Waste transport requirements to the future geological repository

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Overview

1. Introduction
2. **Disposal inventory**
3. **Transport needs**
   - new transport casks designs
   - conveyance systems,
   - transport route and flows
4. **Repository infrastructure options**
5. Conclusion

1. Introduction

2006 Programme Act for the French repository :

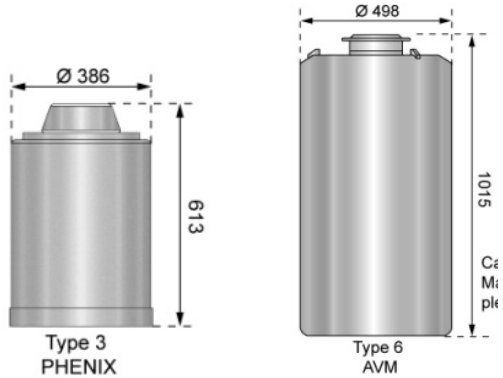
- License application should be reviewed in 2015
- If the licence application is delivered, the disposal should be commissioned in 2025
- A public debate will be held before license application

Need to integrate now an analysis of the waste transport chain

- Anticipate future development needs for transport means
  - Transport casks and conveyance systems
  - Infrastructures
- Integrate transport needs and constraints in the discussions with local stakeholders
  - Transport flows
  - Siting process and needs of infrastructure developments

HLW Packages (vitrified wastes)

- Three types of glass canister
  - AREVA La Hague R7/T7: CSD-V
    - + *Most canisters will not be disposed of before 2045/2050*
      - » decrease to 500 W for repository acceptance
    - + *some canisters (UMo) with moderate thermal output*
  - CEA Marcoule
    - + *AVM and Phenix canisters with moderate thermal output*



- Waste classification
  - Type B transport

ILW-LL Packages

- Very large variety of waste
  - Metal envelope or concrete shell
  - Mass from 300 kg to 7 t
  - Diameters from 0.4 m to 1.8 m

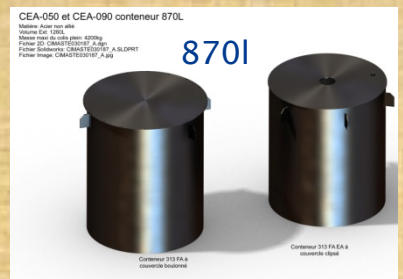

- Three major categories (2009 Inventory)
  - Bitumen sludge (20 to 30%)
  - Technological wastes (~50%)
    - + *Includes old waste in small amounts with specific conditioning*
  - Structural wastes (15 to 20%)
    - + *hulls and end pieces (CSDC)*

- Waste classification
  - Mostly to be transported in Type B packages
    - + *Total activity above A2*
  - A few to be acceptable in IP2 packages as LSA II
    - + *specific activity < 10^{-4} A2/g*
    - + *some bitumen waste, some cemented filtration sludge*

Technological wastes

CBFC'2

500l Concrete



870l

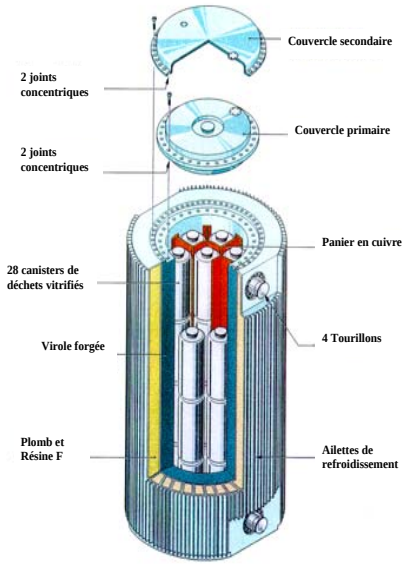
1000 l Concrete

Cask needs

Is the waste already transported?

