Sixth General Radioactive Waste Plan

Sixth General Radioactive Waste Plan [6th GRWP]

MINISTERIO
DE INDUSTRIA, TURISMO
Y COMERCIO

Sixth General Radioactive Waste Plan [6th GRWP]

June 2006

Ministerio de Industria, Turismo y Comercio

Diseño: CerezoDiseño
Coordinación editorial: RGB Comunicación
Impresión: tf. Artes Gráficas
NIPO: 701-06-031-6
Depósito legal:

Presentation of the GRWP

The present 6th General Radioactive Waste Plan, approved by the Cabinet of Ministers on 23rd June 2006, replaces the plan previously approved in July 1999 (5th GRWP) and constitutes a formal revision of that plan, in accordance with Royal Decree 1349/2003 of 31st October on the ordering of the activities performed by the radioactive waste management agency Empresa Nacional de Residuos Radiactivos, S.A (ENRESA) and their financing.

This Plan addresses the changes that have occurred during that period of time, the necessary actions and technical solutions and the economic-financial forecasts being updated in certain cases, and modified in others, and widens the timeframe to the year 2070.

This new 6th GRWP fulfils also a resolution by the Commission for Industry, Tourism and Commerce of the Spanish Congress, of December 2005, urging the Government to undertake the necessary arrangements for it to be issued.

The document is divided into two main parts: the GRWP itself, presented in summary form, and a series of explanatory ANNEXES (6).

The GENERAL RADIOACTIVE WASTE PLAN itself is the basic reference document that clearly and concisely deals with all the strategies and actions to be undertaken in Spain in the different fields of radioactive waste management and the dismantling of facilities, along with the corresponding economic-financial study. This section

also presents the main data relating to radioactive waste generation, programmes for removal, the capacity of the facilities, costs and revenues, etc., such that overall this part of the document is in itself sufficient to serve as a summary of the planning of this particular issue in Spain.

The objective of the EXPLANATORY ANNEXES TO THE GRWP is to allow the reader to gain a deeper insight into each of the aspects contained in the basic reference document. The contents of these ANNEXES are in keeping with the layout of the General Radioactive Waste Plan, and have been configured in parallel with the main text, broken down as follows:

ANNEX A, the INTRODUCTION, includes an informative explanation of radioactivity, radioactive waste and social perception, and then goes on to deal with the underlying reasons for the issuing of the document. An analysis is made of the current situation and of the role played by the different agents involved in the performance of the GRWP activities, with special emphasis on the activities carried out by ENRESA, with the reference legal basis as of today and with a view to the future.

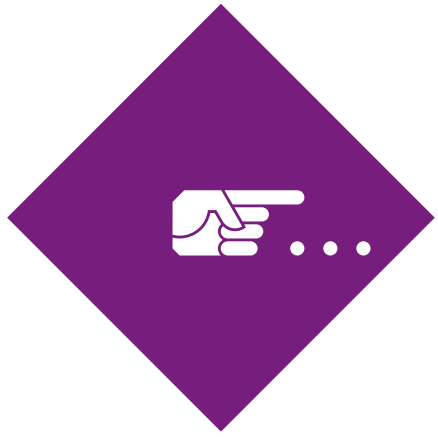
ANNEX B, RADIOACTIVE WASTE GENERATION, presents real data on the current situation as regards the generation and management of radioactive wastes and their origins, as well as future generation forecasts on the basis of a reference scenario and certain calculation assumptions.

ANNEX C describes the COURSES OF ACTION in the four major blocks or areas into which management has been divided: Low and Intermediate Level Waste (LILW), Spent Fuel and High Level Waste (SF/HLW), the Decommissioning of Facilities and Other Actions, and is completed with a specific section on Research and Development (R&D). In each section there is first a reference to the situation internationally and in Spain, followed by a description of the strategic solutions foreseen throughout the entire management period and of detailed actions for the next 4-5 years.

ANNEX D includes the ECONOMIC-FINANCIAL ASPECTS of waste management, with a section on cost estimates and another on the systems for the financing of these costs, with special emphasis on those relating to the nuclear power plants, along with a calculation of the revenues required and to be collected in each case.

Finally, ANNEXES E and F include the most relevant LEGAL PROVISIONS in this field and a GLOSSARY OF the TERMS AND ABBREVIATIONS most frequently used throughout the document.

A
Introduction



Since the discovery of radioactivity at the end of the 19th century, the applications of radioactive isotopes have become a part of our daily life in different fields: in the generation of electricity by the fissioning of heavy atoms; in industry for the measurement of thicknesses and/or densities and the performance of quality processes; in medicine for the detection and treatment of illnesses; in research, for reproduction in the laboratory of practices that may subsequently be applied in real life; in the restoration of works of art and archaeological dating, etc., such that current society is strongly linked to the knowledge, development and application of nuclear practices.

Like all human activities, the aforementioned applications generate waste. The main characteristic of the wastes in this case is that they emit ionising radiations. The protection of living beings against these radiations is achieved fundamentally by incorporating suitable barriers.

In Spain, radioactive wastes are defined as being any waste material or product for which no further use is foreseen and that contains or is contaminated by radionuclides in concentrations or levels of activity higher than those established by the Ministry of Industry, Tourism and Commerce (MITYC), following a report by the Nuclear Safety Council (CSN).

Although there are many types of radioactive wastes, depending on their characteristics and the ways in which they are man-

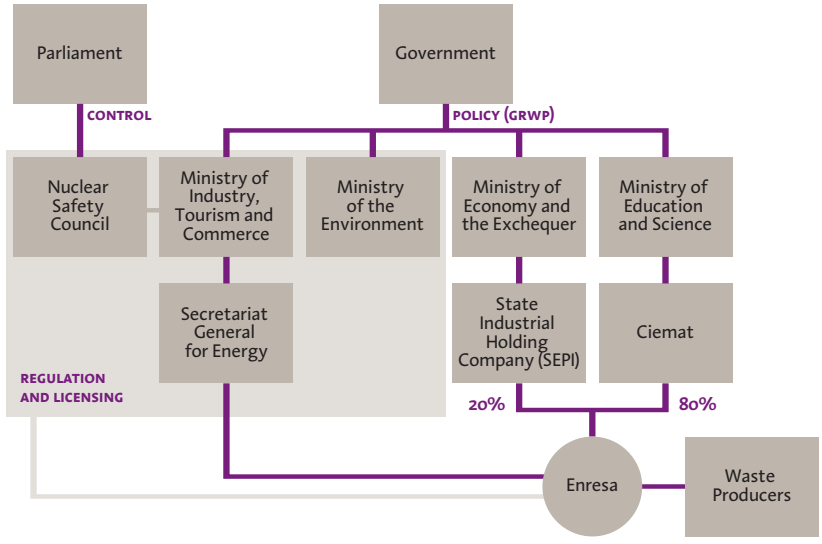
aged, they are normally classified in two major groups: the short-lived low and intermediate level wastes, which are those most commonly produced not only in Spain but across the world, and the long-lived high level wastes, the most significant of which is the spent fuel from the nuclear power plants.

The problem posed by radioactive waste is similar to that implied by all products arising as a result of human activity, whose presence in the biosphere is projected into the future without the possibility of any temporary removal in the short term.

The quantity of radioactive waste that our society generates is much smaller than that of other waste types arising from other activities. Nevertheless, like certain biological or chemical wastes, they require long-term treatment, confinement and storage systems that should comply with specific standards regarding the safety and protection of people and the environment, as well as with the principle of minimisation of waste production. In other words, they should be managed adequately.

Since 1984 the management of radioactive waste in Spain has been the responsibility of the Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA), whose activities and financing system are currently governed by Royal Decree 1349/2003 of 31st October and Royal

Figure 1. Schematic representation of the administrative organisation as of June 2006



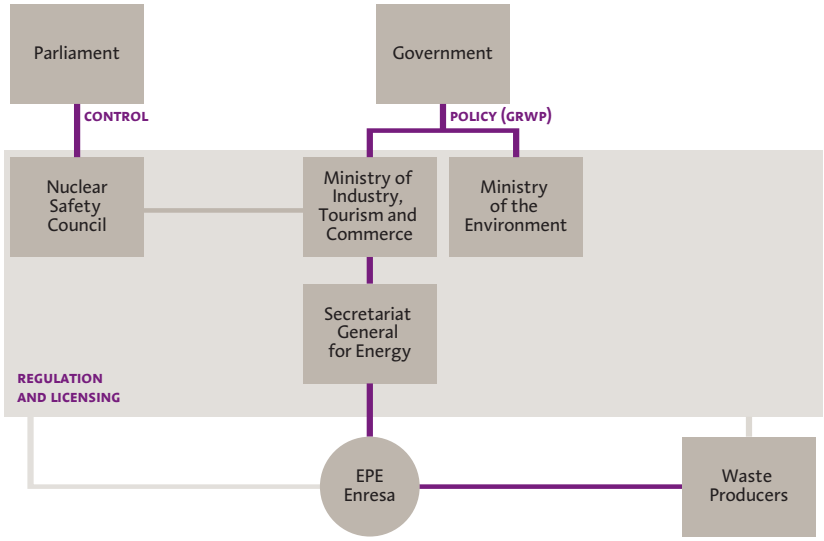
Decree 5/2005 of 11th March on urgent reforms for the promotion of productivity and the improvement of public contracting.

More recently, Law 24/2005 of 18th November, on reforms for the promotion of productivity, created the State Business Entity (SBE) ENRESA for the management of radioactive wastes and regulates the fees to be applied for the rendering of its services, which are to be paid into the Fund for the financing of the activities contemplated in the General Radioactive Waste Plan (GRWP).

Over the last two decades a national system for the performance of all the necessary actions in the different fields of radioactive waste management and the decommissioning of facilities has been steadily defined and shaped, this taking into consideration both the nature of these actions and the capabilities of a group of agents operating in a structured manner. This is reflected schematically in figures 1 and 2, which show the current and future administrative organisation, following the beginning of ENRESA's activity as a State Business Entity ENRESA.

Until such time as the State Business Entity ENRESA is effectively constituted, which will take place through approval by Royal Decree of its Statutes, ENRESA, as a limited company, will continue to fulfil the requirements of Royal Decree 1349/2003 of 31st October, on the ordering of its activities and financing.

Figure 2. Schematic representation of the future administrative organisation



Consequently, the general operating mode of the system involves the fundamental aspects, as regards both the applicable standards and the role of the agents and the operating and safety practices, including the financing system.

Within this system, the General Radioactive Waste Plan (GRWP) constitutes the official document, which ENRESA draws up and submits to the MITYC every 4 years or whenever requested by this Ministry. This addresses the strategies, the necessary actions and the technical solutions to be developed in the short, medium and long term, aimed at ensuring the adequate management of radioactive waste, the dismantling and decommissioning of nuclear and radioactive facilities and the rest of the activities relating to the above, including the economic and financial measures required to carry them out.

Finally, the Government is responsible for establishing the policy on radioactive waste management and the dismantling and decommissioning of nuclear and radioactive facilities in Spain, through approval of the GRWP, this being submitted to it by the MITYC and subsequently reported on to Parliament.

Although, in view of the specific events and actions that have taken place, the current situation of the management system may be described as being satisfactory, the need for this 6th GRWP is justified, quite apart from legal imperatives, by the existence of a series of aspects – in certain cases new and in others deriving from issues pending updating, improvement or resolution – that require ordering and a greater emphasis on analysis.

Particularly significant among these aspects of management is a more accurate definition of the strategy for the management of spent fuel and high level waste, as regards both integral temporary storage – with the priority objective of constructing a Centralised Temporary Storage (CTS) facility – and definitive management, in relation to which decisions have been considerably delayed. It is from here that the establishment of new objectives arises, orienting the future courses of action contemplated in this Plan. The economic and financial aspects also need to be adapted to the new standards.

Furthermore, it is necessary to continue with on-going tracking and analysis of the radioactive waste management programmes carried out within the framework of the International Organisations, as regards both possible standards or regulatory developments (EU,

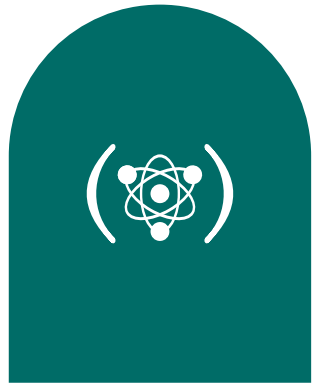
IAEA) and Research and Development projects (EU, NEA/OECD).

Also to be taken into account are the requirements of the Joint Convention on Safety in the Management of Spent Fuel and Radioactive Waste, to which Spain is party.

Finally, emphasis should be laid on the importance of communication and the participation of society in this field, with regard to the taking of decisions to solve the problems posed.

B

Generation of radioactive waste



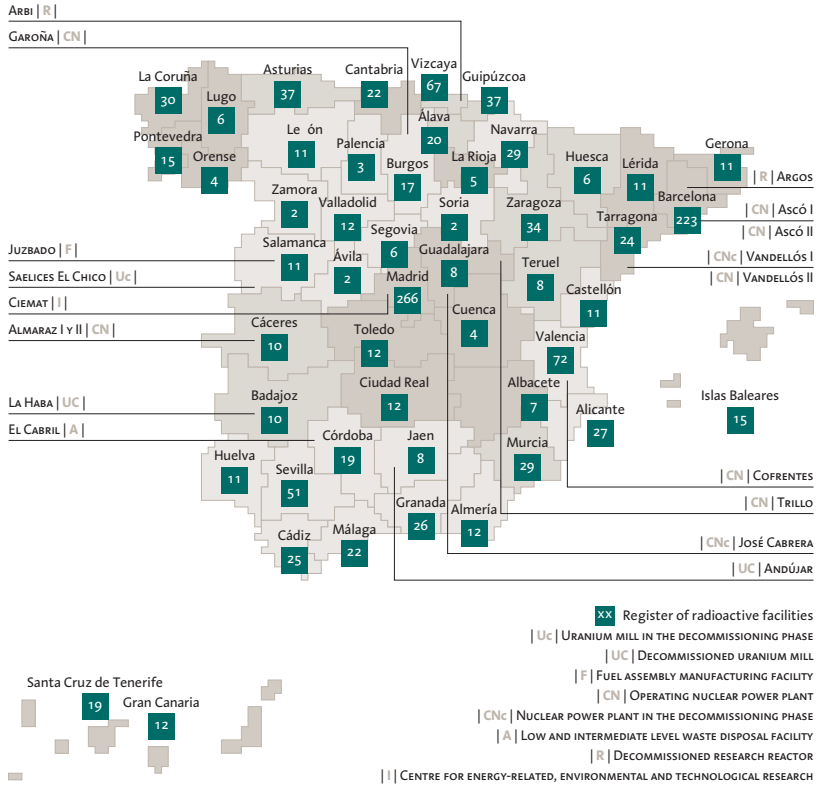
In Spain radioactive wastes are generated at a number of facilities distributed throughout the country (See figure 3) that use radioactive materials and substances as regulated in the specific applicable standards, these being known as Nuclear Facilities (NF's) and Radioactive Facilities (RF's). Radioactive wastes may also occasionally be generated in other areas as a result of specific activities.

The origins of the wastes currently generated, and of those that might potentially be generated in the future, are as follows:

- Operation of Nuclear Power Plants (NPP's).
- Dismantling of NPP's.
- Operation of the Juzbado Fuel Assembly Manufacturing Facility (Salamanca).
- Dismantling of the Juzbado Fuel Assembly Manufacturing Facility.
- Waste generated at the Centre for Energy-Related, Environmental and Technological Research Ciemat.
- Dismantling of research reactors and facilities.
- Application of isotopes in medicine, industry, agriculture and research.
- Occasional incidents.
- Operation of the storage facilities themselves.
- Reprocessing abroad of spent fuel from Spanish NPP's.

In addition to the above, in recent decades Spain has produced important amounts of tailings from uranium mining and milling.

Figure 3. Facilities generating radioactive waste in Spain



These have low contents of natural radioactivity but, in view of the large volumes involved (of the order of 75 million tons of mining tailings and some 14 million tons of tailings from processing), they require specific management actions.

Consequently, with a view to integral management in Spain, radioactive wastes may be classified in two major groups:

- The so-called Low and Intermediate Level Wastes (LILW), which given their characteristics may be temporarily stored, treated, conditioned and definitively disposed of at the El Cabril facility(Córdoba), these including the sub-group of Very Low Level Wastes (VLLW).
- The so-called High Level Wastes (HLW), consisting basically of spent nuclear fuel and other specifically high level wastes.

This group also includes other Intermediate Level Wastes (ILW) which, in view of their characteristics, cannot be disposed of under the conditions established for El Cabril, specific installations being required for this purpose.

In general, LILW are conditioned by the producers. However, at the majority of the RF's or in the event of incidents conditioning is performed in a specific manner and with support from ENRESA on the basis of the available capacities, among which those of the El Cabril installations are fundamental. In all cases the acceptance criteria established by ENRESA for the subsequent management foreseen are to be fulfilled.

