

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

U.S. Nuclear Waste Technical Review Board Summer 2018 Board Meeting **Presentation By: Myron M. Kaczmarsky Senior Director, Holtec Government Services**

June 13, 2018





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

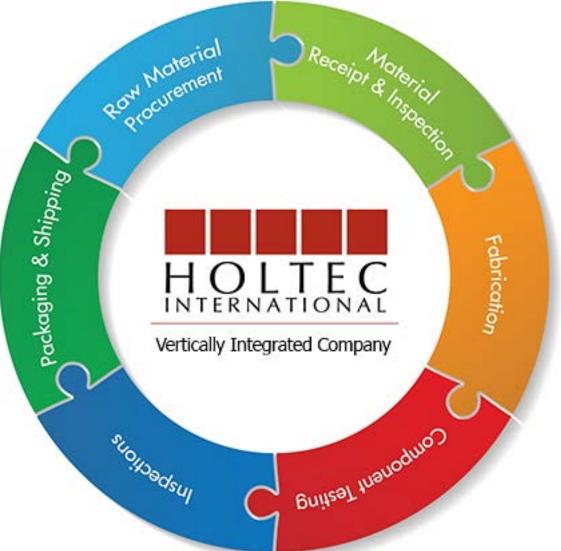


Holtec International Corporate Overview

A vertically integrated turnkey supplier of goods and services to the power generation industry ✓ Design & Engineering V Licensing ✓ Fabrication ✓ Critical Material Supply ✓ Construction ✓ Site Installation V Operations Established in 1986 **Financially Strong V** Orders booked for future deliveries: 5.0+ Billion USD **W** No history of long-term debt ✓ Highest industrial credit rating [D&B-1R2] V 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



Holtec International
S FETY BULLETIN
A Corporate Bulletin to Raise Safety Awareness

Always Alert – Accident Avert

Holtec Manufacturing Division Safety Milestone Achievement

Holtec Manufacturing Division has successfully completed 90 Consecutive Days without experiencing an OSHA Recordable Injury. The facility has successfully worked from October 5, 2013 through December 4, 2013 without a workplace injury. This represents approximately 156,000 safe work hours during this time frame. As of December 12, 2013; Holtec Manufacturing Division has currently worked 98 consecutive days without an OSHA Recordable Injury.

More importantly, Holtec Manufacturing Division has completed 189 consecutive days without a LOST TIME injury....!

In recognition of achieving this safety milestone, a Presidential Safety Bonus will be awarded to each represented Associate in the form of the equivalent of 8 hours of pay.

Dr. Singh challenged the Holtec Manufacturing Division to complete 90 Consecutive Days without and OSHA Recordable injury and we are proud of achieving this accomplishment for the sole reason that each of our Associates went home the same way they came to work each day.

On behalf of all members of the Holtec International Executive Team and Holtec Manufacturing Division Management Team, we would like to extend our congratulations to each of you for doing your part to ensure that safety is our number one priority.

Let's continue to focus on safety and reach our ultimate goal of achieving Zero Injuries! Here is to completing the next 90 Days OSHA Recordable Free!

Page 1 of 1

Date Issued: December 17, 2013 Issue No: 13.09



Safety Contacts

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Nanotec Metals Division Lakeland, FL

Ryan Haynes Tel (863) 709-9448 x5108 Mobile: (727) 252-8585 chaynes@holtec.com

"Safety Starts with Me"

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)
 - \checkmark 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



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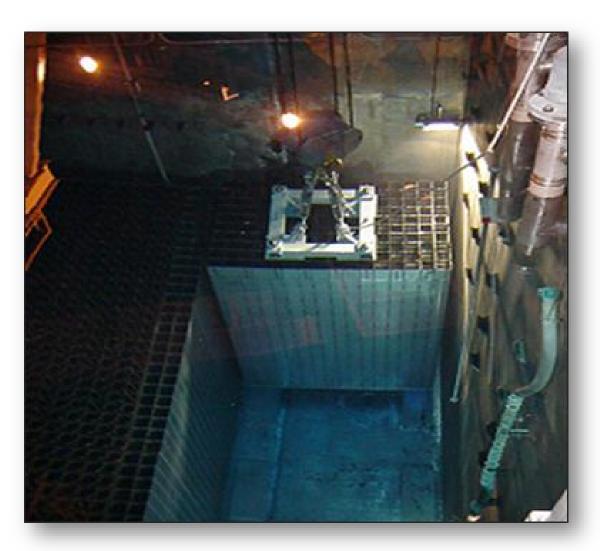
Holtec is Dedicated to Deploying Safe & **Secure Spent Fuel Storage Technologies**

- 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
 - \checkmark 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