HLW: mostly yes

- Existing HLW transport solutions
  - TN28, TN81, Castor: certified Type B cask
    - + *28 glass canisters*
    - + *56 KW*
    - + *> 110 t*
  - Dedicated to CSD-V



ILW-LL: only a few recent cases

- Type B transport solutions
  - are in operation for CSDC (hulls & end pieces)
  - will soon be in operation for La Hague bitumen waste
- Need to develop adequate ILW-LL transport solutions (Type B and IP2)

3. Transport needs

HLW

Areva's La Hague glass canisters (CSDV) have already a transport cask

- A transport solution for AVM and Phenix canisters has to be defined
  - A cask similar to TN28 could be developed
    - + *But smaller capacity due to increased diameter of canister*
  - AVM storage facility has to be adapted in order to load these casks
    - + *Impact on cask weight and dimensions constraints*

ILW-LL

- Ongoing development of ILW-LL Type B casks (launched by Areva)
  - + *Casks for CSDC (compacted hulls & end pieces): 36 canisters, around 120 t*
  - + *TN 833 for bitumen waste :12 drums, around 45 t*
  - + *Cask for CBFC'2*
  - It will provide solutions for transport to the future repository
- Other ILW-LL (large variety) will need new casks developments
  - Either design of specifically waste dedicated casks
  - Either design of a multipurpose cask (for wastes in low quantities)
    - + *With adaptation of the internals for each specific waste geometry*

3. Transport needs

Conveyance systems

Road transport equipment

- For 110 t cask

Railway transport equipment

- For 110 t cask
- For smaller cask (40 t)
  - Shorter wagons compatible with secondary freight lines

For future transports to the repository

- Railway transport is an interesting solution
  - Appropriate
    - + *Heavy transports (cask 75 t to 110 t)*
    - + *Only 3 main production shipping sites*
  - Reduce local impact of nuclear transports
    - + *Minimize the number of convoys*
    - + *Environmental aspects*
- Road transport still to be considered
  - Uncertainty on repository rail accessibility
  - La Hague and Marcoule are not directly connected to rail

