SeabrookNPEm Resource

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NEXTera™
ENERGY
SEABROOK
Seabrook Station
ACRS License Renewal Subcommittee
July 10, 2012

Personnel in Attendance

Kevin Walsh	Site Vice President
Jim Connolly	Engineering Director
Mike Collins	Design Engineering Manager
Mike Ossing	Program Engineering Manager
Mike O'Keefe	Licensing Manager
Rick Noble	Special Projects Manager
Rick Cliche	License Renewal Project Manager

Agenda

- **Background**
  - Plant
  - Status
  - Licensing
- **License Renewal Project Overview**
  - Scoping
  - Time Limited Aging Analysis
  - Application of GALL
  - Commitment Process
- **SER Open Items**

Background –

- Located in the Town of Seabrook, New Hampshire, two miles west of the Atlantic Ocean. Approximately two miles north of the Massachusetts state line and 15 miles south of the Maine state line.
- Seabrook Station is a single unit Westinghouse 4-loop pressurized water reactor with a General Electric turbine generator.
- Reactor housed in a steel lined reinforced concrete containment structure which is enclosed by a reinforced concrete containment enclosure structure.
- 3648 MWt Thermal Power; ~ 1,245 net megawatts electric
- The Atlantic Ocean is the normal ultimate heat sink.
- Approximately 1100 people on site, including contractors.

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Plant Site


•Switchyard
•Turbine Building
•Control/Diesel Building
•Containment Building
•Fuel Storage Building
•Primary Auxiliary Building
•Unit #2 Area
•Waste Process Building

Licensing

Construction Permit (CPPR-135)	July 1976
Zero Power Operating License (NPF-56)	October 1986
Low Power Operating License (NPF-67)	May 1989
Full Power Operating License (NPF-86)	March 15, 1990
Commercial Operation	August 1990
Operating License Transfer to FPL Energy (NextEra)	November 2002
Stretch Power Uprate (3587 MW)	February 2005
Measurement Uncertainty Uprate (3648MW)	May 2006
LR Application Submitted	May 25, 2010
Operating License Expires	March 15, 2030

Plant Status

- Cycle 15 – Refuel outage 14 completed in May 2011
- Current Plant Status
- Next Refuel Outage – September 2012

License Renewal Project Overview

- Site Ownership and Oversight
- Experienced Team (Site, Corporate, Contract)
- Benchmarking
- QA Audits
- Participation/Hosted industry working groups
- Industry Peer Review

Project Overview – Scoping

- Utilized site component database, controlled drawings, design and licensing documents
- SSCs Evaluated to Scoping Criteria 10CFR54.4 (a)(1), (a)(2) and (a)(3)
- Identified SSCs that perform or support an intended function
- Non-Safety Affecting Safety (a)(2)
  - Reviewed safety related equipment locations
  - Conservative “spaces” approach
  - Performed walk-downs for verification
- Use of commodity groups when evaluations were best performed by component type rather than SSC

Project Overview – TLAA

- **Design and Licensing Basis reviewed for potential TLAA's**

  Keyword Search (UFSAR, NUREG-0896, Calcs, Specs)

  Review of previous LRA applications

- **Neutron Fluence**

  Determined fluence for operation to 60 years

  Materials in the extended beltline identified and evaluated

  Upper Shelf Energy values exceed the minimum acceptance limit of 50 ft-lbs

  PTS limits are below the maximum allowable screening criteria

- **Metal Fatigue**

  Cumulative Usage Factor evaluated for 60 years

  Environmentally Assisted Fatigue evaluated for NUREG/CR-6260 locations and we've committed to determine if these locations are limiting

Project Overview – GALL Application

- **43 Aging Management Programs**
  - 29 Existing Programs
  - 14 New Programs
- **GALL Consistency**
  - 16 Consistent
  - 11 Consistent with Enhancements
  - 6 Consistent with Exceptions
  - 4 Consistent with Exceptions and Enhancements
  - 6 Plant Specific

–Buried Piping and Tank Inspection

–Nickel Alloy Nozzles and Penetrations

–PWR Vessel Internals

–Boral Surveillance Program

–SF6 Bus

–Alkali-Silica Reaction (ASR) Monitoring

Project Overview – Commitment Process

- 68 Regulatory Commitments for License Renewal
- Commitments entered into site commitment tracking system
- Implementation activities underway to ensure completion well in advance of PEO

