UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 15, 2017

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
NextEra Energy Seabrook, LLC
Mail Stop: NT3/JW
15430 Endeavor Drive
Jupiter, FL 33478

SUBJECT: SEABROOK STATION, UNIT NO. 1 – ISSUANCE OF AMENDMENT RE: EXTENSION OF CONTAINMENT LEAKAGE RATE TEST FREQUENCY (CAC NO. MF7565)

Dear Mr. Nazar:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 153 to Facility Operating License No. NPF-86 for the Seabrook Station, Unit No. 1. This amendment consists of changes to the technical specifications (TSs) in response to your application dated March 31, 2016, as supplemented by letters dated May 31, October 27, November 17, and December 30, 2016.

The amendment revises TS 6.15, "Containment Leakage Rate Testing Program," to require a program that is in accordance with Nuclear Energy Institute (NEI) Topical Report NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J."

A copy of the related safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Justin C. Poole, Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosures:
1. Amendment No. 153 to NPF-86
2. Safety Evaluation

cc w/enclosures: Distribution via Listserv

SUBJECT: SEABROOK STATION, UNIT NO. 1 – ISSUANCE OF AMENDMENT RE: EXTENSION OF CONTAINMENT LEAKAGE RATE TEST FREQUENCY (CAC NO. MF7565) DATED MARCH 15, 2017

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**ADAMS Accession No.: ML17046A443** *by memorandum dated **by e-mail

| OFFICE | DORL/LPL1/PM | DORL/LPL1/LA | DRA/APLA/BC* | DSS/STSB/BC | DSS/SBPB/BC* |
|---|---|---|---|---|---|
| NAME | JPoole | LRonewicz | SRosenberg | AKlein (w/comment) | RDennig |
| DATE | 02/23/17 | 02/22/17 | 12/20/16 | 02/28/17 | 12/06/16 |
| OFFICE | DE/EMCB/BC* | OGC – NLO** | DORL/LPL1/BC | DORL/LPL1/PM | |
| NAME | JQuichocho | JWachutka (subject to e-mail comments) | JDanna | JPoole | |
| DATE | 01/06/17 | 03/10/17 | 03/14/17 | 03/15/17 | |

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NEXTERA ENERGY SEABROOK, LLC, ET AL.*

DOCKET NO. 50-443

SEABROOK STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 153
License No. NPF-86

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment filed by NextEra Energy Seabrook, LLC (the licensee), dated March 31, 2016, as supplemented by letters dated May 31, October 27, November 17, and December 30, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

*NextEra Energy Seabrook, LLC, is authorized to act as agent for the: Hudson Light & Power Department, Massachusetts Municipal Wholesale Electric Company, and Taunton Municipal Lighting Plant and has exclusive responsibility and control over the physical construction, operation and maintenance of the facility.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-86 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 153, and the Environmental Protection Plan contained in Appendix B are incorporated into the Facility License No. NPF-86. NextEra Energy Seabrook, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Facility Operating License
and Technical Specifications

Date of Issuance: March 15, 2017

ATTACHMENT TO LICENSE AMENDMENT NO. 153

SEABROOK STATION, UNIT NO. 1

FACILITY OPERATING LICENSE NO. NPF-86

DOCKET NO. 50-443

Replace the following page of Facility Operating License No. NPF-86 with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

| Remove | Insert |
|---|---|
| 3 | 3 |

Replace the following page of the Appendix A, Technical Specifications, with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

| Remove | Insert |
|---|---|
| 6-25 | 6-25 |

(4) NextEra Energy Seabrook, LLC, pursuant to the Act and 10 CFR 30, 40, and 70, to receive, possess, and use at any time any byproduct, source, and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) NextEra Energy Seabrook, LLC, pursuant to the Act and 10 CFR 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source, or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;

(6) NextEra Energy Seabrook, LLC, pursuant to the Act and 10 CFR 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility authorized herein; and

(7) DELETED

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

NextEra Energy Seabrook, LLC, is authorized to operate the facility at reactor core power levels not in excess of 3648 megawatts thermal (100% of rated power).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 153*, and the Environmental Protection Plan contained in Appendix B are incorporated into the Facility License No. NPF-86. NextEra Energy Seabrook, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) License Transfer to FPL Energy Seabrook, LLC**

a. On the closing date(s) of the transfer of any ownership interests in Seabrook Station covered by the Order approving the transfer, FPL Energy Seabrook, LLC**, shall obtain from each respective transferring owner all of the accumulated decommissioning trust funds for the facility, and ensure the deposit of such funds and additional funds, if necessary, into a decommissioning trust or trusts for Seabrook Station established by FPL Energy Seabrook, LLC**, such that the amount of such funds deposited meets or exceeds the amount required under 10 CFR 50.75 with respect to the interest in Seabrook Station FPL Energy Seabrook, LLC**, acquires on such dates(s).

* Implemented
** On April 16, 2009, the name "FPL Energy Seabrook, LLC" was changed to "NextEra Energy Seabrook, LLC".

6.14.1 (Continued)

6) A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents and in solid waste, to the actual releases for the period prior to when the change is to be made;

7) An estimate of the exposure to plant operating personnel as a result of the change; and

8) Documentation of the fact that the change was reviewed and found acceptable by the SORC.

b. Shall become effective upon review and acceptance by the SORC.

6.15 CONTAINMENT LEAKAGE RATE TESTING PROGRAM

A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with Nuclear Energy Institute (NEI) topical report NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," and conditions and limitations specified in NEI 94-01, Revision 2-A.

The peak calculated containment internal pressure for the design basis loss of coolant accident, $P_a$, is 49.6 psig.

The maximum allowable containment leakage rate, $L_a$, at $P_a$, shall be 0.15% of primary containment air weight per day.

The provisions of SR 4.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program.

The provisions of SR 4.0.3 are applicable to the Containment Leakage Rate Testing Program.

Containment leakage rate acceptance criterion is $\leq 1.0\ L_a$. During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria are $\leq 0.60\ L_a$ for the Type B and Type C tests and $\leq 0.75\ L_a$ for Type A tests.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

# SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

# RELATED TO AMENDMENT NO. 153 TO FACILITY OPERATING LICENSE NO. NPF-86

# NEXTERA ENERGY SEABROOK, LLC

# SEABROOK STATION, UNIT NO. 1

# DOCKET NO. 50-443

## 1.0 INTRODUCTION

By letter dated March 31, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16095A278), as supplemented by letters dated May 31, October 27, November 17, and December 30, 2016 (ADAMS Accession Nos. ML16159A194, ML16302A397, ML16327A065, and ML17003A273, respectively), NextEra Energy Seabrook, LLC (NextEra, the licensee) submitted License Amendment Request (LAR) No. 16-01, requesting changes to the Technical Specifications (TSs) for Seabrook Station, Unit No. 1 (Seabrook). The amendment would revise Seabrook TS 6.15, "Containment Leakage Rate Testing Program," to require a program that is in accordance with Nuclear Energy Institute (NEI) topical report (TR) NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J" (ADAMS Accession No. ML12221A202), and the conditions and limitations specified in NEI 94-01, Revision 2-A (ADAMS Accession No. ML100620847), for the Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix J, Option B, performance-based containment leak rate testing program. This request would allow the licensee to extend the performance-based containment integrated leak rate test (ILRT) (Type A) interval up to 15 years and the containment isolation valve local leak rate test (LLRT) (Type C) interval up to 75 months.

The supplemental letters dated October 27, November 17, and December 30, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 19, 2016 (81 FR 46964).

## 2.0 REGULATORY EVALUATION

Section 50.54(o) of 10 CFR requires that the primary reactor containments for water-cooled power reactors shall be subject to the requirements set forth in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors." The regulations in 10 CFR Part 50, Appendix J, include two options: "Option A – Prescriptive Requirements," and "Option B – Performance-Based Requirements," either of which will meet

the requirements of the appendix. The testing requirements ensure that (a) leakage through containments or systems and components penetrating containments does not exceed allowable leakage rates specified in the TSs and (b) integrity of the containment structure is maintained during its service life. At Seabrook, the licensee has adopted and implemented Option B for meeting the requirements of 10 CFR Part 50, Appendix J.

Option B of 10 CFR Part 50, Appendix J, specifies performance-based requirements and criteria for preoperational and subsequent leakage-rate testing. These requirements are met by performance of Type A tests to measure the containment system overall integrated leakage rate, Type B pneumatic tests to detect and measure local leakage rates across pressure-retaining leakage-limiting boundaries such as penetrations, and Type C pneumatic tests to measure containment isolation valve (CIV) leakage rates. After the preoperational tests, these tests are required to be conducted at periodic intervals based on the historical performance of the overall containment system (for Type A tests), and based on the safety significance and historical performance of each boundary and isolation valve (for Type B and Type C tests) to ensure integrity of the overall containment system as a barrier to fission product release.

Currently, Seabrook TS 6.15 requires that leakage rate testing be performed, as required by 10 CFR Part 50, Appendix J, Option B, as modified by one approved exception, to the guidelines contained in NRC Regulatory Guide (RG) 1.163, "Performance-Based Containment Leak-Test Program," September 1995 (ADAMS Accession No. ML003740058). This RG endorses, with certain exceptions, NEI 94-01, Revision 0 (ADAMS Accession No. ML11327A025).

Section 50.55a, "Codes and standards," of 10 CFR contains the containment inservice inspection (CISI) program requirements that, in conjunction with the requirements of 10 CFR Part 50, Appendix J, ensure the continued leak-tightness and structural integrity of the containment during its service life.

Paragraph (a)(1) of Section 50.65 (a), "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," of 10 CFR states, in part, that the licensee:

> ... shall monitor the performance or condition of structures, systems, or components, against licensee-established goals, in a manner sufficient to provide reasonable assurance that these structures, systems, and components, as defined in paragraph (b) of this section, are capable of fulfilling their intended functions. These goals shall be established commensurate with safety and, where practical, take into account industrywide operating experience.

The Type A test is an overall ILRT of the containment structure. NEI 94-01, Revision 0, specifies an initial test interval of 48 months, but allows an extended interval of 10 years, based upon two consecutive successful tests. There is also a provision for extending the test interval an additional 15 months, but this "should be used only in cases where refueling schedules have been changed to accommodate other factors." Amendment No. 82 to Facility Operating License No. NPF-86 for Seabrook (ADAMS Accession No. ML020530297) allowed a one-time extension of the ILRT interval to 15 years. However, the ILRT test interval requirement in Seabrook TS 6.15 remained at 10 years.

The results of the two most recent Type A tests of October 30, 1992, and April 27, 2008, are reflected in Section 3.1.1 of the LAR. As can be seen in the LAR dated March 31, 2016, in the

Table "Seabrook Type A Test Historical Results Since 1986," both Type A tests were performed consistent with the definition of $P_a$. Both Type A tests were successful in that the "as-found" test results were less than 1.0 $L_a$ as specified by the limiting value of Seabrook TS 6.15. Both $P_a$ and $L_a$ are defined in Seabrook TS 6.15.

Guidance for extending Type A ILRT surveillance intervals beyond 10 years is provided in NEI 94-01, Revision 2-A.

Guidance for extending Type C LLRT surveillance intervals beyond 60 months is provided in NEI 94-01, Revision 3-A.

The Type A, Type B, and Type C test results must not exceed the $L_a$ with margin, as specified in Seabrook TS 6.15. Option B of 10 CFR Part 50, Appendix J, also requires that a general visual inspection of the accessible interior and exterior surfaces of the containment system for structural deterioration, which may affect the containment leak-tight integrity, be conducted prior to each Type A test and at a periodic interval between tests, based on the performance of the containment system.

NextEra proposes to permanently extend the Seabrook interval for the primary containment ILRT to 15 years from the previous ILRT. The most recent Seabrook ILRT was completed on April 27, 2008. The ILRT for Seabrook is currently required to be performed at a frequency of once every 10 years. Therefore, the next Seabrook ILRT is due to be completed on or before April 27, 2018. Using the proposed interval of 15 years, the next Seabrook ILRT would need to be completed on or before April 27, 2023.

The regulations under 10 CFR Part 50, Appendix J, Option B, Section V.B.3, require that the RG or other implementation document used by a licensee to develop a performance-based leakage testing program be included, by general reference, in the plant TSs. Furthermore, the submittal for TS revisions must contain justification, including supporting analyses, if the licensee chooses to deviate from methods approved by the NRC in endorsed guidance.

The regulations at 10 CFR 50.36(c)(5), "Technical Specifications," require, in part, the inclusion of administrative controls in TSs that are necessary to ensure operation of the facility in a safe manner. This LAR requests a change to a TS under the "Administrative Controls" section of the Seabrook TSs.

## 3.0 TECHNICAL EVALUATION

### 3.1 Licensee's Proposed Changes

Current Seabrook TS 6.15, "Containment Leakage Rate Testing Program" states:

> A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak Test Program, dated September 1995," as modified by the following exception:
>
> a. NEI 94-01-1995, Section 9.2-3: The first ILRT performed after October 30, 1992 shall be performed no later than April 29, 2008.

> The peak calculated containment internal pressure for the design basis loss of coolant accident, $P_a$, is 49.6 psig [pounds per square inch gauge].
>
> The maximum allowable containment leakage rate, $L_a$, at $P_a$, shall be 0.15% of primary containment air weight per day.
>
> The provisions of SR [Surveillance Requirement] 4.0.2 do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program.
>
> The provisions of SR 4.0.3 are applicable to the Containment Leakage Rate Testing Program.
>
> Containment leakage rate acceptance criterion is $\leq 1.0\ L_a$. During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria are $\leq 0.60\ L_a$ for the Type B and Type C tests and $\leq 0.75\ L_a$ for Type A tests.
>
> Overall air lock leakage rate acceptance criterion is $\leq 0.05\ L_a$ when tested at $\geq P_a$.
>
> Each containment 8-inch purge supply and exhaust isolation valve leakage rate acceptance criterion is $\leq 0.01\ L_a$ when tested at $P_a$.

