

PRESS RELEASE

## 2006-2009: four years of scientific research for disposing of radioactive waste

### Press contacts

Frédéric Piquet  
Press relations  
Phone: +33 (0)1 46 11 83 01  
Mobile: +33 (0)6 07 76 36 08  
frederic.piquet@andra.fr

### About Andra

The French National Radioactive Waste Management Agency (Andra) is an industrial and commercial public authority founded by the Waste Act passed on December 30<sup>th</sup>, 1991. Its set of missions was further completed by the **Planning Act dated June 28<sup>th</sup>, 2006**, concerning the sustainable management of radioactive materials and waste.

**Enjoying total independence from radioactive waste producers**, Andra reports to the Ministries in charge of energy, the environment and research.

Andra is in charge of the sustainable management of all French radioactive waste. It provides its know-how to the Government in order to design management solutions, as well as operating and monitoring radioactive waste disposal facilities with a view to protecting Man and the environment from the impact of this waste over the short and the long term.

**Andra has just published the conclusion report of the scientific work it has conducted between 2006 and 2009. The report covers all fields of research that have been studied by the Agency for radioactive waste disposal, ranging from the survey of geological and environmental settings and the physics and chemistry pertaining to waste packages, to digital simulations over a very wide scale in space and time.**

Responsible for developing disposal and storage solutions for radioactive waste, Andra conducts high-level research in a host of fields. Its scientific work is structured into a multiple-year-long scientific programme, and it is assessed by outside experts on a regular basis.

**The vital research phase conducted between 2006 and 2009 has just been consigned in a report published by Andra for public release on June 25<sup>th</sup>, 2010.**

To Andra Science Director Patrick Landais, *"This report is in the first place a means to take stock of all of the studies that have helped specify and confirm the results obtained from 1991 to 2005, particularly thanks to experiments conducted in the underground Laboratory in the Meuse. It also puts the follow-up to the process in perspective, which will result in the scientific and technical file to be produced by Andra in 2012 in supporting its authorisation request for creating a future reversible deep repository facility for HLW and ILW-LL radioactive waste."*

Among the salient items in the **"Scientific Report for the period 2006 to 2009"**, the following are noteworthy:

- A more detailed view of the geology of the area under study in the Meuse/Haute-Marne, on the basis of survey work (seismic reflection profiling and 15 deep boreholes) performed in 2007 and 2008. It has supplied scientific arguments to construct the **proposal, in late 2009, for a 30-km<sup>2</sup> zone of in-depth exploration (ZIRA)** where a 3D seismic campaign has been underway since May 2010 in order to locate a disposal area.

- The setting up in the Meuse/Haute-Marne since 2007 of a **Long-term Environmental Observatory, which is unmatched in France** in terms of its scale, both in space (several hundred square kilometres) and time (about a hundred years). It aims at bringing together a substantial scientific community in order to develop research focusing mainly on chemical element cycles within the various layers in the biosphere, or the consequences of anthropically-driven forcing.
- **The development of experimental means able to reproduce the complex conditions and interactions found in disposal facilities.** As a result, the outcome of experiments on the interactions between iron, glass and clay expected inside the HLW disposal cells will lead to assess the speed of corrosion of steel and the speed of alteration of glass with more accuracy. In addition, they will supply entry data that is critical in providing models of related processes such as hydrogen production and migration resulting from steel corrosion. At the same time, this in-depth intelligence is taken into account when optimising disposal design (especially the composition of materials) and sizing related infrastructures.
- **A better understanding of the hydric, chemical, mechanical and thermal phenomena** that will occur, especially during the reversible disposal period, and then during the thousands of years following its sealing.
- **A more accurate estimate of radionuclide migration speed within Callovo-Oxfordian argillite**, particularly thanks to the diffusion experiment, initiated inside the underground Laboratory in 2005 and completed in September 2009, and to a good understanding of the inmost mechanisms that come into play.
- **The ongoing improvement of the thermodynamic database** which lists all of the chemical elements' behavioural parameters in relation to oxydo reduction, acidity and temperature conditions expected within the disposal facility.
- Changes in software and equipment **leading to increased accuracy in assessing achievement in the future deep disposal facility:** multi-physical pairings (thermal, hydraulic-gas, chemical, mechanical, solute motion), and a mesh pattern for over 10 million elements in 2009 (as compared to 600,000 in 2005).
- The development, begun in 2008, of research initiatives focusing on human and social sciences to **support the concerted definition of the idea of reversibility** in deep disposal (including a national symposium on the topic in June 2009).

