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December 12, 2016

Mr. Eric McCartney
Site Vice President
NextEra Energy Seabrook, LLC
P.O. Box 300, Lafayette Road
Seabrook, NH 03874

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE
SEABROOK STATION LICENSE RENEWAL APPLICATION (CAC NO.
ME4028)

Dear Mr. McCartney:

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 Edward Carley, and a mutually agreeable date for the response is within 15 days from the date of this letter. If you have any questions, please contact me at (301) 415-3617 or e-mail Tam.Tran@nrc.gov.

Sincerely,

/RA/

Tam Tran, Project Manager
License Renewal Branch, RPB1
Division of License Renewal
Office of Nuclear Reactor Regulation

50-443

Enclosure:
Requests for Additional Information

cc w/encl: See next page

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 Site Vice President
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Sincerely,

Tam Tran, Project Manager
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Enclosure:
 Requests for Additional Information
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SEABROOK STATION
LICENSE RENEWAL APPLICATION (LRA)
REQUESTS FOR ADDITIONAL INFORMATION (RAI)

RAI B.2.1.31A-A1 (PARAMETERS MONITORED OR INSPECTED)

Background

SRP-LR Section A.1.2.3.3 states that the “Parameters Monitored or Inspected” program element should identify the aging effects that the program manages and should provide a link between the parameter or parameters that will be monitored and how the monitoring of these parameters will ensure adequate aging management. The SRP also states that the parameter monitored or inspected should be capable of detecting the presence and extent of aging effects.

In its August 9, 2016, submittal, the applicant stated under the Section B.2.1.31A “Parameters Monitored or Inspected” program element that “initial screening for ASR [expansion] will be performed using combined cracking index (CCI) only and CCI values exceeding 1 mm/m will trigger additional actions.” The program also states that the large-scale test program conducted at the University of Texas indicated that direction of expansion is not significantly affected by the reinforcement when expansion is at or below 1 mm/m but that “beyond this level, through-thickness expansion dominates.” The staff noted in the “Acceptance Criteria” program element that 1 mm/m is the threshold for “Tier 3” and subject to enhanced ASR monitoring, such as through-wall expansion monitoring using Extensometers. The “Parameters Monitoring or Inspected” program element states that the periodic extensometer measurements of through-thickness expansion is the parameter to be monitored when an ASR location reaches the Tier 3 monitoring criteria.

The August 9, 2016, letter states that CCI is also used to measure the effects of associated rebar strain.

Issue

During its onsite audit the staff reviewed program basis information and reviewed implementation of the ASR Monitoring program to date, including the CCI monitoring at Tier 2 locations and the through-wall extensometer measurements at “Tier 3” locations. The staff noted that the through-wall monitoring acceptance criteria values were based on the large-scale testing program results, and that the tests considered volumetric expansion (i.e. in the horizontal, vertical, and through-wall directions), and not just the through-wall expansion. From the staff’s review of the program, it is not clear to the staff whether the program considers the volumetric expansion, and whether strain in the horizontal and vertical directions is monitored, once a location is placed into the “Tier 3” category. Further, the staff noted that (a) the applicant has completed some of its core testing from Seabrook structure locations for installation of extensometers and (b) there have been variations in crack distribution depending on the location of the core such that in-plane strain may not be “insignificant” compared to out-of-plane expansion, contrary to the applicant’s claim. From its review of the “Acceptance Criteria” program element, the staff noted that acceptance criteria for volumetric expansion did not appear to be included.

In addition, it is not clear how the program explicitly uses CCI to “measure the effects of rebar strain due to ASR expansion” as is stated in the August 9, 2016 submittal.

Request

1. Considering (a) variations in boundary conditions of Seabrook structures compared to large-scale test beams and (b) results of plant-specific information regarding in-plane vs. out-of-plane expansion-to-date of concrete cores taken at Seabrook, state whether additional parameters such as volumetric expansion will be monitored such that ASR expansion effects are captured in their totality; or provide additional information supporting the use of through-wall monitoring as the only monitoring parameter for “Tier 3” ASR locations. If volumetric expansion will be monitored, explain how this will be accomplished.
2. State how the program will use CCI to manage ASR-induced rebar strains and stresses such that they remain within design code limits, by the ASR-induced strains alone and in combination with design basis loads and load combinations, during the period of extended operation.