SER Open Items

1. OI 3.0.3.2.2-1— Steam Generator Tube Integrity
2. OI 4.2.4-1— Pressure-Temperature Limit
3. OI 3.2.2.1-1— Treated Borated Water
4. OI 3.0.3.1.7-1— Bolting Integrity Program
5. OI B.1.4-2— Operating Experience
6. OI 3.0.3.1.9-1— ASME Section XI, IWE Program
7. OI 3.0.3.2.18-1— Structures Monitoring Program

Open Item – 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. *Clarify commitment*.
- Industry Experience (foreign) indicates potential degradation of steam generator divider plates. *Commitment to inspect, but not included in UFSAR supplement.*

Resolution

- LRA program has been enhanced to clarify the tube-to-tubesheet weld inspection commitment.
- LRA commitment to inspect steam generator divider plates has been added to the UFSAR supplement.

Open Item – Pressure-Temperature Limit

OI 4.2.4-1

- Consistency of methods used to develop the P-T limits with 10CFR50 Appendix G

Resolution

- RAI expected under a separate licensing action. License Amendment Request (LAR) 11-06 requested approval to extend the current curves from 20 to 23.7 EFPY.
- Consistency with 10CFR50 Appendix G will be addressed via response to LAR 11-06 RAI.

Open Item – Treated Borated Water

OI 3.2.2.1-1

- LR-ISG-2011-01 recently issued with guidance for managing the aging effects of stainless steel structures and components exposed to treated borated water.

Resolution

- LRA updated to add affected components to the One Time Inspection Program population.

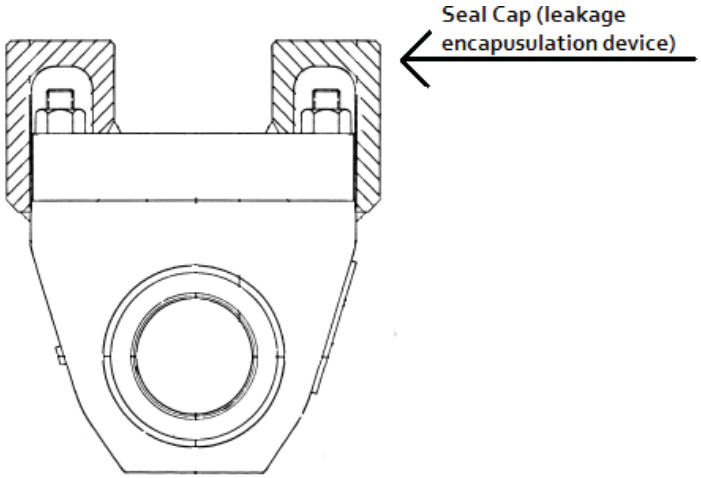
Open Item – Bolting Integrity Program

OI 3.0.3.1.7-1

- Once a seal cap enclosure is installed, the bolting and component external surfaces within the enclosure are no longer visible for direct inspection.

Resolution

- NextEra will remove the seal cap enclosure.



Open Item – Operating Experience

OI B.1.4-2

- Describe the programmatic details used to continually identify, evaluate and use Operating Experience.