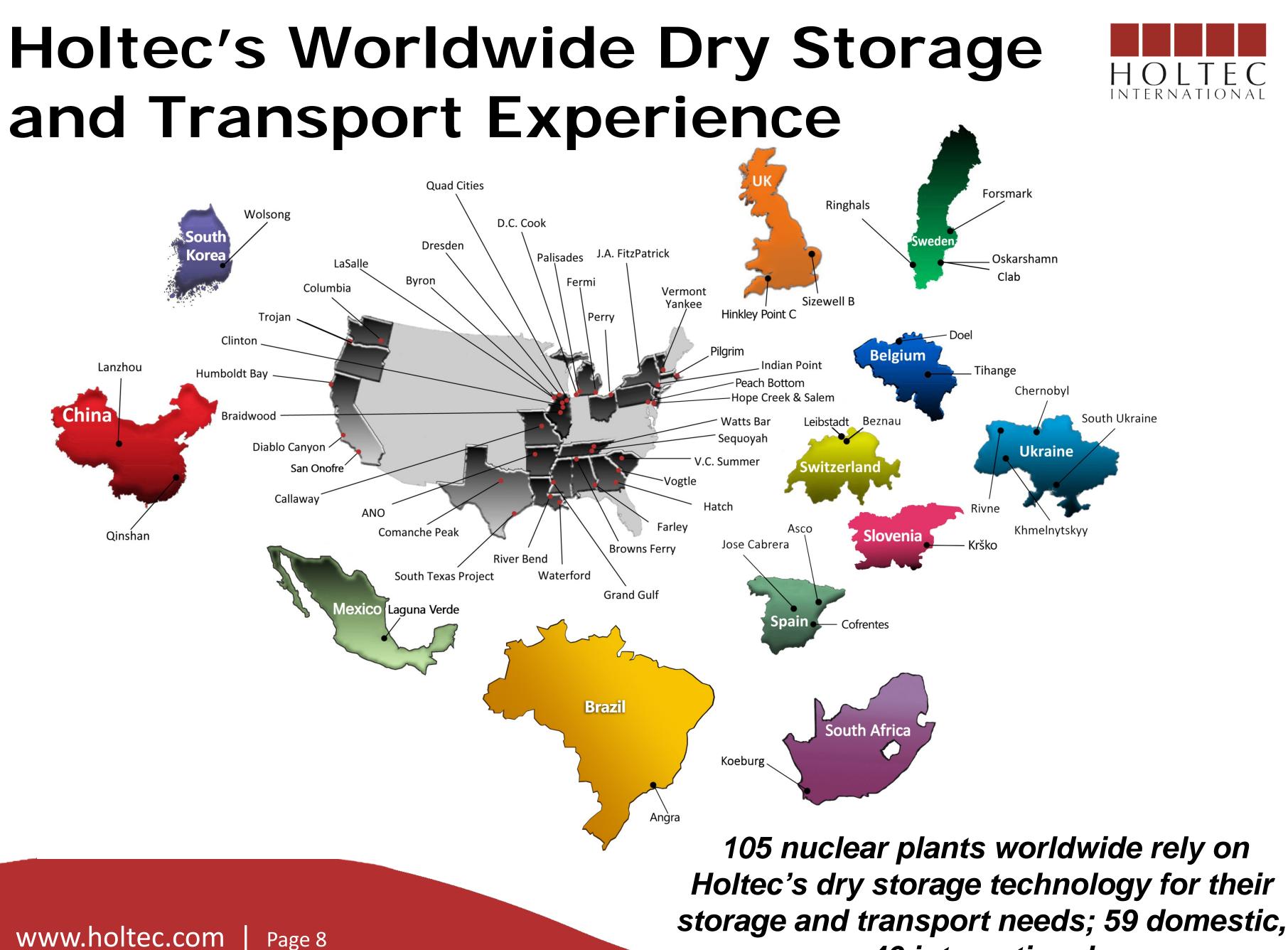




Used Fuel Dry Storage Facility



High Density Wet Storage Racks

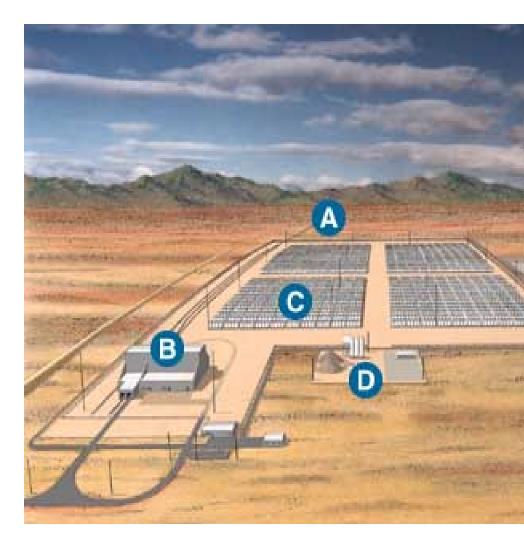


46 international

Holtec's CIS Expertise

Only world supplier with extensive experience in developing CIS:

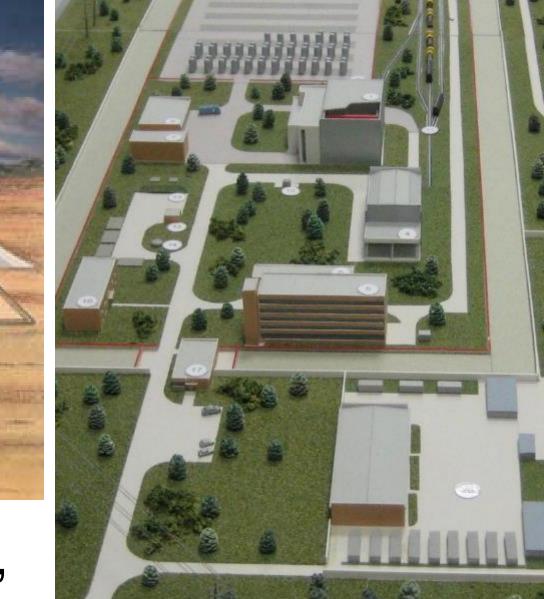
- 1. America's only licensed CIS (Skull Valley, Utah)
- 2. Ukraine's facility in Chernobyl



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



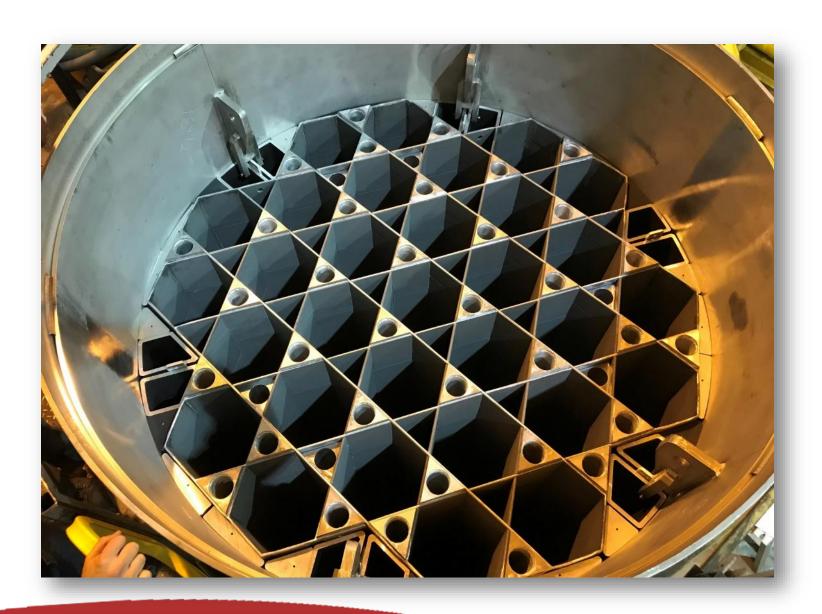




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Ukraine Central Storage Facility

