

Group H

FOIA/PA NO: 2013-0332

**RECORDS BEING RELEASED IN THEIR ENTIRETY**



March 20, 2013

APPLICANT: NextEra Energy Seabrook, LLC

FACILITY: Seabrook Station

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON MARCH 13, 2013, BETWEEN THE OFFICE OF NUCLEAR REACTOR REGULATION, OFFICE OF NUCLEAR REGULATORY RESEARCH, AND REGION I CONCERNING THE LICENSING APPROACH PERTAINING TO THE SEABROOK STATION, UNIT 1 ALKALI SILICA REACTION CONFIRMATORY ACTION LETTER

The Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Regulatory Research (RES), and Region I held a telephone conference call on March 13, 2013, to discuss the licensing approach concerning the Seabrook Station, Unit 1 (Seabrook) alkali silica reaction (ASR) confirmatory action letter (CAL).

In August 2010, Seabrook reported the presence of ASR degradation of concrete in below-grade walls of several Category 1 structures with groundwater intrusion. Seabrook is the first plant to report ASR in the U.S. nuclear industry. The NRC staff's review of this issue, to date, has determined that there are no immediate safety concerns due, in part, to existing safety margins, the localized nature of the ASR, and ongoing crack monitoring. On May 16, 2012 (Agencywide Documents Access and Management System Accession Number ML12125A172), the NRC staff issued a CAL to the plant's owner, NextEra, confirming regulatory commitments made by the company to address ASR at the plant as a result of a management meeting with NRC staff on April 23, 2012.

Enclosure 1 provides a listing of the participants and Enclosure 2 contains the licensing approach recommended by NRR.

*/ra/*

John G. Lamb, Senior Project Manager  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosures:

1. List of Participants
2. Recommended Licensing Approach

41 0

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OFFICE	LPL1-2/PM	LPL1-2/LA	LPL1-2/BC	LPL1-2/PM
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DATE	03/ 20 /13	03/ 20 /13	03/ 20 /13	03/ 20 /13

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**TELEPHONE CONFERENCE CALL**

**SEABROOK STATION, UNIT 1**

**ALKALI SILICA REACTION WORKING GROUP**

**LIST OF PARTICIPANTS**

**March 13, 2013**

<b><u>PARTICIPANTS</u></b>	<b><u>AFFILIATIONS</u></b>
Jim Trapp	Region I
Rich Conte	Region I
Bill Raymond	Region I
Suresh Chadhaury	Region I
Meena Khanna	NRR
Michael Marshall	NRR
Tony McMurtray	NRR
Tim Kobetz	NRR
Kamal Manoly	NRR
George Thomas	NRR
Bill Ott	RES
Rosemary Hogan	RES

**TELEPHONE CONFERENCE CALL**

**SEABROOK STATION, UNIT 1**

**ALKALI SILICA REACTION WORKING GROUP**

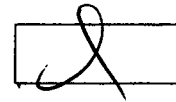
In August 2010, Seabrook Station, Unit 1 (Seabrook) reported the presence of alkali silica reaction (ASR) degradation of concrete in below-grade walls of several Category 1 structures with groundwater intrusion. Seabrook is the first plant to report ASR in the U.S. nuclear industry. The U.S. Nuclear Regulatory Commission (NRC) staff's review of this issue, to date, has determined that there are no immediate safety concerns due, in part, to existing safety margins, the localized nature of the ASR, and ongoing crack monitoring. On May 16, 2012 (Agencywide Documents Access and Management System Accession Number ML12125A172), the NRC staff issued a Confirmatory Action Letter (CAL) to the plant's owner, NextEra, confirming regulatory commitments made by the company to address ASR at Seabrook as a result of a management meeting with NRC staff on April 23, 2012.

Below is the licensing approach recommended by NRR concerning the CAL that was presented at the conference call held on March 13, 2013.

**Seabrook ASR – Regulatory Process Overview and Approach**

1. The licensee has performed an operability determination and is currently tracking this issue as a degraded or nonconforming condition in accordance with their corrective action program. The U.S. Nuclear Regulatory Commission (NRC) staff's review of alkali-silica reaction (ASR) issue, to date, has determined that there are no immediate safety concerns due, in part, to existing safety margins, the localized nature of the ASR, and ongoing crack monitoring. In Inspection Report, dated December 3, 2012, "The NRC determined that NextEra's methods for assessing operability of ASR-affected reinforced concrete structures were reasonable and generally comprehensive. NextEra conducted a margins analysis, using bounding ASR-affected concrete properties derived from research data, to demonstrate that Seabrook structures remained operable. The [NRC] team concluded this margins assessment provided a reasonable operability basis and noted that further testing and engineering analyses are planned by NextEra to address this reinforced concrete structures non-conforming condition. The testing and additional analyses are expected to be completed by mid-2014."
2. Seabrook submitted evaluation/analysis in accordance with the Confirmatory Action Letter (CAL) on May 25, 2012.
  - 2.1. Evaluation of impact of ASR on Seabrook constitutes an analysis performed at NRC request.
  - 2.2. 10 CFR 50.71(e) requires the Final Safety Analysis Report (FSAR) to be updated with "...all analyses of new safety issues performed by or on behalf of the applicant or licensee at Commission request."

- 2.3. The FSAR update must, "... assure that the information included in the report contains the latest information developed. This submittal shall contain all the changes necessary to reflect information and analyses submitted to the Commission by the ... licensee ..."
3. Therefore, NextEra is required to incorporate this information into the FSAR in accordance with 10 CFR 50.71(e)(4).
  - 3.1. Based on the submittal dated May 25, 2012, this FSAR update must be submitted no later than November 17, 2013. Licensee is working on update and plans to submit in May 2013.
  - 3.2. The change to the FSAR must be evaluated in accordance with 10 CFR 50.59 to determine if NRC approval is required prior to incorporation into the FSAR update.
4. The 10 CFR 50.59 evaluation of the FSAR update may trigger a request for amendment pursuant to 10 CFR 50.90. This evaluation is made by the licensee and is subject to NRC review and /or inspection.
  - 4.1. Amendment process provides a strong regulatory framework to document NRC staff review of the licensee evaluation/analysis of ASR.
  - 4.2. Amendment process provides a structured opportunity for public involvement.
  - 4.3. An amendment could be structured to provide license conditions that track future milestones toward permanent resolution of the issue.
5. Licensee final disposition of the degraded/nonconforming condition will likely require additional changes to the facility as described in the FSAR after the large scale testing is completed in mid-2014. Once again, the licensee needs to perform a 10 CFR 50.59 evaluation and determine if an amendment request is needed pursuant to 10 CFR 50.90.



**Advisory Committee on Reactor Safeguards (ACRS)  
License Renewal Subcommittee  
Seabrook Station, Unit 1 (Seabrook)**

**Safety Evaluation Report (SER)  
with Open Items**

July 10, 2012

Arthur Cunanan, Project Manager  
Office of Nuclear Reactor Regulation

1

Good morning Chairman and members of the ACRS staff.

My name is Arthur Cunanan. I'm the project manager for the Seabrook Station license renewal application.

I am here to discuss the staff's review of the Seabrook license renewal application as documented in the Safety Evaluation Report.

Brian has made introductions of NRC staff at the table,

Also seated in the audience are members of the technical staff who participated in the review of the license renewal application or were at the audits conducted at the plant.

Mike Modes will be available on the phone line throughout this presentation and will be presenting the results of the license renewal inspection.

I would like to note that this presentation is not similar to other presentations that you have seen recently related to license renewal. We will be presenting a different conclusion because the open item related to alkali-silica reaction on concrete structures is a significant issue that may take a long time to resolved. Seabrook has had 4 schedule changes. The schedule change were not all related to ASR, some were related to the environmental review, however, if issues do come up, the staff will not hesitate to delay the schedule in order to address the issues. Based on the original schedule, Seabrook is delayed 10 months.

The Safety Evaluation Report has 7 open items. Most of the open items have responses that the staff are reviewing. We will quickly go over these open items and focus our attention on the structures monitoring program open item which relates to the alkali-silica reaction of concrete. This discussion will occur towards the end of the presentation. For the ASR open item, we will focus even further to the issues related to license renewal. However, if you do have questions related to Part 50, Rich Conte, a branch chief from Region 1, is present to answer your questions.

[Next slide]

#2



## Presentation Outline

- Overview of Seabrook license renewal review
- SER Section 2, Scoping and Screening review
- Region I License Renewal Inspection review
- SER Section 3, Aging Management Programs and Aging Management Review Results
- SER Section 4, Time-Limited Aging Analyses (TLAAs)

2

Here is an Outline of today's presentation [next slide]





## Overview

- License Renewal Application (LRA) submitted May 25, 2010
  - Applicant: NextEra Energy Seabrook, LLC (NextEra)
  - Facility Operating License No. NPF-86 requested renewal for a period of 20 years beyond the current license date of May 15, 2030
- Approximately 15 miles south of Portsmouth, NH
- Westinghouse 4-Loop PWR

3

This is an overview of Seabrook Station

The applicant has covered most of the points presented in this slide

[next slide]

Seabrook is a PWR 4-loop design with its original steam generators



## Audits and Inspections

- Scoping and Screening Methodology Audit
  - September 20-23, 2010
- Aging Management Program (AMP) Audits
  - October 12-15, 2010
  - October 18-22, 2010
- Region I Inspection (Scoping and Screening & AMPs)
  - March 7, 2010 – April 8, 2011

4

The staff conducted audits and inspections for the LRA during the periods shown on this slide.

In addition, Region I conducted its License Renewal inspection on March 7 through April 8 of 2011.

Those inspection results will be presented shortly.

[next slide]

## Overview (SER)

- Safety Evaluation Report (SER) with Open Items issued June 8, 2012
- SER contains 7 Open Items (OI):
  - Bolting Integrity Program
  - ASME Code Section XI, Subsection IWE Program
  - Steam Generator Tube Integrity Program
  - Operating Experience
  - Treated Borated Water
  - Pressure-Temperature Limit
  - Structures Monitoring Program

5

In preparing the Safety Evaluation Report and in addition to the audits and inspections already mentioned, the staff conducted in-depth technical reviews and issued over 219 Requests for Additional Information

As mentioned before, the Safety Evaluation Report has 7 open items. We will quickly go over these open items and focus our attention on the structures monitoring program open item which relates to the alkali-silica reaction of concrete. This discussion will occur towards the end of the presentation.

[next slide]



## SER Section 2 Summary

### **Structures and Components Subject to Aging Management Review**

- Section 2.1, Scoping and Screening Methodology
  - Methodology is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21
- Section 2.2, Plant-Level Scoping Results
  - Systems and structures within the scope of license renewal are appropriately identified in accordance with 10 CFR 54.4
- Sections 2.3, 2.4, 2.5 Scoping and Screening Results
  - SSCs within the scope of license renewal are appropriately identified in accordance with 10 CFR 54.4(a), and those subject to an AMR in accordance with 10 CFR 54.21(a)(1)

6

Section 2 of the SER describes the Structures and Components subject to Aging Management Review.

If there are no questions on this slide, I will now turn the presentation over to Mike Modes, the Region I lead inspector, who will discuss the license renewal inspection review.



## **License Renewal Inspections**

**Michael Modes**

Region I Inspection Team Leader

### Overview

- Four inspectors for 2 weeks plus two inspectors for 1 week for the Alkali-Silica Reaction (ASR) Issue
- 10 CFR 50.4 (a) (2) inspection, non-safety affecting safety portion
- Selected Aging Management Programs for a more thorough onsite review (~45%)

Evaluated the scoping of nonsafety-related SSCs impacting safety-related SSCs. [As noted in the report scoping guidance revised for clarity.; it was resulting in too conservative approach for structural descriptions and adding components unnecessarily]

The team reviewed 19 of 42 aging management programs. We reviewed 10 of 13 new and 9 of 29 existing aging management programs.

The applicant had developed appropriate evaluation reports for their aging management programs that allowed the inspectors to make assessments about the applicant's plans, except for the ASR issue.

### AMP Inspection Results

- Buried Piping and Tanks Inspection
- Lubricating Oil Analysis
- Fire Water System

9

Selected observations on how we made a difference onsite – not to be read:

[ Except for the allowance of backfill at a size of 1 1/2", the backfill is equal to or better than the GALL Revision 2 proposal of ASTM D 448-08 Size 67. As a consequence, NextEra is proposing inspection in conformance with an acceptable backfill limit until a discovery is made of coating damage. For steel with cathodic protection, they propose 1 inspection. If backfill damage is discovered, they will increase this by another 3 samples. For steel without cathodic protection, they propose 4 inspections; and if backfill damage is discovered, they will expand by another 4 inspections. ]

The team reviewed cathodic protection system reports and determined the system was in disrepair since being identified as unreliable in 1993. The system was not restored until 2007 when a survey found that only 62 percent of the areas surveyed were being mitigated by cathodic protection. During the first quarter of 2009 the cathodic protection system was finally categorized as green (or satisfactory condition). The cathodic protection system was made a Maintenance Rule (10 CFR 50.65) System during the same quarter.

Because there was an absence of a consistent cathodic protection for a period of 1993 to 2009, it is appropriate for NextEra to inspect buried piping by excavation to corroborate the historical basis to conclude that buried piping was adequately protected, and the backfill correctly specified and filled, during construction.

#### Lube Oil Analysis

The team identified an issue regarding the existing lubricating oil practice on testing for water content. Specifically, the applicant tests for water content on lubricating oil for pumps and motors

when these components are water-cooled and have the potential for water contamination. Nonetheless, the team identified that the lubricating oil and hydraulic fluid samples of charging pump 1-CS-P-128 were not being tested for water content despite the pump being water-cooled. The applicant issued Action Request 01632769 to correct the testing for water content on this pump, to confirm test packages for other components are correct, and to review the testing for water content of all pumps and motors as part of the enhancement to the program to provide a program attachment with the required equipment and the specified sample analyses and frequency.

#### Fire Water System

Application change resulted for flow testing to 2020 version of NFPA 25 and to correct types of fire water buried piping.



### Additional Inspection Issue

- ASME Section XI, Subsection IWL
  
- Structures Monitoring Program

10

The team noted, for the IWL program and the structures monitoring program, a technically acceptable trending system was not implemented to establish the status of observed cracks (stable or active), and qualification and certification of inspectors/examiners was not explicitly established and documented to assure assignment of qualified individuals for inspection. The inspection personnel selection is left to the supervisor of the group. Also, there was a lack of clear quantitative acceptance/evaluation criteria established by the procedure to assure consistency in observation, evaluation, and assessment of inspection results by different inspectors and technical personnel engineers and at different times. This program will be further enhanced with revised implementing procedures to include definition of "Responsible Engineer"/(letter SBK-L-10204, RAI 8.2.1.28-3, Commitment No. 31) and trending information and acceptance criteria (same letter, RAI 8.2.1 .28-1).

Concrete degradation due to alkali-silica reaction is an aging effect that was recently discovered for Seabrook Station. In addition to the control building, it had been noted in other buildings such as Emergency Diesel Generator Building, and the Residual Heat Removal Vault (see additional details in the section b of this report). The Team reviewed applicant photographs of pattern cracking on the primary containment wall in the annulus region. The annulus region appears to have had approximately six feet of water for an extended period of time due to groundwater infiltration.

At the time of the inspection, the team learned that NextEra was just beginning an aging management review of this problem that had many open aspects to it.

