

# THE LONG-TERM MEMORY-PRESERVATION PROJECT OF THE FRENCH NATIONAL RADIOACTIVE WASTE MANAGEMENT AGENCY (ANDRA)

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## ABSTRACT

Maintaining the memory of repositories over the long term is required not only to ensure safety and reversibility, but also in response to social expectations. Hence, since 2010, Andra has been implementing a long-term memory preservation project to reinforce and diversify its current arrangements in that field, as well as explore opportunities to extend memory keeping over thousands of years.

The project includes opportunity studies of dedicated facilities. The projects involving an ecological library (*écothèque*) and a geological library (*géothèque*) contribute to memory preservation by collecting environmental and geological samples, respectively. Three options are being evaluated: (i) creating an archive center for Andra's interim and permanent archives, (ii) establishing an artist centre to study the contribution of arts to memory preservation, and (iii) developing a museum of radioactive waste disposal history and technology.

Other studies conducted in the framework of the project examine our heritage, including the continuity of languages and symbol systems, as well as writing and engraving techniques; the archaeology of landscapes; archaeology practices; the preservation of historical sites and industrial memory; the continuity of institutional organizations; and the memory and history of science evolution, as well as history in general. Significant studies address social issues, such as the institutional preservation of writings, sound, images, items, .., the perception of large timescales by the public, the possibility of social evolution in the far future, the development of

collective memory through social networks, the cognitive processes and intergenerational transmission, the consequences of social breakdowns, the memory of repository employees and their descendants given the example of French former mines, and the potential contribution of futurology to memory preservation. An option under consideration is the integration of memory in the curriculum of French universities involved in nuclear training.

Fruitful discussions of such issues might take place at the international level within a recently launched working group of the Radioactive Waste Management Committee (RWMC) of the OECD Nuclear Energy Agency (NEA).

In parallel, Andra intends to launch discussion groups around its research and industrial sites to involve the local public in the preservation of the repository's memory.

Andra's Long-term Memory-Preservation Project has two relatively near-term milestones: (i) a public debate on the "Cigéo" Deep Geological Repository Project, scheduled in 2013, and (ii) the Cigéo's license application to be examined in 2015.

## INTRODUCTION

Andra's presentation is divided into three main sections: (i) the implementation of a reference solution for the very-long-term memory of experience collected at its *Centre de la Manche* Disposal Facility since 1996 (ii) the need to enhance the robustness of that reference solution and complement it by additional mechanisms that have come about since the mid-2000s, and (iii) the launching in fall 2011 of a broad ambitious project dedicated to memory preservation over the very long term..

## NOMENCLATURE

### 1. Preamble

The problem with preserving long-term memory is having to approach it far from the current knowledge- or information-management means, methods and tools in general. Most of those mechanisms are already in place at Andra and elsewhere, and will evolve over the next decades. However, it is impossible to guarantee their evolution over the very long term, notably when all disposal facilities will no longer be in operation, but simply under surveillance. So far ahead in the future, nothing guarantees that such evolutions will continue on a decennial basis (no real-time basis associated with improvements in information technology). It is therefore necessary to forecast immediately what future generations might actually need, should those evolutions ever come to a stop.

### 2. Presentation of the reference solution

#### *Background information on Andra's memory policy*

The memory issue appeared as early as the early 1980s during the first monitoring phase of the *Centre de la Manche* Disposal Facility, when the solutions under study favored the development of computer tools.

As early as 1990, long-term archiving was prescribed for all information deemed necessary for monitoring a repository over three centuries, as follows:

(i) 120,000 pages of technical documents and 1,000 Andra plans; (ii) 600,000 pages of data generated by waste producers on their waste packages, and (iii) 120 megabytes of data on waste-package management. The project is oriented towards an electronic filing solution associated with setting up a centralized document-management system as the reference basis for electronic document management (EDM).

In late 1995, after more than a decade of research and three unsuccessful calls for tenders, the project to develop an electronic filing system was dropped and the decision was made instead to duplicate all relevant documents on permanent paper.

In 1996, the Governmental Assessment Commission for the Environmental Status of the *Centre de la Manche* Disposal Facility (also known as the Turpin Commission) supported the modalities selected by Andra to develop a long-term filing system on permanent paper. As a complement to long-term archiving, it advocated new improvements that Andra reintegrated in the memory mechanism intended for disposal facilities for low -and intermediate-level waste.

