



Transportation Package for Use in Facilities with Limited Crane Capacity

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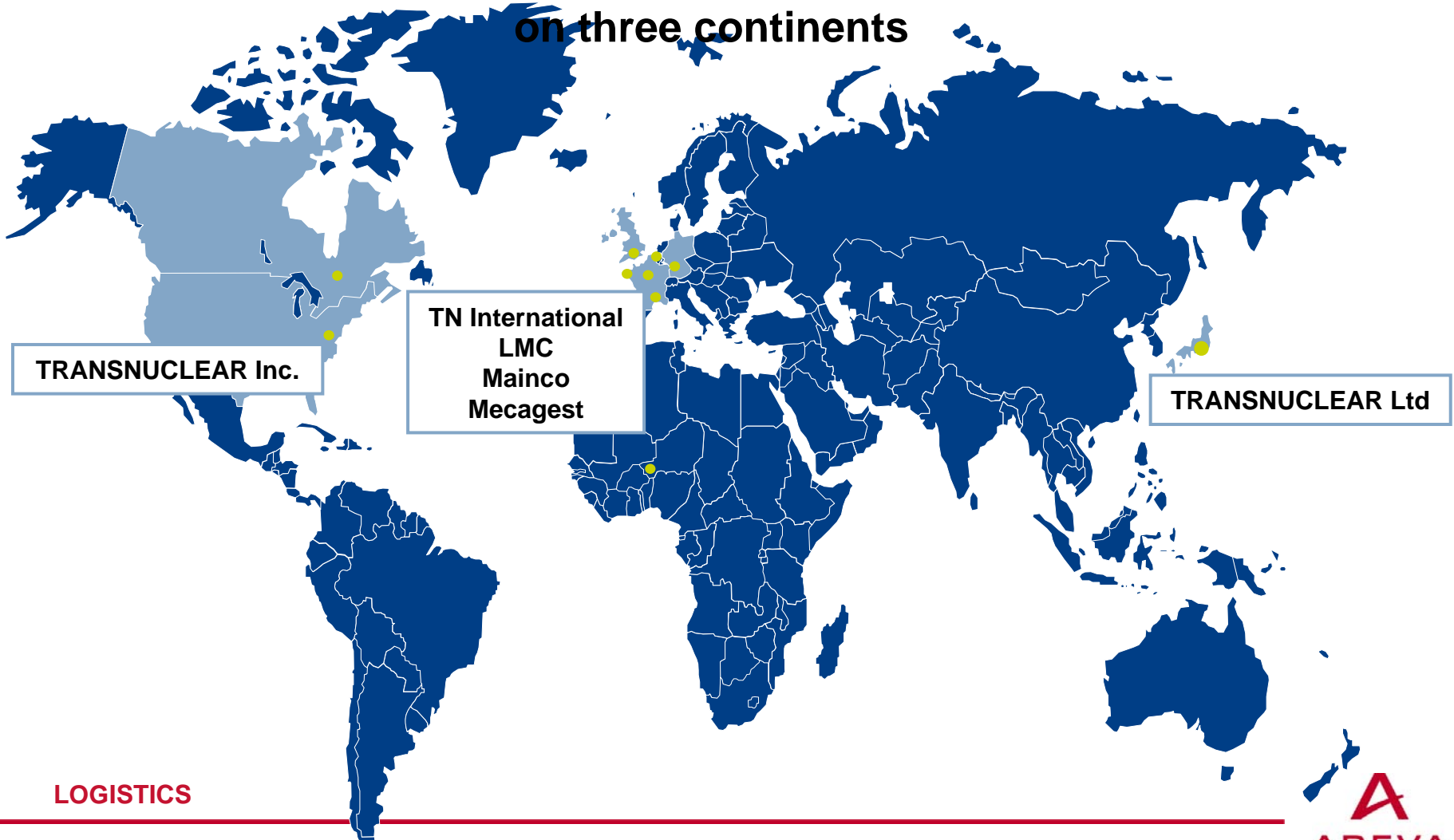
LOGISTICS



Introduction - Logistics Business Unit

Logistics Business Unit includes six legal entities

on three continents



LOGISTICS

Logistics BU Packaging Expertise

- ▶ AREVA Logistics Business Unit owns 3,000 radioactive and nuclear packages and operates total fleet of 5,000 packages
- ▶ More than 150 licenses
- ▶ Packages are licensed to transp the different products of the fue cycle: UF6, Pellets, UNH, Fresh and Used Fuel, Plutonium, MOX Sources, Waste, etc.



