

NUHOMS<sup>®</sup> **EOS**  
Extended Optimized Storage



**Light years ahead.**

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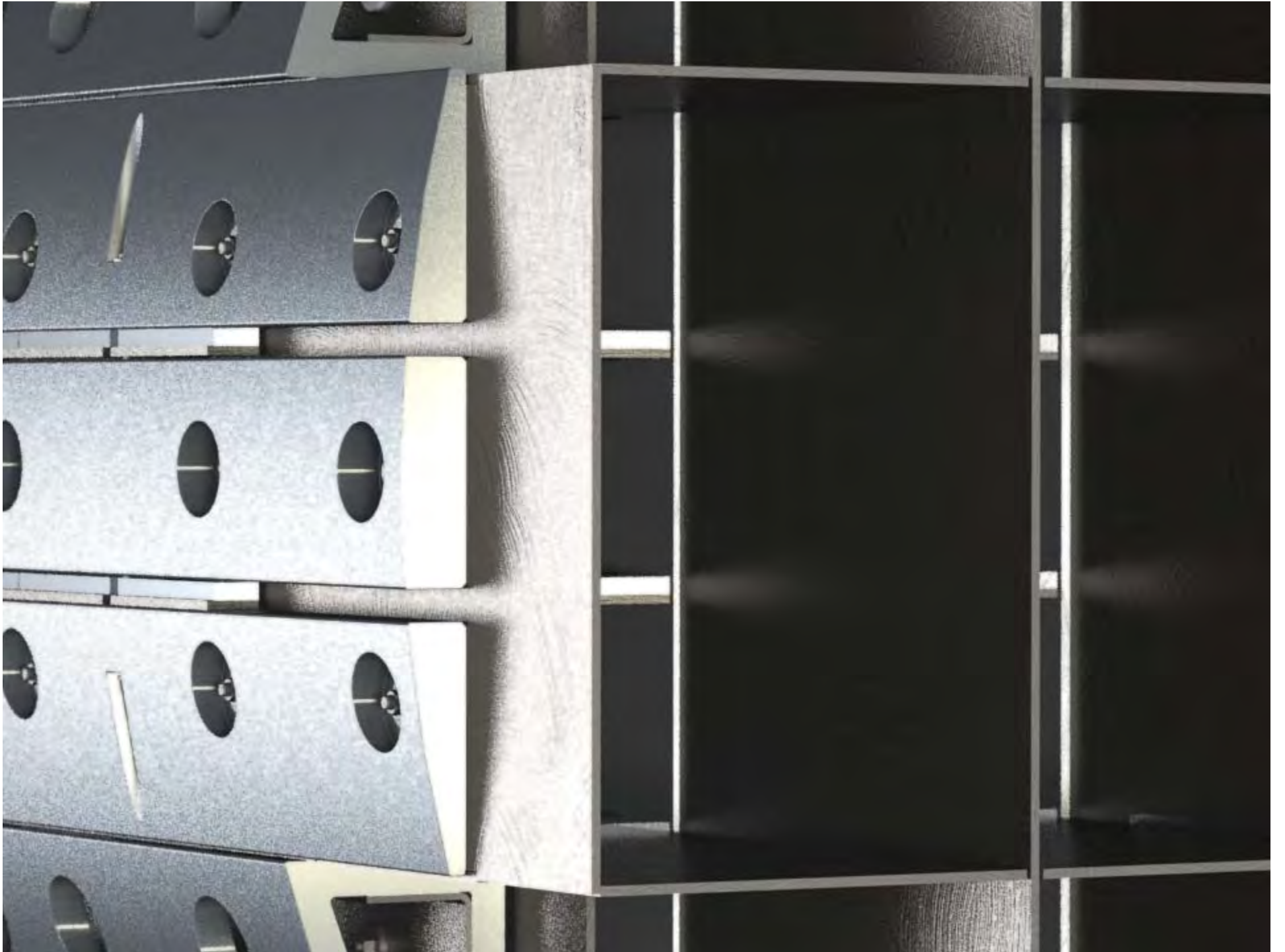
# AREVA TN Americas Industry Leader

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





- ▶ **The Next Evolution in Dry Storage from AREVA TN**
- ▶ **Result of Significant Innovation in Dry Storage Technology**
- ▶ **High Capacity, High Heat Load - BWR and PWR Systems**
- ▶ **Based on Industry-best Safe, Low Risk, High Seismic, “Tried-and-True” Horizontal Storage Concept**
- ▶ **Licensing Application Submitted to NRC – December 2014**
- ▶ **NUHOMS® EOS Available 2017**





