



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

September 14, 2012

Mr. Kevin Walsh
Site Vice President
NextEra Energy Seabrook, LLC
P.O. Box 300
Seabrook, NH 03874

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE
SEABROOK STATION, LICENSE RENEWAL APPLICATION – SET 19

Dear Mr. Walsh:

By letter dated May 25, 2010, NextEra Energy Seabrook, LLC, submitted an application pursuant to 10 CFR Part 54, to renew the Operating License NPF-86 for Seabrook Station, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information were discussed with Richard Cliche, and a mutually agreeable date for the response is within 60 days from the date of this letter. If you have any questions, please contact me at 301-415-1457 or e-mail Patrick.Milano@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Patrick Milano", written over a white background.

Patrick Milano, Senior Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
As stated

cc w/encl: Listserv

SEABROOK STATION
LICENSE RENEWAL APPLICATION
REQUESTS FOR ADDITIONAL INFORMATION Set 19

Follow-up RAI B.2.1.28-3

Background

In response to RAI B.2.1.28-3, dated March 30, 2012, the applicant stated:

Additional inspections of the exterior face of the Containment Structure were performed in September 2011. The results show a maximum crack width of 8 mils, which is less than the 15 mil criteria for acceptance without further evaluation in the first-tier of the Structural Monitoring Program. Inspections revealed two isolated locations of the Containment Structure exterior surface that exhibit pattern cracking that may be indicative of [alkali-silica reaction] ASR. The width of the pattern cracking on the exterior surface of the Containment Structure is smaller than the cracking in the "B" Electrical Tunnel and is considered insignificant. Although the identified crack width does not meet the Structural Monitoring Program threshold for further evaluation, these two locations will be included in the second-tier evaluation criteria of the program due to the past groundwater in-leakage and follow-up inspections will be performed.

By letter dated May 16, 2012, the applicant submitted a plant-specific alkali-silica reaction (ASR) Monitoring Program. Element 1, "Scope of Program" states that the program scope includes concrete structures within the scope of the license renewal Structures Monitoring Program. However, the Containment Building (including equipment hatch missile shield), which is within the scope of the American Society of Mechanical Engineers (ASME) Section XI, Subsection IWL Program, is listed within the scope of the ASR Monitoring Program.

Issue

The applicant has indicated that the pattern cracking on containment may be indicative of ASR, however, by using the acceptance criteria for passive cracks defined in American Concrete Institute (ACI) 349.3R to justify that follow-up inspections will be performed, the applicant has concluded that further evaluation is not necessary. According to ACI 349.3R, concrete surfaces that have passive cracks less than 0.4 mm (15 mils) in maximum width are generally acceptable without further evaluation. Passive cracks are defined as those having an absence of recent growth and an absence of other degradation mechanisms at the crack. The cracks observed in the Containment Structure are indicative of ASR and considered active (not passive), meaning they grow over time, and can affect the structural integrity of the structure. According to ACI 349.3R, active cracking, settlements, or deflections that are observed in a structure are unacceptable, need further technical evaluation, and should be treated because cracking damage can continue or intensify.

The staff is concerned that the applicant has not demonstrated that the pattern cracking on containment, which may be indicative of ASR, will be adequately managed during the period of extended operation. In addition, the staff is not clear if the Containment Building is within the scope of the ASR Monitoring Program, or how the pattern cracking on containment will be

ENCLOSURE

monitored and trended to demonstrate that the effects of aging will be adequately managed during the period of extended operation.

Request

- a. Clarify whether or not the Containment Building is within the scope of the plant-specific ASR Monitoring Program.
- b. If the Containment Building is within the scope of the plant-specific ASR Monitoring Program, clarify the following:
 - i. Whether the cracking index and individual crack width of the pattern cracking on the Containment Building will be monitored at the six month interval described in the May 16, 2012, submittal during the period of extended operation.
 - ii. If a structural evaluation will be performed in case the combined cracking index and or individual crack width exceeds the acceptance criteria of the ASR Monitoring Program.

Follow-up RAI B.2.1.31-1

Background

In response to RAI B.2.1.31-1, dated March 30, 2012, regarding the staffs concern on how the effects of future degradation will either be prevented or managed and how structural integrity will be maintained during the PEO, the applicant stated:

The Structural Monitoring and Section XI IWL Programs will provide the programmatic requirements to manage and prevent future degradation during the period of extended operation.

- Aging management of ASR-related degradation will be integrated into the Structural Monitoring Program where concrete inspection, tracking and evaluation are performed in accordance with ACI 349 and the Maintenance Rule Program.