RAI B.2.1.31A-A2 (DETECTION OF AGING EFFECTS)

Background

SRP-LR Section A.1.2.3.4 states that the “Detection of Aging Effects” program element should describe “when,” “where,” and “how” program data are collected (i.e., all aspects of activities to collect data as part of the program).

Issue

The “Detection of Aging Effects” program element in the revised LRA Section B.2.1.31A of the August 9, 2016, submittal (including “Out-of-Plane Expansion” and “Snap-Ring Borehole Extensometers” sections) does not specify the inspection interval planned for monitoring through-wall expansion using snap-ring borehole extensometers.

Request

Regarding the use of snap-ring borehole extensometers, clarify the methods and frequencies of inspection(s) for “Tier 3” monitoring locations and update the aging management program (AMP) as necessary.

RAI B.2.1.31A-A3 (ACCEPTANCE CRITERIA)

Background

Section B.2.1.31A of the applicant’s updated LRA submittal dated August 9, 2016, states in the Element 6 – Acceptance Criteria section, “[a] structural evaluation is needed when the CCI reaches what is classified as Tier 3 (CCI > 1mm/m).”

Issue

It is not clear to the staff to what the term “structural evaluation” is referring. Specifically, it is not clear whether this statement refers to an analysis in accordance with the deformation program

(B.2.1.31B). Also, it is not clear what evaluation would be performed if the structure is not within the scope of B.2.1.31B and whether all structures within B.2.1.31B receive an analysis regardless of CCI.

Request

State whether the term “structural evaluation” in Section B.2.1.31A refers to an analysis in accordance with the deformation program (B.2.1.31B). State what evaluation would be performed if the structure is not within the scope of B.2.1.31B and whether all structures within B.2.1.31B receive an analysis regardless of CCI. If not, provide technical justification.

RAI B.2.1.31A-A4 (OPERATING EXPERIENCE)

Background:

SRP-LR Section A.1.2.3.10 states that an applicant should commit to a future review of plant-specific and industry operating experience to confirm the effectiveness of its aging management programs or indicate a need to develop new aging management programs.

The applicant’s August 9, 2016, letter states that, with regard to large-scale testing:

- “The results of the test program demonstrated that none of the assessed limit states are reduced by ASR when ASR expansion levels in plant structures are below those evaluated in the large-scale test programs.”
- “Results from the large-scale testing program are also used to support evaluations of structures subjected to deformation.”
- “Data from the structural testing programs have shown that expansion in the in-plane direction plateaus at low expansion levels, while expansion in the through-thickness direction continues to increase.”
- “A correlation relating expansion to reduction in elastic modulus was developed from the large scale testing program data. The correlation relating expansion to reduction in elastic modulus is applicable to reinforced concrete structures at Seabrook.”

The staff noted that the methodology for computing through-wall expansion to-date is described in Report MPR-4153, which was submitted to the staff.

The “Operating Experience” program element states “Seabrook will update the Aging Management Program for any new plant-specific or industry OE”

Issue:

The applicant’s above statements indicate that there is an assumption or hypothesis that the actual structures subject to ASR at Seabrook will behave as observed in the test specimens. Although the test specimens have been created to be as “representative as practical” of Seabrook two-way reinforced concrete walls, the assumption that Seabrook ASR-affected concrete will behave as seen in the test specimens has not been corroborated or validated. The staff has the following concerns:

- The methodology described in MPR 4153 should be corroborated or validated. It is not clear whether the applicant plans to corroborate or validate, over sufficient time and prior

to PEO, such that the behaviors observed due to ASR in the testing specimens and assumed to correlate to Seabrook concrete are consistent.

