



February 7, 2012

SBK-L-12023  
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 18, RAI B.2.1.11-2

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 for the Review of the Seabrook Station License Renewal Application"– Request for Additional Information Set 18," December 12, 2011. (Accession Number ML11341A162)
3. NextEra Energy Seabrook, LLC letter SBK-L-12001, "Seabrook Station Response to Request for Additional Information NextEra Energy Seabrook License Renewal Application – Set 18, RAI B.1.4-2 and B.1.4-3," January 20, 2012.

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.

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In Reference 2, the NRC requested additional information (SET 18) in order to complete its review of the License Renewal Application (LRA). Response to Set 18, RAI B.1.4-2 and B.1.4-3 has been provided under separate cover (Reference 3). Enclosure 1 contains NextEra's response to Set 18, RAI B.2.1.11-2 and associated changes made to the LRA. For clarity, deleted LRA text is highlighted by strikethroughs and inserted texts highlighted by bold italics. There are no new or revised regulatory commitments contained in this letter.

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.



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Paul O. Freeman  
Site Vice President

Enclosures:

Enclosure 1- Response to Request for Additional Information Seabrook Station License Renewal Application Set 18, RAI B:2.1.11-2 and Associated LRA Changes.

cc:

W.M. Dean,	NRC Region I Administrator
J. G. Lamb,	NRC Project Manager, Project Directorate I-2
W. J. Raymond,	NRC Resident Inspector
R. A. Plasse Jr.,	NRC Project Manager, License Renewal
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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

7<sup>th</sup> day of February, 2012

A handwritten signature in black ink, appearing to read "Paul O. Freeman".

Paul O. Freeman

Site Vice President

A handwritten signature in black ink, appearing to read "Victoria S. Brown".

Notary Public



**Enclosure 1 to SBK-L-12023**

**Response to Request for Additional Information  
Seabrook Station License Renewal Application  
Set 18, RAI B.2.1.11-2  
and Associated LRA Changes**

**Request for Additional Information (RAI) B.2.1.11-2:**

**Background**

GALL Report AMP XI.M20, "Open-Cycle Cooling Water," states that the program includes surveillance and control techniques to manage aging effects caused by various aging mechanisms including protective coating failures. GALL Report, Table IX.F, "Aging Mechanisms," states that fouling includes macrofouling (e.g., peeled coatings and debris), and can result in a reduction of heat transfer or loss of material.

SRP-LR Section A.1.2.3.10 "Operating Experience," states that past corrective actions for existing AMPs should be considered and that feedback from past failures should have resulted in appropriate program enhancements. The SRP-LR also states that operating experience information should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

LRA Section B.2.1.11 describes the Open-Cycle Cooling Water System Program as an existing program that manages the aging effects due to various mechanisms including "liner/coating degradation." In addition, the Operating Experience section for this program states:

*The cement lined above ground piping associated with the Diesel Generator heat exchangers has been replaced with flanged Plastisol PVC lined carbon steel spool pieces. The size and accessibility of this piping did not permit the use of AMEX-10/WEKO seals. Follow up inspections of weld areas by ultrasonic testing and internal visual examinations during refueling outages have confirmed that the engineering design change has been effective in preventing loss of material.*

**Issue**

According to recent information provided by Regional NRC personnel, the Plastisol PVC lining has degraded to the extent that it was found missing in certain portions of the carbon steel piping, which potentially affected the intended function of the diesel generator heat exchangers. Based on this plant-specific operating experience, additional information is needed by the staff relative to the effectiveness of past aging management activities for the Open-Cycle Cooling Water System Program, and any enhancements, if warranted, to address this degradation.

**Request**

- (a) Provide a description of the recent PVC lining degradation event, including the associated cause and extent of condition. As part of the response, address the expected life span of the PVC lining material. In addition, provide a discussion of the previous aging management activities that were performed to manage liner degradation prior to the event, including whether any previous activities were specifically performed on the degraded areas.
- (b) Provide a description of the corrective actions taken in response to the recent event and provide any enhancements made to the Open-Cycle Cooling Water Program to ensure that

components' intended function(s) will not be impacted during the period of extended operation. If enhancements will not be made, provide the bases for why there is reasonable assurance that the intended functions will be maintained consistent with current licensing bases.

