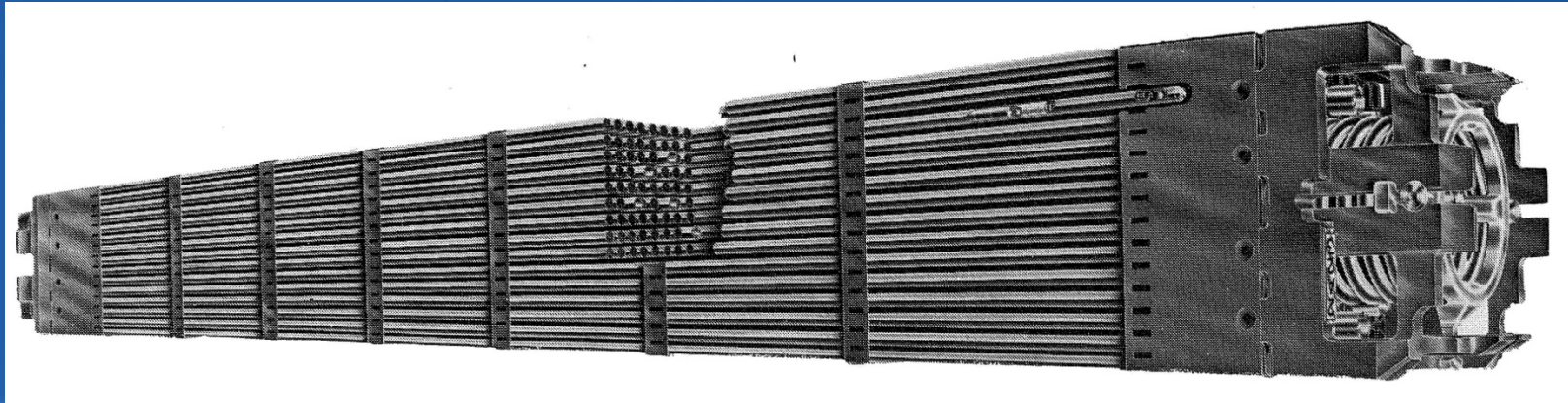


# Used Fuel Storage

**Everett L Redmond II, Ph.D.**  
**August 19, 2010**

# Fuel Assemblies

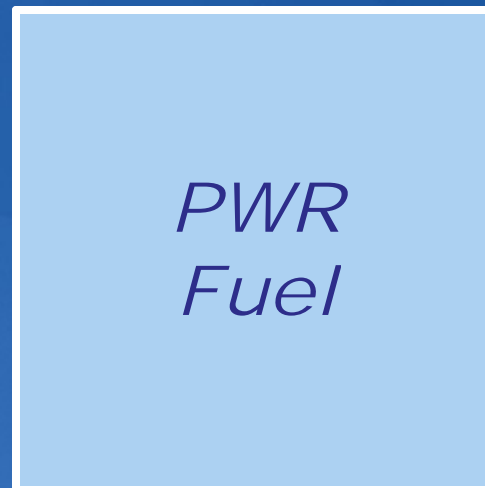


*15x15 PWR Fuel Assembly*

*Relative size of  
PWR and BWR  
fuel assemblies*

*Number of Operating  
Reactors*

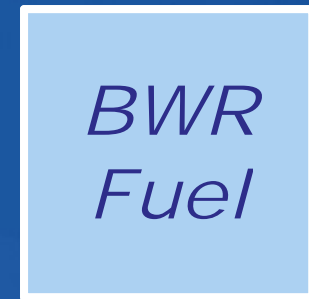
*PWR - 69, BWR - 35*



*PWR  
Fuel*



*~8.4 inches*



*BWR  
Fuel*

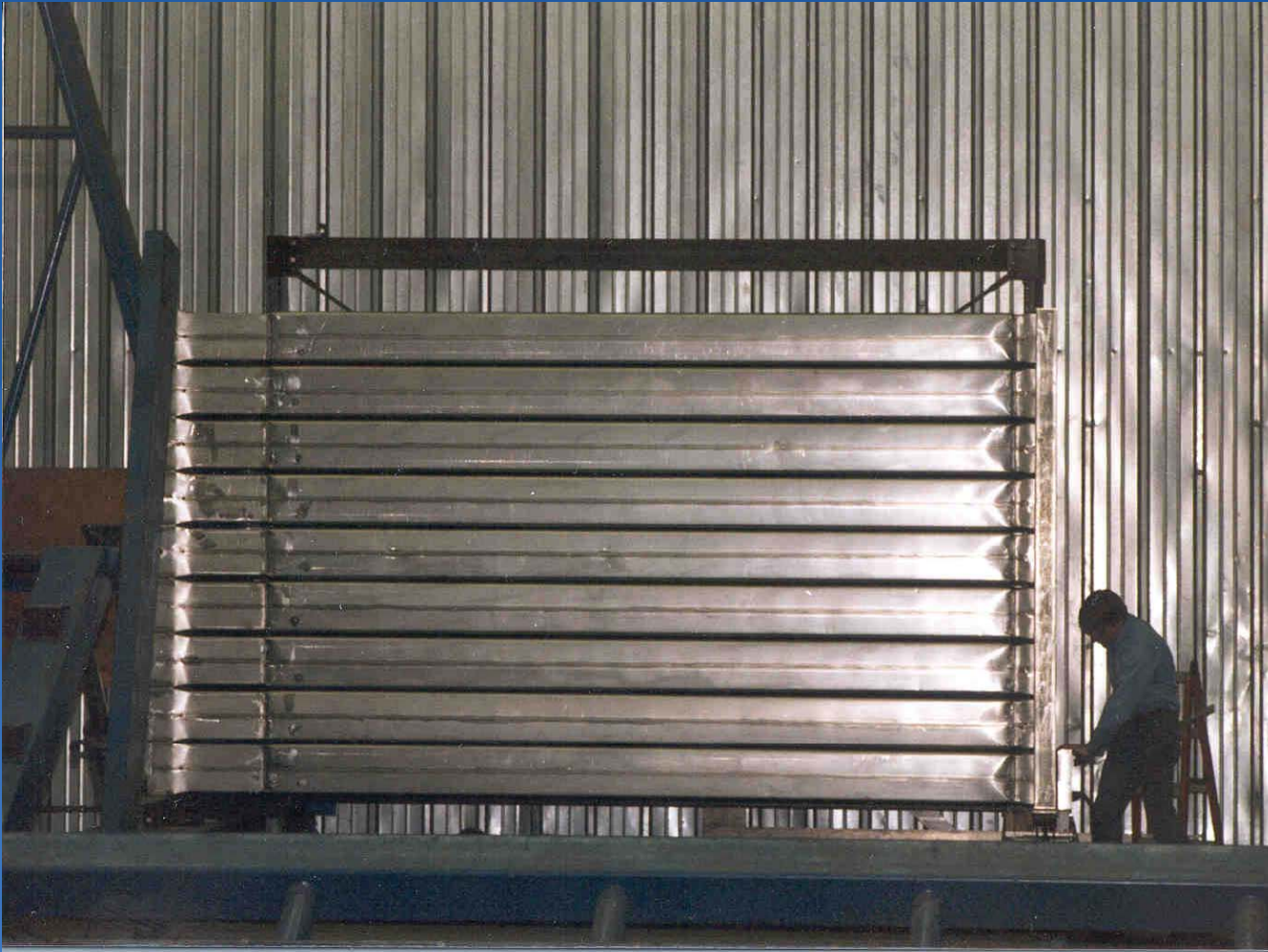


*~5.1 inches*

# Used Fuel Stored in Pool



# New Used Fuel Storage Rack



*Storage rack is on its side prior to installation*

