



Idaho
Cleanup
Project

Technology Innovation and International Partnership Workshop

Idaho Spent Nuclear Fuel Stabilization & Disposition

September 14, 2010
Barbara Beller

Spent Nuclear Fuel (SNF)

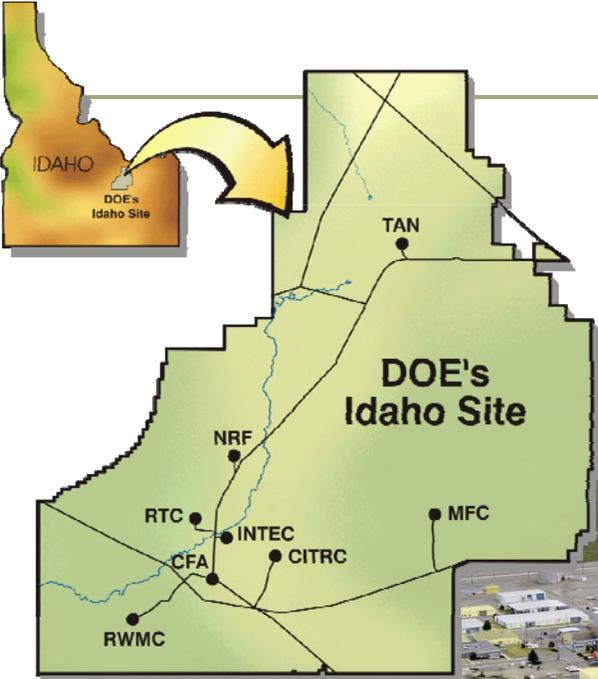
- EM Idaho Cleanup Project (ICP) has responsibility to safely store and disposition approximately 262 of 305 total (EM, NE, Navy) MTHM of SNF:
 - 63% (EM) in Idaho Nuclear Technology and Engineering Center (INTEC) DOE-regulated facilities
 - 37% (EM) in Nuclear Regulatory Commission (NRC) licensed Independent Spent Fuel Storage Installations (ISFSI) at INTEC and Ft. St. Vrain, CO
- Domestic and Foreign Research Reactor (D/FRR) receipts will continue to increase the total ICP SNF inventory.
- The ICP inventory includes a wide variety of fuel types with 220 “attributes”. Attributes include size from 2 lbs to ½ ton; aluminum, stainless steel and zircaloy cladding; sodium-bonded, epoxy-bonded and carbon matrix fuels; intact, slightly damaged and totally crushed fuels; wide range of enrichment, and time in a reactor.
- SNF is Currently Managed in 7 Configurations



Regulatory Schedule Drivers

- **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.
- Consolidation of SNF at Idaho Nuclear Technology and Engineering Center (INTEC)
- 1995 Idaho Settlement Agreement –
 - All SNF in dry storage by 2023 – If not met, SNF receipts in Idaho stop.
 - All SNF out of Idaho by 1/1/2035 - \$60K/day payment if not met.
 - DRR/FRR receipts are permitted, if the SNF is listed in SA amendment.
 - SRS/ID Exchange permitted
- Colorado Agreement –
 - All SNF out of Colorado by 1/1/2035 - \$15K/day payment if not met.





Spent Nuclear Fuel Facilities
 CPP-603 IFSF
 CPP-666 FAST
 CPP-749 SNF underground storage area
 CPP-1774 TMI
 CPP-2707 cask pad
 WV rail casks



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G07-1892-02

Spent Nuclear Storage Facilities Closed

	<u>Completed</u>
TRA-660, ARMF/CFRMF	10/28/97
CPP-603, Basins	04/28/00
TAN-607, TMI*	04/18/01
TRA-603, MTR Canal	09/24/02
TAN-607*	09/29/02
PBF-620, Pool	09/15/03
CPP-603/FECF	04/13/04
<u>TAN-791, Dry Storage Pad</u>	<u>10/26/04</u>



2005 to Present - Complete EM Transfer of SNF to Dry Storage

- May 2005 - June 6, 2010, 3186 SNF fuel handling units were transferred from CPP-666 wet storage to dry storage
 - EM compliance with Settlement Agreement clause E.8., “DOE shall complete the transfer of all spent fuel from wet storage facilities at INEL by December 31, 2023.”
 - Work completed in parallel with ATR Receipts, Navy fuel transfer to NRF
- Navy SNF is being returned to NRF for dry storage in canisters. Transfers currently scheduled to complete prior to 2018.
- Advanced Test Reactor (ATR) SNF continues to be generated. It is stored in the ATR canal for initial cooling and then transferred to CPP-666 basins for interim storage.



