



NUHOMS[®] **EOS**
Extended Optimized Storage

Jane He

AREVA TN

INMM 31st Spent Fuel Management Seminar

January 12, 2016



Outline of the Presentation

- ▶ **The NUHOMS® EOS System**
- ▶ **EOS 37PTH and EOS 89BTH DSCs**
- ▶ **NUHOMS® EOS Design Basis**
- ▶ **NUHOMS® EOS Optimizations**
 - ◆ Capacity/Heat Load
 - ◆ Low Dose
 - ◆ Long term storage
- ▶ **Conclusions**

AREVA TN Americas

- ◆ Established in 1965 to transport nuclear materials in the U.S.
- ◆ Manages globally more than 6,000 shipments of radioactive materials every year by road, rail and sea
- ◆ Dry storage since 1985
- ◆ Acquired high-performance NUHOMS® horizontal system in 1998
- ◆ Market leader with more than 900 systems loaded in the U.S.



The NUHOMS® EOS System

- ▶ **Advanced Dry Storage Technology that addresses lessons learned in the “post Fukushima world”**
- ▶ **Lowest Risk, Horizontal Storage Concept**
 - ◆ Horizontal concept retains robust margins for beyond design basis events
- ▶ **License Application submitted to NRC – June 2015**
 - ◆ Expected NRC approval in 2016
- ▶ **NUHOMS® EOS available for deployment in 2017**

NUHOMS® EOS Offers both PWR and BWR Systems

▶ NUHOMS® EOS 37PTH System

- ◆ 37 PWR Fuel Assemblies
- ◆ Maximum Planar Average Initial Enrichment – 5.00 wt. % U-235
- ◆ Maximum Assembly Average Burnup – 62 GWD/MTU
- ◆ Minimum Cooling Time – 3 Years

▶ NUHOMS® EOS 89BTH System

- ◆ 89 BWR Fuel Assemblies
- ◆ Maximum Planar Average Initial Enrichment – 4.80 wt. % U-235
- ◆ Maximum Assembly Average Burnup – 62 GWD/MTU
- ◆ Minimum Cooling Time – 3 Years

Safety During Beyond Design Basis Events

▶ Maximizing Thermal Margins

- ◆ Very Low Helium Backfill Pressure ensures that the consequences of DSC leakage have no significant impact on heat removal
- ◆ Fuel Cladding Temperature does not require nor take credit for convective heat transfer by Helium backfill within DSC Cavity
- ◆ EOS is designed to reject heat greater than 50 kW

▶ Highest Seismic Capability

- ◆ EOS-HSM provides physical protection and designed to be configured for very high Seismic Loads
- ◆ Option for tying adjacent HSMs for very high seismic loads
- ◆ Side-by-side HSM in an array perform like a monolith in seismic events

Safety During Beyond Design Basis Events

- ▶ **EOS is designed for all types of floods and their after effects**
 - ◆ **Secure Protection from Environmental Hazards**
 - ◆ **Axial Position of the DSC above the ground makes it practically immune to effects of flooding, including “smart flood” or “smart wind” or “air vent blockages due to mud or debris or precipitates”**
 - ◆ **Recovery of above ground air inlet and outlet vents from blocked vents or flooding event is simple and safe**

NUHOMS® EOS Optimizations- Capacity/Heat Load

► **Optimized for Capacity/Heat Load: EOS has highest capacity and highest heat load (PWR) in industry**

