

**The French Policy  
for Radioactive Materials and Waste management - 11056**

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**ABSTRACT**

The French policy for radioactive materials and waste management relies on three principles: R&D, transparency and democratic dialogue, and adequate funding for radioactive waste management and dismantling activities.

The two major policy tools are the National Inventory and the National Management Plan

The National Inventory of Radioactive Waste and Recoverable Materials is drawn up by the French Radioactive Waste Management Agency (ANDRA). It lists all current radioactive waste and materials and provides in a prospective section an estimate of future waste and materials, up to year 2020 and even later for some categories.

The inventory is the basis for the second tool, namely the National Management Plan for Radioactive Materials and Waste (PNGMDR), created by the 2006 Planning Act. The PNGMDR is revised and updated every three years by a multidisciplinary working group placed under the aegis of the Nuclear Safety Authority (ASN) and the Ministry of the Environment and Sustainable Development with a view of specifying long-term management systems for radioactive waste and recoverable materials, proposing improvements for existing systems and organizing research on radioactive waste management. The Plan applies to all waste categories and to some categories of radioactive materials.



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## **INTRODUCTION**

The French policy for radioactive materials and waste management relies on three principles: R&D, transparency and democratic dialogue, and adequate funding for radioactive waste management and dismantling activities.

This policy is consistent with the French legal framework which consists of two laws in that field, i.e. the 1991 Radioactive Waste Law and the 2006 Radioactive Waste Management Planning Act, and is carried out with the help of implementation instruments.

## **TWO MAJOR POLICY TOOLS: THE NATIONAL INVENTORY AND THE NATIONAL MANAGEMENT PLAN**

### **The national Inventory of Radioactive Waste and Recoverable Materials**

At the government's request in June 2000, the Chairman of ANDRA proposed to draw a national reference inventory, based on a broad notion of waste (integrating spent fuel with no further use) and including prospective assessments on "committed" waste in existing facilities with a view to providing an accountable and prospective overview and to securing a sound national reflection on the overall waste-management issue.

ANDRA published the first edition of the National Inventory of Radioactive Waste and Recoverable Materials in November 2004, and the second, in January 2006. The preparation of both inventories was supervised by a steering committee whose membership included representatives from the major waste producers, administrations, ASN and ANDRA. The inventory lists all waste identified as radioactive throughout France and provides corresponding balance sheets; it also includes balance sheets for all existing radioactive materials. In addition, the National Inventory comprises a prospective section with estimates of radioactive waste and materials to be produced until 2010 and 2020, as well as estimates of waste to be produced by facilities intended for dismantling after 2020.

Preparing the National Inventory is an integral part of the tasks entrusted by the government upon ANDRA every three years. The law prescribes that a State subsidy be attributed to the Agency in order to contribute to the funding of that public-interest mission.

The National Inventory may be consulted on ANDRA's Website ([www.ANDRA.fr](http://www.ANDRA.fr)).

### *The particular case of the radioactive materials*

The integration of certain types of radioactive materials, which are not considered as waste, was discussed within the relevant working group responsible for developing the PNGMDR.

Those materials consist mainly of depleted uranium resulting from isotopic-enrichment plants, spent-fuel elements unloaded from nuclear reactors, as well as fissile materials extracted from irradiated fuel (uranium and plutonium) after reprocessing.

Currently, part of those materials is recovered through various existing systems, as follows:

- reprocessed plutonium is used to manufacture MOX (mixed oxide uranium plutonium) fuel;

- depleted uranium resulting from the enrichment of natural uranium is not widely used (only in the fabrication of MOX fuel) and is stored, and
- part of the reprocessed uranium (about one-third of the annual production) is re-enriched abroad and enters in the fabrication of various types of fuel used in two reactors of the Cruas Nuclear Power Plant (NPP). It should be noted that the future enrichment plant (GB II) should be designed to enrich reprocessed uranium.

In its report of 15 March 2005, the Parliamentary Office for the Assessment of Scientific and Technological Options (Office parlementaire d'évaluation des choix scientifiques et technologiques (OPECST)) stated that the PNGMDR would be extended to recoverable materials in order to eliminate gaps in the management of radioactive waste. Consequently, the former National Management Plan for Radioactive Waste (PNGDR), now called the PNGMDR, is now consistent with ANDRA's National Inventory for Radioactive Waste and Recoverable Materials.