That ensemble constitutes the reference solution and includes three “passive-memory” devices: (i) a detailed memory (former long-term memory) encompassing all

technical documents for monitoring, understanding and modifying a disposal facility; (ii) a single-volume synthesis memory intended for decision-makers and various publics, and (iii) a list of registered public easements in the cadastre. It also includes two “active-memory” devices with a view to (i) improving communications with the various publics and (ii) enhancing the role of local information committees (*commission locale d'information* – CLI) or local information and oversight committees (*commission locale d'information et de suivi* – CLIS).

#### *Description of the reference solution*

The constitution of the detailed memory relies on selecting and ranking information according to 13 identified risk scenarios that are consistent with the long-term safety approach. A series of research instruments (e.g., inventories, glossary, indices, abstracts) ensures its legibility and understanding. The long-term endurance of the documents is guaranteed by a suitable selection of the ink and permanent paper and the maintenance of two documents on two different sites – the disposal site itself and the French National Archives. Lastly, the validity and updating of the detailed memory are handled by regular inputs every five years until the end of the monitoring phase.

The synthesis memory is a single document based on a synthetic approach to technical and historical information. Regular updates are scheduled after each revision of the safety reports. The informative strength of the final version will rest on its broad distribution among relevant city halls, notaries, general councils, prefectures, ministries, and national and international institutions. The “temporary” synthesis memory of the *Centre de la Manche*, for instance, includes 169 pages and is already available through social networks.

The registration of public-utility easements in the cadastre ensures the actual presence on site of appropriate administrative means to warn against the risks involved in conducting any work on the site. The actual registration itself, notably for the *Centre de la Manche*, is scheduled in the early decades of the monitoring phase of the site.

Within the section on “active memory”, the communication policy covers all publics, thanks to the organization of “open-door” days, conferences, exhibits or interviews; the distribution of specific communication tools on memory, booklets, as well as the availability of a website. As a complement, the memory issue forms an integral part of the topics addressed at CLI and CLIS meetings and should ensure their local survival.

### 3. The need to go beyond the reference solution

Although the above-mentioned reference solution fulfils French prescriptions, it includes some weak points over the long term, as described below.

First, it is too oriented on preserving the printed documents or data, and does not take sufficiently into account other supports, such as photographs, testimonies, soundtracks, and images that may be of interest to future generations

Second, it does not fulfill the needs of future generations because the relevant information is mostly selected according to the current state of mind and risks .

Third, in the case of the deep geological repository, the different reversibility phases to be specified in the future act of 2016 may prescribe some long-term memory requirements that need to be anticipated.

Finally, and still in the case of the deep geological repository, several stakeholders, including nearby residents, expect memory preservation to be applied for a short period of only a few centuries after the closure of the repository (according to the reference solution).

For these reasons, Andra felt it would be useful to launch a memory-preservation project with a dual purpose: enhance the robustness and the defense-in-depth of the current reference solution for existing facilities, and develop various points-of-view and studies on memory preservation over several millennia.

That dual purpose is reflected in various actions pertaining to the two main components of memory: active memory and “passive” memory. In the case of “active” memory, which recognizes the risk of letting nuclear institutions assume responsibility for it, the goal is to transfer it to the cultural and archiving collections of the nearby and national populations, In the case of “passive” memory, the goal is to expand those memory supports to such topics as architectural elements, items, and symbols

### 4. Andra’s memory-preservation project

Andra’s Memory-Preservation Project was launched in the fall of 2010 and currently involves approximately 20 part-time employees working on several related topics as summarized on the following pages.:

#### a) Work to reinforce the reference solution

- A decennial revision of the *Centre de la Manche* Disposal Facility to make it consistent with the last version of the safety report of that facility from a technical standpoint and take into account the opinions formulated by various stakeholders on societal issues
- a decennial analysis of the relevancy of the detailed memory in relation to the needs of future generations by gathering an international group of French-speaking stakeholders (since all documents are written in French) in order to reflect on its adequacy for decades;
- A validation of the studies done between 2007 and

2009 by two French laboratories on the durability of the ink/permanent paper solution over 600 to 1,000 years.

- Preparation for the future five-years inputs of 2015 and onwards on the detailed memories of the disposal facilities located in the Aube and Manche Districts, with due account of the experience feedback from previous inputs.