- 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



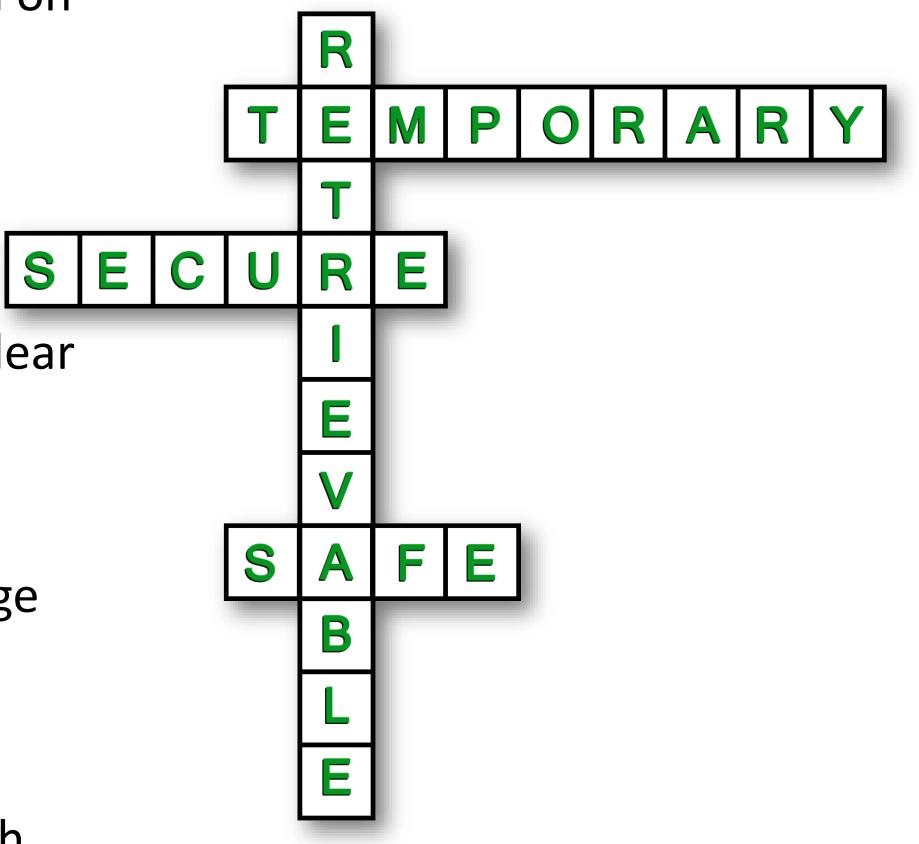
12-Axle Railcar for Ukraine Central Storage Project





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
 - \mathbf{V} 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

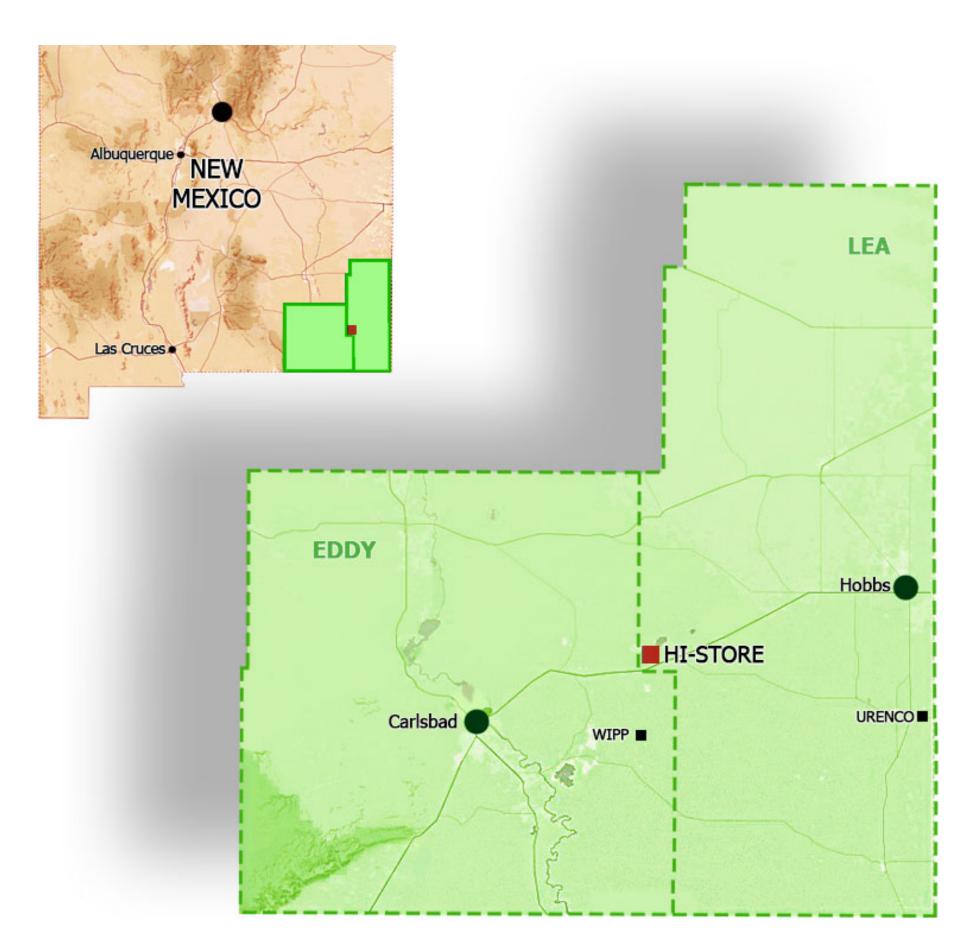




Future HI-STORE CISF

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: \mathbf{V} 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

