



INMM Spent Fuel Management Seminar XXVIII
January 16, 2013, Washington, DC

NAC Technology and Experience: 2012 in Review

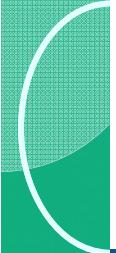
Charles W. Pennington, NAC International



 **MAGNASTOR**



NAC International Is a Wholly Owned Subsidiary of USEC Inc., a Leading
Supplier of Enriched Uranium Fuel for Commercial Nuclear Power Plants



Topics

- ▶ **NAC Corporate Overview**
- ▶ **NAC Technology Background & Experience**
- ▶ **The Year In Review**
 - ▶ **Current Project Update**
 - ▶ **New Business Update**
 - ▶ **Technology Update**
- ▶ **Prospects for the New Year**
- ▶ **Questions**

NAC Corporate Overview

Dry Spent Fuel Storage Facility – 98 Casks Loaded at Palo Verde



NAC Corporate Overview

Proven Nuclear System and Service Solutions

Norcross

Tokyo



London

Moscow

Wholly-owned
Subsidiary of USEC

40 Years in Nuclear
Fuel Cycle
Consulting

Numerous Cask
Technologies
Licensed

U.S. Commercial
SF Transportation
Leadership

More than 400 Storage
and Transport
Systems Delivered

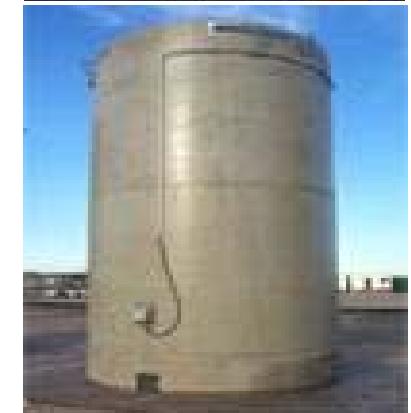
Nuclear Fuel Cycle
Project Engineering

Dry Storage Leadership: Selected by domestic and global utilities,
DOE, and HLW Management Groups for Dry Storage Solutions

44 Years of Nuclear System and Service Solutions Experience

NAC Corporate Service Solutions

- ▶ NAC is a U.S. provider of global nuclear fuel cycle services and products
- ▶ NAC Services:
 - ▶ Fleet of 8 transportation casks
 - ▶ Loading and unloading operations
 - ▶ Transportation services (road, rail, marine, air)
 - ▶ Transport management
 - ▶ Dry spent fuel multipurpose canister systems (MCS), and GTCC and HLW storage systems
 - ▶ Design
 - ▶ Licensing
 - ▶ Fabrication
 - ▶ Construction
 - ▶ Operational Support
 - ▶ Fuel Cycle and Management Consulting



NAC Technology Background & Experience



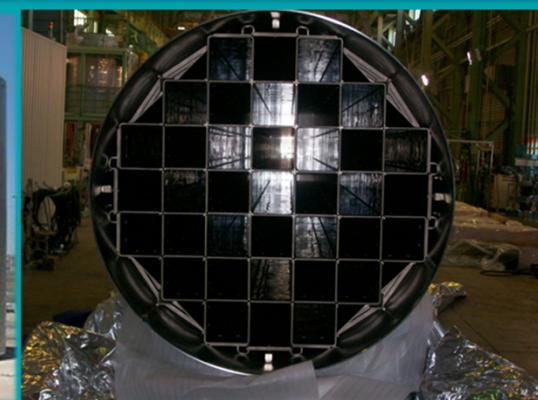
Transfer Cask
At McGuire



Vertical Concrete Cask
At Zion



Vertical Concrete Cask
At McGuire



Transportable Storage
Canister for Zion

NAC Spent Fuel Transport Technology: By Air, Sea, Rail and Road



Greater than 3,700 spent fuel cask movements worldwide covering more than 7 million miles