# Dry Storage Systems



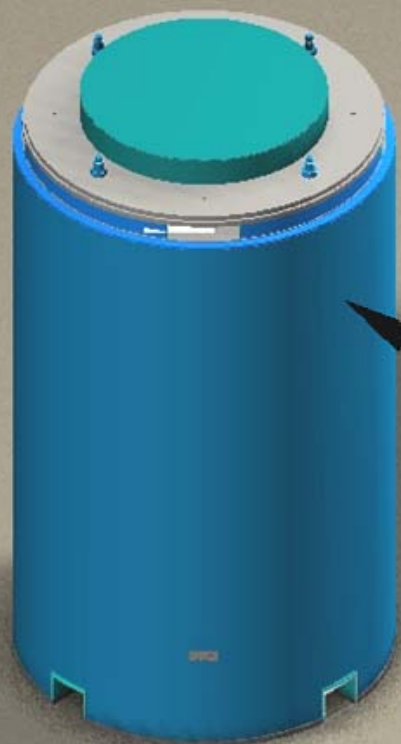
*Vertical Storage Cask*



*Horizontal Storage Module*

# Dry Storage Systems

- **Used fuel dry storage systems are comprised of four parts**
  - **A Dual Purpose Canister (DPC)**
  - **A Transfer Cask used for loading the DPC in the wet storage pool and transferring the DPC to the Vertical Storage Cask, Horizontal Storage Module, or Transportation Cask**
  - **A Vertical Storage Cask or Horizontal Module for storing the DPC on-site**
  - **A Transportation Cask for moving a DPC between sites (typically by rail)**

