The Meuse/Haute Marne Centre: Underground Research Laboratory Technological Exhibition Facility

Marielle Girard
Public relations officer
Andra is an industrial and commercial public body established by the December 30th 1991 Waste Act.

- Its role was completed by the June 28th 2006 Planning Act concerning the sustainable management of radioactive materials and waste.
- Andra, which is independent of radioactive waste producers, is supervised by the Ministries for energy, the environment and research.

Andra’s role
- Andra is responsible for the sustainable management of all French radioactive waste.
- In France, priority has been given to disposal.
- Andra puts its expertise and its know-how, as a public body under State supervision, to design, operate and monitor radioactive waste disposal facilities by protecting man and the environment from the impact of such waste, over the long term.
### Radioactive waste disposal classification

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<th>Radioactive Waste Classification</th>
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Andra sites
## Radioactive waste disposal classification

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Reprocessing of spent fuel

Reprocessing of uranium pellets:
- 96% uranium
- 1% plutonium
- 3% HLW

ILW (structural materials, ....)
Structural materials in concrete matrix (before 1995)

Compacted structural materials (since 2002)

ILW canisters

Other wastes

ILW radioactive waste
HLW canisters

Vitrification (HLW in vitrified matrix) Canister of vitrified products
Temporary storage in the reprocessing plant

La Hague
Marcoule
Cadarache

Temporary storage,
La Hague
Key dates

1991  Loi « Bataille » - Waste Act
1993  Mediation mission
1994  Choice of the Gard, Haute-Marne, Meuse and Vienne districts
Geological survey 1994 - 1996

Four candidate districts selected:

- Gard for its siltite
- Haute-Marne, Meuse for its argilite
- Vienne for its granite
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Callovo-oxfordian argilite

130 m thick
160 million years old
very low permeability
View of the Meuse/Haute-Marne URL
Experimental drift

Main shaft

Auxiliary shaft

Experimental drift

Technical drift

Technical drifts

445 m

490 m

490 m
Experimental Drift GEX

Experimental program and results

J Delay
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A well-documented site and a geological medium that offers favourable properties

- A simple, well-documented geological context
- Sector located away from faults and a fault-free clay formation
- Seismic stability
- Thick (130 m at the laboratory site) and homogeneous layer
- Very low permeability argillaceous rock capable of trapping radioactive elements
- Zone extending for at least 250 km² with properties similar to those of the underground laboratory site
Transposition zone

- Transposition zone = geographical domain geologically equivalent to the underground laboratory site

- Identification of a zone of about 250 km²
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Article 12 of the planning Act of 28 June 2006 says that “...any licence application to create such an installation (deep geological repository) shall only concern a geological formation that has been investigated through an underground laboratory”.

The 2006 Planning Act adopted the disposal concept as the reference solution for the long-term management of HL and IL-LL radioactive waste.

Today, research is continuing into the design and siting of the disposal facility which could be commissioned by 2025, if its licence is granted in 2015.
Three major objectives for the works beyond 2006

- Consolidate data acquired over the period 2002-2005 and conduct long term experiments in the drifts
- Carry out integrated tests of a technological scope
- Carry out a survey of the transposition zone in the surroundings of the underground Laboratory in order to determine more precisely implantation site

A close link between scientific and technological activities
Planned activities: 2008-2012 phase

Experimental drifts

HA vaults

Level -445m

Level -490m

Main shaft

Auxiliary shaft

Experimental drifts

Experimental drift

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Transposition zone 2007-2015

2007-2008: geological survey in the TZ
Transposition zone 2007-2015

2007-2008: geological survey in the TZ
2010-2011: defining of a restricted area of about 30 km²

30 (+ ou - 10) km²
Transposition zone 2007-2015

2007-2008: geological survey in the TZ
2010-2011: defining of a restricted area of about 30 km²
2012-2013: public debate

- TZ: 250 km²
- 30 (+ ou - 10) km²
- 1000 ha
- 250 ha
Decoupling Deep Disposal and surface facilities

Surface facilities zone 1

Few km

Dump

Surface facilities zone 2

Incline

~ 3 km

~ 6 km

Layout of a Deep Disposal Facility
IL waste packages and cells

- **Disposal packages** contain 1-4 primary packages
- Disposal **cells**: $\Phi \leq 10^{-12}$ m tunnels
- Packages and cells **designed to last** for several centuries
Each primary package is placed in a sealed unalloyed steel overpack, with a thickness of 55 mm.

Dead-end tunnel 40m long.
Diameter 0.7m
Reversible emplacement in metal sleeve using a pushing robot
Temperature < 90° C in Argillite
Reversibility

- Different motives: freedom for future generations to make alternative management choices, progressiveness in implementing choices, intellectual modesty regarding scientific knowledge and available techniques and the possible unknown factors.

- Reversible disposal = may play a interim storage role and evolve towards a facility that does not need human intervention, while offering additional long-term safety guarantees.

- Stepwise management of the disposal process, keeping open the possibilities of choice at each stage that lend themselves to flexible management.
Reversibility: stepwise management
Technological exhibition facility

Examples of static demonstrators

Examples of dynamic demonstrators
Technological Demonstrators
A number of steps in progress: 2009-2012

Development of an long term environmental monitoring on a large zone (900km² – water, air, soil, wildlife...),

Evaluation of environmental impacts and constraints,

Evaluation of socio-economical needs and impacts,

Evaluation of flux (transport, energy, workers,...),

Evaluation of needs for infrastructures and territorial development,

Elaboration and data analysis for authorization and administrative procedures,

Consultation and exchanges with local players (public, associations, administrations, industrial and professional corporations...),
The main steps for 2009-2012 are related to:

- Continuation of geological characterization and scientific investigations,
- Technical feasibility of the underground facilities (assessment of excavation processes and impact),
- Development and testing of the technological demonstrators for the handling of disposal containers,
- Selection of locations for the underground and the surface facilities,
- Environmental monitoring over a large regional area and a long period,
- Participation of the territorial players in order to take into account the territory’s specificities, its needs and constraints as well as its ability for development,
- Preparation of the authorization and administrative procedures.

- **2013**: public debate on the project for the reversible deep geological disposal facility

- **2015**: filing of the licence application for the reversible deep geological disposal facility

- **2016**: voting of a law laying down the conditions of reversibility applicable to this disposal facility

- **2025**: commissioning of the reversible deep geological disposal facility
Thank you for your attention