





AREVA BU Logistics presentation

Current issues in international/intercontinental
transport from transporter's point of view

Tcherkoff & Victorin – 05-03-2010 – AIEA, Vienna



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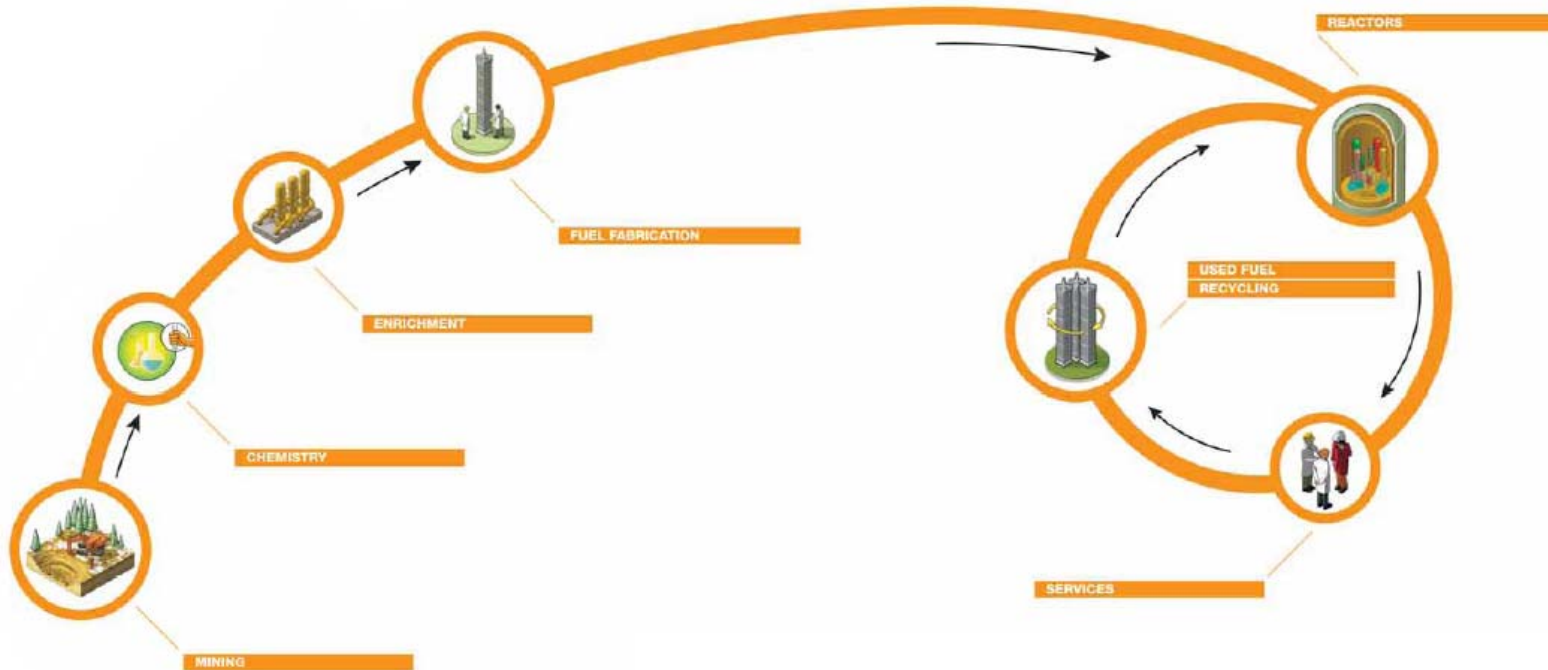