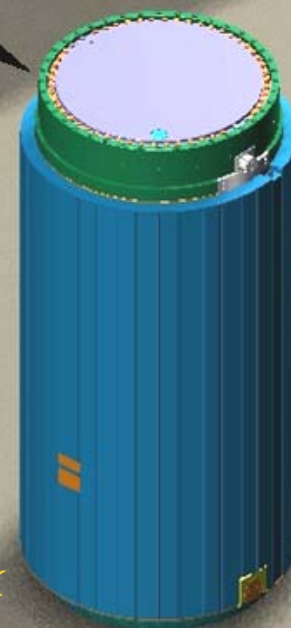


*Vertical Storage Cask*

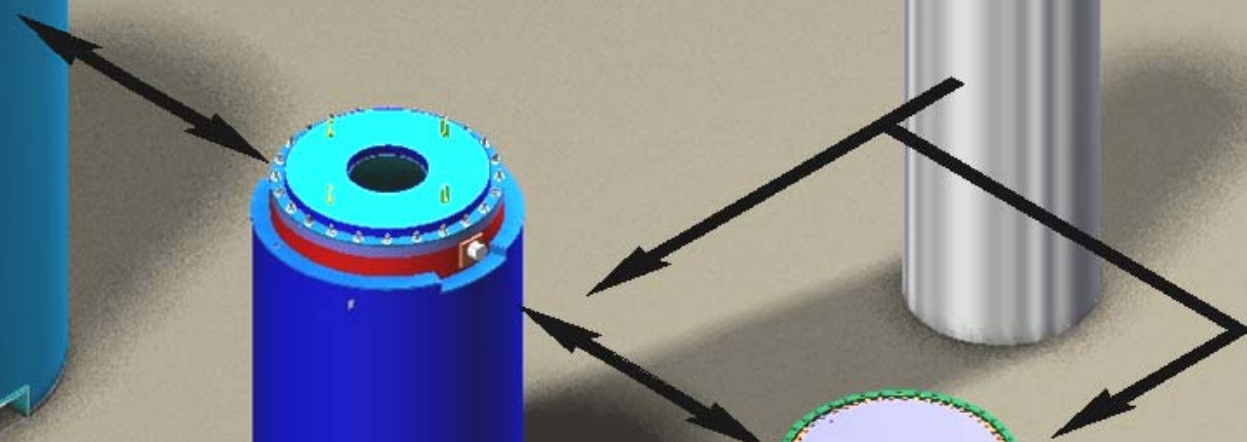
*Dual Purpose Canister*



*On-site Transfer Cask*



*Transportation Cask*

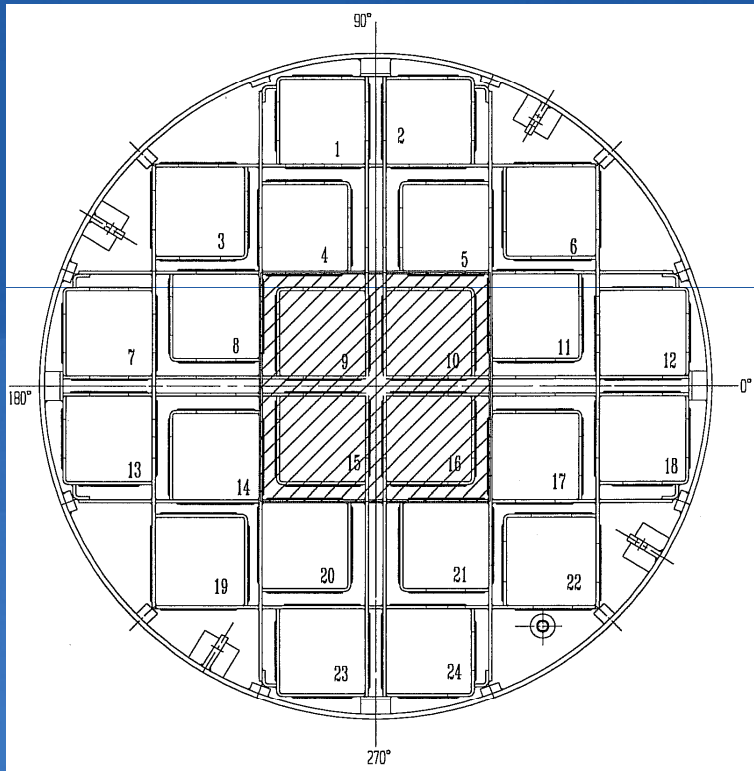


