



Decommissioning **San Onofre**

Nuclear Generating Station

Development & Implementation of Aging Management Programs for San Onofre

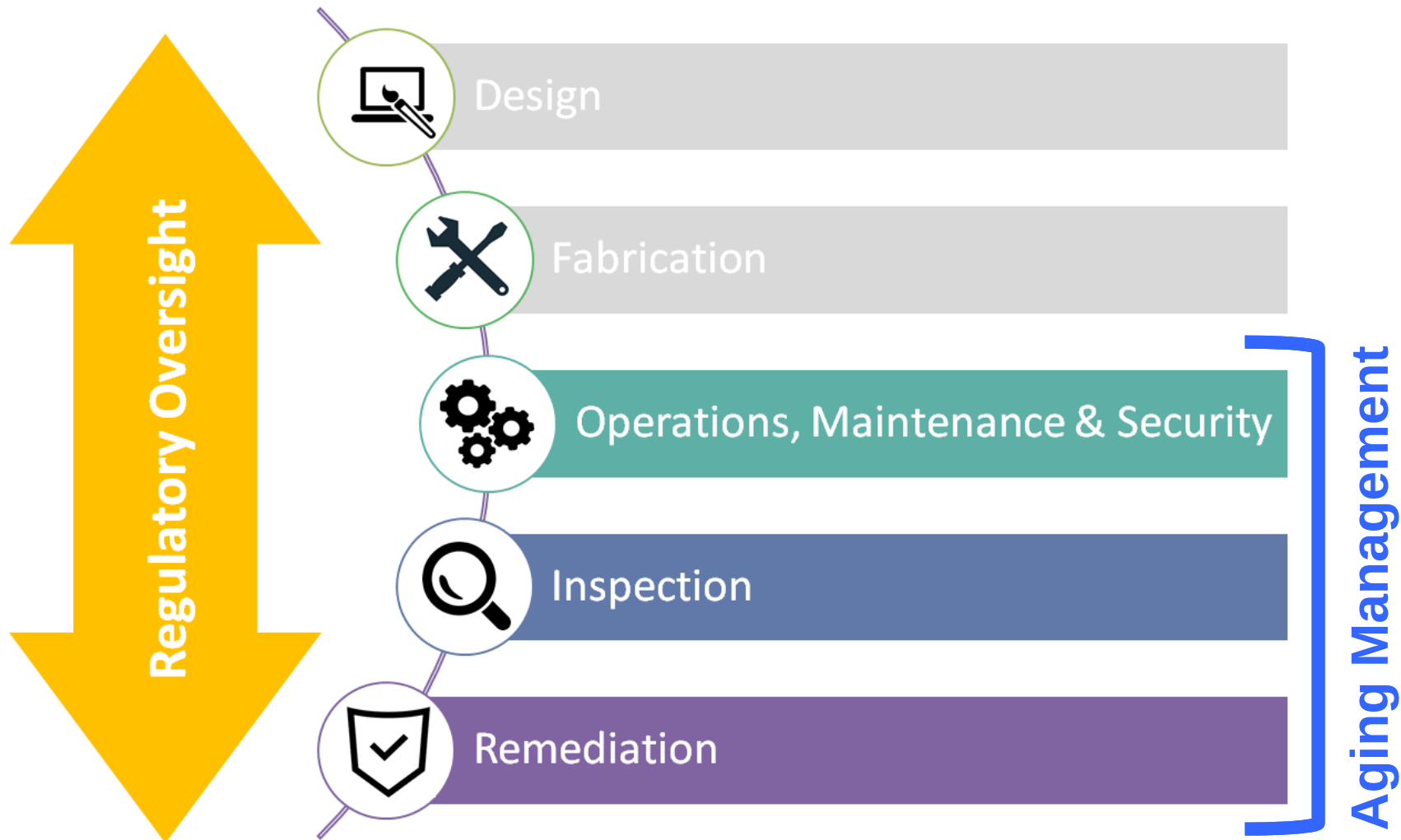
September 14, 2017

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Defense-in-Depth: Aging Management Programs





Aging Management

Current Methods and Ongoing R&D Efforts

Aging Management Programs (AMPs)