The wastes generated at the nuclear power plants and the Juzbado facility are temporarily stored at the producing installations themselves, pending definitive transfer to El Cabril. Those arising at other installations usually remain at the point of origin, circumstantially and in all cases temporarily, until they are removed by ENRESA.

Once unloaded from the reactor, the spent fuel generated at the nuclear power plants is stored under water in the pools existing at the plants for this purpose. Subsequently, and following the period required for it to cool down, the fuel is transferred or transported to the temporary storage facilities, as an intermediate stage pending final management.

As of the end of 2005 there were some 37,200 m^3 of LILW stored in Spain, of which approximately 75% are already at the El Cabril installations, with 24% on site at the NPP's and the small percentage remaining at the Juzbado and CIEMAT storage facilities (no mention is made of the RF's because the radioactive wastes are stored there only temporarily pending their removal by ENRESA).

As regards spent fuel, as of the same date there were 3,272 tU in the nuclear power plant pools, which, added to the 98 tU at the Individualised Temporary Storage facility at Trillo NPP, make a total of 3,370 tU.

In order to provide an overall view of the total quantities of wastes to be managed, consideration should be given also to a series of wastes that, although currently not in Spain, should be considered Spanish. The volume and origins of these wastes are as follows: 13 m^3 of vitrified HLW and 666 m^3 of ILW from reprocessing in France of the

spent fuel from Vandellós I NPP, currently stored in that country and to be returned to Spain as from the year 2010, and also small quantities of fissionable materials (U and Pu) recovered during the reprocessing of the fuel from Santa María de Garoña NPP, sent to Great Britain prior to 1983 and eventually to be returned to Spain for management.

As regards generation forecasts, figure 4 summarises the total quantities of spent fuel and wastes, both LILW and HLW, to be managed in Spain, according to the quantities actually produced as of the end of 2005 and the best estimates and data available at present. For the purposes of planning and calculation, the basic reference scenario may be summarised as follows:

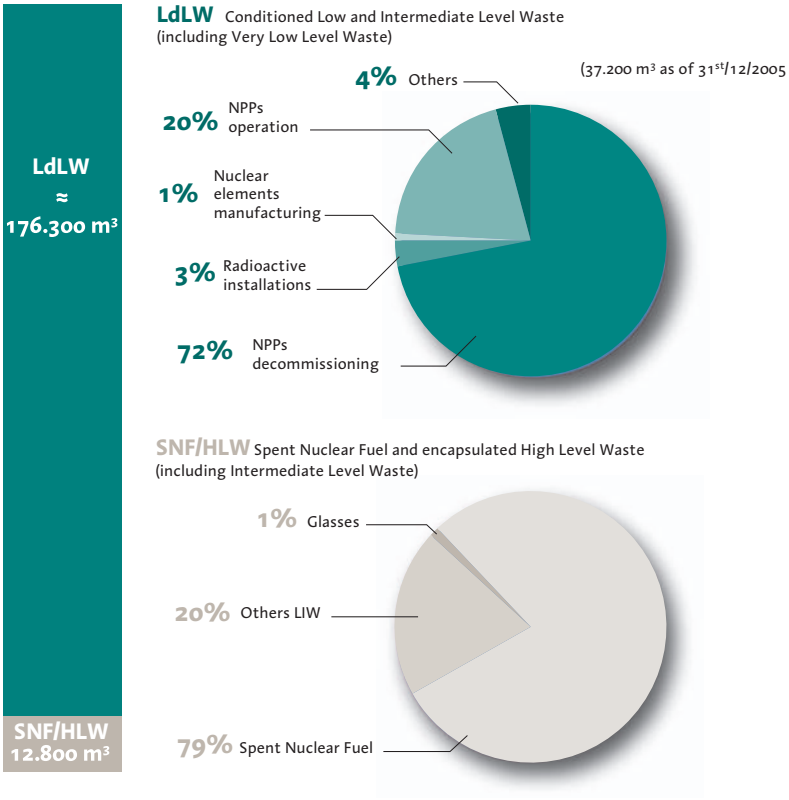
Reference Scenario

- Current nuclear fleet with 6 NPP's in operation (8 reactors). The installed electrical power as of 31/12/2005, 876 MWe, was reduced to 7,716 MWe as a result of the definitive shutdown of José Cabrera NPP on 30/04/2006.
- 40 years service lifetime for the 6 operating NPP's with a production rate similar to that existing at present.
- Open fuel cycle; i.e., the option of reprocessing the spent fuel is not contemplated.
- Total dismantling (Level 3) of the light water NPP's, to be initiated 3 years after their definitive shutdown.

On the basis of all the above, the total volume of radioactive waste to be managed in Spain, conditioned and ready for definitive disposal at the ENRESA installations at El Cabril, will be some 176,300 m^3 in the case of the LILW, this also including those wastes that in view of their very low levels of activity may be managed specifically (VLLW). Furthermore, the volume of wastes not open to disposal at El Cabril would amount, following encapsulation, to some 12,800 m^3, some 10,000 m^3 of which would be spent fuel (6,674 tU) and the rest other intermediate or high level wastes from reprocessing or the dismantling of the NPP's.

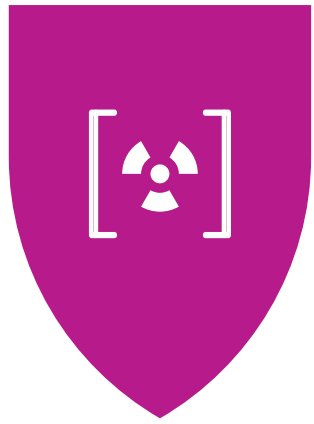
Of these quantities, as of 31/12/2005 almost a quarter of the LILW has already been generated, most now disposed of at El Cabril, along with half the spent fuel, temporarily stored as of that date at the nuclear power plants themselves.

Figure 4. Radioactive waste being managed in Spain



These waste estimates, which are slightly lower than those considered in the 5th GRWP – due to the optimisation of their management and a more accurate assessment, and in view also of the current capacities of the existing storage installations – are the basis for the establishment of the future additional storage requirements, which in the case of the high level waste will arise as from the end of the present decade and in 2009 in order to allow for the dismantling of José Cabrera NPP.

C
Courses of action



LILW MANAGEMENT

General considerations and internacional panorama

This type of wastes is produced both in the generation of electricity by nuclear means and in very diverse non energy-related applications of radioactive materials, as a result of which a very large number of countries have had to establish management systems for them for one reason or another. The solutions considered are also very diverse; quite a number of countries have addressed the definitive management directly and have established integrated systems for this purpose, while others have preferred to fully resolve the issue of temporary storage pending a decision on definitive solutions.

Of the countries that have implemented definitive solutions (see table 1), practically all have adopted what is known internationally as "near surface disposal", which may range from simple "trenches" to installations with engineered barriers, such as those adopted in Spain. There are also solutions based on galleries at different depths.

In view of the experience accumulated at the international level, it may be stated that the technologies and know-how necessary for the safe definitive management of this type of waste exist and are available.

In the case of Spain, the approach adopted in France is especially relevant since it implies a clear decision regarding the implementation of definitive solutions and contemplates in an integrat-

ed and complete manner the entire process, from generation to disposal. Spain has been collaborating closely with France in this field for many years.

In this context it would also be appropriate to underline the recent entry into service in France of a disposal facility specifically designed for very low level waste, alongside the one already in operation for LILW.

Mention should be made also, on the international scene, of the activities being undertaken by several international organisations (EU, NEA-OECD and IAEA). From the Spanish point of view the most inter-

Table 1. Definitive lilw disposal facilities in different countries.

Country	Installation	Type	Situation
Germany	Morsleben	Deep	Decommissioned
	Konrad	Deep	In licensing
Slovakia	Mochovce	Surface	Operation
Spain	El Cabril	Surface	Operation
United States	Clive/Richland/Barnwell	Surface	Commercial operation
	Hanford/Fernald/Idaho Nat. Lab/		
	Los Alamos Nat. Lab Nevada		
	Test Site/Oak Ridge/		
	Savannah River	Surface	Operation DOE
	Beatty/Maxey Flats/Sheffield/		
	West Valley	Surface	Com. decommissioned
	Texas compact	Surface	Com. in licensing
Finland	Olkiluoto	Cavern	Operation
	Loviisa	Cavern	Operation
France	La Manche	Surface	Decommissioned
	L'Aube	Surface	Operation
	Morvilliers (RBBA)	Surface	Operation
Hungary	Puspokszilagy	Surface	Operation
Japan	Rokkasho Mura	Surface	Operation
Great Britain	Dounreay	Surface	Operation
	Drigg	Surface	Operation
Czech Republic	Dukovany	Surface	Operation
	Richard	Cavern	Operation
	Bratrstvi	Cavern	Operation
Sweden	Forsmark (SFR)	Cavern	Operation

esting of these are currently those corresponding to the EU, although support is provided for the activities performed by the IAEA, including technical collaboration with third-party countries.

Analysis of the national situation

As has been indicated in chapter B, LILW are produced in Spain in different regulated activities and facilities (nuclear and radioactive) using nuclear substances or radioactive materials.

They may also be produced outside the system regulated by the specific nuclear or radioactive standards. In this case the Spanish regulatory system has mechanisms in force to recover such control and guarantee the safe management of this type of materials whenever they appear. Indeed, Spain may be said to have one of the most effective systems known at world level in this respect.

Spain has found an overall solution for the management of LILW. A complete and integral management system is available, with all the necessary capacities, configured on the basis of the actions of a series of clearly identified agents operating in a structured manner. The operating mode of the system is well established as regards both standards and the operating practices defined for its application.

Within this system, the nuclear facilities have waste treatment capacities allowing them to condition their wastes in accordance with the ENRESA acceptance criteria for the El Cabril facility. In other cases the producers deliver their wastes to ENRESA in a form agreed on and the latter mainly performs the necessary conditioning tasks.

The radioactive waste management services provided by ENRESA to the operators of Nuclear and Radioactive Facilities are governed by contracts, based on the corresponding "type contracts", which are to be approved by the MITYC.

The El Cabril disposal facility, located in the province of Córdoba, is an essential part of the national LILW management system and is in fact its main axis. The fundamental objective of the facility is the definitive disposal of this type of waste in solid form, although it is also equipped with various technological capacities, including treatment and conditioning installations where the wastes from RF's and those from interventions at non-regulated facilities are processed. Certain complementary treatments are also performed on

wastes from nuclear facilities. The El Cabril centre also has laboratories for waste characterisation and verification, which are the basis for performance of the tests foreseen for the acceptance of the different types of wastes and for verification of their characteristics. The facility also possesses temporary storage capacities, as well as the workshops, laboratories and auxiliary systems necessary for its operation.

The national integral system offers the solidity and operability required to guarantee the safe management of LILW and at the same time is sufficiently flexible to allow for its optimisation. These characteristics have been put into practice and have been reinforced with the experience accumulated in the dismantling of fuel cycle facilities and of the Vandellós I NPP, with the occurrence of incidents in the "non-regulated" industry (especially the metal sector) and with the need to respond to new legal demands (the case of ion smoke detectors, ISD's), which the system has been able to incorporate and which have provided an incentive and rationale for its future optimisation.

Strategic courses of action

The experience accumulated in Spain in the management of LILW has also made it possible to identify areas for improvement and define the most ideal actions to address its optimisation, acting upon those elements of the system that are most necessary at present or that lead to the greatest increase in its operability.

The first objective consists of continuing the normal operation of integral waste management, including the control, acceptance, removal and transport to El Cabril of low and intermediate level wastes, as well as operation of this facility under conditions of safety for the workers, the public and the environment.

Following the efforts made in recent years, the most representative example of which has been the reduction to less than a third of the volume of LILW to be managed, from both the NPP's and the RF's, what is foreseen for the future is their continuation and reinforcement in coordination with the producers and efforts in innovation and research in the development of treatment techniques implying waste volume reduction, along with the complementary development of decontamination and measuring techniques.

Mention should also be made of the recent entry into operation of the systems implemented at El Cabril for the treatment of contaminated aggregates, basically those generated during incidents in the metal industry, through immobilisation in the containers generally used for the reconditioning of the drums received from the nuclear facilities.

The future dismantling of the nuclear power plants, along with the occurrence of the aforementioned incidents in the metallurgical industry, lead us to forecast the future existence of important volumes of wastes with a very low content of radioactivity, for which using the current capacity of the concrete cells constructed at El Cabril, designed for wastes with higher levels of activity, might be inappropriate. For this reason, a construction project has been undertaken at El Cabril for a complementary installation specifically for this group of wastes, in accordance with instructions received from the Congress and the Administration. The start-up of this installation is scheduled for 2007, following granting of the corresponding authorisations.

Also to be maintained are the courses of action designed to improve knowledge of waste and for the safety assessment of the disposal system, also in keeping with the requirements imposed by the Authorities.

As regards improving the capacities of El Cabril and the availability of resources to address future situations, the forthcoming entry into operation of the new "Auxiliary Conditioning Building" should be underlined. This is designed to allow for the implementation of whatever LILW characterisation and decontamination techniques or new waste treatment systems might be necessary in the future, among which those relating to management of the ISD's to be removed by ENRESA in compliance with the most recent standards in this area are especially significant. The building also includes a store for radioactive sources that is more operative than the currently existing facility.

Consequently, the basic lines of the actions for the improvement of LILW management are as follows:

- Coordination of efforts to minimise waste generation and volumes, along with optimisation of the occupation of the space available at El Cabril.

- Management of LILW in a complementary installation designed specifically for this sub-category of waste, as part of the El Cabril facility.
- On-going improvement of knowledge of wastes and of methods and techniques relating to the performance of the disposal system and assessment of its safety.
- Improvement of the available technological capacities, with a view to making the aforementioned processes more flexible and optimal and to prepare resources to address future situations, both those known at present and those others that might arise in the future.

In addition to these lines of management improvement, the following activities should also be underlined:

- Permanent analysis of the evolution of LILW generation and of the possible future resources and infrastructures requirements for the management of this type of wastes.
- Continuation of the collaboration with the National Authorities in all matters relating to LILW, with special attention to whatever standards developments might be required and to management of whatever wastes might be generated outside the regulated system.
- Continued participation in the activities of the International Organisations. Collaboration between ENRESA and other similar companies in other countries in LILW developments, and technical assistance to specific countries or activities.
- Maintenance of the established and proven operability for the safe and efficient performance of the necessary transport operations.

Management of spent fuel and high level waste

General considerations and international panorama

The management of the spent fuel produced by a nuclear power plant may be addressed from the perspective of a closed cycle or an open cycle, and in both cases contemplates two clearly differentiated stages: an initial temporary stage, necessary in any management scenario for the back end of the nuclear fuel cycle, and a subsequent stage of definitive management.

In the closed cycle scenario, the irradiated fuel is sent, following a few years of cooldown in the plant storage pool, to commercial reprocessing facilities in the country or abroad. The by-products of this treatment are, on the one hand, the materials with a remaining energy content (fundamentally uranium and plutonium), which may be reused in the nuclear fuel cycle, and, on the other, the fission products, other actinides and other technological wastes. When reprocessing is undertaken in countries other than the one in which the spent fuel is generated, it is normal for the corresponding contract to stipulate the return of all these substances, duly conditioned, to the country of origin, which will then be responsible for its temporary and definitive management.

In the case of the open cycle, the irradiated fuel remains temporarily stored in the plant pools, complemented as necessary with other transitory storage systems, pending its final management.

Choosing between the open cycle and the closed cycle is fundamentally an energy decision, and therefore a strategic and economic issue that has repercussions on radioactive waste management.

Among the countries that have opted for the closed cycle for all or part of the fuel irradiated in their commercial reactors are France, Great Britain, Japan, India and the Russian Federation (all having their own reprocessing plants in operation or in the design phase), along with Holland and Belgium.

Other countries currently adopting the open cycle, albeit possibly including previous reprocessing in certain cases, are the United States of America, Canada, Finland, Sweden, Spain, Taiwan and South Korea.

All the light water reactors currently in operation, among them the ones at the Spanish NPP's, incorporate in their design a pool used to store the spent fuel in especially designed racks for variable periods of time.

The temporary storage of spent fuel may be carried out using different technologies (under both wet and dry conditions), either in facilities linked to the operating plants themselves or independently at other nuclear facilities. There is favourable experience accumulated over more than 50 years of the storage of irradiated fuel under wet conditions at the plants, and more than 25 and 35 years of experience of storage under dry conditions of fuel from power reactors and research reactors, respectively.

The world's largest spent fuel storage installations are the reception pools of the reprocessing plants at La Hague (France), Sellafield (Great Britain), Mayak-Chelyabinnsk (Russian Federation) and Rokkasho (Japan). These same complexes include large temporary storage installations for the different types of radioactive waste resulting from this treatment.

In practically all the countries with commercial NPP's there are different spent fuel and high level waste storage facilities additional to the pools included in the initial design of the reactors. Among the most significant of the centralised installations is the CLAB, in Sweden, which houses all the irradiated fuel from the country's 12 nuclear groups in an underground pool, HABOG in Holland, ZWILAG in Switzerland and the silos of the reprocessing plants, all using different technologies for dry storage on the surface (see table 2).