AREVA BU Logistics profile



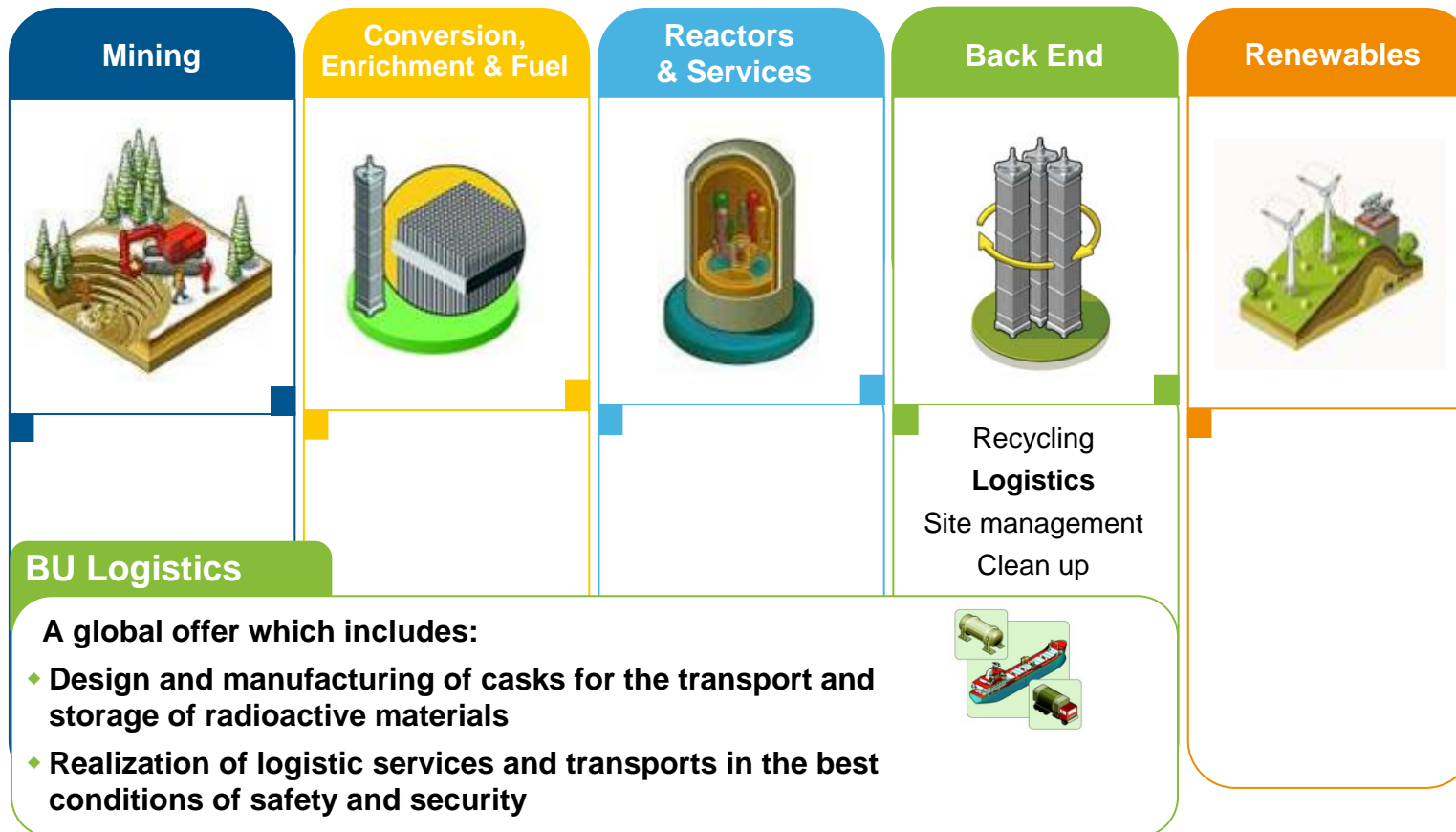
AREVA integrated offer serving energy professionals



The Logistics BU is present at all stages of the nuclear fuel cycle. With its expertise, it oversees all the AREVA group transports all around the world.

