

**Turilin, Andrey**

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**From:** Raymond, William -R1  
**Sent:** Thursday, January 05, 2012 12:19 PM  
**To:** Conte, Richard  
**Cc:** Burritt, Arthur; Thomas, George  
**Subject:** TIA Summary & CAL  
**Attachments:** TIA Summary & CAL .docx

Rich,

As promised, I am forwarding the attached summary which I developed as I reviewed the DRAFT TIA during Christmas break.

This is a "strawman" for a potential CAL – I am sure there are other opinions on what a CAL could contain. The recommended actions are based solely on George's draft with the exception of my suggestion that a CAL also include a schedule to complete "discovery" by core sampling all potentially impacted category I structures. *Think that any CAL that does not assure discovery is fully addressed would be lacking.*

The attached summary is a "cut & paste" from the TIA. The issues could be simplified and combined for the actual CAL.

As I see it, the CAL could broadly address:

- Complete Final POD (by Date)
- Issue Comprehensive Plan
- Issue Test Plan with Technical Basis
- Complete Testing & Structures Analyses
- Mitigation and Long Term Actions

The other technical details in the DRAFT TIA could fit under these headings.

I trust this is helpful.

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### **TIA Summary / Elements of a Proposed CAL**

The following is a summary of the points in the DRAFT TIA response that might be considered as a strawman for the points in a proposed Confirmatory Action Letter on the ASR topic.

A CAL should be considered because, in its review of the actions on the ASR issue to date, the NRC found that NextEra has:

- failed to complete a final operability determination initially scheduled for June 2011
- failed to provide a comprehensive plan for addressing the issue;
- established dates to develop a plan and then extended those deadlines;
- provided contractor recommendations for an action plan during the September inspection and then stated not all the recommendations would be implemented;
- established schedules for taking core samples on Category I structures and then extended those schedules with no date in place as of January 2012 when "discovery" actions will be completed;
- failed to provide a basis for the sampling methods to be used to assure the ASR the extent of condition of ASR impacts on Seabrook structures will be adequately identified;
- failed to complete adequate testing of ASR impacted structures to assure the impacts of ASR on category I structures will be adequately evaluated (shear capacity); and,
- yet to identify actions / plans to mitigate ASR to assure the category I structures will continue to meet the design requirements in the licensing basis for the duration of the current operating license term.

### **TIA Recommendations and Actions to be Confirmed in a Potential CAL to NextEra**

1. **Complete Final Operability Determination (p7)**
  - a. the PODs should be re-assessed based on the results of the licensee's testing and detailed engineering evaluation scheduled to be completed in March 2012.
2. **Issue Comprehensive Action Plan (p 7)**
  - a. This action plan should include the systematic strategy for the root cause, diagnosis, prognosis, structural appraisal, aging management and potential mitigation of the ASR-degradation issue of concrete structures at the station.
3. **Address Other Concurrent Degradation Mechanisms (p7)**
  - a. Since ASR interacts with other deterioration processes, other applicable degradation mechanisms for concrete and reinforcing steel and potential for further deterioration of ASR in combination with other degradation mechanisms should be addressed.
4. **Address ASR Impacts on Exterior of Structures (p7)**
  - a. the licensee has been taking and testing core samples from the interior of the ASR-affected structures. The licensee should address the degradation effects through the wall-thickness and especially on the exterior of the affected structures in contact with the soil and ground water, which may likely be more severe if the source of moisture is water infiltration from the outside.
5. **Address ASR effect on Concrete bond (p8)**
  - a. Address the effect of ASR on the bond between concrete and reinforcement in the affected structures.
6. **Conduct Stiffness Damage Testing & Crack Mapping (p8)**
  - a. Determine ASR severity in a reliable manner by more than one method. The licensee should consider conducting stiffness damage tests of cores in the laboratory in addition to in-situ surface crack mapping to determine the severity.
7. **Finite Element Modeling for Structures with Severe to Very Severe ASR (p8)**

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- a. If the ASR-degradation of an affected important-to-safety structure at Seabrook is determined to be severe to very severe, the licensee should consider consulting experts for appropriate nonlinear finite element modeling of ASR-effects for detailed structural appraisal of the affected structure.
- 8. Provide Schedule to Finish Discovery by Core Sampling (p8 - WJR comment)**
  - a. In the Action Plan, provide a commitment and schedule to obtain core samples from all Category I concrete structures to confirm the presence or absence of ASR degradation.
- 9. Validate POD consistent with ACI 318 design code assumptions (p9-p10)**
  - a. POD is based on assumption that the empirical relationships in ACI 318 remain valid for the ASR-degraded concrete
  - b. the structural analysis and design evaluation of the ASR-affected structure should be based on actual measured material properties and how these properties were affected by ASR expansion rather than assumed properties
  - c. The licensee should establish whether the mechanical properties of the ASR-affected concrete are currently within the normal range for concrete.
- 10. Provide a Sampling Plan consistent with the statistical basis in ACI 318 for determining the actual concrete strength of ASR impacted structures (p12)**
  - a. The statistical basis of the ACI 214.4R is consistent with the statistical basis of the concrete quality, evaluation and acceptance provisions in Sections 4.2.2 and 4.3.1 thru 4.3.3 (also see commentary for these sections) of ACI 318-71.
- 11. Issue a Concrete Test Plan (p13)**
  - a. Issue a test plan technical document (Appendix B quality) that comprehensively addresses the ASR issue in the short-term and the long-term.
  - b. Core sampling or other methods of testing would be required to estimate the severity, expansion-to-date, potential for future expansion, monitoring trends, reinforcement assessment, etc., for the design evaluation and aging management.
  - c. It is important to obtain enough concrete samples representative of difference (variability) in materials used in construction, such as changes in cement, aggregates, and alternate mix proportions.
  - d. that the licensee should make the most effective use of removed core samples to obtain the maximum data to properly characterize the concrete.
  - e. The test plan technical basis should be documented in the engineering evaluation that uses the information/data from the testing.
- 12. Complete Adequate Laboratory Tests for Concrete Evaluation (p13-p15)**
  - a. It is critical that the licensee establish the actual shear capacity of the affected concrete for the design evaluation.
  - b. Perform testing to establish data to evaluate shear strength and bond strength of the affected-concrete and for evaluating the capacity of anchorages and embedments for important-to-safety components in the affected concrete.
  - c. Provide technical justification for the appropriateness of the testing and evaluation methods used.
- 13. Enhance EDS 36180 – 10CFR 50.65 Structure Monitoring Program (p17)**
  - a. EDS 36180, Revision 01, only refers to ACI 349.3R for evaluation criteria for concrete. The ACI 349.3R guidelines focus on commonly occurring conditions and are not all-inclusive. ACI 349.3R does not provide specific or detailed guidance on evaluating ASR. EDS 36180 needs to incorporate specialist literature or specialized evaluations specifically for the long-term ASR issue.