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Looking after the Longer Term:
An Act in 2006 on the Sustainable Management of Radioactive Wastes

Report by Mr Christian BATAILLE and Mr Claude BIRRAUX, Members of Parliament, on the

« Progress and Prospects of Research on the Management of Radioactive Wastes »

The report by Mr Christian BATAILLE and Mr Claude BIRRAUX, Members of Parliament, follows the referral to the Parliamentary Office by the National Assembly Bureau at the initiative of the chairmen of the four National Assembly political groups – UMP, PS, UDF and PC. It is published a few months before the end of the 15 year research period provided for by the Act of 30 December 1991 on the management of radioactive wastes.

Summary

Research bodies, the ministries of research and industry and the *commission nationale d'évaluation* (National Assessment Board) shall draft before the end of 2005 a detailed report of the scientific results obtained as part of the research started under the Act of 30 December 1991.

For their part, the Parliamentary Office Rapporteurs devote the first half of their report to the choices of waste management methods which can be envisaged following research. In the second part of their study, they propose the general principles of a sustainable management of radioactive wastes which could appear in the bill to be submitted to Parliament at the beginning of 2006.

The research conducted pursuant to the Act of 30 December 1991 contained three strands: strand 1 on separation and transmutation; strand 2 on reversible or irreversible disposal in deep geological formations; and strand 3 on long-term conditioning and storage.

The Scientific Findings

The results obtained validate the three methods and their implementation schedule with respect to the French method of reprocessing and recycling spent fuels into MOX.

Separation and transmutation (Strand 1)

At the beginning of 2005, separation and transmutation remain the ultimate goal of waste management. Prior to transmutation, separation is aimed at collecting on the one hand minor actinides, radioactive for hundreds of thousands of years, and on the other hand fission products, radioactive for approximately one thousand years.

CEA-Marcoule Atalante Laboratory

Thanks to separation, fission products would be disposed of as such while, by neutron bombardment, transmutation would transform minor actinides into fission products radioactive for approximately one thousand years.

At the back end of reprocessing, the industrial implementation of separation will however require waiting for the refurbishment of the La Hague facilities in 2040.

The transmutation of minor actinides is also proven scientifically.

Submitted to neutron bombardment, minor actinides are indeed split into lighter

Phenix Reactor, Marcoule

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nuclei whose radioactive period is divided by one thousand, compared with those of minor actinides, to approximately one thousand years.

Research on transmutation has mainly been conducted using the Phenix reactor. To perform transmutation industrially other equipment will be necessary – generation IV reactors and accelerator-driven systems.

Given the time necessary to develop these new types of reactors and check that they can transmute large quantities of minor actinides, industrial-scale transmutation cannot be envisaged before 2040 at the earliest.

Deep Geological Disposal (Strand 2)

Storage in deep geological formations consists in using an underground layer of rocks such as clay, granite, salt or tuff to encapsulate, as if in a safe, radioactive wastes from reprocessing or irradiated fuels that have not been reprocessed.

The IAEA, the UN agency, and many countries – Germany, Belgium, the United States, Finland, Sweden and Switzerland – consider it to be the safest method of managing radioactive wastes.

The ANDRA (Agence nationale pour les déchets radioactifs – National Radioactive Waste Management Agency) has accumulated many favourable results on the capacity of clay to confine radioactive wastes.

Drillings and Shafts in Bure

It has done so as part of its research conducted at the underground laboratories at Mol (Belgium) and at Mont Terri (Switzerland), and also at Bure (Meuse) by drillings from the surface, and by in situ studies in the Meuse/Haute Marne underground laboratory chamber.

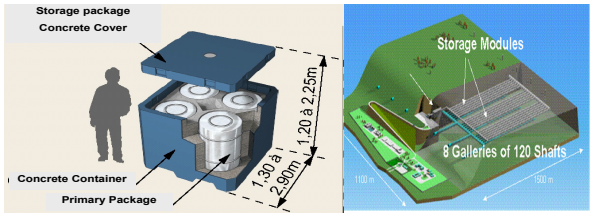
The Callovo-Oxfordian clay formation at Bure presents favourable confinement capacities, even if some studies are still not finished. Also, engineering studies demonstrate that a reversible disposal centre can be designed where waste packages can be retrieved over a long period while keeping a high level of safety. In any case, reversible disposal will not enter into service in France before 2020-2025.

The Meuse/Haute-Marne Laboratory Chamber

Long-term Conditioning and Storage (Strand 3)

Forming strand three of the Act of 1991, long-term conditioning and storage at the surface are two fields where great progress has been made.

The volumes of high- or medium-activity waste have been divided by ten since 1992 by the vitrification of effluents, and the compacting of technological wastes and of the metallic structures of fuel assemblies. Designed to complete the present industrial storage facilities with a life duration of 50 years, long-term surface or subsurface storage are aimed at 100 to 300 years operation. A long-term storage facility could be put into operational service in France by 2016.