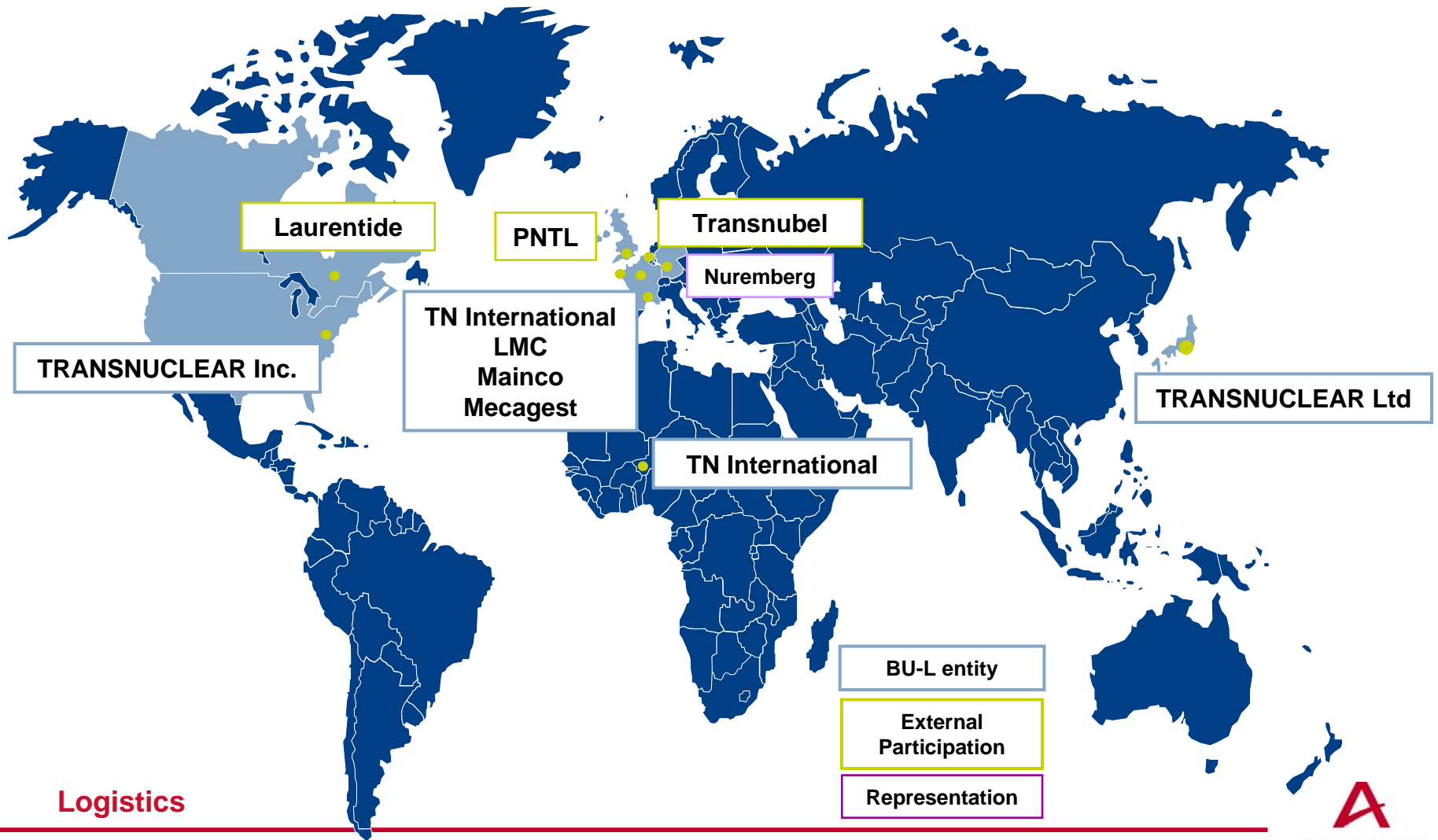
Logistics

BU Logistics positioning inside AREVA group



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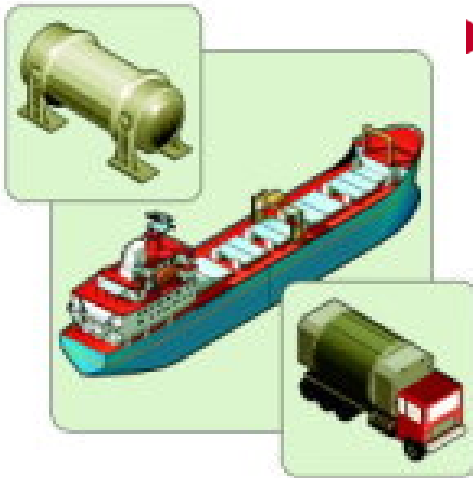
Internationalization Of the BU Logistics network



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Strengths and opportunities



► Our strengths

- ◆ A unique experience and an international recognition
- ◆ A capacity to manage major logistic projects
- ◆ The highest level of safety and security in the world for the transport of radioactive materials
- ◆ An international network, narrow relations with the customers and the competent Authorities

► Our main opportunities

- ◆ The global Renaissance of the nuclear power
- ◆ Nuclear plants to be maintained
- ◆ The recycling, the key constituent of a sustainable energy
- ◆ Growing demand for a secure supply chain



An international network and a 45 years knowhow for the biggest profit of our customers

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Shipping research reactors materials



