appendix B of the Seabrook License Renewal Application (LRA):

LRA section B.2.1.16, Fire Water System incorrectly lists polyvinylchloride instead of fiberglass piping as listed in the Buried Piping Program.

LRA section B.2.1.16, Fire Water System second paragraph on page B-100 is revised to add fiberglass and delete polyvinylchloride.

**B.2.1.16 FIRE WATER SYSTEM**

LRA section B.2.1.16, Fire Water System on page B-100, second paragraph is revised to read as follows:

> Seabrook Station procedures require the performance of periodic flow tests to verify required operating pressure and visual inspection for corrosion, deterioration and or damage for all Fire Water Sprinkler System piping and components. Fire Protection System buried pipes are either ~~polyvinylchloride~~ ***fiberglass*** or carbon steel pipe with an internal cement liner and a coal tar epoxy coating on the exterior. Seabrook Station procedures require the performance of a thorough inspection of all internal parts including corrosion and replace any worn or damaged parts.

**Enclosure 3 to SBK-L- 11054**

**Revised NextEra Energy Seabrook Response to RAI B.2.1.10-2**

**Request for Additional Information (RAI) B.2.1.10-2**

Background

SRP-LR Section 3.1.2.2.13 identifies that cracking due to PWSCC could occur in PWR components made of nickel-alloy and steel with nickel-alloy cladding, including reactor coolant pressure boundary components and penetrations inside the RCS such as pressurizer heater sheathes and sleeves, nozzles, and other internal components. GALL Report, Revision 1, Volume 2, item IV.D1-6 recommends AMP XI.M2, "Water Chemistry," for PWR primary water for managing the aging effect of cracking in the nickel alloy SG divider plate exposed to reactor coolant.

LRA Table 3.1.1, item 3.1.1-81, credits the Water Chemistry Program to manage cracking due to primary stress corrosion cracking in nickel-alloy steam generator primary channel head divider plate exposed to reactor coolant in the steam generators.

Issue

From foreign operating experience in SGs with a similar design to that of Seabrook SGs, cracking due to PWSCC has been identified in SG divider plate assemblies made with Alloy 600, even with proper primary water chemistry. Specifically, cracks have been detected in the stub runner, very close to the tubesheet/stub runner weld and with depths of almost a third of the divider plate thickness. Therefore, the staff notes that the water chemistry program alone does not appear to be effective in managing the aging effect of cracking due to PWSCC in SG divider plate assemblies.

Although these SG divider plate assembly cracks may not have a significant safety impact in and of themselves, such cracks could affect adjacent items that are part of the reactor coolant pressure boundary, such as the tubesheet and the channel head, if they propagate to the boundary with these items. For the tubesheet, PWSCC cracks in the divider plate could propagate to the tubesheet cladding with possible consequences to the integrity of the tube-to-tubesheet welds. For the channel head, the PWSCC cracks in the divider plate could propagate to the SG triple point and potentially affect the pressure boundary of the SG channel head.

Request

1. Please discuss the materials of construction of your SG divider plate assemblies.

   If any constitutive/weld material or base metal of the SG divider plate assemblies is susceptible to cracking (e.g., Alloy 600 or the associated Alloy 600 weld materials), please describe an aging management or inspection program (examination technique and frequency) to ensure that there are no cracks which could propagate into other items which are part of the reactor coolant pressure boundary (e.g., tubesheet and channel head) that could challenge the integrity of those adjacent items.

**Previous Response Submitted in Letter SBK-L-11002 dated January 13, 2011**

1. Seabrook Station Westinghouse Model F steam generator divider plate and weld materials are Inconel (ASME-SB-168) Alloy 600/82/182.

2. Seabrook Station will perform an inspection of each steam generator prior to entering the period of extended operation to assess the condition of the divider plate assembly unless operating experience and/or analytical results show that crack propagation into RCS pressure boundary is not possible, then the inspections need not be performed. The inspection techniques used will be capable of detecting primary water stress corrosion cracking in the steam generator divider plate assemblies and their associated welds. Any evidence of cracking will be documented and evaluated under the corrective action program.

   Seabrook Station remains involved with the on-going industry studies conducted by EPRI related to divider plate cracking. This participation will ensure that any inspection requirements or other resolution actions recommended to the industry are evaluated and implemented as appropriate.