Required for ISFSI license renewal

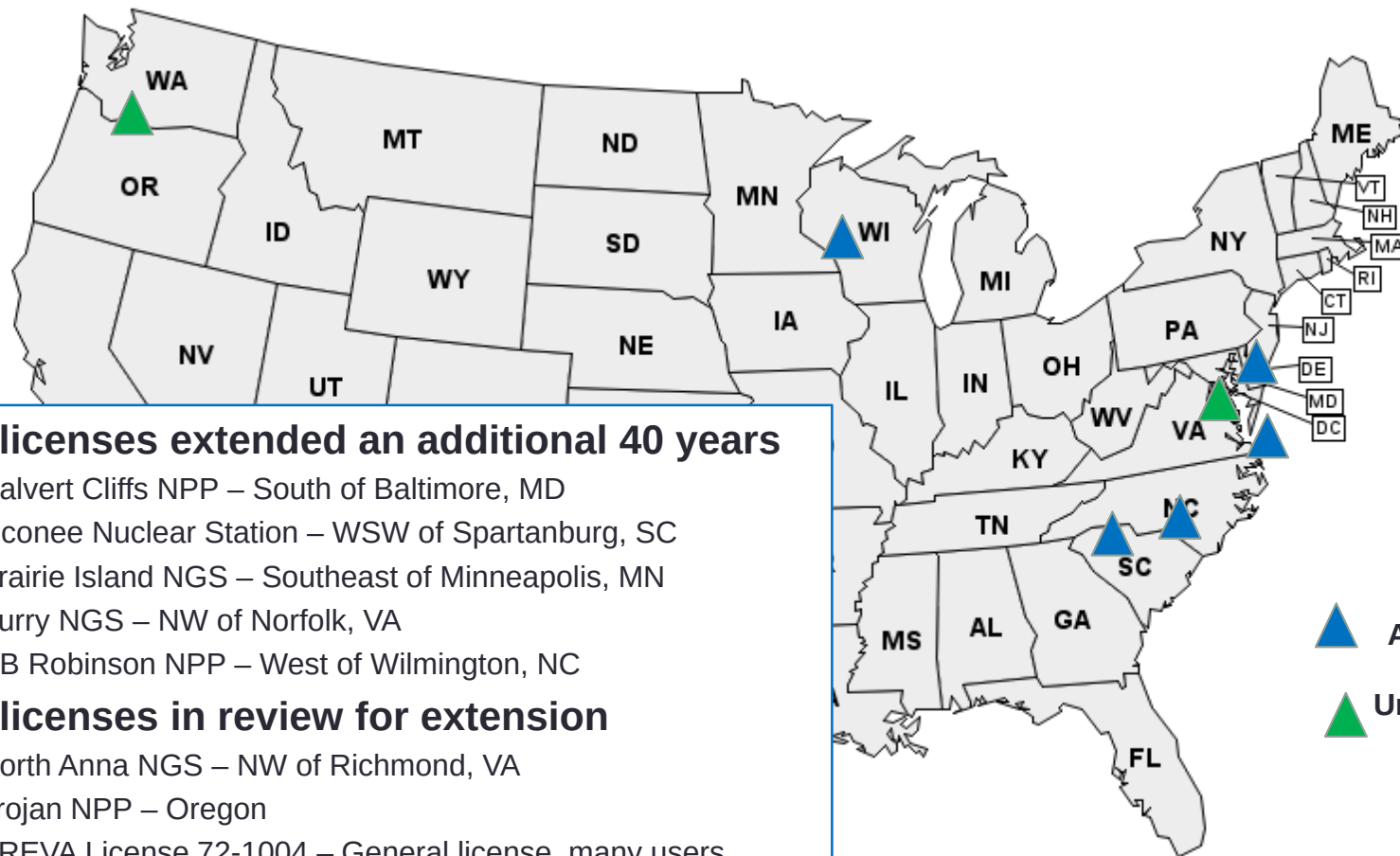
Completed inspections as part of AMPs

Current vendor capabilities

Industry R&D advancing inspection methods

Identify issues requiring remediation

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

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AREVA