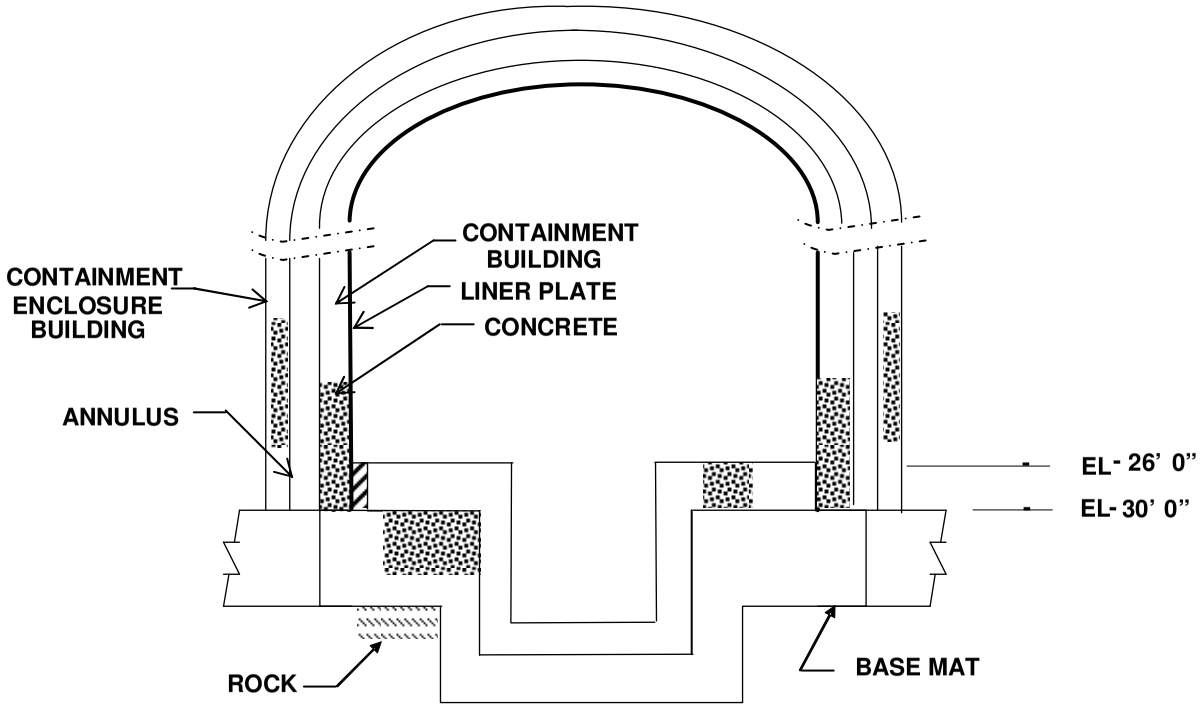
Resolution

- LRA has been updated to document programmatic aspects of evaluating aging related OE and is being reviewed by the NRC Staff.

Open Item – ASME Code Section XI, Subsection IWE Program

OI 3.0.3.1.9-1

– Accumulation of water in the Containment Enclosure Building annular space can potentially degrade the containment liner plate.



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Open Item – ASME Code Section XI, Subsection IWE Program

Resolution

- LRA updated to:
  - -- Perform confirmatory UT testing of the containment liner plate in the vicinity of the moisture barrier
  - -- Implement measures to maintain the exterior surface of the Containment Structure, from elevation -30 feet to +20 feet, in a dewatered state.

Open Item – Structures Monitoring Program

OI 3.0.3.2.18-1

- Aging management of concrete structures affected by Alkali-Silica Reaction (ASR).

- **Resolution**
  - LRA updated to augment existing Structures Monitoring Program by addition of a plant specific Alkali-Silica Reaction (ASR) Monitoring Program.
  - The program is in effect and the extent of crack expansion is being monitored.

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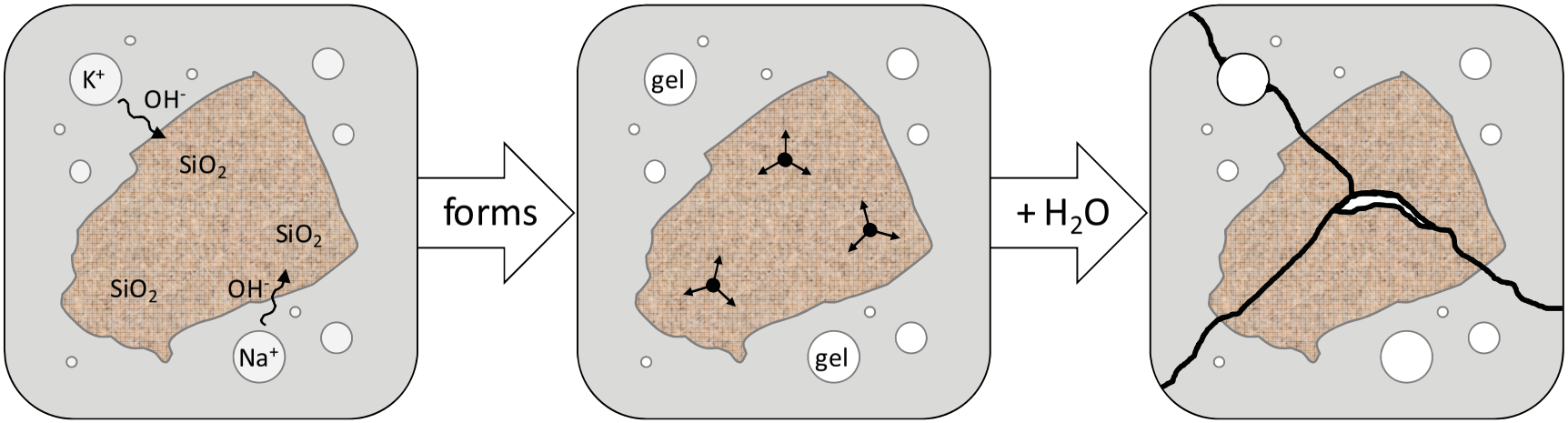
ASR - *Background*