Plan of a Storage/Disposal Container and of a Long-term Facility

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In short, the research carried out since 1992 shows that the three strands define management methods that do not compete but complement one another per se and over time.

Transmutation cannot apply to waste already produced and will not enter into service until after 2040.

Moreover it cannot reduce the radioactivity of minor actinides to under one thousand years. Reversible disposal is therefore essential.

In addition, long-term storage is also essential so as to take charge immediately of non-reprocessed spent fuels and spent MOX fuels whose cooling period before reprocessing is approximately 60 to 80 years, and also so as to introduce flexibility in the management and choice between transmutation and reversible disposal.

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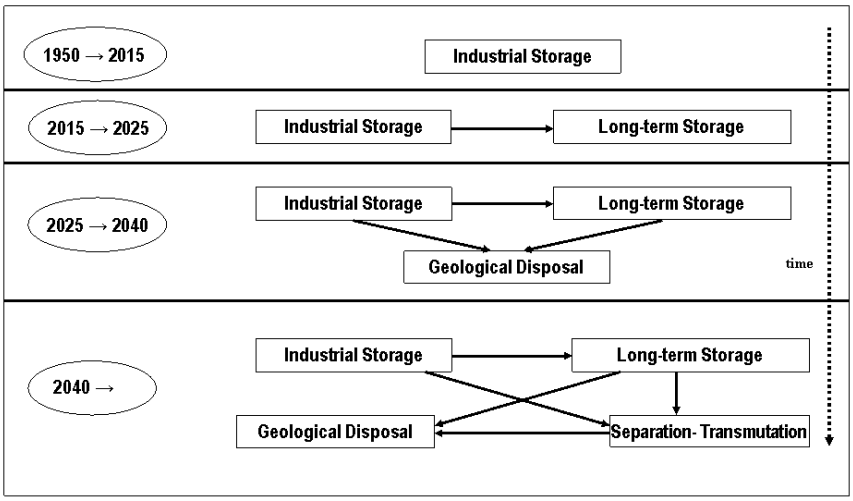


The New Radioactive Waste Management Options and their Implementation Schedule

Political Conclusions

In its second chapter, the report presents the general principles of a sustainable management of radioactive wastes which could be included in the Act in 2006.

Disclosure

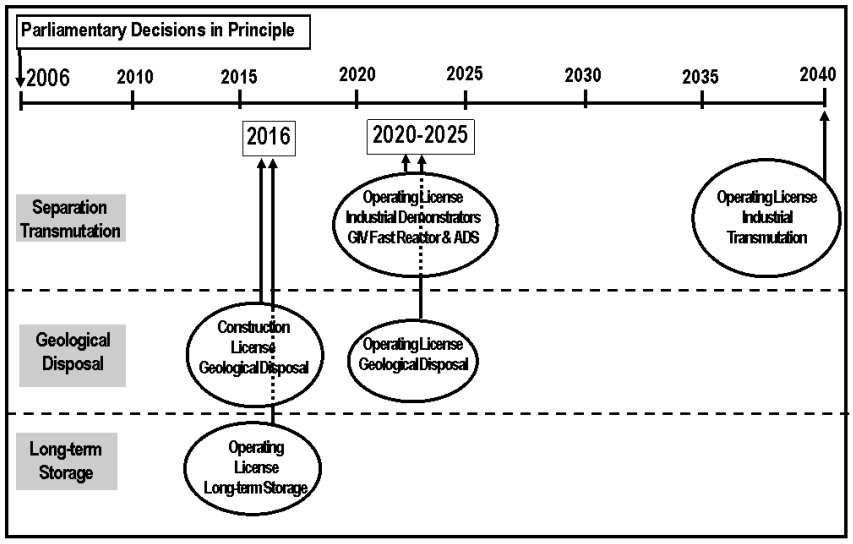
Essential disclosure was the subject of precise provisions in the Act of 30 December 1991. The local disclosure and follow-up committee created under the Meuse/Haute Marne laboratory should in the future improve its efficacy in disseminating its research results. The National Assessment Board created by the Act of 1991 should be prolonged beyond 2006 in order to continue its role as a stimulator, adviser and analyst. The CEA and the ANDRA could be assigned ambitious disclosure goals for visits of their facilities. Lastly, while public debate on actual construction and development projects is premature, dialogue with local elected representatives should be improved as a matter of priority in the years ahead.

