Waste Management Symposia
Panel Session 126, Thursday March 9, 2017
International Management of Used Nuclear Fuel:
Present and Future

CSFSF (Ukraine) & HI-STORE (U.S.): Consolidated Interim Storage Facilities for Used Nuclear Fuel and HLW

By: Joy Russell, Vice President of Corporate Business Development,
Holtec International

Who is Holtec?

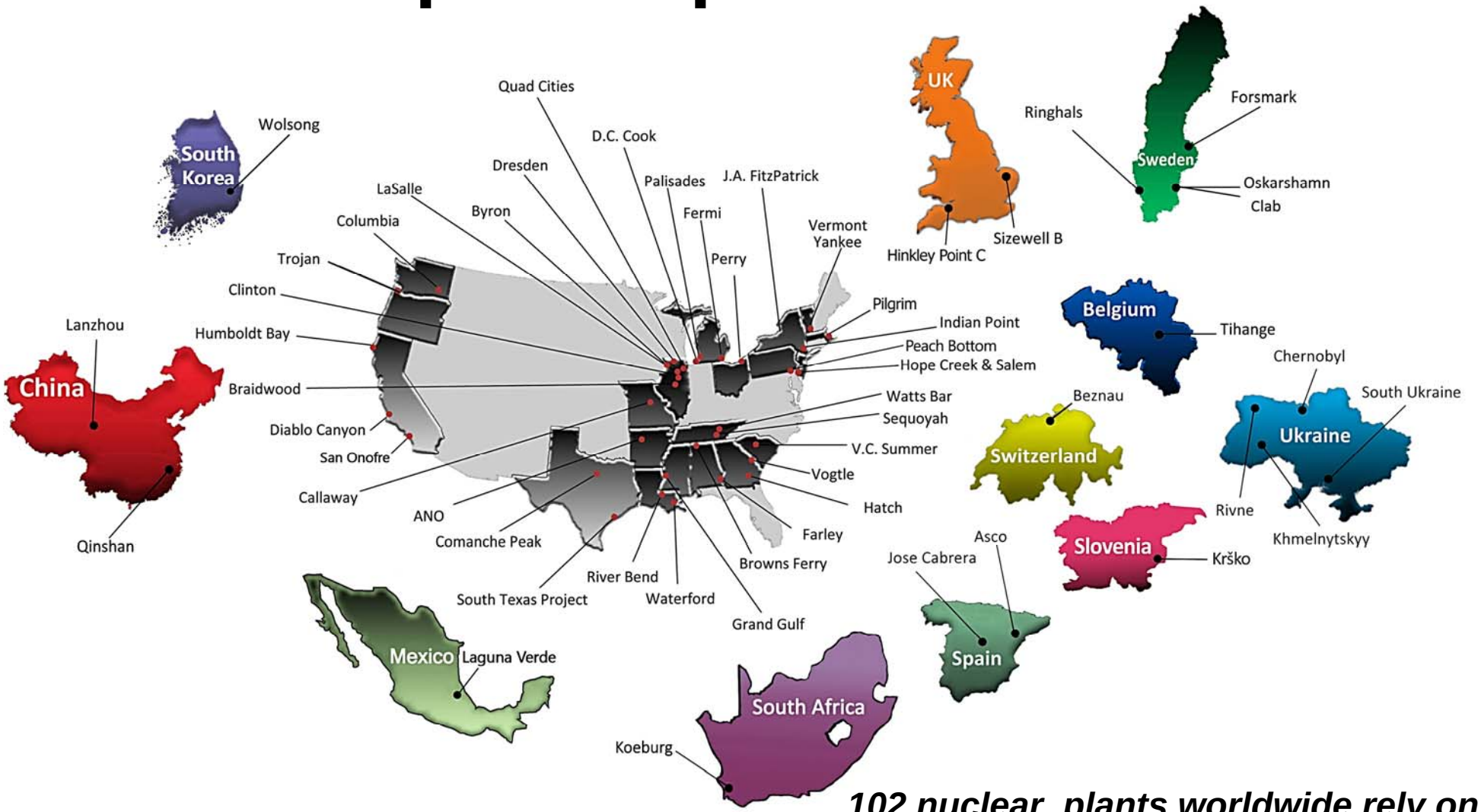
- Holtec is a:
  - ✔ Vertically Integrated
  - ✔ Innovative spent fuel storage technology leader
  - ✔ With unique approaches to design & manufacturing
- Operation centers in 4 states & 5 countries
- Backlog of 4.0 Billion USD +
- Business mix:
  - ✔ 72% Nuclear
  - ✔ 15% Coal, 10% Gas & Renewables, 3% O&G

