

## SeabrookNPEM Resource

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**From:** Cunanan, Arthur  
**Sent:** Friday, July 06, 2012 2:00 PM  
**To:** Cliche, Richard  
**Subject:** RE: NextEra Seabrook ACRS slides  
**Attachments:** Seabrook Sub ACRS Mtg 7-10-12.pptx

Rick,

Attached are the Seabrook ACRS presentation slides.

Sincerely,  
Arthur Cunanan  
Project Manager  
Division of License Renewal  
U.S. Nuclear Regulatory Commission  
301-415-3897  
[arthur.cunanan@nrc.gov](mailto:arthur.cunanan@nrc.gov)

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**From:** Cliche, Richard [<mailto:Richard.Cliche@fpl.com>]  
**Sent:** Friday, July 06, 2012 1:55 PM  
**To:** Cunanan, Arthur; Howard, Kent  
**Subject:** NextEra Seabrook ACRS slides

### **Rick Cliche**

*License Renewal Project Manager*

*Seabrook Station*

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**Hearing Identifier:** Seabrook\_License\_Renewal\_NonPublic  
**Email Number:** 3252

**Mail Envelope Properties** (Arthur.Cunanan@nrc.gov20120706135900)

**Subject:** RE: NextEra Seabrook ACRS slides  
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**From:** Cunanan, Arthur

**Created By:** Arthur.Cunanan@nrc.gov

**Recipients:**  
"Cliche, Richard" <Richard.Cliche@fpl.com>  
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**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

# 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)

# 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

# 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

# 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

## **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)





# **License Renewal Inspections**

**Michael Modes**

Region I Inspection Team Leader

# Regional Inspections

## Overview

- Four inspectors for 3 weeks
- 10 CFR 50.4 (a)(2) inspection, non-safety affecting safety portion
- Selected Aging Management Programs for a more thorough onsite review

## AMP Inspection Results

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

## Additional Inspection Issue

- ASME Section XI, Subsection IWL
- Structures Monitoring Program

## 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

## Observation and Findings

- Applicant's review of the effects of 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)