The proposed amendment would revise Seabrook TS 6.15 by removing the exception in TS 6.15.a. In addition, the proposed amendment would replace the reference to RG 1.163 with a reference to NEI 94-01, Revision 3-A, and the limitations and conditions specified in NEI 94-01, Revision 2-A. The proposed amendment would revise the first paragraph of TS 6.15 to read:

> A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with Nuclear Energy Institute (NEI) topical report 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," and conditions and limitations specified in NEI 94-01, Revision 2-A.

3.2 Deterministic Considerations

The proposed changes in the LAR would revise the aforementioned portion of Seabrook TS 6.15 by replacing the reference to RG 1.163 with a reference to NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A, as the documents used at Seabrook to implement the performance-based leakage testing program in accordance with Option B of 10 CFR Part 50, Appendix J. This change would allow the licensee to conduct the next Type A test at Seabrook on or before April 27, 2023 (i.e., a 15-year interval), in lieu of the current due date of April 27, 2018 (i.e., a 10-year interval). Consistent with the guidance contained in NEI 94-01, Revision 2-A, and NEI 94-01, Revision 3-A, the licensee justified the proposed changes by demonstrating the adequate performance of the Seabrook containment based on (a) the historical plant-specific containment leakage testing program results, (b) the CISI program results, and (c) a Seabrook plant-specific risk assessment. The NRC staff reviewed the LAR and its supplements based on deterministic considerations with regard to

containment leak-tight integrity. A probabilistic risk assessment (PRA) was also performed, as discussed in Section 3.3 of this safety evaluation (SE).

3.2.1 Description of the Seabrook Primary Containment

Per Section 2.2 of the LAR, the Seabrook primary containment is a seismic Category I reinforced concrete dry structure, which is designed to function at atmospheric conditions. It consists of an upright cylinder topped with a hemispherical dome, supported on a reinforced concrete foundation mat, which is keyed into the bedrock by the depression for the reactor pit and by continuous bearing around the periphery of the foundation mat. A welded steel liner plate, anchored to the inside face of the containment, serves as a leak-tight membrane. Welds that are embedded in concrete and not readily accessible are covered by a leak-chase system, which permits leak testing of those welds throughout the life of the plant. The liner on top of the foundation mat is protected by a 4-feet thick concrete fill mat, which supports the containment internals and forms the floor of the containment.

The containment base mat is 10-feet thick with a 1/4-inch steel liner plate, which is covered by 4 feet of concrete and forms the containment floor. The containment cylinder is nominally 4 1/2-feet thick. The wall is thickened around large openings to resist additional local forces and accommodate additional reinforcing steel. The liner plate in the cylinder is 3/8-inch thick in all areas, except penetrations and the junction with the base mat, where it is 3/4-inch thick. The containment dome is 3 1/2-feet thick with a 1/2-inch thick liner plate.

The containment enclosure building is located outside the containment building and has a similar geometry. This structure provides leak protection for the containment and protects it from certain loads.

Seabrook TS 6.15 indicates that the containment was designed for a leakage rate, $L_a$, not to exceed 0.15 percent of primary containment air weight per day, at $P_a$. TS 6.15 states that the peak calculated containment internal pressure for the design-basis loss-of-coolant accident (DBLOCA), $P_a$, is 49.6 psig.

3.2.2 Seabrook Type A Test Performance History

According to TS 6.15, Seabrook was designed for a maximum allowable containment leakage rate, $L_a$, of 0.15 percent by weight of primary containment air weight per day at the peak calculated containment internal pressure, $P_a$.

Seabrook TS 6.15 states that the peak calculated containment internal pressure for the DBLOCA, $P_a$, is 49.6 psig.

Since 1986, a total of four ILRTs have been performed on the Seabrook containment, all with "as-found" satisfactory results. These four ILRT test results were documented in the LAR, as seen in the table below.

**Seabrook Type A Test Historical Results Since 1986**

| Date | Test Pressure (PSIA) | $P_a$ (PSIG) | As Found Leak Rate (%wt/day*) | As Found Acceptance Criteria (%wt/day*) | As Left Leak Rate (%wt/day*) | As Left Acceptance Criteria (%wt/day*) |
|---|---|---|---|---|---|---|
| 03/19/1986 | 64.923 | 49.6 | 0.058 | ≤ 0.15 | 0.058 | ≤ 0.1125 |
| 11/23/1989 | 64.849 | 49.6 | 0.0601 | ≤ 0.15 | 0.059 | ≤ 0.1125 |
| 10/30/1992 | 65.4 | 49.6 | 0.10748 | ≤ 0.15 | 0.10594 | ≤ 0.1125 |
| 04/27/2008 | 50.31 PSIG | 49.6 | 0.1004 | ≤ 0.15 | 0.0999 | ≤ 0.1125 |

*%wt/day = Percent primary containment air weight per day

The NRC staff notes that neither the stretch power uprate approved by License Amendment No. 101, dated February 28, 2005 (ADAMS Accession No. ML050140453), nor the measurement uncertainty recapture power uprate approved by License Amendment No. 110, dated May 22, 2006 (ADAMS Accession No. ML061360034), changed the $P_a$ pressure of 49.6 psig.

The NRC staff notes that the last sentence of Section 9.2.3 of NEI 94-01, Revision 3-A, reads, "In the event where previous Type A tests were performed at reduced pressure (as described in 10 CFR Part 50, Appendix J, Option A), at least one of the two consecutive periodic Type A tests shall be performed at peak accident pressure ($P_a$)." Section 9.1.2 reads, in part, "The elapsed time between the first and the last tests in a series of consecutive passing tests used to determine performance shall be at least 24 months."

As can be seen in the table above, the last two Seabrook tests were performed in October 1992 and April 2008 and both tests were performed at a pressure higher than $P_a$.

The current Seabrook TS 6.15 references RG 1.163 as the program implementation document. In turn, RG 1.163 endorses NEI 94-01, Revision 0, which provides methods acceptable to the NRC staff for complying with the provisions of Option B in Appendix J to 10 CFR Part 50, subject to the four limitations of RG 1.163. Section 9.2.3 of NEI 94-01, Revision 0, reads, in part:

> In reviewing past performance history, Type A test results may have been calculated and reported using computational techniques other than the Mass Point method from ANSI/ANS 56.8–1994 (e.g., Total Time or Point-to-Point). Reported test results from these previously acceptable Type A tests can be used to establish the performance history. Additionally, a licensee may recalculate past Type A UCL [upper confidence limit] (using the same test intervals as reported) in accordance with ANSI/ANS 56.8–1994 Mass Point methodology and its adjoining Termination criteria in order to determine acceptable performance history.

NEI 94-01, Revision 3-A, reads nearly identical, except that the test standard invoked is ANSI/ANS-56.8–2002.

In the LAR, the licensee described the results from the latest two Seabrook ILRTs as:

> The April 2008 periodic Type A test was performed using BN-TOP-1 calculated at the 95% upper confidence limit (UCL). The performance leak rate corresponding to the definition in NEI 94-01 was equal to the as-left ILRT results of 0.0999 %wt/day since no leakage paths were isolated during the ILRT.
>
> The October 1992 periodic Type A test was performed using BN-TOP-1 calculated at the 95% UCL. The performance leak rate corresponding to the definition in NEI 94-01 was equal to the as-left ILRT results of 0.10594 %wt/day since no leakage paths were isolated during the ILRT.

The NRC staff notes that Section 9.2.3 does not mandate (i.e., "may" is used) that a licensee recalculate past Type A test results to demonstrate conformance with the definition of "performance leakage rate" contained in NEI 94-01, Revision 3-A. The NRC staff also notes that the Seabrook ILRT results from 1986 and 1989 demonstrated ample margin (i.e., ≥ 59 percent) between each "as-found" ILRT value and $L_a$. Accordingly, the NRC staff did not request that the licensee recalculate the Type A test results.

Seabrook TS 6.15 establishes the maximum limit for Seabrook startup following completion of Type A testing at ≤ 0.75 $L_a$, which equals 0.1125 percent of the primary containment air weight per day.

The Seabrook containment was designed for a leakage rate, $L_a$, not to exceed 0.15 percent by weight of primary containment air per day at the peak calculated containment internal pressure for the DBLOCA, $P_a$. As displayed in the table above, there has been substantial margin (i.e., ≥ 28 percent) to the "as-found" performance limit as described in TS 6.15 of $L_a$ equal to 0.15 percent weight per day for the four historical ILRTs.

Past Seabrook ILRT results have confirmed that the containment leakage rates are acceptable with respect to the design criterion of 0.15 percent leakage of primary containment air weight, $L_a$, per day, at the DBLOCA pressure, $P_a$. Since the last two Type A tests for Seabrook had "as-found" test results of less than 1.0 $L_a$, a test frequency of 15 years in accordance with NEI 94-01, Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A, would be acceptable for Seabrook.

Based on the historical Seabrook ILRT test results, the NRC staff concludes that Sections 9.1.2 and 9.2.3 of NEI 94-01, Revision 3-A, have been satisfied and that the licensee is effectively implementing the Type A leakage rate test program.

3.2.3 Seabrook Type B and Type C Test Performance History

Current Seabrook TS 6.15 reads, in part:

> Containment leakage rate acceptance criterion is ≤ 1.0 $L_a$. During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria are ≤ 0.60 $L_a$ for the Type B and Type C tests and ≤ 0. 75 $L_a$ for Type A tests.

The NRC staff reviewed the local leak rate summaries contained in the LAR dated March 31, 2016, Attachment 1, Section 3.1.2, Table "Seabrook Station Type B and Type C Leak Rate

Summation History Since 2005." The data contained in this table supported the following conclusions:

- The as-found minimum pathway leak rate for Seabrook shows an average of 8.3 percent of 0.6 $L_a$ with a high of 12.0 percent or 0.072 $L_a$.

- The as-left maximum pathway leak rate for Seabrook shows an average of 14.6 percent of 0.6 $L_a$ with a high of 18.1 percent or 0.109 $L_a$.

Based on the review of the data contained in the table referenced above, the NRC staff concluded that the aggregate results of the "as-found min path" and "as-left min path" for all the Type B and Type C tests from 2005 through 2015 demonstrate a history of successful tests, since the aggregate test results were significantly less than the Type B and Type C test TS limit of ≤ 0.60 $L_a$ contained in Seabrook TS 6.15. The "as-found" minimum pathway summations represent the high quality of maintenance of Type B and Type C tested components, while the "as-left" maximum pathway summations represent the effective management of the Containment Leakage Rate Testing Program.

The percent of the total number of Type B tested components that are on a 120-month extended performance-based test interval is 23.08 percent (3 of 13). Historical test results for all 13 Type B components were displayed in LAR "Table 2 - Type B Penetrations most recent two tests." In response to an NRC staff request for additional information (RAI) (SBPB-RAI-1), the licensee stated that, of the ten residual Type B penetrations not on extended test frequencies, six penetrations are opened each refueling outage and, therefore, are not eligible to be on extended test intervals. These six penetrations include:

- HVAC 1 Flange
- HVAC 2 Flange
- Fuel Transfer Tube Flange
- Equipment Hatch Flange Seals - dependent of moving large equipment in and out of containment
- Spare (E-58) - Opened during outages for services
- Spare (E-59) - Opened during outages for services

Three penetrations are on an extended frequency but not on an extended frequency of 120 months. There are no ongoing corrective actions regarding these penetrations.

- Electrical Penetrations 1 Train A (# 1-33) – tested every other outage as group in one preventative maintenance (PM) task.
- Electrical Penetrations 2 Train B (#33 - 56) – tested every other outage as group in one PM task.
- Fuel Transfer Tube Metal Bellows – tested in April 2014 and October 2009.

The electrical penetrations are train-related where each penetration is tested every other refueling outage. The licensee stated that penetrations on extended frequency have performed well and that measured leakage has not changed significantly over 120 months.

Type C tests include primary containment isolation valves. LAR Attachment 1, "Table 3 -Type C Penetrations most recent two tests," lists all Seabrook Type C penetrations with the associated

valve component numbers. Currently, 26 of 37 (70.27 percent) eligible Type C components are on an extended test interval of 60 months.

Of the 11 penetrations not on extended frequency, four are train-related and are tested every other outage. These four penetrations would have the potential to be moved out to 75 months (i.e., every fourth refueling outage) with the approval of the LAR. One penetration, X-68, is not on extended frequency due to the repetitive LLRT failures of IA-V-531 that have occurred since March 1999 (i.e., refueling outage OR06), as discussed in LAR Section 3.1.2. Two of these penetrations, X-16 and X-18, involve valves that are required to be tested on a 30-month frequency per RG 1.163. The remaining four penetrations that are not on an extended frequency are tested every outage and include:

- X-35C, valves RC-FV2874 and RC-FV2894/RC-FV2832 and RC-V314
- X-35D, valves RC-FV2876 and RC-FV2896/RC-FV2833 and RC-V337
- X-38A, valves FP-V588/FP-V592
- X-38B, valves CGC-V46/CGC-V43 and CGC-V44 and CGC-V45

In response to the NRC staff's RAI SBPB-RAI-3, the licensee indicated that the valve performances associated with these four penetrations are suitable to justify placing them on extended intervals. However, a refueling outage support function is associated with penetration X-38B, while the LLRTs of penetrations X-35C and X-35D both satisfy 2-year inservice testing position indication test requirements associated with Valcor solenoid valves.

