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Safety considerations for the Interim Storage Solution

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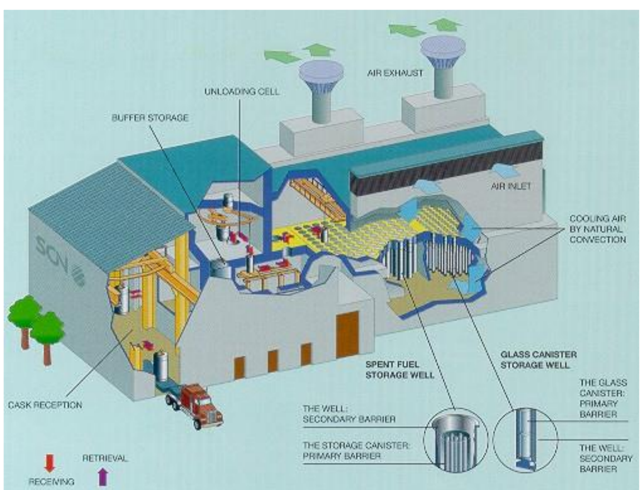
Outline

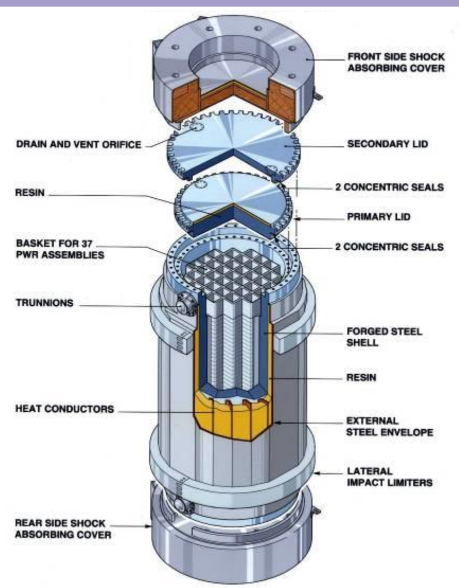
- Overview of the interim dry storage solutions
- Storage Safety Assessment and Aging Management
- Conclusions

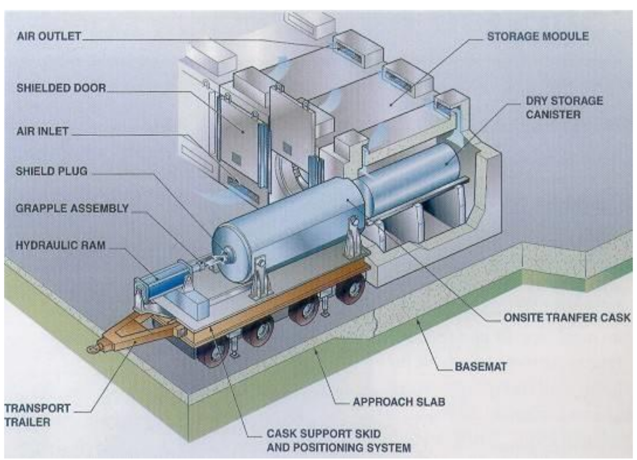
Interim dry Storage Solutions

- **Interim storage of used fuel, basic principle**
  - **Limited time, 30 to 40 years**
  - **Allow for used fuel cooling**
- **Different systems to store used fuel designed by AREVA**
  - **In use for decades**
  - **Safety records : experience covering more than 30 years**

Vaults (Cascad type)	Metal casks (TN®24)	Canister based systems (Nuhoms®)







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Track Record of AREVA TN Experience

- AREVA TN is an experienced provider of storage technology in the world
  - **USA**
    - First NUHOMS® system loaded at Robinson ISFSI in March 1989
    - First TN®24 cask loaded at McGuire in 1988 (in 1984, the TN®24P has been loaded for tests)
  - **Japan**
    - First TN®24 cask loaded at Fukushima Dai-ichi NPP in 1995
  - **Belgium**
    - First TN®24 cask loaded at Doel in 1994
  - **Switzerland**
    - First TN®24 cask loaded at Zwilag in 2000
  - **Armenia**
    - First NUHOMS® system loaded at Medsamor NPP in 2000
- More than 300 TN®24 casks loaded
- More than 800 canisters systems loaded