Based on the above discussion, the following change has been made to the Seabrook Station License Renewal Application:

1. The following commitment is added to Section A.3 LICENSE RENEWAL COMMITMENT LIST of the License Renewal Application on page A-43:

| No. | PROGRAM OR TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| *55* | *Steam Generator Tube Integrity* | ***Seabrook will perform an inspection of each steam generator to assess the condition of the divider plate assembly unless operating experience and/or analytical results show that crack propagation into RCS pressure boundary is not possible, then the inspections need not be performed.*** | *A.2.1.10* | ***Prior to entering the period of extended operation*** |

**Revised NextEra Energy Seabrook Response**

Recognizing that the EPRI Steam Generator Management Program study and resolution of the potential for SG divider plate crack growth is still under development, the NextEra Energy Seabrook response to RAI B.2.1.10-2, submitted in letter SBK-L-11002 dated January 13, 2011, is revised as follows:

1. Seabrook Station Westinghouse Model F steam generator divider plate and weld materials are Inconel (ASME-SB-168) Alloy 600/82/182.

2. Seabrook Station will perform an inspection of each steam generator prior to entering the period of extended operation to assess the condition of the divider plate assembly ~~unless operating experience and/or analytical results show that crack propagation into RCS pressure boundary is not possible, then the inspections need not be performed~~. The inspection

techniques used will be capable of detecting primary water stress corrosion cracking in the steam generator divider plate assemblies and their associated welds. Any evidence of cracking will be documented and evaluated under the corrective action program.

Seabrook Station remains involved with the on-going industry studies conducted by EPRI related to divider plate cracking. This participation will ensure that any inspection requirements or other resolution actions recommended to the industry are evaluated and implemented as appropriate.

Based on the above discussion, the following change has been made to the Seabrook Station License Renewal Application:

1. The following commitment is added to Section A.3 LICENSE RENEWAL COMMITMENT LIST of the License Renewal Application on page A-43:

| No. | PROGRAM OR TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 55 | Steam Generator Tube Integrity | Seabrook will perform an inspection of each steam generator to assess the condition of the divider plate assembly~~ unless operating experience and/or analytical results show that crack propagation into RCS pressure boundary is not possible, then the inspections need not be performed~~. | A.2.1.10 | Prior to entering the period of extended operation |