For penetration X-38A, the licensee stated, in part, that:

> The LLRT is currently done every outage due to system cleanliness issues that caused higher than desired AS Found test results. A system flush is then performed and had been effective in reducing the leakage. This sequence will be monitored over several cycles to see if it is effective in maintaining the penetration leakage at a low repeatable value.

The NRC staff observed from LAR "Table 3 - Type C Penetrations most recent two tests" that both recorded leakage rates for penetration X-38A are less than 77 percent of the administrative limit of 147.8 standard cubic feet per hour (scfh). Therefore, the licensee is acting conservatively in execution of the Containment Leakage Rate Testing Program.

The NRC staff reviewed the corrective actions identified in LAR Attachment 1, Section 3.1.2, associated with the penetration X-68 (i.e., IA-V-531). During refueling outage OR15, check valve IA-V-531 failed the LLRT. The soft-seat in valve IA-V-531 was replaced after the LLRT failure. This has been the only LLRT failure in the population of Seabrook penetrations since fall 2012 (i.e., OR15). The NRC staff noted in SBPB-RAI-2 that penetration X-68 has a history of increasing leakage rates associated with IA-V-531, dating back to OR06 in March 1999. This increasing trend in penetration X-68's leakage rate, by a cumulative factor of more than 20 fold, has gone on unabated, despite installation of the replacement soft seat in OR15.

The response to SBPB-RAI-2 indicated that the licensee is aware of the IA-V-531's performance history since 1999 and explained the phenomenon experienced since the valve's soft seat was replaced during OR15, in part, as follows:

> The successful as-left test of 3.569 scfh justified that the aged soft seat would perform the intended function of containment isolation within the sites Administrative Limit of 147.8 scfh. There were no restrictions provided by the manufacturer on the shelf life or hardness requirements for a new seat. The qualitative determination that the new seat was more pliable than the removed seat was used to justify the installation of the new seat. This decision was confirmed by the as-left test result. The penetration is currently tested every outage.
>
> ...
>
> The most likely cause of the increasing leakage rate is normal wear on the soft seats. The corrective action was to write a PM for the disassembly of the check valve for the inspection of internals and for soft seat replacement every fourth refueling outage. This penetration is leak rate tested every refueling outage. The valve will be leakage rate tested and repaired as necessary. A work request has been written as a contingency work order if a repair is required in OR18.

The NRC staff notes that a definitive minority, 25.9 percent (i.e., 7 of 27), of Type C components currently requires testing every refueling outage. With this information serving as a "telltale" of the integrity of the Seabrook Containment Leakage Rate Testing Program, the NRC staff found the RAI response to be acceptable.

Based on the LAR information restated above and the licensee's responses to SBPB-RAI-1, SBPB-RAI-2, and SBPB-RAI-3, the NRC staff concludes that the percentage of Type B and Type C components on extended frequencies represents good performance and supports allowing an extended test interval of up to 75 months for Type C tested CIVs in accordance with the guidance of NEI 94-01, Revision 3-A.

In summary, the NRC staff concludes that:

- any lack of information or ambiguities contained in the LAR were adequately explained by NextEra in its response to the NRC staff's RAIs;
- the cumulative Type B and Type C test results were below the acceptance limit of TS 6.15; and
- the licensee has a corrective action program that appropriately addresses poor performing valves.

Therefore, the NRC staff finds that the licensee is effectively implementing the Type B and Type C leakage rate test program as required by Option B of 10 CFR Part 50, Appendix J.

3.2.4 Containment Inservice Inspection Program

In Section 3.2 of the LAR, the licensee described its CISI program. Visual inspections are conducted of the concrete in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Subsection IWL, while inspections of the liner are conducted in accordance with ASME Code, Section XI,

Subsection IWE, and under the Containment Coatings Inspection and Assessment Program. The NRC staff reviewed the information provided on the containment inspection programs.

ASME Code, Section XI, Subsection IWE Examinations

In Section 3.2 of the LAR, the licensee described its ASME Code, Section XI, Subsection IWE program. The licensee summarized recent inspection results and noted that the most recent ASME Code, Section XI, Subsection IWE examinations identified several areas of degradation on the containment liner surface. These areas were reviewed and determined to be nonstructural in nature and accepted based on engineering evaluation. The licensee further noted that these areas required successive inspection in accordance with IWE-2420 and that the program was updated to reflect that requirement. The licensee also stated that no areas are subject to augmented examinations. The NRC staff reviewed ASME Code, Section XI, Subsection IWE, paragraph IWE-2420(b), and noted that areas accepted by engineering evaluation do require successive examination in accordance with Examination Category E-C, "Augmented Examination." To address this potential discrepancy, the NRC staff issued EMCB-RAI-1 in its letter dated October 3, 2016 (ADAMS Accession No. ML16230A106).

In its response dated October, 27 2016, the licensee stated that the original submittal was based on the previous revision of the IWE program, which did not include the augmented inspections. The licensee has acknowledged that the IWE program has been updated and included the augmented inspections. The NRC staff reviewed the licensee's response and finds it acceptable because the response indicates that the augmented inspections are captured within the licensee's program as required by ASME Section XI, Subsection IWE.

In Section 3.2.1.1 of the LAR, the licensee summarized recent inspections and corrective actions related to the containment liner to concrete floor moisture barrier. It was noted that the moisture barrier was inspected in the fall of 2015, and degradation of the moisture barrier and liner was identified. The degradation compromised the design function of the moisture barrier to seal the joint between the metal containment liner and the concrete floor slab. The licensee repaired the degraded moisture barrier and conducted ultrasonic testing (UT) of the metal liner. All UT measurements were above the nominal wall thickness and the liner was recoated. These corrective actions adequately addressed identified degradation of the accessible portions of the liner and the moisture barrier; however, if the moisture barrier was degraded and the accessible portion of the liner was degraded, degradation could exist in the inaccessible portions of the liner below the moisture barrier.

The regulations in 10 CFR 50.55a(b)(2)(ix)(A) require that the acceptability of inaccessible areas of the containment liner be evaluated when conditions exist in accessible areas that could indicate the presence of, or could result in, degradation to such inaccessible areas. In its letter dated October, 27 2016, the licensee stated that in 2014, 51 accessible locations near the moisture barrier were examined by ultrasonic examination, and in 2015, an additional 36 areas were examined. All of the readings were within the allowable specified thickness. Although the measurements indicated that there was no significant degradation in the accessible areas of the liner, since the moisture barrier was degraded, the licensee completed an evaluation of the inaccessible portion of the liner. This evaluation also covered the leak-chase channels and the base mat portions of the liner and is discussed in more detail below. The licensee stated that the evaluation was applicable to both the leak chases and the inaccessible cylindrical portions of the liner near the moisture barrier because both locations were exposed to similar environments (i.e., adjacent to concrete with little or no oxygen).

Based on review of the licensee's response described above, the NRC staff finds that the licensee conducted an evaluation of the inaccessible areas of the liner in accordance with 10 CFR 50.55a(b)(2)(ix)(A) requirements. The staff agrees that the majority of the inaccessible cylindrical portions of the liner exist in a similar environment as the leak chase and, therefore, finds it acceptable to use one evaluation to address both areas (acceptability of the evaluation is described below). The NRC staff does not necessarily agree that the area directly below the moisture barrier is similar to the leak chases since this area may contain higher levels of oxygen and be exposed to "fresh" water with a lower pH value. However, the NRC staff notes that UT inspections of the liner directly above the moisture barrier were acceptable, and there were no visual indications (spalled or cracked concrete, staining, etc.) of significant corrosion directly below the barrier. It is, therefore, reasonable to assume that the liner below the moisture barrier is acceptable. Accordingly, the NRC staff finds the licensee's evaluation of the inaccessible areas of the liner, and the licensee's actions to continue inspections of this area in accordance with ASME Section XI, Subsection IWE requirements, acceptable.

In Section 3.2.3 of the LAR, the licensee summarized actions taken during the fall 2015 outage in response to NRC Information Notice (IN) 2014-07, "Degradation of Leak-Chase Channel Systems for Floor Welds of Metal Containment Shell and Concrete Containment Metallic Liner" (ADAMS Accession No. ML14070A114), related to inspections of leak-chase channel systems. Seabrook has 57 leak-chase test connections and 18 were not examined because they were inaccessible or the outer cover could not be removed. During examination of the accessible leak-chase test connections, 27 were identified as having evidence of moisture/degradation inside the cover, while 5 were identified as having water present when the cover was removed. Twenty of the connections were selected for examination by video probe. These inspections showed that the leak chases were frequently damp or contained some water. The licensee stated that overall, the locations appeared to be in good condition with no significant level of metal loss. However, the licensee also stated that no UT was possible due to the inadequate surface condition and that qualified visual examinations were unsuccessful. Water samples were taken from five leak-chase channels; however, chemical analysis was unable to identify the source of the water. Based on pH levels, the licensee believes the water is stagnant and has been in contact with the concrete for a long period of time, and the licensee estimates the corrosion rate is 0.0025 inches/year. The licensee noted that a structural evaluation of the containment indicates a minimum liner wall thickness of 1/8-inch is acceptable for the floor, and the liner is currently above the minimum. Based on the visual indications, the existing evaluation, and the assumed corrosion rate, the licensee concluded that the liner is capable of performing its specified function for the next operating cycle.

The NRC staff reviewed the provided information and determined more information was necessary, including information regarding the estimated corrosion rate and the structural evaluation, as well as more information on the recurring actions that will be taken to address this degradation.

In its letter dated October, 27 2016, the licensee provided a table summarizing the extent of the leak-chase inspections and a note saying that the locations not yet inspected would be inspected during the spring 2017 outage. The response also noted that the 0.0025 inches/year corrosion rate was determined based on the pH values of the water in the chases and information available in the Department of Energy (DOE) Chemistry Fundamentals Handbook (DOE-HDBK-1015/2-93). The licensee stated that this value is a conservative estimate of the rate of corrosion in the chases because it does not account for the stagnant water in the chases that would be depleted of oxygen. The response gave the nominal thickness as 0.375 inches for the cylindrical portion of the liner and 0.25 inches for the base mat and leak-chase portion of

the liner. The minimum wall thickness for these areas is 0.1875 inches for localized areas of the cylindrical portion and 0.125 inches for the base mat.

In its letter dated December 30, 2016, the licensee supplemented its application describing that containment minimum wall calculation was reevaluated and updated for a minimum wall thickness of 0.0625 inches for the base mat liner and 0.1875 inches for the cylinder wall liner below the moisture barrier. Using the corrosion rate of 0.0025 inches/year, the licensee stated that the leak-chase channels and the cylinder meet minimum thickness requirements for at least 75 years of operation. The licensee further stated that this estimate was supported by the visual inspections conducted on the leak chases, which did not identify a significant loss of material. Finally, the licensee stated that the leak chases and associated risers are considered surface areas requiring augmented examination in accordance with ASME Section XI, Subsection IWE, and remote visual examination will be performed to the extent possible.

Based on the review of the licensee's response described above, and the cited references, the NRC staff notes that the assumed corrosion rate is reasonable, based on the information in the cited DOE handbook and the environment present in the leak chases. The NRC staff also notes that the visual examinations to date have not identified any significant metal loss, which supports the assumed slow rate of corrosion. Based on the assumed corrosion rate, the liner is acceptable for at least 75 years. The NRC staff also notes that the licensee stated that leak-chase locations not yet inspected would be inspected during the spring 2017 outage and that the areas would be subject to augmented examination in accordance with IWE moving forward. The NRC staff finds the licensee's response acceptable because it provides a reasonable justification for the assumed corrosion rate and, more significantly, the licensee intends to continue inspecting all of the accessible leak-chase channels under the ASME Section XI, Subsection IWE program.

Based on its review of the LAR, and the additional information provided as discussed above, the NRC staff finds that the licensee is properly implementing the ASME Section XI, Subsection IWE program.

ASME Code, Section XI, Subsection IWL Examinations

In Section 3.2.1.2 of the LAR, the licensee described its ASME Section XI, Subsection IWL ISI program and provided a summary of the inspections conducted in 2010. The licensee summarized recent inspection results and noted that the most recent ASME Section XI, Subsection IWL examinations identified 84 suspect areas that required engineering evaluation. These areas were reviewed and determined to be acceptable without remediation because the areas of degradation will not adversely impact the structural or functional integrity of the containment. Additional visual inspections were completed in the spring of 2014.

Section 3.2.1.2 of the LAR also included a brief description of alkali-silica reaction (ASR) and its impact on the containment. This information was supplemented by the licensee in its letter dated May 31, 2016. The licensee explains that ASR is a chemical reaction in concrete between alkalis in the cement paste and reactive forms of silica in the aggregate. Moisture is necessary for the reaction to occur. The reaction forms an expansive gel that can lead to expansion and cracking in affected concrete structures. During walkdowns of the containment, four isolated locations of patterned cracking indicative of ASR degradation were identified on the cylindrical shell in areas that had historically been exposed to moisture. These areas represent less than 1 percent of the containment surface. The licensee noted that a structural evaluation was performed in the fall of 2012, which determined the containment is capable of meeting all

its design-basis function with the observed cracking. The licensee further noted that during the spring 2014 refueling outage, UT measurements were taken of the containment liner in the areas that showed signs of ASR to determine if wall loss had occurred on the concrete side of the liner. The UT did not show any signs of liner corrosion.

