



Decommissioning
San Onofre
Nuclear Generating Station

**Dry Cask Storage
of
Used Nuclear Fuel**
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DRY CASK STORAGE INITIATIVES

Decommissioning San Onofre Nuclear Generating Station Safety | Stewardship | Engagement



Defense In Depth

Definition

- Philosophy to protect public health and safety
- Multiple, independent, and reinforcing layers of defense
 - Design
 - Fabrication
 - Long-term monitoring
 - Remediation



Focus of Defense in Depth

Containing radioactive materials

Long-term integrity of canisters

Multiple Layers of Defense

Dry Storage System Principal Functions Analysis

Principal Function	Prevention	Detection
Maintaining sub-criticality	<ul style="list-style-type: none"> Robust Basket design Canister integrity 	<ul style="list-style-type: none"> Fabrication inspections Material selection Canister inspection
Preventing radiation exposure from exceeding regulatory limits	<ul style="list-style-type: none"> Robust design Canister integrity Shielding via UMAX structure 	<ul style="list-style-type: none"> Canister inspection Radiation surveys
Preventing release of radioactive materials from exceeding regulatory limits	<ul style="list-style-type: none"> Robust design Canister integrity UMAX structure 	<ul style="list-style-type: none"> Canister inspection Radiation surveys

Improvements

Meeting & Exceeding Regulatory Requirements

- Design
- Fabrication
- Long-term monitoring
- Remediation

Canister Design Improvements

- SCE / Holtec Initiatives:
 - Bolstered seismic criteria
 - Upgraded 316L material
 - Selected 5/8” thickness
 - Advanced basket composite for durability
 - Canning damaged fuel assemblies
 - Removable test coupons used for periodic checks
 - Spare canister for inspection tool development
 - Spare cavity enclosure container for future use



Canister Fabrication Improvements

- SCE / Holtec Initiatives:
 - Enhanced fabrication methods to improve canister life
 - Improved welding techniques
 - Improved plate rolling methods
 - Improved weld testing methods during fabrication
 - Expanded area of “weld penetrant” testing
 - Improved visual inspection methods



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DEVELOPMENT OF INSPECTION METHODS

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Aging Management Program NRC Requirements

1. Scope of program
2. Preventive actions
3. Parameters monitored or inspected
4. Detection of aging effects
5. Monitoring and trending
6. Acceptance criteria
7. Corrective actions
8. Confirmation process
9. Administrative controls
10. Operating experience

Per NUREG-1927



Aging Management Programs (AMPs)

Two San Onofre AMPs in Development

- **AREVA:** Development of AMP is a condition of license renewal for existing NUHOMS system
 - Renewal of CoC for sister NUHOMS system provides preview of likely AMP for San Onofre NUHOMS system
 - License for AREVA system at San Onofre expires 2023
- **Holtec:** Maintenance & Inspection program for new Holtec system required by 2022
 - Coastal Commission commitment

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Industry Initiatives

SCE Participation

- NEI / NRC / DOE meetings
- EPRI Sub-Committee on NDE Methods
- EPRI Sub-Committee on CISCC Analysis
- ASME Sub-Committee on Rules for Inspection
- EPRI Sub-Committee on Repair Methods
- Holtec Users Group
- AREVA Users Group

Development of Inspection Methods

- EPRI tests at Palo Verde, Maine Yankee, McGuire
 - Robot navigates canister axially and circumferentially
 - Camera provides view of canister surface, capability to detect precursors to stress corrosion cracking
 - Tested robot-deployed eddy current array and electromagnetic-acoustic transducer probes
 - First application on loaded canister planned for 2018
- Cask vendors developing inspection equipment to complement EPRI efforts

Inspection Methods

Robotics Field Testing

Courtesy of
Palo Verde
Nuclear Generating Station



Development of Remediation Methods

- Repair mechanisms
 - Degradation mechanisms
 - Analytical methods of crack growth rates, flaw evaluation
 - Remote tool delivery
 - Repair methods
 - Coordination of DOE research
- Housing canister with a larger canister
 - Evaluating option



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MONITORING & SECURITY

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ISFSI Monitoring & Security

- Operations
- Maintenance
- Radiological Environmental Program
- Radiation Protection
- Security