CEA AND TR INTERNATIONAL PARTNERSHIP

Need for any Packaging ?

More than 1600 packaging feet shared for on road or on site transports.

Design	Capacity	Weight (kg)	Maximal dimensions	Material
ROCKAWAY	1 TAD	2 000 kg	L = 5 10 P = 2 10 W = 200	Ø 115 L = 345
TR 100	Standard fuel (in 600 UNH)	10 000	Ø 2 000 P = 2 000	Ø 920 L = 1 900
TR 100	Standard fuel (in 600 UNH) & MOX (range of process)	10 000	Ø 2 000 P = 2 000	Ø 920 L = 2 200
TR 800	Low and enriched materials up to 20% enriched pellets...	200 kg	Ø 400 P = 1 800	Ø 170 L = 1 470
TR 8000	Low and enriched materials up to 20% enriched pellets...	200 kg	Ø 400 P = 1 800	Ø 170 L = 1 470
TR 1000	Specialized handling	10 000	Ø 2 000 P = 2 000	Ø 920 L = 2 200
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CEA AREVA

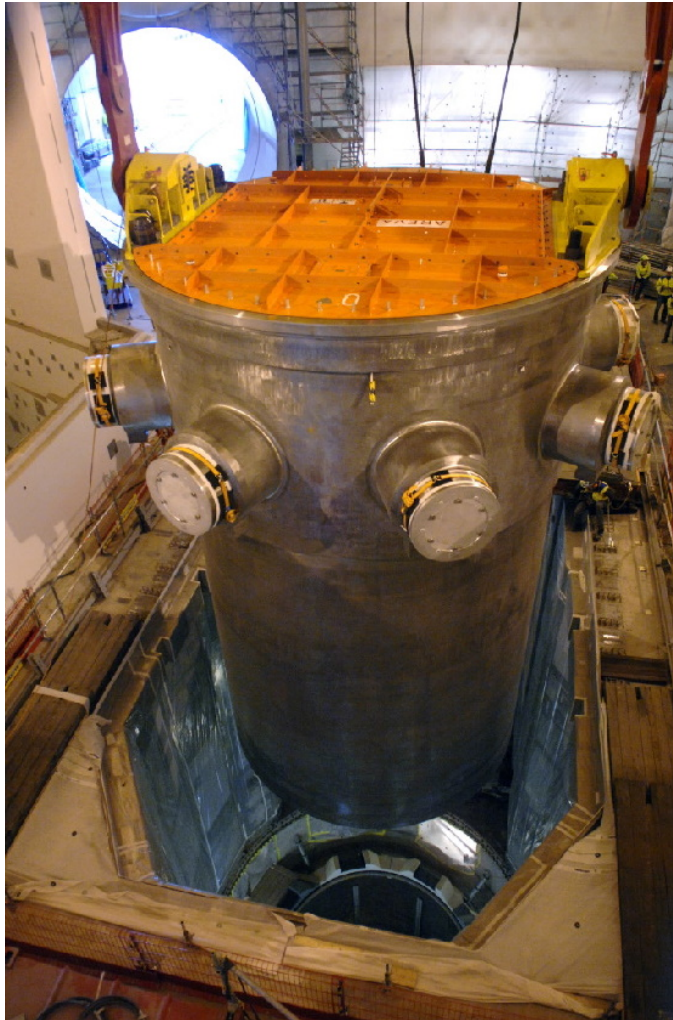
Why a New Design?