However, some members of the Working Group consider that those materials should be considered as waste and integrated as such in a limited management plan, dealing exclusively with those residues. They feel that the presentation of certain substances resulting from the operation of nuclear facilities as recoverable materials tends to influence future decisions regarding the energy policy towards the nuclear option.

In the end, the PNGMDR does not describe the status of recoverable materials, but takes into account their existence and recommends specific long-term management solutions in case they were not reused. On the other hand, the selected approach is designed to verify that those materials are stored under satisfactory safety and radiation-protection conditions. Their future must be reviewed periodically and especially at every update of the PNGMDR.

### **The National Management Plan for Radioactive Materials and Waste (PNGMDR)**

Beyond the above-mentioned principles, the PNGMDR constitutes the key element in the leadership of the French National Management Policy.

The first Plan was tabled before Parliament in March 2006 and was the result of the work undertaken by the Minister of Ecology and Sustainable Development, on 4 June 2003. It was carried out by a multidisciplinary working group placed under the aegis of ASN and the DGEMP, and consisted of representatives from the Administration, producers of nuclear and non-nuclear radioactive waste, ANDRA, the IRSN, representatives from environmental associations, as well as a member of the National Review Board (Commission nationale d'évaluation (CNE)).

Based on the work achieved in the framework of the PNGMDR, the 2006 Planning Act established its principle and Decree No. 2008-357 specified the conditions of its implementation. The Plan is based on the knowledge of the different waste categories mentioned notably in the National Inventory of Radioactive Waste and Recoverable Materials, as developed and published by ANDRA in January 2006.

Moreover, the CNE is responsible for assessing the progress achieved every year concerning investigations and studies on the management of radioactive materials and waste.

#### *Major guidelines of the PNGMDR*

The PNGMDR guidelines are as follows:

- seeking to reduce the quantity and toxicity of radioactive waste, notably through the treatment of spent fuel, and the treatment and conditioning of radioactive waste;
- storing radioactive materials pending treatment and radioactive waste pending disposal in dedicated facilities, and
- after storage, disposing in a deep geological repository the ultimate radioactive waste that may not be disposed of for nuclear-safety or radiation-protection concerns in surface or shallow facilities.

Other principles are also important with regard to radioactive-waste management, such as:

- compliance with protection principles against ionising radiation: (justification, optimisation, limitation) and for environmental monitoring (precaution principle, polluter-pays, etc.);
- prevention or limitation of waste production and toxicity;
- responsibility of waste producers to eliminate their residues under safe conditions in order to protect human health and the environment;
- information and active implication of citizens;
- traceability of waste management (with regard to the radioactive character of the waste and during the management operations of that waste), as well as the definition of associated constraints;
- due consideration of hazards relating to the transport of radioactive waste within the overall optimisation of management risks;
- determination of long-term management systems adapted to the characteristics of the different waste categories, particularly concerning the storage of waste for which no long-term management solution exists so far or the taking-over by the community of “orphan waste” resulting most of the time from historical activities;
- optimisation (cost/benefit) of each overall system and determination of associated controls; due consideration of those optimisation results in the regulatory framework of long-term waste-management systems, and
- quantifiable progress approach relating to methods and techniques.

The PNGMDR objectives

The PNGMDR objectives are as follows:

- to establish a clear definition of the waste categories to be considered as radioactive, with due account of the existence of naturally-occurring radioactivity with a variable intensity and of certain radioactive materials not intended for reuse;
- to seek long-term management solutions for each category of radioactive waste being produced;
- to take over historical radioactive waste;
- to take due account of public concerns about the future of radioactive waste;
- to ensure the consistency of the overall management mechanism for radioactive waste, whatever the radioactivity level or of the chemical or infectious toxicity involved, particularly in the case of waste categories with “mixed” risks;
- without prejudice to the primary responsibility of every waste producer, to optimise waste management at waste producers’ premises: nuclear industry, more conventional industries using notably naturally-occurring radioactive materials for their other properties, activities involving the use of radioelement sources, medical sector, soil and rubble originating from polluted sites, mining industry (especially uranium mines);

- to ensure consistency among practices relating to polluted sites and rehabilitation methods, and
- to analyse past long-term management solutions and to review the justification for an intervention if improvements are necessary in order to achieve a management method that would constantly improve in clarity, rigour and safety.

In order to achieve those goals, it is important to organise a global and national reflection from which to draw the main lines of a policy to master the topic, especially by determining long-term management venues and financing means for the management of radioactive-waste categories lacking a suitable solution.