### Walk-downs

- Residual Heat Removal
- Turbine Building
- Primary Auxiliary Building
- East Main Steam & Feedwater Pipe Chase
- West Main Steam & Feedwater Pipe Chase
- Control Building
- Service Water Pumphouse
- Emergency Feedwater Pumphouse and Pre-Action Valve Building
- Steam Generator Blowdown Building
- Emergency Diesel Generator Room B
- RCA Tunnel
- Tank Farm Area
- System Containment Exterior

Issue reflecting licensee learning as a result of license renewal, found during questioning at RHR system walkdown:

Of interest was a note in the System Walk-down Report, in 2008, recording the presence of water intrusion associated with "several supports in the vault stairwell" and the observation the "conditions are slowly becoming worse as calcium accumulates." WO 0844358 was initiated to verify the bolting integrity. The work order incorrectly compared the testing of anchors submerged in raw water in a manhole with the anchors supporting the RHR piping inserted into a calcium carbonate degraded wall and concluded, based on the submerged bolting, that the bolting in the RHR anchors were acceptable (AR 01633206). This comparison did not take into account the additional concern of a recently discovered alkaline silica degradation associated with the calcium carbonate degraded wall and the issue of anchor bolting integrity was not revisited subsequent to the discovery of alkali silica degradation. WO 0844358 was translated, during a database change, into Condition Report 08-15902 and closed on the basis of the comparison (two different material environmental conditions) even though the condition report contained a proposal to randomly sample the bolts and perform a calibrated torque test. The implications of the NRC Bulletin 79-02 anchor bolt integrity program were never considered during the evolution. Initially, these erroneous comparisons, and incomplete analysis, indicate a weakness in the NextEra's program for identifying and tracking the recently discovered aging effects at the site. The revised analysis resulted in satisfactory conditions and the learning needed in dealing with aging effects to support license renewal (AR 01633206).

### Observation

- Licensee review of the effects Alkali-Silica Reaction on structures was incomplete at the time of the inspection
- Water intrusion was noted during RHR walk-down
  - Deposits
  - Brown Stains (Membrane Failure)

12

No additional talking points needed but....

The staff noted that the applicant continued to develop an appropriate initial response to the aging effect of the alkali-silica reaction in certain concrete structures of Seabrook Station. Because the investigation and testing was ongoing and the applicant was not in a position to propose a new or revised aging management program, the inspection team was unable to arrive at a conclusion about the adequacy of the aging management review for the alkali-silica reaction issue. As part of the ongoing review of the application for a renewed license, the applicant should continue to inform the DLR staff as it develops its response to the alkali-silica reaction issue. With assistance from our Headquarters Office, Region I will review those key points in the implementation of the project plan associated with this issue to ensure the current licensing bases is maintained, a key assumption in the license renewal process.

The usual question of one of the ACRS members to the inspection team is: What are your views on the material conditions of the plant.

They may hold this in abeyance since they are going to visit the site but if asked:

Aside from the ASR issue, there were no instances of significant material condition degradation that would preclude license renewal. With respect to the ASR issue and groundwater in-leakage, there is the obvious cosmetic and housekeeping problem; but, more importantly, structural integrity needs to be assessed as a result of this material condition that has been ongoing over the years. Thus the inspection team exception in its determination related to various AMPs supporting a reasonable assurance conclusion.

### Inspection Conclusions

- Scoping of non-safety SSCs and application of the AMPs to those SSCs were acceptable
- Except for the ASR issue, inspection results support a conclusion of reasonable assurance exists that aging effects will be managed and intended functions maintained
- Documentation supporting the application was auditable and retrievable

13

Scoping and screen limited to inspection review was adequate

Too many aspects of the ASR issue were open and it was clear an open item would be needed for the SER based on discussions with DLR staff who assisted in the inspection.

The inspection also concluded the documentation supporting the application was in an auditable and retrievable form.



## Section 3: Aging Management Review

- Section 3.0 – Aging Management Programs
- Section 3.1 – Reactor Vessel & Internals
- Section 3.2 – Engineered Safety Features
- Section 3.3 – Auxiliary Systems
- Section 3.4 – Steam and Power Conversion System
- Section 3.5 – Containments, Structures and Component Supports
- Section 3.6 – Electrical and Instrumentation and Controls System

14

Thanks, Mike. Moving on to Section 3.

Section 3 of the SER covers the staff's review of the applicant's aging management programs and aging management review line items in each of the systems, which was reviewed against the criteria in the GALL Report.

For a given [AMR], the staff reviewed the intended function, material, environment, aging effect and the proposed [AMP] combination.

If an [AMR] did not align with the GALL Report, the staff conducted a technical review to ensure adequacy and issued requests for additional information , if appropriate.

[next slide]

**3.0.3 – Aging Management Programs**

42 Aging Management Programs (AMPs) presented by applicant and evaluated in the SER

	Consistent with GALL	Consistent with exception	Consistent with enhancement	With exception & enhancement	Plant Specific
Existing (29)	10	3	10	4	2
New (13)	6	3	1		3

As shown on the table, the staff reviewed 42 Aging Management Programs . The staff also reviewed over 6000 Aging Management Review line items from the submitted license renewal application.

### **SER Section 3.0.3.1.7 – Bolting Integrity Program**

#### **OI 3.0.3.1.7-1**

- Seal cap enclosures can contain water leakage that should be managed for aging
- LRA does not contain AMR items that address bolting and external surfaces in seal cap enclosure environments, which may be submerged due to ongoing leakage within the enclosure

16

In recent reviews of license renewal applications and operating experience, the NRC staff noted that seal cap enclosures can contain water leakage and therefore use of such enclosures should be accounted for in license renewal applications to ensure proper aging management.

The applicant stated that it used a seal cap enclosure to contain water leakage. The staff noted that the use of the enclosure was accounted for in the LRA and may prevent the direct inspections of bolting and component external surfaces within the Bolting Integrity and External Surfaces Monitoring Programs, respectively.

It was unclear how components within seal cap enclosures will be age-managed, since direct inspection was not possible.

The applicant has subsequently submitted an LRA supplement stating in its UFSAR supplement to remove the seal cap enclosures no later than December 31, 2014. The LRA supplement is still being reviewed by the staff.

### SER Section 3.0.3.1.9 — ASME Code Section XI, Subsection IWE Program

#### OI 3.0.3.1.9-1

- The applicant has not implemented procedures and inspection requirements to keep this area dewatered in the future

17

The applicant committed to implement measures to maintain the annular space between the containment and containment enclosure building in a dewatered state by December 2012. The applicant has used temporary measures to dewater the annular space.

Due to the applicant's previous failure to maintain the annular space between the containment and containment enclosure buildings in a dewatered state, the staff is concerned that the applicant has not, until now, implemented procedures and inspection requirements to keep this area dewatered in the future. Accumulation of water in the annular space can potentially degrade the containment liner plate and accelerate degradation of concrete. The staff's concern is tracked as Open Item OI 3.0.3.1.9-1.





## SER Section 3 Open Items

### SER Section 3.0.3.2 — Steam Generator Tube Integrity Program

#### OI 3.0.3.2.2-1

- Cracking due to primary water stress corrosion cracking (PWSCC) on the primary coolant side of steam generator tube-to-tubesheet welds
- One-time inspection of the steam generator divider plate assembly

18

This is an administrative item to clarify the applicant's intent and to place the commitment in the UFSAR supplement.

The applicant has since submitted an LRA supplement to clarify its intent on the commitments of the Steam Generator Tube Integrity Program and included the commitments in the UFSAR supplement.

The LRA supplement is still under review.

[next slide]

### SER Section 3.0.5 — Operating Experience

#### OI B.1.4-2

- Details of future operating experience to ensure AMPs will remain effective for managing the aging effects are not fully described

This is an open item that the ACRS has seen before with Columbia Generating Station.

The applicant did not fully describe how it will use future operating experience to ensure that the AMPs will remain effective for managing the aging effects during the period of extended operation.

Operating experience is important because it serves as a feedback mechanism to ensure the continued effectiveness of the aging management programs.

Appropriate aspects associated with the applicant's activities for the ongoing review of operating experience related to aging should be consistent with the guidance in Final LR-ISG-2011-05, "Ongoing Review of Operating Experience."



## SER Section 3 Open Items

### SER Section 3.2.2.1 — Treated Borated Water

#### OI 3.2.2.1-1

- Recently issued interim staff guidance (LR-ISG-2011-01) recommends additional aging management activities for stainless steel components in treated borated water

20

The LRA contains several AMR items that manage stainless steel components exposed to treated borated water for loss of material, cracking, and reduction of heat transfer with the Water Chemistry Program. However, the staff noted that new staff guidance recommends an additional one-time inspection to verify the effectiveness of water chemistry controls in borated water environments.

The applicant has submitted an LRA supplement to include the additional one-time inspection for several AMR items that manage stainless steel components exposed to treated borated water. The LRA supplement is still under review by the staff.

- 4.1 Introduction
- 4.2 Reactor Vessel Neutron Embrittlement
- 4.3 Metal Fatigue Analysis
- 4.4 Environmental Qualification of Electrical Equipment
- 4.5 Concrete Containment Tendon Prestress Analysis (not applicable to Seabrook)
- 4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis
- 4.7 Other Plant-Specific TLAA's

Section 4 of the SER contains the staff's review of Time Limited Aging Analysis (TLAA).

The following slides present the open items related to TLAA's.

**SER Section 4.2.4 — Pressure-Temperature Limit**

**OI 4.2.4-1**

- Concerns that the methodology used to develop the P-T limits are not consistent with the requirements in 10 CFR 50, Appendix G.

As a part of a separate licensing action on P-T limits, the applicant requested approval of P-T limits that would, based on an updated neutron fluence evaluation, extend the operating time of the current curves from 20 EFPY to 23.7 EFPY. The staff had concerns related to whether the methodology used to develop the P-T limits is consistent with the requirements in 10 CFR 50, Appendix G. Because the methodology used to develop the P-T limits during the initial operating period is the same as that to be used during the period of extended operation, this additional information is also pertinent to the review of LRA. Until resolved, this issue is identified as OI 4.2.4-1.



## SER Section 3 Open Items

### SER Section 3.0.3.2.18 — Structures Monitoring and Containment Concrete Inservice (IWL) Inspection Programs

#### OI 3.0.3.2.18-1

- The applicant's enhancement to the Structures Monitoring Aging Management Program is not sufficient to manage the effects of ASR
- The applicant has not enhanced the containment IWL program for ASR
- The applicant submitted an ASR monitoring program (May 16, 2012)

23

Based on the operating experience related to concrete degradation due to alkali-silica reaction (ASR), the staff is concerned that the applicant's enhancement to the Structures Monitoring Aging Management Program is not sufficient to manage the effects of ASR. The further slides will explain the staff's position related to the ASR issue.

I would like to note that when the SER was issued on June 8, 2012, the applicant had submitted an LRA supplement to include a plant-specific ASR monitoring program on May 16, 2012. However, the staff was still reviewing the information, and the evaluation of the document was not included in the SER. Later in the presentation, the staff will include its preliminary findings of the ASR monitoring program.

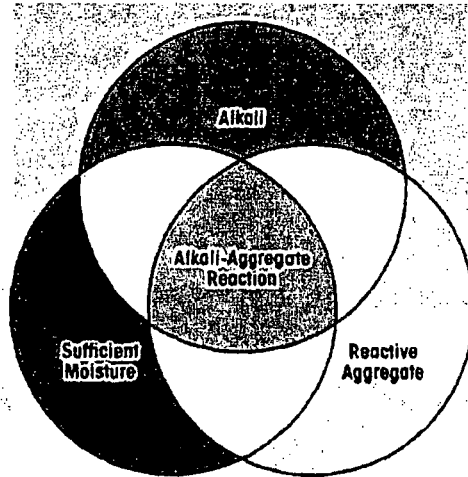
Also, the focus of our presentation is related to the license renewal issues.

The applicant's enhancement to the Structures Monitoring Aging Management Program is not sufficient to manage the effects of ASR

- On May 16, 2012, the applicant submitted ASR monitoring program.
- The staff is currently reviewing this ASR monitoring program AMP.
- The staff's SER did not include a review of this AMP
- The results of the staff's preliminary review of the AMP will be presented in the later slides

[next slide]

## Conditions for Alkali Silica Reaction (ASR)



24

As the applicant has stated in its presentation:

Looking from a broad view and not specific to Seabrook, in order for alkali silica reaction (ASR) to occur, the concrete structure must have alkali in the cement, reactive aggregate, and exposed to water.

[The applicant might discuss.]



- Aggregate containing silica reacts alkali hydroxides in the cement in presence of water
- An alkali silica gel is formed
- Gel swells expands and cause internal stresses
- Patterned cracking in concrete due to expansion and swelling
- Degradation of mechanical properties of concrete

Also, in general, this slide discusses the effects of ASR on concrete.

Aggregate containing reactive silica reacts alkali hydroxides in the cement in presence of water

An alkali silica gel if formed

Gel swells expands and cause internal stresses

Patterned cracking in concrete due to expansion and swelling

Degradation of mechanical properties of concrete

- Some reduction in compressive strength.
- Reduction in tensile, shear strength and bond strength, and elastic modulus of concrete more pronounced.
- Implicit relationships between compressive strength, shear strength, tensile strength, bond strength and elastic modulus as specified in industry codes are not valid for ASR affected concrete

[The applicant might discuss.]

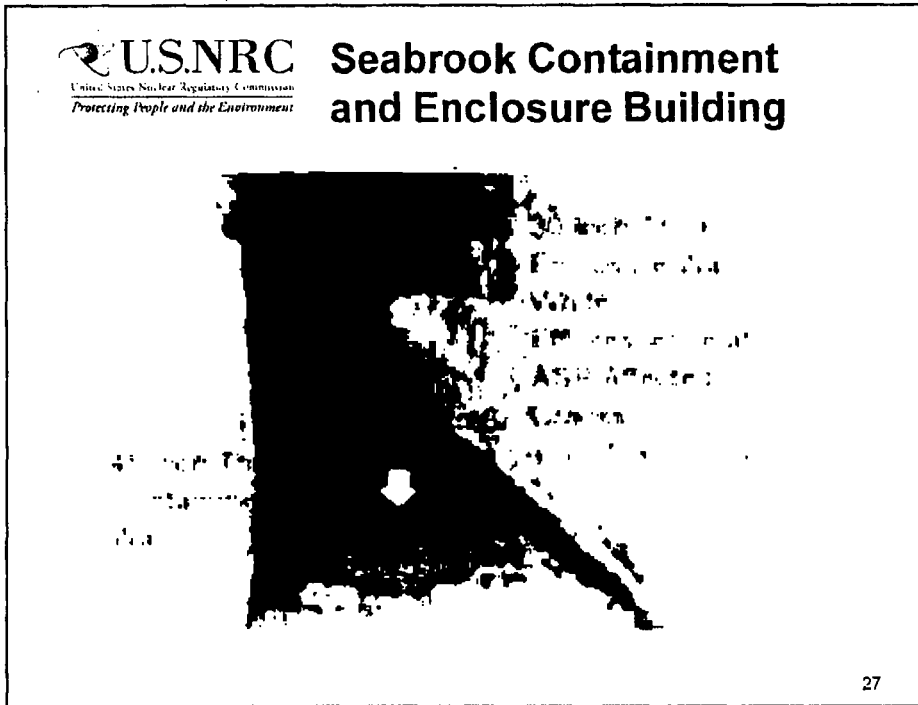


26

This picture shows cracking in the below grade portion of a concrete wall in the control building electrical tunnel at Seabrook Station.