- The effects of ASR degradation are being addressed as a first-of-a-kind issue in the US nuclear power industry without a widely-accepted or standardized approach to addressing it, and the applicant's AMP is based primarily on the scope and data of one "plant-specific" large-scale test program. It is not clear if and how the program will corroborate or validate assumptions made, once there is data available from implementation of the program to confirm the effectiveness of the ASR Monitoring AMP, to manage aging effects for which it is credited.

Request:

Explain whether and how the ASR Monitoring program will corroborate or validate assumptions (e.g., petrographic characteristics, reduction of elastic modulus at a given expansion, 'plateau' behavior of in-plane expansion, dominant out-of-plane expansion, lack of evidence of in-plane cracking) about how structures at Seabrook would behave under ASR expansion based on observations from the testing program. If the ASR Monitoring program is not expected to corroborate or validate these assumptions, provide the technical basis for these assumptions.

RAI B.2.1.31B-B1 (SCOPE OF PROGRAM)

Background

SRP-LR section A.1.2.3.1 states that the "Scope of Program" program element should include the specific structures and components, the aging of which the program manages. The applicant's August 9, 2016, submittal states "[t]he Seabrook Building Deformation Monitoring Program provides for management of the effect of building deformation on Seismic Category 1 structures and associated components within the scope of license renewal." Also included is a list in Section B.2.1.31A of concrete structures within the scope of the license renewal structures monitoring program that will be monitored by the ASR Monitoring AMP and a list in Section B.2.1.31B of structures that will be managed by the Building Deformation program.

Issue

During its onsite audit, the staff reviewed implementing documentation and a list of structures to be evaluated under the Building Deformation program and found discrepancies between the structures listed on the implementing documentation and the August 9, 2016, submittal. Specifically, the seismic Category 1 Control Building, Diesel Generator Building, and Service Water Access (Inspection) Vault were not captured in the implementing documentation. It is not clear whether those structures are included in implementation of the Building Deformation program.

It is also unclear why the list of structures managed is not consistent between Section B.2.1.31A and Section B.2.1.31B; specifically, why the non-category I structures in the ASR Monitoring Program are not included in the Building Deformation Program.

Request

Confirm whether the seismic Category 1 Control Building, Diesel Generator Building, and Service Water Access (Inspection) Vault are included in the Building Deformation Program. If

they are not included, explain why not. In addition, explain why the non-category I structures in the ASR Monitoring Program are not included in the Building Deformation Program.

RAI B.2.1.31B-B2 (PARAMETERS MONITORED OR INSPECTED, DETECTION OF AGING EFFECTS)

Background

SRP-LR Section A.1.2.3.3 states that the “Parameters Monitored or Inspected” program element should identify the aging effects that the program manages and should provide a link between the parameter or parameters that will be monitored and how the monitoring of these parameters will ensure adequate aging management. The SRP also states that the parameters monitored or inspected should be capable of detecting the presence and extent of aging effects.

SRP-LR Section A.1.2.3.4 “Detection of Aging Effects” states that the program element describes “when,” “where,” and “how” program data are collected. For a condition monitoring program the discussion should provide justification that the [monitoring] method and frequency are adequate to detect aging effects before a loss of structure and component (SC)-intended function.

SRP-LR Section A.1.2.3.6 “Acceptance Criteria” states that the acceptance criteria, against which the need for corrective actions are evaluated, could be specific numerical values, or could consist of a discussion of the process for calculating specific numerical values of conditional acceptance criteria to ensure that the structure- and component-intended function(s) will be maintained under all current licensing basis (CLB) conditions.

The applicant’s Building Deformation AMP in Section B.2.1.31B of its August 9, 2016, submittal “Parameters Monitored or Inspected” program element describes a methodology for identifying parameters to monitor for each in-scope structure. The methodology includes three “stages” of analysis or evaluation, one or more of which will be applied to each structure, that will result in threshold parameters to monitor, each with threshold limits (i.e., monitoring acceptance criteria), and a specified monitoring frequency depending on the “stage” of analysis that was applied to the structure. The applicant stated that “[a] set of monitoring elements (consisting of strain measurements, deformation measurements, seismic gap measurements, and/or other quantifiable behaviors) is established along with threshold limits for each monitoring element.” The building deformation monitoring frequency for structures for each stage are provided in Table 1 of Enclosure 4 of the August 9, 2016, submittal. The “acceptance criteria” program element states that a systematic approach to evaluation [Stage 1, 2, or 3 process] of structures impacted by ASR expansion and building deformation is utilized to evaluate ASR and CLB load combinations to validate compliance with structural design code requirements.