CITY OF CARLSBAD RESOLUTION NO. 2013-41

A RESOLUTION SUPPORTING THE EDDY LEA ENERGY ALLIANCE'S (ELEA) EFFORT TO BRING IN AN INTERIM STORAGE FACILITY FOR SPENT NUCLEAR FUEL IN SOUTHEASTERN NEW MEXICO

WHEREAS, the Eddy-Lea Energy Alliance is a limited liability company owned by the New Mexico public entities of the Cities of Carlsbad and Hobbs, and Eddy County and Lea County

WHEREAS, millions of taxpayer dollars are being spent on monitoring and oversight of spent fuel each year and millions more are being spent on settlement

payments related to waste disposition WHEREAS, spent fuel presents a safety hazard at its current location, but could safely be moved to a consolidated interim storage site using proven technology, which is the recommendation of the President's Blue Ribbon Commission on America's Nuclear Future

WHEREAS, the dry, remote southeastern corner of new Mexico is ideal for such emporary storage. A pre-existing scientific and nuclear operations workforce the area, as does a community that is open-minded about possible n ELEA's property, located between Carlsbad and Hobbs, is an excelle interim storage facility

NOW, THEREFORE BE IT RESOLVED BY THE GOVERNIN CITY OF CARLSBAD, that having carefully evaluated interim storage endorse and direct the board of the Eddy-Lea Energy Alliance to age centralized interim storage facility at the ELEA site; and, furthermore to distribute this resolution to the legislature, governor, Energy Secre members of Congress

INTRODUCED, PASSED, ADOPTED AND APPROVED this September, 2013



A MEMORIAL EDDY-LEA ENERCY ALLIANCE TO DEVELOP OWBOLIDATED INTERIM STORACE FACILITY.

a 2013 report from the blue ribbon commissio future strongly recommended that one or ted interim storage facilities be established store the spent nuclear fuel generated by ca's nuclear fleet, which generates approximately twent at of the electricity in the United States; and WHEREAS, muchear power plants are an important source of reliable electricity production in the Daited States, and without them, America would be emitting indred million matriz tons, or twenty-five percent more f carbon dioxide into the atmosphere annually; and

here are thirteen decomissioned reactors is Naited States that meed a place for their used fuel to be tured, and about twenty more will be decommissioned by 2035

WHEREAS, many power generators have overly packed fuel and others have very limited on-site stor capability; and

WHEREAS, the nuclear power utilities have standard contracts with the United States government requiring that the United States government take possession of the



STATE OF NEW MEXICO COUNTY OF EDDY

RESOLUTION NO: R-13-57 SUPPORT FOR A NUCLEAR INTERIM STORAGE FACILITY

N THE MATTER OF the Board of County Commis Energy Alliance's (ELEA) effort to bring an interim storage facility for spent nuclear fuel to

ern New Mexico

public entities of the City of Carlsbad, City of Hobbs, Eddy County and Lea County

HEREAS, millions of taxpayer dollars are being spent on more pent fuel each year and millions more are being spent on settlement payments related to was

WHEREAS, spent fuel presents a safety hazard at its current location, but could safe ated interim storage site using proven technology, which is the moved to a conso ecommendation of the President's Blue Ribbon Cor ssion on America's Nuclear Future; and

prary storage. A pre-existing scientific and nuclear operations workforce exists in the area as does a community that is open-minded about possible nuclear expansion. ELEA's property cated between Carlsbad and Hobbs, is an excellent location for an interim storage facility

BE IT THEREFORE RESOLVED that the Board of County Co ully evaluated interim storage, do strongly endorse and direct the board of the Eddy-Lea Energy Alliance to aggressively pursue a centralized interim storage facility at the ELEA site; are, direct the Alliance to distribute this resolution to the legislature, governor nergy Secretary, and all members of Congre

APPROVED AND ADOPTED this 3RD day of September, 2013. COUNTY BOARD OF COMMISIONERS

Varlene Kopsin

A NEMORIAL

QUESTING THE EDOT-LEA ENERGY ALLIANCE TO DEVELOP A CONSOLIDATED INTERIN STORAGE FACILITY.

MEREAS, the 2013 report from the blue ribbon come rica's nuclear fature strongly recommended that one or more consolidated interin storage facilities be established temporarily store the spent nuclear fuel generated by ica's nuclear fleet, which generates approximately twenty ent of the electricity in the United States; and

WHEREAS, muclear power plants are an important carbonres source of reliable electricity production in the United ates, and without them, America would be emitting mix hundred million metric tons, or twenty-five percent more, of arbon dioxide into the stmosphere annually; and

WHEREAS, there are thirtsen decommissioned rea the United States that need a place for their used fuel to be stored, and about twenty more will be decommissioned by 2035;

WHEREAS, many power generators have overly packed fuel pools, and others have very limited on-site storage capability; and

WHEREAS, the nuclear power utilities have standard ontracts with the United States government requiring that the United States government take possession of the

HDK 40

April 10, 2015

Dr. Ernaat Moniz, Secretary U.S. Department of Energy 1000 Independence Ave., (Washington, DC 20585

Dear Secretary Moniz.