- Patterned cracking observed in concrete walls of different structures during visual examination.
- The cracking occurred because industry standards for concrete aggregates, used during original construction, were not able to identify slow expansive aggregates that can produce ASR.
- Extended condition investigation identified ASR in the concrete walls of 19 structures.
- Some of these structures are:
  - Located below grade and exposed to 30-40 feet head of ground water.
  - Some of the structures exposed to 80 feet head of ground water.
  - Water proofing membrane applied to the concrete walls exposed to ground not performing its intended function.
- Seabrook plant does not have a groundwater dewatering system to prevent ingress of groundwater into the buildings

## Seabrook Containment and Enclosure Building



27

- This picture shows the annulus space between the containment and the enclosure building (about 35 ft below grade).
- The bottom 6 feet of the annular space between containment and containment enclosure building flooded with groundwater for several years.
- Patterned cracking observed in the enclosure building concrete
- The ASR gel is behind the white efflorescence
- Patterned cracking observed in the concrete in two areas of the containment that was exposed to ground water.
- Based on walkdown information, the applicant determined that containment concrete may be indicative of ASR; further evaluation and petrographic examination not performed. In addition, applicant considered the cracking insignificant.



## Seabrook Operating Experience: Concrete Degradation Due to ASR

- Compressive strength and elastic modulus tests performed
- Extent and rate of degradation of concrete over time—not completed
- Applicant does not plan to:
  - Perform additional tests on concrete cores
  - Extract cores from concrete containment and perform petrographic examination
- Applicant plans to perform large scale concrete beam tests
- Concrete expansion tests—in process
- Absence of ASR can only be confirmed by petrographic examination of core samples

28

Applicant has performed compressive strength and elastic modulus tests on ASR affected concrete core samples.

- Concrete compressive strength reduction up to 22 percent
- Elastic modulus reduction up to 47 percent

To date, the applicant has not performed any tests to determine rate of degradation of shear, tensile, and bond strength of ASR affected concrete over time.

- Applicant does not plan to perform small scale tests commonly used and recommended in the industry publications and guidance documents.
- Extract cores from the cracked area of the concrete containment and perform petrographic examination
- Visual examination cannot conclusively rule out presence of ASR.
- Absence of ASR can only be confirmed by petrographic examination.
- Staff cannot conclude without core samples and petrographic the presence of ASR
  
- Applicant plans to perform large scale concrete beam tests to determine mechanical properties and their relationship to the extent and widths of the cracks
- Concrete expansion tests to determine ASR reaction rate and extent of reaction to date are in process
- Results not available

## **SER Open Item** **OI 3.0.3.2.18-1: Containment**

### **Staff's Concern**

- Applicant observed cracking at two locations
  - Crack width no more than 8 mils
- Cracking pattern observed is indicative of ASR
- The applicant considers 8 mils maximum crack width insignificant
  - Cracks due to ASR grow over time
  - 15 mil crack width criteria is for passive cracks
- Absence of ASR can only be confirmed by petrographic examination of core samples
- The applicant has not addressed the long term effects of ASR on degradation of mechanical properties of concrete
- The applicant has not enhanced the containment IWL program for ASR

29

### **Issue**

- The applicant considers indications of ASR in two areas of the containment insignificant because the maximum crack width is not more than 8 mils

### **Staff's concern**

- As discussed before, the applicant performed visual inspection of the containment concrete that was previously exposed to ground water for a number of years
- The inspection revealed patterned cracking indicative of ASR at two locations
- Core samples have not been taken and are not currently planned.
- Maximum crack width of 8 mils, which is less than the 15 mil criteria for acceptance without further evaluation in ACI code for passive cracks.
- According to ACI code 349-3R passive cracks are those that show absence of recent growth and an absence of other degradation mechanism at cracks
- Cracking pattern observed is indicative of ASR
- Cracks due to ASR grow over time
- The applicant has not confirmed the absence of ASR.
- If ASR is present, applicant has to address the long term effects effect of ASR on degradation of mechanical properties of concrete over the long term
- Applicant also needs to enhance ASME Section XI, Subsection IWL AMP for inspection of containment concrete



## SER Open Item OI 3.0.3.2.18-1: Other Structures

### Staff's Concerns

- On March 30, 2012, the applicant committed to:
  - Perform accelerated expansion testing
  - Perform testing on full-scale replicas
  - Determine crack limits and index based on test data
  - Use test results to develop acceptance criteria
- On May 16, 2012, the applicant submitted ASR Monitoring Program AMP that is still under review by NRC
- Preliminary Findings:
  - Program acceptance criteria not based on full scale and expansion tests results
  - Acceptance criteria less stringent than industry standards
  - ASR detected by visual examination

30

### Issue

On March 30, 2012, the applicant committed to:

- Perform accelerated expansion testing to determine remaining reactivity in the aggregate.
- Perform testing on full-scale replicas of station structural configurations.
- Through this testing, quantitative crack limits will be developed.
- These quantitative crack limits will be used to develop acceptance criteria for AMP.

On May 16, 2012, the applicant submitted ASR Monitoring Program AMP that is not consistent with commitments made in March 30, 2012 letter.

- Staff initial concerns are:
- Program acceptance criteria not based on full scale and expansion tests results
- Acceptance criteria less stringent than industry standards
- ASR detected by visual examination
- AMP under review by NRC

## **Aging Management of ASR Affected Structures**

- An acceptable aging management program (AMP) for ASR should be based on the following:
  - Baseline inspection of concrete structures to document current condition of structures
  - Extent of aggregate reaction to date and remaining reactivity/expansion going forward
  - Extent and rate of degradation of mechanical properties
- AMP acceptance criteria should include, as a minimum, a limit for crack width and extent of cracking of concrete (cracking index).

31

An acceptable aging management program (AMP) should include the following information:

Baseline inspection of concrete structures to document the extent and width of cracks

The industry practice is to quantify the extent and widths of cracks in a specified area by a term called crack index.

Extent of aggregate reaction to date and remaining reactivity/expansion going forward

determined by ASTM C1260 and C1293 tests

Extent and rate of degradation of mechanical properties from large scale tests performed under realistic conditions and representative of actual configuration

Acceptance criteria for crack widths and extent of cracking of concrete (cracking index) should be developed based on a relationship between:

- Degradation of concrete mechanical properties
- Extent and rate of expansion
- Cracks measured during large scale tests
- Cracks measured during baseline inspection



## **SER Open Item OI 3.0.3.2.18-1: Summary**

The applicant has not demonstrated that it could adequately manage aging of the Seabrook concrete structures due to alkali-silica reaction (ASR) for the period of extended operations



## Next Steps

Until the applicant can resolve the ASR open item, the staff can not make a conclusion that the requirement of 10 CFR 54.29(a) have been met for the license renewal of Seabrook Station

33

The staff does not agree with the applicant's conclusion. Until the applicant can resolve the ASR open item, the staff can not make a conclusion that the requirement of 10 CFR 54.29(a) have been met for the license renewal of Seabrook Station

The staff recommends a second ACRS subcommittee meeting is necessary to discuss the ASR issue

This concludes my presentation, do you have any questions?

Cracking Index:

**Seabrook AMP:**

Acceptable with deficiencies: CI= 1.0 mm/m Crack width= 1.0 mm

**FHWA:**

Acceptable with deficiencies: CI= 0.5 mm/m Crack width= 0.15 mm

**Institute of Structural Engineers**

CI = 1.0 mm/m (Second level of expansion)

Site condition (wet –buried in soil)

Detailing = Category (no links)

Consequence of failure = Very severe

**French Practice Beton 303**

For cracks width measurement two criteria are screened: IF and cracks width ( $e_i$ )

Aggressive environment:

IF < 0.5 and  $e_i$  > 0.6 : a specific study is required

IF < 0.5 and  $e_i$  > 0.3 : the crack has to be monitored (or treated)

IF < 0.5 and  $e_i$  < 0.3 : the crack can be kept as observed

IF > 0.5 and  $e_i$  > 0.3 : a specific study is required

IF > 0.5 and  $e_i$  < 0.3 : the crack has to be monitored (or treated)

**Containment Building:**

Crack width = 0.008 inch (0.2 mm)

Cracking Index = Not known

Beyond the FHWA limit

## Comparison of Acceptance Criteria

Source	Cracking Index (CCI)	Individual Crack Width	Recommendation	Site Environment / Reinforcement / Consequence of Failure
Applicant AMP	1.0 mm/m or more	1.0 mm or more	Unacceptable, require further investigation	
FHWA Report	0.5 mm/m or more	0.15 mm or more	Unacceptable, require detailed investigation	
French Code Beton 301	0.5 mm/m or more	0.30 mm or more	Specific study is required	
Institute of Structural Engineers London	Less Than 0.6 mm/m		Structural Severity Rating: Moderate, Require Further Evaluation	Wet condition, no shear ties (similar to Seabrook concrete walls), Significant consequence of failure (loss of limb and property)
	Between 0.6 to 1.0 mm/m		Structural Severity Rating: Very High, Require Further Evaluation	

## Meetings/Seminars

- Seminar at NRC HQ on May 26, 2011, "Diagnosis, Prognosis, and Mitigation of ASR," by Professor Kevin Folliard of University of Texas at Austin
- Seminar at NRC HQ on October 20, 2011 about ASR issues. Three international experts presented information on ASR issues.
- Tetsuya Katayama of Japan, "Petrographic diagnosis of ASR - Recent topics in Japan."
- Professor Victor University of Colorado at Boulder, "Numerical Modeling of AAR."
- Neb Orbovic of Canadian Nuclear Safety Commission, "Alkali Aggregate Reaction – Building Regulatory Approach."
- Seminar at NRC RES on June 7, 2012 by experts from University of Purdue and National Institute Standards and Technology  
Jason Weiss of Purdue University and Ken Snyder NIST, " Alkali Silica Reaction in Concrete: Facts, Myths and Unknowns."  
H.S. Lew and Fahim Sadek – NIST, "Gaps in the Understanding of the Structural Capacity of ASR-Affected Concrete Structures."
- Two staff members from NRR attended International Conference on ASR in Austin Texas, between May 20 and 25, 2012, in which more 200 experts participated and more than 100 papers presented. The staff members used this opportunity to get advice from these experts

## Consultants – User Need

- DLR has engaged Dr. Dan Naus and Professor Paulo Monterio of University of Berkeley for technical assistance for the review of the effect of ASR on Concrete Structures.
- DLR has issued a user need to the Office of Research to conduct a high-priority research effort to address the effects of Alkali Silica Reaction (ASR) on concrete structures. This will include independent testing for ASR effects.
- NRC has agreed with Canadian Nuclear safety Commission (CNSC) to share the results of ASR research with each other.
- DLR staff is in informal contacts with French Road Research laboratory experts on ASR and obtained valuable advice.
- DLR staff is touch with the RILEM (The International Union of Testing and Research Laboratories for Materials and Structures.) committee members preparing guidance documents for ASR.

## Generic Communication

- On November 18, 2012, NRC issued Information Notice IN 2011-20 informing the licensees about concrete degradation by alkali silica reaction (ASR) at Seabrook Station. The other licensees were expected to review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems.





## Crack Width and Cracking Index Criteria

### Applicant's Proposed Criteria

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

### Federal Highway Administration Criteria

The following *cracking criteria*, which are obtained from the crack mapping survey performed as part of the Cracking Index method, are proposed to identify an extent of cracking that should justify more detailed investigations.

CI >  $0.5 \text{ mm/m}$  ( $0.018 \text{ in/yd}$ ), and/or  
Cracks of width >  $0.15 \text{ mm}$  ( $0.006 \text{ in}$ )



# Institute Of Structural Engineers Criteria

Table 5 Structural element severity rating

Site environment	Reinforcement detailing class (Chapter 8)	CI = 0.6 to 1.0									
		Expansion Index									
		I		II		III		IV		V	
Consequence of failure (see subsection 6.3.5)											
		Slight	Significant	Slight	Significant	Slight	Significant	Slight	Significant	Slight	Significant
dry	1	n	n	n	n	n	n	n	n	n	n
	2	n	n	n	n	n	n	n	n	n	D
	3	n	n	n	n	n	n	n	D	D	C
intermediate	1	n	n	n	D	D	C	D	C	D	C
	2	n	n	D	C	D	C	C	C	C	B
	3	n	D	D	B	C	B	B	A	B	A
wet	1	D	D	D	C	D	C	C	B	C	B
	2	D	D	C	B	C	B	B	B	B	A
	3	D	C	C	A	B	A	A	A	A	A

Structural severity ratings: | n = negligible | D = mild | C = moderate | B = severe | A = very severe

## **Seabrook Concrete Aggregate Expansion Tests**

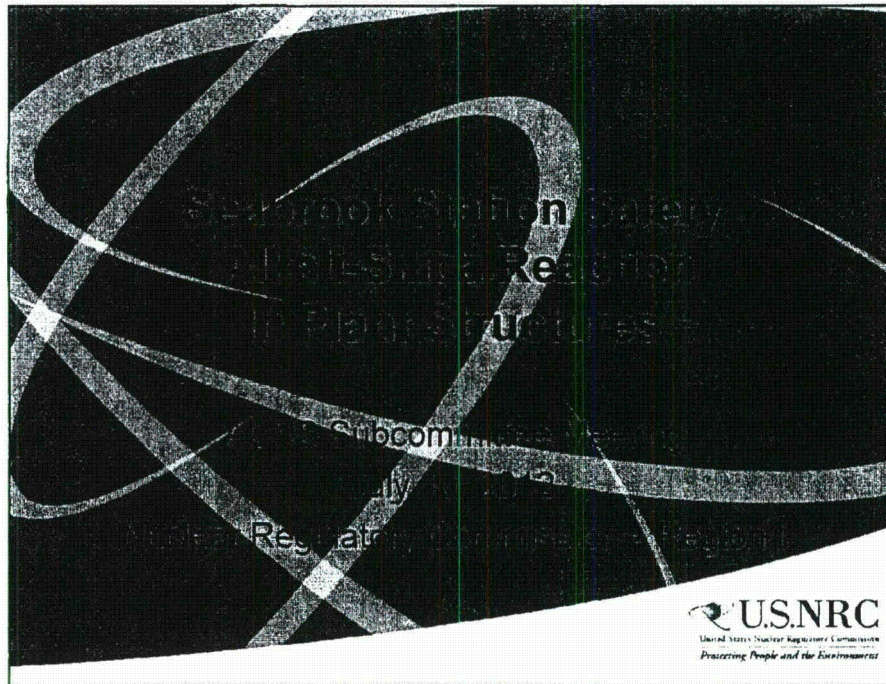
- Concrete expansion tests are used to determine ASR rate and progress
- Tests conducted on concrete aggregates extracted from ASR affected and non ASR affected concrete
- Short Term Test
  - ASTM C1260 Mortar Bar Test
  - Minimum duration 14 days
  - Results not usually conclusive
- Long Term Test
  - ASTM C 1293 Concrete Prism Test
  - Test duration one year

42

These test provide important data to determine the ASR reaction rate and extent of reaction to date.

Results of these tests can be used to establish a relationship between the ASR expansion and the extent and width of cracking.