Corporate Cask System Technology and Licensing Information

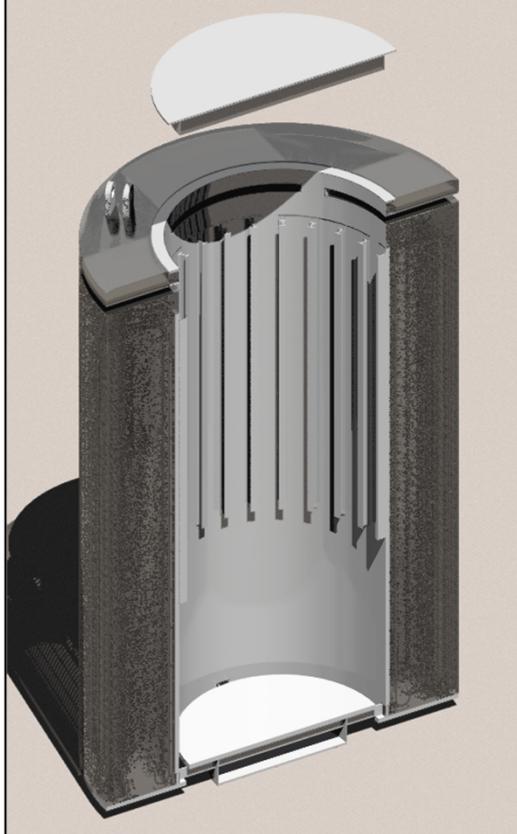
System Designation	U.S. NRC CoC Number or Docket Number	Amendment Number / Application
MAGNASTOR	72-1031 71-9356 Pending	2/Storage
UMS	71-9270 72-1015	3/Transport, 5/Storage
NAC-MPC	71-9235 72-1025	12/Transport, 6/Storage
NAC-MPC-WVDP	In Process	In Process
NAC-STC	71-9235 72-1013 **	12/Transport, 0/Storage
NAC-I28 S/T	72-1020 *	0/Storage
NAC-C28 S/T	72-1003 *	0/Storage
NAC-I26 S/T	72-1002 *	0/Storage
NAC-LWT	71-9225 NRC 71-9225 DOE	57/Transport 8/Transport
NAC-1	71-9183 *	13/Transport
NLI-10/24	71-9034 *	9/Transport
NLI-1/2	71-9010 *	41/Transport



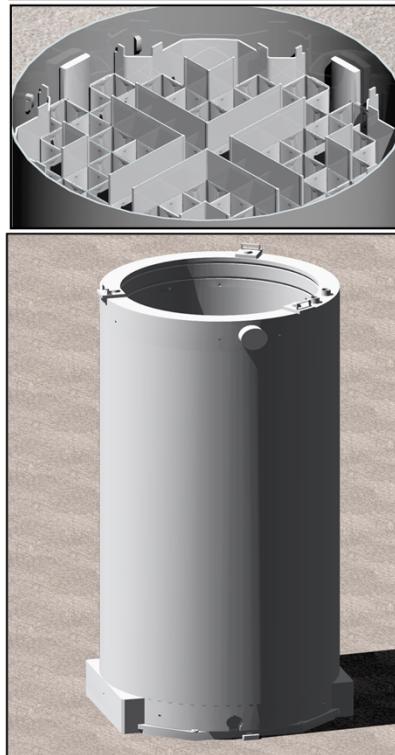
* Certificate no longer active. ** Site Specific. NAC acquired these cask designs.

NAC Dry Storage Technology

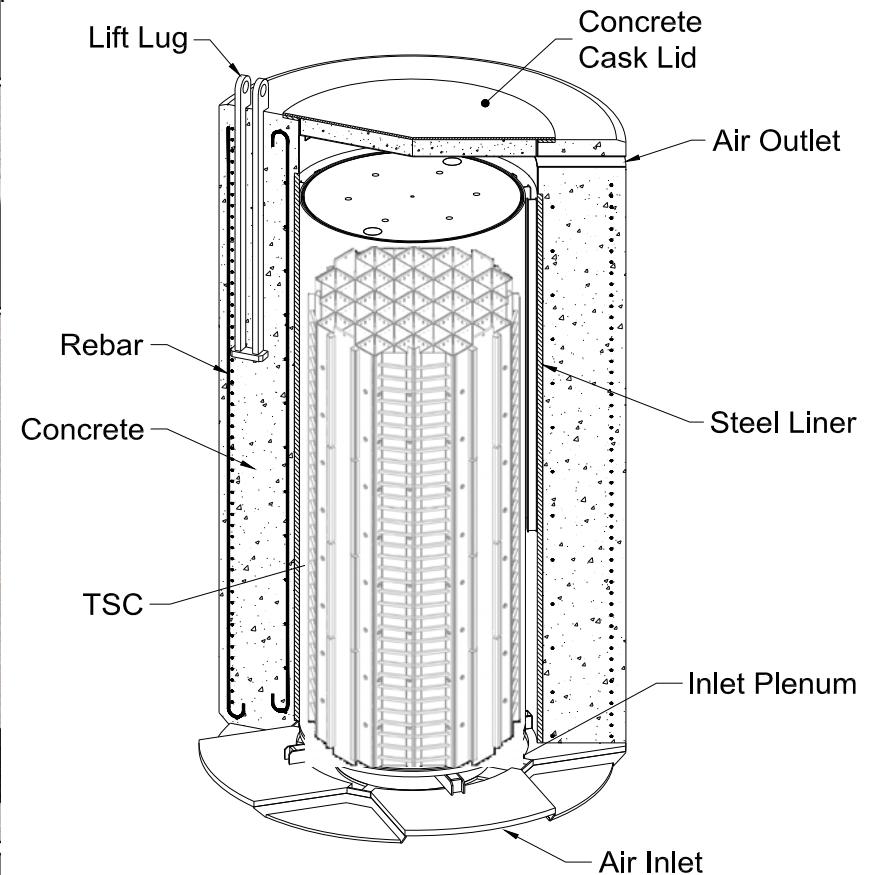
Vertical Concrete
Cask (VCC)