3. Transport needs

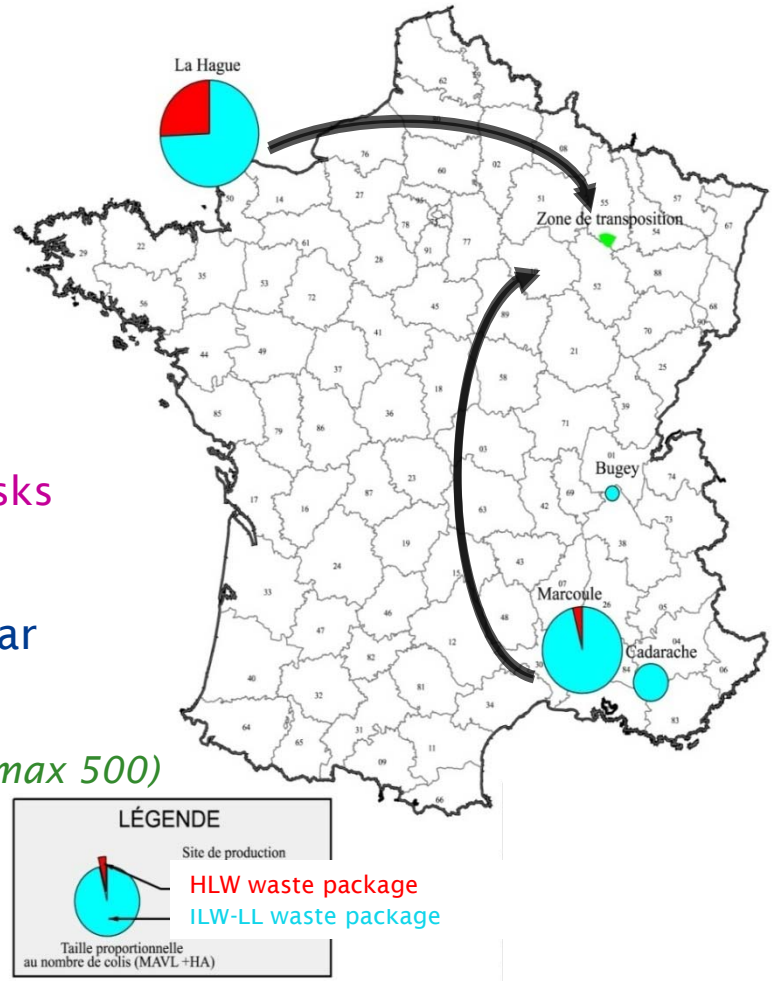
Main transport route and flows

Three main shipping locations

- La Hague
- Marcoule
- Cadarache

Estimate of future waste flows

- HLW: 400 to 600 primary packages/year
  - 1 or 2 casks/month in TN28 or TN81 casks
    + *28 CSDV/cask*
- ILW-LL: average 2500 primary packages/year (80 years)
  - Average 300/350 cask transports/year
    + *Variation due to waste (min 200 & max 500)*
  - By train, more than 1 convoy/week
    + *Convoy of 10 wagons max*
  - Operating scenarios might lead
    + *to work by campaigns*
    + *to modify the yearly figure*



4. Infrastructure options - A benchmark: La Hague

A multimodal site

La Hague :

- Road shipment

Cherbourg :

- Sea terminal
  - Japan, Australia

Valognes :