As regards long-term management, it should be pointed out that although there is wide agreement internationally in relation to the deep geological disposal option, there is at present no facility of this type in the world for SF/HLW. Within the general situation of delay, the countries that have most progressed in this respect might be Finland and the United States, inasmuch as they have a site in the characterisation phase, the most favourable forecasts as regards the initiation of their operation being around the year 2020 and some time after the year 2010, respectively. Countries such as Sweden and France also have developed programmes but without a site having been selected (only laboratories) and with distant perspectives as regards the start-up of the facilities. In Great Britain a process of political and social debate on this issue is under way. Other examples outside the EU, such as Japan or Canada, are still far from reaching the situation of those mentioned above.

Despite the problems of public acceptance that they entail, the option of shared solutions, either through multi-national or regional repositories, warrants increasing attention, especially by countries with small nuclear programmes or not having suitable geological formations.

As regards other definitive management options, such as the separation and transmutation of long-lived radionuclides in order to reduce the volume and radiotoxicity of the wastes, their degree of development is still in too early a stage for them to be considered

Table 2. Centralised temporary SF/HLW storage facilities

Country	Installation	Technology	Storage
Germany	Ahaus	Metallic casks	SF
	Gorleben	Metallic casks	SF and Glass
Belgium	Dessel	Vault	Glass
United States	PFS*	Metal-concrete casks	SF
Russian Fed.	Mayak**	Pool	SF
	Krasnoyarsk**	Pool	SF
France	La Hague**	Pool	SF
	La Hague**	Vault	Glass
	CASCAD	Vault	Glass
Holland	HABOG	Vault	SF and Glass
Great Britain	Sellafield**	Pool	SF
	Sellafield**	Vault	Glass
Sweden	CLAB	Pool	SF
Switzerland	ZWILAG	Metallic casks	SF and Glass

* In the coordination phase.
** Included in the reprocessing complexes themselves

relevant at this time and, furthermore, they would not remove the ultimate need to dispose of a significant amount of waste.

In any case, these definitive management options will require the assignment of resources proportional to the development of the national strategy in this field and will need to be the subject of adequate tracking through participation in the corresponding international programmes.

Analysis of the national situation

Spain initially opted for the reprocessing of the spent fuel from the Vandellós I, José Cabrera and Santa Mª de Garoña nuclear power plants. This practice was stopped in 1982, except in the case of the first of these plants, which ceased to operate in 1989 and whose fuel had to be processed in its entirety for technical reasons. As a result of the commitments deriving from the different reprocessing contracts, various intermediate and high level wastes resulting from reprocessing of the fuel from Vandellós I NPP at the COGEMA installations in France and the energy-containing materials (uranium and plutonium) recovered during the reprocessing of fuel from the Santa

Mª de Garoña plant at-the BNFL facilities in Great Britain will be returned to Spain.

All these materials are currently in storage in France (wastes from Vandellós I NPP) and in Great Britain (materials Santa Mª de Garoña NPP). In the first of these cases, the contractual commitments contemplate the return of the materials to Spain between 2010 and 2015, with heavy economic sanctions if the first transport operation, of high level vitrified wastes, does not take place before 31st December 2010. In the second case, the current storage contracts cover up to the year 2011 for U and up to 2008 for Pu, materials for which attempts would be made to find solutions other than storage.

With the exceptions described above, all the SF from the light water plants that has been generated by the Spanish nuclear power plants is currently stored in the corresponding plant pools. Throughout the 1990's, and in view of the foreseen saturation of these pools, the original storage racks were progressively replaced with other more compact units. In most cases this has made it possible to significantly defer the need for the Spanish system to have an SF storage capacity additional to that provided by the pools.

A unique case is Trillo NPP at which, despite reracking and because of characteristics intrinsic to the design of the plant, the storage capacity would run out in 2003 (retaining the capacity to completely unload the core). The solution adopted in this case was the increase the capacity to store the SF using metallic casks housed in a storage facility on the plant site, which has been in operation since 2002. As of the end of 2005, there were 98.3 tU stored in 10 metallic casks (DPT) designed, licensed and constructed in Spain, these being approved also for spent fuel transport.

Over the next few years the additional SF temporary storage requirements will be dictated by José Cabrera NPP (unloading of 100 tU to a temporary storage facility to allow for the initiation of the dismantling of this plant around 2009) and by the saturation of the pools at different plants (Ascó and Cofrentes) that will take place as from the end of the present decade.

Cabrera NPP (unloading of 100 tU to a temporary storage facility to allow for the initiation of the dismantling of this plant around 2009) and by the saturation of the pools at different plants (Ascó and Cofrentes) that will take place as from the end of the present decade.

As regards wastes other than SF whose disposal is not foreseen for the El Cabril facility, these are normally stored temporarily at the production installations themselves, and even at installations abroad (aforementioned NPP reprocessing wastes).

Specifically, in the forthcoming years Spain will have to manage the aforementioned high and intermediate level wastes arising from the reprocessing of the fuel from Vandellós I NPP, wastes from the dismantling of José Cabrera NPP and other nuclear facilities, minor volumes of wastes generated outside the installations or activities involved in the nuclear fuel cycle and those that may have been generated in non-regulated situations or activities.

From what has been said above it may be concluded that in the next few years it will be necessary to have available sufficient temporary storage capacity, most of these needs converging on the period 2009 – 2014.

With regard to definitive management, it should be pointed out that in Spain work has been on-going since 1985 on the deep geological disposal option, in 4 basic areas:

- Site Selection Plan (SSP), which was paralysed in 1996 and that has provided sufficient information to ensure the existence in the Spanish sub-soil of an abundance of granite and clay, and to a lesser extent saline, formations capable of housing a definitive disposal installation, these being widely distributed geographically.
- Performance of conceptual designs for a definitive disposal facility in each of the aforementioned lithologies, searching for the maximum convergence (points in common) between them.
- Performance of Safety Assessment exercises with respect to the conceptual designs, integrating the know-how achieved through the works and projects performed on the basis of the successive R&D Plans, these underlining the fact that deep geological disposal facilities allow the safety and quality criteria applicable to this type of installations to be met.
- The R&D Plans that have evolved and adapted to the Spanish SF/HLW management programme. These plans have allowed technical knowledge to be acquired and national working

teams to be trained in the development of the definitive disposal option, participating in international research projects and in demonstration projects in overseas underground laboratories.

Important efforts have been made in recent years in researching the separation and transmutation (S+T) option in its different versions, although the scope of these programmes and the absence of installations in the country suitable for the development of the specific research programmes required, mean that participation in the international context is essential. Especially outstanding in this respect are the EC Framework Programmes, with projects aimed at demonstrating actual feasibility and the programmes of the NEA/OECD.

Strategic lines of action

The basic Spanish strategy in this field focuses on the temporary storage of spent fuel and HLW on the basis of a dry storage system guaranteeing the safety and protection of people and the environment over the time periods required for their definitive or very long term management.

Specifically, the solution proposed, in view of the analyses performed from the technical, strategic and economical points of view, is based on the availability of a vault type Centralised Temporary Storage (CTS) facility by around 2010, the operating period of which would be some 60 years. From the point of view of economic calculation and planning, it has been assumed that a definitive disposal facility could be put into operation around the year 2050, which would house this spent fuel, the HLW and those other intermediate activity wastes that cannot be sent to the El Cabril facility.

Consequently, the CTS facility is the basic priority objective for the coming years; its implementation would provide the Spanish system with the necessary solidity and with sufficient time to adopt, when appropriate, the most adequate decisions regarding the definitive management of SF and HLW on the basis of the experience gleaned in the country and the evolution of this issue in other countries across the world.

The suitability of a strategy based on a CTS facility, which was presented to the Government by a unanimous resolution of the Congressional Commission for Industry – made up of representatives of

all the Parliamentary Groups - in December 2004, is supported by the following considerations:

- ➜ It allows management to be addressed under optimal conditions and in a unified manner for all SF, HLW and ILW, while allowing temporary management to be carried out independent of definitive management.
- ➜ It provides the Spanish management system with a capacity to manoeuvre in the event of whatever possible unforeseen circumstances might arise in the future, such as the need to dismantle one of the plants prematurely.
- ➜ A CTS facility reduces the number of SF, HLW and ILW storage installations in the country, and consequently the number of nuclear sites distributed around the national territory, with the subsequent reduction of the risks and burdens associated with this type of installations. This reduction would be more significant with time, and is particularly important in relation to the security of the facilities.
- ➜ It allows for the release of the sites of the decommissioned nuclear facilities for other uses, without restrictions.
- ➜ It allows for compliance with the clauses on the repatriation of wastes and materials arising from the reprocessing abroad of SF.
- ➜ From the point of view of economics, a CTS facility would imply a very significant reduction in the cost of the overall HLW and ILW system, compared to the option of storing the waste at each plant and in the other temporary storage installations required.
- ➜ It allows for the rationalisation and optimisation of operation and of the corresponding support services.

The site for the facility does not require any special characteristics, as a result of which the detailed design of the installation may be adapted to a large number of potential sites around the country.

The facility would be of the vault type and would be modular in nature, equipped with a hot cell for the reception and conditioning of the spent fuel and other waste. This would in turn allow the facility to function as both a storage installation and as a technology and research centre in the area of radioactive waste management.

One of the main impacts of the CTS facility would be that resulting from the transport operations to be carried out (approxi-

mately 2 to 3 expeditions a month), although it is estimated that this might be appreciably mitigated through the presence, or construction where appropriate, of a rail access to the site.

However, the availability of a CTS facility before the year 2011 requires the setting up of information and participation mechanisms facilitating the political and social consensus required for decisions on its location. This GRWP considers that the process of debates and decision-making should not extend beyond 2006, since if it were left for later, projects would need to be developed and alternative solutions implemented as the current capacities became saturated, with the necessary quantities needing to be stored "in situ" pending the availability of the CTS facility, thus increasing the cost of the overall management system.

In this respect, ENRESA will need to undertake the following actions in the short to medium term:

- Establishment of the design basis for the facility and approval for the generic design of a CTS facility from the Competent Authorities.
- Consolidation and application of a methodology for the search for existing and possible solutions to projects involving difficulties in achieving social acceptance, adapted to the characteristics of the CTS facility, which should lead to the achievement of a socially acceptable site fully contributing to the success of the project and its future long-term governability.
- Development of the detailed design, licensing, construction and start-up of the CTS facility within the terms established.

Likewise, alternatives have been foreseen through individualised storage solutions that might be required.

In relation to final management, and in the light of the new timeframe, which would set back by 15 years the forecasts of the 5th GRWP, as regards economic calculations and planning, the activities contemplated in previous plans will be significantly reduced, these being limited fundamentally to consolidation and updating of the knowledge acquired, taking advantage of international developments in the field. In this respect, the activities for the forthcoming years will be as follows:

- Documents will be drawn up summarising the information acquired to date, with site selection activities not being resumed.
- The generic designs for each host rock will be consolidated.
- The corresponding safety assessment exercises will be revised and updated on the basis of progress made in R&D programmes, in keeping with the revised designs and international projects.

In parallel to the above, work will continue in the analysis and knowledge of other technologies, such as the separation-transmutation commented on above, in close collaboration with the international progress and projects addressed in this field, with a dimension and scope in keeping with the research capacities existing in the country.

In order to be able to undertake the necessary initiatives to support the future process of decision-making, over the next few years ENRESA will submit the following reports to the MITYC:

- Report on management options contemplating the different alternatives considered at international level and their adaptation to the Spanish case, including a programme for the development of each of the options.
- Report on the feasibility of new technologies, in particular the possibilities for separation and transmutation.
- Basic Generic Projects summarising the knowledge acquired in relation to definitive disposal.

Likewise, and with a view to being able to analyse the possible processes of coordination and potential mechanisms for public participation facilitating the necessary debate in society, ENRESA will draw up a report including the experiences of decision-making processes in relation to SF and HLW management in countries having similar problems to Spain. This report will include the legislative initiatives, site assignment procedures and methods for participation by the different stakeholders in the project, as well as the current situation of the respective programmes.

This information will serve as a basis for the analysis and formulation of possible parliamentary initiatives that might facilitate the decision-making process and the definition of a more adequate framework for participation.

In parallel with the above, R&D activities will be mapped out and developed in accordance with the premises, criteria and objectives indicated in Section C.V of this Plan.

Decommissioning of facilities

General considerations and international panorama

According to the most widespread definition, the term "decommissioning" encompasses the set of technical and administrative activities to be carried out at the end of the service lifetime of a regulated facility in order to remove all (or some) of the regulatory controls. Consequently, it includes activities relating to decontamination, dismantling, the removal of radioactive materials and waste and components and structures and the "release" of the site for other uses. "Decommissioning" would be the formal recognition of the new administrative and legal status of the facility.

The decommissioning of regulated facilities is another step, the last, in their lifetime, and in general is also included within the scope of the specific applicable regulations.

Especially significant, as regards LILW management, within the regulated facilities are those relating to the "fuel cycle", and in particular the NPP's and the irradiated fuel reprocessing plants (non-existent in Spain), since their dismantling implies the generation of very significant quantities of this type of radioactive waste.

The dismantling of nuclear fuel cycle facilities is an activity that is in a phase of clear growth in many countries, and this growth will continue over the next two decades. The world's operating NPP's are around 20 years old on average and, assuming a service lifetime of 40 years, this means that the number of reactors in the dismantling phase will increase rapidly as from the year 2010, reaching a maximum around 2015 and remaining at this level until 2025. However, the appearance and duration of this peak will vary from one country to the next, due fundamentally to the different nuclear programmes adopted.

The experience already accumulated indicates that the technical activities required for the dismantling and decommissioning of these facilities, including the NPP's, may be carried out on an industrial scale and within the most demanding parameters of quality and safety.

The basic national approaches for the performance of such activities also vary from one country to the next, as a result of the

different circumstances of each regarding a series of relevant aspects, such as the availability of sources of financing, the resulting waste management capacities, decisions regarding site usage, energy strategies, etc. The current trend at world level as it affects the NPP's is towards full and early dismantling, but not in all cases. For other facilities the national approaches tend to be more specific, although there is also a general trend towards not excessively delaying decommissioning activities once the end of the their service lifetime has been reached.

As regards the activities undertaken by the international organisations in the dismantling of nuclear facilities, it should be pointed out that this is an area that has become progressively more important in recent years and that has materialised through new initiatives within the framework of the IAEA, NEA/OECD and the EU.

The international experience acquired in the dismantling of NPP's may be summarised as follows:

- A large number of full commercial reactor dismantling projects are now in the execution phase.
- The technologies and methods required to address the dismantling of any component or zone of a nuclear power plant are now available and have been satisfactorily proven through a number of projects.
- The strategies are influenced in each case by specific conditions (country – plant – owner- site). In the case of plants not sharing their site with other groups, the trend towards complete dismantling in the short term is much greater than in the case of those that do share it.

Spain has an important international presence in this field, based on the significant amount of experience that has been acquired in recent years, including that corresponding to the dismantling of Vandellós I NPP.

Analysis of the national situation

In Spain there is currently a system for the performance of activities leading to the decommissioning of regulated facilities, and the agents who are to intervene in the process are clearly defined.

The operating mode of the system includes: a) the general framework for actions; b) the legal framework; c) the role of the different agents, and d) the basic conditions of safety and operability to be fulfilled and guaranteed in its application, including the financing mechanisms. The licensees of regulated facilities generating radioactive waste are required to have in place the capacities necessary for the management of such waste, and this they may achieve through contracts with ENRESA, the scope of which has to include up to dismantling in the case of the NPP's and, where appropriate, of radioactive facilities.

A relevant element, in a sense different from the situation existing in other countries, is that ENRESA has direct responsibilities assigned to it in the decommissioning of certain of these facilities, and this is included in the applicable standards.

In the case of the NPP's, the responsibility for such dismantling corresponds directly to ENRESA, and this is established in the contract between the Parties, which is complemented by the necessary operating agreements. Also completely defined by the authorities and fully operative are the financing mechanisms inherent to the process.

In the case of Uranium concentrates mining and milling, the responsibility is to the Licensee, unless otherwise determined by the authorities in view of the circumstances, as has been the case for the "historic" facilities.

The responsibility for dismantling of the Juzbado fuel assembly manufacturing facility is to ENRESA, this being established in the corresponding contract. This contract also establishes the mechanism for annual contributions to the fund throughout the operating lifetime of the installation to cover the foreseen costs of dismantling.

In the case of CIEMAT, the responsibility is to the Licensee, the technical and financial aspects of ENRESA's participation having been set out.

The contract between the RF's and ENRESA for the management of the radioactive wastes generated by these facilities allows the Licensees to reach agreements with ENRESA regarding performance and ways to cover the associated costs, although it should be pointed out that the decommissioning of this type of installations does not normally imply any special difficulties once the last operating wastes have been removed.

Also to be underlined is the fact that the current standards contemplate the basic aspects of the regulatory process governing projects for the dismantling and decommissioning of regulated facilities, and that they recognise the need to plan dismantling from the initial stages of the design of these installations.