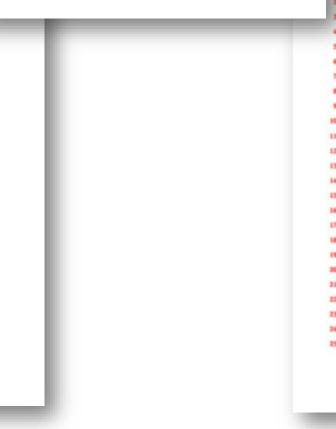
This letter is to inform you of my support of the comm e effort to bring a consultated interirs storage facility for spent fuel to southeastern New

The recent decision by your attriviatedian to adver a consent-based approach for water anagement should highlight areas such as southeastern New Maxico where there is trood upport in the region for such an endeavor. The Eddy-Les Energy Allence (ELEA) is an repartization with regional participation by the City of Cartabad. City of Hobbs, Eddy County and ea County. As you are aware, the residents of this area have a high level of understanding of the nuclear industry and its importance to our national security. There is a strong pre-existing scientific and nuclear operations workfurce in the area, and the dry, remote region is well-quiled for an interim storage site. ELEA has attesty selected a location that has been wetted

There is a significant and growing national need for such an interim storage facility. Millions of tappayer dulars are summity being sport on membring and oversight of sport fuel each year, and millions more are being sport on sectionent paymounts maked to waste disposition, is many instances, these actions are taking place where such activity and the presence of such waste is sagimeable to local corri

These communities in New Maxico support safety moving spent fivel to a consolidated interim storage sile using proven technology which is the most sensitive approach to the problem until e permanent and tong-term solution is available. Dry cases storage is a provin, passiva, and safe system that has been used since 1994 with no adverse incidents.

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State of New Mexico

HI-STORE CISF Utilizes the HI-STORM UMAX Technology

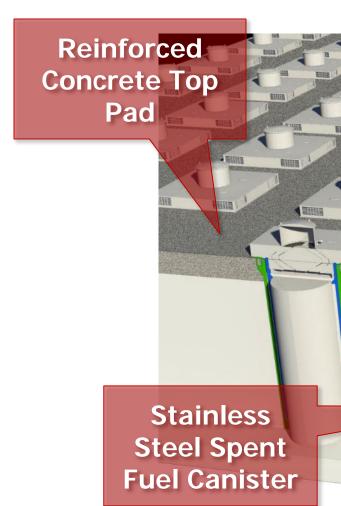
- Below-grade, passive, vertical, air-cooled
- Maximizes Safety & Security
 - Store canisters up to:

✓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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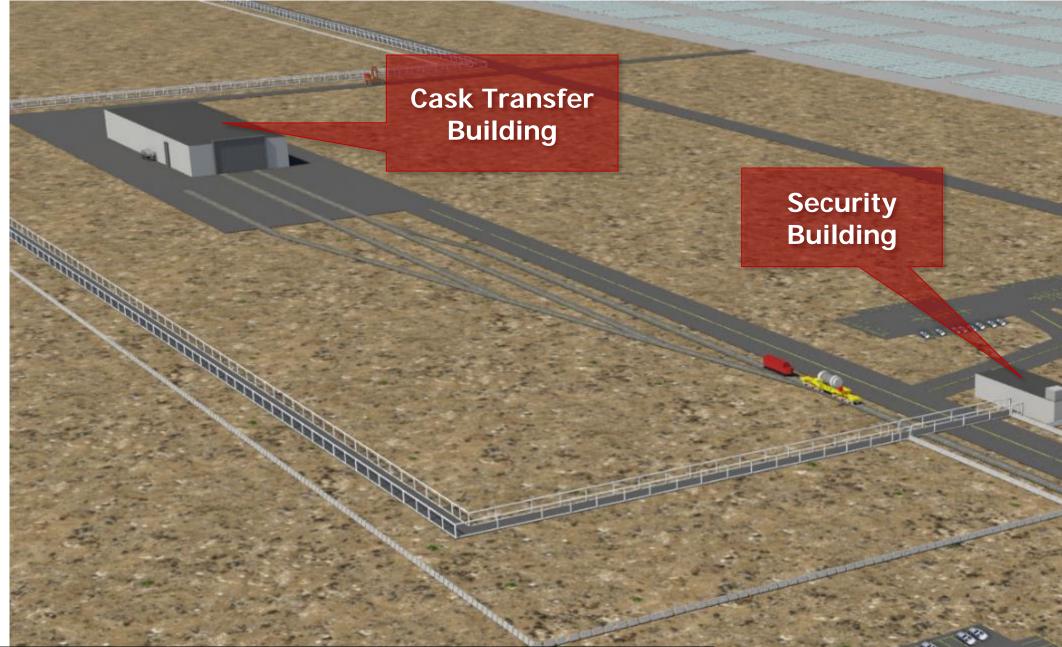
Steel/ **Concrete Lid**