Key Improvements Made - Lessons Learned

- **Leadership**
 - Better communication - LISTEN
 - Clear expectations – understood by all
 - Establish weekly, monthly and quarterly goals
 - Personnel Development – Mentoring
 - Implement worker improvement ideas

- **Processes**
 - Implement shift schedule strategy
 - Improve all aspects of training
 - Simplify fuel handling procedures
 - Better tools for workers
 - Build margin between TSRs and procedures
 - Maintain essential equipment
 - Disciplined Operation
 - Human Performance Improvement



Improved Leadership

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Improved Processes

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Sustainable Excellence

- Trust
- Morale
- Teamwork

- Simplify procedures
- Build in margin
- Training

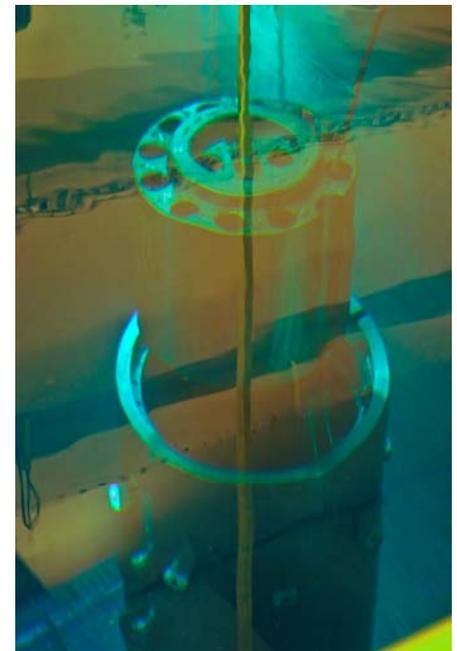
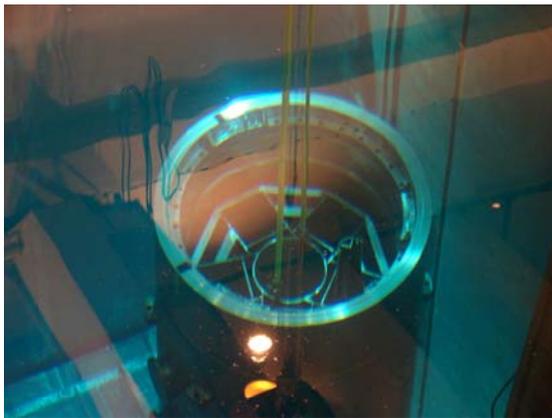
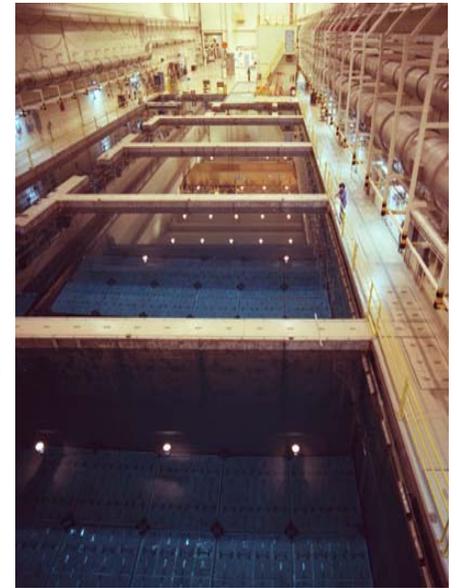
- Improved Safety
- Fewer events
- Increased productivity



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CPP-666 Fluorinel Dissolution and Storage (FAST)

- Basin Storage; 4538 Positions, Approx. 44% full; NE owned ATR, EBR II sodium bonded and Navy fuel; EM dry interim storage in 125B Casks 208 cans of Miscellaneous fuels
- 6 storage pools 35'-41' deep, Unloading pool, transfer canal, stainless steel-lined with leak detection system.
- Started Operation in 1984; 40 year design life
- Authorization basis assumes operation through 2023. Continuous routine S&M.