This relationship can be used to determine a realistic acceptance criteria for aging management of structures affected by ASR.



We conducted an inspection from September 2011 to January 2012 with the assistance of NRR technical staff. A task interface agreement was issued in September 2011 for this assistance.

During the course of the inspection, we found that the applicant's prompt operability determinations were deficient, and that deficiency was processed as a finding (no violation) in the associated report. For example, the applicant hadn't considered that certain buildings had no shear reinforcement and therefore were more heavily dependent on concrete tensile and shear strength rather than compressive strength.

We also issued a violation of very low safety significance as they had accepted "as is" conditions in certain buildings with only a 50.59 screening violation. The applicant rescinded that screening evaluation.

The applicant did not adequately address the mathematical relationships of the American Concrete Institute (ACI) code being empirically based from ASR free concrete (left as an unresolved item and further pursued at a management meeting). Further, we updated an unresolved item on the open prompt operability determinations which has led to the incorporation of a bounding calculation. Finally it appeared to us that an integrated corrective action plan was languishing as the applicant was acquiring contractors to assist them in his effort, another area we pursued at a management meeting.

When we issued the report on March 26, 2012, we took the opportunity invite them in for a management meeting. They had completed an engineering evaluation by that time and they included a bounding calculation, the results of which we still need to review for adequacy.

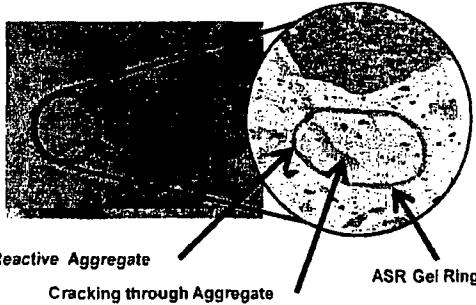
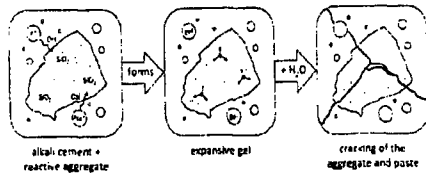
The management meeting occurred on April 23, 2012. In follow-up to the meeting, NextEra sent in two letters reflecting their commitments to us. We confirmed those commitments by a Confirmatory Action Letter (CAL No. 2012-002), dated May 16, 2012. Next steps related to operability issues will involve follow-up of the issues in the CAL.

Additionally, the management meeting was a public meeting and we were able to have some good interaction with stakeholder, governmental representative, etc. on this issue.

During a followup meeting near Seabrook on April 26, 2012, we received a number of positive comments from stakeholders and governmental representatives on the information and interaction provided.

## Alkali-Silica Reaction (ASR)

### What is ASR?



- ASR has been identified in some portions of Seabrook concrete structures
- ASR is a chemical reaction in concrete, which occurs over time in the presence of water, between the alkaline cement and reactive silica found in some aggregates.
- ASR forms a gel that expands causing micro-cracks that affects concrete properties

44

This slide is background on the fundamental problem.

Concrete is made by mixing cement with fine aggregate or sand to make a cement paste. The paste is then mixed with a coarse aggregate or stone.

Alkali-Silica Reaction or ASR is a slow chemical process in which the alkalis in the cement paste reacts with certain reactive types of silica in some aggregates when moisture is present.

This reaction produces an alkali-silica gel that expands within the concrete creating internal pressure that cause micro-cracks in the concrete structure especially in the presence of a large amount of water.

These cracks can change some of the mechanical properties of unreinforced concrete e.g., compressive, but more so shear and tensile strength, and other manifesting parameters such as stiffness and elasticity.

Cracking properties and the look based on “map cracking” can change based on restraints in place; i.e. type of concrete and reinforcement used in the wall actually built.

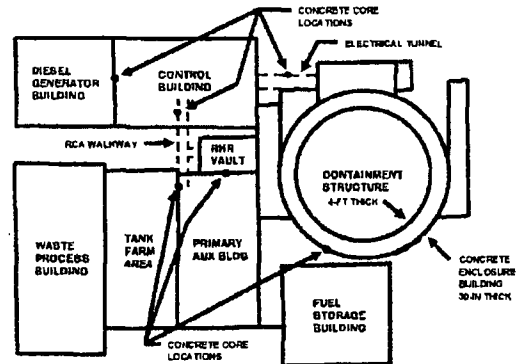
The ASR reaction is common in the transportation industry and impacts bridge structures, roads and airport runways.

The bottom left picture shows indications of ASR in a wall at Seabrook.

ASR can take 5 to 15 years before it is evident by visual inspections.

### Where is ASR Confirmed to be Occurring at Seabrook?

- Initial Structures include:
  - B Electrical tunnel
  - Containment enclosure building
  - RHR vault
  - EDG building
  - EFW building



45

This slide shows a simplified overview of some of the key buildings at Seabrook and those affected by ASR. Art Burritt will point out those areas as I note them.

ASR was first confirmed in the "B" electric tunnel in August 2010 by NextEra. Since this area exhibited the most visible degradation, it has received the most extensive inspection, testing and review. The NRC began inspecting this issue shortly after the ASR was confirmed in the third quarter of 2010.

As NextEra expanded their review, they confirmed ASR impacting additional buildings based on core sampling and conducting tests for compressive strength and modulus of elasticity (point out full name and location on drawing CEB, RHR, EDG, EFW).

There are additional localized areas throughout the plant that have similar but generally less significant indications of ASR, as evident from the patterned cracking, ASR staining or secondary deposits. (effervescence or calcium carbonate)

Seabrook is the first nuclear plant in this country to identify ASR in site structures.

A generic communication has been issued on this and it will need be updated as information comes from the CAL and we conduct our followup inspections.

**Where is ASR Confirmed to be Occurring at Seabrook?**

- Newly Identified:
  - Primary Auxiliary Building
  - MS/FW Pipe Chase East
  - Alternate Cooling Tower
  - Service Water Pump House

46

Additional areas have been found based on an expanded extent of conditions review and an initial assessment by their contractor – see the large map of the Station – hardcopy.

These areas were confirmed by the applicant to have ASR based on their development of a visual technique criteria based on what they learned in examining the Control Building and the initial set of extent of condition buildings.

The design standards used when Seabrook was built, in the late 1970s, required testing and examination of the stone to ensure a reactive aggregate was not used; however, these standards were latter found to not accurately identify slow reacting aggregate.

These construction examination and test standards have since been updated to better address slow reacting aggregates.

Additionally, there was a waterproofing membrane installed during construction that appears to have been damaged during installation and backfill allowing some water intrusion over time.

**Why is Seabrook Still Safe?**

- Conservative safety factors and assumptions used for plant design
- No significant visible deformation, distortion, or displacement was identified in the affected structures
- No indications of rebar corrosion
- ASR limited to localized areas of the affected structures
- ASR and the degradation it causes occurs slowly

47

Thus we have a reasonable expectation that the structures remain capable of performing their safety functions for several reasons (noted below).

All important buildings are well reinforced providing confinement and restraint to ASR expansion, which minimizes to a certain extent potential changes in structural performance as a result of ASR. One needs to look at each building/wall in an integral way.

The NRC has performed an independent assessment of Seabrook structures using the lower-bound effect on structural capacity due to ASR degradation reported in technical literature.

- As a result, the NRC determined that significant safety margins and conservatisms remain in the affected Seabrook concrete structures designed to accommodate these lower bound affects of ASR degradation for controlling load conditions.
- Beyond the design safety factors available, the design assumptions used for assessing concrete have significant conservatisms. For example, one of the most significant loads on the below grade walls is the groundwater hydrostatic pressure. This was calculated with water levels assumed to be at grade level which is well above the highest ground water level ever measured at the site

The NRC has also performed inspections and independently confirmed that there is there is no visible deformation, distortion or displacement of any affected structures.

- This is important because concrete would exhibit these indications well before its capability could be compromised.
- The reinforcing rebar is in good condition and in an environment that inhibits corrosion even with moisture present.
- A section of rebar was exposed and inspected to confirm there was no evidence of rusting or other degradation.

The indications of ASR at Seabrook are limited to localized areas within the affected structure and the ASR degradation occurs slowly and it is being monitored.

The applicant has also performed a bounding calculation and has identified some areas in which design margin has been reduced by up to 22% but it is still acceptable for operations. We will be evaluating this information on our followup inspections.



**Recent Important Steps**

- Management Meeting on April 23, 2012
- Commitments obtained from NextEra in letters dated May 3, and 10, 2012
- Confirmatory Action Letter 2012-002 issued May 16, 2012 confirming commitments made
- Applicant on schedule to meet commitments
- Region has information to start reviews in June 2012
- License renewal has been impacted by applicant development efforts

48

We have continued to evaluate the use of additional regulatory tools to ensure that the Seabrook structures will be able to continue to perform their required functions over the 40 year life of the license.

The management meeting in headquarters was fruitful in obtaining an initial and a revised set of commitments (letters of May 3 and 10, 2012).

We issued a CAL in response to those letters and we are developing information from the CAL response in order to start inspections of applicant actions.

Regarding License Renewal, the schedule has already been delayed due to ASR and will likely be delayed more until the applicant can demonstrate that they fully understand aging effect of ASR issue, it is being controlled, and can be effectively managed for the life of the plant. Applicant will need to demonstrate that can manage the effect – not necessarily the mechanism.

The staff issued an SER with open items (7 - two of which related to ASR issue or groundwater where it should not be) last Friday (June 8, 2012)

The applicant had now proposed an aging management program in May 2012 after the management meeting of April 23 this year.

The first subcommittee meeting with the ACRS is scheduled to occur on July 10, 2012.

**What are the Next Steps - Applicant?**

- Establish a revised operability with bounding calculations
- Interim monitoring program to confirm ASR is a slow reaction rate.
- Short Term and Longer Aggregate Testing for Reaction Rate
- Longer Term Research and Development
- Results on Seabrook similar specimens – mid 2013 – final report mid 2014

49

NextEra plans extensive work at a research and development facility. A description of their plans are due in by June 30, 2012 (CAL Item No. 8).

Results will not be in until mid 2013 for specimens designed to meet existing conditions at Seabrook. We still need to evaluate if there is enough margin in structures and establish confidence in the applicant's approach to be able to rely on the current operability determinations and the monitoring until testing is complete.

We plan to have a public meeting near the site, later this year and NextEra agreed to assist as appropriate.

**What are the Next Steps – NRC Staff?**

- Review the structural assessments to verify safety as more information becomes available
- Coordinated effort by multiple NRC Divisions
  - Forming a working group for coordinate and information exchange
  - Forming a team in Region for the CAL followup with assistance from Headquarters/Contractors
  - Future public meeting close to site

50

We hope to have a view on control building prompt operability determinations (POD) and POD for certain buildings that have had the highest impact on design margin (September 2012) based on a conservative input on concrete properties such as for shear strength.

A number of applicant documents submitted as a result of the CAL will need to be integrated for each building reviewed.

In parallel we will need to stay coordinated in a multidisciplinary way using Regional and NRR resources and a contractor along with the need to evaluate the potential services of NRO Vendor Inspections Branch and the Office of Research.

We are working with Human Resources in order to put together a temporary team lead by DRS EB1 in order to conduct the necessary inspections in followup to the CAL and to assist in the periodic evaluation of needs within or without the agency.

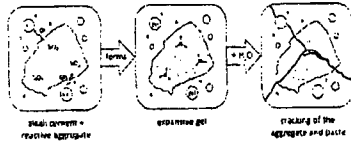
We are committed to have a public meeting later this year locally and it will most likely be after we issue our first report on the followup to the CAL items.

QUESTIONS

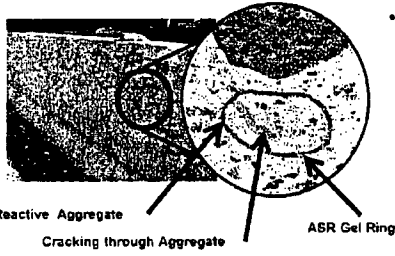
COMMENTS

## Alkali-Silica Reaction (ASR)

### What is ASR?

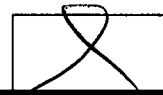


- ASR is a slow chemical reaction in concrete, which occurs in the presence of water, between the alkaline cement and reactive silica found in some aggregates.
- ASR forms a gel that expands causing micro-cracks that affects concrete properties



**If needed, Backup Slide with a Seabrook Specific Photograph**

Heater, Keith



**From:** Floyd, Niklas  
**Sent:** Tuesday, September 17, 2013 1:28 AM  
**To:** Heater, Keith  
**Subject:** FOIA: POSITION PAPER: IN SITU MONITORING OF ALKALI-SILICA

**From:** Pope, Lisa  
**Sent:** Wednesday, May 08, 2013 7:35 AM  
**To:** Khanna, Meena; Marshall, Michael; Kobetz, Timothy; McMurtray, Anthony; Lamb, John; Plasse, Richard; Sheikh, Abdul; Erickson, Alice; Raymond, William; Hogan, Rosemary; Schroeder, Daniel; Dentel, Glenn; Chaudhary, Suresh; Floyd, Niklas; Philip, Jacob; Graves, Herman; Fuhrmann, Mark; Ott, William  
**Cc:** Buford, Angela  
**Subject:** POSITION PAPER: IN SITU MONITORING OF ALKALI-SILICA

**Date:** April 30, 2013

**Letter To:** James M. Trapp, BC, R-I, DRS, EB1

**From:** Angela R. Buford, PM, RASB, DLR

**Subject:** POSITION PAPER: IN SITU MONITORING OF ALKALI-SILICA REACTION (ASR) AFFECTED CONCRETE: A STUDY ON CRACK INDEXING AND DAMAGE RATING INDEX TO ASSESS THE SEVERITY OF ASR AND TO MONITOR ASR PROGRESSION

View ADAMS P8 Properties ML13108A047 = *ACROSS* PUBLIC

Open ADAMS P8 Document (POSITION PAPER: IN-SITU MONITORING OF ALKALI-SILICA REACTION (ASR) AFFECTED CONCRETE: A STUDY ON CRACK INDEXING AND DAMAGE RATING INDEX TO ASSESS THE SEVERITY OF ASR AND TO MONITOR ASR PROGRESSION)

*Lisa M. Pope*

U.S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Division of License Renewal  
11555 Rockville Pike, Rockville, MD 20852  
Location: O-11A07 / Mail Stop: 11F1  
☎ Office: 301-415-8707  
✉ E-mail: [lisa.pope@nrc.gov](mailto:lisa.pope@nrc.gov)

Heater, Keith



**From:** Floyd, Niklas  
**Sent:** Tuesday, September 17, 2013 1:31 AM  
**To:** Heater, Keith  
**Subject:** FOIA: Dispatch of Final Document: Position Paper - "Assessment of ACI 318-71 as Design Basis for Category 1 Concrete Structures Affected by ALKALI-SILICA Reaction at Seabrook Station"

**From:** Green, Rodneshia  
**Sent:** Thursday, June 13, 2013 11:50 AM  
**To:** Khanna, Meena; Ott, William; Kobetz, Timothy; Hogan, Rosemary; McMurtray, Anthony; Schroeder, Daniel; Dentel, Glenn; Cook, William; Raymond, William; Chaudhary, Suresh; Floyd, Niklas; Lamb, John; Plasse, Richard; Sheikh, Abdul; Buford, Angela; Philip, Jacob; Graves, Herman; Fuhrmann, Mark  
**Cc:** Marshall, Michael; Erickson, Alice  
**Subject:** Dispatch of Final Document: Position Paper - "Assessment of ACI 318-71 as Design Basis for Category 1 Concrete Structures Affected by ALKALI-SILICA Reaction at Seabrook Station"