NextEra has initiated actions to perform testing on full-scale replicas of station structural configurations. Through this testing, quantitative crack limits will be developed. The crack limits will be used in the Structural Monitoring Program to manage the effects of ASR-related degradation on concrete material properties of plant structures. These quantitative crack limits will be used to develop acceptance criteria such that corrective action can be implemented prior to loss of intended function.

- Aging management of ASR age related degradation will be integrated into the Section XI IWL Program where concrete inspection, tracking and evaluation are in accordance with ACI 349.

The applicant further stated that:

NextEra has initiated actions to perform testing on full-scale replicas of station structural configurations that will provide the data necessary to establish the current and future implications of ASR deterioration on concrete material properties of plant structures. The use of representative scale and materials will ensure that data collected during each of the test programs will be directly applicable to the assessment and management of in-scope structures at Seabrook Station.

The testing will be used to develop the following correlating data:

- Concrete material properties in different stages of ASR
- Crack mapping index (quantitative damage limits)

By letter dated May 16, 2012, the applicant submitted a plant-specific ASR Monitoring Program, B.2.1.31A to augment the existing Structures Monitoring Program, B.2.1.31.

Issue

The applicant did not clearly indicate whether the May 16, 2012, submittal was intended to replace in whole, replace in part, or supplement the March 30, 2012, response. The response to RAI B.2.1.31-1, provided on March 30, 2012, is not consistent with the plant-specific ASR Monitoring Program submitted on May 16, 2012. The March 30, 2012, response states that the applicant plans to perform testing on full-scale replicas of station structural configurations to develop quantitative crack limits. The crack limits will be incorporated into the Structural Monitoring Program to manage the effects of ASR on concrete walls. These quantitative crack limits will be used to develop acceptance criteria such that corrective action can be implemented prior to loss of intended function. However, the Element 6, "Acceptance Criteria" of the plant specific ASR Monitoring Program has combined crack mapping index and crack width limits for concrete that are not based on any tests on full-scale replicas of the Seabrook station structural configurations. The staff is concerned that the applicant has not demonstrated the aging effects of ASR (i.e., cracking, degradation of mechanical properties) will be adequately managed. In addition, the staff is not clear as to what the acceptance criteria will be to demonstrate that the effects of aging will be adequately managed, or the basis for the acceptance criteria.

Request

- a. Clarify which aging effects the proposed crack mapping index and crack width limits are intended to monitor and trend.
- b. Clarify whether the acceptance criteria is the one stated in the ASR Monitoring Program, or the one described in the March 30, 2012, response which indicates that the acceptance criteria will correlate the degradation of mechanical properties to cracking, based on testing at the University of Texas.
- c. Provide the technical basis for which the acceptance criteria were developed and/or will be developed.

RAI B.2.1.31-5

Background

The applicant in its letter dated May 16, 2012, submitted a plant specific ASR Monitoring Program, B.2.1.31A to augment the existing Structures Monitoring Program, B.2.1.31.

Element 4 – Detection of Aging Effects of the ASR Monitoring Program states that ASR is detected by visual inspections performed by qualified individuals. These individuals must either be a licensed Professional Engineer experienced in this area, or work under the direction of a licensed Professional Engineer. The applicant also states that to identify and verify the presence of ASR, the maximum crack width, a cracking index, and a description of the cracking including any visible surface discoloration are documented.

Issue

The staff is concerned that ASR visual examination, along with measurement of crack width and cracking index, will be used to rule out the presence of ASR in a concrete structure. Visual inspections of concrete structures may indicate the presence of ASR; however, further investigation (i.e. petrographic examination) must be conducted to confirm the absence of ASR.

Request

- a. Clarify whether the ASR visual inspections will be used to rule out the presence of ASR in a concrete structure.
- b. If so, what criteria and/or testing will be used to confirm the absence of ASR in those structures.

RAI B.2.1.31-6

Background

The applicant in its letter dated May 16, 2012, submitted a plant specific ASR Monitoring Program, B.2.1.31A to augment the existing Structures Monitoring Program, B.2.1.31.

Element 6 - Acceptance Criteria of the ASR Monitoring Program states:

NextEra has performed a baseline inspection and ASR associated cracks have been evaluated and categorized. NextEra has assessed 131 accessible areas to date in this manner. The areas affected by ASR have been identified and assessed for apparent degradation from ASR, including estimation of in situ expansion. The results are presented in MPR-3727, Revision 0, "*Seabrook Station: Impact of Alkali-Silica Reaction on Concrete Structures and Attachments.*" Based on site specific assessment and review of industry source documentation this report provides recommendations for screening thresholds used in the ASR Monitoring Program. Using these thresholds, ASR affected areas are screened and categorized for Qualitative or Quantitative Monitoring and Trending and Structural Evaluation.