CPP-603 Irradiated Fuel Storage Facility (IFSF)

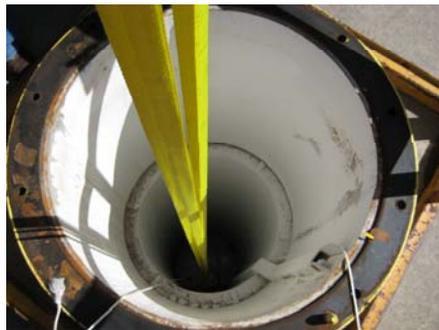
- Dry Storage - 636 Positions; Approx. 85% full; Fort Saint Vrain, ATR, TRIGA Domestic and Foreign Research Reactor, Power Burst Reactor, Pathfinder, Buffalo Pulstar, BORAX.
- Dry Storage addition in 1974 to 1950s vintage structure, designed to receive and store Fort St. Vrain SNF. Authorization basis assumes operation through 2035.
- SNF is remotely handled and stored in 18" diameter stainless or carbon steel canisters (not sealed; not in an inerted) in contact with ambient air. Only intact SNF can be received; Individual fuel elements cannot be retrieved
- Rack Inspection 1 port every 2 years. Corrosion monitoring CS, SS, Al in moist canister.



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CPP-749 Underground Fuel Storage Facility (Vaults)

- Dry Storage; 218 Vaults (1ST 61, 2nd 157); 44% full (2nd only); Shippingport Light Water Breeder and Pressurized Water Reactors, Fermi, Peach Bottom and Tory IIA
- 3 types of vaults constructed between 1971 and 1985 each consisting of carbon steel pipes with shielding lids. 21 vaults are 12 ¾” 197 vaults are 30” in diameter.
- Authorization basis assumes operation through 2035. Routine S&M, monitoring corrosion (Al, CS & SS), H₂ 1 per 3yrs TYP. 1 per 2 months for Tory & verification of vent valve open and clear.



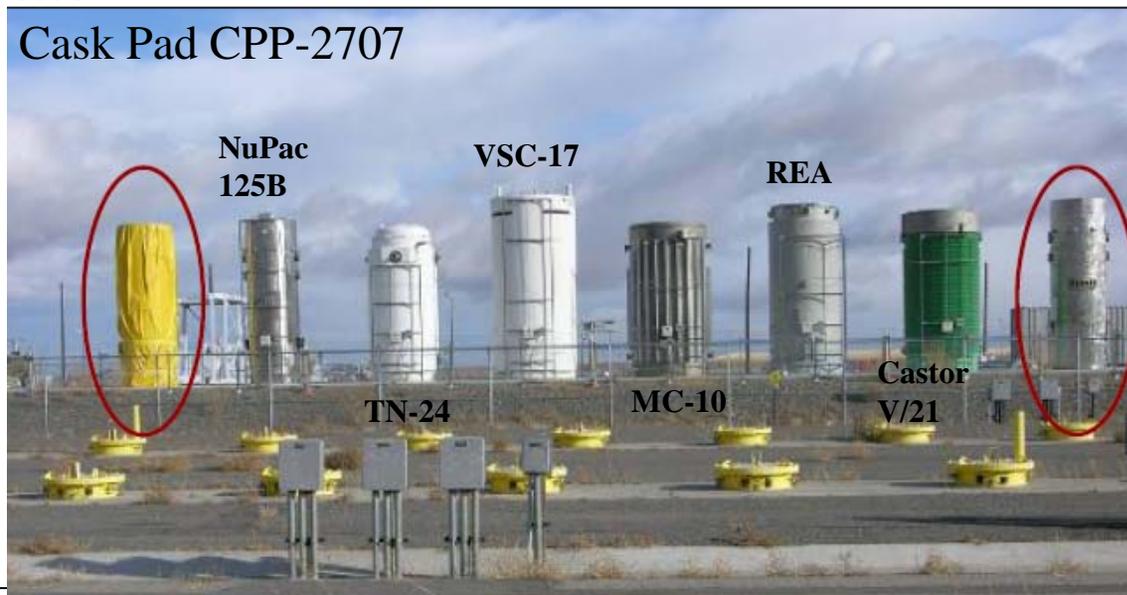
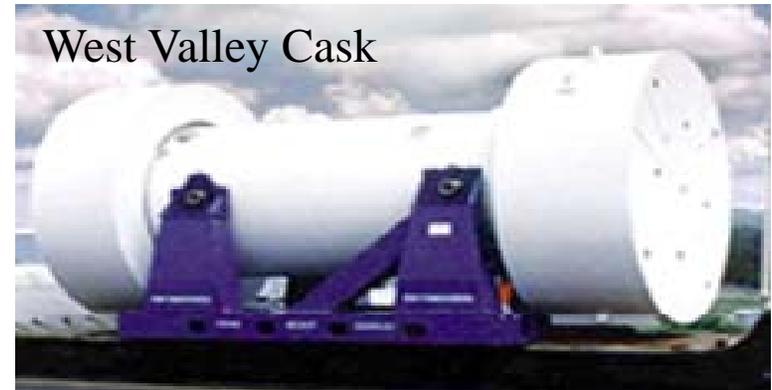
Tory IIA Fuel Transfer CPP-666 to CPP-749