Table of content

- ▶ Regulations
- ▶ Necessary tests for type B and C packages
- ▶ Developing a new cask
- ▶ A typical transport breakdown

Regulations

	Country	Regulations
Road	Europe et Russia	ADR – International Carriage of Dangerous Goods by Road – 2009 Edition
	USA	10 CFR 71 – Packaging and transportation of radioactive material
	Canada	SOR/2000-208 – Packaging and transport of Nuclear Substances Regulations
Sea	All	Code IMDG (Amdt 34-08) – International Maritime Dangerous Goods Code
Air	All	IATA – Dangerous Goods Regulations – 51 st Edition

▶ **Regulations are mostly based on IAEA Recommendations**

◆ But differences exist

▶ **To transport small quantities of irradiated material**

◆ Every Content by road and sea

◆ Content < 3000 A₂ in every country (except USA) by air

◆ Content < A₂ of plutonium in USA by air

} TYPE B

◆ Content > 3000 A₂ in every country (except USA) by air

◆ Content > A₂ of plutonium in USA by air

} TYPE C

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Necessary tests for type B and C packages



	Test	Criteria
Normal conditions of transport	<ul style="list-style-type: none"> • Water spray test • Free drop test (1,2 m or 0,9 m) • Stacking test (5 x mass) • Bar penetration test 	<p>Increase in radiation level (< 20 %)</p> <p>Loss of radioactive contents < $10^{-6} A_2$/hours</p>

TYPE B

TYPE C

Accident conditions of transport	<ul style="list-style-type: none"> • 9 m free drop • 1 m puncture test 	<p>Radiation level < 10 mSv/h at 1 m</p> <p>Loss of radioactive contents < $1 A_2$ in a period of one week</p>
	<ul style="list-style-type: none"> • Thermal test : 800°C Fire for a period of 30 min • Water immersion test : 15 m for a period of 8 hours 	
TYPE B		

Water immersion test	<ul style="list-style-type: none"> • Immersion at 200 m deep for one hour 	No rupture of the containment system
Burial	<ul style="list-style-type: none"> • Environment thermal conductivity 0,33 W/(m.K) • Temperature of 38°C 	<p>Radiation level < 10 mSv/h at 1 m</p> <p>Loss of radioactive contents < $1 A_2$ in a period of one week</p>
Accident conditions of transport	<ul style="list-style-type: none"> • 9 m free drop • 9 m drop of a 500 kg plate • 3 m puncture test on conic probe • Thermal test : 800°C Fire for a period of 60 min 	
TYPE C	<ul style="list-style-type: none"> • Impact test at a velocity of 90 m/s (orientation causing maximum damages) 	

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Developing a new cask



▶ Design

- ◆ Pre concept
- ◆ Qualifying tests
- ◆ Safety report drafting

▶ Licensing

- ◆ Safety report transmitted to Competent Authorities
- ◆ Authorities assessment
- ◆ Licensing approval

▶ Fabrication

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A typical transport breakdown



▶ Bid period

- Content analysis, cask choice, cask booking, transportability study, offer

▶ Customer approval

▶ Transport preparation

- Validation in all crossed countries, content classifications in all crossed countries, agreement from all crossed countries
- Planning validation with Hotlabs including reception and starting periods
- Technical assistance before transport

▶ Transport

- Sending of empty cask to Hotlab consignor
- Technical assistance on site
- Loading, controls
- Reception at consignee facility
- Unloading, controls
- Cask return to base