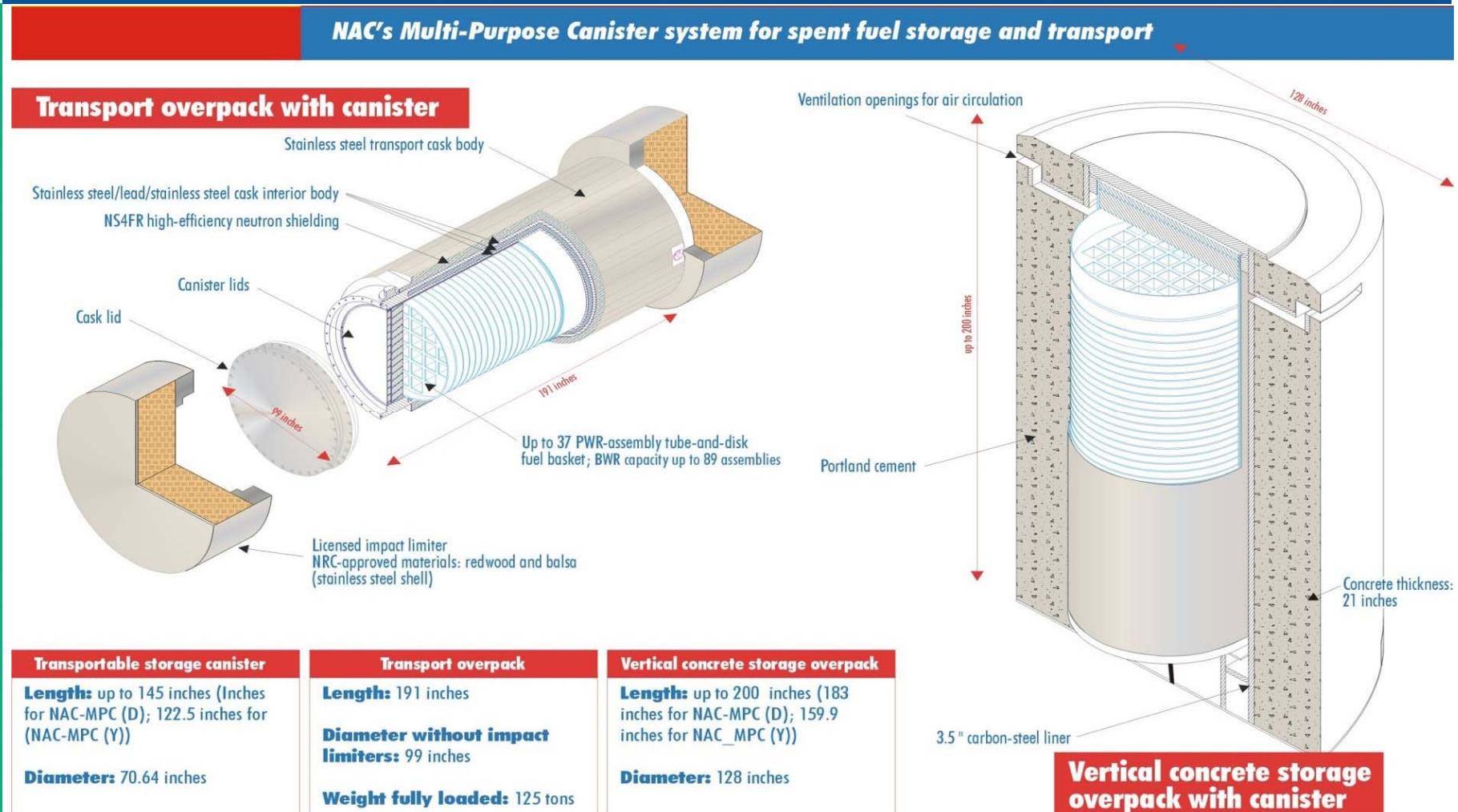
Canister
and Basket



Transfer Cask

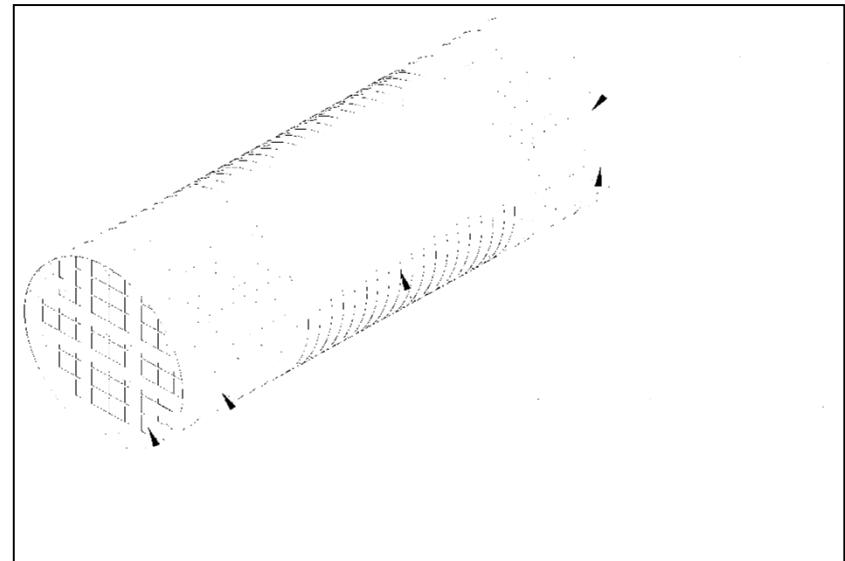


NAC-MPC Summary



The NAC-MPC System

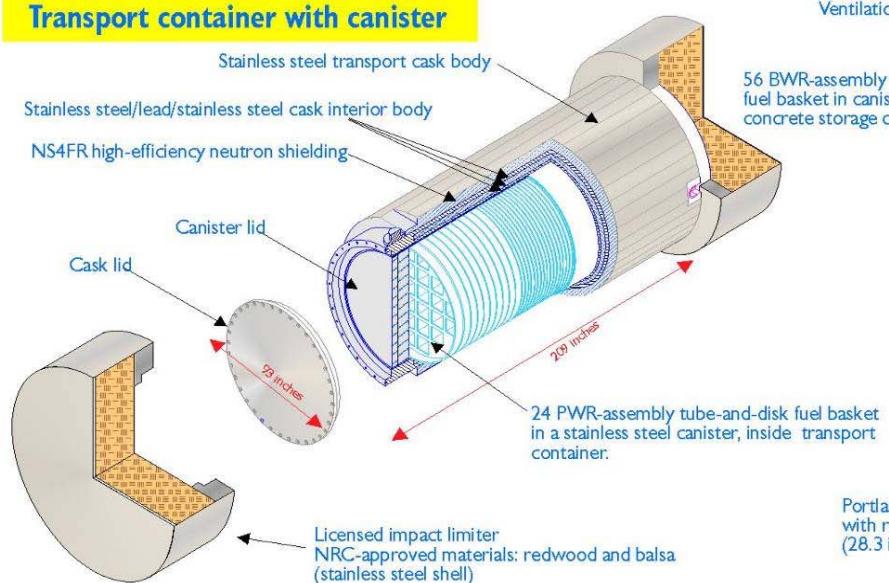
- ▶ Mid-1990's vintage MCS design for non-standard, older fuel
- ▶ Uses tube-and-disk basket design
- ▶ 64 systems loaded at 3 sites, PWR and BWR
- ▶ First dry storage MCS technology for HLW storage and transport, the NAC-MPC-WVDP system; more on that system later



NAC UMS Summary

The Universal MPC System

Transport container with canister



Transportable storage canister

Length: five sizes from 175–192 inches
Diameter: 67 inches
Weight empty (heaviest): 19 tons
Weight loaded (heaviest): 38 tons