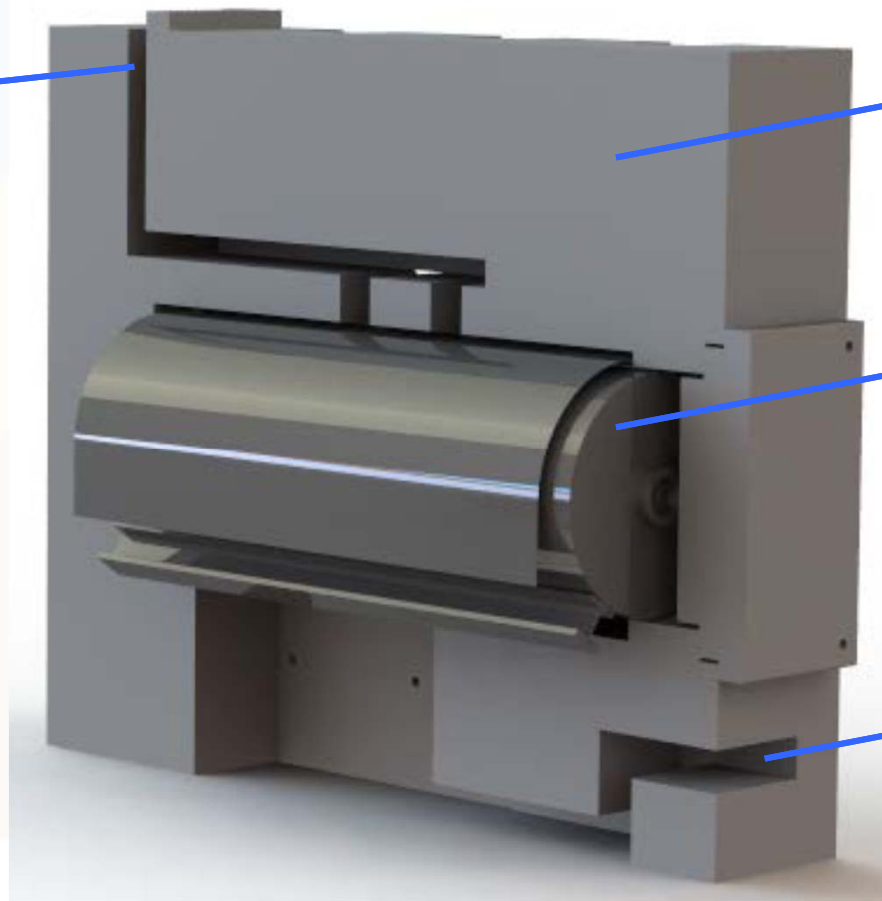
Storage Module and Canister

Outlet Vent

Concrete

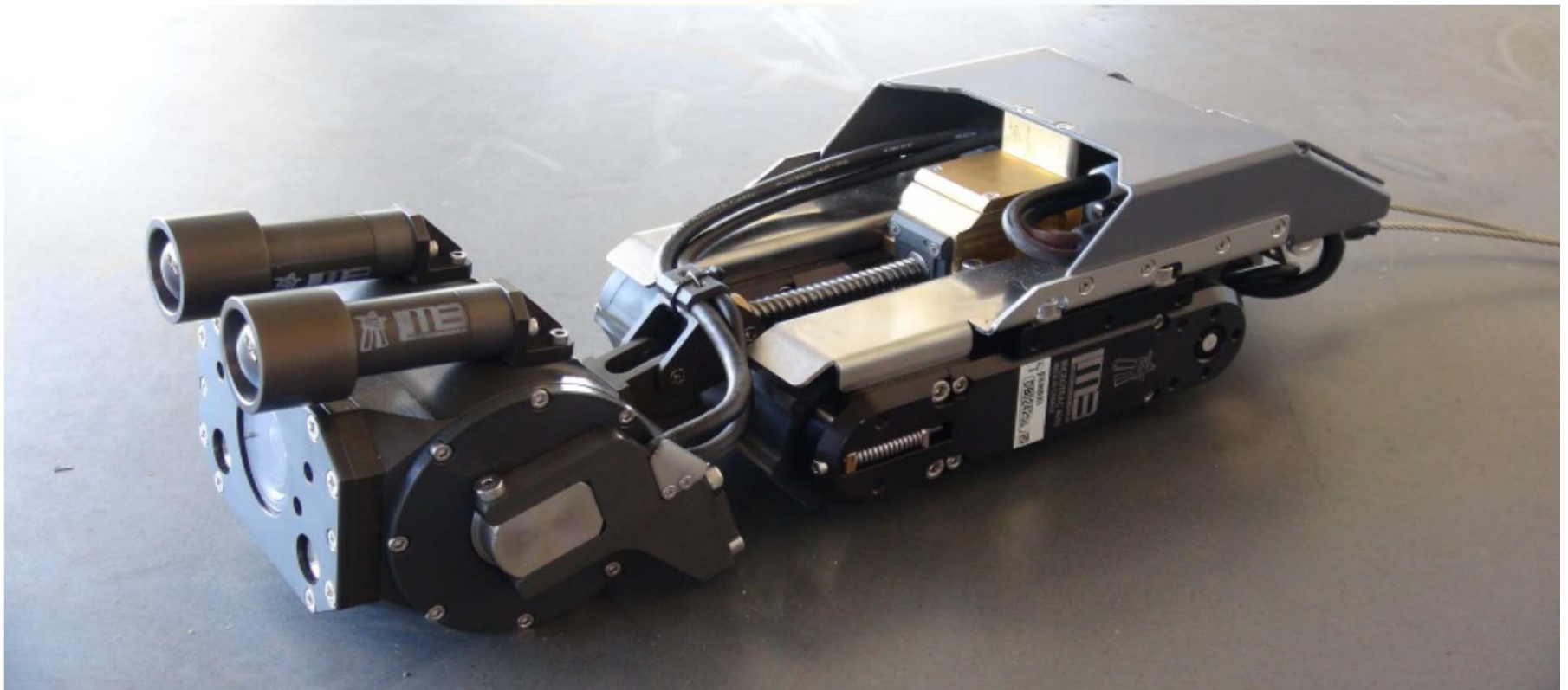
Canister

Inlet Vent





AREVA Inspection Robot



AREVA

Ring Inspection Assembly



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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



