Flying Pig Project Presentation

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1. **Introduction**

1. Presentation of TNI
2. Initiators and Main Steps of the Project

2. **Main technical aspects**

1. Objectives
2. Design
3. Content Definition
4. Operability

3. **Modalities and Future Milestones**
Presentation of TN International

Our Position within AREVA

- Mining
- Conversion, Enrichment & Fuel
- Reactors & Services
- Back End
- Renewables

Logistics BU

A global offer which includes:
- Design and manufacturing of casks for the transportation and storage of radioactive materials
- Provide logistics services and shipments under the best safety and security conditions

50 years of know-how to our customers’ advantage

Turnover = 370 Meur
Staff = 1270

FLYING PIG PROJECT: - 3
Initiation of the Project – Participating Hotlabs
Main Steps of the Flying Pig Project

- Benchmark of existing casks and study for shielding calculations
- Creation of a specific Hotlab Working Group for cost effective solution to transport small quantities of irradiated material
- TNI is selected for the collaboration with Hotlab (after answering to the call for Proposal)
- Determine the mass of transportable irradiated material
- Reach a compromise for shielding analysis (between main dimensions and transportable material masses)

Milestones Timeline:

- Sept 2009
- 2010
- 2011
- 2012
- 2013

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Agenda

1. Introduction
   1. Presentation of TNI
   2. Initiators and Main Steps of the Project

2. Main technical aspects
   1. Objectives
   2. Design
   3. Content Definition
   4. Operability

3. Modalities and Future Milestones
Main Technical Aspects

A specific solution for international transportation of small quantities of 
irradiated research material

- **Principal characteristics of the cask**
  - Content: Various *irradiated* materials
  - Transportation mode: All (including *air* transport)
  - Region of activity: ADR signatory countries and USA (DOT)
  - Fissile quantity: Below the 15 g fissile content limit
  - Operability: Horizontal or vertical dry (un)loading
  - License: French certificate with DOT validation
Main Technical Aspects

Overall dimensions
- Diameter: Ø 900 mm
- Length: 1500 mm

Cavity
- Diameter: Ø 150 mm
- Length: 300 mm

Weight
- ≈2,5 T (for 220 mm of steel shielding)
Maximizing transportable content

Safety studies will be based on:
- Impact of each isotopes on safety fields
  - Containment
  - Dose rate
  - Criticality…

Table of isotopes

Main objective: Open content definition

«Only elements critical to the safety will be present in the approval certificate»

«Content definition as simple as possible in order to accept various types of material»

We take the most out of the cask’s possibilities

<table>
<thead>
<tr>
<th>Isotope</th>
<th>Maximal Activity (Bq)</th>
<th>Thermal limit (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$^3$H</td>
<td>$3.5 \times 10^{16}$</td>
<td>150</td>
</tr>
<tr>
<td>$^{10}$Be</td>
<td>$8.1 \times 10^{13}$</td>
<td>560</td>
</tr>
<tr>
<td>$^{238}$Cm</td>
<td>$1.1 \times 10^{12}$</td>
<td>5000</td>
</tr>
<tr>
<td>$^{247}$Cm</td>
<td>$3.5 \times 10^{10}$</td>
<td>7800</td>
</tr>
<tr>
<td>$^{248}$Cm</td>
<td>$1.5 \times 10^{9}$</td>
<td>6500</td>
</tr>
</tbody>
</table>
Benefit of an existing cask design

- Flying Pig will be based on TN®106 design
  - French Competent Authority (FCA): Certificate of TN®106 is issued by FCA
  - United States Competent Authority: TN®106 have DOT validation in US

- TN®106 is known from Hot labs users
  - The best way to guarantee a good operability
  - TN®106 casks have already completed more than 200 shipments since 2001
Future Milestones

- **Cask Design**
  - **Preliminary Study and Preparation of Contracts**
  - **US DOT Validation**
  - **Starting of Shipments**
  - **Manufacturing**
  - **Expertise of French Competent Authority**
  - **Signature**

- **Final Laboratories’ Specifications**

- **2013**
- **2014**
- **2015**
- **2016**

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*26 Sept 2012*
Conclusion

Major Advantages of the Flying Pig Project

✓ Shared effort and cooperation between hot laboratories to find the best solution
✓ Flexible and inexpensive transport cask for small quantities of irradiated materials
✓ Light weight and transportable by air
✓ Open content definition – flexible choice of content and easy to use
✓ Horizontal and vertical loading/unloading with revolving plug – operability guaranteed with use of proven concept
✓ Certificate from French Competent Authority and US DOT validation planned
Thank you for your attention

We are available to answer your questions

Waiting for the final step
Let the pig(s) fly!