- ASR identified in 1930s mostly in transportation industry and dams.
- Assessments were made of 131 areas of the Plant.



ASR - *Diagnosis*

- Discovery made by petrographic examinations when concrete core samples were removed from below grade structures.
- First core samples were removed in April and May 2010.
- Testing revealed a reduction in modulus of elasticity.
- Additional concrete core samples were removed from the same and five other structures to determine extent of condition.

Insights

1. Areas affected were highly localized. Core samples taken from adjacent locations did not show signs of ASR.
2. When the length of the cores were evaluated (i.e., depth into the wall) it was observed that the cracking was most severe at the exposed surface and reduced towards the center of the wall.

ASR - *Structural Impact*

- Confinement acts to restrain expansion of concrete similar to prestressing, thus improving performance of structural element.
- Removed cores are tested in an unrestrained condition
- No direct correlation between mechanical properties of concrete cores and in situ properties of concrete.
- Testing full scale structural elements provides more accurate concrete performance parameters.

RESTRAINED EXPANSION

UNRESTRAINED EXPANSION

ASR - *Prognosis*

What levels of ASR expansion are expected in the future ?

- Accelerated Expansion Testing
  - -- Indicates reactive silica remains
  - -- Tested rate not applicable to Seabrook structures
    - Lack of confinement
    - Severe exposure conditions
    - Unrealistic specimen preparation (aggregate ground to sand)
- Monitoring the progression of ASR can be effectively accomplished by detailed visual inspections and trending of the observable surface of the structures.
- Crack mapping and expansion monitoring provides the best correlation to the progression of ASR in the structure.

ASR – *Mitigation Strategies*

- ASR can be effectively mitigated in fresh concrete by additions during batching.
- ASR mitigation techniques for existing structures have been shown to be ineffective.
- Stopping groundwater intrusion will not necessarily stop the progression of ASR.

ASR - *Monitoring Program*

- The Structures Monitoring Program, has been augmented by a plant specific Alkali-Silica Reaction (ASR) Monitoring Program.
  - NUREG-1800 Appendix A.1, ten element review
  - Guidelines in ACI 349.3R, “Structural Condition Assessment of Buildings”.
- Action Levels developed based on available ASR guidance.
  - “Report on the Diagnosis, Prognosis, and Mitigation of Alkali-Silica Reaction in Transportation Structures,” U.S. Dept. of Transportation, Federal Highway Administration, January 2010, Report Number FHWA-HIF-09-004.
  - “Structural Effects of Alkali-Silica Reaction: Technical Guidance on the Appraisal of Existing Structures,” Institution of Structural Engineers, July 1992.
  - ORNL/NRC/LTR-95/14, “In-Service Inspection Guidelines for Concrete Structures in Nuclear Power Plants,” December 1995.