The NRC staff reviewed the provided information and noted that a structural evaluation of the containment had been performed in 2012. This evaluation was reviewed through the NRC inspection process and found to be acceptable for operability in the NRC letter dated August 9, 2013 (ADAMS Accession No. ML13221A172). The final resolution of ASR degradation on the containment structure is ongoing and being reviewed by the NRC in a separate licensing action dated August 1, 2016 (ADAMS Accession No. ML16216A240). The NRC staff also noted that UT examinations have been conducted, the results of which demonstrate the liner is not degraded in areas that have been exposed to water and show indications of ASR. The NRC staff further noted that the last ASME Section XI, Subsection IWL examination was conducted in 2010 and that the indications were determined to have no structural impact. Additional inspections of the containment exterior were completed in 2014, with only minor indications identified. It was unclear to the NRC staff if these indications were addressed via the ASME Section XI, Subsection IWL program and if the 2010 examination identified the signs of ASR on the containment.

In its letter dated October 27, 2016, the licensee described that the ASR indications were not identified during the 2010 IWL examination. The licensee noted that the procedures in place at the time did not include inspection requirements to identify the presence of ASR. The initial indications of ASR on the site had just been discovered when the IWL examinations were completed. At that time, the extent of condition was still being determined. The licensee noted that ASR on containment was documented in September 2012, and the IWL program examination procedure was revised in April 2013 to include requirements for identifying ASR. All future ASR indications identified during IWL examinations will be evaluated in accordance with ASME Section XI, Subsection IWL, paragraph IWL-3300. In its letter dated December 30, 2016, the licensee supplemented its response and noted that the 2016 ASME Section XI, Subsection IWL examination had been completed using the updated procedure. The inspection identified additional indications of ASR, which were evaluated in accordance with ASME Section XI, Subsection IWL, paragraph IWL-3300.

The NRC staff reviewed the licensee's application and supplemental information, and finds it acceptable because the licensee has updated its inspection procedures to identify indications of ASR on the containment and to evaluate them in accordance with the requirements of ASME Section XI, Subsection IWL.

Based on its review of the LAR, and the additional information provided as discussed above, the NRC staff finds that the licensee is properly implementing the ASME Section XI, Subsection IWL program.

Impact of Alkali-Silica Reaction on the Leak Tightness of Seabrook Primary Containment

As discussed above, in the LAR, the licensee provides a high-level summary of ASR and the four ASR indications noted on the containment structure. However, a detailed discussion is not provided regarding the impact of ASR on the structural integrity or leak tightness of the containment.

In its letter dated October 27 2016, the licensee stated that the containment structure is comprised of two major structural elements, the biological and structural portion (concrete) and the gas barrier (steel liner). The concrete portion of the containment has been evaluated for the effects of ASR, and the evaluation determined the structure maintained its integrity with adequate margin to meet all design-basis functions. The licensee noted that the containment ILRT is performed to verify and demonstrate leak tightness of the steel liner. During the 16th refueling outage, the liner was ultrasonically examined to determine if wall loss has occurred due to corrosion on the concrete side of the liner. The licensee noted that examination areas included areas local to the ASR locations, and the ultrasonic examination did not indicate any signs of corrosion or metal loss on the concrete side of the liner. In its letter dated December 30, 2016, the licensee supplemented its response and included the results of the 2016 ASME Section XI, Subsection IWL examination. The licensee noted that 50 additional locations were identified that exhibit some visual features suggestive of ASR. Of these locations, the licensee considers 17 of them to be ASR based on the visual features and the location of the indications on the containment structure (i.e., lower elevations where moisture infiltration has occurred previously). These 17 locations include the four areas that had been previously identified and monitored. All locations will continue to be monitored via the ASME Section XI, ASME Subsection IWL program.

The NRC staff reviewed the licensee's response and supplemental information and noted that the licensee has completed a structural evaluation of the concrete portion of the containment building, and the NRC has found this evaluation acceptable for operability. The NRC staff also noted that the licensee has inspected the liner in the areas where ASR has been identified, and no indications of metal loss have been found. The purpose of the ILRT is to test the containment for leak tightness. The licensee has conducted inspections of the liner that indicate the ASR concrete degradation has no impact on the leak tightness of the containment liner. Therefore, the NRC staff finds that there is reasonable assurance that the ASR degradation will not have an impact on the containment leakage rate. This finding does not resolve the issue of ASR degradation on the containment structure in general, the review of which is ongoing as part of a separate licensing action.

NRC Staff's Overall Deterministic Evaluation of the Proposed Extension of Type A Test Interval up to 15 Years and the Type C Test Interval up to 75 Months

Based on the evaluation above, the NRC staff finds that the licensee has adequately implemented its CISI program to periodically examine, monitor, and manage age-related and environmental degradation of the containment structure. The results of past containment concrete and liner visual inspections, supplemented by UT, demonstrate acceptable performance of the containment and demonstrate that the structural integrity of the containment structure, and its liner, are adequate. Thus, the NRC staff finds that there is reasonable assurance that the containment structural integrity and leak tightness of the liner will continue to be monitored and maintained, without undue risk to public health and safety, if the Type A test interval is extended up to 15 years and the Type C test intervals are extended up to 75 months. Therefore, the NRC staff finds it acceptable to extend the intervals, as proposed by the licensee, in accordance with NEI 94-01, Revision 3-A. This conclusion only addresses the acceptability of extending the Type A and Type C test intervals; it does not imply NRC staff acceptance of the ASR degradation in the containment structure. As noted previously, the final resolution of ASR degradation at Seabrook is an ongoing issue, which is being addressed by a separate licensing action.

3.2.5 NEI 94-01, Revision 2-A, Limitations and Conditions

As required by 10 CFR 50.54(o), the Seabrook primary containment is subject to the requirements set forth in 10 CFR Part 50, Appendix J. Option B of Appendix J provides that test intervals for Type A, Type B, and Type C testing be determined by using a performance-based approach. Currently, the Seabrook 10 CFR Part 50, Appendix J testing program plan is based on RG 1.163, which endorses NEI 94-01, Revision 0, subject to the four limitations of RG 1.163, Section C. The licensee's LAR, with supplements, proposes to revise the Seabrook 10 CFR Part 50, Appendix J testing program plan by implementing the guidance contained in NEI 94-01, Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A.

In its letter dated June 25, 2008 (ADAMS Accession No. ML081140105), the NRC provided a Final Safety Evaluation Report (referred to as "SE") with limitations and conditions for NEI 94-01, Revision 2 (ADAMS Accession No. ML072970206). In the SE, the NRC staff concluded that NEI 94-01, Revision 2, describes an acceptable approach for implementing the optional performance-based requirements of 10 CFR Part 50, Appendix J, and is acceptable for referencing by licensees proposing to amend their TSs regarding containment leakage rate testing, subject to the limitations and conditions noted in Section 4.0 of the SE. Section 4.1 of the SE establishes limitations and conditions pertaining to deterministic requirements, while Section 4.2 establishes limitations and conditions pertaining to the plant's probabilistic risk assessment analysis. More explicitly, the SE included provisions for extending the ILRT Type A interval to a maximum of 15 years, subject to the six limitations and conditions provided in the SE. The NRC noted in the SE that NEI 94-01, Revision 2, incorporates the regulatory positions stated in RG 1.163. The accepted version of NEI 94-01, Revision 2, was subsequently issued as Revision 2-A. NEI issued Revision 2-A to NEI 94-01 on November 19, 2008. With Revision 2-A, the TR was revised to incorporate the June 25, 2008, NRC SE.

The NRC staff review of LAR Section 3.4, which contains the Table "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," indicates that the licensee intends to satisfy the limitations and conditions of Section 4.1 of the SE. Accordingly, the licensee intends to adopt the testing criteria of ANSI/ANS 56.8-2002, "Containment System Leakage Testing Requirements," reaffirmed August 9, 2011, in place of the criteria of ANSI/ANS 56.8-1994, approved August 4, 1994, "Containment System Leakage Testing Requirements."

The leakage rate testing requirements of 10 CFR Part 50, Appendix J, Option B (Type A, Type B, and Type C Tests), and the CISI requirements mandated by 10 CFR 50.55a, together ensure the continued leak-tightness and structural integrity of the containment during its service life.

Type B testing ensures that the leakage rate of individual containment penetration components is acceptable. Type C testing ensures that individual CIVs are essentially leak-tight. In addition, aggregate Type B and Type C leakage rates support the leak tightness of primary containment by minimizing potential leakage paths.

In the LAR, the licensee proposes that Seabrook invoke NEI 94-01, Revision 3-A, along with the conditions and limitations of NEI 94-01, Revision 2-A, as the reference documents for the Seabrook Containment Leakage Rate Testing Program in TS 6.15. Therefore, the licensee is also applying to extend the frequencies of the Type C performance-based test intervals beyond 60 months.

The NRC staff has found that the use of NEI 94-01, Revision 2-A, is acceptable for referencing by licensees proposing to amend their TSs to permanently extend the ILRT surveillance interval to 15 years, provided the following six conditions are satisfied.

Condition 1

Limitation/Condition 1 of Attachment 1 to LAR, page 25 of 36, is derived from Sections 3.1.1.1 and 4.1 of the NRC SE dated June 25, 2008, and stipulates that, for calculating the Type A leakage rate, the licensee should use the definition in NEI 94-01, Revision 2, in lieu of that in ANSI/ANS-56.8-2002.

NextEra "Response for Seabrook" Statement

In the Table "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," Section 3.4.1, page 25 of 36, Attachment 1 to the LAR, the licensee stated, in part:

> Seabrook will utilize the definition in NEI 94-01, Revision 3-A, Section 5.0. This definition has remained unchanged from Revision 2-A to Revision 3-A of NEI 94.01.

NRC Staff Assessment

Section 3.2.9, "Type A test performance criterion," of ANSI/ANS-56.8-2002 defines the "performance leakage rate" and reads, in part:

> The performance criterion for a Type A test is met if the performance leakage rate is less than $L_a$. The performance leakage rate is equal to the sum of the measured Type A test UCL and the total as-left minimum pathway leakage rate (MNPLR) of all Type B or Type C pathways isolated during performance of the Type A test.

The NRC staff SE, Section 3.1.1.1, for NEI 94-01, Revision 2, reads, in part:

> Section 5.0 of NEI TR 94-01, Revision 2, uses a definition of "performance leakage rate" for Type A tests that is different from that of ANSI/ANS-56.8-2002. The definition contained in NEI TR 94-01, Revision 2, is more inclusive because it considers excessive leakage in the performance determination. In defining the minimum pathway leakage rate, NEI TR 94-01, Revision 2, includes the leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position prior to the performance of the Type A test. Additionally, the NEI TR 94-01, Revision 2, definition of performance leakage rate requires consideration of the leakage pathways that were isolated during performance of the test because of excessive leakage in the performance determination. The NRC staff finds this modification of the definition of "performance leakage rate" used for Type A tests to be acceptable.

Section 5.0 of NEI 94-01, Revision 2-A (ADAMS Accession No. ML100620847), reads, in part:

> The performance leakage rate is calculated as the sum of the Type A upper confidence limit (UCL) and as-left minimum pathway leakage rate (MNPLR) leakage rate for all Type B and Type C pathways that were in service, isolated, or

> not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, leakage pathways that were isolated during performance of the test because of excessive leakage must be factored into the performance determination. The performance criterion for Type A tests is a performance leak rate of less than 1.0 $L_a$.

The NRC staff reviewed the definitions of "performance leakage rate" contained NEI 94-01, Revision 2, Revision 2-A, and Revision 3-A. The NRC staff concluded that the definitions contained in all three revisions are identical. Based on this information, the NRC staff agrees with the licensee that the definition has remained unchanged from Revision 2-A to Revision 3-A of NEI 94-01.

Therefore, the NRC staff concludes that Seabrook will use the definition found in Section 5.0 of NEI 94-01, Revision 2, for calculating the Type A leakage rate in the Seabrook Containment Leakage Rate Testing Program.

Based on the above, the NRC staff finds that the licensee has adequately addressed Condition 1.

Condition 2

Limitation/Condition 2 of Attachment 1 to the LAR, page 25 of 36, is derived from Sections 3.1.1.3 and 4.1 of the NRC SE dated June 25, 2008 and stipulates that the licensee submits a schedule of containment inspections to be performed prior to and between Type A tests.

NextEra "Response for Seabrook" Statement

In the Table "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," Section 3.4.1, page 25 of 36 of Attachment 1 to the LAR, the licensee stated, in part:

> Reference Section 3.2.1 and 3.2.2. General visual observations of the accessible interior and external surfaces of the containment structure shall continue to be performed in accordance with containment structural integrity test procedures to meet the requirements of the proposed revision to TS 6.15, the inspection requirements of ASME Code Section XI, subsection IWE and NEI 94-01, Revision 3.A, Sections 9.2.1 and 9.2.3.2.

NRC Staff Assessment

NRC staff SE, Section 3.1.1.3, for NEI 94-01, Revision 2, reads, in part:

> NEI TR 94-01, Revision 2, Section 9.2.3.2, states that: "To provide continuing supplemental means of identifying potential containment degradation, a general visual examination of accessible interior and exterior surfaces of the containment for structural deterioration that may affect the containment leak-tight integrity must be conducted prior to each Type A test and during at least three other outages before the next Type A test if the interval for the Type A test has been extended to 15 years." NEI TR 94-01, Revision 2, recommends that these inspections be performed in conjunction or coordinated with the examinations required by ASME Code, Section XI, Subsections IWE and IWL. The NRC staff

> finds that these visual examination provisions, which are consistent with the provisions of regulatory position C.3 of RG 1.163, are acceptable considering the longer 15 year interval. Regulatory Position C.3 of RG 1.163 recommends that such examination be performed at least two more times in the period of 10 years. The NRC staff agrees that as the Type A test interval is changed to 15 years, the schedule of visual inspections should also be revised. Section 9.2.3.2 in NEI TR 94-01, Revision 2, addresses the supplemental inspection requirements that are acceptable to the NRC staff."