[View ADAMS P8 Properties ML13128A521 = ALKALI PUBLIC](#)  
[Open ADAMS P8 Document \(Memo re: Position Paper - "Assessment of ACI 318-71 as Design Basis for Category 1 Concrete Structures Affected by Alkali silica Reaction at Seabrook Station."\)](#)

**Date:** June 10, 2013

**Memorandum to:** James M. Trapp, Chief, Seabrook Alkali-Silica Reaction Issue Technical Team Chairman

**Thru:** Michael Marshall, BC/RASB/DLR

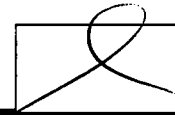
**From:** Alice Erickson, Structural Engineer, RASB, DLR

**Subject:** Position Paper – "Assessment of ACI 318-71 as Design Basis for Category 1 Concrete Structures Affected by Alkali-Silica Reaction at Seabrook Station"

*RODNESHIA Y. GREEN  
NRR/DLR ADMINISTRATIVE ASSISTANT  
(301) 415-1153  
U.S. NUCLEAR REGULATORY COMMISSION  
[RODNESHIA.GREEN@NRC.GOV](mailto:RODNESHIA.GREEN@NRC.GOV)*

H4

**Chaudhary, Suresh**



**From:** Raymond, William  
**Sent:** Thursday, March 01, 2012 2:18 PM  
**To:** Lamb, John; Khanna, Meena; Burritt, Arthur; Marshall, Michael; Murphy, Martin; Conte, Richard; Thomas, George; Sheikh, Abdul; Chaudhary, Suresh; Cunanan, Arthur; Erickson, Alice; Galloway, Melanie; Lund, Louise; Miller, Chris; Cheok, Michael  
**Subject:** RE: For Your Review - Revision 10 - Dry Run of Slides for Chairman Brief regarding Seabrook ASR

They keep getting better....  
Bill

**From:** Lamb, John  
**Sent:** Thursday, March 01, 2012 1:37 PM  
**To:** Khanna, Meena; Burritt, Arthur; Marshall, Michael; Murphy, Martin; Raymond, William; Conte, Richard; Thomas, George; Sheikh, Abdul; Chaudhary, Suresh; Cunanan, Arthur; Erickson, Alice; Galloway, Melanie; Lund, Louise; Miller, Chris; Cheok, Michael  
**Subject:** For Your Review - Revision 10 - Dry Run of Slides for Chairman Brief regarding Seabrook ASR  
**Importance:** High

Ladies & Gentlemen:

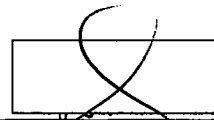
Attached, for your review, is Revision 10 of the DRAFT slides for the Chairman brief. Revision 10 reflects all inputs to date. If you have any changes, please supply the update by noon on Tuesday, March 6, 2012.

The dry run is scheduled for Tuesday, March 6, 2012, at 1:00 pm (Eastern time).

Thanks for the support.  
John



**Chaudhary, Suresh**



**From:** Raymond, William  
**Sent:** Monday, March 05, 2012 12:07 PM  
**To:** Thomas, George; Lamb, John  
**Cc:** Sheikh, Abdul; Chaudhary, Suresh; Conte, Richard; Murphy, Martin  
**Subject:** RE: For Your Review - Notes for Slide 3

I think the revised slide covers it well.  
Bill

**From:** Thomas, George  
**Sent:** Monday, March 05, 2012 11:56 AM  
**To:** Lamb, John  
**Cc:** Sheikh, Abdul; Chaudhary, Suresh; Conte, Richard; Murphy, Martin; Raymond, William  
**Subject:** RE: For Your Review - Notes for Slide 3

John,

For your use - In the attached, I have revised Slide 3 (both slide and speaker notes) and speaker notes only for Slide 7. I did discuss these changes with Abdul.

Thanks.  
George

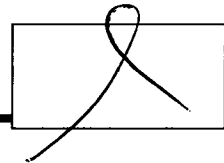
**From:** Lamb, John  
**Sent:** Friday, March 02, 2012 9:46 AM  
**To:** Thomas, George; Sheikh, Abdul; Chaudhary, Suresh  
**Cc:** Khanna, Meena  
**Subject:** For Your Review - Notes for Slide 3

George, Abdul, & Suresh,

Can you review please the speaker notes for slide 3 and provide comments/changes as necessary?

Thanks.  
John

**Chaudhary, Suresh**



**From:** Raymond, William  
**Sent:** Monday, March 05, 2012 1:42 PM  
**To:** Lamb, John; Khanna, Meena; Burritt, Arthur; Marshall, Michael; Murphy, Martin; Conte, Richard; Thomas, George; Sheikh, Abdul; Chaudhary, Suresh; Cunanan, Arthur; Erickson, Alice; Galloway, Melanie; Lund, Louise; Miller, Chris; Cheok, Michael  
**Subject:** RE: For Your Review - Revision 13 - Dry Run of Slides for Chairman Brief regarding Seabrook ASR

Suggestion – Slides 4, 5 and speaker notes.....

Delete reference to “standalone” and simply refer to the RI Report R2011-10 as the “ASR Inspection”, or “Structures Operability Inspection”, or “ASR Action Plan Inspection”, whichever best characterizes the main objective of the effort.

**From:** Lamb, John  
**Sent:** Monday, March 05, 2012 1:24 PM  
**To:** Khanna, Meena; Burritt, Arthur; Marshall, Michael; Murphy, Martin; Raymond, William; Conte, Richard; Thomas, George; Sheikh, Abdul; Chaudhary, Suresh; Cunanan, Arthur; Erickson, Alice; Galloway, Melanie; Lund, Louise; Miller, Chris; Cheok, Michael  
**Subject:** For Your Review - Revision 13 - Dry Run of Slides for Chairman Brief regarding Seabrook ASR  
**Importance:** High

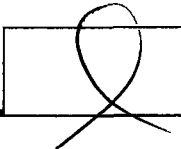
Ladies & Gentlemen:

Attached, for your review, is Revision 13 of the DRAFT slides for the Chairman brief. Revision 13 reflects all inputs to date. If you have any changes, please supply the update by **noon on Tuesday, March 6, 2012.**

The dry run is scheduled for Tuesday, March 6, 2012, at 1:00 pm (Eastern time).

Thanks for the support.  
John

**Chaudhary, Suresh**



**From:** Raymond, William  
**Sent:** Wednesday, April 25, 2012 11:47 AM  
**To:** Thomas, George  
**Cc:** Conte, Richard; Chaudhary, Suresh; Sheikh, Abdul  
**Subject:** RE: Request Seabrook 2nd white paper by UT Professor

George,  
The Bayrak white paper on ACI-318 is now available on Certrec.  
Bill

**From:** Thomas, George  
**Sent:** Wednesday, April 25, 2012 9:20 AM  
**To:** Raymond, William  
**Subject:** RE: Request Seabrook 2nd white paper by UT Professor

Thanks, Bill.

**From:** Raymond, William  
**Sent:** Wednesday, April 25, 2012 8:29 AM  
**To:** Thomas, George  
**Subject:** RE: Request Seabrook 2nd white paper by UT Professor

Will do, George. I'll let you know when it is there.  
Bill

**From:** Thomas, George  
**Sent:** Wednesday, April 25, 2012 7:54 AM  
**To:** Raymond, William  
**Subject:** Request Seabrook 2nd white paper by UT Professor

Bill,

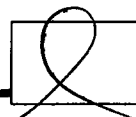
I have a request – could you please request NextEra to place on Certrec the second white paper written by Dr Bayrak, which is Reference 9.5.2 "Perspectives on ACI 318-71, Bayrak O, March 2012" in the Engg Eval .

Thanks.

George Thomas  
Structural Engineer  
NRR/DE/EMCB  
301-415-6181  
[George.Thomas2@nrc.gov](mailto:George.Thomas2@nrc.gov)

H 8

**Chaudhary, Suresh**



**From:** Conte, Richard  
**Sent:** Wednesday, January 30, 2013 10:13 AM  
**To:** Marshall, Michael  
**Cc:** Buford, Angela; Chaudhary, Suresh; Cook, William; Trapp, James  
**Subject:** RE: Response Requested: couple ASR info questions

The timing might be good around March but if you are having a management meeting with the NextEra perhaps we should do something before that management meeting to ensure one voice.

Some issues to think about as we are discussing now in Austin are as follows:

1. Do we not have a impasse for monitoring the problem NOW in year 22-40 vs 40-60?
2. Whatever comes of the research here in Texas almost has to be factored into the aging management program in years 22 to 40 which will be required given this is a first of a kind problem – MPR showed us a slide similar to that which was produced for the April 2012 management meeting which only included shear and lap-splice testing but now include the anchor testing.
3. There seems to be an unstated concern by the 54 staff that 50 staff might accept something in the new CLB that might be unacceptable for the renewed CLB – this is the purpose of the working group but if DLR has some tangible sign of it now, please speak up at the next working group meeting.

By way of status here in Texas, it was interesting to see cracking at the top of the specimens being cured and to see the cracking running down the side walls. Suresh challenged the professors that if the cracking is in front of the anchor, it could affect results. We did learn that anchor testing is being correlated to the original design basis using the latest recognized methodology from ACI - CC test method.

**From:** Marshall, Michael  
**Sent:** Monday, January 28, 2013 11:56 AM  
**To:** Conte, Richard  
**Subject:** Response Requested: couple ASR info questions

Hello Rich,

Do you know what month the next executive briefing will occur?

Michael

**From:** Galloway, Melanie  
**Sent:** Saturday, January 26, 2013 10:43 PM  
**To:** Marshall, Michael  
**Subject:** couple ASR info questions

Michael,

I could have sworn that you sent me via email the papers that Angie and Alice had done on ASR. I was planning on printing them and taking them with me tomorrow. However, when I search for them under your name nothing comes up. Can you resend them? Thanks much.

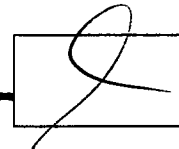
Also, when are we due for an executive briefing on ASR?

Thanks much and have a great week.

H19

Melanie

**Chaudhary, Suresh**



**From:** Conte, Richard  
**Sent:** Wednesday, February 06, 2013 12:01 PM  
**To:** Chaudhary, Suresh  
**Cc:** Raymond, William  
**Subject:** FW: Response: Agenda Topics for February 21st Meeting with NextEra

fyi

---

**From:** Marshall, Michael  
**Sent:** Wednesday, February 06, 2013 10:44 AM  
**To:** Milano, Patrick  
**Cc:** Sheikh, Abdul; Erickson, Alice; Buford, Angela; Conte, Richard; Trapp, James; Cook, William; Morey, Dennis  
**Subject:** Response: Agenda Topics for February 21st Meeting with NextEra

Hello Pat,

RASB would like the following topics on the agenda for the February 21<sup>st</sup> meeting with NextEra.

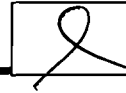
- number of aging effects associated with ASR
- effectiveness of proposed actions to manage the effects of aging associated with ASR
- applicability of technical basis to the various structures within scope of license renewal

Michael L. Marshall, Jr.  
Chief  
Aging Management of Structures, Electrical, and Systems Branch  
Division of License Renewal  
Office of Nuclear Reactor Regulation

301-415-2871  
Email: [michael.marshall@nrc.gov](mailto:michael.marshall@nrc.gov)

#10

**Chaudhary, Suresh**



**From:** Conte, Richard  
**Sent:** Monday, February 11, 2013 10:21 AM  
**To:** Roberts, Darrell; Dentel, Glenn; Wilson, Peter; Miller, Chris; Trapp, James; Cook, William  
**Cc:** Raymond, William; Chaudhary, Suresh; Floyd, Niklas; Sheehan, Neil; Screnci, Diane; Tifft, Doug; McNamara, Nancy  
**Subject:** FW: Dispatch of Final Document: Forthcoming Meeting With Nextera Energy Seabrook, LLC (NEXTERA) Regarding License Renewal for the Seabrook Station

For your particular focus.

We knew it was coming about based on last week's brief at a working group meeting and before that.

It is a technical meeting to resolve several back and fourths on RAIs in the License Renewal Area.

- a. Identification/Characterization of aging effects associated with alkali-silica reaction (ASR)
- b. Effectiveness of proposed actions to manage the effects of aging associated with ASR
- c. Applicability of technical basis to the various structures within scope of license renewal

Jim Trapp and Bill Cook are slated to attend.

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**From:** Spruill, Crystal  
**Sent:** Monday, February 11, 2013 10:12 AM  
**To:** RidsNrrDir Resource; RidsNrrDirRapb Resource; RidsNrrDirRarb Resource; RidsNrrDirRasb Resource; RidsNrrDirRerb Resource; RidsNrrDirRpb1 Resource; RidsNrrDirRpb2 Resource; RidsNrrDraApla Resource; Morey, Dennis; Wrona, David; Milano, Patrick; James, Lois; McIntyre, David; Dacus, Eugene; Spencer, Michael; Smith, Maxwell; Schroeder, Daniel; Trapp, James; Conte, Richard; McNamara, Nancy; Sheehan, Neil; Screnci, Diane; Raymond, William; Greives, Jonathan; Jennerich, Matthew; Burritt, Arthur  
**Subject:** Dispatch of Final Document: Forthcoming Meeting With Nextera Energy Seabrook, LLC (NEXTERA) Regarding License Renewal for the Seabrook Station

View ADAMS P8 Properties ML13038A624 *ALSO ASY PUBLIC*  
Open ADAMS P8 Document (02/21/2013 Forthcoming Meeting With Nextera Energy Seabrook, LLC (NEXTERA) Regarding License Renewal for the Seabrook Station.)

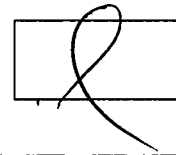
**Date: February 8, 2013**

**Meeting Notice: Forthcoming Meeting With Nextera Energy Seabrook, LLC (NEXTERA) Regarding License Renewal for the Seabrook Station**

*Thank You,*  
*Crystal D. Spruill,*  
Office of Nuclear Reactor Regulation  
Division of License Renewal, Location: O-11H08  
Office: 301-415-1183 Direct: 301-415-2287  
[Crystal.Spruill@nrc.gov](mailto:Crystal.Spruill@nrc.gov)



*H11*



**Chaudhary, Suresh**

---

**From:** Conte, Richard  
**Sent:** Wednesday, February 20, 2013 9:58 AM  
**To:** Clifford, James; Miller, Chris; Roberts, Darrell; Wilson, Peter  
**Cc:** Dentel, Glenn; Thomas, George; Trapp, James; Marshall, Michael; Cook, William; Raymond, William; Chaudhary, Suresh; Buford, Angela  
**Subject:** FW: Update of 1-pagers in preparation for the RIC 2013  
**Attachments:** Alkali Silica Reaction (ASR) in Concrete\_RIC2013.docx

This is a pretty succinct status. I worked with Michael and George to update it.

It was tailored from an old Chairman status report that stopped when the new Chair came in.