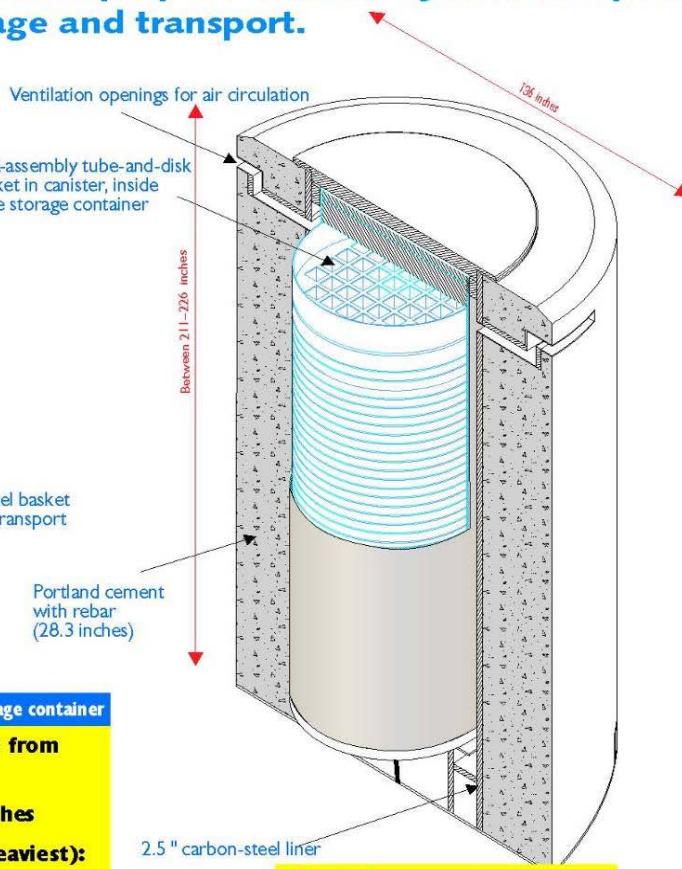
Transport container

Length: 209 inches
Diameter without impact limiters: 93 inches
Weight empty: 83 tons (w/o impact limiters)

Vertical concrete storage container

Length: five sizes from 211–226 inches
Diameter: 136 inches
Weight empty (heaviest): 121 tons
Weight loaded (heaviest): 160 tons

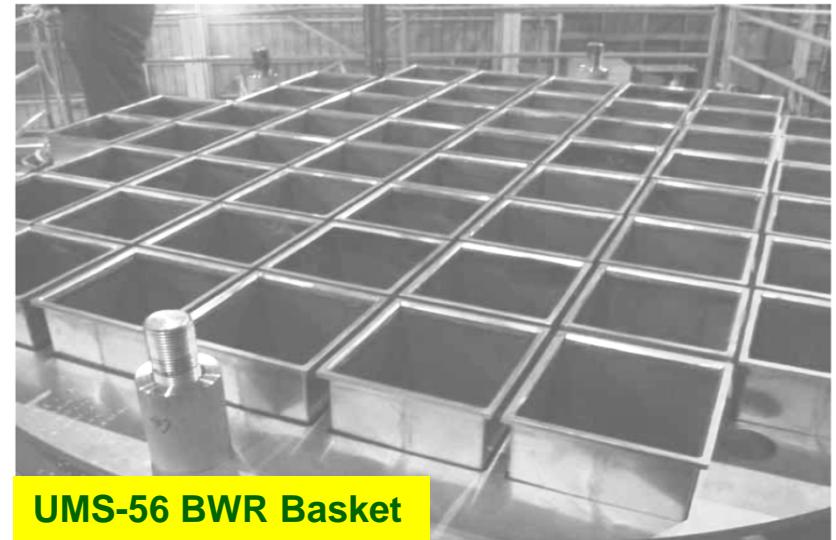
NAC Multipurpose Canister system for spent fuel storage and transport.



