U.S. DEPARTMENT OF ENERGY

Dry Storage of SRS Foreign Research Reactor (FRR) and Domestic Research Reactor (DRR) Used Nuclear Fuel - Update



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Savannah River Site Citizen Advisory Board

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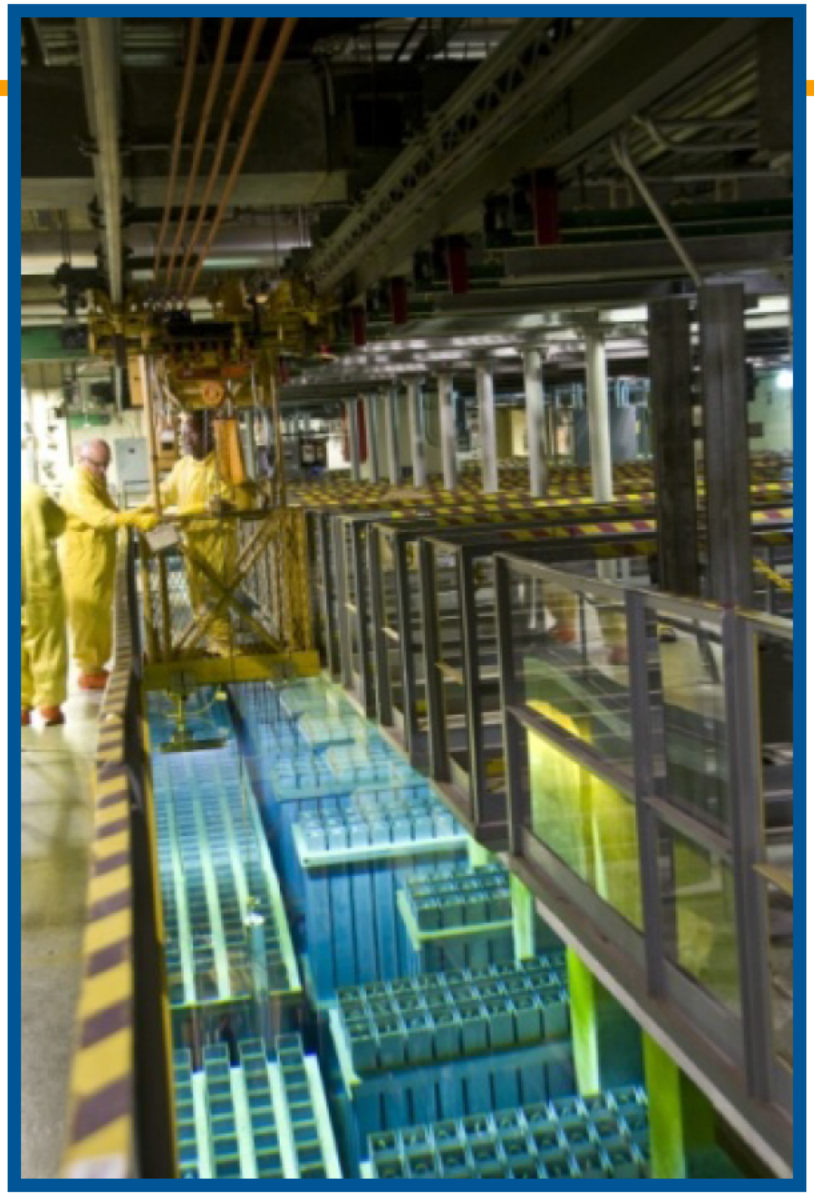
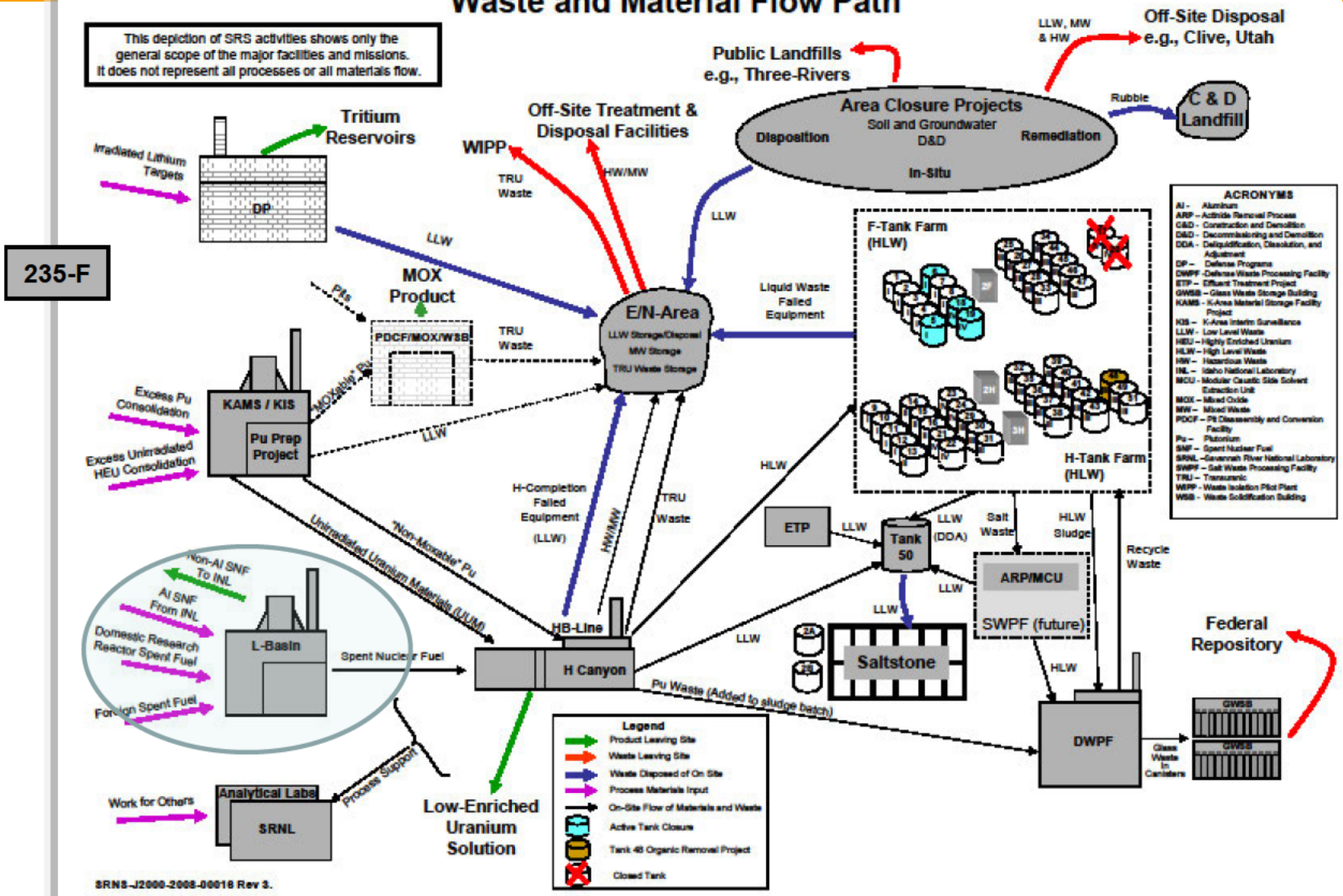
enterprise·srs