Issue

During its onsite audit, the staff reviewed implementing documentation for the Building Deformation monitoring program and interviewed cognizant staff. The staff noted that the program does not have one set of parameters monitored or acceptance criteria, but that the applicant establishes a set of parameters to monitor and acceptance criteria for each structure. The staff also noted that the baseline structural evaluations to establish the criteria for each structure’s individual building deformation monitoring were not complete for all structures in the

scope of the program, and therefore the applicant could not provide the parameters monitored and monitoring method(s) for all of the structures that are in scope of license renewal (i.e., that have license renewal intended functions). The staff was also not provided comprehensive documentation of the process for performing the evaluations, including, but not limited to: (a) a detailed list of the possible monitoring parameters and monitoring method(s) for those parameters; (b) the process for determining what stage of analysis will be used for a given structure; (c) the process for determining that another analysis (different stage) is necessary; and (d) the process for selecting what parameters will be monitored and their monitoring method(s).

The section titled “Stage Two: Analytical Evaluation” states that “additional inspections are performed to measure structural strains and deformations at a broader range of critical locations of the structure.” It is not clear to the staff whether (a) there is a procedure for performing the additional inspections, including location and number of additional inspections or (b) a repeatable process for determining when adequate information has been gathered.

Without either the list of parameters monitored for each structure or comprehensive understanding of the procedures and methodology for determining the parameters to be monitored and their monitoring method(s) such that it is clear that the process is repeatable, the staff is not able to verify that the “parameters monitored or inspected” and “detection of aging effects” program elements are adequate in accordance with the SRP-LR.

Request

Provide, for each structure, a list of parameters monitored and their monitoring method(s), or provide a comprehensive discussion of the processes and procedures for determining the parameters to monitor and monitoring method(s) for structures within the scope of the Building Deformation Program in a manner that would demonstrate repeatability of the process. As a minimum, the discussion of the process should address the items listed in the “Issue” section above.

RAI 3.5-A1 (AGING MANAGEMENT REVIEW)

Background

10 CFR 54.21(a)(3) states that for each structure and component (SC) subject to an aging management review (AMR) as identified in an applicant’s integrated plant assessment, the applicant must demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The applicant’s letter dated August 9, 2016, states in the “Scope of Program” program element that the Building Deformation aging management program “provides for management of the effect of building deformation on Seismic Category 1 structures and associated components within the scope of license renewal. Program scope includes components within the scope of license renewal contained in concrete structures within the scope of the Structures Monitoring Program.”

Issue

The applicant's August 9, 2016, submittal does not include Table 2 AMR line items for SCs that may be subject to aging effects of building deformation, including supported SCs. Since building deformation (i.e., global manifestations of ASR expansion) is being managed by the Building Deformation program, it is not clear whether the applicant evaluated the need to revise the AMR tables associated with the affected SCs and identify whether building deformation would result in aging effects not previously considered in the license renewal application (LRA). In addition, it is not clear if the other program(s) that manage any affected components employ the methods and frequency of inspection to bound those of the Building Deformation program to ensure adequate aging management for affected components.

Request

Provide the results of any evaluation in accordance with the requirements of 10 CFR 54.21(a) that demonstrates that for all SCs affected by building deformation caused by ASR expansion, that either (a) the Building Deformation program will specifically inspect and manage for the effects of building deformation; (b) building deformation will not result in behavior of supported SCs that was not previously considered; or (c) the other AMPs that manage aging of the SCs are adequate to ensure that the effects of building deformation do not affect the SCs from performing their intended functions.

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