



U.S. DEPARTMENT OF  
**ENERGY**

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# Idaho Site Spent Nuclear Fuel Management

Nuclear Waste Technical Review Board  
June 2010

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Spent Nuclear Fuel Disposition

# Spent Nuclear Fuel (SNF) Quantities and Types

- DOE-Idaho has responsibility for approximately 290 MTHM of SNF, 11% of DOE inventory stored at the following facilities:
  - Idaho Nuclear Technology and Engineering Center (INTEC)
  - Platteville, CO Ft. Saint Vrain Independent Spent Fuel Storage Installation (ISFSI)  
NRC Regulated
  - Advanced Test Reactor (ATR) canal
  - Materials and Fuels Complex (MFC)
- Domestic and Foreign Research Reactor (D/FRR) receipts will continue.
- ATR will continue to generate SNF.
- The SNF inventory includes a wide variety of fuel types with 220 “attributes” e.g. size, cladding, beryllium and carbon matrix fuels, fuel condition (intact to crushed), enrichment, and time in a reactor.





- 1995 *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Record of Decision* – All activities in the current baseline were analyzed in the 1995 EIS.
- 1995 Idaho Settlement Agreement (SA) –
  - All SNF in dry storage by 2023 – If not met, DOE SNF receipts suspended.
  - All SNF out of Idaho by 1/1/2035 - \$60K/day to Idaho if not met.
  - Specified amounts of SNF including DRR/FRR and Navy receipts are permitted.
  - SRS/ID Exchange is permitted if shipments received from SRS do not exceed the cumulative number of shipments sent to SRS from Idaho, measured annually.
- Colorado Agreement –
  - All SNF out of Colorado by 1/1/2035 - \$15K/day to Colorado.

# Response to Changes in SNF Management Policy

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- Idaho will continue to safely store SNF in existing facilities until a new national SNF management policy is developed.
- Policy will consider the recommendations of the Blue Ribbon Commission.
- Idaho Cleanup Project (ICP) has developed several management alternatives for HQ and General Accounting Office.
  - Idaho may increase cask pad storage or add modular storage at INTEC.

# Current INTEC SNF Storage Configurations

- Highlighted on yesterday's tour and described at the end of this package:
  - DOE Regulated
    - CPP-603, Irradiated Fuel Storage Facility
    - CPP-666, Fuel Storage Basins
    - CPP-749, Underground Storage Vaults
    - CPP-2707, Cask Pad
    - Rail cars
  - NRC Regulated
    - CPP-1774, Three Mile Island Independent Spent Fuel Storage Installation (TMI)
- The DOE Authorization Basis for all DOE regulated SNF facilities supports use through 2035 with appropriate surveillance and maintenance.
- TMI license currently extends through 2019. DOE will submit an application for license renewal.

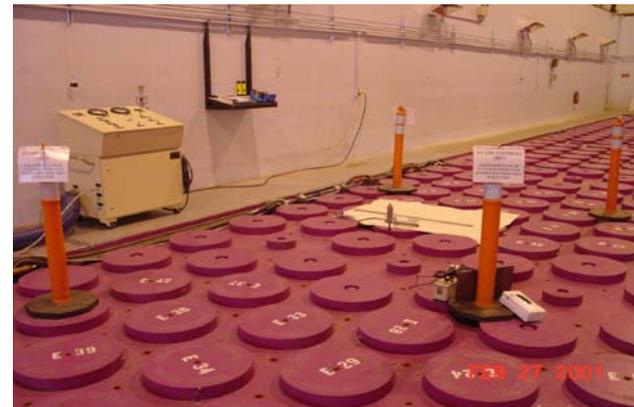
# Elements of Authorization Basis

- Description of facility – as built configuration
- Determination of hazard category – driven by material in the facility e.g. nuclear or hazardous. Attributes of the facility design executed to minimize risk to the worker, on-site, and off-site individuals.
- Analyses of normal operation, abnormal and postulated accident conditions including:
  - Nuclear criticality
  - Radiation safety
  - Fire protection, etc.
  - Transportation
  - Emergency preparedness
- Analyses of natural hazards – seismic, flooding, weather related (snow load, wind including cyclonic storms, etc.)
- Permit Conditions (clean air, water, RCRA, etc.)
- Analyses of required to comply with safeguards and security requirements
- Identification of safety significant systems, structure and/or components



# NRC Licensed Independent Spent Fuel Storage Installations (ISFSI)

- ICP holds 3 NRC licenses:
  - ISFSI Fort Saint Vrain (FSV),
  - Three Mile Island (TMI)
  - Idaho Spent Fuel Facility (ISFF, not constructed).
- Ft. St. Vrain ISFSI is located in CO and was designed for carbon matrix SNF. It holds ~15 MTHM.
- It was constructed in 1989; licensed in 1991. A 20-yr license renewal application was submitted to NRC on 11/10/2009.
- Surveillance and maintenance (S&M) is defined by the NRC license.