Purpose

- To provide an update on the Dry Storage of Used Nuclear Fuel as requested by the chair of the Nuclear Materials Committee

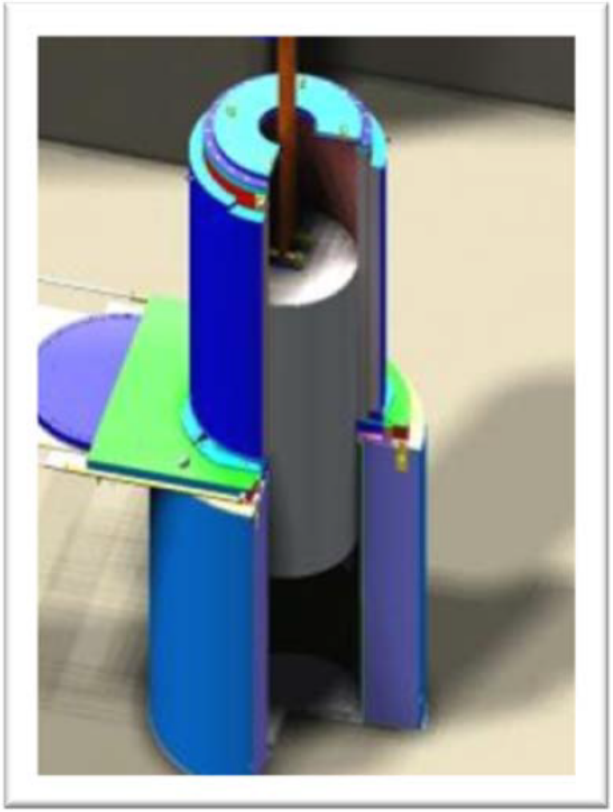


Savannah River Site
Waste and Material Flow Path



Typical Transfer Systems

L-Basin
Shielded Transfer System



Commercial Transfer Cask

Commercial Transfer/Cask Storage Systems

Dry Transfer system

Inner Canister

Concrete Overpack

Photos taken from NAC website of the MAGNASTOR System

Commercial Transfer/Cask Storage Systems continued

Dry Transfer system

Concrete Overpack

Photos of the NUHUMS taken from Transnuclear website and Internet

Commercial Storage pads/facilities

Three Mile Island ISFSI
at Idaho National Laboratory

SRS FRR/DRR Dry Storage Conceptual Strategy

- SRNS Study was completed in September 2012
- The Study identified the need for a pilot case where casks were instrumented for data collection on fuel conditions and cask atmosphere
  - "How dry is dry" : Dryness of Aluminum –Cladded Fuel is the difficulty being addressed. Why because residual water left in the fuel has the potential to generate Hydrogen.
- The program demonstrates the scientific basis for extended storage and establishes safe, secure pad storage of fuel in a "road-ready" condition.
- Strategy consists of 3 Phases

SRS FRR/DRR Dry Storage Conceptual Strategy Phases

Phase 1 ***Estimated Costs = $110M-130Million***

Included laboratory testing as well as real testing on 3 Concrete storage overpacks containing 12 canisters

Phase 2 ***Estimated Costs = $200M-250Million***

Full Scale operation of fuel transfer to dry storage for up to 960 bundles in 110 canisters contained in 22 concrete storage overpacks.

Phase 3 ***Estimated Costs = $715M - 950Million***

Provides Dry Storage for the remaining Aluminum cladded and non-Aluminum cladded fuel in L-Basin. 571 canisters contained in 115 concrete Storage Overpacks plus 55 taller canisters contained in 11 Concrete Storage Overpacks.

Total Estimated Costs = $1.025B – 1.3Billion **Overall Result**

Storage pad would contain approximately 151 Concrete Storage Overpacks containing approximately 748 canisters

Commercial Dry Storage Information

- Commercial Nuclear Industry has used Dry Storage casks since early 2000's for spent nuclear fuel

- Commercial SNF is mainly stainless steel/zircaloy cladded with enrichment of U^{235} in the 4-5% range and a variety of burnup ranges

- **NRC issued Information Notice 2013-07:** Premature degradation of spent fuel storage cask structures and components from environmental moisture, in April 2013.
  - Peach Bottom Atomic Power Station ISFSI – Identified Galvanic Corrosion
  - Three Mile Island Unit 2 ISFSI at the Idaho National Laboratory Site – Identified Cracks and efflorescence caused by water infiltration and freeze/thaw cycles