**Enclosure 4 to SBK-L-11054**

# LRA Appendix A - Final Safety Report Supplement

# Table A.3 License Renewal Commitment List

## A.3 LICENSE RENEWAL COMMITMENT LIST

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 1. | PWR Vessel Internals | An inspection plan for Reactor Vessel Internals will be submitted for NRC review and approval at least twenty-four months prior to entering the period of extended operation. | A.2.1.7 | Program to be implemented prior to the period of extended operation. Inspection plan to be submitted to NRC not less than 24 months prior to the period of extended operation. |
| 2. | Closed-Cycle Cooling Water | Enhance the program to include visual inspection for cracking, loss of material and fouling when the in-scope systems are opened for maintenance. | A.2.1.12 | Prior to the period of extended operation |
| 3. | Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems | Enhance the program to monitor general corrosion on the crane and trolley structural components and the effects of wear on the rails in the rail system. | A.2.1.13 | Prior to the period of extended operation |
| 4. | Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems | Enhance the program to list additional cranes for monitoring. | A.2.1.13 | Prior to the period of extended operation |
| 5. | Compressed Air Monitoring | Enhance the program to include an annual air quality test requirement for the Diesel Generator compressed air sub system. | A.2.1.14 | Prior to the period of extended operation |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 6. | Fire Protection | Enhance the program to perform visual inspection of penetration seals by a fire protection qualified inspector. | A.2.1.15 | Prior to the period of extended operation. |
| 7. | Fire Protection | Enhance the program to add inspection requirements such as spalling, and loss of material caused by freeze-thaw, chemical attack, and reaction with aggregates by qualified inspector. | A.2.1.15 | Prior to the period of extended operation. |
| 8. | Fire Protection | Enhance the program to include the performance of visual inspection of fire-rated doors by a fire protection qualified inspector. | A.2.1.15 | Prior to the period of extended operation. |
| 9. | Fire Water System | Enhance the program to include NFPA 25 guidance for "where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing". | A.2.1.16 | Prior to the period of extended operation. |
| 10. | Fire Water System | Enhance the program to include the performance of periodic flow testing of the fire water system in accordance with the guidance of NFPA 25. | A.2.1.16 | Prior to the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 11. | Fire Water System | Enhance the program to include the performance of periodic visual or volumetric inspection of the internal surface of the fire protection system upon each entry to the system for routine or corrective maintenance. These inspections will be documented and trended to determine if a representative number of inspections have been performed prior to the period of extended operation. If a representative number of inspections have not been performed prior to the period of extended operation, focused inspections will be conducted. These inspections will be performed within ten years prior to the period of extended operation. | A.2.1.16 | Within ten years prior to the period of extended operation. |
| 12. | Aboveground Steel Tanks | Enhance the program to include components and aging effects required by the Aboveground Steel Tanks. | A.2.1.17 | Prior to the period of extended operation. |
| 13. | Aboveground Steel Tanks | Enhance the program to include an ultrasonic inspection and evaluation of the internal bottom surface of the two Fire Protection Water Storage Tanks. | A.2.1.17 | Within ten years prior to the period of extended operation. |
| 14. | Fuel Oil Chemistry | Enhance program to add requirements to 1) sample and analyze new fuel deliveries for biodiesel prior to offloading to the Auxiliary Boiler fuel oil storage tank and 2) periodically sample stored fuel in the Auxiliary Boiler fuel oil storage tank. | A.2.1.18 | Prior to the period of extended operation. |
| 15. | Fuel Oil Chemistry | Enhance the program to add requirements to check for the presence of water in the Auxiliary Boiler fuel oil storage tank at least once per quarter and to remove water as necessary. | A.2.1.18 | Prior to the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 16. | Fuel Oil Chemistry | Enhance the program to require draining, cleaning and inspection of the diesel fire pump fuel oil day tanks on a frequency of at least once every ten years. | A.2.1.18 | Prior to the period of extended operation. |
| 17. | Fuel Oil Chemistry | Enhance the program to require ultrasonic thickness measurement of the tank bottom during the 10-year draining, cleaning and inspection of the Diesel Generator fuel oil storage tanks, Diesel Generator fuel oil day tanks, diesel fire pump fuel oil day tanks and auxiliary boiler fuel oil storage tank. | A.2.1.18 | Prior to the period of extended operation. |
| 18. | Reactor Vessel Surveillance | Enhance the program to specify that all pulled and tested capsules, unless discarded before August 31, 2000, are placed in storage. | A.2.1.19 | Prior to the period of extended operation. |
| 19. | Reactor Vessel Surveillance | Enhance the program to specify that if plant operations exceed the limitations or bounds defined by the Reactor Vessel Surveillance Program, such as operating at a lower cold leg temperature or higher fluence, the impact of plant operation changes on the extent of Reactor Vessel embrittlement will be evaluated and the NRC will be notified. | A.2.1.19 | Prior to the period of extended operation. |
| 20. | Reactor Vessel Surveillance | Enhance the program as necessary to ensure the appropriate withdrawal schedule for capsules remaining in the vessel such that one capsule will be withdrawn at an outage in which the capsule receives a neutron fluence that meets the schedule requirements of 10 CFR 50 Appendix H and ASTM E185-82 and that bounds the 60-year fluence, and the remaining capsule(s) will be removed from the vessel unless determined to provide meaningful metallurgical data. | A.2.1.19 | Prior to the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 21. | Reactor Vessel Surveillance | Enhance the program to ensure that any capsule removed, without the intent to test it, is stored in a manner which maintains it in a condition which would permit its future use, including during the period of extended operation. | A.2.1.19 | Prior to the period of extended operation. |
| 22. | One-Time Inspection | Implement the One Time Inspection Program. | A.2.1.20 | Within ten years prior to the period of extended operation. |
| 23. | Selective Leaching of Materials | Implement the Selective Leaching of Materials Program. The program will include a one-time inspection of selected components where selective leaching has not been identified and periodic inspections of selected components where selective leaching has been identified. | A.2.1.21 | Within five years prior to the period of extended operation. |
| 24. | Buried Piping And Tanks Inspection | Implement the Buried Piping And Tanks Inspection Program. | A.2.1.22 | Within ten years prior to entering the period of extended operation |
| 25. | One-Time Inspection of ASME Code Class 1 Small Bore-Piping | Implement the One-Time Inspection of ASME Code Class 1 Small Bore-Piping Program. | A.2.1.23 | Within ten years prior to the period of extended operation. |
| 26. | External Surfaces Monitoring | Enhance the program to specifically address the scope of the program, relevant degradation mechanisms and effects of interest, the refueling outage inspection frequency, the inspections of opportunity for possible corrosion under insulation, the training requirements for inspectors and the required periodic reviews to determine program effectiveness. | A.2.1.24 | Prior to the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 27. | Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components | Implement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. | A.2.1.25 | Prior to the period of extended operation. |