#### b) Preliminary work to prepare the memory preservation of a future deep geological repository

- The constitution of the detailed memory of the Meuse/Haute-Marne Underground Laboratory and other supporting documents before the creation of the Cigéo
- The studies and the implementation of memory-support demonstrators over two million years (e.g., sapphire disks)

#### c) Theoretical studies

- The perception of large timescales (e.g., multi-millennia and beyond) among the public, in the framework of a laboratory group specializing in human and social sciences
- The long-term durability of writing and engraving supports, other than paper, and notably studies on surface markers to be installed on the cover of disposal facilities, in relation with existing international studies produced by Andra’s counterparts
- The long-term durability of languages and symbols to deter-mine a reasonable time estimate during which currently spoken languages around the world might be known by the populations at first, and then only by specialists, and ultimately, the communication solutions that might be adopted when those languages become obsolete.
- The institutional preservation of written documents, sound-tracks, images, and items by French and international specialized organizations to analyze the preventive measures to limit degradation over time and favor appropriation by future generations.
- The archaeology of landscapes, notably those associated with the evolution of the Earth that may differ from entropic ones generated by human beings, as well as memory-preservation possibilities within the human creations themselves.
- Potential societal evolutions, not only in the technical and scientific fields, but also in the behavior of our societies, divided into three broad orientations (regression, stagnation, progression), notably in relation to Japanese studies on that topic;

- Potential contributions to the archaeology of the future by

combining futurology scenarios (with what, with whom and how might the future occur) together with interpretations of the traces of radioactive waste disposal facilities within those scenarios;

- The integration of memory preservation of radioactive-waste disposal facilities in training programmes on nuclear energy, in general, and on radioactive waste, in particular, with Andra's partner universities and colleges
- the interactions between long-term memory and safety in order to determine the benefits of memory preservation for long-term safety and the consequences on that long-term safety, if the memory of disposal facilities for radioactive waste disappeared;
- art as a potential vector for memory preservation over the very long term, by hiring numerous French and international artists in different artistic fields in order to express their vision of the issue through their art;
- the potential contributions of electronic filing over long timescales, notably by organizing a watch over that field, which is starting to structure itself and, within a few decades, should open up to new horizons over the long term;
- the intergenerational transmission of the memory through available social networks on Internet, because where it is possible to organize modern revolutions, it might also be feasible to disseminate sustainable information worldwide on disposal facilities for radioactive waste;
- the interactions between the memory preservation and the reversibility of a disposal facility in order to determine the needs relating to memory preservation throughout the different reversibility phases and what consequences there might be on that reversibility if the memory of disposal facilities for radioactive waste disappeared;
- the memory of various "historical" disposal facilities spread across France and French territories, but not managed by Andra (old uranium mines, former testing sites for nuclear weapons, etc.), and
- international work on memory preservation within the NEA/RWMC Working Group on Record, Knowledge and Memory Preservation (RK&M) as the benchmark for best practices in participating countries, common definitions and bibliography, and drafting of recommendations);

*d) three reflection groups with local populations* around Andra sites and concerned with memory preservation over the long term (*Centre de la Manche* Disposal Facility, *Centre de l'Aube* Disposal Facility for low-level and intermediate-level waste and the Cigéo facility straddling the Meuse and Haute-Marne Districts) with a view not only to attracting the interest of those populations in that issue, but also to collecting their views on the best approach for them to appropriate it locally;

*e) opportunity studies to create dedicated buildings for memory preservation:*

- a centre for historical archives (in connection with the French *Public Archive Act* and *Heritage Code*) not only to ensure memory preservation, but also to promote it among the various publics;
- a residence for artists, comparable to what is achieved in contemporary art, in order for artists to isolate themselves in a suitable location and to develop new memory-preservation leads through their art;
- a disposal-facility museum, which would display various concept of disposal facilities along with technologies that were used over decades (France started waste disposal on land in 1969 and is expected to continue likewise until at least 2150, thus justifying the need to display the large number of evolutions to the public);
- a nuclear museum, similar to the *previous one*, that would not be limited to the sole issue of radioactive-waste disposal, but extended rather to nuclear energy as a whole, and
- the use of already dedicated sites for public purposes, such as the Technological Centre in the Meuse and Haute-Marne Districts, and the Visitors' Centre at the *Centre de l'Aube* in order to make available a public space dedicated to memory preservation and public reactions.

The Memory Preservation Project includes two milestones associated with the deadlines of the French Program: (i) a public debate to be held in the first half of 2013 and during which Andra will be called upon to justify the relevant elements of its project within a broad debate involving the stakeholders; (ii) a license application for the creation of a deep geological repository to be submitted in 2015, together with a description of the mechanisms set in place by Andra to manage the memory preservation of the facility, the layout modalities and the prospects for subsequent complements, notably for the future closure of the site.