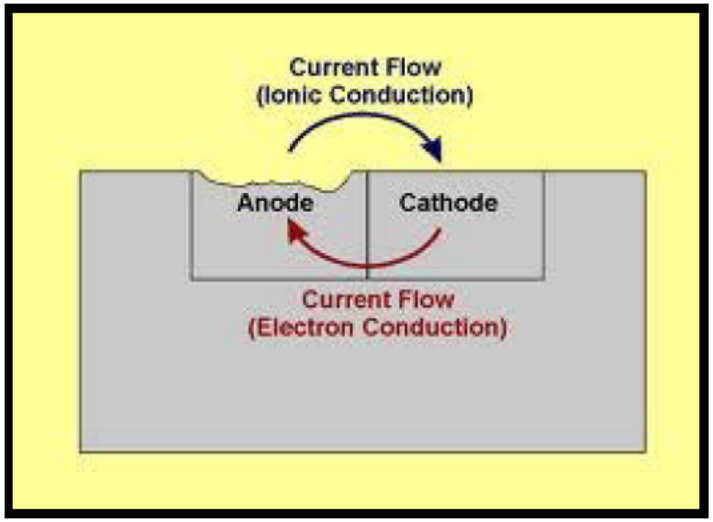
- **Purpose of the NRC Information Notice:** Demonstrates the importance of periodic monitoring of the physical condition of the SNF Storage system. This allows detection of any accelerated degradation before the system is unable to perform its intended functions.

Galvanic Corrosion

- Metals and alloys can have different electrode potentials, and when two or more come into contact in an electrolyte, one metal acts as anode (- charged) and the other as cathode (+ charged).

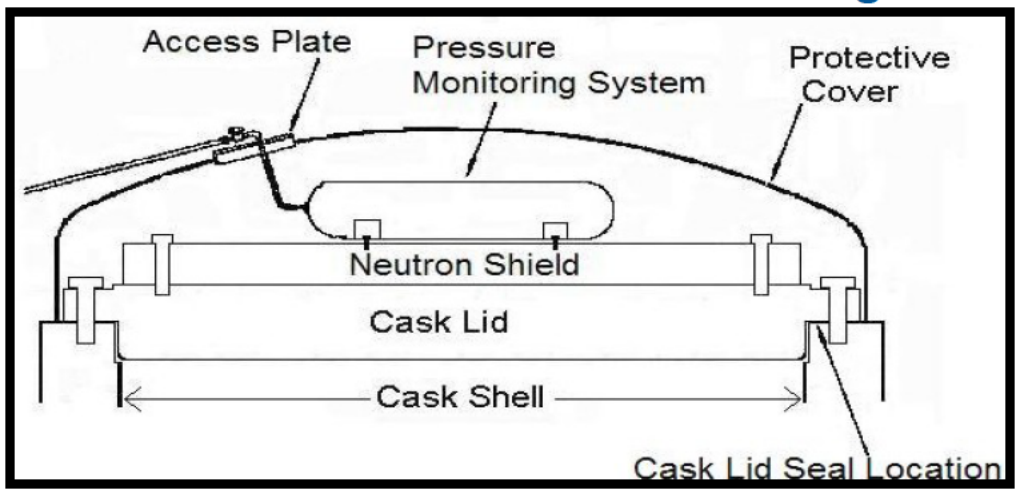
- The electropotential difference between the dissimilar metals is the driving force for an accelerated attack on the anode member of the galvanic couple.

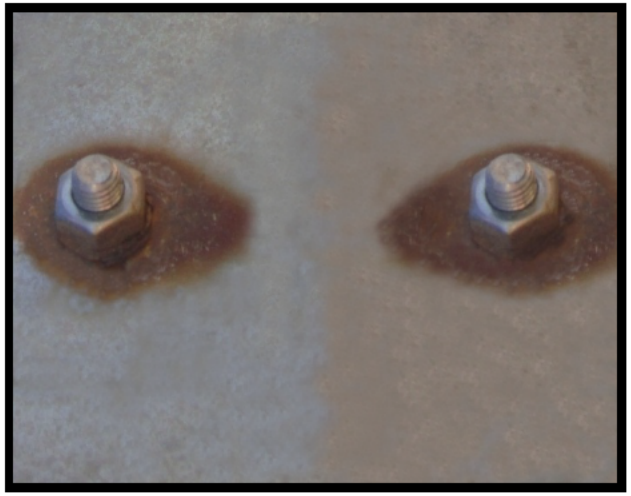
- The anode metal dissolves into the electrolyte, and deposit collects on the cathodic metal.



Example Galvanic Corrosion Pictures

Peach Bottom Cask Lid Drawing





Summary

- Dry Storage is an option being evaluated for the SRS FRR/DRR Used Nuclear Fuel at SRS

- No decision has been made on the long term storage of SRS FRR/DRR Used Nuclear Fuel in a dry condition.