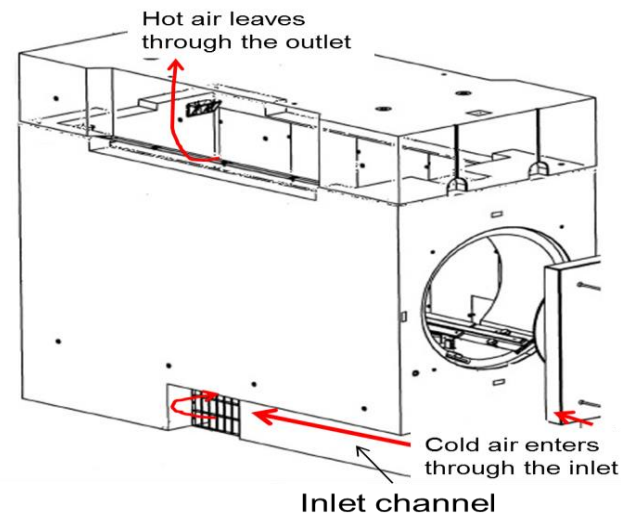
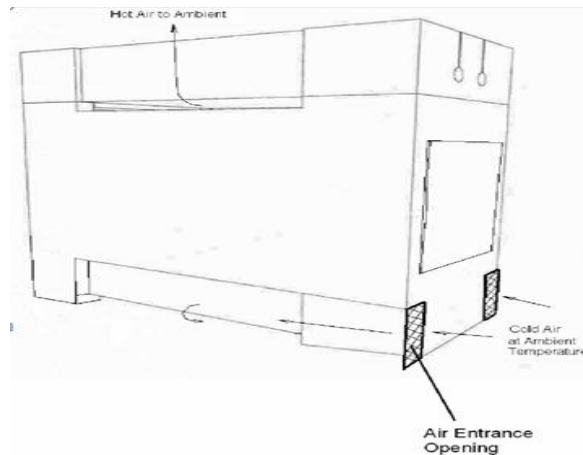
- ◆ EOS 37PTH for PWR and EOS 89BTH for BWR
- ◆ Increased heat rejection to 50 kW with significant margin to safety
- ◆ Innovative non-welded, high strength low alloy steel basket



NUHOMS® EOS Optimizations- Low Dose

► Optimized for Very Low Dose

- ◆ Adjacent HSMs self-shield each other resulting in very low dose rates on the HSM surfaces and ISFSI fence and at site boundary
- ◆ Inlet and outlet vents are designed to minimize streaming without impeding heat removal capability of the system
- ◆ Dose reduction hardware in the inlet and outlet vents minimizes dose in these areas without sacrificing air flow paths



NUHOMS® EOS Optimizations- Long Term Storage

► Inspections

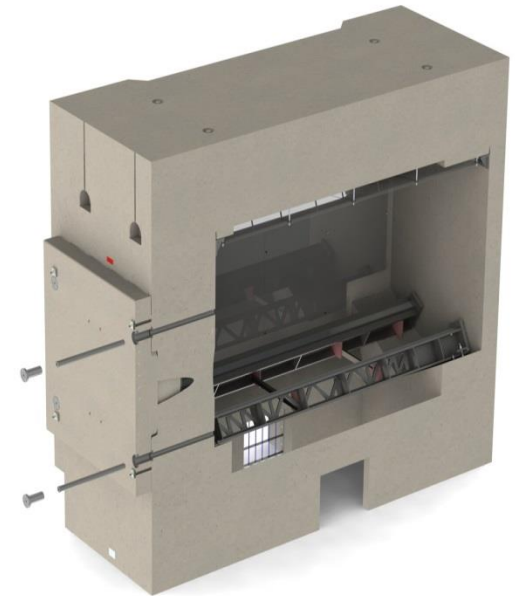
- ◆ HSMs have built-in inspection port for ease and effectiveness of long-term aging management
- ◆ Above ground system allows for ease of inspection of DSCs without lifting

► Non-Destructive Examination (NDE) Tools

- ◆ NDE techniques include high resolution cameras, surface deposit sampling, eddy current inspection
- ◆ Established NDE techniques used to inspect canisters with implementation tool well into development

► Above ground, horizontal system offers

- ◆ Simple retrieval for inspection
- ◆ Ease of retrieval for shipment off-site
- ◆ Ease of accessibility in case of need for cleaning or repair



NUHOMS® EOS Optimizations- Long Term Storage

- ▶ **Options for NUHOMS® EOS Canister in Duplex Stainless Steel**
 - ◆ Not susceptible to stress corrosion cracking in chloride environments
 - ◆ Highly resistant to localized and general corrosion
- ▶ **Duplex Steel Used in other AREVA Nuclear Waste Package Applications**
 - ◆ TRUPACT-III Transportation Package Containment Boundary
 - ◆ High Integrity Radioactive Waste Containers
- ▶ **Duplex Steel in Use 80+ years in aggressive corrosive environments**

Conclusion

- ▶ **NUHOMS® EOS** builds on a state-of-the-art and proven system with innovations that prepare for the future...
 - ◆ Unparalleled safety and low dose performance
 - ◆ Lowest risk in canister loading, transfer and operational events
 - ◆ Highest seismic capability
 - ◆ High capacity
 - ◆ High-strength low alloy steel materials with enhanced thermal performance ... 50kW
 - ◆ Innovative non-welded basket design
 - ◆ Corrosion-proof duplex stainless steel for plants in marine environments
 - ◆ Built-in inspection port for Aging Management

Questions & Answers