NEI 94-01, Revision 3-A, Section 9.2.1, reads, in part:

> Prior to initiating a Type A test, a visual examination shall be conducted of accessible interior and exterior surfaces of the containment system for structural problems that may affect either the containment structure leakage integrity or the performance of the Type A test. This inspection should be a general visual inspection of accessible interior and exterior surfaces of the primary containment and components. It is recommended that these inspections be performed in conjunction or coordinated with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE/IWL required examinations.

NEI 94-01, Revision 3-A, Section 9.2.3.2, reads:

> To provide continuing supplemental means of identifying potential containment degradation, a general visual examination of accessible interior and exterior surfaces of the containment for structural deterioration that may affect the containment leak-tight integrity must be conducted prior to each Type A test and during at least three other outages before the next Type A test if the interval for the Type A test has been extended to 15 years. It is recommended that these inspections be performed in conjunction or coordinated with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE/IWL required examinations.

The NRC staff reviewed LAR Attachment 1, Section 3.2.1, "Containment Inservice Inspection Program," and Section 3.2.2, "Containment Visual Inspection." The Seabrook CISI plan (IWE and IWL) was developed with an initial interval start date of August 19, 2000. The subsequent interval start date for the Subsection IWE and IWL programs was August 19, 2010. This subsequent interval of general visual IWE and IWL examinations is displayed in LAR Table "Current IWE/IWL Interval."

Currently, Seabrook TS 6.15 requires, in part, visual examinations in accordance with the guidelines contained in RG 1.163. Regulatory Position 3 of this RG provides that these examinations should be conducted prior to initiating a Type A test. As indicated in the "NextEra 'Response for Seabrook' Statement," this examination requirement will be maintained in accordance with Section 9.2.1 of NEI 94-01, Revision 3-A.

Based on the above information, with the proposed revision to Seabrook TS 6.15, the licensee intends to satisfy the inspection requirements of ASME Code, Section XI, Subsection IWE, and NEI 94-01, Revision 3.A, Sections 9.2.1 and 9.2.3.2.

Based on the above, the NRC staff finds that the licensee has adequately addressed Condition 2.

Condition 3

Limitation/Condition 3 of Attachment 1 to the LAR, page 25 of 36, is derived from Sections 3.1.3 and 4.1 of the NRC SE dated June 25, 2008, and stipulates that the licensee addresses the areas of the containment structure potentially subjected to degradation.

NextEra "Response for Seabrook" Statement

In the Table "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," Section 3.4.1, page 25 of 36 of Attachment 1 to the LAR, the licensee stated, in part:

> Reference Section 3.2.1 through 3.2.9. General visual observations of the accessible interior and external surfaces of the containment structure shall continue to be performed in accordance with containment structural integrity test procedures to meet the requirements of the proposed revision to TS 6.15, the inspection requirements of ASME Code Section XI, subsection IWE and NEI 94-01, Revision 3.A, Sections 9.2.1 and 9.2.3.2.

NRC Staff Assessment

The NRC staff notes that the "NextEra 'Response for Seabrook' Statement" refers to "Reference Section 3.2.1 through 3.2.9." This was a typographical error and was acknowledged by the licensee in its response to SBPB-RAI-4 and should have read "Reference Sections 3.2.1 through 3.2.7."

NRC staff SE Section 3.1.3, for NEI 94-01, Revision 2, reads, in part:

> In approving for Type A tests the one-time extension from 10 years to 15 years, the NRC staff has identified areas that need to be specifically addressed during the IWE and IWL inspections including a number of containment pressure-retaining boundary components (e.g., seals and gaskets of mechanical and electrical penetrations, bolting, penetration bellows) and a number of the accessible and inaccessible areas of the containment structures (e.g., moisture barriers, steel shells, and liners backed by concrete, inaccessible areas of ice-condenser containments that are potentially subject to corrosion).

The NRC staff reviewed the information contained in the following LAR sections:

a) Section 3.2.1, "Containment Inservice Inspection Program"
b) Section 3.2.2, "Containment Visual Inspection"
c) Section 3.2.3, "Containment Liner Test Channel Plugs"
d) Section 3.2.4, "Containment Liner Corrosion"
e) Section 3.2.5, "Inaccessible Areas"
f) Section 3.2.6, "Containment Coatings Inspections"
g) Section 3.2.7, "License Renewal Commitments"

As evidence of satisfying the provisions of NRC staff SE Section 3.1.3, the NRC staff cites the following LAR excerpts:

- LAR Section 3.2.5, "Inaccessible Areas," reads, in part:

  Seabrook has not needed to implement any new technologies to perform inspections of any inaccessible areas at this time. However, Seabrook actively participates in various nuclear utility owners groups and ASME Code committees to maintain cognizance of ongoing developments within the nuclear industry. Industry operating experience is also continuously reviewed to determine its applicability to Seabrook. Adjustments to inspection plans and availability of new, commercially available technologies for the examination of the inaccessible areas of the containment would be explored and considered as part of these activities.

- LAR Section 3.2.1, "Containment Inservice Inspection Program," reads, in part:

  Seabrook has no areas subject to ASME Code Section XI, Subsection IWE, augmented examinations.

- LAR Section 3.2.1.1, "Containment IWE Inspections," reads, in part:

  Seabrook moisture barrier inspections and repairs were successfully completed during OR17. The Seabrook containment building containment liner wall to concrete floor moisture barrier continues to remain capable of performing its safety-related functions.

- LAR Section 3.2.3, "Containment Liner Test Channel Plugs," reads, in part:

  The following actions will be completed no later than OR18 (Spring 2017):

  - Complete the IWE Moisture barrier inspections of leak-chase channels in OR18 for those penetrations where the outer cover or inner plug could not be removed.

    Moisture barriers are required to be examined under Table IWE-25001, Category E-A, Item No. E1.30. 100% of the moisture barriers are required to have a general visual examination performed once an Inspection period. Barriers not inspected in OR17 must be inspected in OR18. ...

    Eighteen total moisture barriers remain to be inspected. Eight leak-chase channel systems require inspection as well as any of the eighteen moisture barriers that are degraded.

- LAR Section 3.2.7, "License Renewal Commitments," reads, in part:

  Seabrook Commitment 50:

  Perform UT of the accessible areas of the containment liner plate in the vicinity of the moisture barrier for loss of material. Perform opportunistic UT of inaccessible areas.

  Status:

  Baseline inspections were completed during OR16 (Spring 2014). Repeat containment liner UT thickness examinations at intervals of no more than five (5) refueling outages.

  Results:

  In the 51 areas the observed minimum thickness ranged from 0.368" to 0.405". The examination areas did not exhibit any signs of corrosion on the opposite side of the steel liner.

  Per ASTM A20 the permitted manufacturing tolerance for under thickness conditions of A516 Grade 60 steel plate is 0.010". The allowable reduction in thickness per ASME Section XI, IWE-3122.3(a) is 10% of the nominal plate thickness. The observed minimum thicknesses meet both requirements.

- LAR Section 3.2.4, "Containment Liner Corrosion," reads, in part:

  Inspections at Seabrook have detected no significant corrosion to the containment liner.

  Corrosion at the containment liner to concrete floor interface, moisture barrier region, has resulted in limited corrosion. Coating failures have resulted in limited or general corrosion. These are not considered relevant to containment leakage.

Based on the above review, the NRC staff finds that the licensee has adequately addressed Condition 3.

Condition 4

Limitation/Condition 4 of Attachment 1 to the LAR, page 25 of 36, is derived from Sections 3.1.4 and 4.1 of the NRC SE dated June 25, 2008, and stipulates that the licensee addresses any tests and inspections performed following major modifications to the containment structure, as applicable.

NextEra "Response for Seabrook" Statement

In the Table "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," Section 3.4.1, page 25 of 36 of the LAR, the licensee stated, in part:

> In general, the NRC staff considers the cutting of a large hole in the containment for replacement of steam generators or reactor vessel heads, replacement of large penetrations, as major repair or modifications to the containment structure. Seabrook has performed no major repairs or modifications to the containment structure. No major repairs or modifications are planned.

NRC Staff Assessment

NRC staff SE Section 3.1.4, for NEI 94-01 Revision 2, reads, in part:

> Section 9.2.4 of NEI TR 94-01, Revision 2, states that: "Repairs and modifications that affect the containment leakage integrity require LLRT or short duration structural tests as appropriate to provide assurance of containment integrity following the modification or repair. This testing shall be performed prior to returning the containment to operation." Article IWE-5000 of the ASME Code, Section XI, Subsection IWE (up to the 2001 Edition and the 2003 Addenda), would require a Type A test after major repair or modifications to the containment. In general, the NRC staff considers the cutting of a large hole in the containment for replacement of steam generators or reactor vessel heads, replacement of large penetrations, as major repair or modifications to the containment structure.

The NRC staff notes that the "NextEra 'Response for Seabrook' Statement" for Condition 4 accurately describes what the NRC staff considers to be a major repair or modification to the containment. The licensee states that historically, no major repairs or modifications have been performed on the Seabrook containment. Furthermore, the licensee indicates that no major repairs or modifications of the containment are planned. Accordingly, the NRC staff finds that the licensee has adequately addressed Condition 4.

Condition 5

Limitation/Condition 5 of Attachment 1 to LAR, page 25 of 36, is derived from Sections 3.1.1.2 and 4.1 of the NRC SE dated June 25, 2008, and stipulates that the normal Type A test interval should be less than 15 years. If a licensee has to utilize the provisions of Section 9.1 of NEI 94-01, Revision 2, related to extending the ILRT interval beyond 15 years, the licensee must demonstrate to the NRC staff that it is an unforeseen emergent condition.

NextEra "Response for Seabrook" Statement

In the Table "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," Section 3.4.1, pages 25 and 26 of Attachment 1 to the LAR, the licensee stated, in part:

> Seabrook will follow the requirements of NEI 94-01, Revision 3-A, Section 9.1. This requirement has remained unchanged from Revision 2-A to Revision 3-A of NEI 94-01. In accordance with section 3.1.1.2 of the NRC safety evaluation dated June 25, 2008 (ADAMS Accession No. ML081140105), NextEra Energy

> Seabrook will also demonstrate to the NRC staff that an unforeseen emergent condition exists in the event an extension beyond the 15 year interval is required. Justification for such an extension request will be in accordance with the staff position in Regulatory Issue Summary (RIS) 2008-27.

NRC Staff Assessment

Section 3.1.1.2 of the NRC staff SE dated June 25, 2008, reads:

> As noted above, Section 9.2.3, NEI TR 94-01, Revision 2, states, "Type A testing shall be performed during a period of reactor shutdown at a frequency of at least once per 15 years based on acceptable performance history." However, Section 9.1 states that the "required surveillance intervals for recommended Type A testing given in this section may be extended by up to 9 months to accommodate unforeseen emergent conditions but should not be used for routine scheduling and planning purposes." The NRC staff believes that extensions of the performance-based Type A test interval beyond the required 15 years should be infrequent and used only for compelling reasons. Therefore, if a licensee wants to use the provisions of Section 9.1 in TR NEI 94-01, Revision 2, the licensee will have to demonstrate to the NRC staff that an unforeseen emergent condition exists.

The NRC staff notes that the licensee acknowledges the provisions of NEI 94-01, Revision 2-A, SE Section 3.1.1.2, with its "NextEra 'Response for Seabrook' Statement." In addition, NextEra acknowledges that any request for an extension beyond the 15-year interval must be justified in accordance with the NRC staff's position contained in RIS 2008-27. Therefore, the licensee has confirmed its understanding that any extension of the Type A test interval beyond the upper-bound performance-based limit of 15 years should be infrequent and that any requested permission (i.e., for such an extension) will demonstrate to the NRC staff that an unforeseen emergent condition exists.

Based on the above review, the NRC staff finds that the licensee has adequately addressed Condition 5.

Condition 6

Limitation/Condition 6 of Attachment 1 to the LAR, page 26 of 36, is derived from Section 4.1 of the NRC SE dated June 25, 2008, and stipulates that for plants licensed under 10 CFR Part 52, applications requesting a permanent extension of the ILRT surveillance interval to 15 years should be deferred until after the construction and testing of containments for that design have been completed and applicants have confirmed the applicability of NEI 94-01, Revision 2, and Electronic Power Research Institute (EPRI) Report No. 1009325, Revision 2, including the use of past containment ILRT data.

NextEra "Response for Seabrook" Statement

In the Table "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," Section 3.4.1, page 26 of 36 of Attachment 1 to the LAR, the licensee stated:

> Not applicable. Seabrook was not licensed under 10 CFR Part 52.

NRC Staff Assessment

The NRC staff finds that Seabrook is an operating reactor currently licensed under the requirements of 10 CFR Part 50. Therefore, the NRC staff agrees that Condition 6 does not apply to Seabrook.

Summary

Based on the above evaluation of each condition, the NRC staff determined that the licensee has adequately addressed the six conditions identified in Section 4.1 of the NRC SE for NEI 94-01, Revision 2. Therefore, the NRC staff finds it acceptable for the licensee to adopt the "conditions and limitations" of TR NEI 94-01, Revision 2-A, as part of the implementation documents in Seabrook TS 6.15.

3.2.6 NEI 94-01, Revision 3-A, Limitations and Conditions

As required by 10 CFR 50.54(o), the Seabrook primary containment is subject to the requirements set forth in 10 CFR Part 50, Appendix J. Option B of Appendix J provides that test intervals for Type A, Type B, and Type C testing be determined by using a performance-based approach. Currently, Seabrook TS 6.15 is implemented in accordance with the guidelines contained in RG 1.163. The licensee's LAR, with its supplements, proposes to revise the Seabrook TS 6.15 by replacing Option B implementation document RG 1.163 with NEI 94-01, Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A, to govern the test frequencies and the grace periods for Type A, Type B, and Type C tests.