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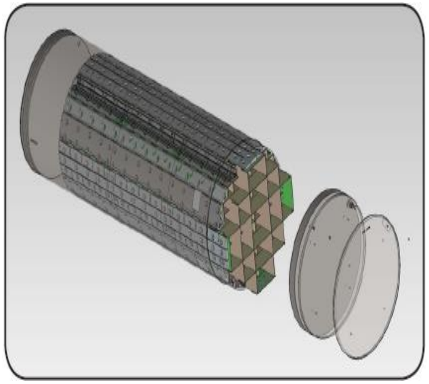
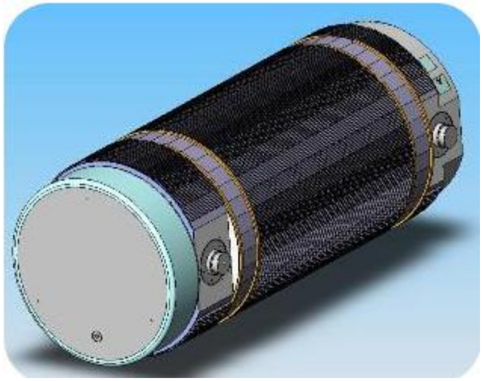
Tne New Generation of storage systems

- **NUHOMS® next generation: NUHOMS® Extended Optimized Storage (EOS):**
  - the highest capacity and heat load
  - 37 PWR or 89 BWR
  - up to 50 kW
  - burnup of up to 62 GWd/tHM
  - maximum allowable enrichment as high as 5%



- **TN®24E: Dual Purpose Casks for the German Market**
  - the highest capacity and heat load
  - 21 PWR – UO2 or MOX (up to 17 MOX)
  - up to 39 kW
  - burnup of up to 65 GWd/tHM
  - maximum allowable enrichment as high as 4.65%



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Safety Proven Records

- Demonstration tests were done by the Idaho National Engineering Laboratory on the AREVA TN-24P cask and NUHOMS® system

- US – Post Irradiation Examination of spent fuel assemblies stored 15 years in metal cask
  - no significant deterioration to cask or FAs

- Japan – Post Irradiation Examination
  - Integrity inspections of TN24 cask performed after 5 and 10 years of storage loaded with 52 BWR assemblies (≈30GW d/tU)
  - no release of inner gas (Kr-85) and no defect observed on the assemblies

Safety Assessment

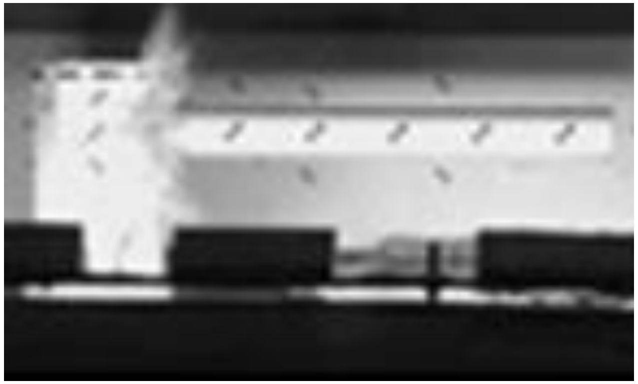
- **The system has been designed to ensure the safety of the used fuel during the storage period and transportation.**
  - **Maintain subcriticality**
  - **Prevent release of radioactive material above acceptable amounts**
  - **Ensure radiation rates and doses so as not to exceed acceptable levels**
  - **Maintain retrievability of stored radioactive materials throughout the life of the dry system**

Safety Assessment in severe accident

Main Accident Conditions during Storage

- Cask drop
- Cask flooding
- Fire
- Earthquake
- Cask burying
- Aircraft crash

- Aircraft crash test on TN NOVA™



Storage Extension

- **Storage duration may have to be extended, potentially beyond one century**
  - **Necessity to reevaluate safety assessment**
  - **Consideration needs to be given to potential aging deterioration of component materials**

- **The main objectives of the aging management program are:**
  - **to ensure that the interim storage safety functions are maintained in the long term,**
  - **to study the degradation phenomenon and mitigate the degradation,**
  - **to address safety issues based on R&D on storage systems, components and used fuel.**

Conclusion

- **Vast industrial experience and numerous safety studies have shown the ability of interim dry storage systems to protect the public and manage safely used nuclear fuel in the long term.**

- **The interim dry storage solution is a key component of a used fuel management program while reprocessing or the implementation of final disposal is put in place.**

» **Responsible towards coming generations: Develop Geological Repository actively and minimize interim storage duration**

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Thank you for your Attention

Questions?

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