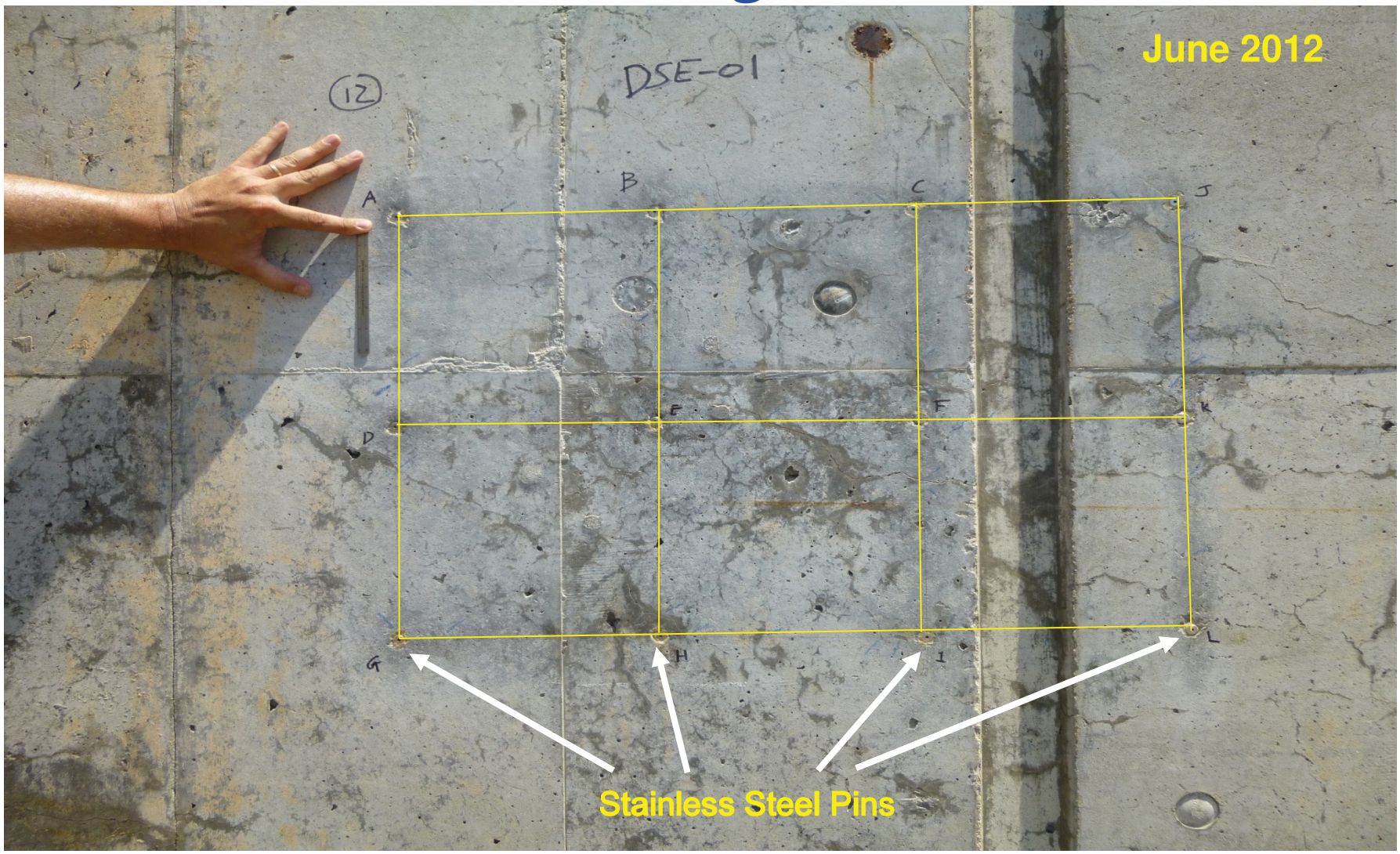
ASR - *Monitoring Program*

- ASR detected by inspection of concrete structures by visual observation of cracking on the surface of the concrete. Baseline data collected.
- Two parameters are used to monitor the extent and rate of ASR associated cracks. One is Cracking Index (CI) and the other is Individual Crack Width. Baseline data has been gathered.
- Evaluation of a structure's condition completed according to the guidelines set forth in the Structures Monitoring Program.

ASR - *Monitoring Program*

Structural Monitoring Program	Recommendation for Individual Concrete Components	Combined Cracking Index CCI	Individual Crack Width
Tier 3	Structural Evaluation	1.0 mm/m or greater	1.0 mm or greater
Tier 2	Quantitative Monitoring and Trending	0.5 mm/m or greater	0.2 mm or greater
	Qualitative Monitoring	Any area with indications of pattern cracking or water ingress	
Tier 1	Routine inspection as prescribed by Structures Monitoring Program	Area has no indications of pattern cracking or water ingress – No visual presence of ASR	