The dismantling of large facilities produces significant quantities of waste materials containing radioactivity, mainly LILW, which in the case of Spain may be managed at El Cabril, often as VLLW. NPP dismantling and decommissioning activities may be seriously hampered (or even rendered impossible) depending on the availability or otherwise of a sufficient capacity for management of the spent fuel. Likewise, the decommissioning of these facilities, and of other relevant fuel cycle installations, even certain specific RF's, leads to the generation of moderate (but appreciable) quantities of radioactive waste that, in the Spanish case, require specific temporary storage installations, such as the CTS facility.

In recent years a considerable amount of experience has been acquired in this field in Spain, including the performance of various projects, among which the dismantling of Vandellós I NPP is particularly outstanding for its scope and relevance. This has placed Spain among the group of countries that have overall experience in this area. The performance of this project within the established timeframe and to the required scope has been possible thanks to the existence in the country of an infrastructure sufficient to guarantee the financing of the costs, the application of the necessary technologies and the adequate management of the wastes generated.

The experience described above has allowed for the development of a set of capabilities of different types that are now completely available. Linked to the above is the development and availability of generic and specific tools for the management and optimisation of dismantling activities, and of databases on actual experiences. All this experience will now be applied to the different projects to be carried out in the near future, such as: a) the dismantling and decommissioning of José Cabrera NPP; b) the dismantling of various CIEMAT facilities (PIMIC); and c) the dismantling of installations and definitive restoration of the mining works at Saelices El Chico and other disused uranium mines.

Strategic courses of action

In view of the experience accumulated in recent years, the basic approach for future ENRESA activities in this area, fundamentally with respect to the nuclear power plants, consists of the following:

- Maintain cooperation with the Authorities in whatever standards-related or other developments they wish to undertake. Special attention should be given to the transition from the operating stage and to incorporation of the necessary degree of flexibility in the mandatory documents and the licensing process during project performance, in order to take into account the changing reality of the facility as the project progresses.
- Continue to perform the necessary generic studies on the dismantling of NPP's of the type installed in Spain (1,000 MWe PWR and BWR) in order to optimise future specific projects and obtain a better estimate of the costs and wastes generated.
- Maintain coordination and cooperation between the operating agents (Licensees and ENRESA), for better development of the basic national strategy defined, which consists of total dismantling to be initiated three years after definitive shutdown, unloading of the fuel and removal of operating LILW.

  As regards Vandellós I NPP, and with Level 2 dismantling having been completed, this plant becomes a passive installation that will remain in this situation, under the responsibility of ENRESA, throughout the dormancy period (initially estimated at 25 years), until such time as total dismantling is undertaken, partial release of the site being possible during this intermediary period.
- Design and address the dismantling of José Cabrera NPP, which definitively ceased to operate on 30/04/06, taking advantage of the experience acquired from Vandellós I.

  The alternative of complete and immediate dismantling has been chosen for this project, releasing practically all the site and thus allowing it to be used without restrictions.
- Participate with the Licensee in dismantling and environmental restoration activities at Saelices el Chico and other mines belonging to ENUSA, using the previous accumulated experience.

- Maintain the necessary support to CIEMAT, the Universities and the RF's in the necessary dismantling activities, contributing with the accumulated experience.
- Maintain efforts in optimisation of the practical process of "clearance" of waste materials with minimum radioactive contents.
- Maintain lines of activity and cooperation for the future dismantling of the Juzbado nuclear fuel manufacturing facility.
- Satisfy whatever approaches are decided on by the Authorities for long-term institutional surveillance.
- Maintain a presence in suitable international forums, with preferential attention to the NEA and the EU, in the generic aspects of mapping out and making arrangements for these projects.
- Promote national developments in order to take advantage of the experience acquired for future actions, while consolidating current know-how. For this purpose, the "Mestral" Technology Centre has been set up at the site of Vandellós I.

Other actions

Quite apart from what has been commented on above, in Spain it is necessary to carry out a series of actions that, in view of their special nature, are described independently in this section.

- PROTOCOL ON COLLABORATION IN THE RADIOLOGICAL SURVEILLANCE OF METALLIC MATERIALS

  In 1998 an incident occurred at a steelyard in the province of Cádiz, this consisting of the smelting of a high activity radioactive source of Cs-137 that had been included in a batch of metallic scrap used in the process. The event did not have any appreciable affects on people or the environment but did imply operating problems for the factory, high costs to cover all the subsequent cleaning and recovery tasks, and a very appreciable volume of LILW/VLLW.

  As a result of this incident, the national Authorities promoted initiatives to prevent the repetition of this type of events and to mitigate their effects were they to occur. The first result was the signing in November 1999 of a "Protocol" for voluntary collaboration between the agents involved in one way or another in this issue. Subsequently, other industrial associ-

ations and trade unions involved in the metal industry have joined this Protocol.

Since the signing of the Protocol there have been a significant number of events of varying scope involving the detection of radioactive material in or accompanying such metallic materials, and ENRESA has undertaken their removal and management.

As a result of the aforementioned incident, ENRESA has removed some 2,500 m^3 of radioactive wastes, which have been sent to the El Cabril facility.

➜ Support for emergency response

One of the tasks assigned to ENRESA by the regulations is that of providing support for the competent Authorities, in the manner established, in the event of a radiological emergency. The scope of this support is defined at a very basic level in certain national plans and programmes, such as the PLABEN, and should be mapped out for other circumstances and assumptions, such as those that would arise in the case of other emergency situations not due to an event at an NPP and that might occur in any area of the country. In any case, ENRESA would intervene in response to requests from the competent Authorities, and specifically within the framework of the PLABEN, as a member of the "Radiological Response Group" directed by the CSN.

In order to be able to fulfil the tasks assigned to it, ENRESA has developed a series of operating capabilities complementary to those normally pertaining to it.

➜ Management of radioactive lightning rod headers

In their day the national Authorities established a standard that made it obligatory to formalise the existence of this type of apparatus, in accordance with the specific regulations governing radioactive issues, or to have ENRESA remove them as radioactive waste.

In recent years ENRESA has been removing and managing these headers, and the radioactive sources they contain, exporting them for recycling. The process may now be considered to be complete to all practical and formal effects. Nevertheless,

the operating capacity required to respond to lightning rods of this type being discovered in the future is maintained.

No incidents worthy of mention have occurred during this process.

Management of ion smoke detectors (ISD's)

This type of detector incorporates a small radioactive source and its commercialisation (not use) is regulated. The use of this type of detectors is very widespread and there are several million installed throughout the national territory.

Up to February 2005, there were in principle two ways in which these detectors could be managed: delivery to ENRESA as a radioactive waste or definitive management via conventional routes, as long as the apparatus fulfilled a series of requirements regarding manufacturing and use. Since that date a new procedure has been put in place for the definitive management of ISD's at the end of their service lifetime, inasmuch as they are "electrical and electronic devices" (RD 208/2005 on electrical and electronic apparatus and the management of their wastes).

By virtue of the above, as from 2005 the manufacturers and suppliers, along with the local entities, as established in the standards, are responsible for setting up and financing systems to ensure the management of the radioactive sources that such devices incorporate, which are to be handed over to ENRESA.

ENRESA is currently preparing a new Action Plan, in close contact with the Authorities, taking into account the provisions of the aforementioned RD 208/2005.

Management of other radioactive materials arising outside the regulatory system

In addition to the specific cases described in the previous sections, the national system has established two basic mechanisms for the removal and safe management of any radioactive material arising beyond the scope of regulatory control. The Authorities implement these mechanisms through the issuing of "Intervention orders" or "Transfer resolutions", involving ENRESA as appropriate in each case. Especially relevant in this

respect is Royal Decree 229/2006 on the control of high level encapsulated radioactive sources and stray sources.

ENRESA has undertaken a limited number of actions in response to "Intervention orders", these having included the removal and management of radioactive sources for medical applications, used during the first half of the 20th century, and certain cases of companies commercialising consumer goods that had been confiscated by the Administration and others involving regulated installations of other types whose Licensees could not be located.

Interventions relating to "Transfer Resolutions" are more common and refer essentially to sources and other radioactive materials existing at installations (regulated or otherwise) as a result of activities performed some time ago and not originally following the established procedures or doing so inadequately.

The type of radioactive sources and materials that are removed via these mechanisms are varied and the volumes are not generally significant.

Research and Development

General considerations and international situation

R&D is one of the basic elements in the generation of the know-how and technologies required to guarantee the safety and feasibility of the different stages of radioactive waste management, thereby playing a relevant role in this management.

Like most countries that generate radioactive waste, Spain has developed systematic R&D programmes applied to both the different types of waste and the activities involved in the dismantling of nuclear facilities, environmental restoration and radiation protection. The efforts dedicated to such activities focus both nationally and internationally on those areas and activities for which industrial solutions have not yet been implemented, without forgetting the optimisation and on-going improvement of the safety and operability of the operating facilities through the incorporation of the technological and scientific progress made.

At international level there is close collaboration in the field of R&D, both through the EU Framework Programmes – and specifically within EURATOM – and through bilateral or multinational agreements.

As regards high level waste, the European R&D programmes centre on Deep Geological Disposal as the definitive solution, regardless of whether or not there might be a reuse or re-elaboration of the fuel prior to such definitive management, or even with specific considerations regarding the feasibility and application of transmutation techniques, aspects that also carry with them important R&D programmes, both specific in certain countries and within the EU Framework Programmes.

In relation to disposal, the "underground laboratories" are currently the main centres generating knowledge and verification of technologies and methodologies for full-scale demonstration of the feasibility of constructing and operating a repository as the final solution and of the safety of such a facility.

As regards separation and transmutation, important R&D efforts are being made, led by the countries that have fuel reprocessing capabilities, to obtain the basic data and technologies for the development of a prototype allowing the technical, industrial and economic feasibility of these systems to be analysed in relation to energy generation, along with their impact on radioactive waste management (reduction of the toxicity of radioactive waste).

R&D in the management of LILW, dismantling, radiation protection and environmental restoration is oriented internationally towards optimisation of technologies for the characterisation of the radioactive inventory of the wastes to be managed (waste packages), the durability of confinement systems, the improvement and optimisation of monitoring systems, waste volume reduction, the optimisation of decontamination and cutting techniques for materials to be dismantled, etc. In this field there is widespread collaboration and interconnection between the different programmes, with a view to sharing experiences and generating a common database, especially in the case of NPP dismantling.

Analysis of the national situation

The R&D carried out in Spain has promoted active participation in international programmes in all areas of management, although, given the initial shortcomings, the greatest efforts have been made in relation to the management of HLW and also to those projects whose results are immediately applicable in ENRESA's on-going activities (LILW management and dismantling).

Since 1986, radioactive waste management in Spain has been accompanied by five-year R&D programmes. The fifth plan is currently in force, covering the period 2004-2008. The main objectives of and resources assigned to these plans have been the result of the strategies established in the different GRWP's.

At present, and as a result of the R&D performed, there is an important scientific and technological infrastructure that ensures the availability of many of the capabilities and technologies required for management. These capabilities include both scientific groups and the analytical and numerical infrastructure developed, as well as the methodological experience acquired.

Taking into account the level of the technology and the experience and capabilities acquired, and considering also that in the current spent fuel and HLW management strategy temporary storage is ENRESA's main short-term priority, that geological disposal is not an urgent requirement and that important activities are foreseen in the fields of VLLW management and the dismantling of nuclear facilities, R&D should be oriented and developed such that:

- ➜ It provides systematic and preferential support for activities relating to temporary storage, dismantling and the management of VLLW and LILW.
- ➜ It includes an area of direct support for CTS, limiting activities relating to the definitive management of SF/HLW to the consolidation and updating of the knowledge acquired, in keeping with international developments.
- ➜ It ensures the maintenance and updating of capabilities and know-how associated with the characterisation of the behaviour of HLW (fundamentally spent fuel) and the isotopes it contains, as well as with the separation and transmutation of high level waste in support of the short and long-term management of irradiated fuel.

These activities should be performed maintaining a level of investment similar to today's and also maintaining international collaboration, all of this adapted to the new timeframe for the performance of ENRESA's management activities.

In conclusion, the development of technological capabilities and know-how has undergone a significant increase in Spain, in many fields achieving a similar level to that of the most advanced countries in the nuclear field. Nevertheless, the continuation of the R&D is and will be a necessity, albeit with different objectives, until such time as the management facilities are in operation.

Foreseen actions

The R&D activities for the next five years should provide support and coverage for the following:

- The drawing up and/or revision of management strategies for the different types of radioactive wastes, based on better understanding of such wastes, the matrixes they contain and the physical, chemical, environmental and radiological properties of the isotopes they contain.
- Support for the detailed design, licensing and construction of temporary storage facilities and their operational and environmental surveillance, with special attention paid to CTS.
- The drawing up of long-term management options for high level waste, which will be reflected in strategic documents and integrate all the progress made at both national and international level.
- Participation in the EU EURATOM programme in areas of interest for the Spanish management programme.
- Continuation of the lines of improvement regarding environmental restoration technologies and the environmental monitoring of sites housing facilities both installations for LILW/VLLW and the CTS facility.
- In the case of LILW, improvement of the knowledge of the durability of concretes, volume reduction technology implementation tests and the characterisation of waste packages for the integral modelling of the operation of the disposal facility.
- Design, construction and licensing of the layers covering the disposal platforms at the El Cabril facility.
- Optimisation and improvement of the management of the scientific and technological assets generated by R&D, such that there is assurance of the immediate availability of these

assets when required and their suitable transfer to the new objectives of the R&D.

- Development of the technological and methodological bases for the dismantling of nuclear facilities, taking advantage of the experience acquired in the dismantling of Vandellós I NPP and applying it to José Cabrera NPP or to other installations at which interventions were necessary.
- The research and initial and on-going training activities to be carried out at the Mestral TC, on the site of Vandellós I.
- Tracking at international level of the management modes for specific materials, such as graphite.

D
Economic and financial aspects

The objective of this part of the document is to evaluate the costs of management, in keeping with the scenario, strategies and programmes dealt with in the previous chapters, and to calculate the revenues required for their financing depending on the legally established systems, as shown in the schematic representation of methodologies in figure 12.

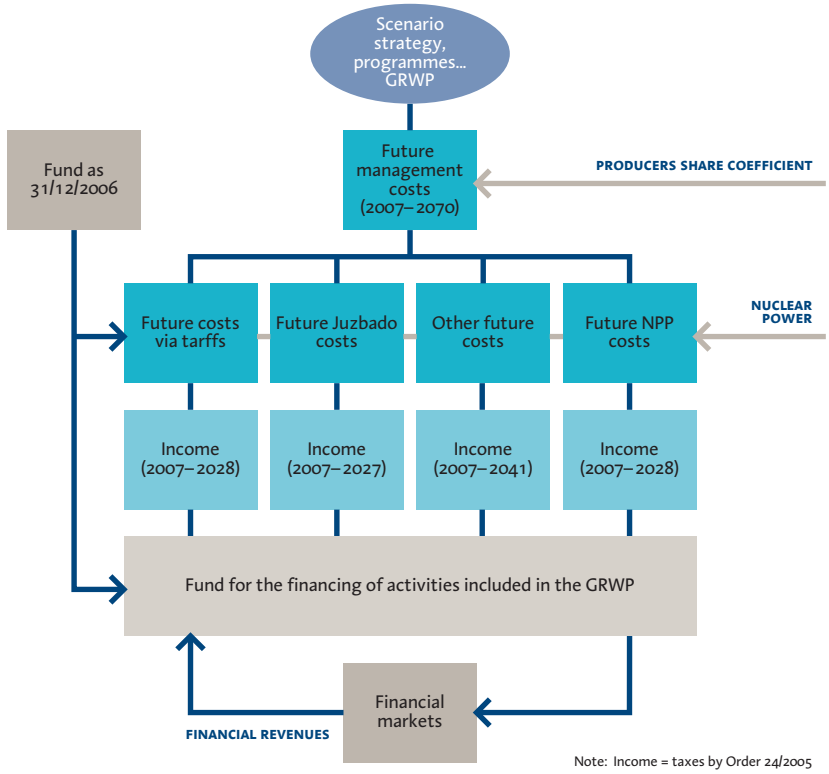
In this respect, this GRWP contemplates 2 main periods of management:

- the historical period, from the origins in 1985 to the year 2006, with 31st March 2005 being a particularly important date, since it was when a new system for the financing for the NPP's, to be described below, was established, and
- the future, from 2007 to the end of the management period, around the year 2070.

The historic period is summarised with the value of the Fund as of 31st/12/06, which for the purposes of planning amounts to 1,835 M€, as a result of the difference between revenues and costs incurred up to that date.

The future management period constitutes the starting point for economic calculations, in keeping with the new financing system established.

