UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION I
475 Allendale Road
King of Prussia, PA 19405

May XX, 2011 TIA Draft Seabrook ASR

MEMORANDUM TO: John Jolicoeur, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

FROM: Peter Wilson, Deputy Director /RA/
Division of Reactor Safety

SUBJECT: REQUEST FOR TECHNICAL ASSISTANCE
SEABROOK STATION ALKALI-SILICA REACTION

Region I requests technical assistance from the Office of Nuclear Reactor Regulation (NRR) to determine how the recently ~~newly~~ discovered aging affect of alkali-silica reaction, for safety related concrete structures at Seabrook Station, should be treated in the context of the current design and licensing basis in accordance with 10 CFR 50 requirements. This issue is closely related to the development of an aging management program for the applicable structures in light of the alkali-silica reaction issue since NextEra is using similar tests and obtaining concrete parameters in order to show operability and that the aging effect can be reasonably managed as a part of their license renewal application – we foresee considerable interface between the Divisions of Engineering and License Renewal.

Background

As a result of NextEra's assessment to support renewal of their license per Part 54, the applicant/licensee analyzed concrete core samples from exterior walls of the Control Building. In August 2010 the tests resulted in a report of a change in material properties. The analysis revealed moderate-to-severe alkali-silica-reaction ~~(ASR)~~, in chronically wetted areas of the foundation, with reductions reported in the concrete compressive strength and modulus of elasticity. These reductions demonstrated the possibility that the Control Building may not have met its design basis function, and therefore, required further evaluation. The Control Building was subsequently found to be within the design limits defined by the current licensing basis (with reduced margins) by an operability determination. The licensee continues to evaluate the extent of these conditions for other structures subject to the alkali-silica~~ASR~~ problem.

We have been coordinating information on the issue with a number of NRR divisions since January 2011 in light of the uniqueness of the problem. It appears that the appearance of ASR is a first-of-a-kind for the nuclear industry in the United States. It apparently is due in part to poor construction and concrete testing practices. C~~Further and c~~urrently, it took some time for the licensee to uncover the problem due to inadequate maintenance rule monitoring per 10 CFR 50.65 a(1). An NRC identified non-cited violation of very low safety significance (Green) was ~~is being~~ issued ~~this month~~ by the Division of Reactor Projects. Applicant/licensee testing to date has not shown any reliable test results being outside design specifications for the seismic

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category I safety related structures (control building and containment enclosure building thus far).

–NextEra's next actions are in order to develop the aging management review to support the license renewal process. The process is summarily described in their letter of April 14, 2011, specifically in response to request for additional information (RAI) No. B.2.1.31-1 pp 4-7 (ml 11008A131). Those actions also describe ~~kick-out~~ points for which there will be an analysis for impact on the current licensing basis, e.g., final operability determination based on the extent of conditions review in June 2011. ~~Because of the newness of this ASR problem and since the UFSAR is not clear on the design and licensing basis for all the safety related structures at the site,~~ Tthe Region I staff has a number of questions for which Headquarters assistance is needed in the review of operability determinations being conducted by NextEra for the following reasons: 1) The recently discovered problem indicates that the UFSAR assumes that the alkali-silica reaction is prevented during new construction which appears to be no longer true; 2) in light the problem, it is not clear what the design and licensing basis for all the safety related structures at the site – typical assumptions on the relationship between compressive strength or modulus of elasticity to shear force may no longer be valid, tensile strength may be a better indicator of shear force; and, 3) preliminary analysis by NextEra appear to be focus on local effect at the foundations whereas as global or bulk analysis of building loads and seismic response may be needed.~~.~~ In light of license renewal, technical information needs to be coordinated between the Divisions of Engineering and the Division of License Renewal to ensure that NextEra adequately assesses the impact of this problem~~ASR~~ on all seismic category I safety related structures, properly does operability reviews at key points in the process, adequately determines short term (Part 50) ~~corrective~~ actions vs. longer term (part 54) ~~monitoring~~ actions.

There is also an issue with the effect of spent fuel pool leakage on the concrete structure of the fuel handling building. Concrete core sampling is planned for that building also. See response to the RAI B.2.1,31-4 in NextEra's letter of April 14, 2011, pp 8-9 (ml 11008A131).