A Combined Cracking Index (CCI) of less than the 1.0 mm/m and Individual Crack Width of less than 1.0 mm can be deemed Acceptable with Deficiencies. Areas with deficiencies determined to be acceptable with further review are trended for evidence of further degradation.

Issue

The staff is concerned that the proposed CCI and Individual Crack Width criteria may not be adequate. The staff reviewed the following industry publications and found that detailed investigation and structural evaluation may be appropriate if the CCI is greater than 0.5 mm/m and/or an Individual Crack Width is greater than 0.20 mm for the nuclear power plant concrete structures that are important to safety and exposed to groundwater.

1. FHWA, "Report on the Diagnosis, Prognosis, and Mitigation of Alkali Silica Reaction (ASR) in Transportation Structures"
2. Institution of Structural Engineers, "Structural Effects of Alkali-Silica Reaction – Technical Guidance Appraisal of Existing Structures"
3. French National Rule for Inservice Inspection of Nuclear Power Plant Structures
4. Oak Ridge National Laboratory letter Report NRC/LTR-9514, "In-Service inspection Guidelines for Concrete Structures in Nuclear Power Plants"

Request

Provide the basis for using a CCI of 1.0 mm/m or less and Individual Crack Width 1.0 mm or less as Acceptable with Deficiencies without performing detailed investigation and structural evaluation.

RAI B.2.1.31-7

Background

The applicant in its letter dated May 16, 2012, submitted a plant specific ASR Monitoring Program, B.2.1.31A to augment the existing Structures Monitoring Program, B.2.1.31.

Element 5 – Monitoring and Trending of the ASR Monitoring Program states:

NextEra has performed a baseline inspection and ASR associated cracks have been evaluated and categorized. NextEra has assessed 131 accessible areas to date in this manner. The areas affected by ASR have been identified and assessed for apparent degradation from ASR, including estimation of in situ expansion. Monitoring of CI and Individual Crack Width of at least 20 areas identified in the baseline inspection as having the CCI will be performed at six month intervals. Measurement of Cracking Index and Individual Crack Width will be performed in the same areas as the baseline. Trend data from these follow-up inspections will be used in determining the progression of expansion and a basis for any change to the frequency of the inspection.

Issue

It is not clear to the staff why only 20 areas out of the 131 areas with ASR cracks have been selected for baseline inspection. The ASR affected areas are in different structures and ASR degradation may progress at different rates and at different times. It is not clear to the staff how the aging of the structures due to ASR, in the remaining 111 areas, will be managed without any inspection and trending data. There is a potential that some of the remaining 111 areas may degrade at a faster rate than the 20 areas that are selected for baseline inspection. The crack index (CI) and Individual Crack Width need to be monitored in all ASR affected areas to establish a trend over time. In addition, it is not clear how the progression rate will be related to a change in frequency of inspection.

Request

- a. Explain why only 20 areas out of 131 areas associated with ASR cracks have been identified for baseline inspection.
- b. Provide clarification as to how the aging of the structures due to ASR in the remaining 111 areas will be managed without any inspection.
- c. Clarify whether the trend data will be used to decrease the inspection frequency and if so, describe the basis for any change in inspection frequency.
- d. When the total number of affected areas increases, describe if the number of areas being monitored will change and provide the technical justification for this approach.

RAI B.2.1.31-8

Background

In response to follow-up RAI B.2.1.31-1, dated March 30, 2012, with regard to the staff's concern about the extent of degradation/corrosion of rebar and possible reduction of load carrying capacity in steel embedments and anchors in ASR affected areas, the applicant stated the following:

NextEra conducted an operating experience review utilizing a key word search of corrective action documents from August 1998 through May 2010. In addition, during the removal of the "B" Electrical Tunnel core bores, a section of the concrete cover was removed to expose the rebar in the ASR affected area. No instances of rebar corrosion or degradation were identified in either of these reviews. Seabrook will continue to monitor for rebar corrosion through the Structural Monitoring Program."

The applicant also stated that "anchor bolt pull-out testing is being performed at the University of Texas. The results of this testing will provide the basis to manage the effects of aging on anchors and ensure that anchors continue to support the intended functions.

