PREDEC 2016

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An optimized cask technology for conditioning, transportation and long term interim storage of « End of Life » nuclear waste

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Waste Management Concerns

Customers feedback

- Customers have currently - or will have - to
  - Manage waste remaining into the pool and/ or waste issued from the decommissioning phases
  - Consider a large diversity of nuclear waste in terms of:
    - types, volumes and activities – from High Level to Low level,
    - with different natures such as: activated fuel structure, control rods, thimble plugs, contaminated equipment, sludge, resins …

Customers are concerned with the complexity, cost and sub-optimization of the current waste management strategies. Looking for minimizing the volume of final waste to dispose of.

Waste Management Concerns

Authorities feedback

- Country specific positions
  - Definition of the waste acceptance criteria for Intermediate and High Level Waste under consideration
  - Final Repository waste acceptance requirements for HLW/ ILW long life are not yet defined

Waste Management Approaches

Two possible options depending on Countries Regulations

Determine - at the earliest stage a comprehensive strategy for waste conditioning and packaging and storage

Benefits:

- minimize costs for future package development & manufacturing
- avoid multiple handling of waste package transfer for transportation
- push for standardization of packages as far as possible, saving costs

Drawbacks:

- uncertainties related to long term storage

Containerize waste temporarily, waiting for criteria for storage and disposal

Benefits:

- leave the options opened
- reduce the initial costs, and consequently postpone the major investments

Drawbacks:

- uncertainties and unknowns related to long term costs and risks of future retrieving and re-packaging
- potential evolutions/ degradations of the containerized waste, with production of additional secondary waste

Functional Definition

To reconcile both waste management approaches, taking into account the cost optimization

Customer is looking for:

⇒ **B(U) cask**

⇒ **Simple**

⇒ **Flexible**

⇒ **Easy to handle**

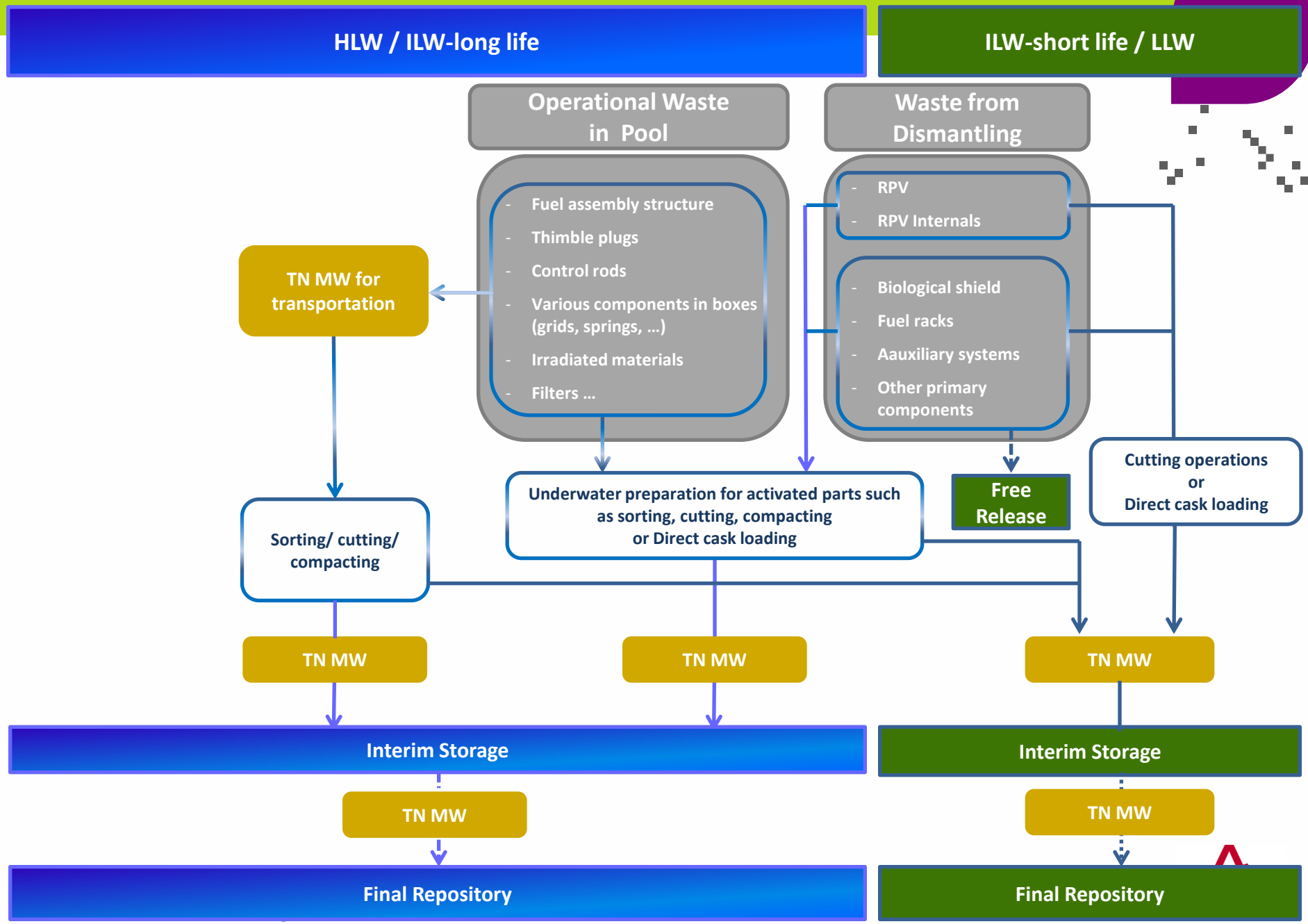
⇒ **To condition today**

⇒ **Long term interim 'storable' for a period of at least 40 years**

⇒ **'Transportable' today and tomorrow, to the final repository at the end of the interim storage period**

⇒ **At market price…**

Waste Management of European Reactor



Introducing the new TN® MW Cask

- AREVA is developing the TN® MW (*MW for Multi Waste)*
  - For interim storage and transportation
  - To provide high integrity waste packaging solutions
  - Avoiding multiple handling and reconditioning operations,
  - While minimizing the risks of non-compliance with future WAC (Waste Acceptance Criteria)

TN® MW a New Cask for Waste

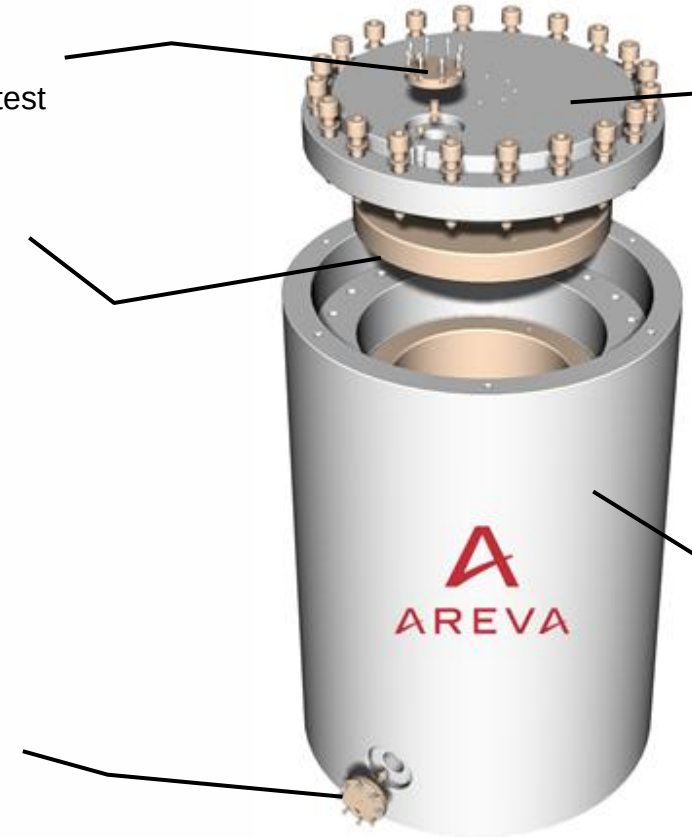
- Design objectives:
  - Design is based upon standard and proven models & technologies already developed and in use at AREVA for other B(U) casks
  - Relying on the wide AREVA experience in dual purpose casks