# Advanced Test Reactor Canal Storage

- SNF removed from the ATR is temporarily maintained in the reactor canal.
- ATR SNF is transferred to CPP-666 (basins) for storage.
- ATR SNF is the largest piece count ( ~4,000 elements) of SNF managed in Idaho (low total MTHM). Potentially considered a candidate for processing at Savannah River Site H-canyon.
- 2006 ATR complex design basis reconstitution has resulted in revision to the authorization basis which should be completed this year.



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# ATR Canal



86-0570-02-04

## Materials and Fuels Complex SNF/HLW Storage & Disposition

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- Sodium-bonded SNF from the Experimental Breeder Reactor-II is stored in dry, below grade shielded steel cylinders in the Radioactive Scrap and Waste Facility.
- Sodium-bonded SNF from the Hanford Fast Flux Test Facility is stored in the Hot Fuel Examination Facility shielded hot cell.
- These SNF types will be treated in the electrometallurgical treatment process in the Fuel Conditioning Facility.
- Electrometallurgical Treatment produces uranium product, ceramic HLW and metal HLW forms.



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# Radioactive Scrap and Waste Facility



# SNF Characterization, Packaging, Packaged Storage and Load-out

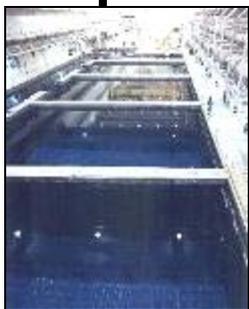
- The current ISFF design is licensed by NRC. Regulatory strategy will be determined when the project is authorized. It has not been constructed.
- Its mission is to receive Idaho SNF; examine/characterize SNF as necessary for disposition e.g. (interim storage, process facility acceptance); package and store SNF in standard canisters; and capability to load SNF into truck casks for transport off site.
- Program changes could cause redesign to:
  - Provide non-canisterized SNF storage.
  - Accommodate SNF not currently assigned to Idaho (Oak Ridge HIFR). (Following formal evaluation of impacts).
  - Provide load-out to rail transport systems.
- Reuse of existing facilities is also under consideration to meet mission needs.



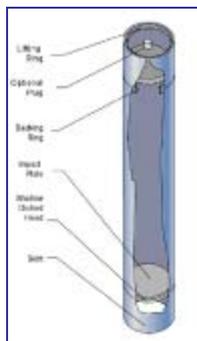
# Idaho Spent Fuel Facility Concept



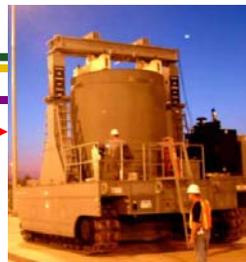
Modify Existing Facility for packaging



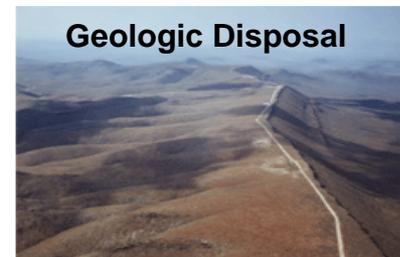
Transfer for packaging



DOE standardized canister



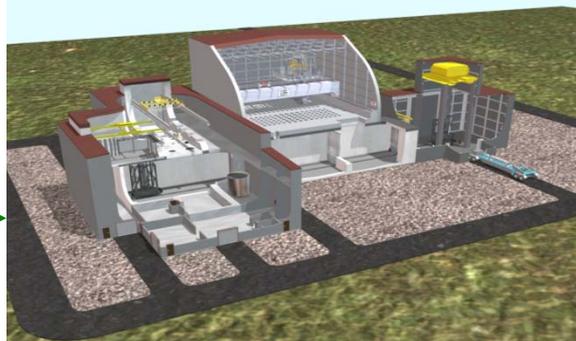
Build new dry storage



Geologic Disposal



To repository by 2035



## Aging Management

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- The ICP post-2012 contract(s) SOW may include a set of life-cycle studies for all DOE-regulated SNF storage facilities.
- Focus will be on defining refurbishment necessary to maintain SNF storage facilities and Idaho Site infrastructure.
- Studies will be similar to the NRC license renewal required life-cycle studies.
- Have identified major upgrades needed for CPP-603 for more efficient SNF handling.