# Canister Design Parameters

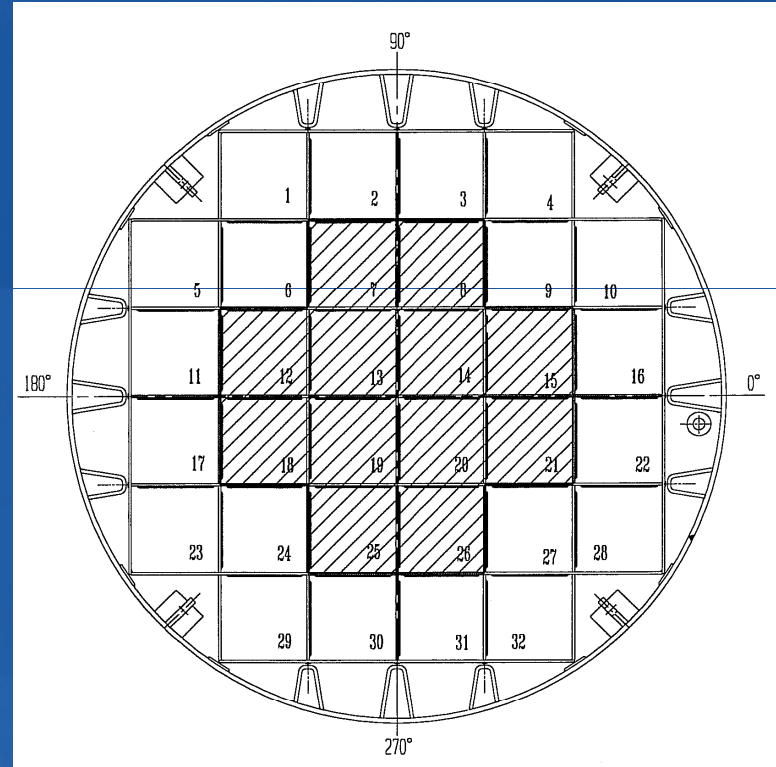
- **PWR Capacity: 21 to 37 assemblies**
- **BWR Capacity: 44 to 87 assemblies**
- **Maximum thermal capacity: approximately 35 kW**
- **Maximum enrichments:**
  - PWR 5.0 wt%**
  - BWR approximately 4.5 wt%**