In its letter dated June 8, 2012 (ADAMS Accession No. ML121030286), the NRC provided an SE, with limitations and conditions, for NEI 94-01, Revision 3. In the SE, the NRC concluded that NEI 94-01, Revision 3, describes an acceptable approach for implementing the optional performance-based requirements of 10 CFR Part 50, Appendix J, and is acceptable for referencing by licensees proposing to amend their TSs regarding containment leakage rate testing, subject to the limitations and conditions identified in SE Section 4.0 and summarized in SE Section 5.0. The accepted version of NEI 94-01, Revision 3, was subsequently issued as Revision 3-A. NEI issued Revision 3-A to NEI 94-01 on July 31, 2012. With Revision 3-A, the report was revised to incorporate the June 8, 2012, NRC SE.

The licensee indicated in LAR Section 3.4.2, "June 8, 2012 NRC Safety Evaluation," that it intends to meet the limitations and conditions of Section 4.0 of the SE. Accordingly, the licensee intends to adopt, in part, the testing criteria in ANSI/ANS 56.8–2002 as part of its licensing basis. As stated in Section 2.0 of NEI 94-01, Revision 3-A, where technical guidance overlaps between NEI 94-01, Revision 3-A, and ANSI/ANS 56.8–2002, the guidance of NEI 94-01, Revision 3-A, takes precedence.

In the LAR, the licensee proposes to invoke NEI 94-01, Revision 3-A, as the implementation document for Seabrook TS 6.15 to govern its Type B and Type C LLRT program.

The NRC staff has found that NEI 94-01, Revision 3, is an acceptable reference for use in licensee TSs to extend the Option B to 10 CFR Part 50, Appendix J, Type B and Type C test intervals beyond 60 months, provided the following two conditions are satisfied:

Condition 1

Condition 1 of the NRC SE dated June 8, 2012, stipulates that:

> NEI TR 94-01, Revision 3, is requesting that the allowable extended interval for Type C LLRTs be increased to 75 months, with a permissible extension (for non-routine emergent conditions) of nine months (84 months total). The staff is allowing the extended interval for Type C LLRTs be increased to 75 months with the requirement that a licensee's post-outage report include the margin between the Type B and Type C leakage rate summation and its regulatory limit. In addition, a corrective action plan shall be developed to restore the margin to an acceptable level. The staff is also allowing the non-routine emergent extension out to 84-months as applied to Type C valves at a site, with some exceptions that must be detailed in NEI 94-01, Revision 3. At no time shall an extension be allowed for Type C valves that are restricted categorically (e.g. BWR MSIVs [boiling-water reactor] [main steam isolation valves]), and those valves with a history of leakage, or any valves held to either a less than maximum interval or to the base refueling cycle interval. Only non-routine emergent conditions allow an extension to 84 months.

Condition 1 presents three separate issues to be addressed:

(1) The allowance of an extended interval for Type C LLRTs of 75 months carries the requirement that a licensee's post-outage report include the margin between the Type B and Type C leakage rate summation and its regulatory limit.

NextEra Response to Condition 1, Issue (1):

The NextEra response to Condition 1, Issue 1, is captured in LAR Section 3.4.2, "June 8, 2012 NRC Safety Evaluation," page 26 of 36 of Attachment 1. Specifically, the licensee stated, in part:

> The post-outage report shall include the margin between the Type B and Type C minimum pathway leak rate summation value, as adjusted to include the estimate of applicable Type C leakage understatement, and its regulatory limit of 0.60 $L_a$.

(2) A corrective action plan shall be developed to restore the margin to an acceptable level.

NextEra Response to Condition 1, Issue (2):

The NextEra response to Condition 1, Issue 2, is captured in LAR Section 3.4.2, "June 8, 2012 NRC Safety Evaluation," page 27 of 36 of Attachment 1. Specifically, the licensee stated, in part:

> When the potential leakage understatement adjusted Type B and Type C minimum pathway leak rate total is greater than the Seabrook administrative leakage summation limit of 0.50 $L_a$, but less than the regulatory limit of 0.60 $L_a$, then an analysis and determination of a corrective action plan shall be prepared to restore the leakage summation margin to less than the Seabrook

administrative leakage limit. The corrective action plan shall focus on those components which have contributed the most to the increase in the leakage summation value and the manner of timely corrective action (as deemed appropriate) that best focuses on the prevention of future component leakage performance issues.

(3) Use of the allowed 9-month extension for eligible Type C valves is only authorized for non-routine emergent conditions.

NextEra Response to Condition 1, Issue (3):

The NextEra response to Condition 1, Issue 3, is captured in LAR Section 3.4.2, "June 8, 2012 NRC Safety Evaluation," page 27 of 36 of Attachment 1. Specifically, the licensee stated, in part:

> Seabrook will apply the 9 month grace period only to eligible Type C components and only for non-routine emergent conditions. Such occurrences will be documented in the record of tests.

NRC Staff Assessment

The NRC staff has reviewed NEI 94-01, Revision 3-A, against the licensee's responses for the three issues associated with Condition 1. Based on this review, the NRC staff concludes that NextEra acknowledges all of the requirements of Condition 1 and that the licensee has established its intent for Seabrook to comply with these requirements. Therefore, the NRC staff finds that the licensee has adequately addressed Condition 1.

Condition 2

Condition 2 of the NRC SE dated June 8, 2012, stipulates that:

> The basis for acceptability of extending the ILRT interval out to once per 15 years was the enhanced and robust primary containment inspection program and the local leakage rate testing of penetrations. Most of the primary containment leakage experienced has been attributed to penetration leakage and penetrations are thought to be the most likely location of most containment leakage at any time. The containment leakage condition monitoring regime involves a portion of the penetrations being tested each refueling outage, nearly all LLRT's being performed during plant outages. For the purposes of assessing and monitoring or trending overall containment leakage potential, the as-found minimum pathway leakage rates for the just tested penetrations are summed with the as-left minimum pathway leakage rates for penetrations tested during the previous 1 or 2 or even 3 refueling outages. Type C tests involve valves which, in the aggregate, will show increasing leakage potential due to normal wear and tear, some predictable and some not so predictable. Routine and appropriate maintenance may extend this increasing leakage potential. Allowing for longer intervals between LLRTs means that more leakage rate test results from farther back in time are summed with fewer just tested penetrations and that total used to assess the current containment leakage potential. This leads to the possibility that the LLRT totals calculated understate the actual leakage potential of the penetrations. Given the required margin included with the performance criterion

and the considerable extra margin most plants consistently show with their testing, any understatement of the LLRT total using a 5-year test frequency is thought to be conservatively accounted for. Extending the LLRT intervals beyond 5 years to a 75-month interval should be similarly conservative provided an estimate is made of the potential understatement and its acceptability determined as part of the trending specified in NEI 94-01, Revision 3, Section 12.1.

When routinely scheduling any LLRT valve interval beyond 60-months and up to 75-months, the primary containment leakage rate testing program trending or monitoring must include an estimate of the amount of understatement in the Type B & C total, and must be included in a licensee's post-outage report. The report must include the reasoning and determination of the acceptability of the extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

Condition 2 presents two separate issues to be addressed:

(1) Extending the Type C LLRT intervals beyond 5 years to a 75-month interval should be similarly conservative, provided an estimate is made of the potential understatement and its acceptability determined as part of the trending specified in NEI 94-01, Revision 3, Section 12.1.

NextEra Response to Condition 2, Issue (1):

The NextEra response to Condition 2, Issue 1, is captured in LAR Section 3.4.2, "June 8, 2012 NRC Safety Evaluation," page 28 of 36 of Attachment 1. Specifically, the licensee stated, in part:

The change in going from a 60 month extended test interval for Type C tested components to a 75 month interval, as authorized under NEI 94-01, Revision 3-A, represents an increase of 25 percent in the local leak rate test periodicity. As such, NextEra Energy Seabrook will conservatively apply a potential leakage understatement adjustment factor of 1.25 to the as-left leakage total for each Type C component currently on the greater than 60 month (up to 75 month) extended test interval. This will result in a combined conservative Type C total for all 60-75 month local leak rate tests being carried forward and included whenever the total leakage summation is required to be updated (either while operating on-line or following an outage). When the potential leakage understatement adjusted leak rate total for those Type C components being tested on a greater than 60 month (up to 75 month) extended interval is summed with the non-adjusted total of those Type C components being tested at less than the 60-75 month interval and the total of the Type B tested components, if the minimum pathway leak rate is greater than the Seabrook administrative leakage summation limit of 0.50 $L_a$, but less than the regulatory limit of 0.60 $L_a$, then an analysis and corrective action plan shall be prepared to restore the leakage summation value to less than the administrative leakage limit. The corrective action plan shall focus on those components that have contributed the most to the increase in the leakage summation value and the manner of timely corrective action (as deemed appropriate) that best focuses on the prevention of future component leakage performance issues. ...

(2) When routinely scheduling any LLRT valve interval beyond 60 months, and up to 75 months, the primary containment leakage rate testing program trending or monitoring must include an estimate of the amount of understatement in the Type B and Type C total, and must be included in a licensee's post-outage report. The report must include the reasoning and determination of the acceptability of the extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

NextEra Response to Condition 2, Issue (2):

The NextEra response to Condition 2, Issue 2, is captured in LAR Section 3.4.2, "June 8, 2012 NRC Safety Evaluation," pages 28 and 29 of 36 of Attachment 1. Specifically, the licensee stated:

> If the potential leakage understatement adjusted minimum pathway leak rate is less than the administrative leakage summation limit of 0.50 $L_a$, then the acceptability of the 75-month local leak rate test extension for all affected Type C components has been adequately demonstrated and the calculated local leak rate total represents the actual leakage potential of the penetrations.
>
> In addition to Condition 1, Issues 1 and 2, which deal with the minimum pathway leak rate Type B and Type C summation margin, NEI 94-01, Revision 3-A, also has the following margin related requirement contained in Section 12.1, "Report Requirements."
>
> A post-outage report shall be prepared presenting results of the previous cycle's Type B and Type C tests, and Type A, Type B and Type C tests, if performed during that outage. The technical contents of the report are generally described in ANSI/ANS-56.8-2002 and shall be available on-site for NRC review. The report shall show that the applicable performance criteria are met and serve as a record that continuing performance is acceptable. The report shall also include the combined Type B and Type C leakage summation, and the margin between the Type B and Type C leakage rate summation and its regulatory limit. Adverse trends in the Type B and Type C leakage rate summation shall be identified in the report and a corrective action plan developed to restore the margin to an acceptable level.
>
> In the event an adverse trend in the potential leakage understatement adjusted Type B and Type C summation is identified, an analysis and a corrective action plan shall be prepared to restore the margin to an acceptable level thereby eliminating the adverse trend. The corrective action plan shall focus on those components that have contributed the most to the adverse trend in the leakage summation value and what manner of timely corrective action, as deemed appropriate, best focuses on the prevention of future component leakage performance issues.
>
> An adverse trend is defined as three consecutive increases in the Type B and Type C minimum pathway leak rate summation value adjusted to include the estimate of applicable Type C leakage understatement, as expressed in terms of $L_a$.

NRC Staff Assessment

The NRC staff has reviewed NEI 94-01, Revision 3-A, against the licensee's responses for the two issues associated with Condition 2. Based on this review, the NRC staff concludes that NextEra acknowledges all of the requirements of Condition 2 and that the licensee has established its intent for Seabrook to comply with these requirements. Therefore, the NRC staff finds that the licensee has adequately addressed Condition 2.

Summary

Based on the above evaluation of each condition, the NRC staff determined that the licensee has adequately addressed the two conditions in Section 4.0 of the NRC SE for NEI 94-01, Revision 3. Therefore, the NRC staff finds it acceptable for the licensee to adopt NEI 94-01, Revision 3-A, as the implementation document in Seabrook TS 6.15.

3.2.7 Summary of Deterministic Considerations for the Proposed Extension of ILRT and LLRT Intervals

The NRC staff reviewed the Type A, Type B, and Type C leakage test results related to the licensee's proposal to extend the 10 CFR Part 50, Appendix J test intervals.

The ILRT results provided in Section 3.1.1 of the LAR indicate that the previous two consecutive Type A tests at Seabrook were successful, with containment performance leakage rates less than the maximum allowable containment leakage rate of 0.15 percent of primary containment air weight per day (1.0 $L_a$ at $P_a$) contained in Seabrook TS 6.15. Therefore, the NRC staff finds that the performance history of Type A tests supports extending the current ILRT interval on a permanent basis to 15 years as provided by NEI 94-01, Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A.

The NRC staff reviewed the local leak rate summaries contained in the LAR Attachment 1, Table "Seabrook Type B and Type C Leak Rate Summation History Since 2005," and notes that the aggregate results of the "as-found min path" and "as-left max path" for all the recent Type B and Type C tests are less than the Type B and Type C test TS limit of $\leq 0.60\ L_a$ contained in TS 6.15. The NRC staff reviewed the corrective actions described in SBPB-RAI-2 and in LAR Attachment 1, Section 3.1.2, "Type B and C Testing," taken for the valve (i.e., IA-V-531) that failed the Seabrook Type C LLRT program test during refueling outage OR15 in 2015. The NRC staff concludes that adequate corrective action for the failed valve has been performed. Therefore, the NRC staff finds that the licensee is effectively implementing the Type B and Type C leakage rate test program, as required by 10 CFR Part 50, Appendix J, Option B. Accordingly, the NRC staff finds that the performance history of Type B and Type C tests supports extending the current Type C test interval to 75 months as provided by NEI 94-01, Revision 3-A.

