Development & Implementation of Aging Management Programs for San Onofre

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Defense-in-Depth: Aging Management Programs

- Design
- Fabrication
- Operations, Maintenance & Security
- Inspection
- Remediation

Regulatory Oversight

Aging Management

Decommissioning San Onofre Nuclear Generating Station  Safety | Stewardship | Engagement
Aging Management
Current Methods and Ongoing R&D Efforts

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ISFSI License Renewals

ISFSI licenses extended an additional 40 years
1. Calvert Cliffs NPP – South of Baltimore, MD
2. Oconee Nuclear Station – WSW of Spartanburg, SC
3. Prairie Island NGS – Southeast of Minneapolis, MN
4. Surry NGS – NW of Norfolk, VA
5. HB Robinson NPP – West of Wilmington, NC

ISFSI licenses in review for extension
1. North Anna NGS – NW of Richmond, VA
2. Trojan NPP – Oregon
3. AREVA License 72-1004 – General license, many users
4. Energy Solutions 72-1007 – General license
Past Inspections Using Existing Technology

- Equipment to perform canister inspections exists
- Industry developing more advanced inspection technologies
- Past inspections performed:
  - Completed inspections
    - AREVA – Rancho Seco and Calvert Cliffs
    - TN-40 – Prairie Island
    - TN-32 – North Anna
  - Ongoing inspections
    - AREVA – Calvert Cliffs, Oconee, HB Robinson
    - Holtec – Trojan
Vendor Inspections
AREVA

• Visual inspection of canister is accomplished by robotic inspection
  – Tool inserted through inlet vent of ISFSI module
  – Remote camera able to recognize defects in canister

• Inspection Ring technology available for use
AREVA
Horizontal Storage System

Current AREVA ISFSI at SONGS also similar design in use at Calvert Cliffs, NJ
AREVA

Storage Module and Canister

Outlet Vent

Concrete

Canister

Inlet Vent
AREVA
Inspection Robot
AREVA
Ring Inspection Assembly
Vendor Inspections Holtec

• Visual inspection of canister is accomplished by remote inspection
  – Remote camera is inserted through outlet vent
  – Camera able to recognize defects in canister

• Inspection Ring technology available for evaluation of observed deficiencies
SONGS Inspections
AREVA/TN System AMP

- SONGS AREVA system license extension
- AREVA preparing for license extension process
- SCE will participate with AREVA in AMP development
  - AMP in development to support extension beyond 2022
    - Consistent with previous industry AMPs
    - Leverage current inspection capabilities
    - Will include periodic canister inspections to ensure canister integrity
SONGS Inspections
Holtec UMAX System I&M

• NRC regulations: AMP not required until start of license renewal period (2035)
  – SCE committed to CA Coastal Commission creation of a Inspection & Maintenance (I&M) plan for new ISFSI
  – Holtec supporting development of I&M plan for newly expanded SONGS ISFSI (UMAX system)
  – Timing: 2020
CISCC

- Chloride induced stress corrosion cracking (CISCC) can develop in stainless steel, but is rare
  - No instances of cracks have been identified in inspections conducted to date
  - CISCC requires conditions to start:
    - Salt and water deposition
    - Initiation site (such as a pit)
    - Stresses in steel to enable crack to expand
  - Several design & fabrication improvements minimize potential for development of canister flaws
  - If initiated, cracks are slow developing, occurring over years
  - Canister have no high-pressure force to expand a crack
Flaw in Passive Canister Unlike Flaw in Operating Plant Component

• Q: In unlikely event of a crack that grew through canister wall over time, what would happen?

• A: Minimal to no impact to the site or public
  – Inert helium release
  – Any fission gases that did escape would diffuse into the air, and have minimal to no impact to the public
  – No high-pressure forces in canister to cause a release
  – Solid fission products would remain in fuel rods in canister
Fuel Assembly
Fuel Assembly
Mitigations
Addressing Potential Flaws

• To address potential flaw, SCE working with vendors / industry to develop mitigation techniques

• Techniques under development
  1. Remote weld repair
  2. Canister-in-canister encapsulation
  3. Transport cask to store/contain compromised canister