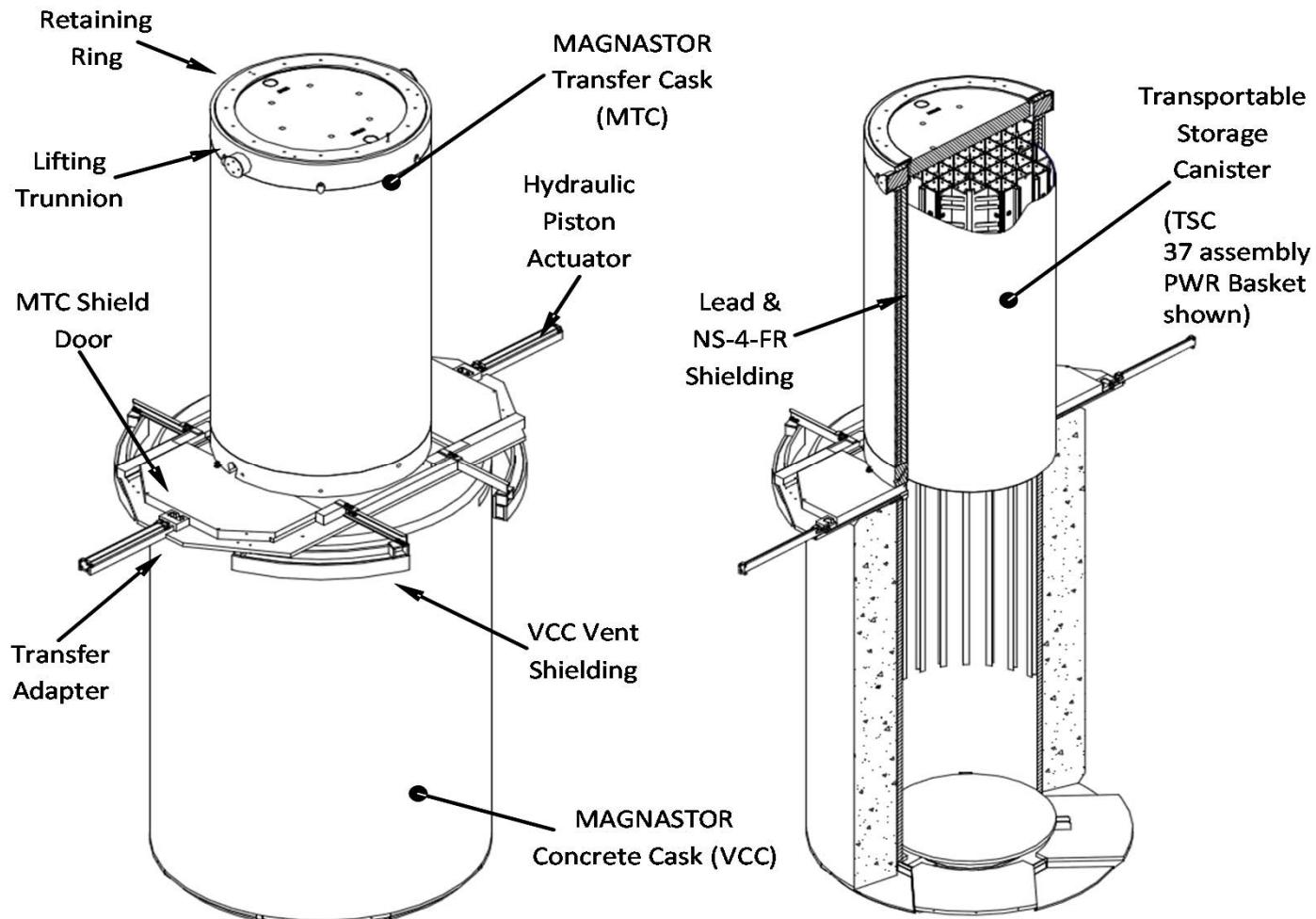
Vertical concrete storage container with canister

The NAC-UMS System

- ▶ Late-1990's MCS design for use at facilities with standard fuel designs
- ▶ Uses tube-and-disk basket design similar to MPC's
- ▶ 214 systems loaded and in use



NAC Dry Storage Technology Integration: The MAGNASTOR System



The MAGNASTOR System

- ▶ 2005 MCS design for standard fuel
- ▶ Unique, first-of-kind, developed cell basket design
- ▶ 136 systems ordered
- ▶ Dry runs completed, major loading campaigns start soon



Conclusion about NAC MCS technology:

MPC, UMS, AND MAGNASTOR SYSTEMS IN DEMAND GLOBALLY, WITH STRONG DESIGN, OPERATIONS, ECONOMIC, AND COMMERCIAL VITALITY AND VIABILITY.