Holtec Manufacturing Capabilities

- Holtec Manufacturing Division (HMD)
  - Turtle Creek, PA
- Orrvilon, Inc. (ORR)
  - Orrville, Ohio
- Holtec Technology Campus (HTC) **NEW!**
  - Camden, NJ
- Advanced Manufacturing Division **NEW!**
  - Dahej, India
- Over 1.3M ft^2 of shop space

Pioneer of Below-grade Spent Nuclear Fuel Storage

Holtec's Worldwide Dry Storage and Transport Experience



102 nuclear plants worldwide rely on Holtec's dry storage technology for their storage and transport needs; 59 domestic, 43 international

Canister Systems are Optimized for Storage

HOLTEC INTERNATIONAL

Gasketed Cask

- Shielding
- Physical Protection
- Heat Transfer

Used Fuel

Welded Canister

- Superior Containment of Radioactivity
- Criticality Control
- Heat Transfer

Storage Overpack

- Superior Shielding
- Physical Protection
- Superior Heat Transfer

Lower performance in storage in all areas due to transportation regulations, dimensional, and weight restrictions, Issues with cask qualification after long Storage

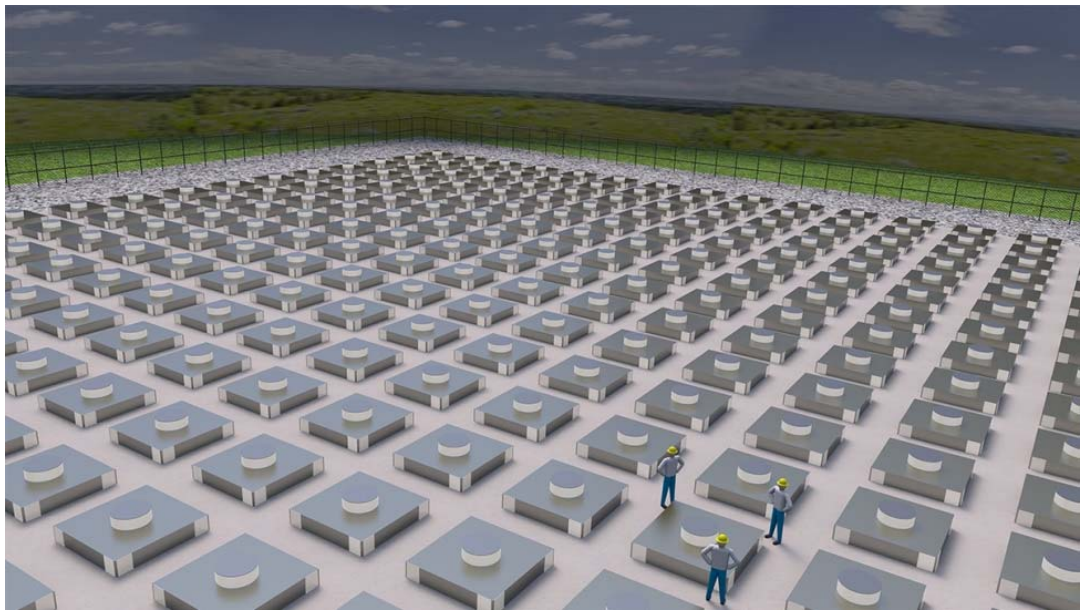
Optimized performance for storage conditions and can be transported in a separate cask without repackaging fuel