Low Compressive Strength Concrete

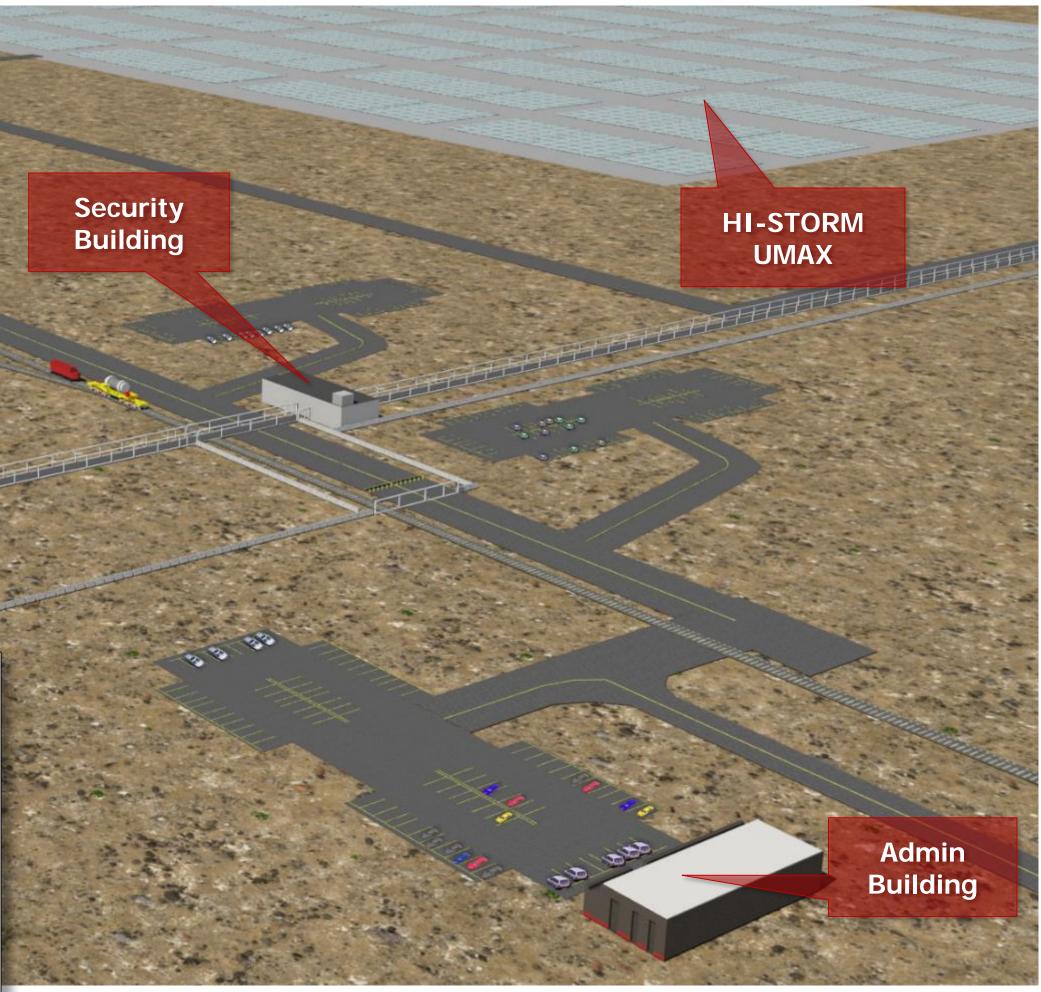
Reinforced **Concrete Base** Mat

Steel Liner

Site Layout

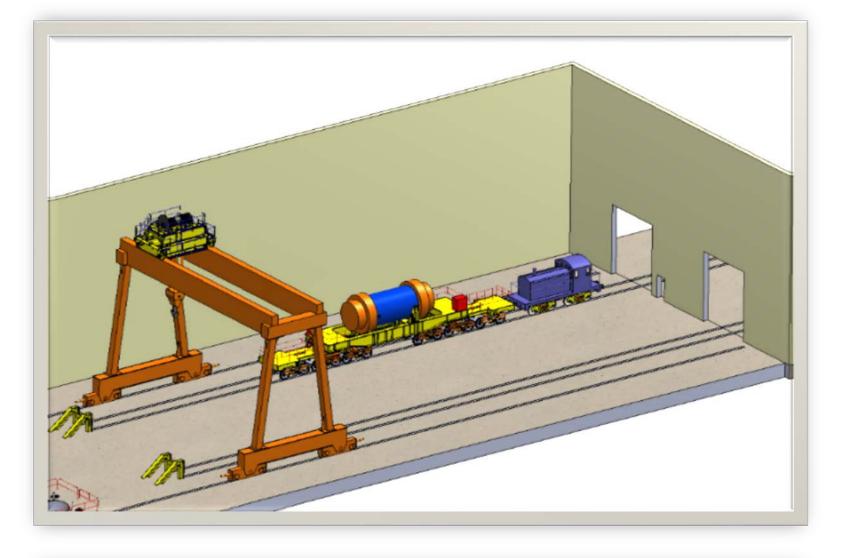


- Initial Storage Capacity = 500 canisters (8,680 MTU)
- Total Storage Capacity = 10,000 canisters (173,000 MTU)
- Facility utilizes 500 of the 1,000 acres available
- Operations could commence by 2023