| 28. | Lubricating Oil Analysis | Enhance the program to add required equipment, lube oil analysis required, sampling frequency, and periodic oil changes. | A.2.1.26 | Prior to the period of extended operation. |
| 29. | Lubricating Oil Analysis | Enhance the program to sample the oil for the Switchyard $SF_6$ compressors and the Reactor Coolant pump oil collection tanks. | A.2.1.26 | Prior to the period of extended operation. |
| 30. | Lubricating Oil Analysis | Enhance the program to require the performance of a one-time ultrasonic thickness measurement of the lower portion of the Reactor Coolant pump oil collection tanks prior to the period of extended operation. | A.2.1.26 | Prior to the period of extended operation. |
| 31. | ASME Section XI, Subsection IWL | Enhance procedure to include the definition of "Responsible Engineer". | A.2.1.28 | Prior to the period of extended operation. |
| 32. | Structures Monitoring Program | Enhance procedure to add the aging effects, additional locations, inspection frequency and ultrasonic test requirements. | A.2.1.31 | Prior to the period of extended operation. |
| 33. | Structures Monitoring Program | Enhance procedure to include inspection of opportunity when planning excavation work that would expose inaccessible concrete. | A.2.1.31 | Prior to the period of extended operation. |
| 34. | Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements | Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. | A.2.1.32 | Prior to the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 35. | Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits | Implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program. | A.2.1.33 | Prior to the period of extended operation. |
| 36. | Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements | Implement the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. | A.2.1.34 | Prior to the period of extended operation. |
| 37. | Metal Enclosed Bus | Implement the Metal Enclosed Bus program. | A.2.1.35 | Prior to the period of extended operation. |
| 38. | Fuse Holders | Implement the Fuse Holders program. | A.2.1.36 | Prior to the period of extended operation. |
| 39. | Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements | Implement the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. | A.2.1.37 | Prior to the period of extended operation. |
| 40. | 345 KV $SF_6$ Bus | Implement the 345 KV $SF_6$ Bus program. | A.2.2.1 | Prior to the period of extended operation. |
| 41. | Metal Fatigue of Reactor Coolant Pressure Boundary | Enhance the program to include additional transients beyond those defined in the Technical Specifications and UFSAR. | A.2.3.1 | Prior to the period of extended operation. |
| 42. | Metal Fatigue of Reactor Coolant Pressure Boundary | Enhance the program to implement a software program, to count transients to monitor cumulative usage on selected components. | A.2.3.1 | Prior to the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 43. | Pressure –Temperature Limits, including Low Temperature Overpressure Protection Limits | Seabrook Station will submit updates to the P-T curves and LTOP limits to the NRC at the appropriate time to comply with 10 CFR 50 Appendix G. | A.2.4.1.4 | The updated analyses will be submitted at the appropriate time to comply with 10 CFR 50 Appendix G, Fracture Toughness Requirements. |
| 44. | Environmentally-Assisted Fatigue Analyses (TLAA) | NextEra Seabrook will perform a review of design basis ASME Class 1 component fatigue evaluations to determine whether the NUREG/CR-6260-based components that have been evaluated for the effects of the reactor coolant environment on fatigue usage are the limiting components for the Seabrook plant configuration. If more limiting components are identified, the most limiting component will be evaluated for the effects of the reactor coolant environment on fatigue usage. If the limiting location identified consists of nickel alloy, the environmentally-assisted fatigue calculation for nickel alloy will be performed using the rules of NUREG/CR-6909.<br><br>(1) Consistent with the Metal Fatigue of Reactor Coolant Pressure Boundary Program Seabrook Station will update the fatigue usage calculations using refined fatigue analyses, if necessary, to determine acceptable CUFs (i.e., less than 1.0) when accounting for the effects of the reactor water environment. This includes applying the appropriate $F_{en}$ factors to valid CUFs determined from an existing fatigue analysis valid for the period of extended operation or from an analysis using an NRC-approved version of the ASME code or NRC-approved | A.2.4.2.3 | At least two years prior to entering the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| | | alternative (e.g., NRC-approved code case).<br><br>(2) If acceptable CUFs cannot be demonstrated for all the selected locations, then additional plant-specific locations will be evaluated. For the additional plant-specific locations, if CUF, including environmental effects is greater than 1.0, then Corrective Actions will be initiated, in accordance with the Metal Fatigue of Reactor Coolant Pressure Boundary Program, B.2.3.1. Corrective Actions will include inspection, repair, or replacement of the affected locations before exceeding a CUF of 1.0 or the effects of fatigue will be managed by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method accepted by the NRC). | | |
| 45. | Mechanical Equipment Qualification | Revise Mechanical Equipment Qualification Files. | A.2.4.5.9 | Prior to the period of extended operation. |
| 46. | Protective Coating Monitoring and Maintenance | Enhance the program by designating and qualifying an Inspector Coordinator and an Inspection Results Evaluator. | A.2.1.38 | Prior to the period of extended operation |
| 47. | Protective Coating Monitoring and Maintenance | Enhance the program by including, "Instruments and Equipment needed for inspection may include, but not be limited to, flashlight, spotlights, marker pen, mirror, measuring tape, magnifier, binoculars, camera with or without wide angle lens, and self sealing polyethylene sample bags." | A.2.1.38 | Prior to the period of extended operation |
| 48. | Protective Coating Monitoring and Maintenance | Enhance the program to include a review of the previous two monitoring reports. | A.2.1.38 | Prior to the period of extended operation |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 49. | Protective Coating Monitoring and Maintenance | Enhance the program to require that the inspection report is to be evaluated by the responsible evaluation personnel, who is to prepare a summary of findings and recommendations for future surveillance or repair. | A.2.1.38 | Prior to the period of extended operation |
| 50. | ASME Section XI, Subsection IWE | Perform testing of the containment liner plate for loss of material. | A.2.1.17 | Prior to the period of extended operation. |
| 51. | ASME Section XI, Subsection IWL | Perform confirmatory testing and evaluation of the Containment Structure concrete | A.2.1.28 | Prior to the period of extended operation |
| 52. | ASME Section XI, Subsection IWL | Implement measures to maintain the exterior surface of the Containment Structure, from elevation -30 feet to +20 feet, in a dewatered state. | A.2.1.28 | Prior to the period of extended operation |
| 53. | Reactor Head Closure Studs | Replace the spare reactor head closure stud(s) manufactured from the bar that has a yield strength > 150 ksi with ones that do not exceed 150 ksi. | A.2.1.3 | Prior to the period of extended operation. |
| 54. | Steam Generator Tube Integrity | Unless an alternate repair criteria changing the ASME code boundary is permanently approved by the NRC, or the Seabrook Station steam generators are changed to eliminate PWSCC-susceptible tube-to-tubesheet welds, submit a plant-specific aging management program to manage the potential aging effect of cracking due to PWSCC at least twenty-four months prior to entering the Period of Extended Operation. | A.2.1.10 | Program to be submitted to NRC at least 24 months prior to the period of extended operation. |

