

**Tran, Tam**

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**From:** Tran, Tam  
**Sent:** Wednesday, March 29, 2017 3:14 PM  
**To:** 'Edward.Carley@nexteraenergy.com'  
**Cc:** James, Lois; Chazell, Russell; Morey, Dennis; Allik, Brian; Edmonds, Yvonne; Poole, Justin; McIntyre, David; Weil, Jenny; Dacus, Eugene; Harris, Brian; Ghosh, Anita; Wachutka, Jeremy; Gray, Mel; Bower, Fred; Cataldo, Paul; Meier, Peter; Vadella, Robert; Tiff, Doug; Sheehan, Neil; Screnci, Diane; Browne, Kenneth  
**Subject:** ASR RAI February 27, 2017  
**Attachments:** SBK RAI ASRMP BDMP Buford Lehman Thomas Wittick 2-21-17.pdf

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

**SUBJECT: REQUEST 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.

This request for additional information was discussed with Mr. Edward Carley, and a mutually agreeable date for the response is no later than June 14, 2017, except for RAI B.2.1.31B-B2-1. For RAI B.2.1.31B-B2-1, by June 14, 2017, NextEra will provide NRC with a response date. 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  
Project Branch 1  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket No.: 50-443  
Enclosure:  
Request for Additional Information  
cc w/encl: See next page

ADAMS Accession No.: ML17088a614

(\*) concurred by e-mail

OFFICE	PM:RPB1:DLR	BC:RARB:DLR	BC:RPB1:DLR	PM:RPB1:DLR
NAME	T Tran*	B. Wittick*	R. Chazell*	T Tran
DATE	02/27/2017	03/23/2017	03/23/2017	03/29/2017

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SEABROOK STATION  
LICENSE RENEWAL APPLICATION (LRA)  
REQUEST FOR ADDITIONAL INFORMATION (RAI)

**RAI B.2.1.31A-A1-1 – ASRMP: Consideration of In-plane and Through-Thickness Expansion in Acceptance Criteria for Effect on Structural Limit States**

Background:

In RAI B.2.1.31A-A1, the staff discussed concerns that the Alkali-Silica Reaction (ASR) Monitoring Program (ASRMP) was monitoring strain (cracking, expansion) in the in-plane and out-of-plane directions separately, using the basis that in-plane cracking (CCI) plateaus at a certain expansion, and then through-wall expansion continues, and therefore the program would use only the through-wall expansion measurement as the monitoring parameter for Tier 3 locations (CCI greater than 1 mm/m). In its December 23, 2016, response to RAI B.2.1.31A-A1 the applicant clarified that as part of routine expansion monitoring as detailed in the “detection of aging effects” program element of the ASRMP, it will monitor, on a 6-month interval, both in-plane (via CCI monitoring) and through-thickness expansion (using snap-ring borehole extensometers) of all Tier 3 locations. The applicant also revised the “acceptance criteria” program element and the updated final Safety Analysis Report (UFSAR) Supplement for the ASRMP to state the above and revised the Table titled “Effect of ASR on Structural Limit States” to indicate that the expansion limit criteria for flexure/reinforcement anchorage and shear is for through-thickness expansion. The “parameters monitored or inspected” program element states the following with regards to effects on structural capacity for flexure/reinforcement anchorage and shear:

Based on the MPR/FSEL [University of Texas] large-scale test program results, structural evaluations should consider that there has been no adverse impact on flexure capacity and reinforcement anchorage (development) length performance [and shear capacity], *provided that through-thickness expansion is at or below bounding conditions of the large-scale testing and expansion behavior is comparable to the test specimens* [emphasis added].

Also, the “monitoring and trending” program element states “[f]or anchor capacity, shear capacity, and reinforcement anchorage, use in-plane expansion (CCI) and out-of-plane expansion (modulus + SRBE measurements) to compare with the test results from the Large Scale Testing Program.”

The applicant’s December 23, 2016, response to RAI B.2.1.31A-A1 also stated that in-plane and through-thickness measurements will be used to determine volumetric expansion. The applicant also stated that a small number of Tier 3 locations at Seabrook exhibit in-plane expansion that exceeds the plateau in-plane expansion observed in the large-scale testing program, and to account for this difference, the applicant will monitor volumetric expansion and confirm that ASR expansion is within the volumetric expansion criterion determined from the test programs.