TN® MW Characteristics

The TN® MW cask:

- B(U) package 2012 IAEA Regulations
- Maximum weight : 10 T
- Maximum payload : 2T
- Easy to handle with a forklift or a hoist
- Activity up to 300 TBq for Co-60
- Wet or dry loading
- Safe for operators and site
- 50 years of storage life without maintenance in normal storage conditions
- Prevent corrosion during pool operations and storage lifetime

TN® MW
in Storage Condition



Upper vent opening allows draining / drying operations, leak tightness test

Forged lid fixed to the body by means of bolts

Additional internal shielding for HLW

Body made of a thick forged shell

Bottom vent orifice for draining/drying operation

- Leak tightness of the cask is provided by two gaskets
- 4 lifting lugs or special gripping and handling interfaces
- Different types of basket depending of waste characteristics

NB: for Dry Loading Version, vent orifice at the bottom is not present

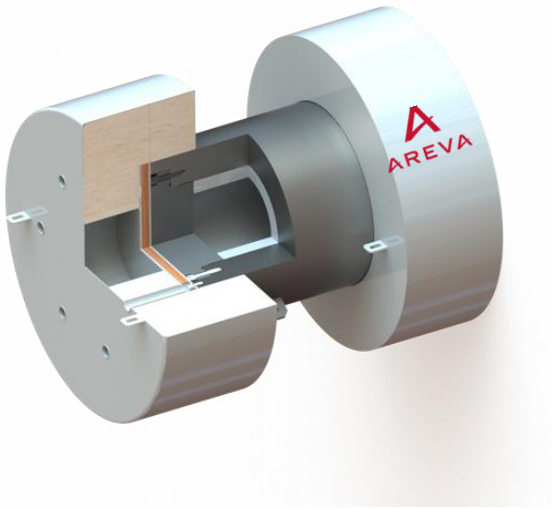
Main features of the TN® MW in Storage Condition

TN® MW
with its additional
on-site transport chair

On-site transport chair

Dimensions (mm)	∅	Height
External dimensions	1 080	1 475
Cavity for ILW	680	1017
Cavity for HLW with additional internal shielding	515	900
Maximum weight (without shock absorbers)		10 T

TN® MW in Transport Conditions



- 2 shock absorbers (top and bottom)
- Transport in horizontal position with a dedicated frame
- Attached to the cask by means of screws
- Transport in vertical position under development

Overall dimensions :

- **Diameter : 1860 mm**
- **Height : 2320 mm**

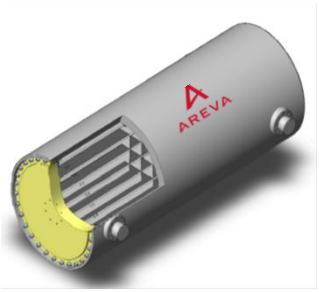
The TN® MW Family

- TN® MW can be customized to various customer needs

TN® MW
Small version

- Up to now, 4 additional versions are under development:
  - **On site transport version (<100A2) for 400 L drum**
    - Commissioned in 2016
  - **IP-2 version for storage and transport of liquid waste, contaminated waste and sludge**
  - **Type B(U) Fissile version with a dedicated basket for criticality**
    - Licensed in France & Belgium in April 2017
  - **Type B(U) – Large Version: cask for storage and transportation of activated waste**

TN® MW
On-site version
for 400 L drum



TN® MW
Large Version

Main Characteristics of the Large version

Approximate weight	48 T
Cavity Length	4 500 mm
Cavity diameter	1 700 mm
Max. load (without shock absorbers)	60 T

Conclusion

- TN® MW, new cask generation for waste allows to
  - address a large spectrum of waste
  - avoid the development of new concepts/equipment and the multiple handling operations at each stage (transport/ interim storage)
  - condition at the earliest stage
  - reduce and control waste management costs

- Fabrication, licensing and delivery of the first TN® MW is scheduled in 2017