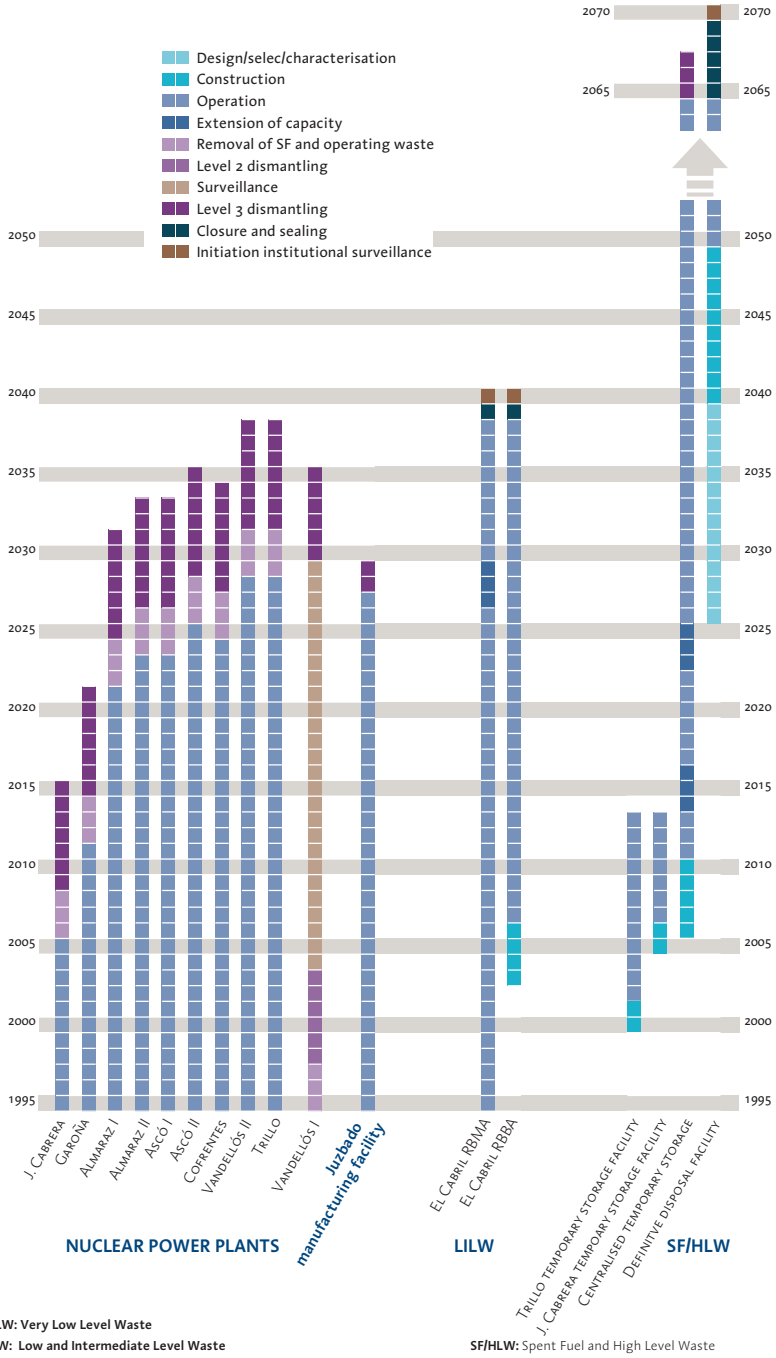
Figure 12. Schematic representation of financing of activities included in the GRWP



The basis used for the determination of future management costs consists of the best data available at present for each of the major areas of activity into which they have been broken down (LILW, spent fuel and HLW, decommissioning of facilities, R&D, structural and others).

Figure 13 shows the general schedule for the management of spent fuel and radioactive waste deriving from the basic planning scenario (see part B). In this schedule may be seen the main dates and milestones relating to the operation, decommissioning and dismantling of the nuclear power plants and the Juzbado fuel assembly manufacturing facility, as well as those relating to the construction, operation, closure and sealing of the LILW disposal installations and those corresponding to the temporary storage and disposal of SF and HLW.

Figure 13. General spent fuel and radioactive waste management schedule



VLLW: Very Low Level Waste
LILW: Low and Intermediate Level Waste
SF/HLW: Spent Fuel and High Level Waste

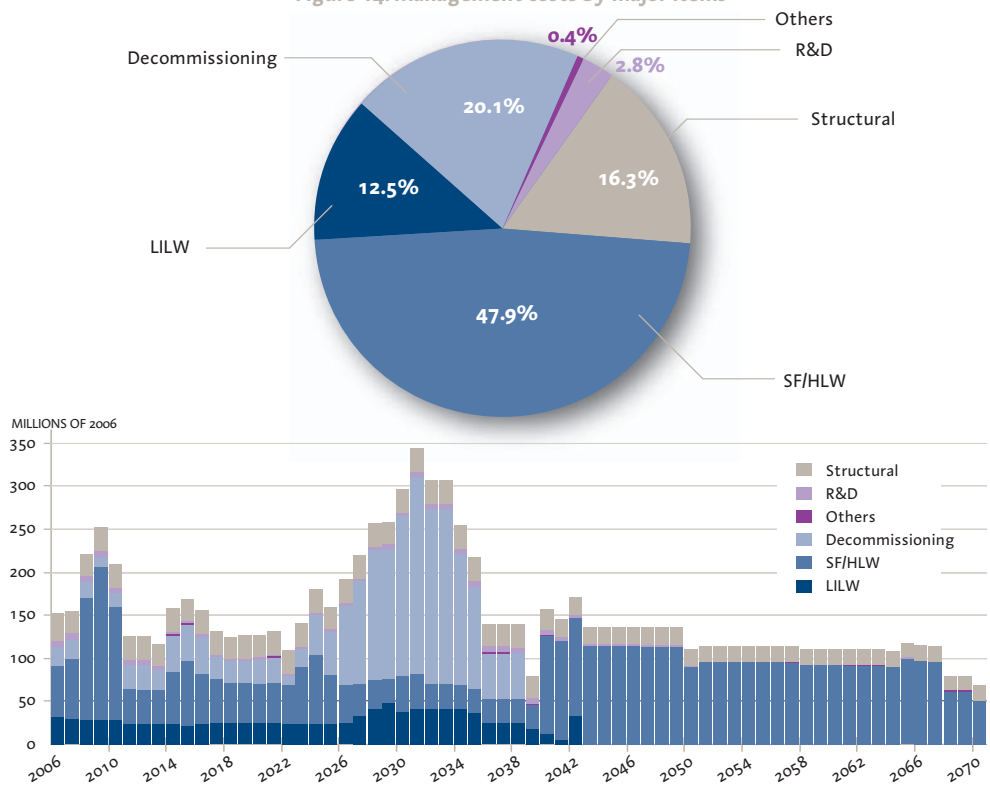
In accordance with the above, the total cost of management amounts to 13,023 M€, of which 48% would correspond to SF/HLW, 20% to dismantling and decommissioning of the facilities, 12% to LILW, 3% to R&D, 16% structural and the remaining 1% to other activities (see figure 14).

The costs actually incurred to the end of 2005 is approximately a quarter of the total; the future cost foreseen as from the year 2007 is 9,734 M€, the value updated as of 01/01/07, with a discount rate of 1.5%, being 6,513 M€.

Cost of management

In the costs relating to the management of SF/HLW, alternative solutions have been contemplated as contingencies, making it possible to fulfil the commitments deriving from the contracts for the

Figure 14. Management costs by major items



return of reprocessing substances, ensure the continued operation of those plants whose pools are close to saturation and address tasks relating to the dismantling of these plants following definitive shutdown, until the CTS facility is fully available.

Once the future costs of management have been determined, with the corresponding detailed breakdown by items, they are grouped into four different sets in keeping with the financing systems established for each, these being by electricity tariffs, nuclear power plants, the Juzbado fuel assembly manufacturing facility and other installations, which include the following services:

- Electricity tariffs

  Management of the radioactive waste and spent fuel generated at the nuclear power plants and dismantling and decommissioning of the latter, attributable to operation of the plants prior to 1st April 2005, as well as the management of radioactive waste from research activities directly related to the generation of electricity by nuclear means and the dismantling and decommissioning operations to be performed as a result of uranium mining and milling prior to 4th July 1984.

- Nuclear power plants

  Management of the radioactive waste and spent fuel generated at the nuclear power plants and dismantling and decommissioning of the latter, attributable to operation of the plants after 1st April 2005, these being those associated with the management of the radioactive waste introduced in the plant storage facility following that date, those associated with management of the spent fuel arising from the new fuel loaded into the reactor during refuelling outages finishing after that date, and the proportional part of dismantling and decommissioning corresponding to the remaining plant operation period as of that date.

- Juzbado fuel assembly manufacturing facility

  Management of radioactive waste arising as a result of the manufacturing of fuel assemblies, including the dismantling of the manufacturing installations.

→ Management of radioactive waste generated at other installations

Breaking these future (2007-2070) costs down into these 4 groups requires the application to the different cost items of certain share coefficients related to the historic and future productions of the different generators and types of wastes (LILW, VLLW, ILW), spent fuel and the service lifetimes of the nuclear power plants, taking 31/03/2005 as the reference date.

Table 3 summarises the results obtained along with the corresponding updated values of these future costs and the amounts pending collection as from 01/01/07, following discounting of the fund applied to each.

Once the four aforementioned groups of future costs have been broken down, the revenues required in each case for their financing are calculated, depending on the resulting amounts and the collection period established. A discount rate of 1.5% is used for these calculations.

On the basis of the above, and taking into account that the Fund existing as of 31/03/2005 cannot be used for the financing of the internalised costs of the nuclear power plants, the current value of the necessary income to be collected via the electricity tariffs is 2,704 M€.

On the basis of the estimated value of this type of income for the year 2006 (40 M€), resulting from application of the percentages to the tariffs and tolls established for that year by Royal Decree (0.210% and 0.601%, respectively), and assuming linear annual increases up to the year 2028, the amount to be collected in this manner for the year 2007 would be 49.65 M€2006.

Table 3. Share of future costs depending on the financing system

Millions of €06

Item	Electricity tariffs	NPP	Juzbado	Other installations	Total
Future management costs (2007-2070)	6,340	3,350	16	28	9,734
Update value as of 01/01/07	4,339	2,138	12	24	6,513
Pending collection	2,704	1,939	11	24	4,678

For the purposes of VAT, ENRESA will issue monthly invoices to the licensees operating the NPP's, sharing the total revenues for the month by this route depending on the installed power of each plant.

As regards the necessary revenues to be collected from the nuclear power plants, figure 15 shows the calculation methodology and the resulting values, on the basis of the previous determination of a global coefficient for the plants overall, expressed in euro cents 2006 per kWh, which is subsequently corrected by a series of factors taking into account the specific characteristics of each type of plant.

The total necessary income to be collected in this manner as from 2007, and throughout the operating period of the nuclear power plants, amounts to 1,939 M€2006, which divided by the updated energy to be generated by these facilities (estimated on the basis of annual hours of operation in keeping with current operation and future expectations) gives an overall coefficient of 0.221 cent €2006/kWh.

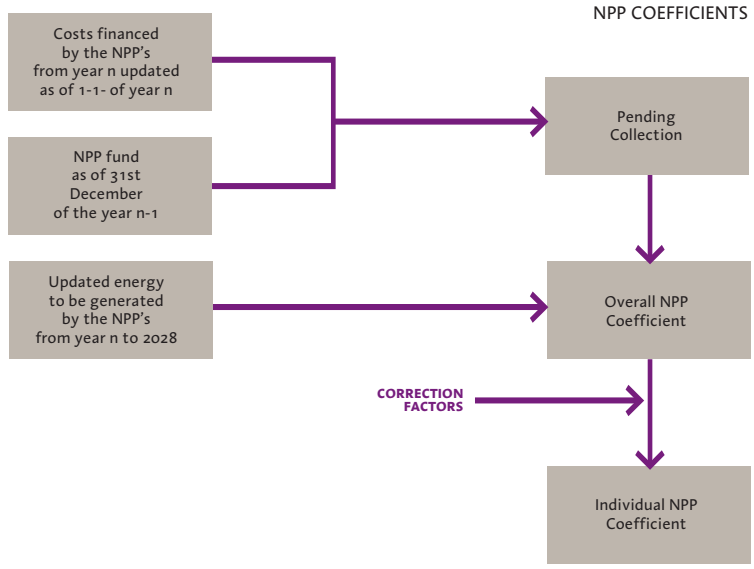
Considering the correction factors established for each nuclear power plant, the following individual coefficients are obtained for each, to be applied as from the year 2007 and up to the date of their respective definitive shutdowns.

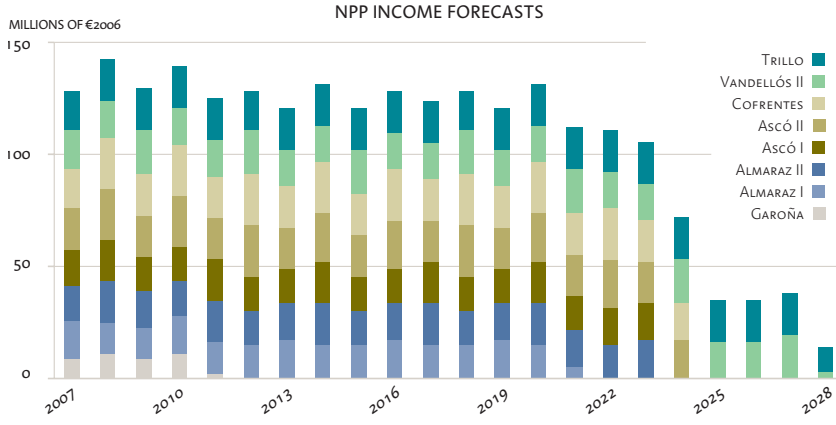
NPP	cent.€06/kWh
Santa Mª de Garoña	0.259
Almaraz I	0.219
Almaraz II	0.219
Ascó I	0.219
Ascó II	0.219
Cofrentes	0.241
Vandellós II	0.219
Trillo	0.219

The methodology applied in the case of the Juzbado fuel assembly manufacturing facility is similar to that corresponding to the nuclear power plants. In other words, the updated future cost of operating waste management and dismantling is calculated and this, divided by the future updated production of fuel assemblies gives a unit cost of 2,158 €06/tU for the period 2007-2027.

Finally, in the case of other installations an individualised cost study is performed for the different types of wastes generated by these facilities. The actual values obtained are then compared with

Figure 15. Income Via The Nuclear Power Plants





the current values to give the tariffs to be applied to the generators at the moment of waste removal.

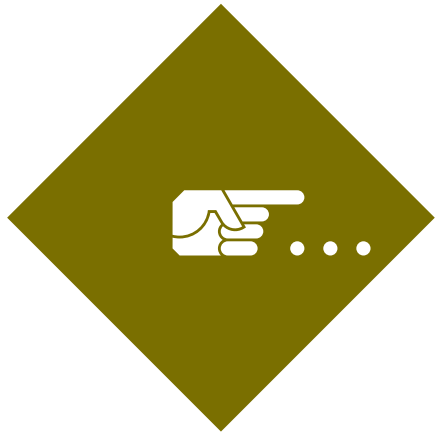
It should be pointed out that since the management period lasts longer in time than the period of application of the different revenues, it is necessary to collect amounts up front in order to generate the funds required to finance all the costs of management, along with the corresponding financial yield.

On conclusion of the management period contemplated in the GRWP, the total amounts collected and deposited in the Fund via the different financing routes, including the financial yield, should cover the costs incurred, such that the resulting balance is zero.

The values presented in this GRWP may be revised annually by the Government, by Royal Decree, on the basis of an updated economic-financial report on the cost of the corresponding activities.

Annex A

Introduction



Radioactive waste: its nature and public perception

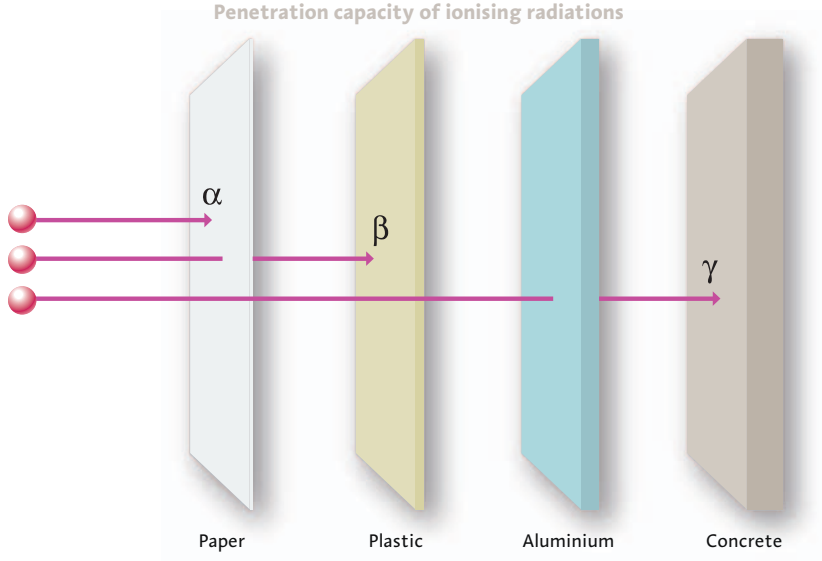
Radioactive materials are just one of the many resources used by mankind, in a wide variety of activities. Since the very discovery of radioactivity and subsequent unravelling of matter, applications of use to society were developed. The fields in which this technology has most progressed have been medicine, industry, research and electricity generation.

