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Containment Degradation Research and Implications- Overview of Containment Degradation Issues

Meena Khanna
Division of Engineering/NRR
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Crystal River Unit 3 Containment Delamination Issue - Background

- On September 26, 2009, Crystal River shut down for planned refueling outage.
- Major work activity planned for this outage was steam generator replacement.
  - Licensee created a construction opening in the side of containment building.
- On October 2, 2009, while creating opening, licensee identified gap/separation, affecting outer layer of concrete of building wall.

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Crystal River Unit 3 Containment Delamination Issue – NRC Initiatives

- Region II Special Inspection Team (SIT) established on October 13, 2009.
- SIT public exit meeting conducted September 2, 2010.
- SIT Inspection Report issued October 12, 2010 (ADAMS Accession No. ML102861026A).

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Crystal River Unit 3 Containment Delamination Issue Root Cause Assessment

- **Licensee's investigation concluded:**
  - **Delamination was caused during creation of opening in containment.**
  - **Main cause of delamination was scope and sequence of tendon detensioning, resulting in redistribution of stresses that exceeded concrete tensile capacity.**
- Special Inspection Team (SIT) reviewed licensee's root cause assessment and results documented in SIT inspection report 05000302/200907.
  - SIT found that delamination did not represent increase in risk to public.
  - SIT found licensee's investigation to be thorough and did not identify immediate generic safety concerns associated with the delamination.

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Crystal River Unit 3 Containment Delamination Issue – Ongoing Efforts

- Progress Energy plans to conduct a structural integrity test, followed by an integrated leak rate test to ensure containment integrity.
- Progress Energy continues containment repair construction activities.
- Ongoing resolution of technical issues is being addressed via NRC inspection procedure IP50001, Steam Generator Replacement Inspection.
  - Results of this inspection will be documented in an inspection report.
- The region plans to conduct a public meeting prior to plant startup.

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Division of License Renewal Containment Concrete Inspection Findings

- **Revised Inspection Attributes Resulting from License Renewal Activities**
  - **Salem**
    - **Applicant revised acceptance criteria for degradation in accordance with ACI 349 Code**
  - **Palo Verde**
    - **Applicant committed to inspect concrete containment every 5 years, as required by ASME during period of extended operation**
  - **Diablo Canyon**
    - **Applicant revised acceptance criteria and frequency of concrete containment during period of extended operation**

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Salem Liner Plate

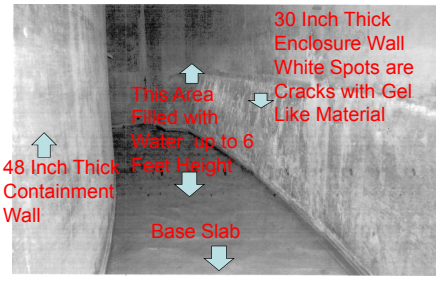
- The bottom 30 feet of containment cylinder liner plate is covered with insulation.
- During the LRA audit, staff noted some areas of the liner plate behind the insulation are corroded.
- Applicant agreed to augmented inspections (UT and visual examination) of the liner plate behind the insulation.

Salem Liner Plate Corrosion

Seabrook Concrete Containment and Enclosure Building

- **LRA Audit Findings:**
  - **Cracking of the enclosure building and other plant structures below grade due to ground water infiltration.**
  - **Ground water present at the bottom 6 feet in the annular space between the enclosure and containment wall for long period until 2008.**
  - **Alkali silicate reaction cracking in concrete due to long term exposure to ground water.**
- **Staff Concerns:**
  - **Reduction in modulus of elasticity of 40 percent may affect the design adequacy and functionality of plant structures and components.**
  - **Cracking due to alkali silicate reaction can jeopardize integrity of affected structures.**

Seabrook Containment and Enclosure Building Cracking



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Conclusions

- Continue to monitor plant operating experience.
- Issue generic communication, as necessary.
- Remain engaged with internal and external stakeholders.

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