- ▶ **Lack of cask designs which can support full length fuel rods transported before and after irradiation examination**
- ▶ **Lack of US NRC licensed packages for research reactors transported before and after irradiation examinations in the U.S.**

Design and Licensing Constraints

- ▶ **Multiple Contents**
- ▶ **Multiple Facilities**
- ▶ **Multiple Countries**

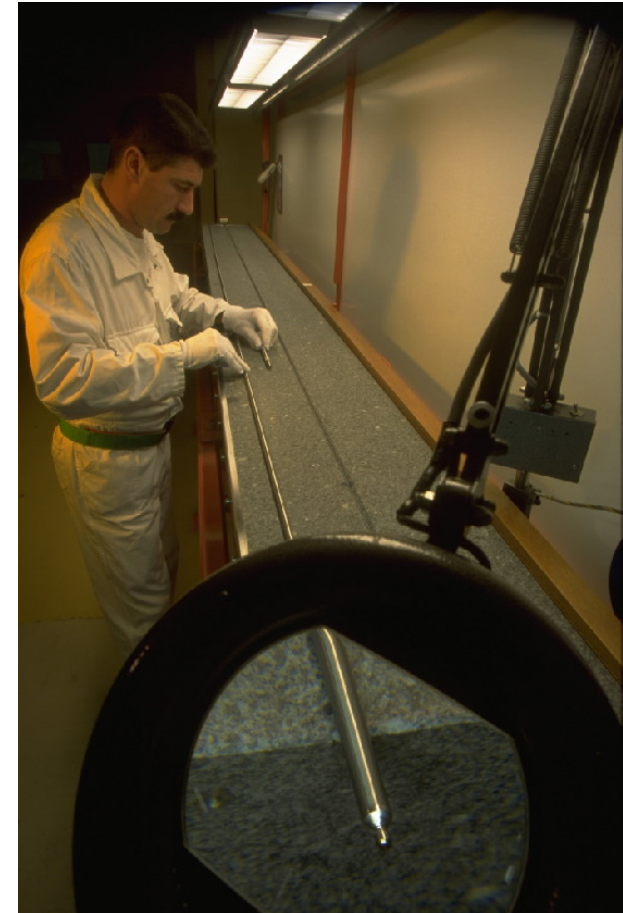
EPR Operations: Post-Irradiation Examination (PIE) of EPR™ reactor Fuel Pins



LOGISTICS

Irradiated EPR™ Reactor Fuel Pins

- ▶ Max length: ~ 4.5 m (179 inches)
- ▶ Significantly longer than general PWR/BWR pins
 - ◆ ~4.3 m (169 inches)
- ▶ Also anticipate need for PIE of MOX fuel pins



Irradiated Nuclear Fuel in North America

► Primarily research reactors

- ◆ TRIGA
- ◆ MTR
- ◆ Diverse Research Reactor Fuel types

SQUARE

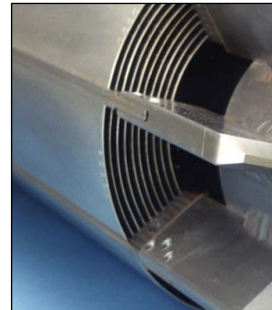
FLAT PLATES



CURVED PLATES



TUBULAR



LOGISTICS

Infrastructure Constraints or Unique Interface Requirements

- ▶ Limited crane capacity
- ▶ Shallow pool
- ▶ Horizontal hot cell operations
- ▶ Portal and transfer system interfaces



Transport Constraints

- ▶ To facilitate performance of international shipments and to minimise transport costs, need to transport the package inside a standard ISO 20' container
- ▶ Transport weight restrictions in various countries must also be considered



Multi-Country Licensing

- ▶ **Multiple Cultures**
- ▶ **Multiple Languages**
- ▶ **Variations in international regulatory requirements and standards**
- ▶ **Transnuclear, Inc. is leading a design project team integrating expertise from across the AREVA group**



TN-LC Cask – Main Characteristics

- ▶ **Cask cavity length: > 4,500 mm (179 inches) to accommodate EPR™ reactor pins**
- ▶ **Cask cavity diameter: TBD**
 - ◆ Tradeoff between capacity and analysis results
- ▶ **Max. weight (including impact limiters): < 30 metric tons**
- ▶ **Wet and dry loading/unloading capability**
- ▶ **Vertical or horizontal operability**

Conclusion

- ▶ **TN-LC design must be compatible with the interface requirements and constraints of different facilities around the world and the regulatory requirements of multiple countries**
- ▶ **The TN-LC cask will provide a versatile packaging for the transport of irradiated nuclear material that will be useful to the commercial and research communities**

Thank You for Your Attention