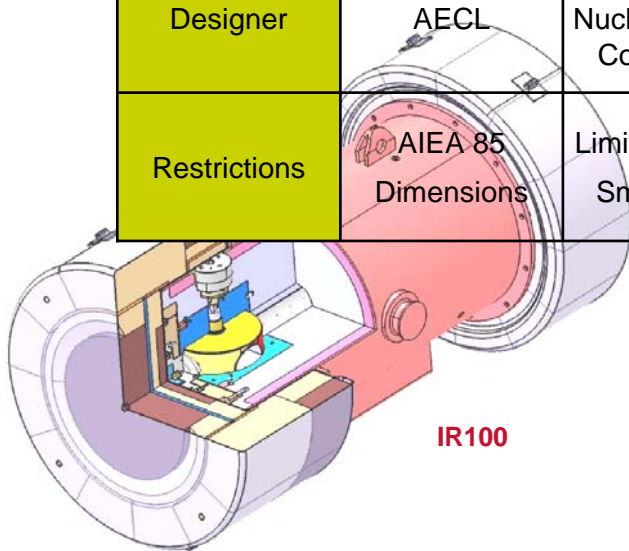
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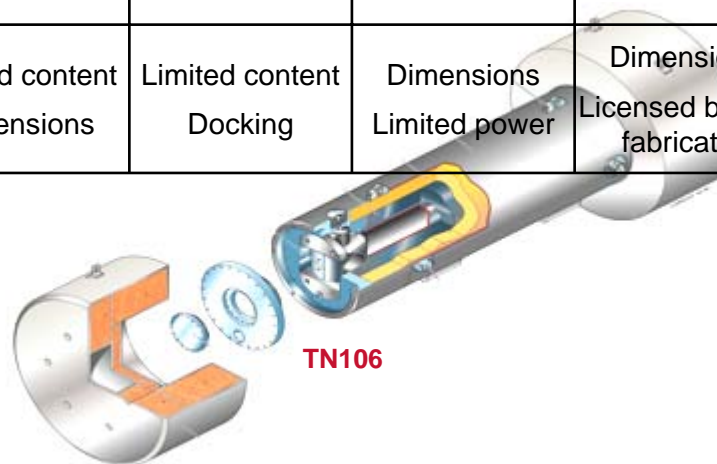
Short description of available casks on the market

Available casks

	AECL-CRL	Beatrice	Agnès	SAFSHIELD	IR100	TN106 – Short
Agreement	B(U)F-85	B(U)-96	B(U)-96	B(U)-96	B(U)F-96	B(U)F-96
Content	Varied	Varied isotopes (Mo, I, Ir)	Uranium	Varied isotopes (Co, Cs, Ir)	Varied	Varied
Cavity (mm)	Ø320 x 1168	Ø50 x 103	Ø22 x 160	Ø161 x 342	Ø150 x 1020	Ø203 x 1000
Overall (mm)	Ø1220 x 1930	Ø286 x 374	Ø1650 x 1705	Ø1040 x 1360	Ø1200 x 2272	Ø1458 x 2424
Weight (kg)	5500	150	5404	3830	6875	7284
Designer	AECL	South Africa Nuclear Energy Corporation	La Calhene	Croft	CEA	TN International
Restrictions	AIEA 85 Dimensions	Limited content Small cavity	Limited content Dimensions	Limited content Docking	Dimensions Limited power	Dimensions Licensed but not fabricated