---

**From:** Thomas, George  
**Sent:** Tuesday, February 19, 2013 9:12 AM  
**To:** Marshall, Michael; Conte, Richard; Trapp, James  
**Subject:** FW: Update of 1-pagers in preparation for the RIC 2013

For your reference, a copy of the final one-pager on ASR that was provided for RIC 2013.

---

**From:** McMurtray, Anthony  
**Sent:** Friday, February 15, 2013 2:25 PM  
**To:** Roque-Cruz, Carla  
**Cc:** Hoang, Dan; Li, Yong; Thomas, George  
**Subject:** RE: Update of 1-pagers in preparation for the RIC 2013

Carla,

Attached are the four updated 1-pagers for EMCB. Please replace the 1-pager you received earlier in the week from Dan Hoang with the attached (Davis-Besse Shield Bldg. Laminar Cracking).

Tony

---

**From:** Roque-Cruz, Carla  
**Sent:** Tuesday, January 22, 2013 12:08 PM  
**To:** Murphy, Martin; Thorp, John; Rosenberg, Stacey; Kulesa, Gloria; McMurtray, Anthony; Lupold, Timothy; Mathew, Roy  
**Cc:** Hiland, Patrick; Cheok, Michael; McConnell, Matthew; Wolfgang, Robert  
**Subject:** Update of 1-pagers in preparation for the RIC 2013

***BCs and actors.***

***In preparation for the RIC we have to update/archive/create 1-pagers. I have attached all of DE's 1-pagers and below is a list with the responsible branch. Please:***

- 1. Let me know if any of these 1-pagers can be archived (Red ones are the 1-pagers I think we can archive). Due: February 15, 2013***
- 2. Update the ones that need updating. Due: February 15, 2013***



3. *Let me know and develop any new 1-pagers you think we should add to the list (GM storms, NDE North Anna, ???) Due: February 15, 2013*

*Containment Delamination – EMCB*

*Degraded Voltage Protection – EEEB*

*Digital I&C Watts Bar – EICB*

*Digital I&C – EICB*

*Materials Initiative for NSIAD – EPNB*

*Submerged Cables – EEEB*

*Inspection Alloy 600 upper Rx head – EPNB*

*~~Inspection Alloy 600 dissimilar butt weld – EPNB~~*

*Buried Piping – EPNB*

*~~North Anna Seismic Event – EMCB~~*

*Shield Building Laminar Crack DB – EMCB*

*SBO Rulemaking – EEEB*

*MRP-227 – EVIB*

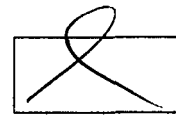
*Seabrook Alkali Silica Reaction – EMCB*

*Hydro-Fracking – EMCB*

*External Hazards – EMCB*

Thank you | Gracias,

Carla P. Roque Cruz  
Technical Assistant, NRR/DE  
301-415-1455



**Chaudhary, Suresh**

---

**From:** Conte, Richard  
**Sent:** Tuesday, February 26, 2013 9:45 AM  
**To:** Thomas, George  
**Cc:** Trapp, James; Cook, William; Raymond, William; Floyd, Niklas; Chaudhary, Suresh; Miller, Chris; Clifford, James; Dentel, Glenn  
**Subject:** RE: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety  
**Attachments:** ASR Concrete Degradation at Seabrook for 2013 CNS Report.docx

Sorry wrong file.

Attached is the one for the National report.

---

**From:** Conte, Richard  
**Sent:** Tuesday, February 26, 2013 9:08 AM  
**To:** Thomas, George  
**Cc:** Trapp, James; Cook, William; Raymond, William; Floyd, Niklas; Chaudhary, Suresh; Miller, Chris; Clifford, James; Dentel, Glenn  
**Subject:** RE: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

Back to you George. I did some noodles and corrected of ML numbers. The one you had for the inspection report was for the information notice ML number. "It is in tracked changes."

Is the national report part of our responsibilities to IAEA?

---

**From:** Thomas, George  
**Sent:** Monday, February 25, 2013 12:11 PM  
**To:** Conte, Richard  
**Subject:** FW: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

Rich – do you have any comments on this?  
Thanks.  
George

---

**From:** Thomas, George  
**Sent:** Wednesday, February 20, 2013 3:08 PM  
**To:** Marshall, Michael; Khanna, Meena; Conte, Richard  
**Cc:** McMurtray, Anthony; Roque-Cruz, Carla  
**Subject:** FW: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

Hello All,

I have been asked to provide a discussion on ASR Concrete Degradation at Seabrook for the 2013 US National Report (NUREG-1650) for the Convention on Nuclear Safety. Attached is a draft whose content is primarily taken out of the one-pager we did recently. Please review and provide any comments ASAP. Sorry, for the quick turn-around but this needs to go to OIP ASAP.

Thanks for your help.  
George

H13

---

**From:** Thomas, George  
**Sent:** Wednesday, February 20, 2013 2:54 PM  
**To:** McMurtray, Anthony  
**Subject:** RE: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

Tony,

Attached, for your review, is my draft input on the ASR concrete degradation issue for the CNS Report.

---

**From:** Roque-Cruz, Carla  
**Sent:** Tuesday, February 19, 2013 3:46 PM  
**To:** Thomas, George; Audrain, Margaret  
**Cc:** McMurtray, Anthony  
**Subject:** RE: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

*George.*

*Attached is the last CNS report. The concrete degradation topic is a new topic that they added to the report for this year, just like NDE, SG integrity and some others. The folks from the int'l branch want a few paragraphs of significant information related to this topic. I would say to write a few paragraphs focused on the issue of ASR. We will give the write-up to DLR for their review once you are done.*

*I hope this info helps. Let Meg or I know if you have any other questions.*

---

**From:** Thomas, George  
**Sent:** Tuesday, February 19, 2013 3:22 PM  
**To:** Roque-Cruz, Carla; Audrain, Margaret  
**Cc:** McMurtray, Anthony  
**Subject:** RE: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

Carla,  
Thanks. Is there a draft or outline of the CNS report? What did the YT request? Any such info will be helpful.  
George

---

**From:** Roque-Cruz, Carla  
**Sent:** Tuesday, February 19, 2013 3:09 PM  
**To:** Thomas, George; Audrain, Margaret  
**Cc:** McMurtray, Anthony  
**Subject:** RE: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

*George.*

*Please see the attached emails. One has the input that DE provided for "buried piping" and the other one the input for "NDE".*

---

**From:** Thomas, George  
**Sent:** Tuesday, February 19, 2013 2:12 PM  
**To:** Audrain, Margaret; Roque-Cruz, Carla

**Cc:** McMurtray, Anthony

**Subject:** RE: Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

Meg/Carla,

Tony asked me work on this a little while ago. Could you please provide me with the information on what needs to be done.

Thanks.

George

---

**From:** McMurtray, Anthony

**Sent:** Tuesday, February 19, 2013 1:24 PM

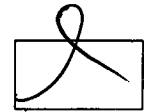
**To:** Thomas, George

**Subject:** Input on Concrete Degradation for the 2013 U. S. National Report for the Convention on Nuclear Safety

George,

Please call me at (301) 415-2746 so we can discuss the required input noted above.

Tony



**Chaudhary, Suresh**

---

**From:** Conte, Richard  
**Sent:** Monday, March 11, 2013 2:07 PM  
**To:** Dean, Bill; Miller, Chris; Clifford, James; Trapp, James  
**Cc:** Cook, William; Raymond, William; Chaudhary, Suresh  
**Subject:** FW: Debrief between Commissioner Magwood and RA Bill Dean today FW: Can you please get me some information

Bill is this a good enough example of fame to show the potential impact of ASR.

**From:** Sheikh, Abdul  
**Sent:** Monday, March 11, 2013 1:33 PM  
**To:** Conte, Richard  
**Subject:** RE: Debrief between Commissioner Magwood and RA Bill Dean today FW: Can you please get me some information

<http://losangeles.urbdezine.com/2012/07/18/6th-street-viaduct-replacement-project/>

**From:** Conte, Richard  
**Sent:** Monday, March 11, 2013 1:04 PM  
**To:** Thomas, George; Sheikh, Abdul; Buford, Angela; Erickson, Alice; Raymond, William  
**Cc:** McMurtray, Anthony; Marshall, Michael; Cook, William; Chaudhary, Suresh  
**Subject:** Debrief between Commissioner Magwood and RA Bill Dean today FW: Can you please get me some information

You guys have anything quick in terms of this bridges or highways closed or were demolished because of ASR.

Most of the references talk about this bridge girder and that bridge column but they don't say this was shut down because of it – most likely for obvious reasons.

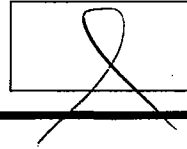
**From:** Dean, Bill  
**Sent:** Monday, March 11, 2013 11:11 AM  
**To:** Conte, Richard  
**Cc:** Cook, William; Miller, Chris; Clifford, James  
**Subject:** Can you please get me some information

Rich  
During a periodic with Comm. Magwood today, in talking about ASR, he asked me what DOT's experiences were with severe degradation as a result of ASR (e.g., have they had to close bridges, roads, etc.). Do we have anything I could share with him on that particular question?

Thanks

Bill

H14



**Chaudhary, Suresh**

**From:** Conte, Richard  
**Sent:** Thursday, March 28, 2013 8:18 PM  
**To:** Floyd, Niklas; Sheehan, Neil; Trapp, James; Cook, William; Raymond, William; Chaudhary, Suresh  
**Cc:** Clifford, James; Miller, Chris  
**Subject:** FW: Dispatch of Final Document: Summary of Meeting Held on February 21, 2013, Between the NRC and Nextera Energy Seabrook Nuclear Power Station LRA (TAC NO. ME4028)

The document should be linked on the Seabrook ASR website.

Jim and Chris, important messages from DLR on the lack of a technical basis for ASR AMP. From today's discussion, Jim Connelly Director of Engineering for NextEra is to discuss next steps with Melanie Galloway. It does look like they are choosing the path to rely on the Ferguson Lab test results.

There remains an important internal to NRR interface issue on what DORL/DE accepts for the CLB, will it be acceptable to DLR? It would appear that the three groups need to coordinate. NexEra suggests that there may be problems on this area starting with what is needed the docket. We suggested to NextEra that Louise Lund be invited into the discussion with DLR.

Angie Buford was onsite and she will brief Melanie on the details.

---

**From:** Green, Rodneshia  
**Sent:** Thursday, March 28, 2013 5:17 PM  
**To:** RidsNrrDir Resource; RidsNrrDirRpb1 Resource; RidsNrrDirRpb2 Resource; RidsNrrDirRarb Resource; RidsNrrDirRasb Resource; RidsNrrDirRapb Resource; RidsNrrDirRerb Resource; RidsNrrDirRsrsg Resource; RidsNrrDraApla Resource; Wrona, David; James, Lois; Lamb, John; McIntyre, David; Dacus, Eugene; Spencer, Mary; Smith, Maxwell; Trapp, James; Conte, Richard; McNamara, Nancy; Sheehan, Neil; Screnci, Diane; Raymond, William; Burritt, Arthur; Jennerich, Matthew; Greives, Jonathan; Schroeder, Daniel  
**Cc:** Milano, Patrick; Morey, Dennis  
**Subject:** Dispatch of Final Document: Summary of Meeting Held on February 21, 2013, Between the NRC and Nextera Energy Seabrook Nuclear Power Station LRA (TAC NO. ME4028)

[View ADAMS P8 Properties ML13066A488](#) *Access public*  
[Open ADAMS P8 Document \(Summary of Meeting Held on February 21, 2013, Between the NRC and NextEra Energy Seabrook, LLS Regarding License Renewal Application, Seabrook Station \(TAC No. ME4028\).\)](#)

**Date:** March 21, 2013

**Memorandum to:** NextEra Energy Seabrook, LLC.

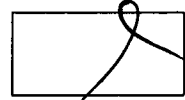
**From:** Patrick Milano, Sr. PM, RPB1, DLR

**Subject:** SUMMARY OF MEETING HELD ON FEBRUARY 21, 2013, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND NEXTERA ENERGY SEABROOK, LLC., REGARDING THE SEABROOK NUCLEAR POWER STATION LICENSE RENEWAL APPLICATION (TAC NO. ME4028)

*H-15*

*RODNESHIA Y. GREEN*  
*NRR/DLR ADMINISTRATIVE ASSISTANT*  
*(301) 415-1183*  
*U.S. NUCLEAR REGULATORY COMMISSION*  
*RODNESHIA.GREEN@NRC.GOV*

**Trapp, James**



**From:** Cook, William  
**Sent:** Monday, April 22, 2013 12:26 PM  
**To:** Sheikh, Abdul; Buford, Angela  
**Cc:** Marshall, Michael; Trapp, James; Floyd, Niklas; Chaudhary, Suresh  
**Subject:** RE: Seabrook ASR - University of Texas Test Procedures and Related Documents

Abdul,

We are charging our time to the inspection report 05000443/2012010. The documents of interest are the anchor bolt test and the large scale beam test. The anchor bolt test overview was recently submitted (redacted and unredacted version) and the beam testing overarching document and test specifications procedures are yet to be made available. All are in Certrec or soon should be (4/30/13 target). We will keep you in the loop. Thanks for supporting and welcome to the inspection team!

Bill

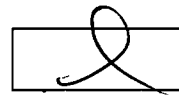
**From:** Sheikh, Abdul  
**Sent:** Monday, April 22, 2013 11:05 AM  
**To:** Buford, Angela; Cook, William  
**Cc:** Marshall, Michael  
**Subject:** Seabrook ASR - University of Texas Test Procedures and Related Documents

I have been asked to prepare for the visit to University of Texas to help in review and observe the tests. Can you please a list of the current documents available on the applicant's server so that I do not spend time reviewing old and superseded documents. Also, can you please let me know the TAC number for this work.

Thanks

H16





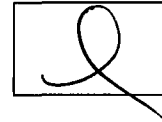
DE/EMCB Comments on AR1644074 Evaluation of Containment Enclosure Building (CEB)

(4-27-11)

1. An important effect of reduction in elastic modulus ( $E_c$ ) of concrete due to ASR is a reduction in stiffness (axial, flexural, shear) of the affected areas relative to the stiffness of the unaffected areas. This would result in redistribution of forces in the global response of the structure under design loads due to changes in the relative stiffness of the affected and unaffected areas from that considered in the original global structural analyses of the CEB using the SAG computer code. Further, since the ASR degradation is in the lower areas of the CEB, the reduction in elastic modulus could affect the boundary conditions assumed in the original analysis at the junction of the basemat and the CEB wall. Note that FSAR Section 3.8.4.4.a states, in part, that "*Lateral forces are transferred to the foundation mats primarily by the action of shear walls; some load is also transferred by means of flexural action of the wall, all of which are rigidly attached at the mat.*" Also refer to pages 11 and 12 of Calculation C-S-1-10150. The AR1644074 Evaluation does not address the effect of the reduced modulus on the global response of the structure. It assumes that the forces and moments in the different elements of the structure under design loads remains the same and only evaluates the local sections (concrete stresses, strains and flexural capacity) for the reduced modulus, which are based on forces and moments from the original structural analysis.
2. The AR1644074 Evaluation does not evaluate the effect of the reduced modulus on the shear capacity of the affected area. [This might be a point of inconsistency. DLR appears willing to accept for now the possibility that an analytical approach would be acceptable in order to estimate the shear force, which is what NextEra is planning to do. However, there seems to be an insistence (DE/DLR) that the shear force can only be obtained by tensile strength information. Does DE believe that an analytical approach is feasible. If there are serious concerns about the feasibility of an analytical approach, we should communicate that soon – NextEra is considering a clarification at a management meeting.]
3. The AR1644074 Evaluation does not address the effect of the reduced modulus on the potential changes in the natural frequencies of the CEB structure, which could have effect the response of the structure to seismic load.
4. The AR1644074 Evaluation of the local section does not evaluate the effect of reduced modulus on stress and strain in the rebar. The strain in the rebar could go beyond the yield strain. From page 47 of Calc CE-4 referenced in the evaluation for element 255, the stress in the hoop reinforcement is 61.493 ksi, which is already beyond yield.
5. The AR1644074 Evaluation of the local section is based on element 255, which is 27" thick and appears to be outside the area affected by ASR. The areas affected by ASR appear to be at the lower elevations of the CEB which are 36" thick. A critical element in the affected area needs to be evaluated. Further, note that the forces and moments in

element 255 could increase based on Comment 1 above, and thereby further affect concrete and rebar stresses and strains in element 255.