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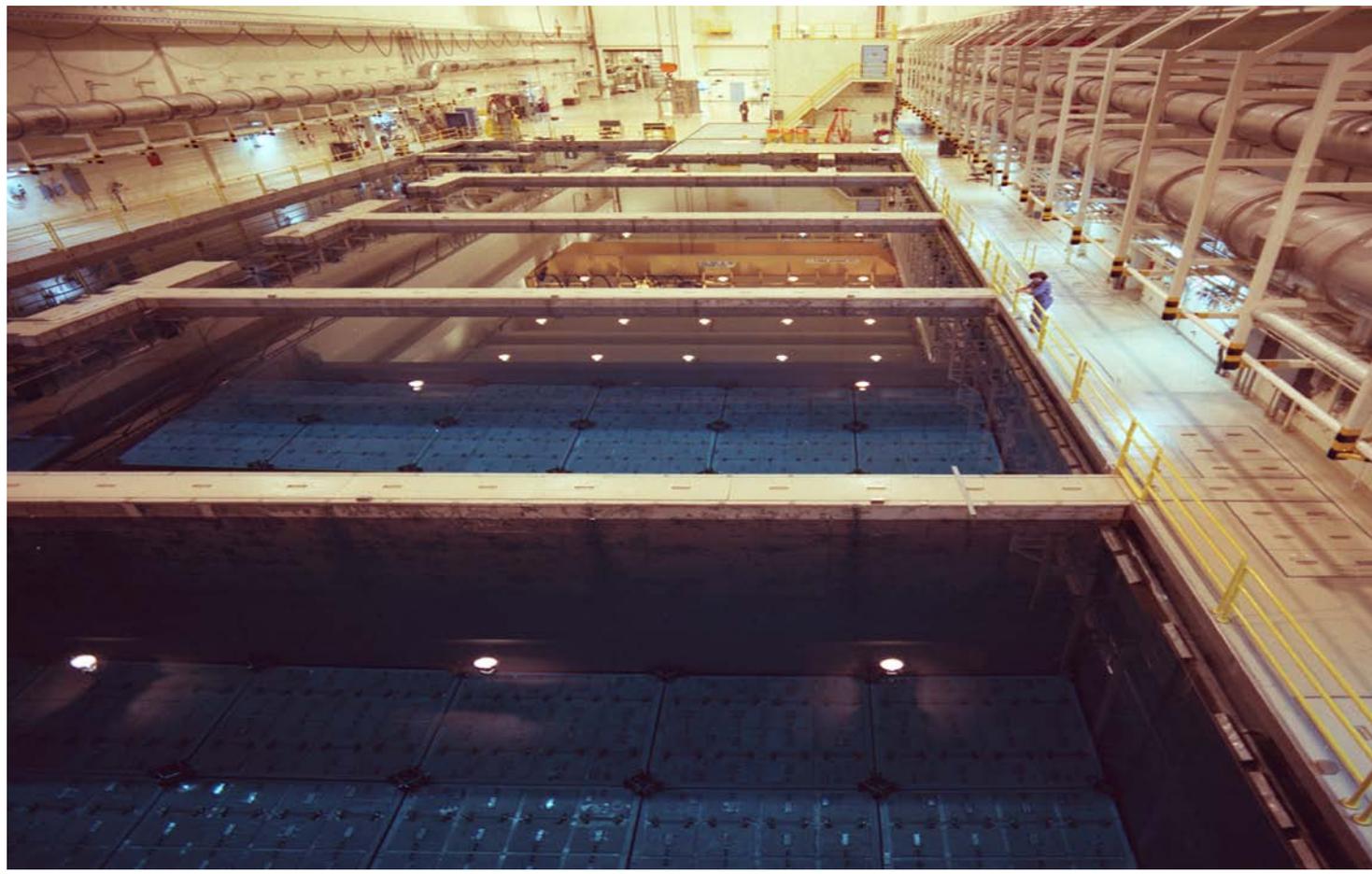
# INTEC SNF Storage Facilities



## CPP-666 – SNF Wet Storage Basins (FAST)

- 79,000 ft<sup>2</sup> facility operational in 1984 includes receiving area, cask receiving and decontamination, unloading pools, 6 interconnected storage pools, transfer canal and supporting functions.
- Basins and canal are stainless steel-lined concrete with leak detection system. 4 basins are 31' deep and 2 are 41' deep.
- Shares systems (ventilation) and structure with adjacent hot cell.
- SNF is stored in stainless steel racks. Water chemistry is tightly controlled.
- All ICP-assigned SNF has been retrieved and transferred to dry storage.
- Stores ATR fuel.
- EBR-II SNF (sodium-bonded) will be retrieved and transferred to MFC for electrometallurgical processing.
- Naval Nuclear Propulsion Program SNF is being returned to Naval Reactors Facility under an MOA.
- Authorization basis assumes operation through 2035. Routine S&M is required; future upgrade to ventilation system and water treatment system are anticipated.

