AREVA
International Transportation for Used Fuel, HLW and MOX Fuel

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General Overview of AREVA
Back-End Transports

► Used fuel transports from NPP to Recycling Plant (La Hague)
  ◆ About 250 casks transported per year
► High Level Wastes
  ◆ HLW : Vitrified wastes – nearly 20 casks transported per year returned to owner (country of origin)
► Recycling Products
  ◆ Fresh MOX fuel from recycling plant to NPP – More than 50 casks transported each year to France, Germany, Switzerland, Belgium and Japan
  ◆ Fresh ERU fuel (re-enriched recycled uranium)
Applicable Regulations

- **International**
  - IAEA recommendations
  - International Maritime and Air regulations (OACI, IMDG)

- **European**
  - Road (ADR), Rail (RID)

- **National**
  - French laws for implementation of international and European regulations
  - Other national regulations including physical protection
Regulation Implementation - French Model

French Model is based on:

- French Regulator issue regulations based on international recommendations and regulations:
  - Safety
    - Authority Surete Nucleaire (ASN)*
      - Technical expert (IRSN)
  - Physical Protection
    - Ministry Ecology, Energy, sustainable development and sea (MEEDDM) - HFDS
      - Technical expert (EOT)

- French Regulators issue package certificates, security requirements, perform audit and inspections compliance

- Private Industry implements

* independent commissioners elected by Government
Be prepared to explain what private sector really does. For example, they do not implement many of the physical protection functions.

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Safety

Commercial Operation
Design/licensing preparation/
Package operation and maintenance

- Package designer and license holder
- Consignor
- Consignee
- Package operators
- Package Manufacturers
- Carrier

Regulator specification and control
Review and approve package licenses

- Authorité Sûreté Nucléaire (ASN)
- Technical expert
  IRSN
- Foreign Competent Authorities
Diverse and Complex Environment

- Safety and Security Regulations (National, European and International)
- Numerous facilities /interfaces
- Numerous packages for different products
- Various transport modes
- Numerous Stakeholders
- High level of sensibility

Requires an Integrated Logistic Supply Chain
Why an Integrated Approach?

- **Long Term Strategy/Anticipation of:**
  - Regulations Change
  - Available Transport Routes
  - Need for packages and conveyance systems

- **Package and Transport Conveyance designs are “integrated”**
  - Interfaces including facility interfaces
  - Optimization of operations (minimize risk by reducing number of shipments)

- **Standardization and Reliability of Logistic Chain Processes**

- **Reactivity to unforeseen changes**
Logistic Supply Chain
Integrated Approach – French Model

Private Logistic Company is responsible for:
- Cask design and licensing
- Transport Conveyance Design*
- Operations
- Communication/Public Acceptance

* Unless design is performed by regulator for category I and II shipments
AREVA Logistic Models
Integrated Approach

Used fuel
TN12/2, TN13/2, TN112, TN17/2

HLW Residues -TN28VT

Uranyl nitrate - LR65

Fresh URE fuel - FCC

Fresh MOX fuel
MX6, MX8, TN12/2 MOX
AREVA Logistic Model
Integrated Approach

Tractor& trailer for used fuel and HLW packages

Maritime terminal – spent fuel/HLW/MOX

Railway terminal

Rail car for used fuel and HLW packages
Example of Integrated Approach: MOX Transport

- Extract of French Law (Article R1333-70)
  
  Un-irradiated Plutonium:
  
  - Cat I: 2kg or more
  - Cat II: Less than 2Kg but more than 400g
  - Cat III: Less than 400g but more than 3g

- MOX Shipments are classified as Category 1
Example of Integrated Approached: MOX
Various Routes/Countries/Regulations

- Deliveries to France, Germany, Belgium, Switzerland and Japan
- Truck, Rail, Maritime
- Due to physical protection categorization, additional complexity
Transportation Means for MOX Shipments

- Secured conveyance includes:
  - A secured truck*,
  - A specific trailer*,
  - A specialized secured container*,
  - The loaded package(s)

*Based on French Competent Authority specification, the « Authorized Carrier » performed:

The design of the secured conveyance. The design is approved by the French Competent Authority. The design and manufacturing are optimized in order to facilitate the loading/unloading operations (open roof)

The manufacturing of secured conveyance. The secured conveyance is approved by the French Competent Authority upon inspection
MOX Transport - Package Description

- **MX8 Package** - Initially designed for EDF
  
  **Main Characteristics:**
  - 8 PWR 17 x 17 Assemblies
  - Max. Th. Power: 6 000 W and 750 W / FA
  - Max weight loaded: 22,3 MT
  - Dry loading/wet unloading
  - 1 cask per secured conveyance

- **MX6** - Designed for German utilities (longer fuel)

  **Main Characteristics:**
  - 6 PWR 16 x 16 Assemblies
  - Max. Th. power: 6 600 W and 1 100 W / FA
  - Max weight loaded package: 19,4 MT
  - Dry loading and unloading
  - 1 cask per secured conveyance
Physical protection requirements specific to countries

- Transfer of physical protection responsibility between different countries
- Need to use qualified carriers and equipment based on country-specific requirements
- Provide transport solution to perform MOX international shipments while meeting applicable physical protection and maintaining efficient transport systems
Lessons Learned
How to succeed and remain successful?

- More than 40 years of successful experience with Logistics
  - Integrated Approach in France
    - Readiness: Anticipate the preparation of the transports (Licensing, Manufacturing, Dry-run).
    - Design integration: Facilities, Package, Transport Conveyance
    - Take into account international characteristics of the transports
      - Safety and Security authorities requirements
      - Public Acceptance
    - Reactivity/Communication with all Stakeholders

Integrated Logistic Entity - Continuous Exchanges with Competent authorities