6. The AR1644074 Evaluation does not explicitly evaluate the effect of the reduced modulus on the flexural capacity of affected local sections, but makes reference to Calc C-S-1-10150 performed for the electrical tunnel. The effect on flexural capacity of the affected Section of the CEB should be explicitly evaluated since the effect of the reduced modulus on moment capacity of a section is a function of the amount of reinforcement in the section, the section dimensions and material properties. The CEB wall reinforcement, dimensions and material properties appear significantly different from that of the electrical tunnel.
7. On page 2 of the AR1644074 Evaluation, it is stated that "The reduction in  $E_c$  causes the neutral axis of the balanced concrete and reinforcing steel section to shift toward the tension reinforcing steel." It appears that the reduction in  $E_c$  would tend to cause the neutral axis to shift toward the extreme compression fiber that the tension reinforcing steel [ What does this phrase mean in the context of the whole sentence and what does the shift to the extreme compression fiber mean in the context of the adequacy of the evaluation – NextEra is considering a clarification at a management meeting.]
8. To have any level of statistical validity, the number of cores used in an evaluation should be at least 3. The AR1644074 Evaluation uses results based on only 2 core tests of the ASR affected area. [This might be a potential inconsistent message. The DLR telecon of 5/31 did not address their commitment in letter of April 14 to sample IAW with ACI 228.1R-03, "in-Place Methods to Estimate Concrete Strength" as being adequate or not. It is the Region's understanding that the Containment Enclosure Building sampling met this standard. There are other later ACI standards that would require more sampling on any one wall based on statistical analysis to 95% confidence level) and our seminar leader suggests at 3 samples, good, bad and mediocre – NextEra is considering a clarification at a management meeting.]
9. What are the strain levels at the reported values of concrete compressive strength and elastic modulus from core tests reported in Table 1 of AR1644074? Does petrographic examination of the cores indicate ASR through the thickness of the wall.
10. The AR1644074 evaluation should include a problem statement description of the condition being evaluated and its preliminary extent (at least based on visual inspection) for the structure in question so that an outside reviewer can understand what is being evaluated.



**From:** Miller, Ed  
**Sent:** Tuesday, May 31, 2011 3:10 PM  
**To:** Lehman, Bryce; Sheikh, Abdul; Conte, Richard; Modes, Michael; Raymond, William; Auluck, Rajender; Burritt, Arthur; Galloway, Melanie  
**Subject:** Response to Chairman Questions from ASR Briefing

Here is the final version we sent to the Chairman.

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**From:** Miller, Ed  
**Sent:** Tuesday, May 31, 2011 3:08 PM  
**To:** Marshall, Michael  
**Cc:** Galloway, Melanie; Raymond, William; Bowman, Gregory  
**Subject:**

Mike,

Here are answers to the follow-up questions from the briefing to Chairman Jaczko on the Seabrook ASR issue. Please let me know if you need any additional information.

Ed Miller  
415-2481

Q1: Has ASR occurred in the DC Metro?

A1: A quick search did not identify any documentation of ASR occurring in the DC Metro,

Q2: Additional information on the Containment Enclosure Building.

A2: The Containment Enclosure Building (CEB) at Seabrook functions in a similar fashion to secondary containments at some BWRs. It serves to collect any fission products that may leak from the primary containment structure following a LOCA. The area between the two containment structures is maintained at a negative pressure (~0.25" water gauge) to ensure that any leakage into the area is 1) collected; 2) filtered (HEPA and charcoal); and 3) released from an elevated location in a controlled and monitored fashion. Millstone Units 2 and 3 have a similar structure in both function and construction. Sites that have structures with a similar function, but different construction are Waterford 3, Davis-Besse, St. Lucie 1 and 2, Kewaunee, Prairie Island 1 and 2, Sequoyah 1 and 2, and Watts Bar 1.

Q3: What experience has the international nuclear community had with ASR?

A3: ASR has been confirmed at Gentilly Units 1 and 2 in Becancour, Quebec. ASR has also been confirmed at Saint-Laurent A1 in Saint-Laurent, France. Additionally, ASR degradation has been identified in the turbine generator foundation at Ikata No. 1 in Japan. We will seek additional information of these cases to inform our understanding at Seabrook.

Q4: What is the effect of this degradation on external events response (earthquake, tornado, etc)?

A4: The Seabrook seismic Category I structures are designed to house safety related equipment and protect them from postulated environmental conditions as described in the FSAR. The structure design includes consideration of combinations of loads (normal and

117

accident), and loads due to site severe and extreme environmental conditions. Since ASR develops in the presence of water, the above grade portions of structures are unaffected by ASR such that the ability of the structure to resist environmental loads (wind and tornado) would not be affected. Although ASR has impacted the below grade concrete walls, the structures remain operable for site environmental extreme events, including flooding and earthquakes. Although concrete strength and modulus were reduced compared to the initial values, the licensee's preliminary operability determination determined that the concrete strength remained above the values needed for the design basis loads. Similarly, the preliminary operability determination determined that the change in the flexure of the below grade walls was small given the margins available. The NRC staff continues to review the licensee's analytical methods to validate these conclusions.

Q5: What acceptance testing is available for detecting reactive aggregates prior to construction? What testing did Seabrook perform?

A5: ASR has been a known degradation mechanism since the late 1930's and ASTM standards have been in place since the 1950's to test for reactive aggregates prior to construction. Several of these standards were used during construction at Seabrook; however, recent experience has demonstrated that these older standards are inadequate in their ability to identify slowly reacting aggregates (i.e., the standard may identify an aggregate as non-reactive only to have it begin reacting after 10 or 20 years in service). Newer standards introduced in the late 1980's and early 90's are better able to identify slowly reacting aggregates but have their own drawbacks. Experts are continuing to work to develop a test which can reliably identify all reactive aggregates in a reasonable amount of time. Based on the OE and standards specified during construction, Seabrook probably used slowly reacting aggregates which were not identified as reactive during the initial testing. This is one of the issues the NRC and the licensee are actively investigating.

**Tift, Doug**

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**From:** Conte, Richard  
**Sent:** Monday, February 11, 2013 10:21 AM  
**To:** Roberts, Darrell; Dentel, Glenn; Wilson, Peter; Miller, Chris; Trapp, James; Cook, William  
**Cc:** Raymond, William; Chaudhary, Suresh; Floyd, Niklas; Sheehan, Neil; Screnci, Diane; Tift, Doug; McNamara, Nancy  
**Subject:** FW: Dispatch of Final Document: Forthcoming Meeting With Nextera Energy Seabrook, LLC (NEXTERA) Regarding License Renewal for the Seabrook Station

For your particular focus.

We knew it was coming about based on last week's brief at a working group meeting and before that.

It is a technical meeting to resolve several back and fourths on RAls in the License Renewal Area.

- a. Identification/Characterization of aging effects associated with alkali-silica reaction (ASR)
- b. Effectiveness of proposed actions to manage the effects of aging associated with ASR
- c. Applicability of technical basis to the various structures within scope of license renewal

Jim Trapp and Bill Cook are slated to attend.

**From:** Spruill, Crystal  
**Sent:** Monday, February 11, 2013 10:12 AM  
**To:** RidsNrrDlr Resource; RidsNrrDlrRapb Resource; RidsNrrDlrRarb Resource; RidsNrrDlrRasb Resource; RidsNrrDlrRerb Resource; RidsNrrDlrRpb1 Resource; RidsNrrDlrRpb2 Resource; RidsNrrDraApla Resource; Morey, Dennis; Wrona, David; Milano, Patrick; James, Lois; McIntyre, David; Dacus, Eugene; Spencer, Michael; Smith, Maxwell; Schroeder, Daniel; Trapp, James; Conte, Richard; McNamara, Nancy; Sheehan, Neil; Screnci, Diane; Raymond, William; Greives, Jonathan; Jennerich, Matthew; Burritt, Arthur  
**Subject:** Dispatch of Final Document: Forthcoming Meeting With Nextera Energy Seabrook, LLC (NEXTERA) Regarding License Renewal for the Seabrook Station

[View ADAMS P8 Properties ML13038A624](#) *Mr. Trapp Public*  
[Open ADAMS P8 Document \(02/21/2013 Forthcoming Meeting With Nextera Energy Seabrook, LLC \(NEXTERA\) Regarding License Renewal for the Seabrook Station.\)](#)

**Date:** February 8, 2013

**Meeting Notice: Forthcoming Meeting With Nextera Energy Seabrook, LLC (NEXTERA) Regarding License Renewal for the Seabrook Station**

*Thank You,*  
*Crystal D. Spruill,*  
Office of Nuclear Reactor Regulation  
Division of License Renewal, Location: O-11H08  
Office: 301-415-1183 Direct: 301-415-2287  
[Crystal.Spruill@nrc.gov](mailto:Crystal.Spruill@nrc.gov)



*818*

**From:** Debbie Grinnell [debbie@c-10.org]  
**Sent:** Wednesday, February 27, 2013 2:24 PM  
**To:** Conte, Richard  
**Subject:** Seabrook

Dear Richard,

If I understand this correctly, Sections 3.8.1 on concrete containment and 3.8.5 on foundations describe the governing regulations and means that NRC reviewers should pursue to determine if licensees have satisfied the regulations.

What specific regulatory requirements and NRC procedures will be used to determine whether the efforts undertaken by NextEra are acceptable?

We are aware in phone conversations with you, that the NRC has asked NextEra why they choose not to use Unit 2 for their replica project. Unit 2 is logical as it is unused, of the same concrete composite and subjected to the same water infiltration to subsurface foundations that lie side-by side and in close proximity to Unit 1. NextEra's response was "secondary to industrial safety hazard concerns". What does that mean? Unit 2 containment was capped and has been aggressively dewatered as long as Unit 1. The dewatering hasn't worked and doesn't work It does however dilute.

What has the NRC requested to clarify the basis of NextEra's rational to not use Unit 2? What investigation of the Unit 2 structures have been made for concrete degradation and ASR specifically?

We know Unit 2 has been dewatered for as long as Unit 1 and exposed to subsurface water although not to the boric acid, heat, humidity and radionuclides from the spent fuel pool that Unit 1 has been subjected to. Operators reported to the ACRS that the containment annulus was in six feet of water since construction.

How are you going to evaluate this Texas examination and the results? What objective criteria are you going to use?

Thank you.

Debbie

Debbie Grinnell

C-10 Foundation

44 Merrimac Street

Newburyport, Ma.

978-465-6646

#19

Debbie – I am responding to your email dated February 27, 2013, asking questions regarding Seabrook's Alkali-Silica Reaction (ASR) concrete issues. I trust the information provided below will help to answer your questions.

You asked what governing regulations and means that NRC reviewers would use to determine if NextEra has satisfied the regulations. Specifically, what specific regulatory requirements and NRC procedures will be used to determine whether the efforts undertaken by NextEra are acceptable?

While the ASR issue at Seabrook is a first-of-a-kind issue for the United States nuclear industry, the processes that the NRC will use to assess the resolution of the issue will be existing processes that have been historically applied with effectiveness to evaluate changes to nuclear power plant licensing bases. With operability determinations on the affected structures completed and reviewed by NRC (as communicated in the December 2012 public meeting), NextEra and NRC staff attention has turned to effective monitoring until the testing associated with the research and development effort is complete. Should NextEra rely on the test results, they will need to determine how those results relate to the current licensing and design basis. If they are relying on a different methodology, then 10 CFR 50.59 requires that the change be subject to NRC staff review.

NextEra has initiated a research and testing program in conjunction with the University of Texas Ferguson Structural Engineering Laboratory (FSEL) to demonstrate that the existing safety-related structures meet the current licensing and design bases. If acceptable, the results of this testing may supplement the existing prompt operability evaluation that has demonstrated, using conservative ASR impact of performance assumptions, that the concrete structures remain operable. Should conditions warrant NRC staff review in accordance with 10 CFR 50.59, and 50.90 for a license amendment, then the NRC staff would review the change in accordance with 10 CFR, 50.90 and NUREG-0800 "Standard Review Plan (SRP)" (for example, Section 3.8.4 applies to review of affected "Other Category 1 Structures") and the corresponding Updated Final Safety Analysis Report (UFSAR) sections that define the current licensing basis. NextEra's UFSAR provides information on the original plant licensing review based, in part, on ACI 318-71 and others codes and standards. It must be noted that the SRP provides one approach acceptable to the NRC staff to meet the applicable regulatory requirements. However, licensees may adopt other appropriate technical approaches for the specific issue(s) being addressed in order to meet the applicable regulations in 10 CFR 50 Appendix A, General Design Criteria (e.g. for Other Category 1 Structures, GDC 1, 2, and 4 as applicable) and demonstrate that the intended functions would be accomplished, which are reviewed on a case-by-case basis.

It is expected that the information used will be based on those measures from applicable quality assurance requirements in 10 CFR 50 Appendix B and, specifically, Criterion XI "Test Control." The information developed would be used for the final operability determination or a license amendment request, as the case may be. The licensee's processes and procedures to arrive at the final corrective action to comprehensively address the ASR issue would also be evaluated against the applicable quality assurance requirements in 10 CFR 50 Appendix B in general, and specifically Criterion XVI "Corrective Action." Inspections to-date had confirmed the use of such measures on a sampling basis.

You also questioned whether there would be an advantage to conducting ASR related concrete testing on Unit 2 structures and whether or not the NRC staff has evaluated using the concrete at Unit 2 for the research and development effort.

While conducting material testing of Unit 2 concrete is a possibility and may be informative, it was not proposed by NextEra as reflected in Confirmatory Action Letters responses. Further the use of Unit 2 concrete appears to have limited technical value as conditions in Unit 2 have not been the same as those in Unit 1 as reflected in the long term abandonment of Unit 2. NextEra also abandoned the taking of Unit 2 concrete core samples due to adverse environmental and occupational safety and hazardous conditions, a consequence of the abandonment.

The FSEL test program will fabricate and test block and beams at various levels of ASR, some of which exceed those currently experienced at Seabrook. The blocks and beams will be tested to failure (anchor breakout, flexure, shear, lap splice (bond), etc.), and the results of these tests will be used to establish the effects on structural performance of ASR affected concrete. Also, there will also be a comparison of ASR affected beam test results with those for control beams unaffected by ASR. Therefore, it would appear to be impractical to do this type of testing with sawed out large-scale specimens from existing below grade Unit 2 concrete structures.