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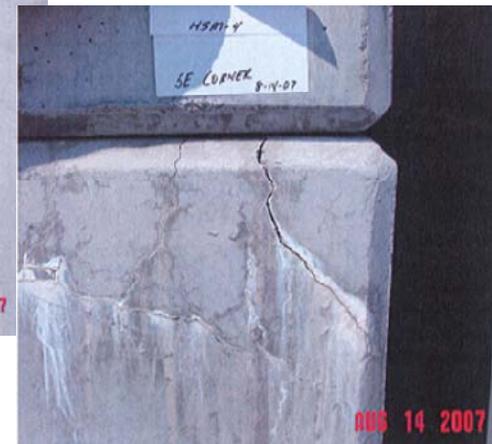
CPP-2707, Cask Pad Rail Cars

- CPP-2707, Cask Pad
 - 20 types of SNF including 5 from Loss of Fluids Test (LOFT) experiments Pressure, Temperature and H₂
- Rail Cars – SNF from West Valley
 - Big Rock Point, BWR and Robert E. Ginna PWR



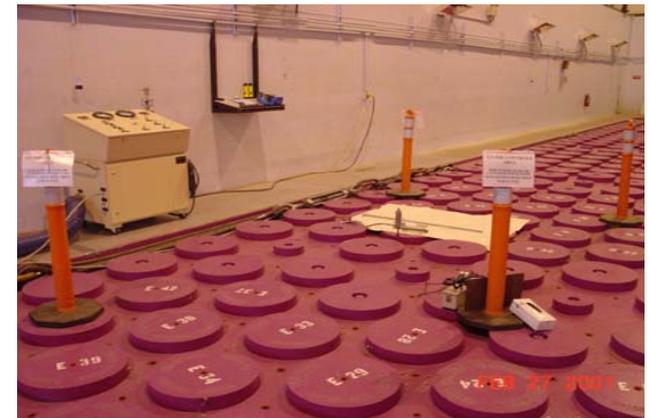
CPP-1774, Three Mile Island NRC Licensed Independent Spent Fuel Storage Installation (ISFSI)

- Dry Storage 344 stainless steel canisters (debris, knock-out and filter). 12 per carbon steel DSC.
- TMI is a set of 30 modular storage horizontal storage modules (29 filled).
- 1999 NRC license. Renewed by 2019; per 10 CFR Part 72, renewal application due 2017.
- S&M defined by license. H₂ every 10 years, surface condition, concrete.