3.2.8 Conclusion

Based on the NRC staff review of the licensee's submittal of March 31, 2016, as supplemented, and the regulatory and technical evaluations above, the NRC staff finds that there is reasonable assurance that the licensee has addressed the NRC conditions to demonstrate acceptability of adopting NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A, as the 10 CFR Part 50, Appendix J, Option B, implementation documents.

The NRC staff finds that the licensee adequately implemented its Containment Leakage Rate Testing Program (i.e., Type A, Type B, and Type C leakage tests), for the Seabrook containment structures. The results of past ILRTs and recent LLRTs demonstrate acceptable performance of the Seabrook containment and demonstrate that the structural and leak-tight integrity of the containment structure is being adequately maintained. Additionally, the licensee adequately implemented its ASME Section XI, Subsection IWE and IWL program. The NRC staff also finds that the structural and leak-tight integrity of the Seabrook containment will continue to be monitored and maintained if Seabrook adopts NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A, as the 10 CFR Part 50, Appendix J, Option B, implementation documents. Accordingly, the NRC staff determined that there is reasonable assurance that the structural and leak-tight integrity for the Seabrook containment will continue to be maintained, without undue risk to public health and safety, if the current Type A test intervals are extended to 15 years and if the current Type C test intervals are extended to 75 months.

The NRC staff concludes that it is acceptable, from a deterministic perspective, for the licensee to: (i) revise Seabrook TS 6.15 to adopt NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A, as the 10 CFR Part 50, Appendix J, Option B, implementation documents; (ii) extend, on a permanent basis, the Type A test interval up to 15 years; and (iii) extend the Type C test intervals up to 75 months. The NRC staff also reviewed the proposed change to verify that the revised program description continues to contain the appropriate administrative controls for the Containment Leak Rate Testing Program. The NRC staff concludes that the revised TS continues to provide the appropriate administrative controls to ensure that the requirements of 10 CFR 50.36(c)(5) continue to be satisfied.

## 3.3 Probabilistic Risk Assessment

### 3.3.1 Background

Section 9.2.3.1, "General Requirements for ILRT Interval Extensions beyond Ten Years," of NEI 94-01, Revision 3-A, states that plant-specific confirmatory analyses are required when extending the Type A ILRT interval beyond 10 years. Section 9.2.3.4, "Plant-Specific Confirmatory Analyses," of NEI 94-01, Revision 3-A, states that the assessment should be performed using the approach and methodology described in EPRI Technical Report 1009325, Revision 2-A[1], "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals." The analysis is to be performed by the licensee and retained in the plant documentation and records as part of the basis for extending the ILRT interval.

In the SE dated June 25, 2008, the NRC staff found the methodology in NEI 94-01, Revision 2, and EPRI TR-1009325, Revision 2, acceptable for referencing by licensees proposing to amend their TSs to permanently extend the ILRT interval to 15 years, provided certain conditions are satisfied. These conditions, set forth in Section 4.2 of the SE for EPRI TR-1009325, Revision 2, provided that:

1. The licensee submit documentation indicating that the technical adequacy of its PRA is consistent with the requirements of RG 1.200, Revision 2, "An Approach for

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[1] EPRI TR-1009325, Revision 2-A, is also identified as EPRI TR-1018243. This report is publicly available and can be found at www.epri.com by typing "1018243" in the search field box.

Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," March 2009 (ADAMS Accession No. ML090410014), relevant to the ILRT extension application. Additional application-specific guidance on the technical adequacy of a PRA used to extend ILRT intervals is provided in the safety evaluation report for EPRI TR-1009325, Revision 2.

2. The licensee submit documentation indicating that the estimated risk increase associated with permanently extending the ILRT surveillance interval to 15 years is small and consistent with the clarification provided in Section 3.2.4.6[2] of the SE for EPRI TR-1009325, Revision 2.

3. The methodology in EPRI TR-1009325, Revision 2, is acceptable, provided the average leak rate for the preexisting containment large leak accident case (i.e., accident case 3b) used by a licensee is assigned a value of 100 $L_a$ instead of 35 $L_a$.

4. An LAR is required in instances where containment over-pressure is relied upon for emergency core cooling system (ECCS) performance.

3.3.2 Plant-Specific Risk Evaluation

The licensee performed an assessment of the effect on risk metrics for extending the Type A containment ILRT interval from 10 years to 15 years at Seabrook. This assessment was provided by the licensee in Attachment 4 of its letter dated March 31, 2016, as supplemented by letters dated May 31, October 27, and November 17, 2016.

In Section 1.1 of Attachment 4 to the LAR, the licensee stated that the plant-specific risk assessment for Seabrook follows the guidance in:

- Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J, NEI 94-01, Revision 3-A, July 2012.

- EPRI TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals," August 1994, Palo Alto, CA.

- Interim Guidance for Performing Risk Impact Assessments in Support of One-Time Extensions for Containment Integrated Leakage Rate Test Surveillance Intervals, Revision 4, Developed for NEI by EPRI and Data Systems and Solutions, November 2001.

- RG 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," May 2011 (ADAMS Accession No. ML100910006).

- Letter from C. H. Cruse, Constellation Nuclear, to NRC Document Control Desk, Re: Calvert Cliffs Nuclear Power Plant, "Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated

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[2] The SE for EPRI TR-1009325, Revision 2, indicates that the clarification regarding small increases in risk is provided in Section 3.2.4.5; however, the clarification is actually provided in Section 3.2.4.6.

Leakage Rate Test Extension," March 27, 2002 (ADAMS Accession No. ML020920100).

- EPRI TR-1009325, Revision 2-A, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals," 2008, Palo Alto, CA.

The licensee addressed each of the four conditions for the use of EPRI TR-1009325, Revision 2-A, that are listed in Section 4.2 of the NRC SE dated June 25, 2008. A summary of how each condition was met is provided in the sections below.

3.3.3 Technical Adequacy of the Probabilistic Risk Assessment

The first condition stipulates that the licensee submit documentation indicating that the technical adequacy of its PRA is consistent with RG 1.200, Revision 2, relevant to the ILRT extension application.

The PRA quality (including the technical adequacy of the PRA), as it relates to the ILRT extension application, is described in Section 3.2.4.1 of the SE to EPRI TR-1009325, Revision 2:

> Licensee requests for a permanent extension of the ILRT surveillance interval to 15 years pursuant to NEI TR 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, will be treated by NRC staff as risk-informed license amendment requests. Consistent with information provided to industry in Regulatory Issue Summary 2007-06, "Regulatory Guide 1.200 Implementation," the NRC staff will expect the licensee's supporting Level 1/LERF [large early release frequency] PRA to address the technical adequacy requirements of RG 1.200, Revision 1... Any identified deficiencies in addressing this standard shall be assessed further in order to determine any impacts on any proposed decreases to surveillance frequencies. If further revisions to RG 1.200 are issued which endorse additional standards, the NRC staff will evaluate any application referencing NEI TR 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, to examine if it meets the PRA quality guidance per the RG 1.200 implementation schedule identified by the NRC staff.

The NRC staff also stated that Capability Category (CC) I of the ASME PRA Standard shall be applied as the standard for assessing PRA quality for ILRT extension applications, as approximate values of core damage frequency (CDF) and LERF and their distribution among release categories, are sufficient to support the evaluation of changes to ILRT frequencies.

In Appendix A of Attachment 4, "Seabrook Station Permanent ILRT Interval Extension Risk Impact Assessment: Seabrook Station PRA Capability," of its LAR, the licensee stated that the Seabrook PRA model is a fully integrated, full scope Level 1 and Level 2 model, which includes assessment of internal events; internal flood events; internal fire events; and external hazards, including seismic events. The licensee also stated that the Seabrook PRA model of record used in support of its ILRT LAR meets the requirements of Part 2, "Internal Events," and Part 3, "Internal Flood," of the ASME/ANS PRA Standard as endorsed by RG 1.200, Revision 2. Specific discussion of the technical adequacy of the Seabrook PRA is discussed in Section 3.5.2 and Appendix A of Attachment 4 of the LAR.

The licensee stated that the internal events portion of the Seabrook PRA has been subjected to three peer reviews (1999, 2005, and 2012) against internal event supporting requirements. In addition, the licensee noted three reviews by external sources were conducted in 2002, 2006, and 2011 of specific internal events model issues and five self-assessments were performed in 2005, 2007, 2010, 2011, and 2014. The licensee stated that all internal events peer review significance level A and B findings had been addressed and dispositioned and that the 2014 PRA met all Part 2 (internal events) CC II (or higher) requirements of the PRA Standard, as endorsed by RG 1.200, Revision 2.

The licensee stated that the internal flood events portion of the Seabrook PRA has also been updated in several recent revisions to its 1991 Individual Plant Examination of External Events submittal, the latest being in 2011. Specifically, 32 facts and observations (F&Os), including 12 findings associated with 16 supporting requirements, were identified as a result of a 2009 peer review with a 2011 fire events PRA update addressing these, as well as subsequent self-assessment items. In 2014, the internal flood PRA was further revised to include updated initiating event and human error probability (HEP) data.

In its letter dated May 31, 2016, the licensee provided all peer review findings and dispositions from the latest full- and focused-scope peer reviews and self-assessments associated with ASME/ANS PRA Standard, Part 2 (Internal Events) and Part 3 (Internal Flood Events). The licensee stated that all findings were resolved and dispositioned and that there were no open findings for which the PRA did not meet the ASME/ANS PRA Standard.

The NRC staff reviewed the peer review findings and dispositions provided by the licensee and found most of the peer review dispositions to be acceptable. However, the NRC staff did request additional information regarding the dispositions of peer review findings HR-G7-1, 5-5 (IFSN-A9), and LE-E4-01 (LE-E4 and E1). Specifically, peer review finding HR-G7-1 addressed the licensee's identification and treatment of dependency between multiple human actions, 5-5 (IFSN-A9) addressed the potential for discrepancies between defined PRA source values and associated spreadsheets, and LE-E4-01 (LE-E4 and E1) addressed the incorporation of "state-of-knowledge" uncertainty throughout the model. In its letter dated October 27, 2016, the licensee provided additional information regarding the peer review findings/dispositions cited above.

For HR-G7-1, the licensee stated that the dependence among human actions is accounted for within the baseline PRA model as determined by a HEP dependency analysis. While it was noted that no specific minimum floor value was imposed for joint HEPs in the analysis used to support the ILRT LAR, a sensitivity analysis was provided in which a joint HEP floor of 1E-6 was imposed. The floor value was imposed on its fully integrated model, which included internal events, internal flood, internal fire, and external events. The sensitivity results demonstrated that calculated ILRT risk metrics were still below LAR acceptance criteria; however, the increase in CDF was significant (an increase of approximately 109 percent over the baseline CDF value). For LERF and delta-LERF, the increases were 7 percent and a significant 113 percent, respectively. For the delta-dose rate and conditional containment failure probability (CCFP), the corresponding increases were 108 percent and 1 percent, respectively.

In its letter dated November 17, 2016, the licensee provided additional clarification regarding the sensitivity results, as well as results from an additional sensitivity analysis in which a floor value of 1E-5 was imposed for fire events. The additional conservatism (1E-5 vs. 1E-6) in the joint HEP floor value was applied to fire events in consideration of the fact that external events contributed substantially to the total CDF reported. As described in Section 3.3.4 of this SE, the

sensitivity results demonstrated that calculated ILRT risk metrics were still below LAR acceptance criteria, increasing from 109 percent to only 113 percent for the baseline CDF value, 7 percent to only 9 percent for total LERF, and 113 percent to only 117 percent. The corresponding increases for delta-dose rate and CCFP were from 108 percent to only 111 percent and no measurable change from 1 percent, respectively. The NRC staff reviewed the sensitivity analyses and clarifications and concludes that the disposition of HR-G7-1 is acceptable.

With regard to finding/disposition 5-5 (IFSN-A9), the licensee stated that the identified potential for discrepancies between defined PRA source values and associated spreadsheets did not result in discrepancies in the subject assumed flooding rates used to develop the associated scenarios. With regard to finding/disposition LE-E4-01 (LE-E4 and E1), the licensee provided additional basis for its judgment that "state-of-knowledge" uncertainty was adequately addressed. Specifically, the licensee stated that it reviewed sequences and associated group contributions and Monte Carlo simulation uncertainty results for selected major top event frontline mitigation systems. It was reported that that check did not identify significant differences between the split fraction Monte Carlo-generated mean values and point-estimate mean values suggesting that the key contributors to the selected top events are not particularly sensitive to, or do not involve, multiple occurrences of the same variable. The NRC staff reviewed the licensee responses and concludes that the licensee's disposition of 5-5 (IFSN-A9) and LE-E4-01 (LE-E4 and E1) is acceptable.

In Section 3.2.4.2 of the SE for NEI 94-01, Revision 2, and EPRI TR-1009325, Revision 2, the NRC staff states that:

> Although the emphasis of the quantitative evaluation is on the risk impact from internal events, the guidance in EPRI Report No. 1009325, Revision 2, Section 4.2.7, "External Events," states that: "Where possible, the analysis should include a quantitative assessment of the contribution of external events (e.g., fire and seismic) in the risk impact assessment for extended ILRT intervals." This section also states that: "If the external event analysis is not of sufficient quality or detail to directly apply the methodology provided in this document [(i.e., EPRI Report No. 1009325, Revision 2)], the quality or detail will be increased or a suitable estimate of the risk impact from the external events should be performed." This assessment can be taken from existing, previously submitted and approved analyses or other alternate method of assessing an order of magnitude estimate for contribution of the external event to the impact of the changed interval.