IR100



TN106

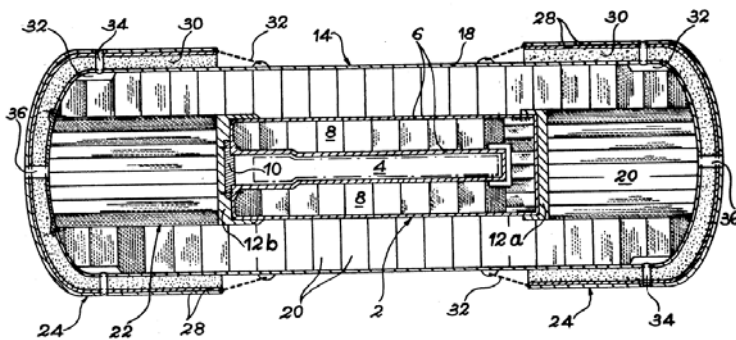


Options for new cask development

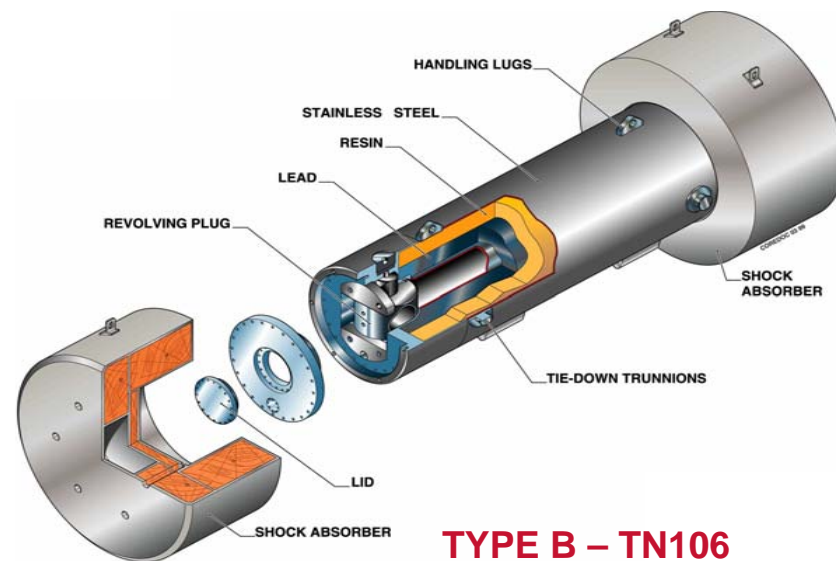
Option for new cask development

► Differences between TYPE B / TYPE C

- ◆ Tests of type C are heavier than type B
- ◆ Type B is a well known design / Few designs of type C have be authorized*
- ◆ Material for type C cask will be technically challenging
- ◆ Design period will be longer for type C Cask



« TYPE C » - Patent 2 610 907 - CEA



TYPE B – TN106

* : According to the IAEA Agreement list – TECDOC – 1377 – October 2003 – Only one design have been authorized in Russia



Cost efficiency approach



Cost effective new cask development



▶ A cost effective new cask ?

◆ Simplify the design by

- Reducing the dimensions of the cavity
- Reducing the weight of irradiated content (to reduce gamma protection)
- Fixing the loading mode (top or horizontal loading)
- Defining requirements for the new cask (overall dimension, docking,...)
- Defining the preferred transport mode

◆ Simplify the safety analysis report by

- Defining all irradiated materials to transport
- Reducing number of contents to “most needed” contents
- Reducing number of conditioning box or develop a “standard” box

◆ Simplify licensing procedures by

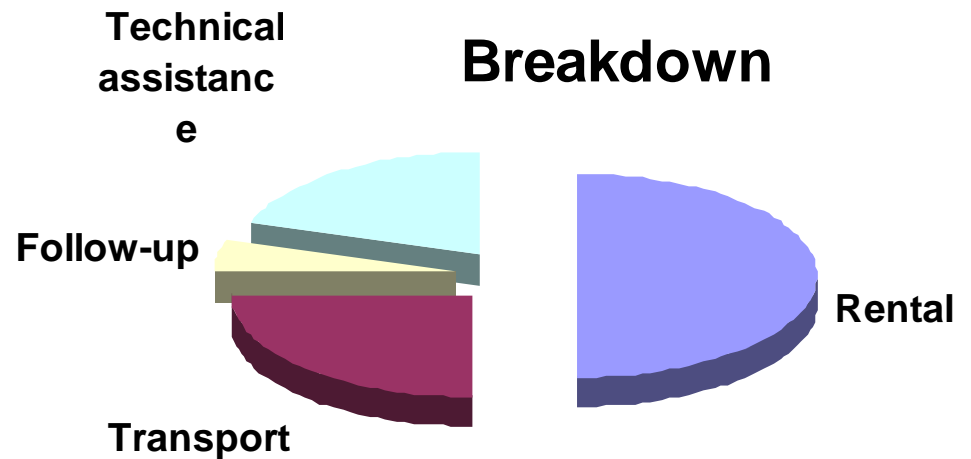
- Defining the countries where the cask has to travel through (and reduce countries number)

How to reach cost efficiency ?



► Main spending categories

- 1) Rental
- 2) Transport
- 3) Follow-up
 - Project management follow-up
 - Commissioning supervision
- 4) Technical assistance on site



► Impacting rental

- ◆ Rental rate is our only way of recouping the investment of the cask development
- ◆ It is a direct function of the number of transports per year
- ◆ The less those numbers are, the highest the rental will be

» the only way of guaranteeing a competitive rental price is to maximize the use of the cask => efficient cooperation between hotlabs

» In order for us to guaranty no price variations from one year to the other, we must have a minimum of transports guaranteed by the hotlabs

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Conclusion



- ▶ **No existing cask able to feed the expressed needs** (ref letter of NMS/AL/2009-37)
- ▶ **To develop the expected cask :**
 - ◆ **Type B or C choice is decisive for the project**
 - ◆ **Large number of countries = large number of package approval validations**
 - ◆ **Cost efficiency is highly dependent on market's size = number of transport per year**

» **AREVA is committed to participate to this project and has extensive experience in design, fabrication and operation of casks**

» **Project's funding mechanism is crucial for AREVA : various alternative should be discussed**

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