Fort Saint Vrain Modular Vault Dry Storage NRC Licensed Independent Spent Fuel Storage Installations (ISFSI)

- Dry Storage 1464 FHU; 2/3 full; Graphite fuel. Fort Saint Vrain, Platteville, Colorado
- 1991 NRC license.
- A 20-yr license renewal application package, including evaluation for life extension was submitted to NRC 11/10/2009. (2 yr. prior to expiration)
- S&M is defined by the NRC license.



Post 2012 SNF Management

- All ICP-assigned SNF is consolidated and in dry storage at the INTEC facility area and in the Ft. St. Vrain ISFSI.
- *Absolute requirement to maintain safe storage per the authorization basis*
 - *Plan to maintain fuel to ensure the adequate canister/basket/bucket integrity for future retrieval from storage.*
 - *Monitor fuel condition to avoid degradation of fuel that is not canned.*
- *Ensure security for nuclear material (material changes, regulation changes).*
- Recommending that post-2012 contract(s) SOW include a set of life-cycle extension studies for all DOE-regulated SNF storage facilities.
 - Studies would be similar to the NRC license renewal required life-cycle extension studies.
- Recommending that more attention be paid in post-2012 contract SOW to S&M necessary to maintain INTEC and Idaho Site infrastructure (collocation impacts)



Technology Needs

- *Technology to effectively dry SNF and to confirm dryness of SNF contained in a basket/container.*
- *Improve monitoring capabilities, understanding of material properties in service over time.*
- *Spent Nuclear Fuel Packaging – Poison Baskets, improved welding techniques*
- *Technology to drill into cans and provide internal inspection in high radiation fields.*
- *Improved dry storage facility mechanical systems maintenance models/decision trees*
- *Enhanced retrieval, characterization and canistering flow models*
- *Enhanced high-field radiological monitoring*
- *Comfortable PPE*
- *Reduced waste generation*
- *D&D'able materials/structures*
- *Continued improvements in radiation control.*
- *Continued improvements in crane design - manipulator dexterity, maintenance access.*
- *Continued improvements in transport tracking.*



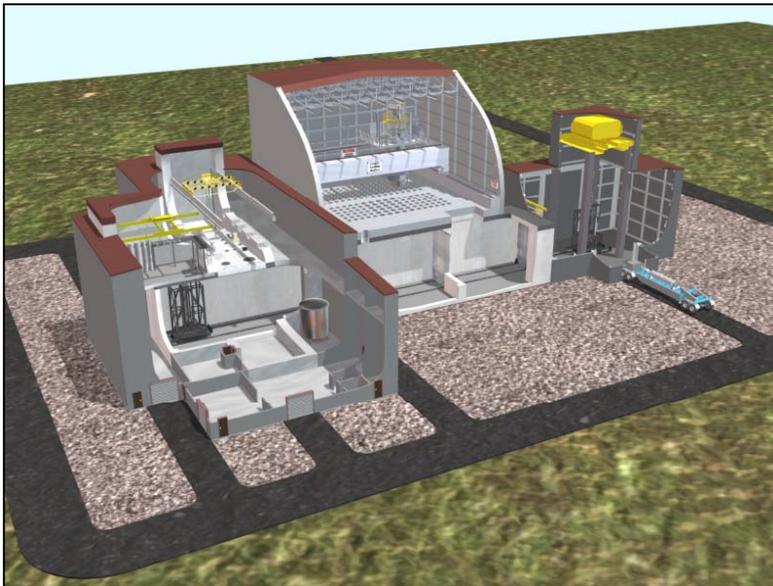
Path Forward for EM Fuel

- *Blue Ribbon Commission Report due - January 2012.*
- *Revised national policy on SNF (used fuel) management may be developed considering recommendations.*
- *ICP will review the mission need for Idaho Spent Fuel Facility (ISFF) and if necessary revise in response to any change to national policy*
- *ISFF Functions (new or reuse of existing facilities):*
 - *Receipt of SNF*
 - *Characterization, stabilization*
 - *Packaging (standardized canister, sealed, inert)*
 - *Standardized Canister storage*
 - *Load-out to transport casks*
- *Requirement to comply with Settlement Agreement*
 - *E.8., “DOE shall complete the transfer all spent fuel from wet storage facilities at INEL by December 31, 2023.”*
 - *C.1, “DOE shall remove all spent fuel, including naval spent fuel and Three Mile Island spent fuel from Idaho by January 1, 2035”*

