Integrated Planning for Packaging, Transportation, and Storage of Commercial SNF at an Interim Storage Facility

U.S. Nuclear Waste Technical Review Board
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Topics

- Holtec International Corporate Overview
- Holtec’s View of Consolidated Interim Storage
- HI-STORE CISF: A Consolidated Interim Storage Facility for Spent Nuclear Fuel & High Level Waste
- Spent Nuclear Fuel is Transported Safely & Securely
- Integrated Planning and Path Forward
Holtec International Corporate Overview

- A vertically integrated turnkey supplier of goods and services to the power generation industry
  - Design & Engineering
  - Licensing
  - Fabrication
  - Critical Material Supply
  - Construction
  - Site Installation
  - Operations
- Established in 1986
- Financially Strong
  - Orders booked for future deliveries: 5.0+ Billion USD
  - No history of long-term debt
  - Highest industrial credit rating [D&B-1R2]
  - Self-financed R&D: SMR-160, Decommissioning & Consolidated Interim Storage
- Business Mix:
  - 85% Nuclear power & nuclear waste
  - 10% Fossil power – combined cycle
  - 5% Renewables – solar, wind, etc.
Holtec’s Manufacturing Capabilities
Three Major U.S. Manufacturing Plants

- Holtec Manufacturing Division (HMD)
  - Turtle Creek, PA
- Orrvilon, Inc. (ORR)
  - Orrville, Ohio
- Advanced Manufacturing Division (AMD) NEW!
  - Holtec Technology Campus, Camden, NJ
- Precision Fabrication Systems (PFS) NEW!
  - Dahej, India
- Over 1.3 Million square feet of Manufacturing Space
Safety Program

- Holtec approaches safety through a holistic and proactive Injury and Illness Prevention Program (IIPP).

- The elements of Holtec’s safety program consist of:
  - Management Commitment
  - Employee Involvement
  - Hazard Recognition and Mitigation
  - Program Evaluation and Continuous Improvement
  - Employee Training and Knowledge Management
  - Safety Procedures
Quality Program

- Holtec's Quality Assurance Program has been approved to meet the following applicable industry quality assurance standards:
  - Established in 1986
  - 10CFR50 Appendix B
  - 10CFR71 Subpart H (Approval Number 0784)
  - 10CFR72 Subpart G
  - NQA-1
  - ISO 9001:2008
- Triennially audit results provided by the U.S. NRC, NUPIC, and other organizations
- Holtec design centers and fabrication facilities operate under the same QA Program
- Holtec holds all ASME code stamps actively used in the industry (nuclear and non-nuclear)
  - ASME III N-Stamp (N1, N2, N3, NB)
  - ASME III NPT-Stamp (design and fabrication)
  - ASME III R-Stamp (in-shop repair)
  - ASME U-Stamp
Holtec is Dedicated to Deploying Safe & Secure Spent Fuel Storage Technologies

- Spent nuclear fuel dry storage & transport systems for all fuel types
  - Over 100 nuclear plants worldwide are under contract for Holtec’s dry storage systems
  - Almost one half of the available world market
  - Over 1,000 Holtec systems have been successfully loaded. This number is growing by over 100 canisters per year.

- High density in-pool spent nuclear fuel storage systems
  - Over 120 nuclear plants on four continents racked with Holtec’s wet storage technology
  - Over 60% of available world market
Holtec’s Worldwide Dry Storage and Transport Experience

105 nuclear plants worldwide rely on Holtec’s dry storage technology for their storage and transport needs; 59 domestic, 46 international.
Holtec’s CIS Expertise

Only world supplier with extensive experience in developing CIS:

1. America’s only licensed CIS (Skull Valley, Utah)

2. Ukraine’s facility in Chernobyl

Private Fuel Storage, CISF licensed for 4,000 Holtec Storage Systems (Licensed in 2003)

Ukraine’s Central Storage Facility (under construction)
Ukraine Central Storage Facility

- Store spent fuel from Energoatom’s nine VVER reactors (Rivne, Khmelnitsky, and South Ukraine)