### **NextEra Energy Response to Request (a)**

#### **Background**

During Refueling Outage 2 (1992), several through wall leaks were observed in the 16" cement lined Service Water piping for the Diesel Generator heat exchangers (DGHXs). Subsequently, in Refueling Outage 3 (1994), the cement lined carbon steel Service Water piping associated with the Diesel Generator heat exchangers was replaced with Plastisol PVC lined carbon steel piping. At the time that the design change was initiated, the liner material was noted to have an anticipated service life of 15 years. Subsequent discussion with the liner manufacturer indicated an expected life of 15 - 20 years for the Plastisol PVC liner in seawater.

During routine surveillance testing in July 2011, Service Water flow through the Train 'B' DGHX was identified as degraded. At that time, the apparent cause of the flow degradation was postulated to be macrofouling of the heat exchanger or flow orifice. A corrective action document was initiated to inspect the heat exchanger and flow orifice during the next outage. In October 2011, the plant entered a forced outage for unrelated reasons and the Train 'B' DGHX downstream flow orifice was inspected. Inspection revealed that pieces of Plastisol PVC lining of sufficient size so as to partially restrict flow through the orifice had become detached from the pipe.

#### **Description of PVC Liner Degradation Event**

Inspection of the Plastisol PVC lined piping revealed the majority of the lining in one Service Water spool piece downstream of the Train 'B' DGHX to be in poor condition. The lining was loose or missing in multiple locations. This spool piece had been previously inspected during Refueling Outage 6 (1999) with no deficiencies noted. All remaining liner material installed in this spool piece was removed to prevent further delamination.

The remainder of the Plastisol PVC lined pipe in the Train 'B' DGHX piping (with the exception noted below) and all of the Train 'A' DGHX piping was inspected and the results did not identify similar delamination. One section of 'B' DGHX pipe was not inspected based on acceptable UT measurements and boroscope inspection results associated with the adjacent vertical section of piping. Localized areas were noted to show bubbles or small waves in the liner. The Plastisol PVC liner in these areas was removed and edges smoothed.

In lieu of repair, the Plastisol PVC lined piping has been scheduled for replacement with a corrosion resistant, unlined material during the next refueling outage. Evaluation of the existing unlined portions of carbon steel pipe as a result of liner removal indicates sufficient wall thickness for continued operation until the piping can be replaced.

### Associated Cause

A sample of the liner was sent to a materials analysis laboratory for examination. Results of that examination concluded that the Plastisol PVC liner material removed from the Service Water system exhibited indications of aging. This was evidenced by cracking on both the OD (pipe wall side) and ID (seawater side) of the removed liner material. Hardness testing was performed on the section of liner material removed from the Service Water system and on an unused sample of liner material that was available from 1994 testing at the same laboratory. This test indicated a noticeable increase in hardness of the used liner material compared to the unused sample.

NextEra conducted a root cause evaluation of the Plastisol PVC lining degradation event. The root cause evaluation concluded that the lack of formal process to track the inspections and replacement strategy for the Plastisol PVC lined pipe and the failure of the inspection strategy to be consistently implemented over the past 17 years had led to the unexpected delamination of the DGHX Plastisol PVC lined pipe as discovered in October 2011.

This evaluation identified two root causes for this event.

1. A "limited life" design change (the Plastisol PVC material had a 15 year service life) was implemented in 1994 with no provisions for formally tracking the periodic verifications of the material condition of the coating.
2. Oversight of the Service Water system was not adequate due to a lack of compliance with the system performance monitoring guideline requirements associated with the Plastisol PVC lined pipe.

### Previous Aging Management Activities and Inspections

Following the piping replacement in 1994, the responsible System Engineer implemented an inspection strategy for this piping intended to ensure that a portion of the Plastisol PVC lined piping was inspected during each outage with each subsequent inspection scope and frequency being driven from previous inspection results. Inspection of the piping was performed each outage from Refueling Outage 4 (1996) through Refueling Outage 9 (2003) with no significant indications of liner degradation except as discussed below. Minor defects noted were determined to be caused by spool piece removal and reinstallation.