Remediation

- 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

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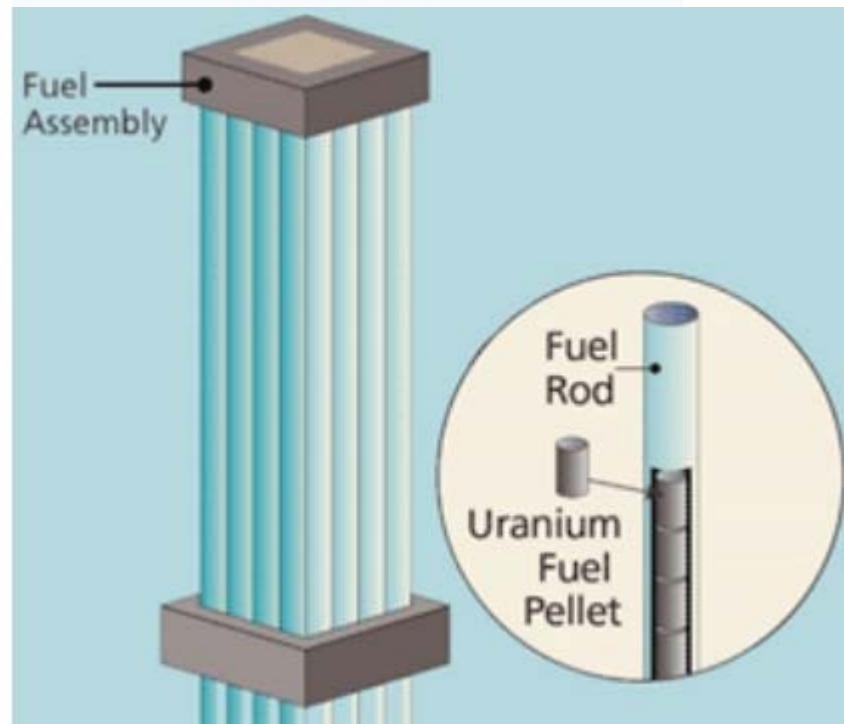
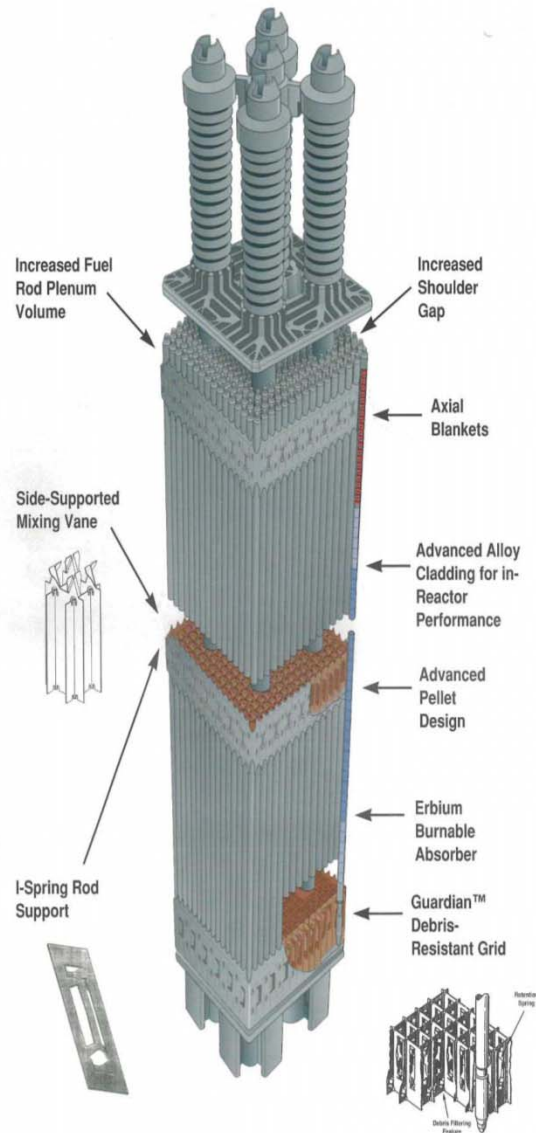
Flaw in Passive Canister Unlike Flaw in Operating Plant Component