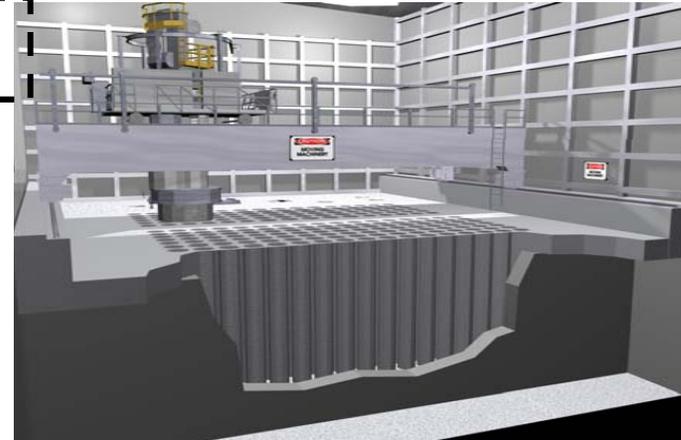


ISFF Conceptual diagram

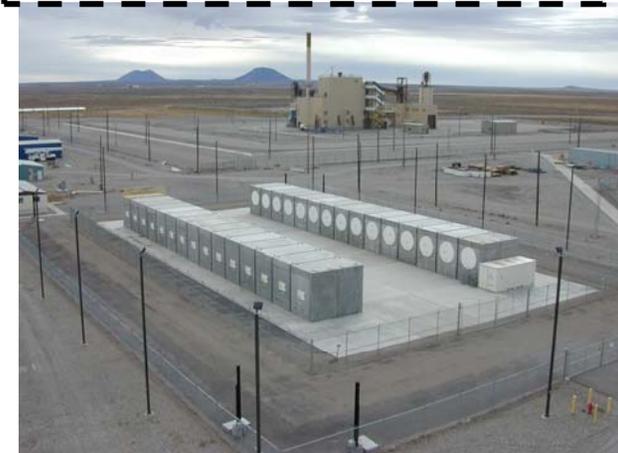
Hot cell to condition and package fuel in standardized canister,



Stand Alone Facility or Hot cell addition to CPP-603



Either Vault type storage, above or Modular Storage below could be selected.



Panel Discussion

- *At our last meeting everyone presented the status of their current or planned storage facilities and the adequacy of capacity for extended storage (~100 years). This session is intended to expand on the previous one by discussing potential changes to current and planned systems if storage extends beyond 100 years up to 300 years.*
 - *Extend existing storage as long as possible.*
 - *Uncertainty regarding existing facilities: Assuming repackaging then 15 years to empty existing storage, “ISFF” no funding until 2014; from CD-0 to Ops is about 8-10 years to start of operation; we are at 2037-2039 right now.*
 - *Business Models: Corporate knowledge, contract strategies, contract turn-over*
 - *Existing facilities are more expensive to maintain but a steady base cost is easier to manage than a spike for construction. (Time dependent)*
 - *Waste generation and management; why contaminate another interim storage location?*
- *Idaho Spent Fuel Facility Given at some time – Integrate needs with other programs. Funding from all.....*
 - *Same Canister, more robust material for longer life, more than one storage configuration?*