### *Scope of the PNGMDR*

The PNGMDR applies to the following waste categories:

- all waste resulting from nuclear activities (regulated activities due to the presence of radioactivity involved) and which may have been contaminated by radioactivity or activated due to the nuclear activity;
- all waste resulting from activities involving the manipulation of radioactive materials, but exempted from regulatory control, which include significant concentrations of radioactivity or are very important in number, and which require specific measures (e.g., smoke detectors);
- all waste containing natural radioactivity, which may be reinforced following a human activity without calling upon necessarily the radioactive properties of the materials, and whose radioactive concentration is too high to be overlooked from a radiation-protection standpoint;
- all residues resulting from the treatment of uranium ore being disposed of in ICPEs, and
- all radioactive materials.

## **THE PRINCIPLES OF THE FRENCH POLICY FOR RADIOACTIVE MATERIALS AND WASTE MANAGEMENT**

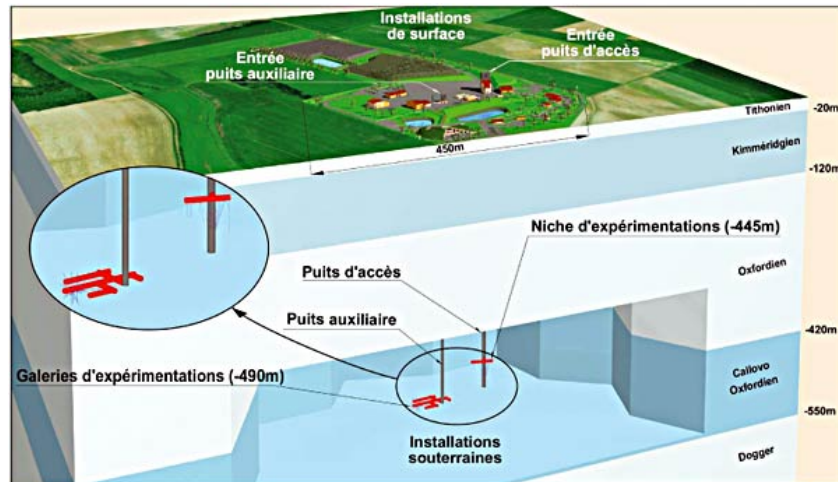
### **A management policy based on research and development**

#### *High-level and intermediate-level long-lived waste*

For high-level and intermediate-level long-lived (HL-IL/LL) waste, three complementary research areas have been identified and described in the 2006 Planning Act as follows:

- partitioning and transmutation of long-lived radioelements: a status report on the various transmutation systems will be prepared in 2012. Depending on the conclusions of that report, facility prototypes may start to be built in 2020 and commissioned industrially around 2040. Those investigations are conducted in parallel with those on fourth-generation reactor systems with a view to studying the possibility to reduce the toxicity of those residues by separating the most toxic elements and by transforming them into lesser-radioactive or shorter-lived radioelements, since the latter are easier to isolate from human beings and the environment over long timescales. At best, those new measures would only involve residues generated after 2040;
- reversible waste disposal within a deep geological formation: the goal is for the repository-licence application to be reviewed in 2015 in the hope of commissioning

the facility by 2025, subject to the favourable outcome of the review. The act sets out a minimum reversibility period of 100 years.



View of the future repository

That disposal option is described by the act as the reference solution to replace the current storage of ultimate radioactive residues that are unsuitable for disposal in surface or shallow facilities due to safety and radiation-protection concerns. The purpose of ANDRA investigations is to design such a repository and to rely on the experimental results achieved in the Meuse/Haute-Marne Underground Research Laboratory located at Bure. The Laboratory is designed to study the rocks in situ by qualifying their mechanical, chemical, hydrogeological and thermal properties.

- conditioning and storage processes: new facilities will need to be created or existing facilities will need to be modified no later than 2015.

Contrary to disposal, storage is only a temporary solution, offering a provisional means for securing waste over a certain timescale currently under study (at the scale of a few decades), notably in the prospect of major scientific advances.

The reversibility of repositories, as prescribed by the 2006 Planning Act, is a noteworthy evolution in relation to the 1991 Law. The Planning Act prescribes that, when time comes to review the corresponding creation-licence application, the safety of the repository within a deep geological formation will be assessed throughout the different phases of its management, including its final closure that only a new act may authorise. A specific law prescribing reversibility conditions will also specify a minimum period of at least 100 years during which the reversibility of the repository will be maintained as a precaution.