In its letters dated March 31, 2016, and May 31, 2016, the licensee stated that no peer reviews or self-assessments were performed for other hazards (e.g., Part 4: Internal Fire, and Part 5: Seismic Events). However, it was noted that the internal fire and seismic events were qualitatively and quantitatively (by sensitivity) assessed. This assessment was provided in Section 6.3 of Appendix A to Attachment 4 of the March 31, 2016, LAR submittal.

Regarding internal fire events, the licensee stated the following in its October 27, 2016, response:

> ... [F]ire events do not contribute significantly to LERF (1.3E-10/yr [year]). This is consistent with Seabrook's relatively low total LERF contribution (1.5E-07/yr) from all internal and external events, with the total LERF of all events being

approximately two orders of magnitude lower than total CDF (1.2E-05/yr). The relatively low total LERF is a reflection of Seabrook's robust containment design and associated release mitigation capability. Because Seabrook's baseline LERF is relatively low, the "added" 3b-LERF introduced by the ILRT extension, although very small, is relatively large compared to the low baseline LERF. Thus, the delta-LERF as a result of applying the industry ILRT methodology appears as a relatively large increase for Seabrook.

... [A]s a result of applying the latest industry fire risk methods, it is recognized that the final updated fire-induced CDF/LERF could increase above the current values. Therefore, a fire/ILRT risk sensitivity evaluation was performed by conservatively assuming that the current fire-induced CDF is increased by a factor of 2 ... This evaluation shows that the 15 year ILRT test interval 3b LERF would become 1.45E-07/yr resulting in a delta-LERF of 1.16E-07/yr. This represents an increase in the delta-LERF of approximately 1.4E-08/yr above the baseline delta-LERF of 1.02E-07/yr. This shows that the baseline delta-LERF is relatively insensitive to the assumed increase in fire risk.

Conclusion - The baseline quantitative fire CDF and LERF contributions are judged appropriate for use in the delta LERF impact of the ILRT Type A test interval extension. No additional fire risk insights were identified for further consideration.

Regarding seismic events, the licensee stated the following in its March 31, 2016, submittal:

The proposed extension of the ILRT interval does not impact the frequency of any seismic initiating event nor does the ILRT extension impact the reliability of active equipment credited in seismic initiating event sequences. The Seabrook plant is a relatively late vintage design and has a robust structural seismic capacity. Seismic risk is dominated by large, beyond-design-basis seismic events that result in transients with loss of offsite power with failure of the Emergency Diesel Generators and Supplemental Emergency Power Supply diesels (station blackout condition) and failure of other non-seismically supported and seismically supported equipment needed for core cooling. Large seismic events can also result in large LOCA [loss-of-coolant accident] events with seismic-induced failure of ECCS equipment. Smaller size seismic events are less likely to cause a large LOCA or blackout-type event and support systems and ECCS are more likely to remain available. These lower level seismic event sequences (transient sequences where the equipment survives the seismic event but is then subject to random failure) are important sequences but are less dominant than the large seismic event sequences.

The ILRT test is focused on performing a periodic validation of the containment liner leak tightness, which is a condition independent of the risk of seismic events. Therefore the ILRT extension has no direct effect on the core damage/release mitigation capability from seismic events.

... [T]he Seabrook seismic PRA ... has not been formally peer reviewed against the requirements of the PRA Standard and RG-1.200, Revision 2. As a result of applying the latest industry seismic risk hazard and methods, ... by assuming that the current seismic-induced CDF is equivalent to 1E-05/yr, taken from

> Table D-1 of Appendix D to, "Results of Safety/Risk Assessment of Generic Issue 199, 'Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants.'", [t]his sensitivity ... increases the seismic contribution to the release category frequencies ... by a factor of 3.08 (3.25E-06/yr to 1.0E-05/yr) ... This evaluation shows that the 15 year ILRT test interval 3b LERF would become 2.01E-07/yr resulting in a delta-LERF of 1.61E-07/yr. This represents an increase in the delta-LERF of approximately 6E-08/yr above the baseline delta-LERF of 1.02E-07/yr. This shows that the baseline delta-LERF is relatively insensitive to the assumed increase in seismic risk.
>
> Conclusion - The baseline quantitative seismic CDF and LERF contributions are judged appropriate for use in the delta LERF impact of the ILRT Type A test interval extension.

Regarding other external events, the licensee stated the following in its March 31, 2016, submittal:

> Other external events include LOSP [loss of offsite power] due to severe weather, external flooding, high winds, tornado, transportation and near-by facility hazards, turbine missile, etc. Some of these events (e.g., weather-related LOSP) are quantified in the internal events PRA model while others are screened out based on the low probability of occurrence and rigorous plant design features. Collectively, all "other" external events are judged to have a very small contribution to CDF/LERF. The proposed extension of the ILRT test interval does not impact the initiating event frequencies of other external events nor does the ILRT extension impact the reliability of active equipment needed to mitigate these events.

In summary, the licensee has evaluated its internal events PRA against the currently endorsed ASME PRA Standard (i.e., ASME/ANS RA-Sa-2009) and RG 1.200, Revision 2; evaluated the findings developed during the peer review of its internal events PRA for applicability to the ILRT interval extension; addressed the findings or evaluated their impact; and included a quantitative assessment of the contribution of external events. The NRC staff reviewed the internal events peer review findings and concludes that the dispositioned findings have been adequately addressed for this application. Furthermore, the NRC staff concludes that the impact from external events is appropriately considered. Based on the above, the NRC staff concludes that the PRA used by the licensee is of sufficient technical adequacy to support the evaluation of changes to ILRT frequency. Accordingly, the first condition is met.

### 3.3.4 Estimated Risk Increase

The second condition stipulates that the licensee submit documentation indicating that the estimated risk increase associated with permanently extending the ILRT interval to 15 years is small and consistent with the guidance in RG 1.174 and the clarification provided in Section 3.2.4.5 of the NRC SE for NEI 94-01, Revision 2, and EPRI TR-1009325, Revision 2. Specifically, a small increase in population dose should be defined as an increase of no more than 1.0 person-rem per year or 1 percent of the total population dose, whichever is less restrictive. In addition, a small increase in conditional containment failure probability (CCFP) should be defined as a value marginally greater than that accepted in previous one-time 15-year ILRT extension requests. This would require that the increase in CCFP be less than or equal to

1.5 percentage points. Additionally, for plants that rely on containment over-pressure for net positive suction head (NPSH) for ECCS injection, both CDF and LERF will be considered in the ILRT evaluation and compared with the risk acceptance guidelines in RG 1.174. As discussed in Section 3.3.6 of this SE, Seabrook does not rely on containment over-pressure for ECCS performance. Thus, the associated risk metrics include LERF, population dose, and CCFP. The licensee reported the results of the plant-specific risk assessment and the reported risk impacts are based on a change in test frequency from three tests in 10 years (the test frequency under 10 CFR Part 50 Appendix J, Option A) to one test in 15 years. As summarized in Section 7.0 of Attachment A to the March 31, 2016, submittal and consistent with the RAI responses from October 27, 2016, and November 17, 2016:

> ... [T]he following conclusions regarding the assessment of the plant risk are associated with permanently extending the Type A ILRT test frequency to once in fifteen years:
>
> - Regulatory Guide 1.174 provides guidance for determining the risk impact of plant specific changes to the licensing basis. Regulatory Guide 1.174 defines very small changes in risk as resulting in increases of CDF below 1E-06/yr and increases in LERF below 1E-7/yr. Since the ILRT does not impact CDF, the relevant criterion is LERF. The increase in LERF resulting from a change in the Type A ILRT test interval from three in ten years to one in fifteen years is conservatively estimated as 1.02E-07 /yr which is marginally above the RG 1.174 "very small" risk criterion. In light of the conservative assignment of 3b large liner leaks to LERF the incremental increase is judged to pose a very small increase to plant risk using the acceptance guidelines of Reg. Guide 1.174.[3]
>
> - Regulatory Guide 1.174 also states that when the calculated increase in LERF is in the range of 1E-07 per reactor year to 1E-06 per reactor year, applications will be considered only if it can be reasonably shown that the total LERF is less than 1E-05 per reactor year. The assessment includes the impact from External Events. In this case, the total class 3b contribution to LERF including External Events was conservatively estimated as 1.28E-07 /yr for Seabrook Station. The resulting total LERF is 1.28E-07/yr + 1.55E-07/yr = 2.83E-07/yr. This is below the RG 1.174 acceptance criteria for total LERF of lE-05/yr and therefore this change satisfied both the incremental and absolute expectations with regard to the RG 1.174 LERF metric.

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[3] As per Section 3.5.3 of the March 31, 2016, submittal, page 32 of 36, the increase in LERF of 1.02E-7 per year is cited as "negligibly above (2E-9/yr) the LERF threshold for 'very small' change in risk per Regulatory Guide 1.174 acceptance criteria." The conclusion is that, "[g]iven the conservative, bounding nature of the LERF category 3b evaluation per the EPRI methodology, the incremental change in LERF is judged to pose a 'very small' increase in plant risk." Also cited is the "total" LERF being "well below the 1E-5/yr total LERF requirement in Regulatory Guide 1.174." Attachment 4 to the March 31, 2016, submittal, Section 4.3 (pp. 15-16), provides discussion as to this particular source of conservatism, especially the potential for delta-LERF values to lie above the "very small" change guidelines in RG 1.174. Additionally cited is that the Seabrook analysis is "very conservative compared to previous submittals ... approved by the NRC because it does not factor in the possibility that failures could be detected by other tests."

- The change in Type A test frequency to once per fifteen years, measured as an increase to the total integrated plant risk for those accident sequences influenced by Type A testing, is 3.82E-02 person-rem/yr [corresponding to a percentage increase of 0.12%]. EPRI Report No. 1009325, Revision 2-A states that a very small population dose is defined as an increase of $\leq$1.0 person-rem per year or $\leq$1 % of the total population dose, whichever is less restrictive for the risk impact assessment of the extended ILRT intervals. This is consistent with the NRC Final Safety Evaluation for NEI 94-01 and EPRI Report No. 1009325. Moreover, the risk impact when compared to other severe accident risks is negligible.

- The increase in the conditional containment failure probability from the three in ten year interval to a permanent one time in fifteen year interval is 0.86%. EPRI Report No. 1009325, Revision 2-A, states that increases in CCFP of $\leq$1.5 percentage points are very small. This is consistent with the NRC Final Safety Evaluation for NEI 94-01 and EPRI Report No. 1009325. Therefore this increase is judged to be very small.

Therefore, permanently increasing the ILRT interval to fifteen years is considered to be a very small change to the Seabrook Station risk profile.

Based on the risk assessment results, the NRC staff concludes that the increase in LERF is small (and only marginally above the threshold for "very small") and consistent with the acceptance guidelines of RG 1.174; the increase in the total population dose and the magnitude of the change in the CCFP for the proposed change are small and supportive of the LAR. The defense-in-depth philosophy is maintained, as the independence of barriers will not be degraded as a result of the requested change, and the use of the three quantitative risk metrics collectively ensures that the balance between prevention of core damage, prevention of containment failure, and consequence mitigation is preserved. Accordingly, the second condition is met.

3.3.5 Leak Rate for the Large Preexisting Containment Leak Rate Case

The third condition stipulates that in order to make the methodology in EPRI TR-1009325, Revision 2, acceptable, the average leak rate for the preexisting containment large leak rate accident case (i.e., accident case 3b) used by the licensees shall be 100 $L_a$ instead of 35 $L_a$.

As noted by the licensee in Section 3.5.1 of the LAR, the methodology in EPRI TR-1009325, Revision 2-A, incorporates the use of 100 $L_a$ as the average leak rate for the preexisting containment large leak rate accident case, and this value has been used in the Seabrook plant-specific risk assessment. Accordingly, the third condition is met.

3.3.6 Applicability if Containment Over-Pressure is Credited for ECCS Performance

The fourth condition stipulates that in instances where containment over-pressure is relied upon for ECCS performance, an LAR is required to be submitted. In Section 3.5.1 of the LAR, the licensee stated that Seabrook does not rely on containment overpressure for ECCS performance. Accordingly, the fourth condition is not applicable.

3.3.7 Conclusion

Based on the above, the NRC staff concludes that the proposed LAR, as supplemented, for a permanent extension of the Type A containment ILRT frequency to once in 15 years for Seabrook is acceptable. In accordance with the revised Seabrook TS 6.15, the containment leakage rate testing program for Seabrook shall be in accordance with the guidelines contained in NEI 94-01, Revision 3-A, and conditions and limitations specified in NEI 94-01, Revision 2-A.

## 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Hampshire and Massachusetts State officials were notified of the proposed issuance of the amendment on March 3, 2017. The New Hampshire State official had no comment. The Massachusetts State official had comments/questions regarding the guidance that the NRC staff uses in evaluating requests to extend leak rate timeframes, whether other plants have been approved for similar extensions, and whether the NRC staff had taken the impacts of ASR into consideration during its review of the Seabrook LAR. In response, the NRC staff informed the Massachusetts State official that other plants have previously requested and received approval for similar extensions and that the NRC staff's evaluation of such requests is based on previous test history and the ability for the licensee to address the conditions included as part of the NRC staff's endorsement of NEI 94-01, Revisions 3-A and 2-A, including impacts to risk. The NRC staff also informed the Massachusetts State official that the SE discusses the staff's consideration of the impacts of ASR on the acceptability of the LAR.

## 5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on July 19, 2016 (81 FR 46964). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

## 6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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