## 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

## **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



## SER Section 3

### 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

# **SER Section 3 Open Items**

## **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

# **SER Section 3 Open Items**

## **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

# **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

# **SER Section 3 Open Items**

## **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

# **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

## **SER Section 4: TLAA**

- 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 TLAAs

# **SER Section 4 Open Item**

## **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.



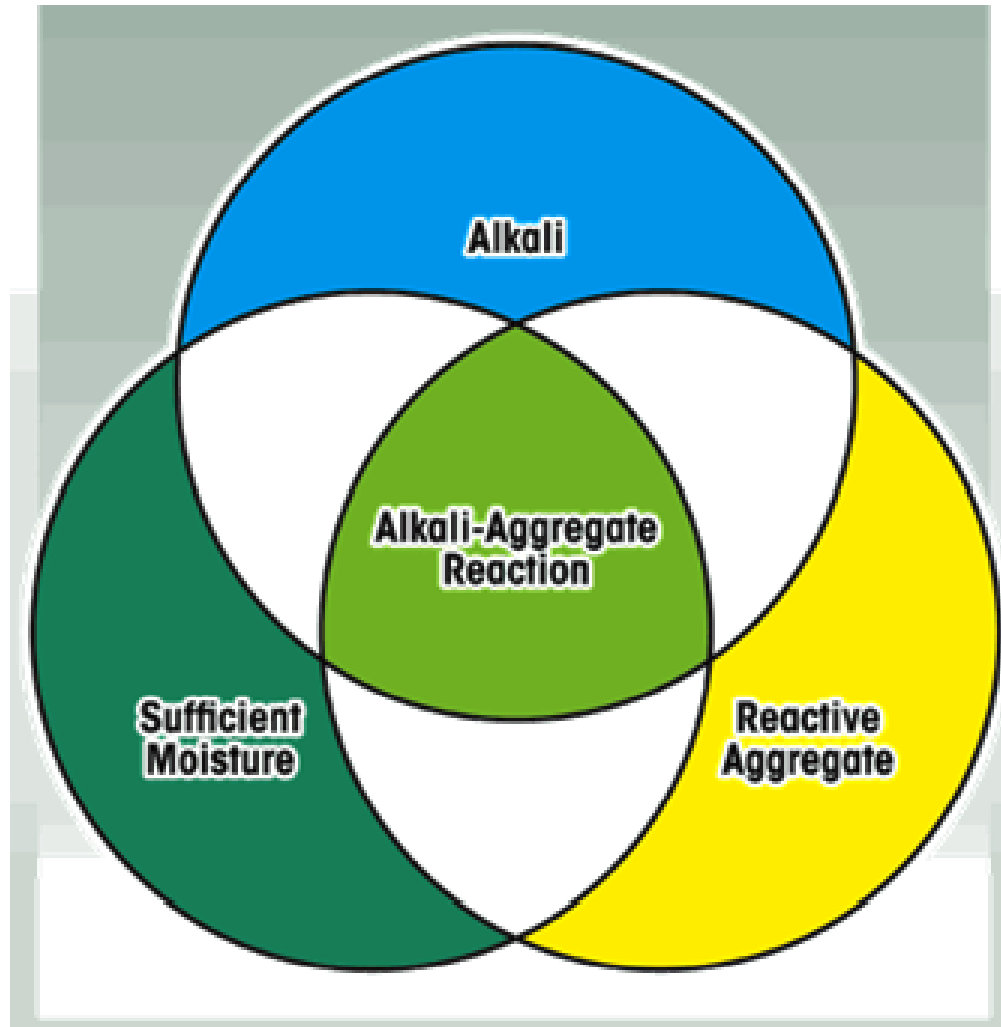
# **SER Section 3 Open Items**

## **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)

# Conditions for Alkali Silica Reaction (ASR)



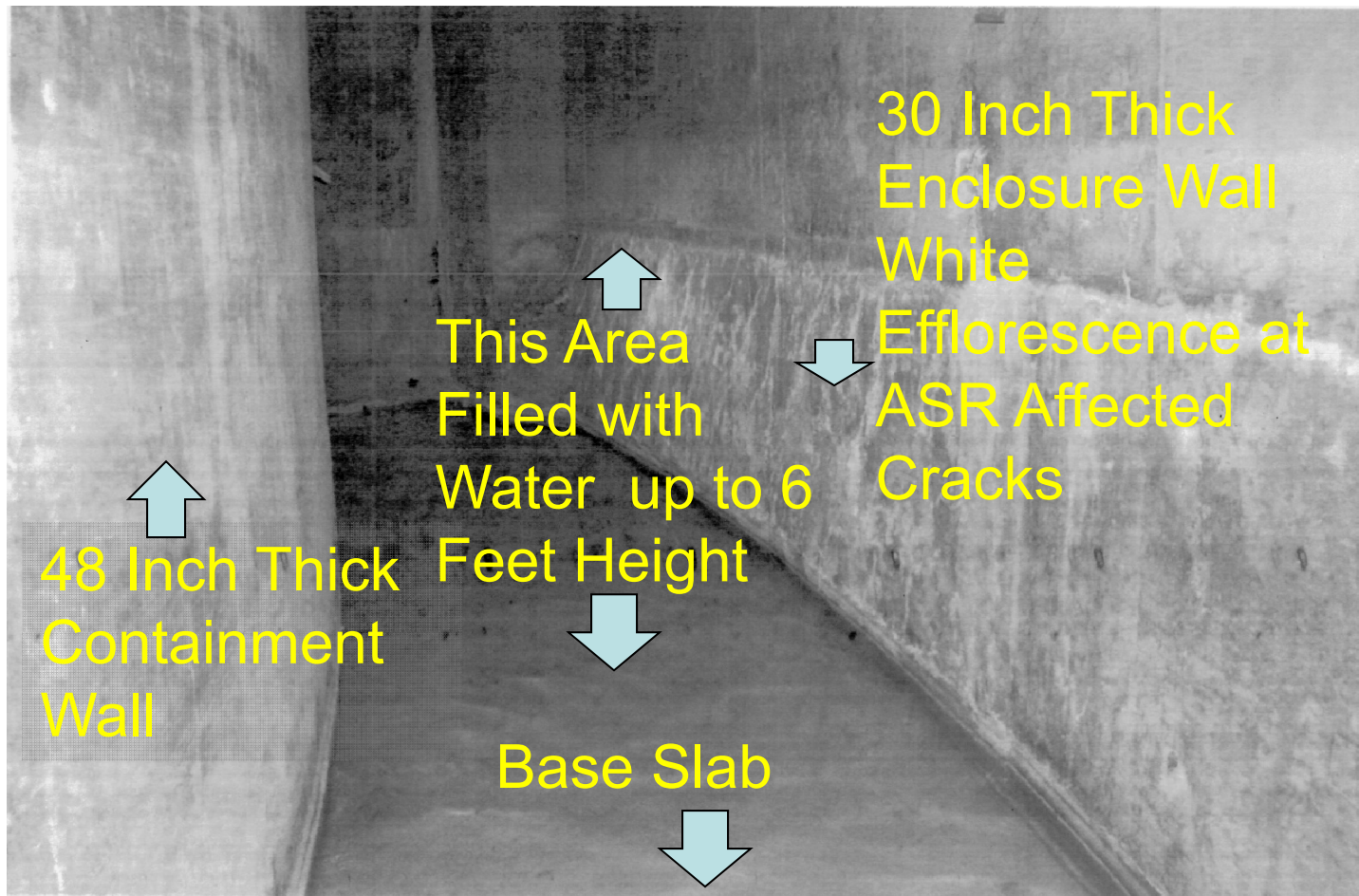
# Effect of ASR on Concrete

- 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

# ASR at Seabrook Electrical Tunnel



# Seabrook Containment and Enclosure Building



# **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
- Applicant's approach for the aging management of ASR affected structures continues to evolve



# **SER Open Item**

## **OI 3.0.3.2.18-1: Containment**

### Staff's Concerns

- 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
  - GALL report and related industry standards require further evaluation of active 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

## **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 under review by the NRC staff
  - Initial Observations:
    - Program acceptance criteria not based on full scale and expansion tests results
    - Acceptance criteria less stringent than industry standards
    - ASR detected by visual examination



# **Aging Management of ASR Affected Structures**

- GALL Report recommends that the applicant augment the AMPs for the specific conditions and operating experience
- Applicant has proposed a plant specific AMP to manage AMP
- An acceptable 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
  - Appropriate acceptance criteria based on test data and additional analysis

## **SER Open Item**

### **OI 3.0.3.2.18-1: Summary**

The applicant has not yet demonstrated that it could adequately manage aging of the Seabrook concrete structures due to ASR for the period of extended operations

## **Conclusion**

Until the applicant can resolve all the open items, 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