Storage in Cask system

Storage in Canister-based system

Holtec & ELEA Team

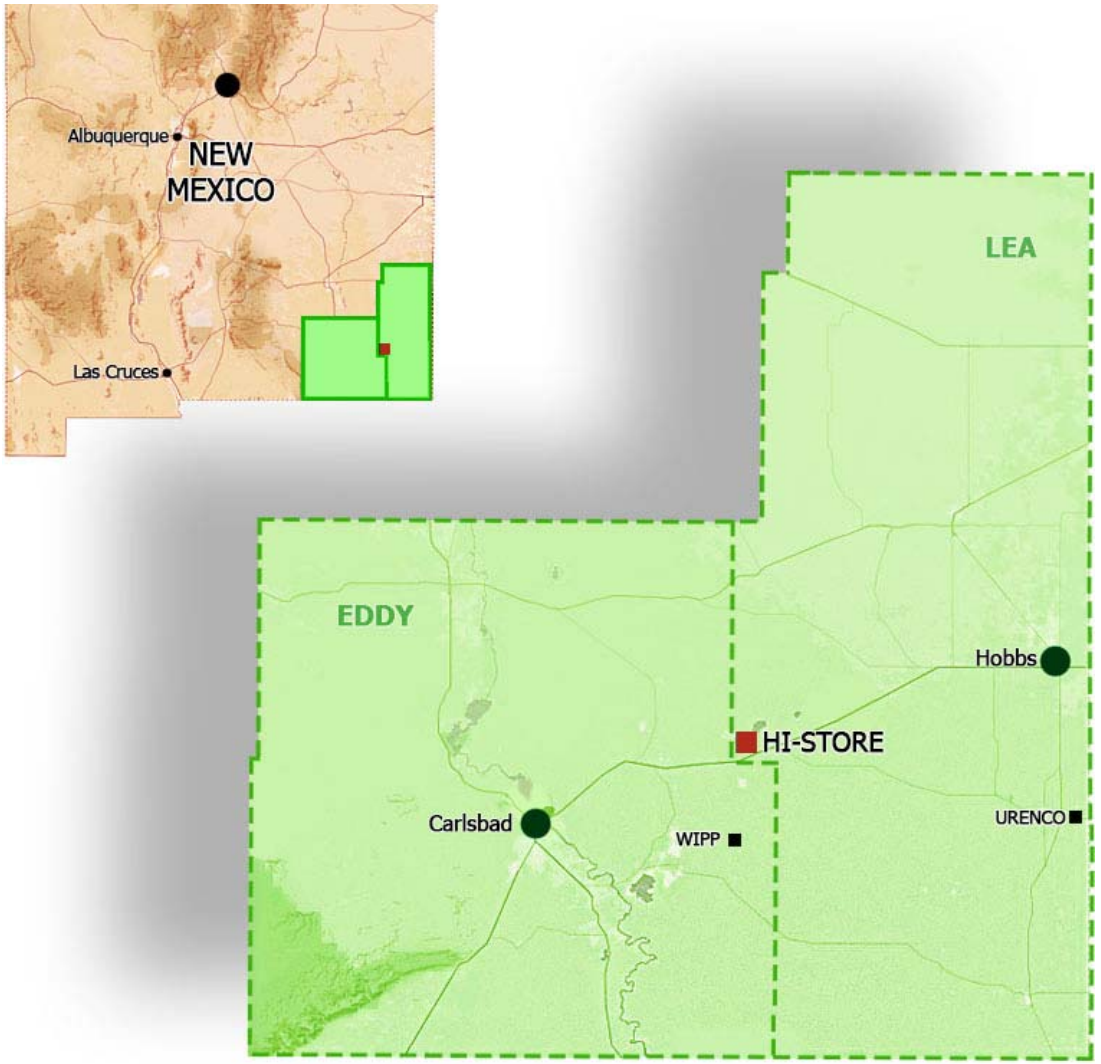
- Holtec International
  - U.S. Company with U.S. manufacturing
  - Advanced dry storage technology
  - Experience in licensing fuel storage facilities
- Eddy-Lea Energy Alliance, LLC
  - Long-standing alliance of the Cities of Carlsbad & Hobbs and the Counties of Eddy & Lea
  - Formed in 2006 under New Mexico's Local Economic Development Act