Issue:

The staff determined that it is reasonable for the applicant to assess the quantitative expansion parameters monitored (i.e., CCI, through-thickness) for impact on structural capacity in flexure/reinforcement anchorage and shear as indicated above in the “parameters monitored or

inspected” and “monitoring and trending” program elements, provided that (1) through-thickness expansion is at or below bounding conditions of the large-scale testing and (2) expansion (including in-plane expansion) is comparable to that observed in the test specimens. However, the “acceptance criteria” program element of ASRMP, which addresses the effect of ASR on structural limit states in the Table titled “Effect of ASR on Structural Limit States” on Page 21 of Enclosure 3, only includes the criteria for through-thickness expansion for flexure/reinforcement anchorage, and shear, and does not provide acceptance criteria to assess measured in-plane expansion (CCI) compared to the large-scale testing. Further, for cases in which in-plane expansion measured on Seabrook structures exceeds the “plateau” levels seen in the testing, there is no technical basis for the applicant’s stated volumetric expansion criterion to support the conclusion that the large-scale testing results can be considered bounding (with regard to impact on structural limit states) because the proposed comparison of volumetric expansion of testing specimens versus Seabrook structures does not consider the directionality effects of expansion and cracking on structural limit states.

Request:

Clarify how the “acceptance criteria” program element of the ASRMP incorporates consideration of measured in-plane expansion during each monitoring interval, in addition to the measured through-thickness expansion, in the criteria for assessing effect on structural capacity in flexure and reinforcement anchorage and shear to ensure that expansion in all directions is also bounded or comparable to that observed in the large-scale test specimens that forms the basis. Update applicable program elements and UFSAR supplement accordingly.

## **RAI B.2.1.31A-A4-2 – ASRMP: Corroboration of Modulus – Expansion Correlation from FSEL Testing**

### Background:

The proposed ASR Monitoring Program states that Seabrook will install extensometers in Tier 3 (CCI > 1 mm/m) and other selected locations to measure expansion in the through-thickness direction. The LRA states that this approach will enable measuring expansion for a given concrete structural member from the time the extensometer is installed and going forward. To calculate total expansion, the applicant stated that it will determine expansion from original construction until the time the extensometers are installed using a correlation developed from the large-scale testing program. The methodology is described in Report MPR 4153, which was submitted to the NRC, and uses a normalized reduction in modulus of elasticity to calculate through-thickness expansion-to-date for Seabrook structures.

In the December 23, 2016, response to RAI B.2.1.31A-A4, the “operating experience” program element of the revised ASR Monitoring Program was revised to state that the applicant will corroborate the correlation of normalized modulus versus through-thickness expansion derived from the MPR/FSEL testing against Seabrook plant data at least 2 years prior to the period of extended operation (PEO) by comparing expansion determined from elastic modulus testing of core bores and extensometer readings from three Tier 3 Seabrook monitoring locations.

### Issue:

While the staff agrees that the methodology used to correlate the MPR/FSEL-derived modulus of elasticity to through-wall expansion should be corroborated, the staff is concerned about the adequacy of using cores at three locations at only one point in time to provide a meaningful validation of a correlation curve that is a function of expansion over time versus normalized reduced modulus of elasticity. In addition, despite the applicant’s claim that literature data [also from laboratory testing] follow a trend consistent with the FSEL test data, the use of this methodology is first-of-a-kind for estimating through-wall ASR expansion to-date for in situ structures, and it may need to be validated in the field for higher levels of expansion by re-evaluating the methodology during the PEO. Also, it is not clear (1) what criteria will be used to determine whether the data correlates and (2) how locations will be selected such that the measurements adequately bound the population of Tier 3 locations.

### Request:

1. Provide technical basis for the adequacy of taking only three measurements at Seabrook at a single point in time to corroborate the correlating curve derived from large-scale test specimens. In addition, discuss how locations will be selected such that the measurements adequately bound the population of Tier 3 locations.
2. Considering the need to validate that the curve applies to ASR expansion over time, state whether the corroboration activity of the modulus-expansion correlation will re-occur during the period of extended operation. Provide a technical basis for the number of times the corroboration activity will be performed that would demonstrate validity for the period of extended operation.
3. State how the evaluation will determine whether the data taken for Seabrook structures correlates to the curve derived from large-scale test specimens.

## **RAI B.2.1.31B-B2-1 – “Parameters Monitored or Inspected” for Building Deformation Monitoring Program**

### Background:

During its onsite audit October 25-27, 2016, the staff reviewed implementing documentation for the Building Deformation Monitoring Program and interviewed cognizant Seabrook personnel and contractors. 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 threshold parameters to monitor and corresponding acceptance criteria (threshold parameter limits) for each structure using a proposed 3-stage evaluation process. 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 methods for all structures. Therefore, by RAI B.2.1.31B-B2 dated December 12, 2016, the staff requested that the applicant either (1) provide a list of parameters for each structure when the evaluations are complete; or (2) provide a comprehensive discussion of the processes and procedures for determining the parameters to monitor and monitoring methods for structures in the scope of the program in a manner that would demonstrate repeatability of the process.