A large part of those scientific findings are founded on the results of experiments performed within the underground Laboratory. **In particular, 11 of them were launched starting in 2006 and led to a threefold increase in the number of sensors deployed** (there were 3,300 in 2009 as compared to 1,100 in 2005).

Andra's Scientific Report also highlights **the important role of partnerships and collaboration with other research agencies or higher learning institutions**. During the period of reference, agreements were signed with about a dozen partners (BGS, BRGM, CEA, CNRS, INRIA, Nancy University, Troyes University etc), and others were signed in 2010 (INRA, Sandia). During 2006 and 2007, as a result of the issues underlying such a project as reversible deep disposal, Andra has also created or renewed laboratory groups, structured within a multidisciplinary framework and focused on core issues in disposal studies. In total, **there are over 70 laboratories taking part in Andra research**, and for the period from 2006 to 2009, all of this scientific work led to the release of **242 international scientific publications rank A** and to the support of **28 PhD theses**.

#### MAJOR DATES IN ANDRA RESEARCH:

##### 1994 to 2005

The Waste Act dated December 30<sup>th</sup>, 1991 was mainly focused on high-level (HLW) and intermediate-level long-lived (ILW-LL) waste, and it provided Andra with a 15-year period to produce a scientific report about the feasibility of its deep storage facility, with an scheduled legislative examination regarding French radioactive waste management (this is the Act dated June 28<sup>th</sup>, 2006). **The starting major research phase began in 1994 in the Meuse and the Haute-Marne, with initial boreholes reaching a depth of 1,000 metres**. In 1999, Andra was authorised to build its underground laboratory (in Bure, in the Meuse), and excavation work began in 2000. **The first shaft reached the Callovo-Oxfordian argillite layer in May 2004, at a depth of 420 metres**. Galleries dug in situ helped conduct a series of experiments. In 2005, Andra filed **the "Dossier 2005 - Argile" demonstrating the feasibility of a deep repository** for HLW/ILW-LL waste within this thick argillite layer located in the Meuse/Haute-Marne.

##### 2006 to 2012

The Planning Act dated June 28<sup>th</sup>, 2006 extended Andra's mission to all radioactive waste, and it set new deadlines: **the application for authorisation to build the reversible deep repository was to be prepared in 2015**; if authorised, the disposal would be scheduled for operation in 2025. The Act also stipulated that the request for authorisation should be preceded by a public debate (planned, a priori, for 2013). **Accordingly, the Agency aimed at producing the HLW/ILW-LL project's scientific and technical file in late 2012**. It was intended to support both the public debate and the application for authorisation to create the storage facility (DAC), to be handed in by late 2014. Within that perspective, the year 2009 represented a highly critical step in the HLW/ILW-LL project. Indeed, by late 2009, Andra engineers and researchers were able to suggest a specific underground zone (the ZIRA) in which to conduct in-depth investigations intended to lead to the location of the future storage facility; they also approved options in design, safety and reversibility. It is thus the scientific advances made between 2006 and 2009 that are contained in **the Scientific Report published in June 2010 by Andra**.

#### FOR FURTHER INFORMATION

- Andra's "Scientific Report for the Period 2006 to 2009" available online at: [www.andra.fr](http://www.andra.fr)