Issue

The applicant in its letter dated May 16, 2012, submitted a plant specific ASR Monitoring Program, B.2.1.31A to augment the existing Structures Monitoring Program, B.2.1.31. However, the plant specific ASR Monitoring Program does not address the inspection and monitoring of rebar that are embedded in the concrete, embeds, or anchors. Considering current degraded condition of the concrete and the continued infiltration of ground water through cracks generated by ASR, there is a higher potential for degradation of the rebar. Lack of corrosion in one rebar that was inspected in 2010 does not guarantee that other rebar will not be corroded in the future due to the continuous ingress of ground water through ASR affected cracks during the period of extended operation that ends in 2050. It is not clear to the staff how the applicant plans to inspect and monitor the rebar, embeds, and anchors for the ASR affected areas.

Request

- a. Discuss any plans to expose additional areas of ASR affected concrete, and describe how these areas will be inspected and monitored for corrosion and loss of bond during the period of extended operation.
- b. Describe how the embeds and anchors in the ASR affected structures will be inspected and monitored during the period of extended operation.

RAI B.2.1.31-9

Background

The applicant in its letter dated May 16, 2012, submitted a plant specific ASR Monitoring Program to augment the existing Structures Monitoring Program, B.2.1.31. GALL Report AMP XI.S6, "Structures Monitoring Program," recommends detection of aging affects for inaccessible, below-grade concrete structural elements when conditions exist in accessible areas that could indicate the presence of degradation.

Issue

The staff reviewed Element 3, "parameters monitored," and Element 4, "detection of aging effects," of the plant specific ASR Monitoring Program and did not find any discussion on how the effects of the ASR will be detected and monitored in the inaccessible structures such as base slabs of buildings, water intake and discharge structures, service water pump house, and below grade walls of the spent fuel pool covered with the liner plate on inside surface.

Request

Describe how inaccessible concrete elements of structures that are affected by ASR will be monitored and inspected during the period of extended operation.

RAI B.2.1.31-10

Background

In response to Follow-up RAI B.2.1.31-1, dated March 30, 2012, the applicant stated that it will develop a long range plan to implement mitigation measures to arrest degradation attributed to ASR. Utilizing the rate of progression of ASR concrete degradation, the applicant will prioritize areas to be remediated. The applicant will develop mitigation techniques to divert groundwater from the below grade structures utilizing industry input on waterproofing technology and insights gained from the new groundwater fate and transport study (the study of groundwater distribution and movement) completed for the Seabrook site. Implementation of the action plan is scheduled to be completed in December 2013.

Issue

The staff reviewed Element 2, "preventive actions" of the plant specific ASR Monitoring Program and noted that the program does not rely on preventive actions. It is not clear to the staff if the applicant is still planning to develop and implement mitigation measures to arrest degradation attributed to ASR as stated in the letter dated March 30, 2012.

Request

Clarify whether or not mitigation measures will be taken to arrest degradation attributed to ASR, and indicate if those mitigation measures will be relied upon to demonstrate that the effects of ASR will be adequately managed, during the period of extended operation.

RAI B.2.1.31-11

Background

By letter dated May 16, 2012, the applicant submitted a plant-specific ASR Monitoring Program. Element 1, "Scope of Program" states the program scope includes concrete structures within the scope of the license renewal Structures Monitoring Program.

Issue

The staff noted that the Containment Enclosure Building (CEB) was not included within the scope of the ASR Monitoring Program. Considering that the CEB has already been confirmed to be affected by ASR through petrographic examination, the staff needs clarification on whether the CEB is considered within the scope of the plant-specific ASR Monitoring Program and whether the scope of the ASR Monitoring Program is limited to those structures within the scope of the Structures Monitoring Program.

Request

- a. Clarify whether the CEB and any building that may become or is susceptible to ASR will be included within the scope of the plant-specific ASR Monitoring Program.
- b. Clarify whether there are structures outside the scope of the Structures Monitoring Program that are within the scope of the plant-specific ASR Monitoring Program.
- c. If structures outside the scope of the Structures Monitoring Program are included in the ASR Monitoring Program, describe how and when newly discovered areas exhibiting visual signs of ASR will be identified.

September 14, 2012

Mr. Kevin Walsh
Site Vice President
NextEra Energy Seabrook, LLC
P.O. Box 300
Seabrook, NH 03874

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE SEABROOK STATION, LICENSE RENEWAL APPLICATION – SET 19

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Sincerely,

/RA/ S. Cuadrado de Jesus for

Patrick Milano, Senior Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
As stated

cc w/encl: Listserv

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DATE	9/11/12	9/12/12	9/12/12	9/14/12

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Letter to Kevin Walsh from Patrick Milano dated September 14, 2012

**SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE
 SEABROOK STATION, LICENSE RENEWAL APPLICATION – 19**

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