Panel Discussion

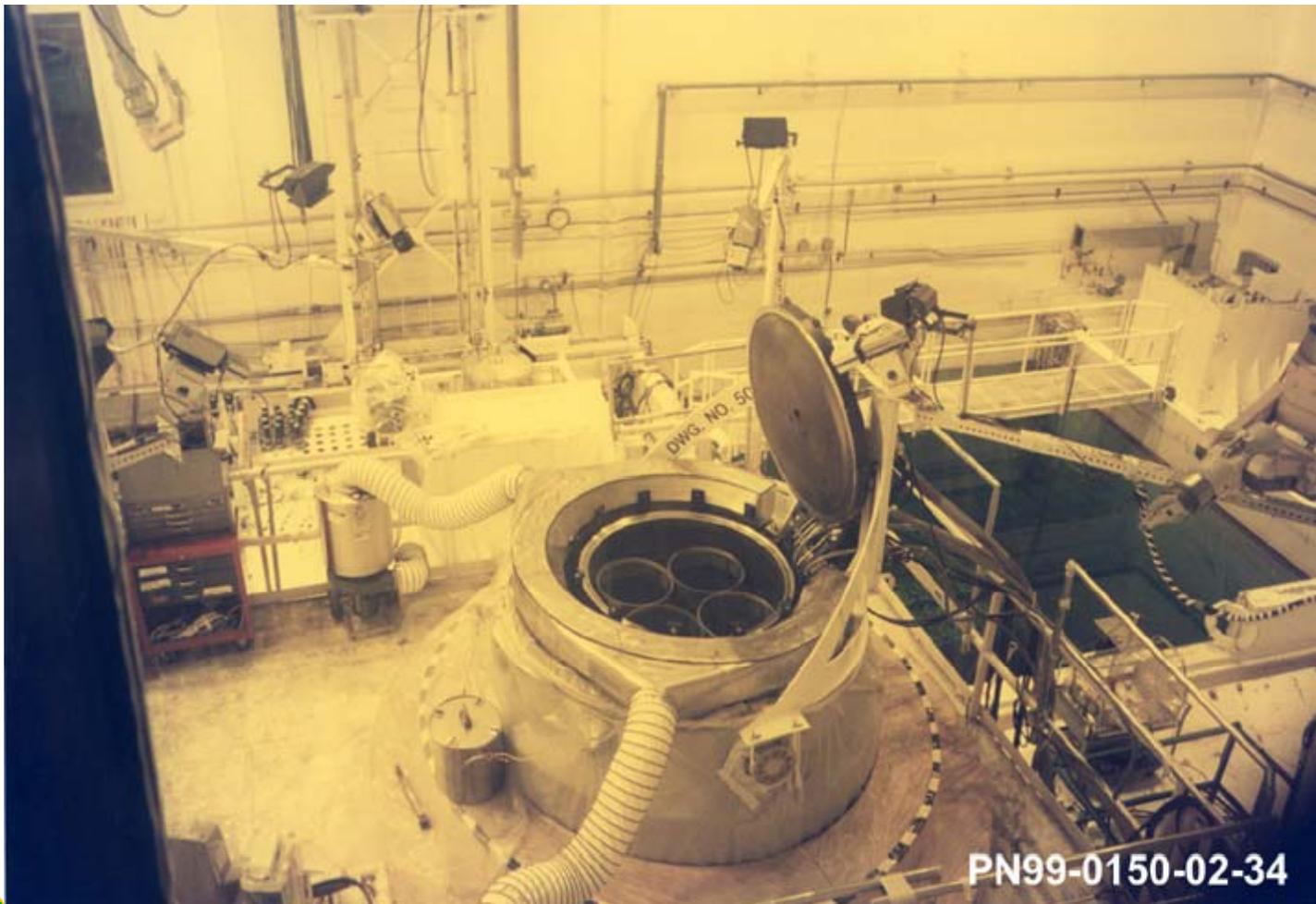
- *Would you change your design for the storage facility and or the package design?*
 - *Storage will require additional studies for optimization. Several configurations may be employed e.g. MVDS may not be best for high temperature fuels (LWBR Seed 994.7 watts)*
- *Would any procurement of new packages or facility designs change in specifications?*
 - *DOE-ID holds a NRC license for processing and storage for Peach Bottom, Shippingport LWBR (not seed) and TRIGA. Canister specs are developed.*
- *What process you would use to arrive at a decision to repackage fuel and HLW for off site shipment or 300 year on site storage.*
 - *ensure safety basis requirements are met (10 CFR 830)*
 - *Stakeholder Influences/expectations*
 - *5 year cost profile (capital investment if very hard to make)*
 - *Life cycle cost*