Radioactivity is the property possessed by certain elements (radionuclides) to disintegrate spontaneously. During this process they modify their nuclear structure by emitting radiations in the form of alpha particles (low penetration power and high ionisation power), beta particles (greater penetration power than alpha particles but lower ionisation power) and gamma electromagnetic radiations (high penetration power and lower ionisation than alpha or beta particles).

The emission of these radiations leads the atom to modify its structure, becoming a different isotope or a different element, until a large part of its radioactivity is lost and, in the majority of cases, it even becomes a stable element.

The half-life (the time required for the number of atoms in a radionuclide to be reduced by half as a result of spontaneous disintegration) is also specific to each unstable nucleus. This period ranges from fractions of a second to millions of years.

Radioactivity may be natural or artificial in origin. Natural radioactivity comes from the radioactive materials found in the



Earth's crust, many of which are incorporated in the air and in foodstuffs; from cosmic rays (extraterrestrial origin); and from substances found inside the human organism (potassium, carbon, etc.).

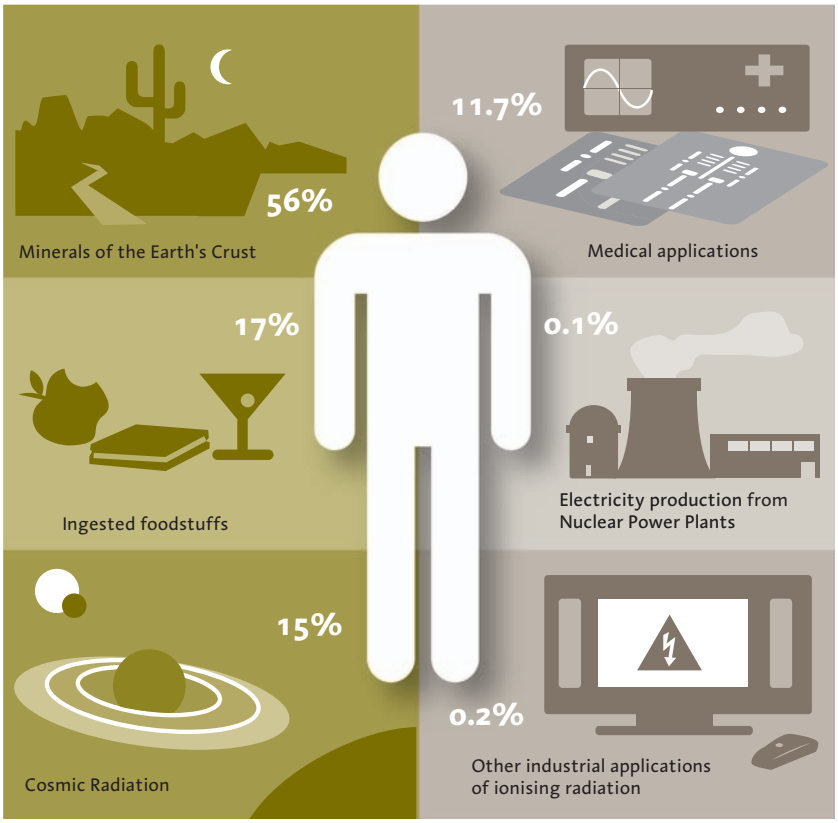
This natural radioactivity or background radiation, which is part of the environment, is not uniform at each point on the planet but depends on factors such as height above sea level (the exterior radiation is retained in part by the atmosphere), the content of radioactive material in the soil (percentage of granites, for example), etc.

Artificial radioactivity is that which has its origins in human applications of ionising radiations in fields such as electricity generation, medicine, industry and research.

Depending on the natural characteristics of the place where they live and on the degree of technological development of the society to which they belong, people will be subjected to different levels of radioactivity.

The United Nations Committee for the Study of the Effects of Atomic Radiations (UNSECAR) has calculated the contribution made by different sources to the average radiological activity to which an adult is exposed. These values, expressed in percentage terms, are distributed as follows: 56% from minerals in the Earth's crust, 17% from the food we eat, 15% from outer space, 11.7% from medical applications, 0.1% from electricity generation by nuclear means and 0.2%

Percentage of exposition to ionising radiation



from other industrial applications of ionising radiations. In other words, 88% of the total is natural in origin and 12% is artificial.

Human beings also experience12,000 radioactive disintegrations per second as a result of their own chemical composition.

Interactions between radiation and matter may occur as a result of irradiation or contamination. In the first case the radiation impinges directly on the matter, while in the second the radiation-emitting source or substance is deposited in the matter.

The protection of living beings against the effects of radiation is achieved by preventing such interactions between the matter and radiation; in other words by avoiding irradiation and contamination.

In the case of irradiation, this may be accomplished by simply increasing the distance from the source or reducing exposure time,

as well as by placing barriers of suitable materials between the source and living beings. Contamination is prevented by sealing the radioactive sources, that is by placing around them materials that keep them from being dispersed in the environment by water or other external agents.

In short, in both cases protection is achieved by placing suitable barriers between the radionuclides and the living beings, both to shield against radiation and to confine radioactivity.

Radioactive waste is any waste material or product for which no further use is foreseen and that contains or is contaminated by radionuclides in concentrations or levels of activity in excess of those established by the competent authorities.

There is a wide variety of radioactive wastes. Historically various classifications have been made on the basis of their different characteristics. Thus, initially they were divided depending on their physical state, and later on the basis of their specific radioactivity and the type of radiation emitted.

The most widely used classification today refers to the treatment and disposal system that may be used for the different types of waste. This classification considers basically the half-lives of the different radionuclides contained and their specific activity.

Depending on these characteristics and on the way in which the waste is managed, as detailed throughout this document, wastes are basically classified in two major groups:

- ➜ Low and Intermediate Level Waste (LILW)
- ➜ High Level Waste (HLW)

LILW contain beta-gamma emitters with half-lives of less than 30 years; they do not generate heat as a result of disintegration, since their specific radioactivity is low; their concentration of alpha-emitters (long-lived) is very low (trace). After 300 years the activity of these wastes will have reduced to such an extent that, at that time, the radioactive doses deriving from them will be equivalent to those corresponding to the natural background.

HLW are wastes containing long-lived alpha-emitters with half-lives in excess of 30 years, in appreciable concentrations, and that may generate heat as a result of radioactive disintegration since

they have a high specific activity. The main example of such waste is the spent fuel unloaded from nuclear reactors, which contains the fission products and transuranic elements generated during burnup, when the reprocessing option is not used, or the waste produced in the reprocessing of this fuel.

The management of radioactive waste requires the performance of a series of activities, such as treatment, transport and storage or disposal, the objective being to protect people and the environment against the radiation emitted by the radionuclides contained in the waste and to minimise the burden of such protection for the generations of the future.

This management must be undertaken in an adequate and safe manner, this requiring the performance of safety studies, studies of environmental impact, etc. and the subsequent assessment of the risk involved, which are to be approved by the organisations competent in this area.

The explanations provided by the experts as regards risk, in terms of the arithmetic product of the probability of damage or undesirable effects occurring, and their consequences, are not always easily understood by the general public. There is also a personal perception of risk that is not based on the scientific parameters indicated above, evaluation of which would require other experts in social matters, since the attitudes involved have a strong emotional component.

In this respect, the influence of the media is noteworthy, since the population constantly receives messages of risk. In the specific field of radioactivity, and in view of the fact that it is invisible, odourless and intangible, a fundamental role is played by the credibility and trust given by society to the information sources, be they the administrations, public organisations or private sectors, industries, etc.

According to opinion polls, Spain is at around the European average as regards the concern and mistrust of the population in relation to radioactive waste and its management. A large majority of people associate the issue with the nuclear power plants and consider it to be an important problem entailing risk. There is still a fairly high level of ignorance as regards the way in which this type of waste is managed, although in general those who have had access to information on what is done with radioactive waste consider its manage-

ment to be good or very good.

When members of the public are asked to identify what type of waste plant or disposal facility they would never accept close to their homes, radioactive waste stands out however many guarantees of safety are offered. This is where one of the fundamental problems arises: the need to manage radioactive waste with guarantees (national need) must be resolved via specific facilities (strong local implications). Consequently, the mechanisms to be established for decision-making should promote overall coherence within the country from the local to the national level and vice versa.

It is quite clear that the local entities that might be involved in decision-making will in all cases play a leading role, in the context of willingness, the transparency of the information and dialogue and the open participation of the local public.

From the above it may be appreciated that there is an overwhelming need to communicate the current reality of radioactive waste management and its future perspectives to society and its most significant representatives. In this way the public might better understand the processes involved and perceive risks from a more rational and less emotional standpoint. It should also be pointed out that the risk in question is very small, as is demonstrated by the fact that there has been no relevant incident in radioactive waste management in Spain, despite the fact that more than 3 million kilometres have been covered in waste transport, that more than 22,000 radioactive lightning rods have been removed, that a uranium mill has been completely dismantled, that a large nuclear power plant has also been dismantled (to 80%), and that some 35,000 m^3 of waste have been conditioned and disposed of, etc.

Need to establish a management system for radioactive waste

To a large extent electricity generation in the European Union (EU) rests on the use of nuclear energy, which contributes approximately a third of the total. In Spain also, electricity generation by nuclear means represents a considerable proportion, approximately a fifth of the national total in 2005.

Furthermore, the use of radioactive isotopes in medicine, industry and research is widespread. Suffice it to say that around 100,000 people are treated every year in Spain with radiations (radiotherapy) and

that many more are diagnosed with radioactive isotopes in nuclear medicine.

These activities generate certain quantities of radioactive waste, much smaller than those of other hazardous wastes but that, like many others, require specific management modes in order to guarantee the safety of persons and minimise the impact on the environment.

In view of all the above, in 1983 the Government of the Nation decided that it was necessary to set up a non profit-making public entity to develop an inventory of these materials and remove, condition and dispose of them, in other words to undertake integral and adequate waste management. In this respect, Royal Decree 1522/1984 of 4th July authorises the constitution of the company Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA).

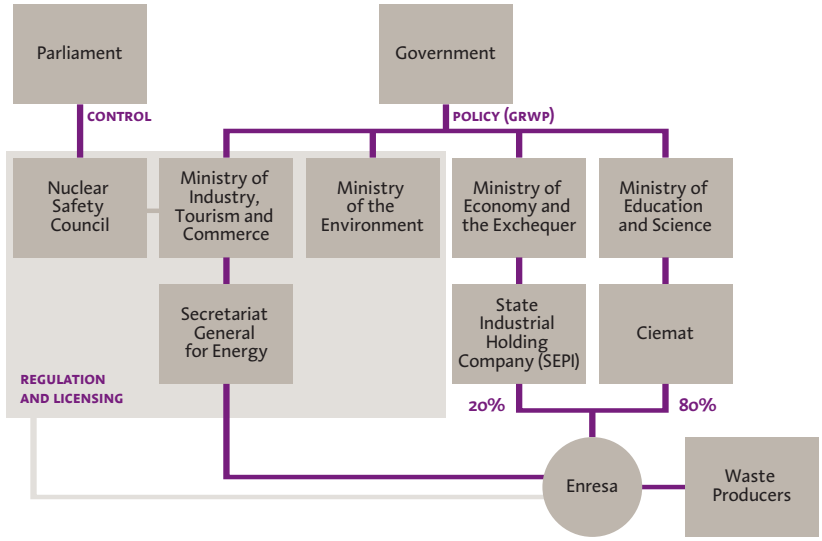
Likewise, ENRESA was commissioned, among other things, to undertake the task of managing operations relating to the dismantling of regulated nuclear and radioactive facilities at the end of their service lifetimes and of the environmental restoration, where appropriate, of the disused uranium ore mines and treatment facilities existing in Spain.

Over the last two decades a national system has been defined and shaped for the performance of all the necessary activities in the different fields of radioactive waste management and decommissioning of facilities, considering both the nature of such activities and the capabilities of a set of agents operating in a structured manner, which may be represented schematically as follows:

- **State Administration**

  Outstanding among the different levels of the State Administration for its very direct link with radioactive waste management is the Ministry of Industry, Tourism and Commerce (MITYC) which, through the Secretariat General for Energy and the Directorate General for Energy Policy and Mines, is empowered to grant the licenses, permits and authorisations required by Nuclear and Radioactive Facilities (NF's and RF's) and to submit to the Government for approval the General Radioactive Waste Plan (GRWP), which presents all the strategies and activities to be undertaken in Spain in this area.

Figure A.1. Schematic representation of the current administrative organisation



Also involved, among others, are the Ministry of the Environment (MIMA), in relation to the facilities' Environmental Impact Statements and the activities that they require, and the Autonomous Communities (AC's), which have certain faculties transferred to them in the case of the RF's, and the Town Councils in their areas of competence, such as the granting of municipal licenses.

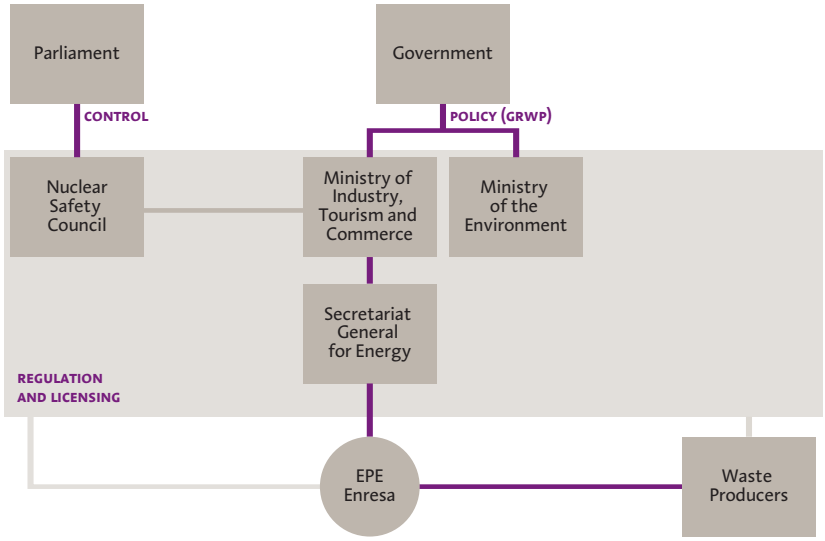
➜ The Nuclear Safety Council (CSN)

As the sole organisation responsible for nuclear safety and radiation protection, the CSN draws up the mandatory reports and decisions within its realm of competence and submits them to the Authorities responsible in each case, reporting on its activities to Parliament.

➜ Waste producers

These are the licensees of the NF's and RF's generating the radioactive waste to be managed by ENRESA. Contracts are in place between these licensees and Enresa, establishing their relations and respective responsibilities. As will be indicated below, there may also be other types of producers.

Figure A.2. Schematic representation of the future administrative organisation



→ Enresa
This is the entity authorised to carry out the management of radioactive waste; it maintains administrative and technical relations with all the agents involved in the system, discussed on above, and with other support organisations necessary for the performance of its functions, among which are CIEMAT, the Universities and other R&D organisations, companies, etc., along with others at international level which will be dealt with below.

Consequently, the general operating mode of the system contemplates all the applicable standards, as well as the role of the agents, the operating and safety practices, etc, including the financing system.

Legal framework and basis of the management system

From the legal point of view, the enactment of Royal Decree 1349/2003 of 31st October on the ordering of ENRESA's activities and their financing regrouped into a single text all of the various standards applicable to radioactive waste management and the dismantling and decommissioning of nuclear and radioactive facilities. This Royal Decree adapted its precepts to the reality of the times and included

among its articles other provisions contained in various laws relating to the issue in question and subject to regulation, the aim being to facilitate their understanding and application.

The laws referred to in this Royal Decree are Law 13/1996, of 30th December, on Fiscal, Administrative and Social Measures, as regards the financing of the costs involved in the removal and management of radioactive lightning rod headers (Art. 172), Law 14/1999, of 4th May, on Tariffs and Public Prices for services rendered by the CSN, regarding the possible financing of the management of radioactive wastes generated in certain exceptional circumstances (second additional provision), and Law 24/2001, of 27th December, on Fiscal, Administrative and Social Measures, relating to the Fund for the financing of activities included in the GRWP (fourteenth additional provision).

Subsequently, Royal Decree Law 5/2005, of 11th March, on urgent reforms to promote productivity and improve public contracting, reworded (Art. 25º) the 6th additional provision of the Electricity Industry Act, Law 54/1997, of 27th November, relating to the Fund for the financing of activities included in the GRWP, replacing the system for financing the costs of NPP radioactive waste and spent fuel management and of the dismantling and decommissioning of these facilities through application to the electricity tariff with a system in which the licensees would undertake such financing as from 1st April 2005. This Royal Decree also establishes that the State will assume the ownership of the radioactive waste once its definitive disposal has been initiated, along with whatever surveillance might be required following the decommissioning of a nuclear or radioactive facility, on completion of the time period established in the corresponding decommissioning declaration.