Extending Research

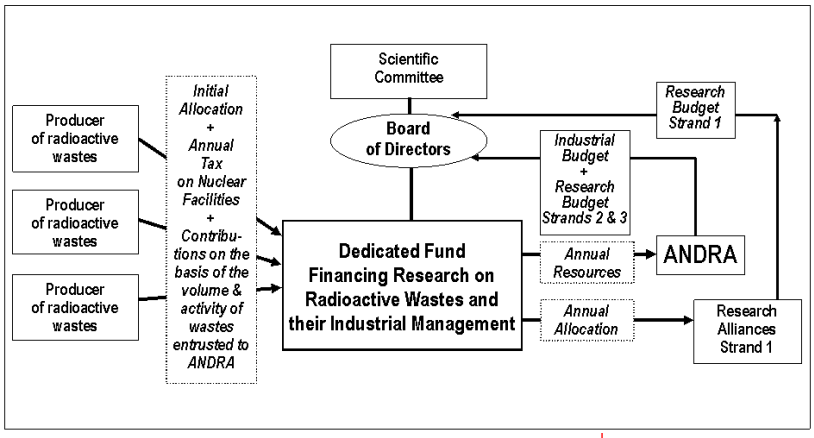
In any case, the research instigated by the Act of 1991 should of course be extended by the Act of 2006 so as to go further towards the solutions endorsed for each of the three strands. In the wake of the success already obtained, the research on separation should be pursued in order to reach group separation of all minor actinides and long-lived fission products. As for research on the reactors of 2040 and after, which exist only at the concept stage for the time being, it is of course essential and will require investments that must be planned and secured. For geological disposal, research must be completely finished in order fully to demonstrate the confinement properties of the clay at Bure and to detail the engineering concepts of geological disposal. As for long-term storage, it requires the completion of studies with a view to the construction of an operational surface or subsurface centre.

Research Exploitation

Corresponding to an effort of 2.2bln € for the period 1992-2003, research on radioactive wastes management must be exploited at the scientific, technical and industrial levels, both locally and nationally. Research on separation has led, at Marcoule, to the development of high level methods in molecular engineering and in extraction techniques, which should lead to the creation of a separative chemistry institute. Similarly, the high level methods developed at the Meuse/Haute Marne laboratory in geophysics, geochemistry, or in engineering, should lead to the creation of the scientific and technological hubs proposed by these two French departments. The financial accompany-



Major Dates / Aims of Radioactive Waste Management which the Act of 2006 could include



A Few Envisageable Mechanisms for a Dedicated Fund on Radioactive Wastes

ing measures introduced by the Act of 1991 should be applied over the planned 15 year period. In Sweden or in Finland, nuclear activities are grouped in sites integrating several segments of the industrial chain. In France, voluntaristic economic development should be promoted in the territorial departments concerned by radioactive waste management.

A Parliamentary Decision in Principle to use the Three Management Methods

The research conducted in the three strands must now lead to the decision in principle to use the three management methods in the future. It should lie with Parliament to set transmutation as the ultimate goal of waste management, take a decision in principle regarding reversible geological disposal and decide the creation of a long-term surface or subsurface storage facility. In compliance with the separation of powers, it would lie with the Government to implement these decisions as part of a schedule of goals appearing in the Act. In this respect, 2016 could be the goal for operational start-up of long-term storage, 2020-2025 for the start-up of geological disposal and 2040 for industrial transmutation.

The PNGDR-MV

The overall logic of radioactive wastes management would be ensured by the *Plan national de gestion des déchets radioactifs et des matières valorisables* (PNGDR-MV – National Plan for the Management of Radioactive Wastes and Recoverable Materials). The plan would be integrated in the Act of 2006. The PNGDR-MV would deal in particular with standard spent fuels or MOX whose reprocessing is deferred over time, and also with intermediate or low level long-lived wastes.

FGDR dedicated fund

As regards funding, the Act of 2006 would specify the set-up of a dedicated fund for the management of radioactive wastes (FGDR – *fonds dédié de gestion des déchets radioactifs*) fed by contributions paid by their producers based on the tax on basic nuclear facilities. This dedicated fund would have to fund not only the ANDRA for its industrial activities and its research, but would also fund research carried out on separation and transmutation by other partners (CEA, CNRS, universities). It would help programme independence and the necessary long term effort.

ANDRA's Mission

Lastly, it would lie with the Act of 2006 to simplify the structures of the ANDRA and broaden its responsibilities, by entrusting it not only with the management of waste repositories but also with the long-term storage of wastes so as to ensure coherence of decisions and minimise costs for the community.

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Parliamentary intervention in the follow-up to the Act of 2006, which is essential for the transparency of the nuclear industry and for dialogue between all the stakeholders, would be ensured by debates programmed over a period of time and by twice-yearly automatic referrals to the Parliamentary Office for Science and Technology Assessment.

All these provisions would ensure technical progress continues to be made regarding nuclear wastes management and would allow us to assume now and at our level our responsibilities, clarifying the role of the institutions of democracy.

March 2005