| No. | PROGRAM or TOPIC | COMMITMENT | UFSAR LOCATION | SCHEDULE |
|---|---|---|---|---|
| 55. | Steam Generator Tube Integrity | Seabrook will perform an inspection of each steam generator to assess the condition of the divider plate assembly ~~unless operating experience and/or analytical results show that crack propagation into RCS pressure boundary is not possible, then the inspections need not be performed~~. | A.2.1.10 | Prior to entering the period of extended operation |
| 56. | Closed-Cycle Cooling Water System | Revise the station program documents to reflect the EPRI Guideline operating ranges and Action Level values for hydrazine and sulfates. | A.2.1.12 | Prior to entering the period of extended operation. |
| 57. | Closed-Cycle Cooling Water System | Revise the station program documents to reflect the EPRI Guideline operating ranges and Action Level values for Diesel Generator Cooling Water Jacket pH. | A.2.1.12 | Prior to entering the period of extended operation. |
| 58. | Fuel Oil Chemistry | Update Technical Requirement Program 5.1, (Diesel Fuel Oil Testing Program) ASTM standards to ASTM D2709-96 and ASTM D4057-95 required by the GALL XI.M30 Rev 1 | A.2.1.18 | Prior to the period of extended operation. |
| 59. | Nickel Alloy Nozzles and Penetrations | The Nickel Alloy Aging Nozzles and Penetrations program will implement applicable Bulletins, Generic Letters, and staff accepted industry guidelines. | A.2.2.3 | Prior to the period of extended operation. |
| 60. | Buried Piping and Tanks Inspection | Implement the design change replacing the buried Auxiliary Boiler supply piping with a pipe-within-pipe configuration with leak indication capability. | A.2.1.22 | Prior to entering the period of extended operation. |
| 61. | Compressed Air Monitoring Program | Replace the flexible hoses associated with the Diesel Generator air compressors on a frequency of every 10 years. | A.2.1.14 | Within ten years prior to entering the period of extended operation. |
| 62. | Water Chemistry | Enhance the program to include a statement that sampling frequencies are increased when chemistry action levels are exceeded. | A.2.1.2 | Prior to entering the period of extended operation. |