Overall, the NRC staff will not apply resources to something that has not been proposed.



**Tift, Doug**

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**From:** Trapp, James  
**Sent:** Wednesday, February 27, 2013 3:42 PM  
**To:** Conte, Richard; Dentel, Glenn; Floyd, Niklas; Chaudhary, Suresh; Raymond, William  
**Cc:** Miller, Chris; Clifford, James; Lew, David; Dean, Bill; Tift, Doug; Screnci, Diane; Lamb, John; Khanna, Meena; McNamara, Nancy; McMurtray, Anthony; Sheehan, Neil  
**Subject:** RE: Seabrook

Rich - let's meet early next week to develop a strategy for response. I think we can put together informed responses to all the concerns discussed in the email using the collective knowledge of our task force members.

I don't see anything in the email that requires an immediate response or change in our approach.

---

**From:** Conte, Richard  
**Sent:** Wednesday, February 27, 2013 3:15 PM  
**To:** Trapp, James; Dentel, Glenn; Floyd, Niklas; Chaudhary, Suresh; Raymond, William  
**Cc:** Miller, Chris; Clifford, James; Lew, David; Dean, Bill; Tift, Doug; Screnci, Diane; Lamb, John; Khanna, Meena; McNamara, Nancy; McMurtray, Anthony; Sheehan, Neil  
**Subject:** FW: Seabrook

We will need a strategy to respond - phone call or email back to her.

In my phone calls with her this week she did not seem to understand that we do not evaluate options not presented by the licensee. The CAL responses have or will be evident that Unit 2 study is not on the table.

She is also considering a letter or 2.206 petition – looks like she opted for the email route for now.

Whatever we say we should run by NRR, I have a working group scheduled for March 13. Should be able to draft something sooner. I already explained the CAL process, the OD process under Part 50 and the potential of review by 50.59 and 50.90 once test information is relied upon.

**From:** Debbie Grinnell [<mailto:debbie@c-10.org>]  
**Sent:** Wednesday, February 27, 2013 2:24 PM  
**To:** Conte, Richard  
**Subject:** Seabrook

Dear Richard,

If I understand this correctly, Sections 3.8.1 on concrete containment and 3.8.5 on foundations describe the governing regulations and means that NRC reviewers should pursue to determine if licensees have satisfied the regulations.

What specific regulatory requirements and NRC procedures will be used to determine whether the efforts undertaken by NextEra are acceptable?

We are aware in phone conversations with you, that the NRC has asked NextEra why they choose not to use Unit 2 for their replica project. Unit 2 is logical as it is unused, of the same concrete composite and subjected to the same water infiltration to subsurface foundations that lie side-by-side and in close proximity to Unit 1. NextEra's response was "secondary to industrial safety hazard concerns". What does that mean? Unit 2 containment was capped and has been aggressively dewatered as long as Unit 1. The dewatering hasn't worked and doesn't work. It does however dilute.

H2O

What has the NRC requested to clarify the basis of NextEra's rational to not use Unit 2? What investigation of the Unit 2 structures have been made for concrete degradation and ASR specifically?

We know Unit 2 has been dewatered for as long as Unit 1 and exposed to subsurface water although not to the boric acid, heat, humidity and radionuclides from the spent fuel pool that Unit 1 has been subjected to. Operators reported to the ACRS that the containment annulus was in six feet of water since construction.

How are you going to evaluate this Texas examination and the results? What objective criteria are you going to use?

Thank you.

Debbie

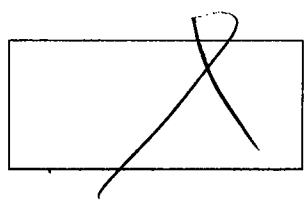
Debbie Grinnell

C-10 Foundation

44 Merrimac Street

Newburyport, Ma.

978-465-6646



**Tift, Doug**

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**From:** Conte, Richard  
**Sent:** Friday, September 21, 2012 4:41 PM  
**To:** Tift, Doug  
**Subject:** RE: Seabrook Question

"Will the plant have to do any testing during the upcoming refueling to determine whether there is ASR in other areas that have yet to be identified?"

While the ASR team review continues, it does not appear to be they need to identify other areas, it appears all potential areas have been identified by a thorough walk-through. Some areas identified as potentially ASR may need further evaluation this outage or beyond.

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**From:** Tift, Doug  
**Sent:** Friday, September 21, 2012 1:47 PM  
**To:** Conte, Richard  
**Subject:** RE: Seabrook Question

Got an answer for me?  
-Doug

---

**From:** Conte, Richard  
**Sent:** Monday, September 17, 2012 2:11 PM  
**To:** Tift, Doug  
**Subject:** RE: Seabrook Question

ok

---

**From:** Tift, Doug  
**Sent:** Monday, September 17, 2012 2:10 PM  
**To:** Conte, Richard  
**Subject:** RE: Seabrook Question

Ok. Let me know Friday.

Thanks,  
-Doug

---

**From:** Conte, Richard  
**Sent:** Monday, September 17, 2012 2:09 PM  
**To:** Tift, Doug  
**Subject:** RE: Seabrook Question

Yes we will have a more definite by Friday.

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**From:** Tift, Doug  
**Sent:** Monday, September 17, 2012 2:08 PM  
**To:** Conte, Richard  
**Subject:** RE: Seabrook Question

Well, the visit was a couple of weeks ago and I didn't even get the question from OCA until last week, so I get the impression this is not a pressing question.

Are you saying you will have to get this answer by Friday anyway to brief Bill? If so, it can wait until Friday.

-Doug

---

**From:** Conte, Richard  
**Sent:** Monday, September 17, 2012 2:06 PM  
**To:** Tift, Doug  
**Subject:** RE: Seabrook Question

How much time do we have.

We are doing a brief of RA this Friday at 100pm.

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**From:** Tift, Doug  
**Sent:** Monday, September 17, 2012 2:05 PM  
**To:** Conte, Richard  
**Cc:** McNamara, Nancy; Burritt, Arthur  
**Subject:** RE: Seabrook Question

Not yet.

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**From:** Conte, Richard  
**Sent:** Monday, September 17, 2012 2:05 PM  
**To:** Tift, Doug  
**Cc:** McNamara, Nancy; Burritt, Arthur  
**Subject:** RE: Seabrook Question

Was this ever answered?

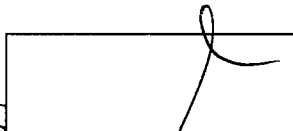
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**From:** Tift, Doug  
**Sent:** Thursday, September 13, 2012 8:43 AM  
**To:** Conte, Richard  
**Cc:** McNamara, Nancy; Burritt, Arthur  
**Subject:** FW: Seabrook Question

Rich,

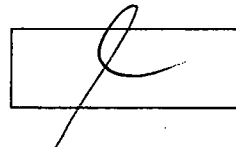
Gene received a question from a Congressional staffer.

Thanks,  
-Doug



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**From:** Dacus, Eugene  
**Sent:** Thursday, September 13, 2012 8:35 AM  
**To:** Tift, Doug  
**Subject:** Seabrook Question



Doug,

Got this question from a staffer: "Will the plant have to do any testing during the upcoming refueling to determine whether there is ASR in other areas that have yet to be identified?"

Eugene Dacus  
Sr. Congressional Affairs Officer  
U.S. Nuclear Regulatory Commission  
Office: 301-415-1697  
Fax: 301-415-8571  
E-mail: [eugene.dacus@nrc.gov](mailto:eugene.dacus@nrc.gov)

## Chaudhary, Suresh

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**From:** Conte, Richard  
**Sent:** Wednesday, February 27, 2013 3:16 PM  
**To:** Trapp, James; Dentel, Glenn; Floyd, Niklas; Chaudhary, Suresh; Raymond, William  
**Cc:** Miller, Chris; Clifford, James; Lew, David; Dean, Bill; Tift, Doug; Scenci, Diane; Lamb, John; Khanna, Meena; McNamara, Nancy; McMurtray, Anthony; Sheehan, Neil  
**Subject:** FW: Seabrook

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In my phone calls with her this week she did not seem to understand that we do not evaluate options not presented by the licensee. The CAL responses have or will be evident that Unit 2 study is not on the table.

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Whatever we say we should run by NRR, I have a working group scheduled for March 13. Should be able to draft something sooner. I already explained the CAL process, the OD process under Part 50 and the potential of review by 50.59 and 50.90 once test information is relied upon.

---

**From:** Debbie Grinnell [<mailto:debbie@c-10.org>]  
**Sent:** Wednesday, February 27, 2013 2:24 PM  
**To:** Conte, Richard  
**Subject:** Seabrook

Dear Richard,

If I understand this correctly, Sections 3.8.1 on concrete containment and 3.8.5 on foundations describe the governing regulations and means that NRC reviewers should pursue to determine if licensees have satisfied the regulations.

What specific regulatory requirements and NRC procedures will be used to determine whether the efforts undertaken by NextEra are acceptable?

We are aware in phone conversations with you, that the NRC has asked NextEra why they choose not to use Unit 2 for their replica project. Unit 2 is logical as it is unused, of the same concrete composite and subjected to the same water infiltration to subsurface foundations that lie side-by side and in close proximity to Unit 1. NextEra's response was "secondary to industrial safety hazard concerns". What does that mean? Unit 2 containment was capped and has been aggressively dewatered as long as Unit 1. The dewatering hasn't worked and doesn't work It does however dilute.

What has the NRC requested to clarify the basis of NextEra's rational to not use Unit 2? What investigation of the Unit 2 structures have been made for concrete degradation and ASR specifically?

We know Unit 2 has been dewatered for as long as Unit 1 and exposed to subsurface water although not to the boric acid, heat, humidity and radionuclides from the spent fuel pool that Unit 1 has been subjected to. Operators reported to the ACRS that the containment annulus was in six feet of water since construction.

How are you going to evaluate this Texas examination and the results? What objective criteria are you going to use?

Thank you.

Debbie

Debbie Grinnell  
C-10 Foundation  
44 Merrimac Street  
Newburyport, Ma.  
978-465-6646

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978-465-6646

H 23



Debbie – I am responding to your email dated February 27, 2013, asking questions regarding Seabrook's Alkali-Silica Reaction (ASR) concrete issues. I trust the information provided below will help to answer your questions.

You asked what governing regulations and means that NRC reviewers would use to determine if NextEra has satisfied the regulations. Specifically, what specific regulatory requirements and NRC procedures will be used to determine whether the efforts undertaken by NextEra are acceptable?

While the ASR issue at Seabrook is a first-of-a-kind issue for the United States nuclear industry, the processes that the NRC will use to assess the resolution of the issue will be existing processes that have been historically applied with effectiveness to evaluate changes to nuclear power plant licensing bases. With operability determinations on the affected structures completed and reviewed by NRC (as communicated in the December 2012 public meeting), NextEra and NRC staff attention has turned to effective monitoring until the testing associated with the research and development effort is complete. Should NextEra rely on the test results, they will need to determine how those results relate to the current licensing and design basis. If they are relying on a different methodology, then 10 CFR 50.59 requires that the change be subject to NRC staff review.

NextEra has initiated a research and testing program in conjunction with the University of Texas Ferguson Structural Engineering Laboratory (FSEL) to demonstrate that the existing safety-related structures meet the current licensing and design bases. If acceptable, the results of this testing may supplement the existing prompt operability evaluation that has demonstrated, using conservative ASR impact of performance assumptions, that the concrete structures remain operable. Should conditions warrant NRC staff review in accordance with 10 CFR 50.59, and 50.90 for a license amendment, then the NRC staff would review the change in accordance with 10 CFR, 50.90 and NUREG-0800 "Standard Review Plan (SRP)" (for example, Section 3.8.4 applies to review of affected "Other Category 1 Structures") and the corresponding Updated Final Safety Analysis Report (UFSAR) sections that define the current licensing basis. NextEra's UFSAR provides information on the original plant licensing review based, in part, on ACI 318-71 and others codes and standards. It must be noted that the SRP provides one approach acceptable to the NRC staff to meet the applicable regulatory requirements. However, licensees may adopt other appropriate technical approaches for the specific issue(s) being addressed in order to meet the applicable regulations in 10 CFR 50 Appendix A, General Design Criteria (e.g. for Other Category 1 Structures, GDC 1, 2, and 4 as applicable) and demonstrate that the intended functions would be accomplished, which are reviewed on a case-by-case basis.

It is expected that the information used will be based on those measures from applicable quality assurance requirements in 10 CFR 50 Appendix B and, specifically, Criterion XI "Test Control." The information developed would be used for the final operability determination or a license amendment request, as the case may be. The licensee's processes and procedures to arrive at the final corrective action to comprehensively address the ASR issue would also be evaluated against the applicable quality assurance requirements in 10 CFR 50 Appendix B in general, and specifically Criterion XVI "Corrective Action." Inspections to-date had confirmed the use of such measures on a sampling basis.

You also questioned whether there would be an advantage to conducting ASR related concrete testing on Unit 2 structures and whether or not the NRC staff has evaluated using the concrete at Unit 2 for the research and development effort.

While conducting material testing of Unit 2 concrete is a possibility and may be informative, it was not proposed by NextEra as reflected in Confirmatory Action Letters responses. Further the use of Unit 2 concrete appears to have limited technical value as conditions in Unit 2 have not been the same as those in Unit 1 as reflected in the long term abandonment of Unit 2. NextEra also abandoned the taking of Unit 2 concrete core samples due to adverse environmental and occupational safety and hazardous conditions, a consequence of the abandonment.

The FSEL test program will fabricate and test block and beams at various levels of ASR, some of which exceed those currently experienced at Seabrook. The blocks and beams will be tested to failure (anchor breakout, flexure, shear, lap splice (bond), etc.), and the results of these tests will be used to establish the effects on structural performance of ASR affected concrete. Also, there will also be a comparison of ASR affected beam test results with those for control beams unaffected by ASR. Therefore, it would appear to be impractical to do this type of testing with sawed out large-scale specimens from existing below grade Unit 2 concrete structures.

Overall, the NRC staff will not apply resources to something that has not been proposed.

**Tift, Doug**

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**From:** Trapp, James  
**Sent:** Wednesday, February 27, 2013 3:42 PM  
**To:** Conte, Richard; Dentel, Glenn; Floyd, Niklas; Chaudhary, Suresh; Raymond, William  
**Cc:** Miller, Chris; Clifford, James; Lew, David; Dean, Bill; Tift, Doug; Screnci, Diane; Lamb, John; Khanna, Meena; McNamara, Nancy; McMurtray, Anthony; Sheehan, Neil  
**Subject:** RE: Seabrook

Rich - let's meet early next week to develop a strategy for response. I think we can put together informed responses to all the concerns discussed in the email using the collective knowledge of our task force members.

I don't see anything in the email that requires an immediate response or change in our approach.

---

**From:** Conte, Richard  
**Sent:** Wednesday, February 27, 2013 3:15 PM  
**To:** Trapp, James; Dentel, Glenn; Floyd, Niklas; Chaudhary, Suresh; Raymond, William  
**Cc:** Miller, Chris; Clifford, James; Lew, David; Dean, Bill; Tift, Doug; Screnci, Diane; Lamb, John; Khanna, Meena; McNamara, Nancy; McMurtray, Anthony; Sheehan, Neil  
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H 24

A vertical line with checkmarks at the top, middle, and bottom, and a handwritten signature at the bottom right.

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