HI-STORE CISF, Southeastern, NM

HI-STORE Site Location

- 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
- Strong support:
  - ✔ Local communities
  - ✔ State and Local government

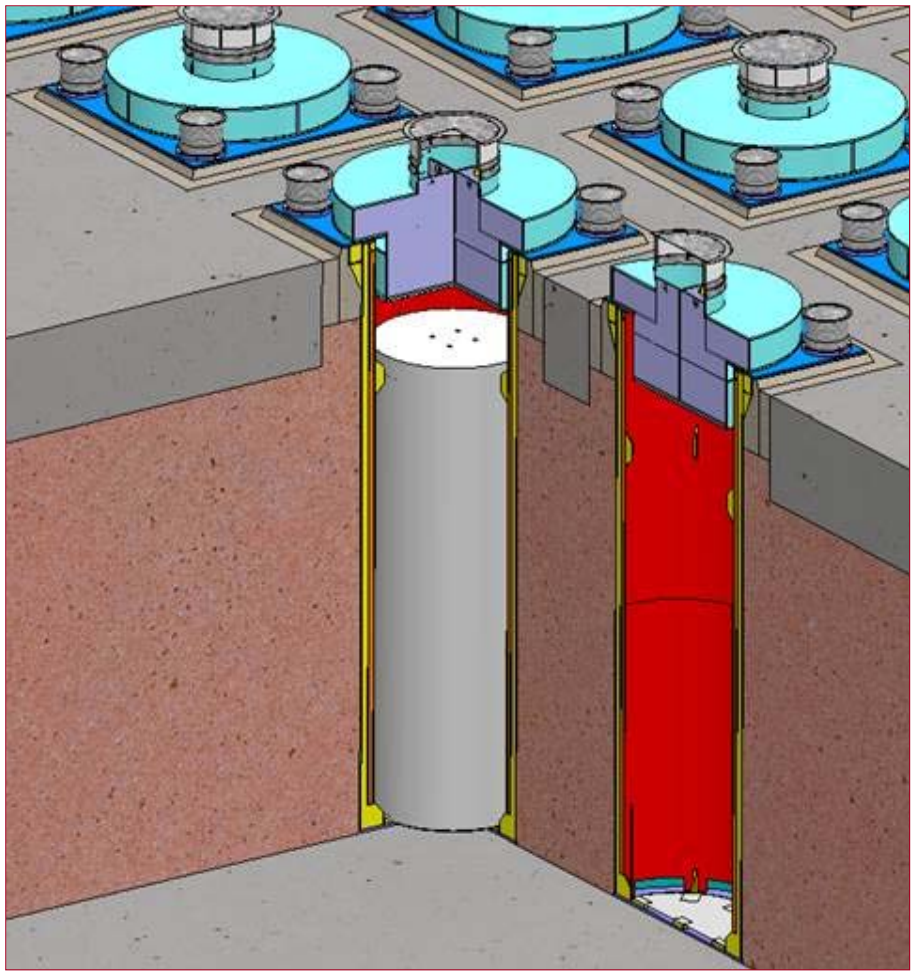


HI-STORE Technology: HI-STORM UMAX

In-Ground View of HI-STORM UMAX

HI-STORE Characteristics

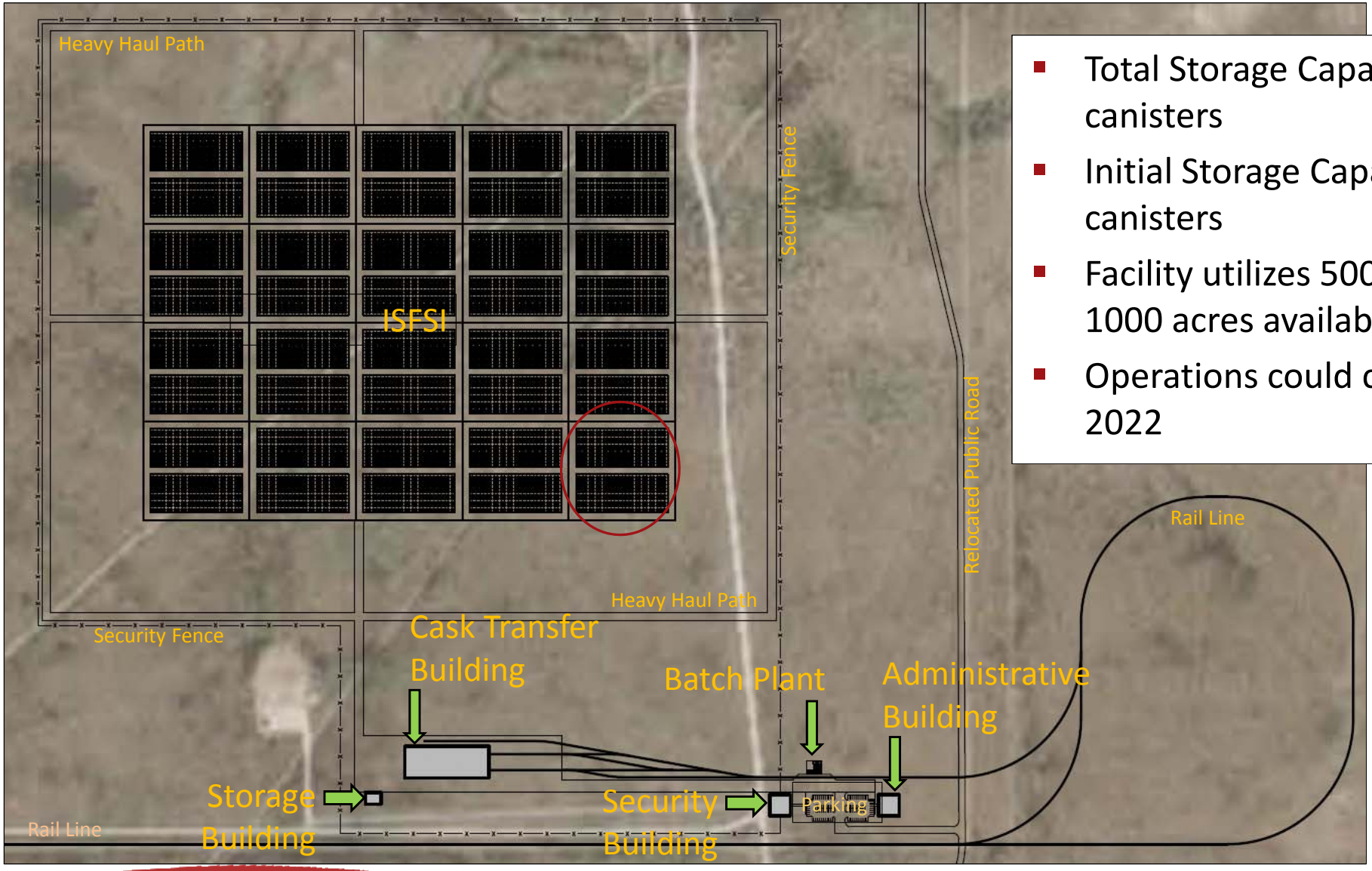
- Holtec's Below grade Dry Storage Technology
- Canister is entirely below grade
- Designed store canisters up to 75 ¾ inches in diameter, and up to 213 inches tall
- Will store any US-origin commercial nuclear fuel currently packaged in dry storage canisters, or stored in the nation's fuel pools
- No repackaging of fuel required