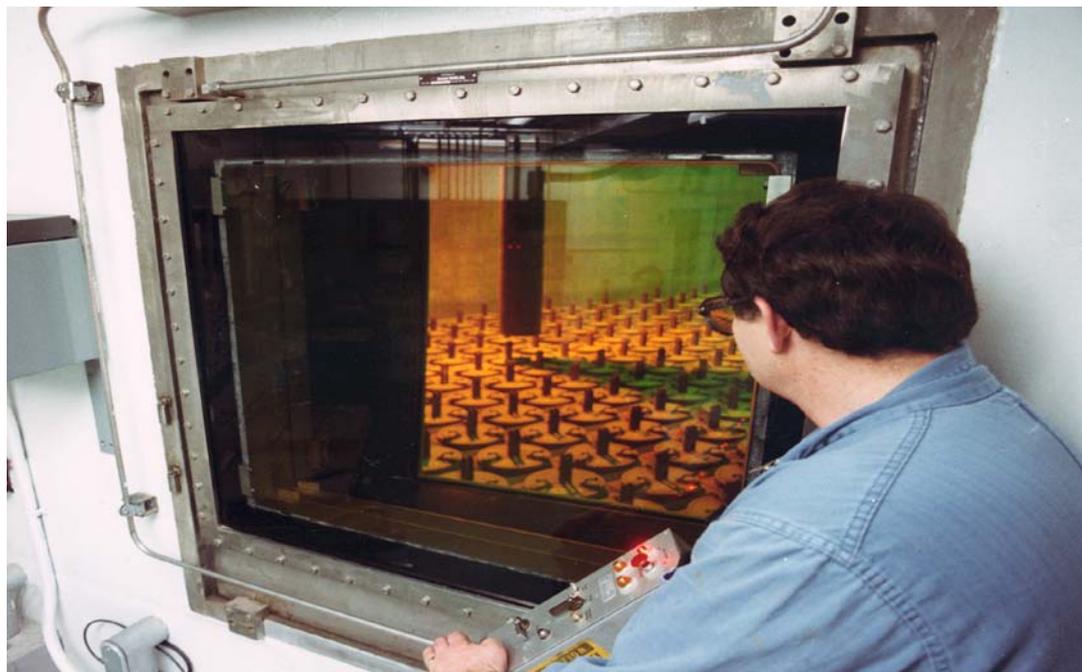
# CPP-666 Fuel Storage



# CPP-603 – Irradiated Fuel Storage Facility

- Dry storage area was completed in 1974. It was designed to receive Ft. Saint Vrain SNF and shares structure with older, closed and grouted fuel basin.
- ~18 MTHM – FRR/DRR SNF receipt expected through 2019.
- Authorization basis assumes operation through 2035.
- SNF is remotely handled and stored in 18" diameter canisters in contact with ambient air.
- Generally intact SNF is received; compromised SNF must be canned (these cans are not welded).
- Mechanical systems need to be upgraded to maintain min. safe storage and to support retrieval of SNF.
- Storage array relies on moderator exclusion. Roof leaked last winter and is being re-coated.

# CPP-603 Storage Array



## CPP-749 – Underground Storage Vaults

- 3 types of vaults constructed between 1971 and 1985 each consisting of carbon steel pipes with shield plugs. 21 vaults are 12 ¾" diameter, 197 vaults are 30" in diameter.
- ~79 MTHM
- Authorization basis assumes operation through 2035. Routine S&M, cathodic protection and corrosion monitoring is required.
- Some vaults are not usable because these vaults are located in an area where water from fire-water system leaks has collected (perched water) in the past. Perched water management is an element of the CERCLA Record of Decision for INTEC.

## CPP-2707 Cask Pad and Rail Car

- Cask pad was constructed in 2003; authorization basis assumes operations through 2035.
- Pad has space for 20 cask storage positions; 6 are in use.
- SNF stored in the casks came from Test Area North fuel examination facility and includes epoxied fuel.
- Rail car holds 2 rail casks from West Valley containing SNF of commercial origin.
- ~ 68 MTHM total for facility.



# Underground Vaults and Cask Pad



Vaults



West Valley Cask



Cask Pad CPP-2707

## Three Mile Island ISFSI

- The TMI ISFSI (NRC regulated) is located within the INTEC facility.
- 82 MTHM of TMI debris was loaded into 29 horizontal storage modules in 2000.
- NRC license must be renewed by 2019.
- S&M defined by license.