# PWR Assembly Baskets

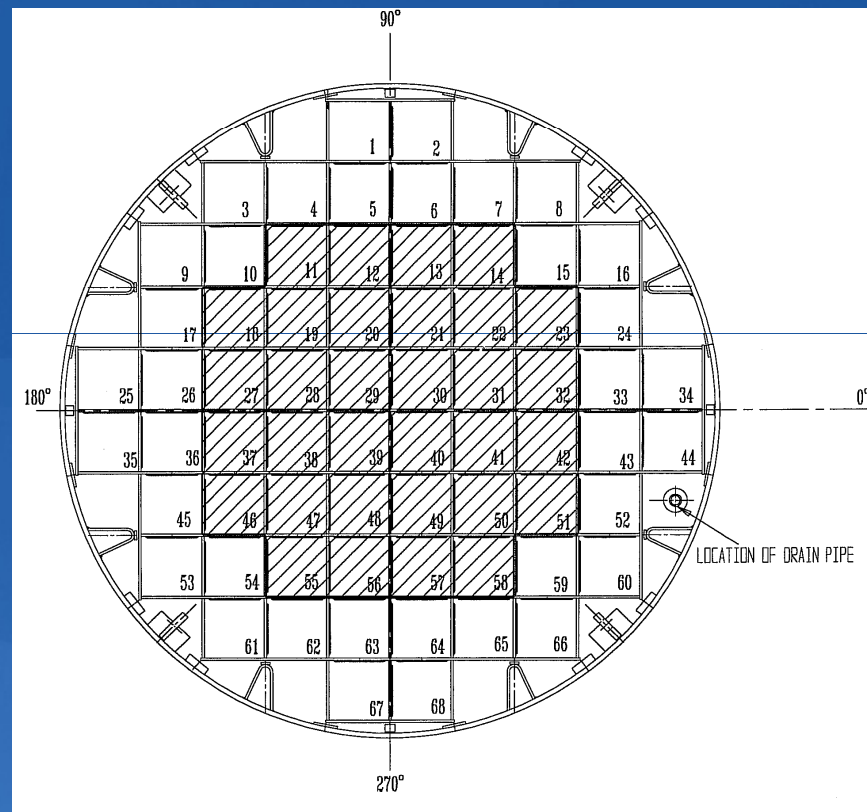


24 Assemblies



32 Assemblies

# BWR Assembly Basket

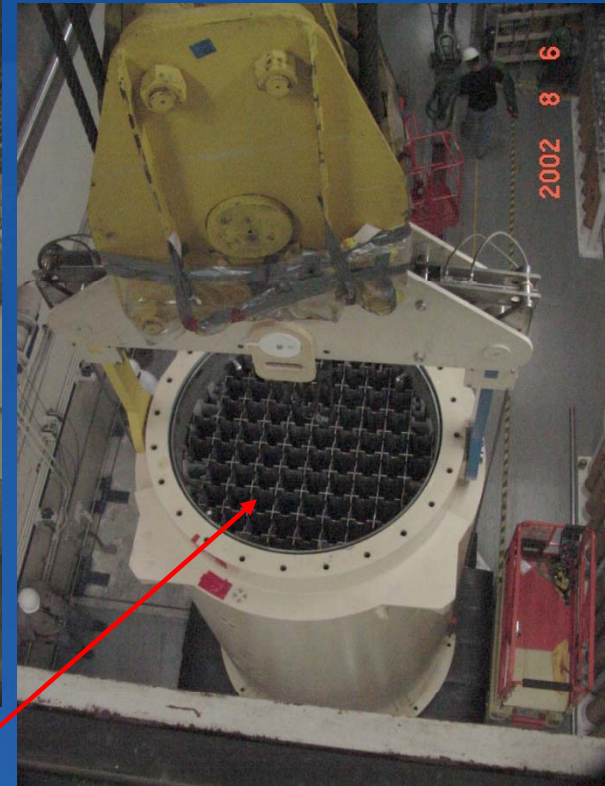


68 Assemblies



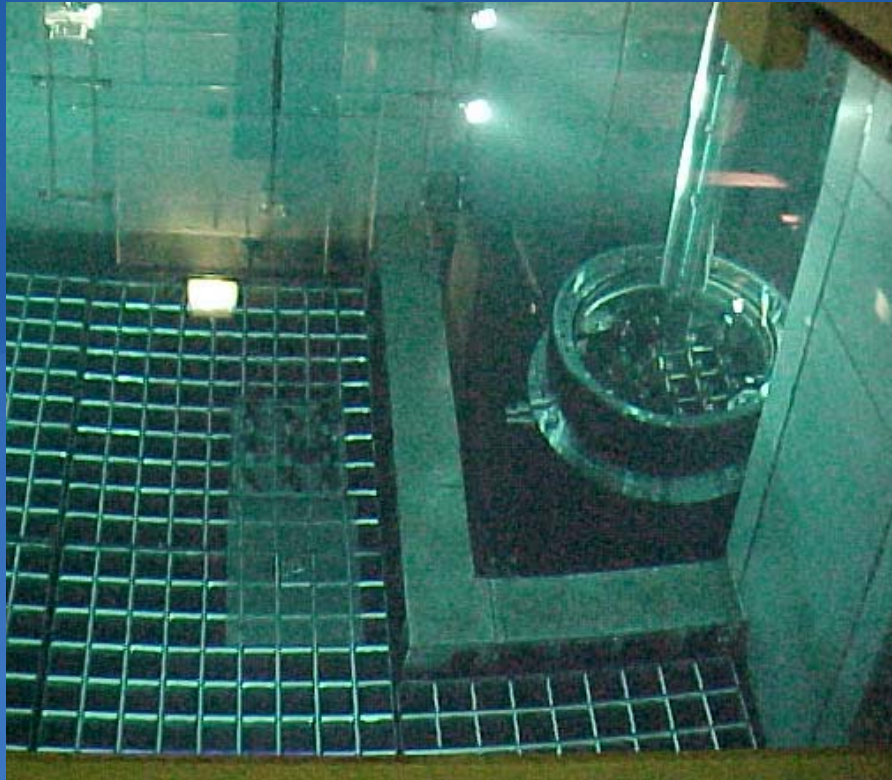
Picture from Holtec International Certificate of Compliance 1014