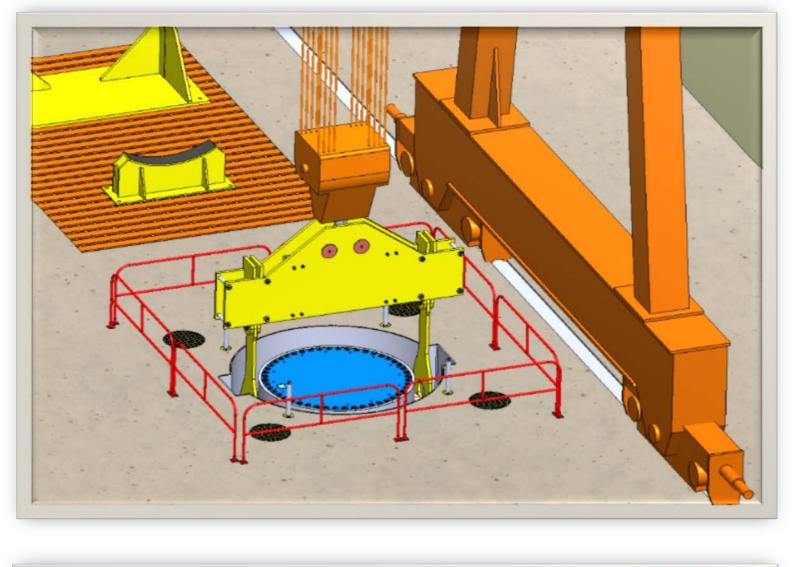


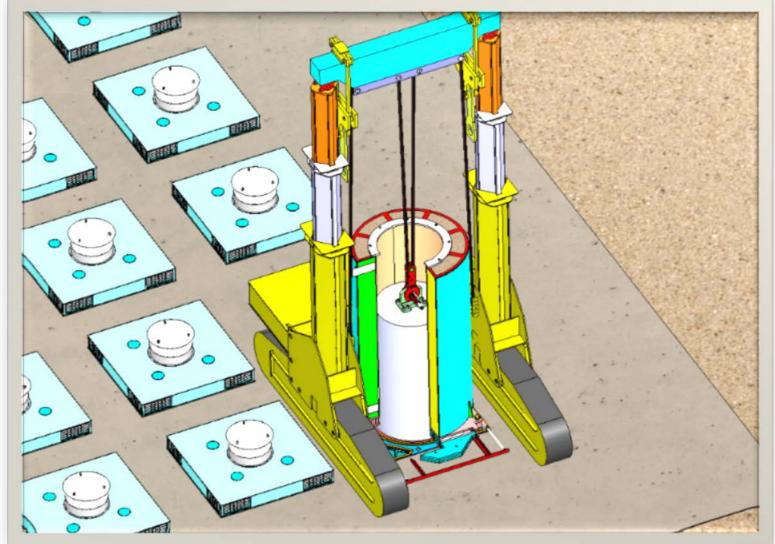


Operations at the HI-STORE CISF









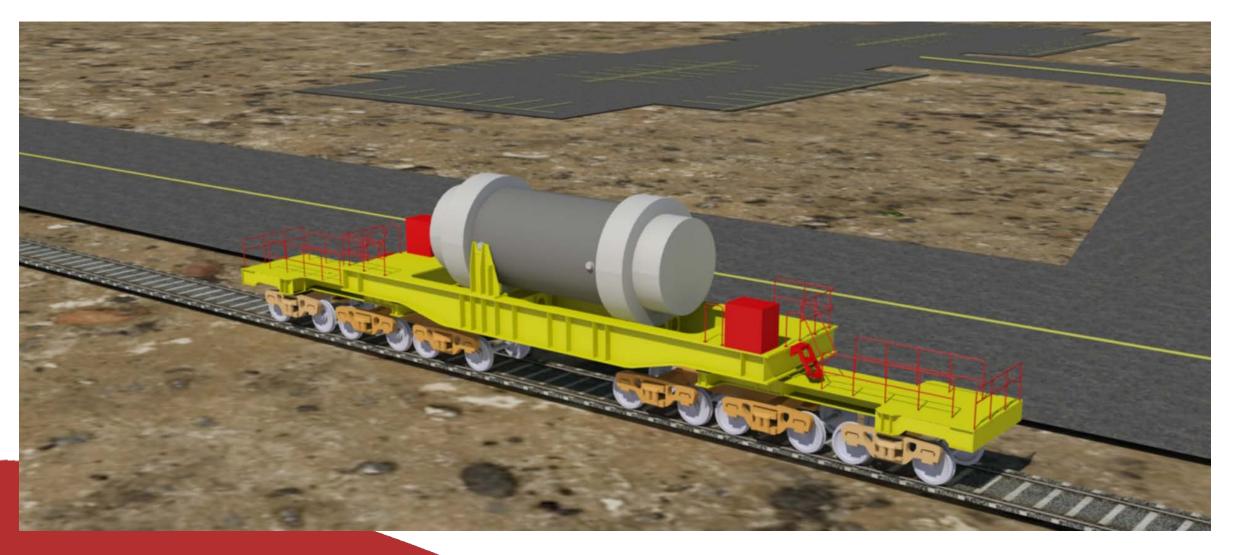




Transport to HI-STORE CISF

Spent nuclear fuel will arrive at the HI-STORE CISF by rail **W** Robust and safe transport casks using specialty designed railcars Transportation of radioactive material including Spent Nuclear Fuel is strictly regulated More than the second Transportation (DOT) Two transport casks designed and licensed with the NRC by Holtec International will be used

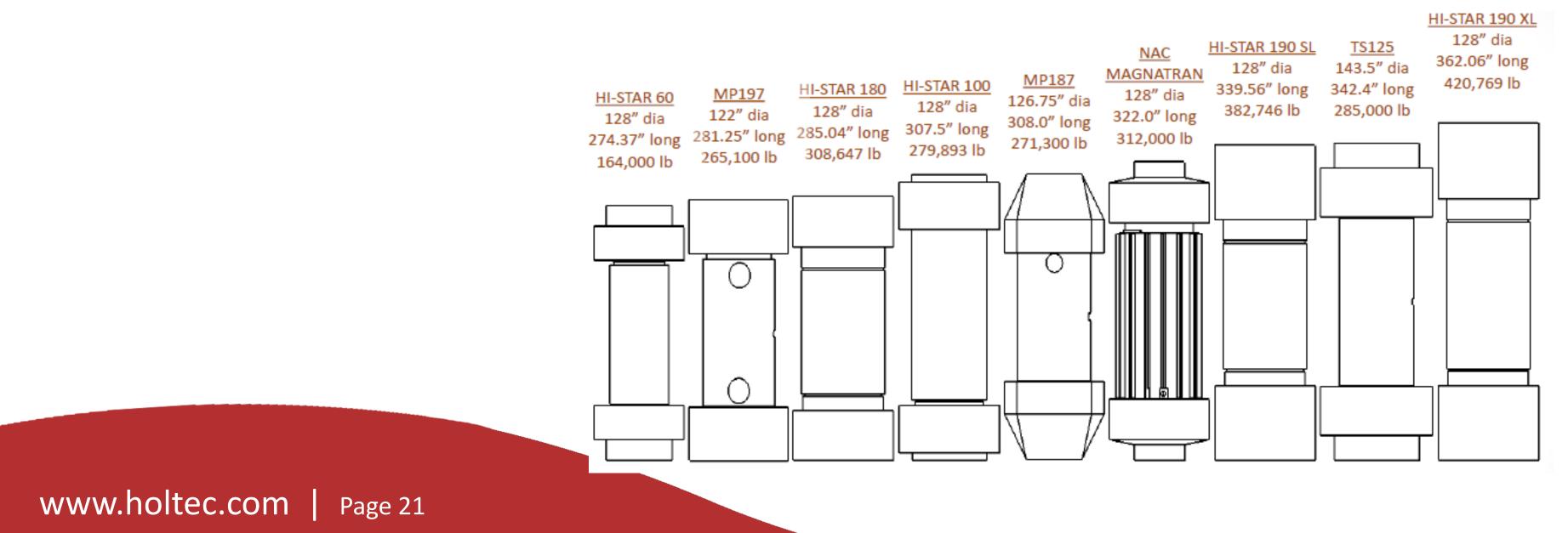
 \sim HI-STAR 190 (licensed) and HI-STAR 100MB (pending)