- Railways terminal

Present heavy cask flows

- approx 200 SF/year
- 20 HLW/year

4. Repository infrastructure options

Existing transport paths in the Meuse/Haute-Marne area

Theoretically possible access

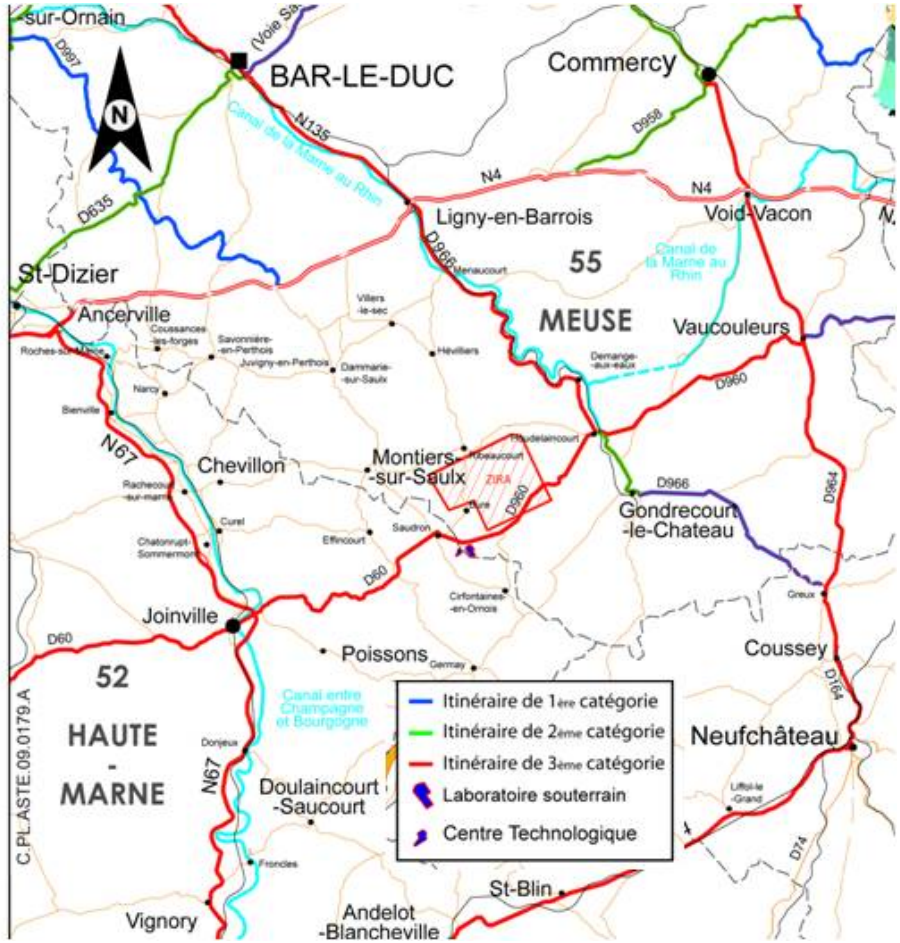
- Road
- Railways
- Waterways

Two main pathways

- Ornain valley in Meuse
- Marne valley in Haute Marne

The impact of the siting process

- 30 km² “ZIRA” selected in 2010
- Seek railway access to surface installations



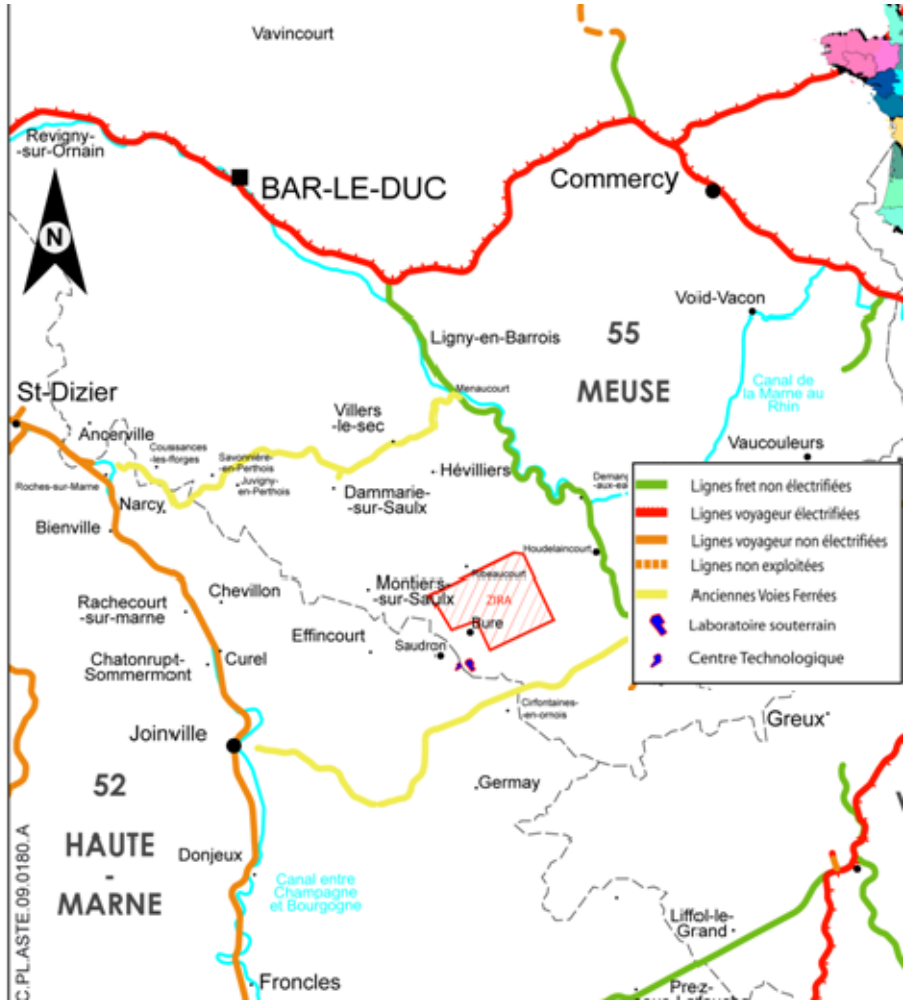
Map of road accesses

New infrastructures will be needed to connect the future repository

Railway infrastructure

- Main railways in red (electrified) and orange (non electrified)
  - St Dizier/Joinville in Haute Marne
- A one way small freight line
  - from Gondrecourt to Ligny en Barrois (Ornain Valley)
- Former lines (yellow) dismantled

- Two options to be considered
  - New infrastructure up to the repository future site
    - + *If accessible*
  - A rail terminal and a final approach by road
    - + *similar to Valognes for La Hague*



Conclusion

Transport is a key factor in nuclear operations

- Questions and solutions on transport have to be anticipated
  - Yearly transport flows to the repository is a fundamental data
    - + *based on transport capabilities from the producer's sites*
    - + *for investment optimisation of the surface installations of the repository*
    - + *for impact studies*
  - Agreement of new Type B transport casks is also a long process

In order to build public confidence, reliable transport options have to be prepared as early as 2012/2013.

- Railway transport solutions, with road alternatives
- New infrastructures (not only on the repository site)

Transport is already part of the repository siting process and will be an issue in the public debate