By letter dated December 23, 2016, the applicant responded to RAI B.2.1.31B-B2 and provided an overview of its evaluation process, a list of field observations and measurements for deformation evaluations to determine potential threshold parameters to monitor, and examples of the types of decisions that are made during the evaluation. The applicant also supplemented Commitment 91 by stating it will “[d]evelop a design standard to implement Aging Management Program B.2.1.31B Building Deformation, Program Element 3 – Parameters Monitored/Inspected. The design standard will clarify the deformation evaluation process and provide an auditable format to assess it. The design standard will include steps for each of the three evaluation states that include parameters monitored, basis for why the parameter is monitored, and conditions that prompt action for the subsequent step.”

The “Parameters Monitored or Inspected” program element on pages 40-42 of Enclosure 3 of the December 23, 2016, submittal includes statements such as “[i]t should be noted that the values in the table are presented in the table as an *example and are not intended to be applicable to actual locations* [emphasis added],” and incomplete references in the Table appear to indicate that the evaluation process (including threshold parameters, monitoring methods and acceptance criteria) may not have been completed for any structure.

10 CFR 54.13(a) requires that information provided to the Commission by an applicant for a renewed license or by the Commission’s regulations must be complete and accurate in all material respects. 10 CFR 54.21(a)(3) requires, for each structure and component subject to aging management review (AMR), the applicant demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. The staff’s guidance for generic aging management review is provided in Branch Technical Position for Aging Management Program Elements (Section A.1.2.3 of the [standard review plan] SRP-LR, Revision 2).

### Issue:

The staff determined that the response and description of the evaluation process that leads to parameters monitored and acceptance criteria was a general overview on how NextEra may perform an evaluation and lacked specificity on how engineering decisions are made that lead to development of parameters monitored or acceptance criteria. The staff needs to review specifics of the evaluation process that clearly demonstrate that it is repeatable and consistent between structures. It appears that the design standard referenced in Commitment 91 may provide those details, but the applicant's implementation deadline for this Commitment is March 15, 2020, which implies this will be completed in the future.

At this time, the staff is unable to complete its review of the section B.2.1.31B, "parameters monitored or inspected" and related "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements and make a safety determination given that, contrary to the regulations in 10 CFR 54.13(a) and 54.21(a)(3) and the Branch Technical Position for Aging Management Program (AMP) elements in SRP-LR, aspects of program elements of the Building Deformation Monitoring Program AMP that are important to a safety determination of adequate aging management are incomplete and are currently in development.

Request:

For each structure in the scope of the Building Deformation Monitoring Program, provide the [threshold] parameters monitored, demonstrate capability of these parameters for detecting the presence and extent of aging effects, and establish the link between the parameter(s) monitored and how monitoring of these parameters will ensure adequate aging management.

Update the applicable and inter-related program elements of the AMP, FSAR supplement, and/or other aspects of the license renewal application (LRA), as applicable, consistent with the response above.

## **RAI 3.5-A1-1: AMR**

### 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.

LRA Section B.2.1.31B (letter dated August 9, 2016, and amended by letter dated December 23, 2016) states in the "Scope of Program" program element that the 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. Program scope includes components within the scope of license renewal contained in concrete structures within the scope of the Structures Monitoring Program." In RAI 3.5-A1, the staff noted that the applicant's submittal did not include Table 2 AMR line items for SCs that may be subject to aging effects of building deformation, including supported SCs. The staff requested that the applicant provide the results of their aging management review for structures and components that are affected by structures in the scope of the Building Deformation Monitoring program in accordance with 10 CFR 54.21(a).

### Issue:

In its December 23, 2016, response to RAI 3.5-A1, the applicant stated that "baseline inspection of buildings susceptible to Building Deformation has identified various categories of equipment affected by deformation as listed in Element 3 – Parameters Monitored/Inspected" but did not include any Table 2 line items for BDMP. To be consistent with regulation for aging management review (AMR) in 10 CFR 54.21(a)(3) and license renewal guidance found in [Nuclear Energy Institute] NEI 95-10, NUREG-1800 and NUREG-1801, the applicant should indicate AMR Table 2 line items and any associated Table 1 line items (e.g., one for concrete components, others for components and commodities affected by ASR Building Deformation) that call out the appropriate program(s) (e.g., [building deformation monitoring program] BDMP, [ASR monitoring program] ASRMP, [structure monitoring program] SMP) for managing aging effects of building deformation due to ASR.

### Request:

Provide AMR results that identify the structures and components, materials and environments that will be affected by building deformation and indicate the applicable aging management program, in accordance with 10 CFR 54.21(a).