Transport to HI-STORE CISF

- There are two options for transporting the wide range of commercial SNF canister designs:
 - V 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 \mathbf{M} For transport the canister is not the containment boundary



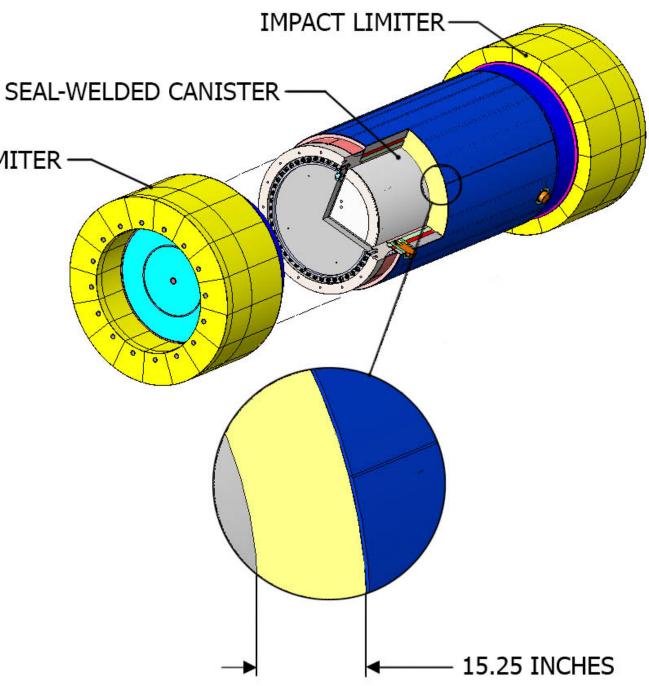


Transport to HI-STORE CISF

- Transport casks are designed and fabricated to safely confine the fuel and shield workers and the public from radiation
 - \checkmark 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

IMPACT LIMITER





Holtec Transport Cask

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.





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Purple Line From Left Is Railroad Spur

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.
 - **M**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
 - \checkmark 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**.

Mail shipments were also completed with no release of radioactivity



HI-STORE Site-Specific License Timeline

- Application submitted to USNRC:
- Application accepted by USNRC:
- RAI #1 Expected:
- NRC Public Meetings in DC:
- NRC Public Meetings in NM:
- RAI #2 (if needed):
- NRC Completes Review:
- Pending Agreement w/DoE and/or Nuclear Utilities:
 Construction Start: 2020
 Construction Complete: 2023
 Accept First Shipment: 2023



March 2017 March 2018 Mar – Aug '18 April 25, 2018 April 30 – May 3 '18 February 2019 July 2020 2020 2023 2023

HI-STORM UMAX License Amendment Timeline

- Amd. #3 submitted to USNRC adding 24PT1 canister:
- Amd. #3 accepted by the USNRC :
- Early RAI #1 received:
- Full RAI package expected:
- Response to RAIs expected:
- NRC to issue the CoC/Safety Evaluation Report:



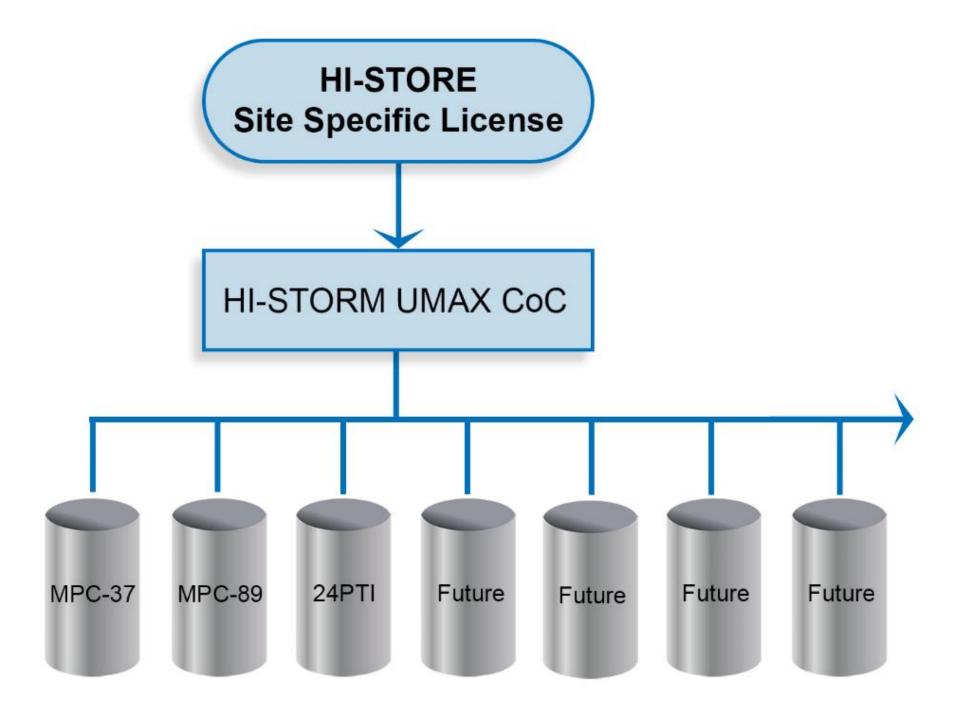
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Aug 2016 Jan 2018 Jan 2018 May 2018 July 2018 Oct 2020

Integrated Planning and Path Forward

- Continue Licensing Effort Moltec 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?