HI-STORE Characteristics

- Operational Advantages
  - Single System
  - Canister placed into storage or removed in less than one shift
- Maximizes Security
  - Facility is visually inconspicuous
  - Profile < 2 ft tall
  - Less visible target from the air
  - Reduced visibility from public land
  - No area of obstructed view
- Maximizes Safety
  - Minimize dose to environment & crew
  - Virtually immune to environmental disasters - hurricanes, floods, tornados, earthquakes
  - Designed to withstand crashing aircraft or on-site fire without any radiological consequences

HI-STORE Site Layout



- Total Storage Capacity 10,000 canisters
- Initial Storage Capacity 500 canisters
- Facility utilizes 500 of the 1000 acres available
- Operations could commence 2022

Two Part Approach to Licensing

Part 1. HI-STORM UMAX FSAR Amendment

- August 2016 Submitted HI-STORM UMAX License Amendment:
  - Added NUHOMS 24PT1 canister for vertical storage
  - Standard HI-TRAC (transfer cask) and HI-STORM UMAX designs are utilized for NUHOMS canisters
- In succession update HI-STORM UMAX certificate to:
  - Add canisters from specific shutdown / decommissioned plants
  - Add all canisters licensed to store SNF

Two Part Approach to Licensing

Part 2. Site Specific License Application

- Pre-submittal Meeting Dec 6, 2016: Environmental Report focus
- Pre-submittal Meeting February 1, 2017: Outline of the SAR focus
- NRC audit February 22&23, 2017: pre-application audit of Holtec's HI-STORE application
- March 31, 2017: Submit Site Specific License Application per 10 CFR 72
  - ✔ Initial application - 500 canisters
  - ✔ Future amendments for additional canisters up to 10,000
  - ✔ Reference the amended HI-STORM UMAX Certificate and FSAR for technical details

Overview of Ukraine's Central Spent Fuel Storage Facility (CSFSF) Project

- Lacking on-site spent fuel storage at its Khelminiskyi, Rivne and South Ukraine nuclear power plants (totaling 9 VVER reactors), Ukraine has been sending their spent fuel to Russia for reprocessing and storage of waste
- Ukraine made the decision to implement a CSFSF:
  - ✔ It will save Ukraine over $100M per year in transport costs.
  - ✔ It provides sovereign control over the back end of the fuel cycle

Ukraine CSFSF

- Spent fuel will be transported from the three plant sites to the CSFSF located in the Chornobyl Exclusion Zone