- The State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) issued Certificate #E0001060 on June 29, 2017
  - Authorized Energoatom to construct and commission a central storage facility in the Chernobyl Exclusion Zone

- Groundbreaking ceremony held on November 9, 2017
  - Construction work to be completed in mid-2019
Ukraine Central Storage Facility

- Plant-use equipment being manufactured (in USA); all delivered by mid-2019
  - Double walled canister: HI-STAR 190
- Initial CSFSF-use equipment will also be delivered by mid-2019
  - HI-STORM 190 overpack
Ukraine Central Storage Facility

- 8-Axle & 12-Axle railcars designed:
  - Two (2) 12-Axle fabricated
  - One (1) 8-Axle fabricated

- Follow-on deliveries include:
  - 3 additional transportation systems (HI-STAR, Impact Limiters, and Railcars)
  - 90 more MPC/HI-STORM systems

- Initial fuel moves will occur in late 2019
Holtec’s View of Consolidated Interim Storage

- Opportunity for DOE to follow through on the government’s promise to defuel nuclear plant sites
- Supplements long-term repository
- Allows removal of spent fuel from nuclear plant sites sooner than awaiting final repository
- Cost efficient away-from-reactor storage
- Eliminate stakeholder & political challenges with fuel storage at nuclear plant site by relocating fuel to area with strong local and state support
HI-STORE CISF: A Consolidated Interim Storage Facility for Spent Nuclear Fuel & HLW

- Holtec & ELEA Team – Public Private Partnership (2016)
- Eddy-Lea Energy Alliance, LLC
  - Long-standing NM alliance
  - Owners are:
    - Counties of Eddy & Lea
    - Cities of Carlsbad & Hobbs
  - Formed in 2006 under the NM Local Economic Development Act
- ELEA owns the property
- Holtec funding the HI-STORE & HI-STORM UMAX applications
- Holtec will operate facility
HI-STORE CISF Site

- 1,000 acres: Geologically stable, dry, elevated land
- Developed infrastructure: Electric, water, roads & rail
- Remote location:
  - ✔ 35 miles from nearest town
  - ✔ Midway between Carlsbad & Hobbs, NM
- Populace: Robust scientific & nuclear workforce
  - ✔ WIPP
  - ✔ URENCO
Strong Local Support

- **Strong support:**
  - Local communities
  - State & Local government

- **Letters from the Cities of Carlsbad and Hobbs**

- **Letters from Counties of Eddy and Lea**

- **Letter from Governor of New Mexico**

- **Memorial Letters from House and Senate of New Mexico**
HI-STORE CISF Utilizes the HI-STORM UMAX Technology

- Below-grade, passive, vertical, air-cooled
- Maximizes Safety & Security
- Store canisters up to:
  - ✔️ 75 ¾ in dia. / 213 in tall
- Any US-origin commercial nuclear fuel:
  - ✔️ Packaged in dry storage canisters
  - ✔️ Stored in fuel pools
- Operational Advantages
- No repackaging required

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Site Layout

- Initial Storage Capacity = 500 canisters (8,680 MTU)
- Total Storage Capacity = 10,000 canisters (173,000 MTU)
- Facility utilizes 500 of the 1,000 acres available
- Operations could commence by 2023
Operations at the HI-STORE CISF
Transport to HI-STORE CISF

- Spent nuclear fuel will arrive at the HI-STORE CISF by rail
  - ✓ Robust and safe transport casks using specialty designed railcars
- Transportation of radioactive material including Spent Nuclear Fuel is strictly regulated
  - ✓ The Nuclear Regulatory Commission (NRC) and the U.S. Department of Transportation (DOT)
- Two transport casks designed and licensed with the NRC by Holtec International will be used
  - ✓ HI-STAR 190 (licensed) and HI-STAR 100MB (pending)
Transport to HI-STORE CISF

- There are two options for transporting the wide range of commercial SNF canister designs:
  - Utilize the original transport cask that was approved for the canister
  - Transport in a Holtec Transport Cask (HI-STAR 190 and HI-STAR 100MB)
- Licensing non-Holtec canisters is not a technical issue for HI-STORM UMAX
  - In process of licensing for MPC-37, MPC-89, and TN-24PT1
  - For transport the canister is not the containment boundary