More recently, article eight of Law 24/2005, of 18th November, on reforms for the promotion of productivity, creates the State Business Entity ENRESA for the management of radioactive waste and regulates rates for the rendering of its services, to be transferred to the Fund for the financing of activities included in the GRWP.

In this last new legal text, ENRESA, which until that date had been a state limited company, is transformed into a State Business Entity in charge of an essential public service: the management of radioactive waste, including spent fuel from the NPP's, and the dis-

mantling and decommissioning of nuclear and radioactive facilities. Also the system of internalisation of costs is established, such that the SBE ENRESA administers the rates applied to the radioactive waste producers.

Until the constitution of the SBE becomes effective, which will take place with the entry into force of its Statute, to be approved by Royal Decree, ENRESA as a limited company will continue to fulfil the requirements of Royal Decree 1349/2003, of 31st October, on the ordering of its activities and their financing.

Other standards relating to those mentioned above are the Nuclear Energy Act, Law 25/1964, of 19th April, and Law 15/1980, of 25th April, governing the Creation of the CSN, along with the corresponding Decrees, Orders and other provisions by which these are enacted.

A complete series of relations, functions and responsibilities corresponding to the different agents involved in the system has been articulated and developed on the basis of these standards, this being summarised in the following points.

- The Authorities are responsible for establishing the framework of standards, defining the role of the different agents involved and the ways in which they are to interrelate. They are responsible also for establishing the basic safety and operability conditions to be met and for guaranteeing the application of the system, including the financing mechanisms.
- The Government shall establish the policy governing radioactive waste management and the dismantling and decommissioning of nuclear and radioactive facilities in Spain by approving the GRWP, which will be submitted to it by the MITYC and on which it will subsequently report to Parliament.
- The GRWP is the official document that ENRESA draws up and sends to the MITYC every four years, or whenever this Ministry so requires, and that presents the strategies, necessary actions and technical solutions to be developed in the short, medium and long term, aimed at ensuring the adequate management of radioactive waste, the dismantling and decommissioning of nuclear and radioactive facilities and the activities relating to the former, including the economic and financial forecasts for their performance.

- ENRESA is responsible for submitting to the Authorities the proposal required to define the national plans, projects and activities necessary for this management, and also for promoting the actions required for their optimisation. It is also required to define the operating mode of the system and the conditions to be met for the reception and acceptance of the wastes, as well as for the decommissioning and dismantling of the facilities. Finally, it is responsible for providing information to society.
- The Producers are responsible for conditioning the wastes generated for their removal by ENRESA, in the manner established in the corresponding contracts, for participating in the decommissioning and dismantling plans for their facilities and for contributing to the optimisation and improvement of the management system adopted, covering the corresponding costs of management by ENRESA, in accordance with the financing systems established.

Evolution and current status of the management system

More than 20 years have passed since ENRESA was constituted by Royal Decree in 1984, during which a very important impetus has been given to radioactive waste management in Spain.

In order to be able to efficiently and safely undertake the tasks assigned to it, ENRESA possesses suitable human resources and the most advanced technological applications and management capacities, in line with the international context to which it belongs, this guaranteeing quality in the different activities and processes involved in radioactive waste management.

The current situation of the management system may be described as being satisfactory, as demonstrated by the following facts:

- Consolidation of the operation of an integral management system for the LILW generated in Spain, a highly relevant part of which are the El Cabril installations, with more than 13 years of operating experience, which include a system for the final disposal of this type of waste. The current system will be completed with additional capacities for the specific definitive management of LILW with lower radioactive content.

- Systematic performance of waste transport operations from the generating facilities to El Cabril, without incidents of any type and in accordance with the stipulations of the specific regulations governing this issue.
- Demonstrated response capacity to resolve specific problems arising as a result of the existence of radioactive wastes outside the regulatory control system, such as the management of radioactive lightning rod headers and the wastes arising from contamination incidents (scrap smelting at steelyards, certain diverse sources,...).
- Existence of specific operative solutions to cover the various needs that have arisen for the temporary storage of spent fuel, as demonstrated by the reracking of the NPP storage pools and the construction and operation of a Temporary Storage facility at Trillo NPP for the plant's own spent fuel.
- Capacity to develop and propose integral optimised solutions for the temporary management of spent fuel and high level waste, particularly significant among which is the generic design of a centralised temporary storage (CTS) system independent of the site.
- Development and availability of know-how and operating experience in relation to the dismantling of regulated facilities and the environmental restoration of their sites, with the following being particularly significant:
  - Completion of Level 2 dismantling at Vandellós I NPP, with the entry of the installation into the dormancy phase.
  - Rehabilitation and decommissioning of numerous disused uranium mines and uranium concentrates manufacturing facilities, such as the AUM in Jaén and La Haba in Badajoz, and direct technical and financial collaboration at other installations belonging to ENUSA, as contemplated in the standards and decided on by the Authorities.
  - Performance of the dismantling projects for José Cabrera NPP and certain of the CIEMAT facilities, as part of the PIMIC.
- Drawing up and development of R&D Plans in support of the management activities and in harmony with the European

Union's Framework Programmes and other international standards.

- ➜ Progress in line with the international context in understanding of the capacities and technologies required for the definitive management of spent fuel and high level waste.
- ➜ Participation, within the framework of international cooperation, in the programmes of the international organisations responsible for radioactive waste management and dismantling. ENRESA has been a member of Cassiopee (Consortium for Operational Assistance to Eastern European countries) until it officially ceased its activities in 2005, leading EU technical assistance projects, particularly significant among which were those relating to the creation of radioactive waste management agencies in the Czech Republic and Bulgaria. It is also currently a member of the EDRAM consortium, within which it shares and exchanges experiences with the most advanced countries of the OECD.
- ➜ Other complementary capacities at the service of the Authorities in its area of competence, to cover both scheduled and non-scheduled needs, including emergency situations.

Need for a new GRWP

There are several circumstances that underline and justify the need for this new 6th General Radioactive Waste Plan (GRWP).

Firstly, the enactment of Royal Decree 1349/2003, of 31st October, on the ordering of ENRESA's activities and their financing, Article 6 of which contemplates a revision by ENRESA of the GRWP every 4 years, or whenever required by the MITYC, this to be submitted to the aforementioned Ministry for presentation to the Government for its approval and subsequent reporting to Parliament, based on the Government's authority regarding the establishment of policies on radioactive waste management and the dismantling and decommissioning of nuclear and radioactive facilities. (All these aspects are included also in the recent Law 24/2005, creating the State Business Entity ENRESA and regulating the tariffs for the rendering of its services).

Likewise, the GRWP fulfils a resolution by the Congressional Commission for Industry, of December 2004, arising as a result of the

presentation of the annual CSN report for 2003, which urges the MITYC to propose a revision of the GRWP to the Government in order to update the strategies contained therein, in view of the evolution of the conditions constituting the framework for the current Plan, and in particular those referring to the start-up of a CTS facility. A year later, a similar resolution by this Commission reiterated the request for the Government to approve a new GRWP during 2006.

Furthermore, there is the enactment of Royal Decree Law 5/2005, of 11th March, referred to above, which modifies the system for financing of the activities included in the GRWP, internalising the costs relating to the management of the radioactive waste and spent fuel from the NPP's and the dismantling and decommissioning of these facilities, attributable to the operation of these installations after 31st March 2005. (This cost internalisation system is also endorsed by Law 24/2005, by which the SBE ENRESA was created).

Finally, and in keeping with the above, there is a need to update waste generation estimates and re-evaluate the costs and calculations of the necessary revenues, as well as to establish new objectives as regards the management of LILW, spent fuel and HLW, the decommissioning of facilities (NPP's, PIMIC, mines), R&D, etc., that will orient the lines of action of this Plan, as detailed throughout the document.

From the point of view of standards, although developments in this field are relatively complete, there will be a continued need to adapt them to the pace required by the new strategic approaches and technological solutions, as well as to the evolution of the national and international regulations.

In this last respect, the entry into force in June 2002 of the Joint Convention on Safety in the Management of Spent Fuel and Safety in the Management of Radioactive Waste should be underlined. The objective of this Convention, which basically seeks to act as an incentive, is to achieve and maintain a high level of safety in management, including the final disposal of spent fuel and radioactive waste throughout the world. Being party to the Convention, Spain is obliged to comply with the obligations deriving therefrom, reporting at least every three years on its management policy and practices and indicating the legal and regulatory framework on which they are based and the suitability of the available human and financial resources.

The Joint Convention emphasises the measures required to ensure that in all stages of management, including final disposal, people, society and the environment are adequately protected against radiological risks. These measures cover from the establishment of procedures for site selection to the design and construction of the facilities, systematic safety assessment and environmental evaluation prior to construction, during operation and following decommissioning, and operation and institutional measures following decommissioning.

Furthermore, it is necessary to maintain the continuous tracking and analysis of the radioactive waste management programmes carried out by the International Organisations, as regards both possible legal or regulatory developments (EU, IAEA) and Research and Development projects (EU, NEA/OECD).

ENRESA's role and operation

The role of ENRESA should be interpreted as that of a public entity at the service of the citizens, the objective being to prevent the radioactive wastes that are inevitably produced in a developed society like Spain from having undesirable consequences for persons and the environment.

Quite apart from the participation of all the agents involved, referred to above, ENRESA, as the as the unifying element in the systematic national approach to radioactive waste management, has availed itself of the organisation and resources required for the adequate performance of its functions.

The objectives pursued with the ENRESA organisation are, firstly and from the technical point of view, to consolidate the current assignment of the different solutions contemplated in the GRWP, separating short and medium-term operational responsibilities (LILW management, the dismantling of facilities, etc.) from those having a timeframe stretching as from the year 2010 (temporary storage of fuel, definitive management of HLW, etc.). In addition, it seeks to concentrate the functions of defining the policies and general strategies required for achievement of the objectives mapped out and to group the services of the company, guaranteeing synergy between the different areas and promoting a centralised management of the different services required for its operation.

In addition to the strategic, technological, operative and administrative lines, mention should also be made of certain aspects of a structural nature, such as those relating to the management and information systems, environmental and quality management and international relations and communication, which contribute to significantly increasing ENRESA's capacities to act.

In the field of international relations, it should be pointed out that from the very beginning this type of collaboration has been considered fundamental, given the safety demands, the high technological level, the heavy investments required and the socio-political implications of radioactive waste management and the dismantling of nuclear facilities. The aim of such relations is to facilitate compliance with ENRESA's tasks through access to the knowledge provided by other experiences and other management programmes established by international organisations and the national authorities of other countries. This knowledge is an invaluable aid in many cases for the definition and development of solutions.

As regards communications to provide information to society, ENRESA has channelled its efforts towards intervention in the media (TV, press, etc.), the continuity of the information centres, exhibitions in museums and other places, communication support, etc., as well as towards institutional collaboration with activities supporting the economic and social development of the areas of influence of the facilities, through the ENRESA Foundation.

The characteristics of ENRESA's activities lead to the need for strong social interweaving, with openness and transparency and considerable efforts in communicating to society in general and in the areas in which the organisation carries out its activities in particular, allowing for a clear perception of what its function is and what guarantees are offered by its management.

However, given that the problem of radioactive waste is a problem pertaining to society, the representatives of society should participate in communication and not leave the entire responsibility to ENRESA. For this reason it is important to create a communications fabric with institutions representative of Spanish society, made up of universities, professional associations, electricity utilities, professionals from the field of nuclear medicine, consumer organisations, trade unions, political representatives, etc., in order

for the members of the public to perceive that the institutions consider the task of controlling and managing radioactive waste to be a necessity.

Annex B

Radioactive waste generation

In Spain radioactive waste (RW) is generated at a series of installations distributed throughout the country that use radioactive materials and substances in accordance with the specific applicable standards, known as Nuclear Facilities (NF's) and Radioactive Facilities (RF's). Radioactive waste may also occasionally be generated in other areas as a result of specific activities.

Figure B.1. shows schematically the geographical location of these sources of radioactive waste generation. Described below are the origins and characteristics of the wastes currently produced and those that might potentially be generated in the future.

➜ Nuclear Power Plant (NPP) operating waste

Waste is generated as a result of the normal operation of NPP's, on the one hand variable quantities of spent fuel that, if not subjected to any subsequent treatment (reprocessing), are considered to be high level waste (HLW) because of their characteristics as regards radioactivity, half-life, heat power, etc., and on the other a series of other radioactive wastes, in larger quantities, that in view of their characteristics are known as low and intermediate level wastes (LILW).

The average annual production of a Spanish 1,000 MWe nuclear power plant is of the order of 20 tU of spent fuel and between 50 m^3 and 130 m^3 of conditioned waste, mostly LILW,

depending on the type of plant: pressurised water reactor (PWR) or boiling water reactor (BWR), respectively.

➜ NPP dismantling waste

When a nuclear power plant comes to the end of its service lifetime and its dismantling is undertaken, large quantities of radioactive waste are generated, most very low level waste (VLLW).

The total dismantling of a 1,000 MWe light water nuclear power plant gives rise to some

10,000 m^3 of VLLW, along with some 3,000 m^3 of LILW and 110 m^3 of higher or intermediate level waste (ILW). In general, larger volumes are produced at BWR plants than at PWR's.

In the case of graphite-gas plants (GCR) such as Vandellós I NPP, consideration must be given to the management of the graphite currently stored "in situ".

➜ Operating waste from the Juzbado Fuel Assembly Manufacturing Facility.

The operation of this facility generates relatively small quantities of radioactive waste, of the order 10 m^3/year, these being of the LILW type.

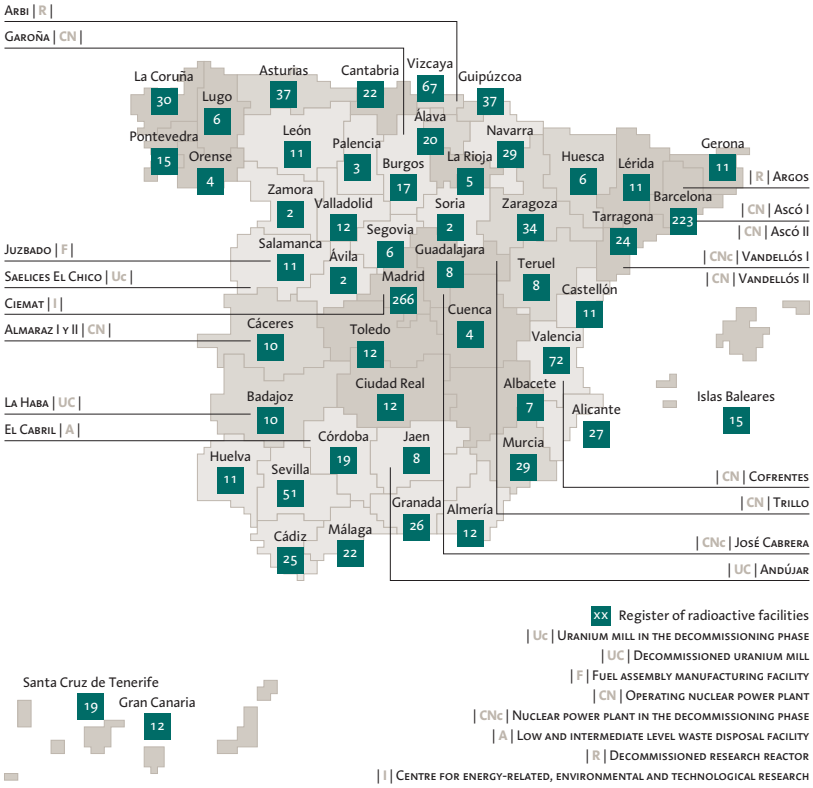
➜ Waste from dismantling of the Juzbado Fuel Assembly Manufacturing Facility.

It is estimated that the dismantling of a facility of this type might give rise to the future generation of some 50 m^3 of LILW.

➜ Waste generated at CIEMAT.

The operation of this research centre has generated a series of "historic" wastes, the result of the nuclear energy development programme in Spain, which have been managed adequately. The so-called PIMIC programme (Integral Plan for the Improvement of the CIEMAT Installations) is currently on-going and scheduled for the period 2001-2009, and is expected to generate some 900 m^3 of waste, practically all of them LILW or VLLW. Significant amounts of radioactively contaminated soils might also

Figure B.1. Radioactive waste generating facilities



be generated, the volume of which will depend on the characteristics and type of the interventions required, which are still pending definition.

➜ Waste from the dismantling of research reactors

Apart from the waste existing at CIEMAT, this heading refers to the now dismantled Argos research reactor, in Barcelona, which has not given rise to the generation of radioactive waste, and the Arbi reactor, in Bilbao, where waste generation has been limited to a few packages containing LILW, arising from the former management abroad of its minimally used fuel.

➜ Waste from Radioactive Facilities (RF's)

These are generated as a result of the application of radioisotopes in medicine, industry, agriculture and research.

Although there are many installations of this type in Spain, the quantities of waste generated at them are relatively small compared to those from other sources. Practically all these wastes, some 40 m³/year, are LILW, and this figure is trending downwards as a result of a number of different actions, several driven by ENRESA. Also generated are certain discarded radioactive sources, which cannot always be managed as LILW.