Results of piping inspection in Refueling Outage 5 (1997) noted some bubbles in the Plastisol PVC liner and delamination at the flange. An action was assigned to perform a more thorough inspection during the next outage (Refueling Outage 6) to determine if a generic problem existed for Plastisol PVC liner based on these inspection results.

The DGHX Train 'B' Plastisol PVC lined piping was inspected during Refueling Outage 6 (1999). Inspection results identified overall liner conditions to be "good" with no indications of deterioration. Two small areas of liner degradation at flange locations were identified and repaired. The System Engineer documented that the damage mechanism was suspected to be mechanical in nature and likely occurred during previous pipe spool removal/installation. Areas of bubbling were identified but no significant indications of the Plastisol PVC liner separating from the pipe surface were observed. It was concluded that there is no generic

problem existing for the Plastisol PVC liner.

DGHX Train 'B' Plastisol PVC lined piping was inspected during Refueling Outage 8 (2002). Inspection results identified damage to Plastisol PVC lined pipe upstream of an expansion joint. A portion of the Plastisol PVC liner in the individual spool piece was removed and repaired. Inspection notes stated that there was lack of adhesion of the liner to the pipe surface.

Following Refueling Outage 9 (2003), periodic inspection of the Plastisol PVC lined piping was discontinued in favor of a new long term inspection strategy. This strategy focused on the Service Water system as a whole and distributed piping inspections over several outages. The Plastisol PVC lined pipe was not singled out for more frequent inspections. In accordance with this long term strategy, the DGHX piping (Plastisol PVC lined) was not scheduled for another inspection until Refueling Outages 15 and 16 (2012 and 2014, respectively).

### **NextEra Energy Response to Request (b)**

#### **Description of the Corrective Actions Taken as a Result of this Event**

Corrective Actions have been assigned to ensure that "limited life" design changes include adequate post-modification inspection and replacement activities to preclude similar unanticipated failures.

1. The design control process will be revised to include the requirement to utilize the preventive maintenance process for inspections and replacement activities.
2. A process will be established that ensures monitoring and inspection programs comply with system performance monitoring guidelines and that long term strategies comply with Regulatory Commitments (such as GL 89-13).

To resolve the issues in the DGHX Plastisol PVC lined piping, actions have been assigned to support replacement of the Plastisol PVC lined pipe in the subsequent refueling outage (currently scheduled for fall of 2012).

1. A design change document will be developed to resolve the degraded/nonconforming conditions.
2. The associated Service Water piping will be periodically inspected to verify adequate pipe wall thickness until replaced.

To verify the extent of condition, actions have been assigned to evaluate concrete lined piping in the Screen Wash System and Circulating Water System for determination of liner adequacy and to determine if other coatings utilized in the Service Water system have service life limitations. If any exist, corrective actions will be initiated to determine extent of condition and to develop a formal process to periodically verify the material condition of the coatings.

An action has also been assigned to issue an Industry Operating Experience Report documenting this event.

Review of Open-Cycle Cooling Water Program to Determine if Enhancements are Needed

NextEra Open-Cycle Cooling System Program (B.2.1.12) has provisions for managing protective coatings and therefore, enhancements are not required to the aging management program. The program relies on the implementation of the recommendations of NRC Generic Letter (GL) 89-13, "*Service Water System Problems Affecting Safety-Related Equipment*" to ensure that the aging effects on the open-cycle cooling water systems will be adequately managed for the period of extended operation. The program, as mandated by GL 89-13, includes (a) surveillance and control of corrosion, erosion, protective coating failure, bio-fouling, silting, and heat transfer degradation, (b) tests to verify heat transfer, (c) routine inspection and maintenance of plant components, (d) system walk downs to ensure compliance with the stations licensing basis and (e) a review of maintenance, operating and training practices and procedures to ensure the effectiveness of established programs.

The operating experience described above and the actions taken ensure that routine inspection and maintenance of this piping will be conducted appropriately for the applicable piping material, liner material, and design considerations. Replacing the Plastisol PVC lined piping (currently planned for Refueling Outage 15 in October 2012) prior to entering the Period of Extended Operation ensures that failure of this lining material does not become a viable aging mechanism requiring management.