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**Diagram:**

- HI-STAR 60: 128" dia, 274.37" long, 164,000 lb
- MP197: 122" dia, 281.25" long, 265,100 lb
- HI-STAR 180: 128" dia, 285.04" long, 308,647 lb
- HI-STAR 100: 128" dia, 307.5" long, 271,893 lb
- MP187: 126.75" dia, 308.0" long, 312,000 lb
- NAC MAGNATRAN: 128" dia, 322.0" long, 392,000 lb
- HI-STAR 190 SL: 128" dia, 339.56" long, 382,746 lb
- TS125: 143.5" dia, 342.4" long, 285,000 lb
- HI-STAR 190 XL: 128" dia, 362.06" long, 420,769 lb
Transport to HI-STORE CISF

- Transport casks are designed and fabricated to safely confine the fuel and shield workers and the public from radiation
  - Multiple layers of steel, lead, and other materials
- Inside the cask, the used fuel, in solid form, is contained in another sealed canister
- Fully loaded casks weigh 125 tons or more for rail shipments
Rail Access to HI-STORE CISF

- Location (distance) of the existing rail terminal from the site
  - 3.8 miles west Southwestern Railroad (SWR)
  - 32 miles east Texas-New Mexico Railroad

- The local area has a well-developed rail road infrastructure. The length of additional rail spur required for the site in less than 10 miles.

- The transportation rail car is transferred to a newly constructed rail spur located along State Highway 243, where the transportation casks remain on the rail car and are transported approximately 5 miles east to the HI-STORE CISF.
Transport of Spent Nuclear Fuel is Proven and Safe

According to a report prepared by Oak Ridge National Laboratory and Argonne National Laboratory (2016):

- More than 25,000 shipments of used nuclear fuel have been made worldwide, shipping more than 87,000 Metric Tons of Fuel.
- All shipments were undertaken without any injury or loss of life.

According to the NRC, more than 1,300 used fuel shipments have been completed safely in the United States over the past 35 years:

- Most of the used fuel was shipped by rail
- All shipments were completed with no release of radioactivity

The U.S. Navy reports that, over the past 60 years, it has completed nearly 850 shipments of used fuel from naval propulsion reactors, covering 1.6 million transportation miles.

- All shipments were also completed with no release of radioactivity.
HI-STORE Site-Specific License Timeline

- Application submitted to USNRC: March 2017
- Application accepted by USNRC: March 2018
- RAI #1 Expected: Mar – Aug ’18
- NRC Public Meetings in DC: April 25, 2018
- NRC Public Meetings in NM: April 30 – May 3 ’18
- RAI #2 (if needed): February 2019
- NRC Completes Review: July 2020
- Pending Agreement w/DoE and/or Nuclear Utilities:
  - Construction Start: 2020
  - Construction Complete: 2023
  - Accept First Shipment: 2023
HI-STORM UMAX License Amendment Timeline

- Amd. #3 submitted to USNRC adding 24PT1 canister: Aug 2016
- Amd. #3 accepted by the USNRC: Jan 2018
- Early RAI #1 received: Jan 2018
- Full RAI package expected: May 2018
- Response to RAIs expected: July 2018
- NRC to issue the CoC/Safety Evaluation Report: Oct 2020
Integrated Planning and Path Forward

- Continue Licensing Effort
  - Holtec Funding Internally
  - Goal – License approval in 2020

- Federal Funds for Construction & Operation
  - Legislation to change NWPA
  - H.R. 474 (Issa / Conaway Bill)
    - CIS funding from Waste Fund
  - H.R. 3053 (Shimkus Bill)
    - Gives DOE full control of the public land
    - Expands the capacity limit on the Yucca Mountain repository from 70,000 to 110,000 metric tons
    - Authorizes the DOE to store SNF at an NRC-licensed interim storage facility owned by a nonfederal entity, and
    - Provides mandatory funding for specific stages of repository development
Questions?