Investigations on deep geological disposal and on storage are conducted by ANDRA and financed in accordance with the “polluter-pays” principle by a special tax on nuclear installations (BNI)s producing HL waste. So far, research on partitioning and transmutation, funded by a CEA subsidy, has induced the expenses shown in Table 1 below:

Table 1 : Total research expenses for deep geological disposal, storage and partitioning/transmutation with special focus on 2005, 2006 and 2007

Areas	Total expenses from 1992 to 2007 (in millions of euros)
Area 1 (partitioning/transmutation)	1,065 (including 89 in 2005; 79 in 2006; 75 in 2007)
Area 2 (deep geological disposal)	1,346 (including 101 in 2005; 81 in 2006; 116 in 2007)
Area 3 (conditioning/storage)	813 (including 55 in 2005; 50 in 2006; 42 in 2007)
Total – Research on HL-IL/LL waste	3,223 (including 245 in 2005; 210 in 2006; 235 in 2007)

### **A management policy based on transparency and democracy principles**

The second area of the Management Policy for Radioactive Materials and Waste consists in maintaining a democratic dialogue at all levels, as follows:

- at the local level and on a continuous basis, thanks to the implementation of a CLI for each treatment and disposal facility;
- at the level of the public at large: the PNGMDR, based on ANDRA's National Inventory of Radioactive Materials and Waste, is a key element to ensure transparency. In addition, France may also rely on public national debates. Such a debate was organised over a four-month period before the adoption of the 2006 Planning Act. Another debate will be organised before the review of the licence application for the creation of a deep geological repository, and
- in Parliament: in the framework of the licensing of a deep geological repository, the 2006 Planning Act prescribes two parliamentary deadlines, the first in 2015 in order to set forth its reversibility conditions, and the second over a longer term, in order to authorise its future closure. The final decision to issue the creation licence will lie with the government, but no licensing decree shall be issued for the disposal facility without holding a parliamentary review beforehand.

Lastly, according to Article 22 of the Planning Act, any officer responsible for nuclear activities and any company referred to in Article L 1333-10 of the Public Health Code shall establish, update and make available to the administrative authority all required information for the performance of that control. The Planning Act includes penalties in case of any non-compliance on the part of operators.

Decree No. 2008-357 specifies the scope and nature of that information in order to complete the National Inventory for Radioactive Materials and Waste and to clarify the PNGMDR.

### **A policy based on an adequate funding for radioactive Materials and waste activities**

With due account of the challenges relating to radioactive-waste management, public authorities are concerned with securing sufficient funds for investigation purposes and for management itself.

The selected system in France for dismantling BNIs and managing the resulting radioactive waste rests on the full financial liability of industrial stakeholders, as follows:

- BNI operators must assess the charges for dismantling their facilities and for managing their spent fuel and radioactive waste; they must also establish conservative estimates and constitute specific assets allocated exclusively to those estimates in order to ensure that actual means exist at the end of the operating lifetime of a facility to finance the various operations involving its dismantling and the management of its radioactive waste. In order to prevent and to limit the charges to be borne by future generations, these dedicated assets shall have sufficient levels of security, diversification and liquidity. In order to achieve that goal, regulatory provisions provide for clear admissibility rules for those assets (notably concerning the asset category and the diversification level of the portfolio). In addition, no asset allocated to those estimates shall be used for any other purpose of the operator and shall be claimed by any creditor (including in case of financial difficulties on the part of the operator), except for the State in the exercise of its functions to ensure that operators comply with their obligations relating to the dismantling of facilities and the management of radioactive waste. Those assets shall be the subject of a separate entry;
- provisions also exist for the State to exert its control and to benefit from regulation and sanction powers, including the seizure of funds. That control shall only be valid on the basis of the reports to be submitted every three years by operators in order to describe how they intend to implement that mechanism, and
- a second-level control authority, called the National Financial Assessment Committee (Commission nationale d'évaluation financière), was created under the aegis of Parliament.

## CONCLUSION

With a clear and ambitious regulatory framework, France has set up a consistent policy for radioactive materials and waste management. The national plan establishes a clear road map for the future. However, the coming years will be critical with the expected political decision to create a deep geological disposal for HL-LL radioactive waste.