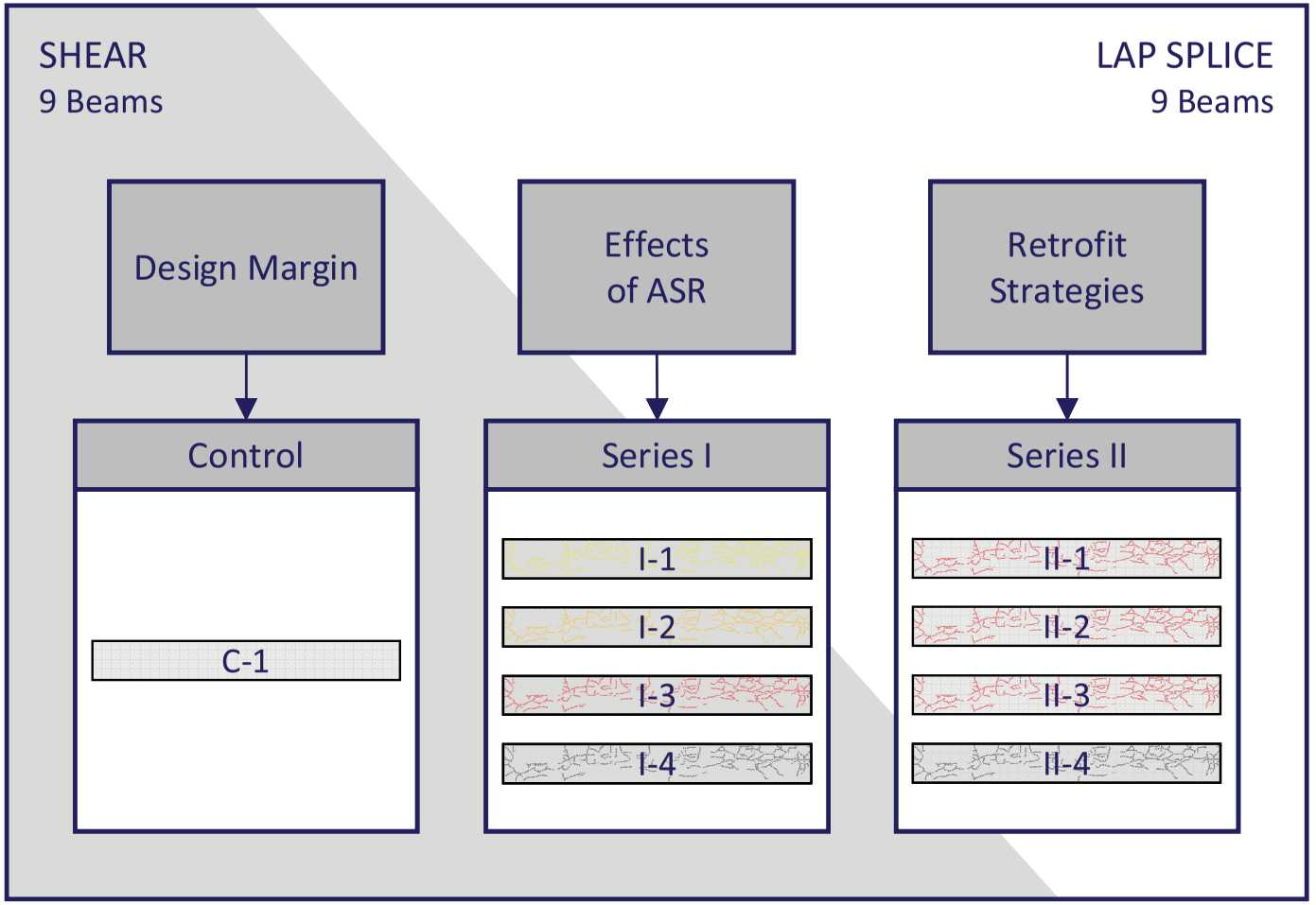
ASR - *Monitoring at Seabrook*



U-Texas- *Plant Specific Testing*

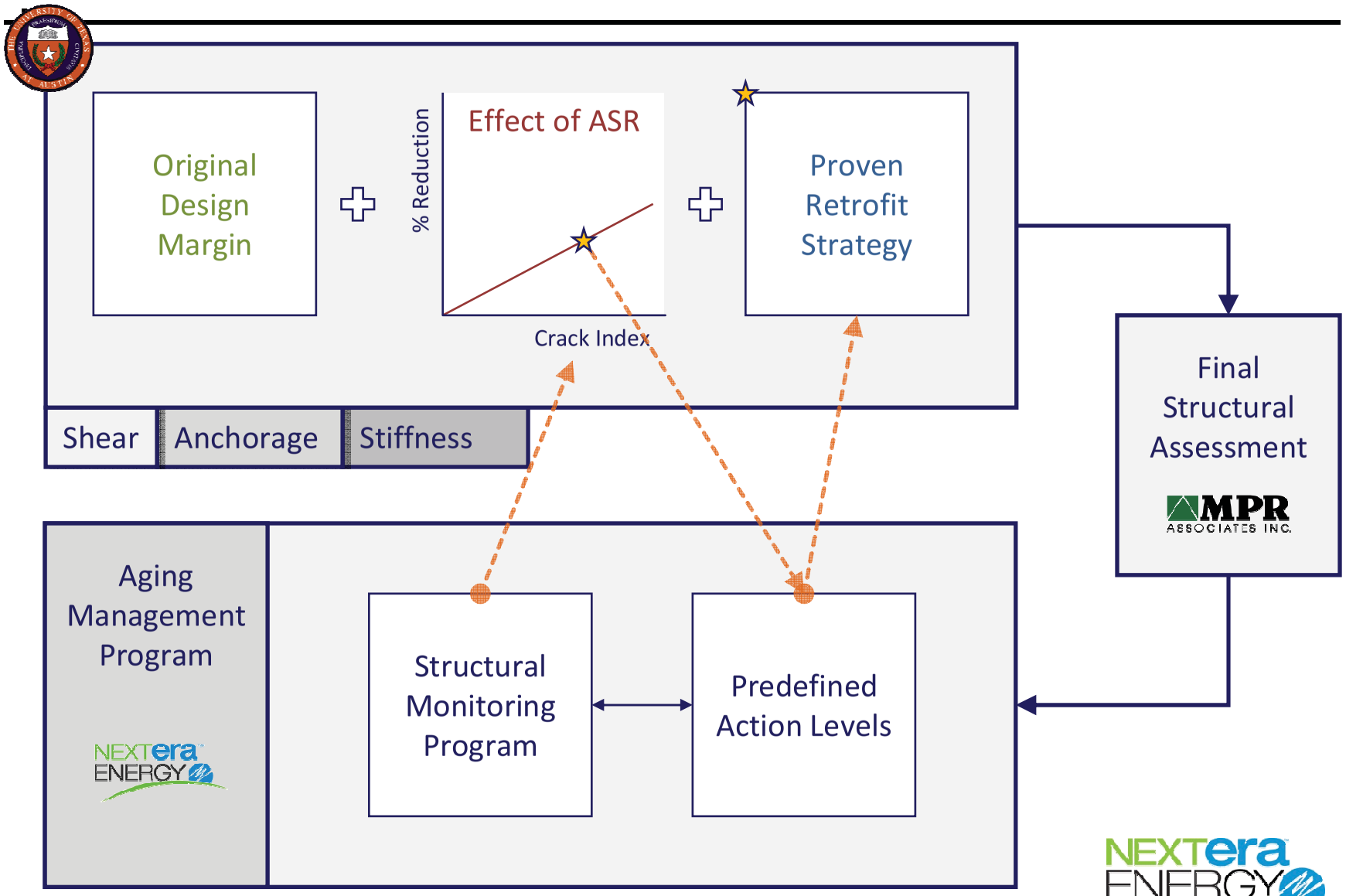
- Perform additional anchor testing using concrete blocks with design characteristics similar to Seabrook Station.
- Large scale destructive testing of reinforced concrete beams with accelerated ASR will be conducted to determine the actual structural impact of ASR.
  - Determine the actual structural impact of ASR
  - Actions levels will be established based on correlation between the test results and observed expansion levels/crack indices. *Update ASR Monitoring Program with plant specific action levels.*

TEST PROGRAMS



STRUCTURAL TESTING

APPLICATION OF RESULTS



ASR- *Conclusions*

- The aging effects of ASR on Seabrook Station concrete structures is understood and manageable.
- Monitoring the progression of ASR can be effectively accomplished by detailed visual inspections and trending of the observable surface of the structures.
- Crack measurement provides the best correlation to the progression of ASR in the structure.
- The Alkali-Silica Reaction (ASR) Monitoring Program provides reasonable assurance that structures will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

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Questions?