SONGS Dry Cask Storage System

Defense in Depth

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By:
Dr. Kris Singh, President & CEO
Holtec International, One Holtec Drive, Marlton, NJ
Partnership

- **SCE, HOLTEC, and Industry Partnership:**
  - SCE and Holtec have partnered to expand the existing SONGS Independent Spent Fuel Storage Installation (ISFSI)
  - Holtec collaborating with SCE to develop an Aging Management Program (AMP) as part of ‘Defense in Depth’ (DiD) for the Dry Storage Canister (DSC) systems
  - SCE and Holtec efforts are for both the NUHOMS and HI-STORM type DSCs
  - SCE and Holtec will implement the AMP well in advance of regulatory requirements
Defense in Depth

- **Defense In Depth:**
  - Designing and operating facilities in a way that prevents and mitigates accidents
  - Creating multiple independent and redundant layers of defense
  - Minimizing the reliance on any single feature

- **Three Principal Functions of DiD for Dry Storage:**
  - Maintain sub-criticality
  - Prevent radiation exposure from exceeding regulatory limits
  - Prevent release of radioactive materials from exceeding regulatory limits
Aging Management

- **Defense In Depth Includes:**
  - Engineered Controls (design / material)
  - Programmatic Controls (fabrication)
  - Mitigating Controls (AMP: testing, inspection, surveillance)

- **Chloride Induced Stress Corrosion Cracking (CI SCC):**
  - Chloride Atmosphere with High Relative Humidity
  - High Stress
  - Susceptible Material
Engineered and Programmatic Controls

- **Engineered Controls:**
  - Design features
    - Warm surface of canister shell helps prevent dissolved salts in the air from condensing
    - Vertical orientation allows for easy access to 100 percent of the surface for sample collection, options being developed for NUHOMS horizontal canisters
  - Identify and introduce CISCC resistant design features in the new canisters such as the use of corrosion resistant 316L stainless steel
  - Thickness increased from 1/2 to 5/8-inch
  - Additional foundation strength with concrete fill by replacing engineered fill with 3,000-PSI concrete for entire foundation
  - Use of stainless steel in lieu of carbon steel for the cavity enclosure canister (CEC) to enhance corrosion resistance
Engineered and Programmatic Controls

- **Programmatic Controls:**
  - Fabrication methods such as reduction of stresses by over-roll
  - Weld materials
  - Welding methods such as minimization of Heat Affected Zone
  - Consideration of surface improvement such as peening for reduction in stresses
Mitigating Controls

Mitigating Controls - Aging Management:

- Monitoring of Radiation Detectors (existing requirement)
- General area periodic inspections (existing requirement)
- Maintain security surveillance and access controls (existing requirement)
- Develop an AMP using NRC guidance to maintain the integrity of the confinement boundary
- Monitor environmental parameters (temperature / humidity)
- Develop surveillance tools by converting existing methodologies into monitoring plans for UMAX and NUHOMS
- Develop chloride content inspection tools by converting existing equipment (used in pilot inspection programs)
Mitigating Controls - Aging Management (continued):

- Stage a NUHOMS existing empty canister within the salt laden atmosphere for periodic surveillance of salt accumulation
- Install empty DSC in a CEC for periodic inspection, developing delivery tools, and evaluating inspection and repair methods
- Install pre-stressed coupons for accelerated environmental impact within the UMAX CECs
- Stage a transfer cask for long-term storage of any compromised canister
- Evaluate inspection results from DSC in salt laden atmosphere, spare empty canister, pre-stressed coupons, and operating experience for input to the AMP
Mitigating Controls

- **Mitigating Controls - Remediation:**
  - Periodically inspect using visual examination tools
  - Identify any indication of salt accumulation, pit or crack that may identify the initiation of a crack
  - Develop remediation measures for NUHOMS and UMAX canisters years before the risk of confinement breach becomes credible
  - Develop repair methods for nuclear components to DSCs
  - Convert existing delivery tools and methods for use in inspection and repair of DSCs
Concluding Remarks

- Defense in Depth strategies for engineered, programmatic and mitigating controls

- A program to protect the long term performance integrity of the SONGS storage system is being developed

- The program will be implemented on the HI-STORM UMAX canisters for the entire life cycle of the storage systems. For NUHOMS systems, the AMP will begin concurrently with the “UMAX” system