Storage and Transport System Experience

Customer	Technology	Systems
Various – Transport	NAC-LWT	8
Dominion – Surry	ST	2
ENSA – Spain	DPT	License
HZ – Japan	ST/STC	License
China Nuclear EIC	STC	2
Dairyland Power – Lacrosse BWR	MPC	5
Yankee Atomic – Rowe	MPC	16
Connecticut Yankee	MPC	43
CHB WV - HLW	MPC-WVDP	57
Maine Yankee	UMS	64
APS – Palo Verde	UMS	124
Duke Energy – McGuire	UMS	28
Duke Energy – Catawba	UMS	24
INER – Chinshan BWR	UMS	25
Duke Energy – McGuire	MAGNASTOR	20
Duke Energy – Catawba	MAGNASTOR	24
Zion – Energy Solutions	MAGNASTOR	65
Taiwan Power – Kuosheng BWR	MAGNASTOR	27
Totals		> 550



2012 In Review: Highlights



Current Projects: 2012 General Update

2012 was a very busy year

- ▶ **TSCs: 37 fabricated, 119 in process**
- ▶ **VCCs: 101 constructed**
- ▶ **Transfer systems: 2 fabricated**
- ▶ **Damaged fuel cans: 45 fabricated**
- ▶ **Dry runs: 3 completed**

But . . .

- ▶ **3 loading campaigns delayed due to plant considerations**



Specific Project Update: Dairyland

- ▶ **Dairyland's Lacrosse BWR (LACBWR) completed loading of stand-alone ISFSI [completed site storage facility (CSSF)]**
- ▶ **There are 4 stand-alone CSSFs using NAC technology, with the 5th and 6th in process**



Future Industry Options for Path Forward

Nuclear Facility



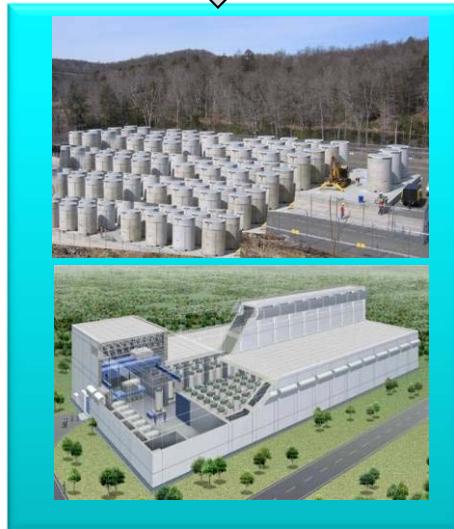
Spent Fuel Pool (on site)



Dry Storage Facility (on site)



Centralized Storage Facility (CSF)

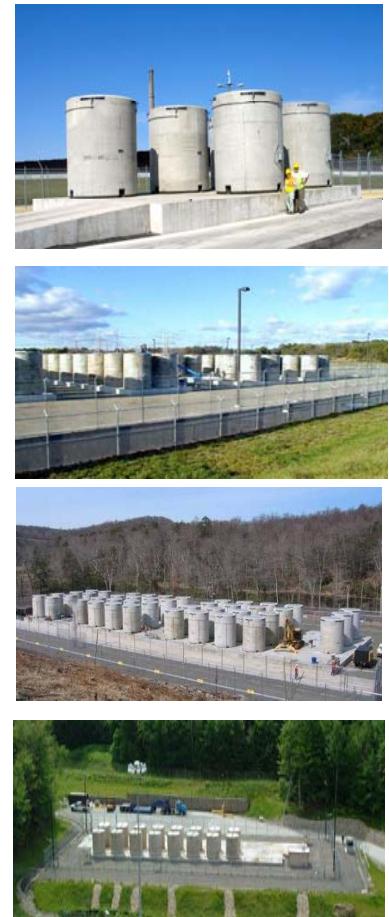


Potential Strategies

- ▶ Dry storage at site
- ▶ Transport from pool to CSF
- ▶ Transport to CSF from site storage
- ▶ CSF repackage for final disposal as needed.

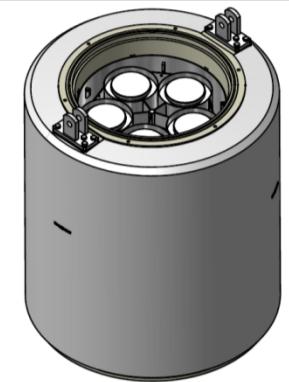
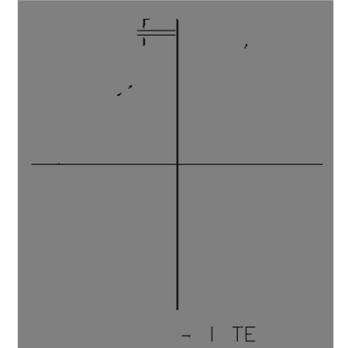
CSSF Experience in the U.S.