Back-up

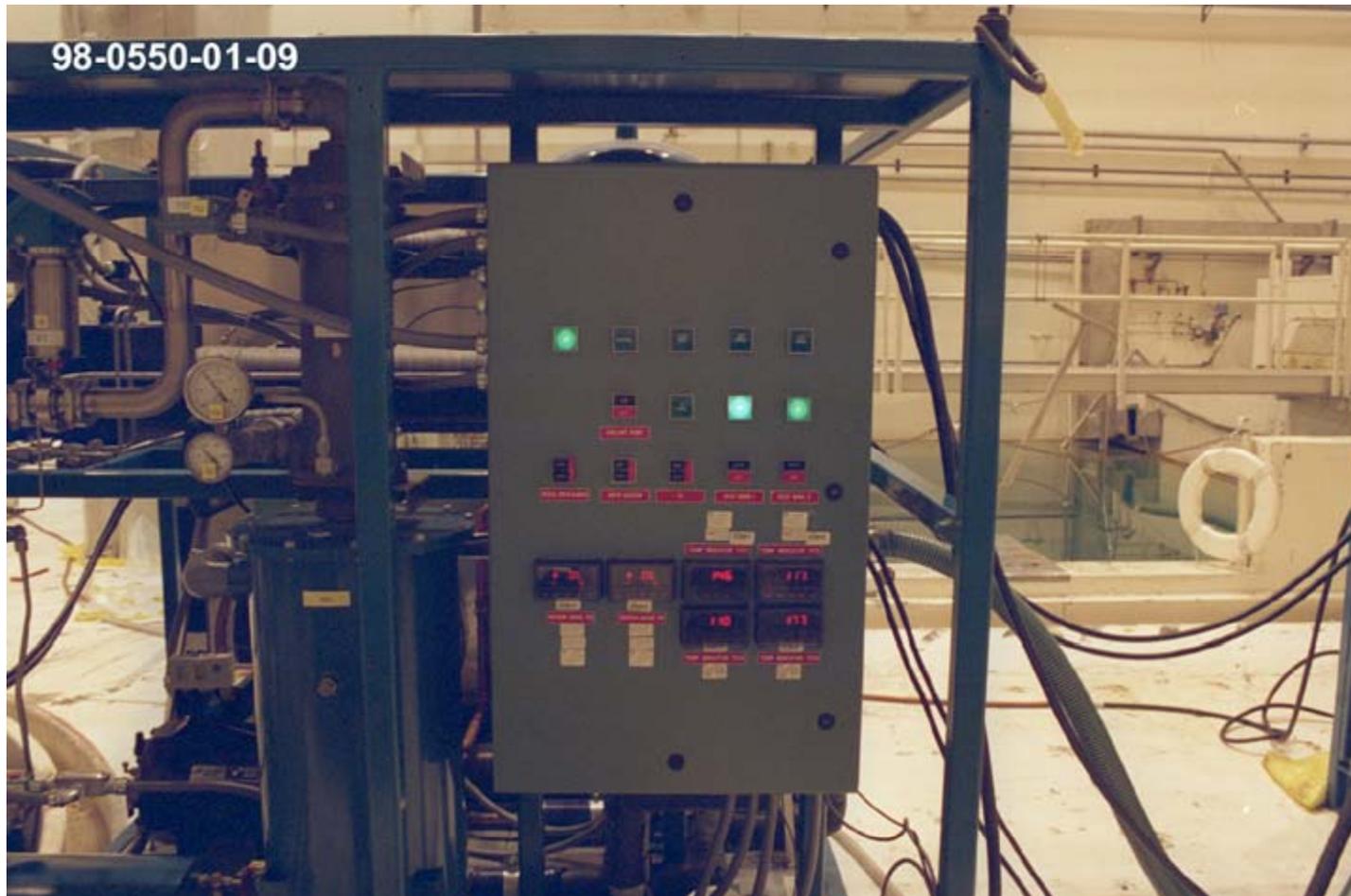


Heated Vacuum Drying System



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TMI Heated Vacuum Drying System



TMI DCS Closure Welding