Licensee Position

NextEra has conducted a number of evaluations associated with this problem. Their actions are centered around taking core samples of the concrete and conducting various tests on those samples. The primary actions to date are:

1. Preliminary Prompt Operability Determination for the Control Building based on compressive strength and modulus of elasticity testing. Petrographic examination was also conducted confirming the presence of ASR in the core samples.

2. Design Change No. EC-272057, Concrete Modulus of Elasticity for the Control Building Electrical Tunnel and the Containment Enclosure Building, referring to AR Nos. 581434 and AR 1644074 which accepts the reduction in the modulus of elasticity in light of concrete core testing using a 10 CFR 50.59 screening process.

It should be noted that no tensile strength testing is being performed on the concrete core samples. DE representatives raised this question along with a number of other questions with the licensee in conference call of April 27, 2011 between NextEra and Region I/NRR staffs.

While NextEra's testing to date has not shown any reliable test results being outside design specifications for the seismic category I safety related structures (control building and containment enclosure building), the answer to more detailed design questions should be addressed as the licensee does its extent of condition review in order to support a functionalilityity or operability determination with respect to Part 50 requirements.

Requested ~~commended~~ Actions:

For each of the documents reviewed listed below or the near future as further analysis occurs for license renwal (Engineering Evaluation scheduled for March 2012) associated with ~~s~~safety related seismic category I structure, Region I needs the assistance of NRR/DE in order to evaluate and determine the adequacy of the licensee's ~~plans and~~ analysis results in accordance with the current licensing basis~~, standard review plan, national standard or other agency expectation~~ for this unique problem. A branch technical position may be warranted. Focus areas ~~Minimum areas~~ to be covered are as follows:

1. Adequacy of concrete core sampling and ~~representativeness o~~the statisitical validity of the concrete core samples~~. in term of a local or bulk problem.~~

2. Test parameters measured in addition to compressive strength and modulus of elasticity such a tensile strength.

3. Assess the effect of ~~Need for~~ the alkali-silica reaction ~~ASR reaction~~ rates and current status of that effect ~~rate~~ in terms of exceeding design limits for the life of the 40 year license.

4. Special information from petrographic analysis of the core samples in order to support a safety review of this matter.

5. Analysis results for building desing loads including ~~deadweight, wind or~~ seismic results, including the adequacy of the local vs. ~~etc. (local vs.~~ bulk or global analysis~~)~~.

6. Review the adequacy of the licensee's assessment of the fuel handling building as a result of spent fuel pool leakage and adequacy of their plans for core bore sampling no later than December 31, 2015.

The information found in each of these review needs to be shared also with the Division of License Renewal as they oversee the applicant's conduct of the aging management review for its structures monitoring program.

Follow-up questions related to the above review should also be addressed as needed.

Summary

Region I requests NRR to address the above noted areas in a memorandum as each key document is produced by NextEra:

1. Confirmatory review for adequacy of the initial prompt operability review for the control building reviewed by Region I. ~~in the fall of 2010.~~
2. ~~Review of the Design Change Package No. EC – 272057, 50.59 screening on the reduction of the modulus of elasticity for the control building and the containment enclosure building (currently under review)~~
3. ~~2.~~ Final Operability Determination when issued on or about ~~in~~ June 30, 2011.
4. ~~3.~~ Oerability Determinations surrounding the Engineering Evaluation scheduled on or about ~~for~~ March 2012.
5. ~~Update on Structures Monitoring Program as a result of the Engineering Evaluation noted in item 3 above.~~
6. ~~Review the long range plan to arrest ASR degradation before December 2013.~~
7. ~~4.~~ Results of core sampling for the Fuel Handling Building shortly after December 2015.

Coordination

This request was discussed between Richard Conte (RI/DRS/EB1) and Meena Khanna (NRR/DE/EMCB) during a various conference calls on the subject of ASR at Seabrook. The TIA was accepted with an agreed upon response date within **XX** days after receipt. The Region also understands that final response to this TIA will be made public.

References

http://portal.nrc.gov/edo/ri/EB1/Shared%20Documents/Forms/AllItems.aspx

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Docket No. 50-443

SUNSI Review Completed: ADAMS: Yes No Initials: T=Telephone E=E-mail F=Fax

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