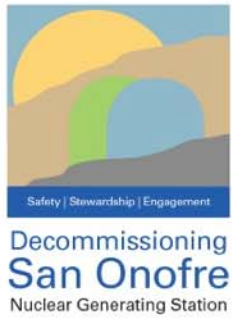
- Q: In unlikely event of a crack that grew through canister wall over time, what would happen?
- A: Minimal to no impact to the site or public
 - Inert helium release
 - Any fission gases that did escape would diffuse into the air, and have minimal to no impact to the public
 - No high-pressure forces in canister to cause a release
 - Solid fission products would remain in fuel rods in canister



Decommissioning
San Onofre
Nuclear Generating Station

Fuel Assembly

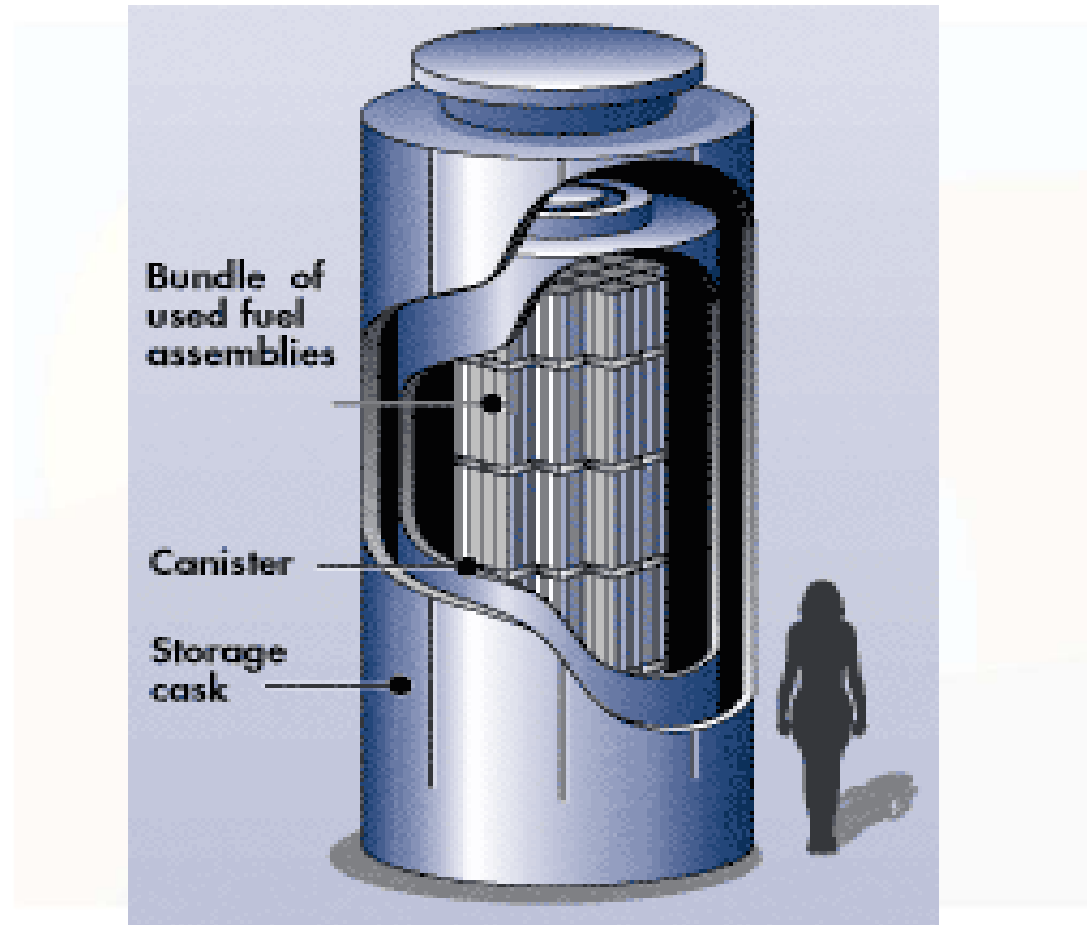




Fuel Assembly



Typical Dry Canister System



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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