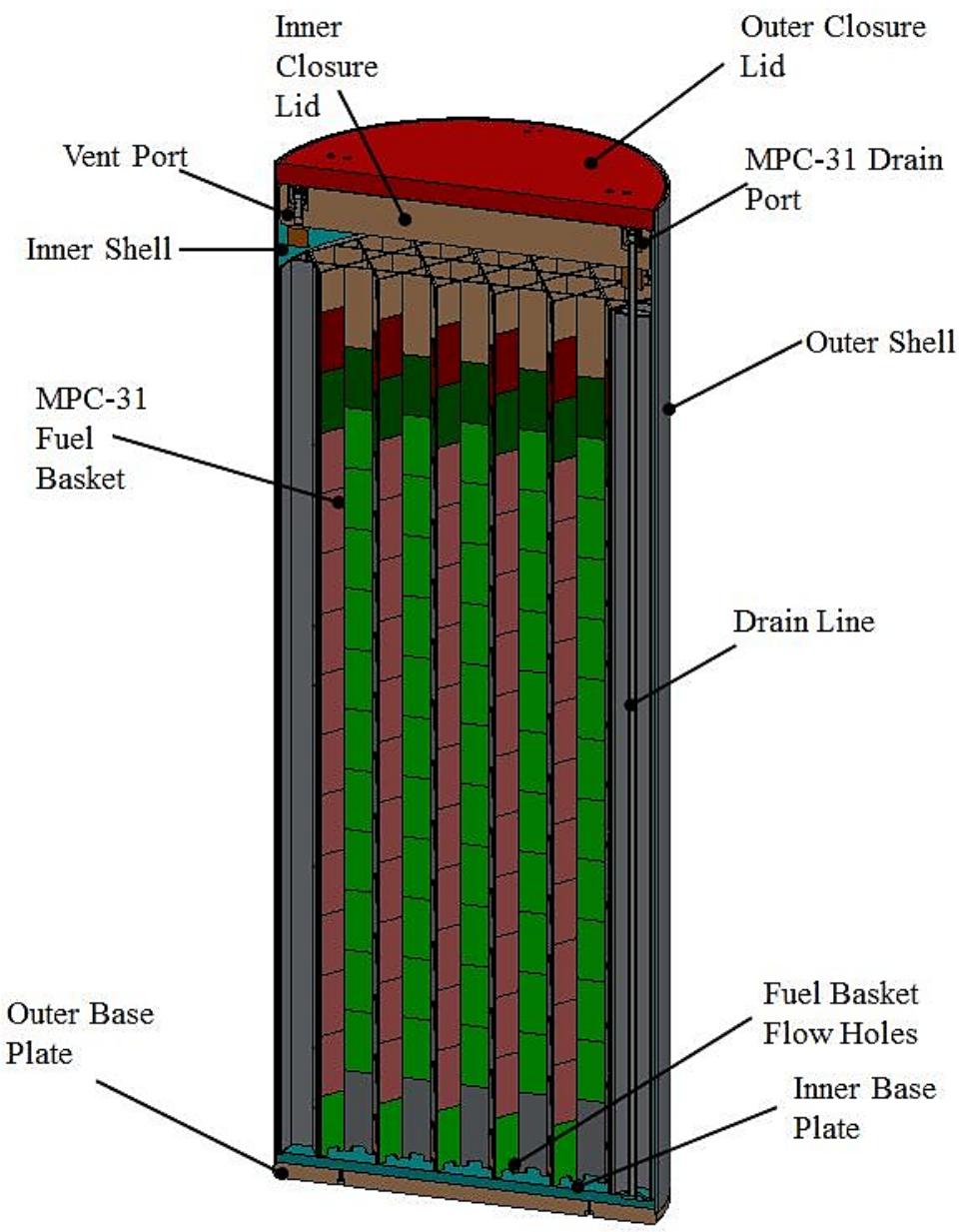
CSFSF Storage Technology

- Holtec was contracted to design, license and supply the spent fuel storage systems for the CSFSF:
  - 94 HI-STORM 190 Spent Fuel Storage Systems,
  - 5 HI-STAR 190 Transport casks,
  - 5 Rail transport cars, and
  - All ancillaries to load fuel at each plant and unload and store the multipurpose canisters at the central site.
- The Ukraine State utility, Energoatom, will construct the site in the Chornobyl Exclusion Zone

Conceptual Layout of CSFSF

The HI-STORM 190 System

- HI-STORM Overpack with Multipurpose Canister
- "Double Walled" MPCs
  - ✔ A canister in a canister
  - ✔ Metamic-HT™ Basket
  - ✔ 31 VVER 1000 Assemblies
  - ✔ 85 VVER 440 assemblies
  - ✔ Helium inside and between canister walls provides complete protection for SSC
- HI-STAR 190 Transport Cask
  - ✔ 38 kW Heat Capacity



CSFSF to be Operational in 2019

Activity	Status
CSFSF site preparation	Underway
Delivery of equipment at plant sites	2017-2018
Tests of processing equipment will be conducted at plant sites	2018
HI-STORM Overpack delivery to CSFSF	2018
The first MPC & HI-STAR cask loading at plant site	Dec. 2018
The first HI-STAR transportation and first HI-STORM loading	Mar-May 2019
The site will be expanded to take the fuel for the life of the plants and eventually hold over 450 storage systems	

Questions