HI-STORM UMAX Underground Storage Systems

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Holtec International
INMM Spent Fuel Seminar 2015

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Outline

- Holtec International Overview
- Holtec’s Canister Based Spent Fuel Storage Systems
- Holtec’s Humboldt Bay Underground Spent Fuel Storage Systems
- HI-STORM UMAX Overview
- HI-STORM UMAX at Callaway NPP

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Holtec International Overview

- Established in 1986
- Over 750 employees
- Eight operations centers in the US and overseas, including manufacturing facilities in Pittsburgh, PA and Orrville, Ohio
- Business Mix:
  - 72% Nuclear
  - 15% Coal, 10% Gas & Renewables, 3% Other
- Vertically Integrated
  - Design, Licensing, Engineering, Procurement, Manufacturing, Construction, Installation, Loading

Corporate Technology Center located in Marlton, New Jersey U.S.A

Canister Based Storage and Transport Systems

- Over 700 Storage Systems loaded to date
- About 100 being loaded per year
- Approximately half of Holtec’s dry storage systems are loaded by Holtec’s Site Services Division

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<thead>
<tr>
<th>#</th>
<th>Component</th>
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<tbody>
<tr>
<td>1</td>
<td>MPC Multi-Purpose Canister</td>
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<tr>
<td>2</td>
<td>HI-TRAC Transfer Cask (Onsite Transfer)</td>
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<tr>
<td>3</td>
<td>HI-STORM Storage Overpack (Aboveground Interim Storage)</td>
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<tr>
<td>4</td>
<td>HI-STORM UMAX Storage Cask (Underground Storage)</td>
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<tr>
<td>5</td>
<td>HI-STAR Transport Cask (Offsite Transport)</td>
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Underground Storage Systems
Humboldt Bay

- Underground ISFSI at Humboldt Bay (California)
- Dual-purpose HI-STAR casks (Storage / Transport) with MPCs
- 6 casks (5 Fuel, 1 GTCC)
- 390 BWR assemblies, intact and damaged
- Site-Specific License
- Loaded 2008

Principal Advantages

- Safety
  - Highly Resistant to Seismic Loads
  - Highly Resistant against Aircraft and Missile Impacts

- Dose
  - Minimal contribution to the site boundary dose
  - Minimized dose to personnel in the vicinity of the ISFSI
Underground Storage Systems
Principal Advantages

- **Security**
  - Low profile minimizes the target area
  - Low profile facilitates visual observation and precludes “hiding places”

- **Aesthetics**
  - Configured to be visually inconspicuous

- **Operations and Accessibility**
  - Easy to load
  - Dimensionally compact

- Loading is essentially the same as that for Holtec’s above-ground dry storage systems
**HI-STORM UMAX**

**Design Features**

- Air entrance and exit locations are at the top; no internal penetrations.
- Divider Shell separates air flow
- The closure lid is a massive steel/concrete structure locked in place to prevent movement during a seismic event.

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<tr>
<td>1</td>
<td>Cavity Enclosure Container (CEC)</td>
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<td>2</td>
<td>Divider Shell</td>
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<td>3</td>
<td>Closure Lid</td>
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<tr>
<td>4</td>
<td>MPC-37 Multi-Purpose Canister</td>
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<tr>
<td>5</td>
<td>ISFSI Pad</td>
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<tr>
<td>6</td>
<td>Controlled Low-Strength Material (CLSM)</td>
</tr>
<tr>
<td>7</td>
<td>Support Foundation Pad (SFP)</td>
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HI-STORM UMAX
Design Features

- Basket in the MPC is made entirely of METAMIC-HT
- Capacity
  - 37 PWR assemblies
  - 89 BWR Assemblies

Constituent Components of the Underground Storage System
HI-STORM UMAX
Design Features

• A typical ISFSI can have any number of Vertical Modules.

HI-STORM UMAX
Manufacturing

• HI-STORM UMAX Components are fabricated at the Holtec Manufacturing Division (HMD) located in Pittsburgh, PA
HI-STORM UMAX
Manufacturing

Fabricated CECs at HMD

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HI-STORM UMAX Construction
at Callaway NPP

HI-STORM UMAX Support Foundation Pad

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HI-STORM UMAX Construction at Callaway NPP

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48 CECs placed on Support Foundation Pad

HI-STORM UMAX Construction at Callaway NPP

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CECs surrounded by Flowable Fill
HI-STORM UMAX Construction at Callaway NPP

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Preparation to pour ISFSI Pad

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Final Configuration with ISFSI Pad
### Underground Storage Systems Summary

- Underground Storage Systems provide significant advantages from a seismic, dose, security and operational perspective
- First underground system for 6 Canisters deployed at Humboldt Bay in 2008
- Large HI-STORM UMAX Underground ISFSI for 48 Canisters currently under construction at Callaway
- SONGS has selected the HI-STORM UMAX to defuel the spent fuel pools

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