# DPC Being Inserted into Transfer Cask Prior to Used Fuel Loading at Nuclear Reactor Site

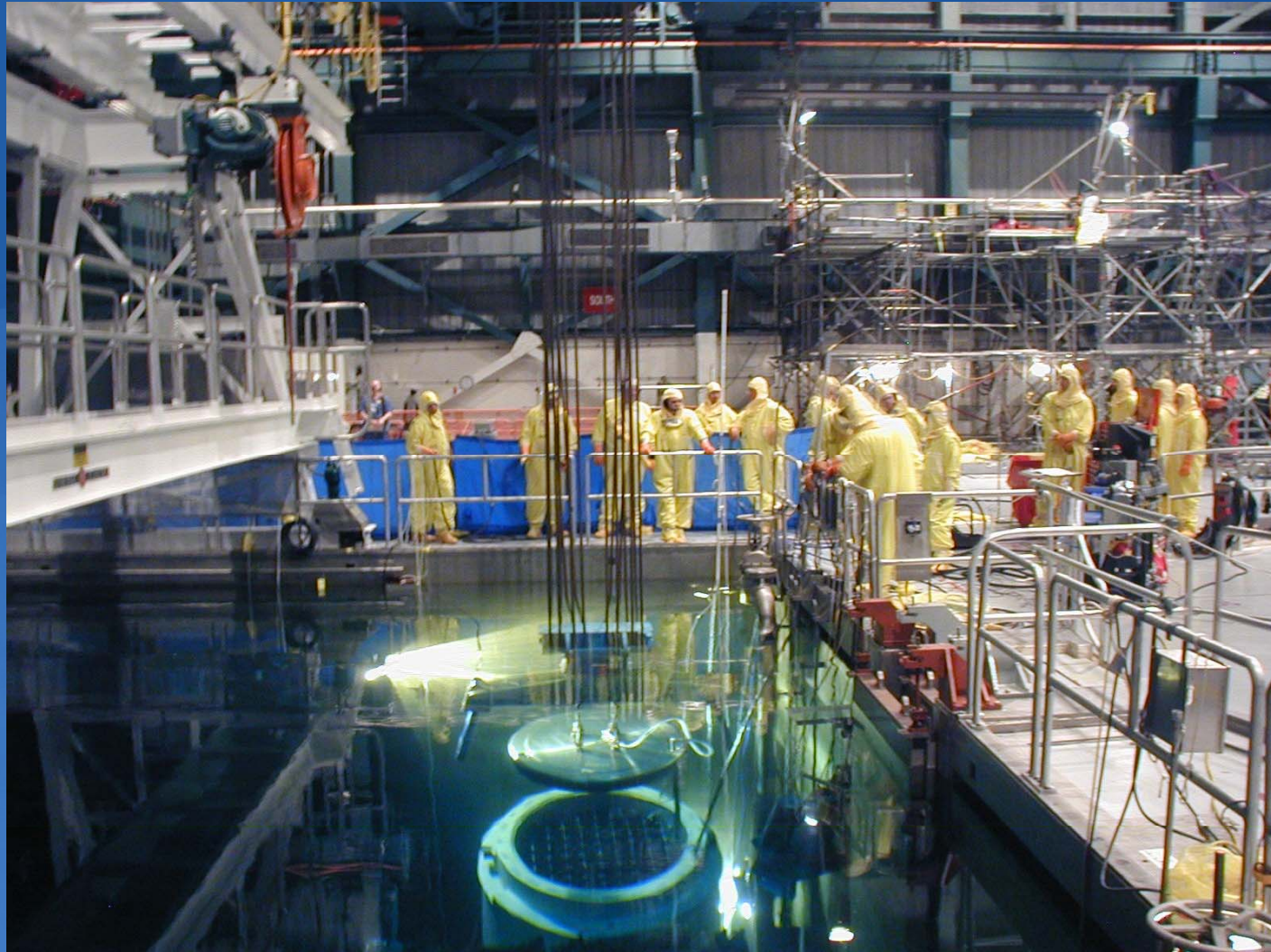


*Fuel storage basket inside DPC is visible*

# Used Nuclear Fuel Assembly Being Loaded into DPC Basket In Spent Fuel Pool