- ▶ **Highest capacity and highest heat load in industry**
- ▶ **EOS 37PTH for PWR and EOS 89BTH for BWR**
- ▶ **Optimized for heat transfer/shielding**
- ▶ **Built-in inspection port built for ease of long-term aging management**
- ▶ **Duplex Stainless Steel canister ensures corrosion proof system for plants in marine environments**
- ▶ **Building enclosure for plants located in geographic areas where physical appearance is important**



- ▶ **Basket Design Streamlined for ease of fabrication**
- ▶ **Innovative non-welded, high strength low alloy basket**
- ▶ **Basket Heat Transfer Uses Conduction and Radiation**
- ▶ **Increased Heat Rejection to 50 kW with significant margin to safety**
- ▶ **EOS-HSM Airflow Path Optimized to achieve the most efficient heat rejection capability and offer the best shielding performance**



# NUHOMS® EOS State-of-the-Art Basket Design





- ▶ **“Improve upon the best!”**
- ▶ **Above Ground, Horizontal Already Offers Proven Solution for...**
  - ◆ **Unparalleled Safety**
  - ◆ **Lowest Dose**
  - ◆ **Highest Seismic Capability**
  - ◆ **Secure Protection from Environmental Hazards**
  - ◆ **Proven Performance in Terrorist Attack**
  - ◆ **Lowest Transfer Risk**
  - ◆ **Lowest Plant Life Cost**





## ▶ Reinforce the NUHOMS® Above Ground Horizontal Advantage...

- ◆ Easier and cheaper to build
- ◆ Easier to maintain
- ◆ Easier to access canisters for future transportation
- ◆ Low risk and elegant horizontal transfer process
- ◆ Side-by-Side single robust structure with the highest seismic capability
- ◆ Self-Shielding results in extremely low dose rates
- ◆ Immune to effects of flooding, including “smart flood” or “smart wind”
- ◆ Ease of operations – Vacuum Drying, DSC Closure and Transfer to HSM
- ◆ No Site-Specific Licenses or “Licensee Required” Analysis for Operations
- ◆ Ease of Inspections for Aging Management with NO LIFTS



**DANGER**  
Do Not Remove  
Side Tie-down  
Bolts  
If Only Ram is  
Installed

**CAUTION**  
  
RADIOACTIVE MATERIAL  
HEALTH PHYSICS COVERAGE  
REQUIRED FOR ENTRY

REGULATOR IS SET  
TO 2.5  
**NOT ADJUST**



- ▶ **Maximize Thermal Margins**
- ▶ **Basket Heat Transfer DOES NOT require Internal Convection**
- ▶ **Low Helium Backfill Pressure**
- ▶ **Fuel Cladding Temperature not affected by Helium within DSC Cavity**
- ▶ **Maximize ISFSI Operational Performance**
  - ◆ **Ease of DSC insertion and withdrawal**
  - ◆ **NO LIFTING of a Loaded DSC**
  - ◆ **Same Footprint as existing HSM-H Design**
  - ◆ **No change to DSC heat removal Air Flow Paths**
  - ◆ **Still Free Standing and compatible with existing HSM arrays**



▶ **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
- ◆ Variable Fuel Assembly Length

▶ **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
- ◆ Variable Fuel Assembly Length

# NUHOMS® EOS Horizontal Storage Module



- ▶ **Thick reinforced concrete - No gap between modules = maximum shielding**
- ▶ **Large Height Difference between inlet and outlet air vents**
- ▶ **Enhanced flood performance**
- ▶ **Robust seismic capability**
- ▶ **Ease of horizontal retrieval of DSC from HSM**
- ▶ **Low risk ... no reverse “stack up”**







# Aging Management Plan NUHOMS® Inspection



## ▶ Inspections

- ◆ NUHOMS® EOS horizontal storage modules have built-in inspection port
- ◆ Above ground system allows for ease of inspection of 100% of canisters