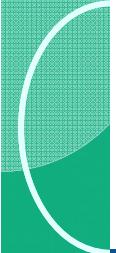
- ▶ NAC technology is used for about 75% of all spent fuel at CSSFs
- ▶ With Zion and West Valley to become CSSFs in the near future, NAC systems will store even more spent fuel at CSSFs
- ▶ NAC CSSF performance over 15 years shows that large centralized dry storage campaigns can be successful at CSFs with the right experience



New Business Highlight for 2012

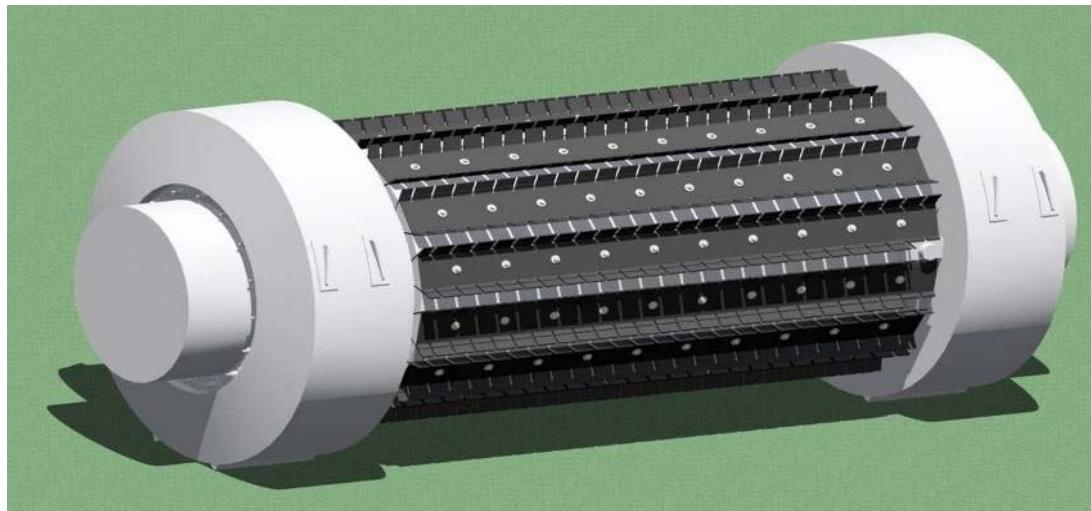
- ▶ Contract with CH2MHill & B&W, LLC West Valley (CHBWV) for DOE HLW storage in dual purpose dry storage systems
- ▶ First U.S. application of spent fuel dual purpose storage technology to HLW dual purpose storage
- ▶ In the 1990s, NAC applied dry storage technology to lead development of GTCC waste storage systems
- ▶ 275 WVDP HLW canisters to be stored in 57 NAC-MPC-WVDP systems at West Valley
- ▶ NAC-MPC system with the NAC-STC transport cask (in operation) is perfect fit for West Valley needs
- ▶ Loading scheduled for 2014





Technology Update for 2012: The NAC MAGNATRAN Cask System

- ▶ Designed to transport MAGNASTOR TSCs
- ▶ License application submitted in 2012
- ▶ Universal transport package capabilities
- ▶ Designed to meet USNRC, DOT and IAEA (-96) requirements
- ▶ High burnup spent fuel (62 GWd / Mtu)
- ▶ Peak thermal heat loads 23 kW / 22 kW (PWR / BWR)





2013 Prospects: What We Expect

- ▶ Projects:
 - ▶ Hardware fabrication of 100+ systems
 - ▶ Major MAGNASTOR and UMS loading campaigns
 - ▶ Major loading campaign at Chinshan
 - ▶ Total loadings may exceed 30
 - ▶ More MAGNASTOR sales
 - ▶ Substantial spent fuel transport
- ▶ Technology:
 - ▶ Innovations in dry storage system loading
 - ▶ Economic solutions to issue of stainless steel SCC
 - ▶ First HLW storage / transport licensing submittal
 - ▶ Further MAGNASTOR and MAGNATRAN advances

QUESTIONS?

Visit us at
www.nacintl.com

Charles W. Pennington
NAC International
Marketing and
Business Development