at Nuclear Reactor Site



# DPC Lid Being Installed Underwater



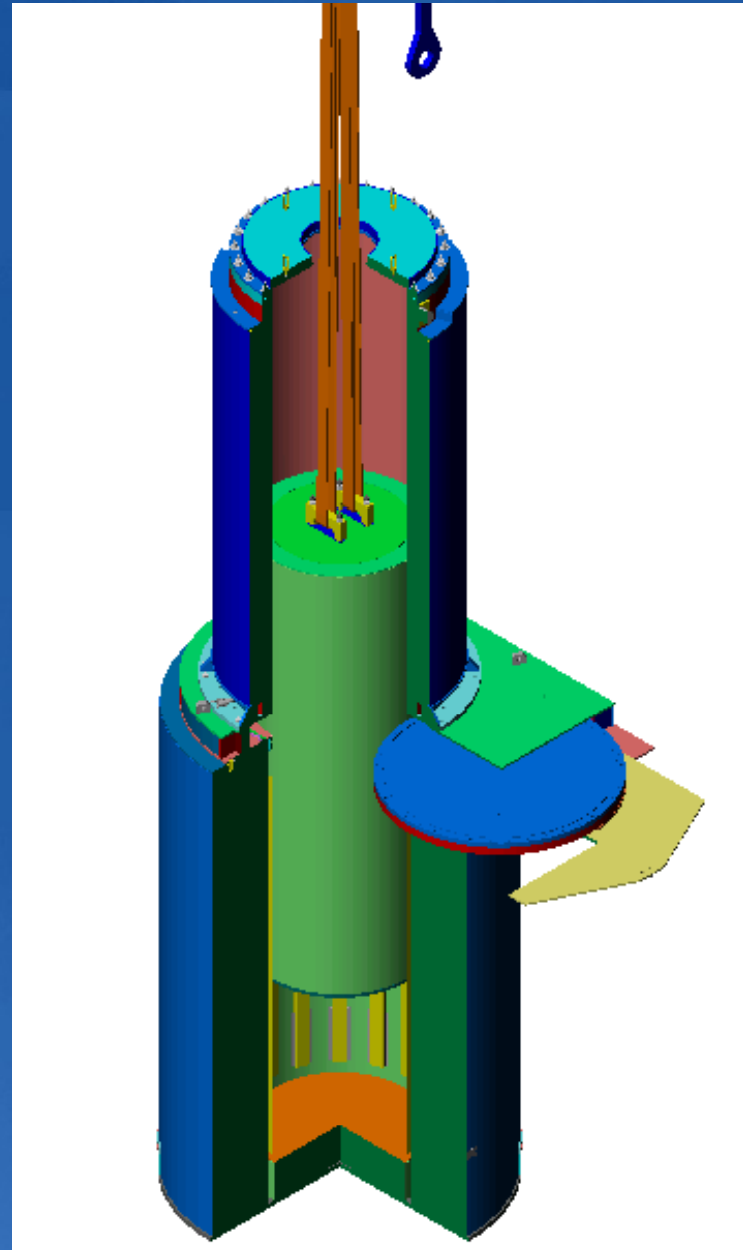
# DPC Closure Operations



# Loading Vertical Storage Casks

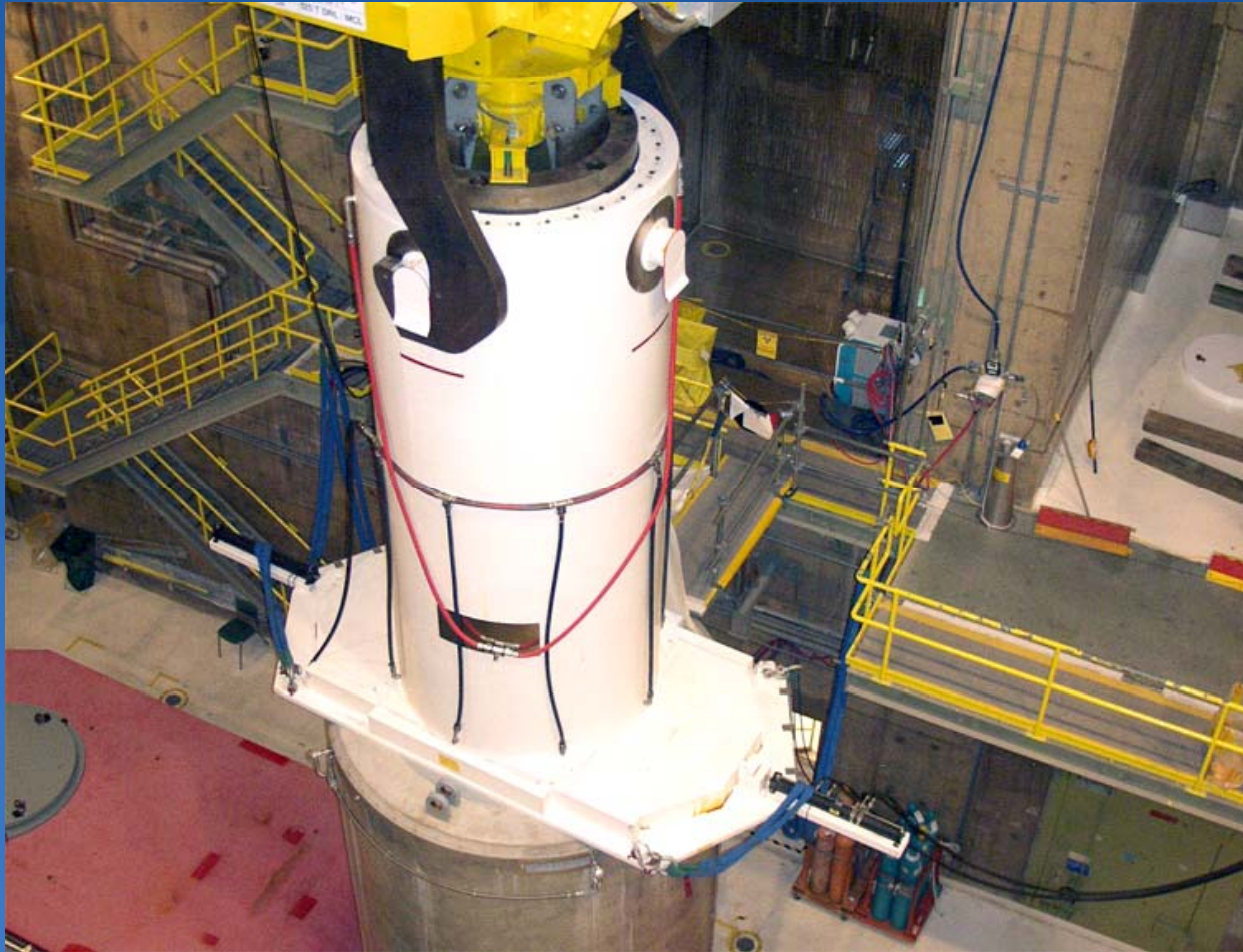
## DPC Placement into Vertical Storage Cask