## ▶ 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 allows for:

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

# Corrosion-Proof

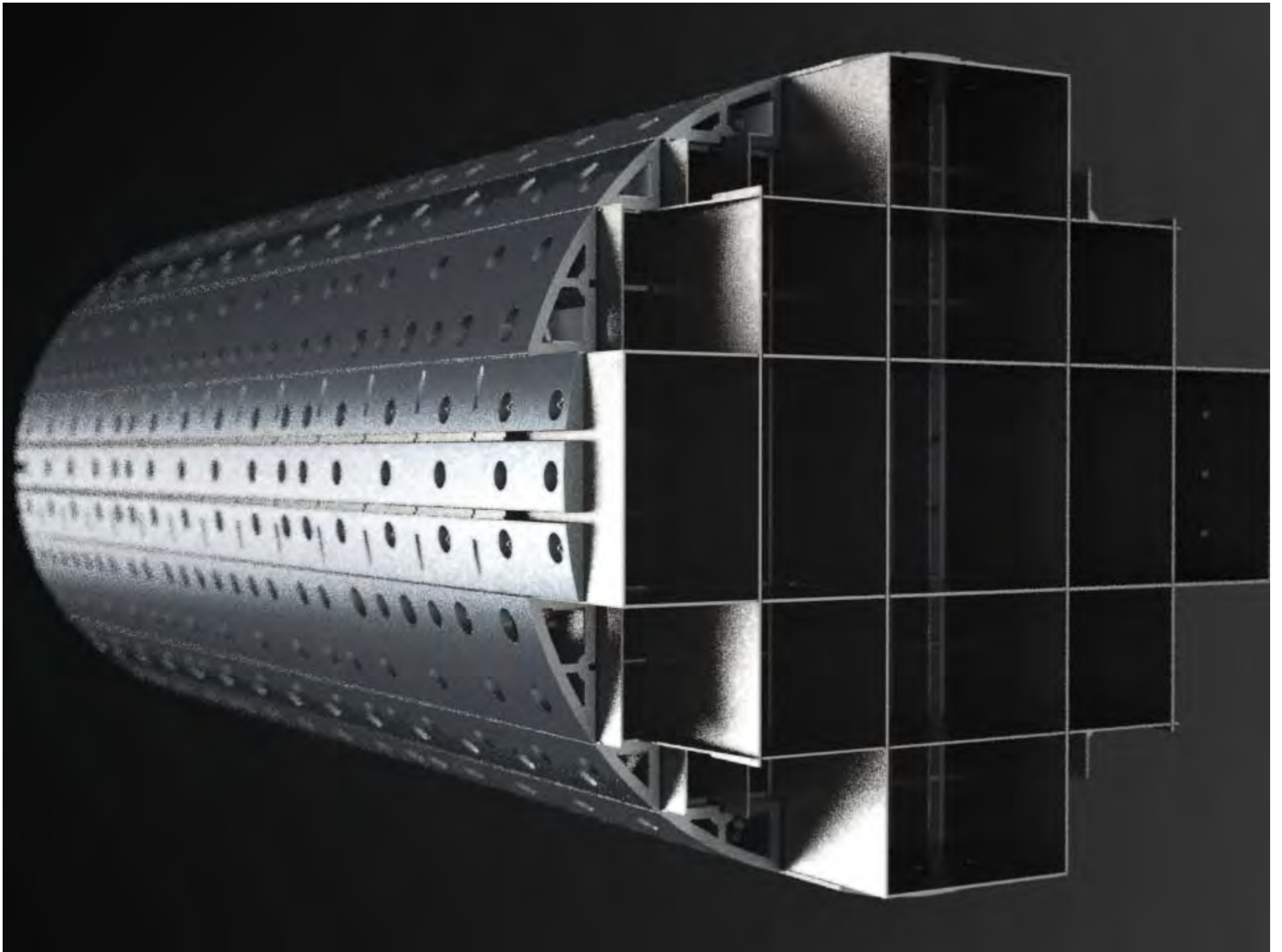


- ▶ **NUHOMS® EOS Canister in Duplex Stainless Steel**
  - ◆ Withstands 80+ years in aggressive corrosive environments
  - ◆ Not susceptible to stress corrosion cracking in chloride environments
  - ◆ Highly resistant to localized and general corrosion
  - ◆ Exceptional heat transfer capabilities
  - ◆ Exceptional mechanical strength and energy absorption
- ▶ **Used in other AREVA Nuclear Waste Applications**
  - ◆ TRUPACT-III Transportation Package Containment Boundary
  - ◆ High Integrity Radioactive Waste Containers
- ▶ **Will Perform for 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 and dose in canister loading and transfer
  - ◆ Highest seismic capability
  - ◆ High capacity
  - ◆ High-strength alloy materials with enhanced thermal performance ... 50kW
  - ◆ Innovative non-welded design
  - ◆ Streamlined fabrication process
  - ◆ Corrosion-proof duplex stainless steel for plants in marine environments
  - ◆ Built-in inspection port for Aging Management
  - ◆ Building enclosure for plants located in areas where appearance is important





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