- Transfer cask is placed atop vertical storage cask
- DPC is lowered from transfer cask into vertical storage cask





# Transfer Cask Sitting on Storage Cask



**A Crawler  
Moves the  
Vertical  
Storage Cask  
to the Storage  
Pad**



# Loading Horizontal Storage Modules

# Transfer Cask Placed On Transfer Trailer



# Transfer Cask Aligned With Horizontal Storage Module



# DPC is Pushed Through Transfer Cask Into Horizontal Storage Module



# Radiation Dose Surveys

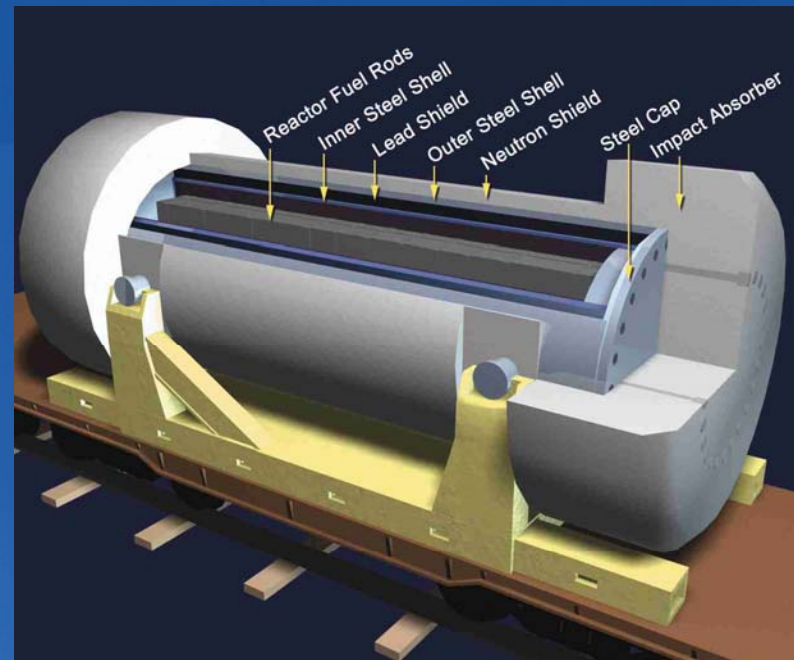


# Transport Cask



# Artist Rendition of a Transport Cask

- Nuclear fuel is transported in strong vault-like containers
  - Truck containers weigh 25 to 40 tons
  - Rail containers weigh 75 to 125 tons
- Multiple barriers provide “defense in depth protection”



# Acknowledgements

- **Pictures and graphics were provided by**
  - **Holtec International**
  - **Nuclear Assurance Corporation**
  - **Transnuclear**