- Waste arising from occasional incidents, either at the regulated facilities or as a result of the presence of radioactive sources and other radioactive materials at facilities or in activities not controlled by the regulatory system.

  A specific example of the latter, particularly relevant in recent years, is due to the appearance of radioactive materials in the metallic scrap recycled by the iron and steel industry. In these cases the wastes generated are almost exclusively LILW, and even VLLW in the majority of cases, although others that cannot be managed as LILW may also arise.

- Waste arising from the collection and disassembly of ion smoke detectors, carrying small radioactive sources and requiring adequate management once discarded, taking into account their classification as wastes from electrical and electronic apparatus (R.D 208/2005).

- Secondary waste, generated as a result of the operation of the current LILW disposal facility at El Cabril and, where appropriate, of the future temporary storage (CTS) and definitive disposal (DGD) facilities for spent fuel and HLW and of management of the headers removed from radioactive lightning rods.

  All of these arise in minor quantities and are LILW, or occasionally ILW.

As regards integral management in Spain, radioactive wastes may be classified in two major groups:

- The so-called Low and Intermediate Level Wastes (LILW) that, given their characteristics, may be temporarily stored, treated,

conditioned and definitively disposed of at the El Cabril installations (Córdoba), these including the sub-group of the Very Low Level Wastes (VLLW) referred to above.

➜ The so-called High Level Wastes (HLW), consisting basically of spent nuclear fuel and other specific wastes with high levels of activity. This group may also include those other wastes (ILW) that, in view of their characteristics, cannot be definitively managed under the conditions established for El Cabril and that require special installations.

In addition to the above, in recent decades Spain has produced important quantities of tailings from uranium mining and the manufacturing of uranium concentrates. All of these have low contents of natural radioactivity but, in view of the large volumes involved, require special management actions (see point C.III).

In general, LILW is conditioned by the producers. However, at most of the RF's, or in the event of incidents, the conditioning is performed specifically with support from ENRESA, depending on the available capacities, preferably those in place at El Cabril. In all cases, the acceptance criteria established by ENRESA for the subsequent management foreseen must be fulfilled.

The LILW generated at the nuclear power plants and at the Juzbado facility are temporarily stored at the producing installations themselves, and are finally transferred to El Cabril. Those coming from other sources (hospitals, laboratories, etc.) usually remain, circumstantially and in all cases temporarily, at the installations of origin until removed by ENRESA.

Once unloaded from the reactor, the spent fuel generated at the nuclear power plants is stored under water in the pools existing for this purpose at these facilities. Subsequently, following a period of cooldown, it is, or will be, transferred or transported to the existing or future temporary storage facilities, as an intermediate step and pending definitive management.

Figure B.2. shows schematically the overall process of radioactive waste management in Spain, from the points of production to the final destinations, a distinction being made between management performed now and that foreseen for performance in the future, as established in the present GRWP and explained in ANNEX C of this document.

Figure B-2. Flowchart of radioactive waste management in Spain

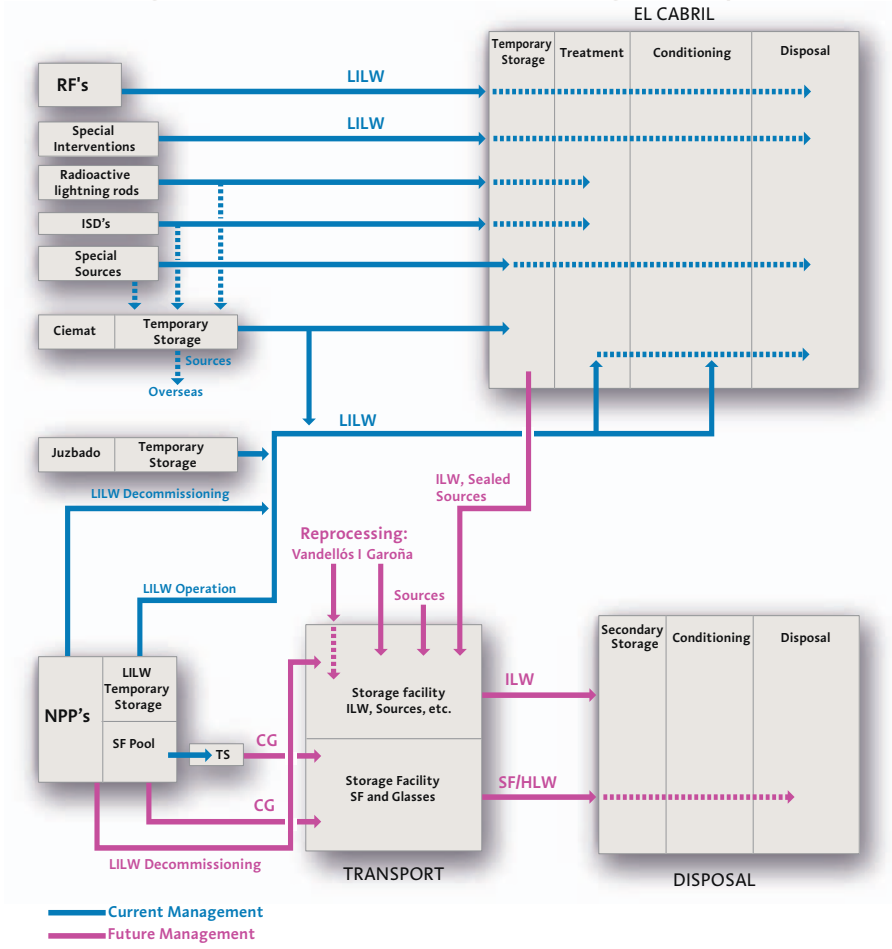


Table B.1 shows the status as of 31/12/05 of the different radioactive waste storage facilities existing in Spain, a distinction being made between the Nuclear Power Plants, the Juzbado facility, CIEMAT and El Cabril. No reference is made to the RF's (hospitals, laboratories, etc.) since, as indicated above, the radioactive waste generated at these installations is stored only temporarily, pending removal by ENRESA.

Accordingly, at the end of 2005 there was a total of approximately 37,200 m^3 of low and intermediate level waste stored in Spain, practically all of it conditioned, and 3,370 tU of spent fuel.

Table B1. Spent fuel and radioactive waste stored in Spain as of 31-12-05

Facility	Conditioned LILW		Spent fuel		
	m³	Degree of occupation (%)	tU	Degree of occupation (%)[1]	Foreseen date of saturation [1]
Operating nuclear power plants					
José Cabrera	719	22	82	64	
Santa Mª de Garoña	947	65	311	79	
Almaraz I	1,576	28	465	61	2020
Almaraz II			432	57	2022
Ascó I	610	32	417	72	2013
Ascó II			408	70	2014
Cofrentes	1,598	36	551	75	
Vandellós II	301	11	360	54	2021
Trillo	146	6	344	84	
Vandellós I[2]	2,976				
Total	**8,873**		**3,370**		

[1] Degree of occupation of the NPP pools and foreseen dates of saturation, considering a reserve capacity equivalent to one core. The absence of dates for José Cabrera and Santa María de Garoña indicate that their pools will not become saturated during the service lifetime assumed in this Plan. Cofrentes NPP is currently under study. In the case of Trillo NPP, of the 344 tU stored, 98 tU are contained in 10 metallic casks (DPT) located in an independent facility constructed on the plant site, the degree of occupation of which would amount to 13%.

[2] Plant dismantled, except for the reactor shroud, which as of 31/12/05 has 1,393 m³ of VLLW from dismantling in the temporary cask storage (TCS) installation pending dispatch to El Cabril, and 1,583 m3 of operating ILW (graphite, stirrups, absorbents, etc.) in the temporary graphite store (TGS).

Facility	LILW conditioned	
	m³	Degree of occupation (%)
Juzbado (ENUSA)	462	62

In order to provide an overall view of the total quantities of waste to be managed, it would be necessary to take into account also a series of wastes that, although currently outside Spain, should be considered Spanish. Their volumes and origins are as follows: 13 m³ of vitrified HLW and 666 m³ of ILW from the reprocessing in France of spent fuel from Vandellós I NPP, currently in storage in that country and to be returned to Spain as from 2010; minor quantities of fissionable materials (U and Pu) recovered during the reprocessing of spent fuel from Santa María de Garoña NPP, sent to Great Britain prior

Table B1. (Cont'd)

Facility	Solid and conditioned wastes	Various encapsulated sources
	Stocks of materials declared as RW as of 31/12/05, controlled by the Waste Management Service [1,2]	
Ciemat	12 m³	150 unidades

[1] This does not include the wastes in the equipment at facilities to be dismantled or those that will arise during the PIMIC Project (900 m³). The contaminated soils that cannot be declassified are not included.

[2] Additionally there is a number of consumer goods (smoke detectors and lightning rod headers) removed by ENRESA for disassembly of the small radioactive sources they contain, that are periodically removed by ENRESA.

Facility	LILW in temporary storage (m³)	
El Cabril	Conditioned	
	Modules	1,446
	Transitory Reception Building	543
	Conditioning Building	160
	RF Zone	7
	Subtotal	2,156 [1]
	Non-conditioned	
	Modules	372
	Platforms	2,050
	Tanks (effluents)	17
	RF Zone	18 [2]
	Subtotal	2,457 [3]
	LILW in definitive disposal (m³) [4]	
	Waste packages disposed of in cells [4]	96.870
	Nº of containers in cells [5]	4.740
	Nº of full cells	14
	Degree of cell occupation [6]	53%

[1] Of the total volume of conditioned waste packages, 817 m³ are from NF's (37,9%).

[2] Without including evaluation of the volume of 647 sources, 143 special solids and 10 threads of Iridium and 11 non-compactable solids.

[3] Of the total volume of non-conditioned containment units, 2.412 m³ are from incidents (98,2%).

[4] The equivalent volume of LILW stored in the cells, expressed in terms of input volume to El Cabril, before the processes of reduction and conditioning to which the wastes are subjected, is 23.216 m³, of which 18.408 m³ would come from NPP operation, 1.719 m³ from the dismantling of Vandellós I NPP and 3.089 m³ from other.

[5] 4,602 CE-2a containers with an external volume of 11,14 m³ and 138 CJE racks of the same equivalent volume.

[6] Ratio of the 4,740 storage positions occupied to the 8,960 currently available in the 28 cells constructed.

to 1983 and to be returned to Spain for possible management as radioactive waste.

As regards generation forecasts, table B.2. summarises the total quantities of spent fuel and radioactive waste, both low, intermediate and high level, to be managed in Spain, based on the quantities actually produced as of 31/12/2005 and on the best estimates and data currently available. For the purpose of planning and calculation, the basic reference scenario may be summarised as follows:

Reference scenario

- Current nuclear fleet with 6 NPP's in operation (8 reactors). The installed electrical power as of 31/12/2005, 7,876 MWe, was reduced to 7,716 MWe as a result of the definitive shutdown of José Cabrera NPP on 30/04/2006.
- 40 years of service lifetime for the 6 operating NPP's, at an operating level similar to today.
- Open fuel cycle; that is to say that the option of reprocessing the spent fuel is not contemplated.
- Total dismantling (Level 3) of the light water NPP's, to be initiated 3 years after their definitive shutdown.

On the basis of the above, the total volume of radioactive waste to be managed in Spain, conditioned and ready for disposal at the ENRESA facility at El Cabril, amounts to some 176,300 m^3 in the case of LILW, 57% of which, i.e., some 100,000 m^3, might be managed specifically in view of their very low levels of activity (VLLW). The volume of wastes that cannot be disposed of at El Cabril, the final destination of which will initially be the CTS facility and subsequently DGD, amounts to some 12,800 m^3, 79% of which would be spent fuel (6,674 tU) and the rest other intermediate or high level wastes.

The following table shows the ratio of the conditioned LILW produced as of 31/12/05 (37,162 m^3) to those to be generated up to the year 2040 (139,184 m^3). The total absolute values are included in brackets and shown in table B.2.

With respect to the estimates contemplated in the 5^{th} GRWP, a slight general reduction may be observed in the volume of LILW. This is due to the optimisation of their management and to a more accurate assessment, with special emphasis on the wastes from the

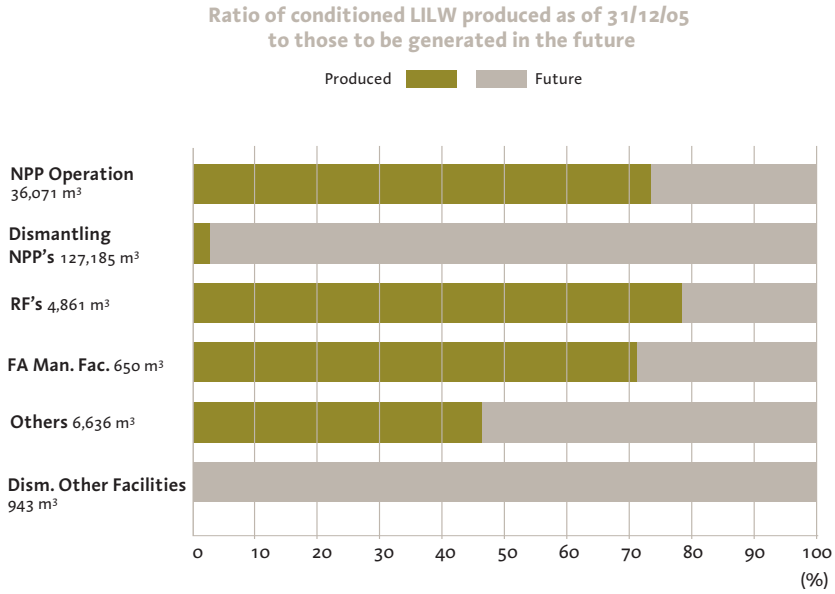


Table B.2. Total estimated quantities of radioactive waste and spent fuel to be managed in España

Low and intermediate level wastes open for disposal at El Cabril

Origin	Quantity (m3)		
	Up to 31/12/05	From 01/01/06	Total
Manufacturing of Fuel Assemblies [1]	462	188	650
NPP Operation [1]	26.503	9.568	36.071
Research Activities and Applic. Radioisotopes [2]	3.811	1.050	4.861
NPP Dismantling	3.314	123.871	127.185
Dismantling Other Facilities [3]	0	943	943
Others [4]	3.072	3.564	6.636
Total [5]	37.162	139.184	176.346

[1] Consideration is given to volume reduction programmes.

[2] RF's and various wastes (radioactive lightning rods, ion smoke detectors, sources, etc.). As in the case of the other producers, the values refer to the actual or foreseen input volume to the ENRESA facilities.

[3] Includes the fuel assembly manufacturing facility and the updating and improvement of the CIEMAT facilities.

[4] Includes the secondary wastes arising as a result of the operation of El Cabril, as well as contaminated scrap and other wastes deriving from contamination incidents.

[5] Somewhat more than 100.000 m3 (approximately 60% of the total wastes) might be managed in specific cells for very low level wastes.

Table B.2. (Cont'd)

Conditioned high and intermediate level wastes not susceptible to disposal at El Cabril

Origin	Quantity (m^3)		
	Up to 31/12/05	From 01/01/06	Total
Vitrified waste from reprocessing of Vandellós I SF [1]	13	0	13
ILW from reprocessing of Vandellós I SF [2]	666	0	666
NPP Dismantling [3]	0	1,055	1,055
Others (future encapsulation plant)	0	850	850

[1] Currently in France (84 glasses with a unit volume of 150 litres).

[2] Currently in France (Volume of waste to be returned to Spain without consideration given to shielding)

[3] Some 780 t of this type of waste are estimated, which once conditioned in capsules (1.35 m^3/t), imply this volume, without consideration given to shielding.

Spent fuel to be stored in the NPP pools, ITS/CTS facilities

Item	Up to 31/12/05		From 01/01/06		Total		Total General
	PWR	BWR	PWR	BWR	PWR	BWR	
Nº of fuel assemblies	5,556	4,708	5,755	3,552	11.311	8.260	19,571
tU spent fuel	2,508	862	2,649	656	5,157	1,517	6,674

Spent fuel and high and intermediate level waste to be disposed of

Item	Quantity (m^3)
PWR fuel assemblies [1]	8,173
BWR fuel assemblies [1]	1,991
Vitrified waste from reprocessing of Vandellós I SF [1]	81
ILW from reprocessing of Vandellós I SF	666
NPP Dismantling [2]	1.055
Others (220 l drums. future encapsulation plant)	850
Total	12,816

[1] Equivalent volume, assuming a 2,89 m^3 capsule with a capacity for 4 PWR assemblies, 12 BWR and 3 glasses.

[2] Equivalent volume, assuming containers with an exterior volume of 11,33 m^3 and a ratio of 1 t/m^3.

dismantling of the NPP's, with only a slight increase under the heading of others, attributable to incidents occurring due to the processing of radioactive materials present in the metallic scrap recycled in the iron and steel industry. In the case of the spent fuel and

Figure B.3. Quantities of radioactive waste to be managed in Spain

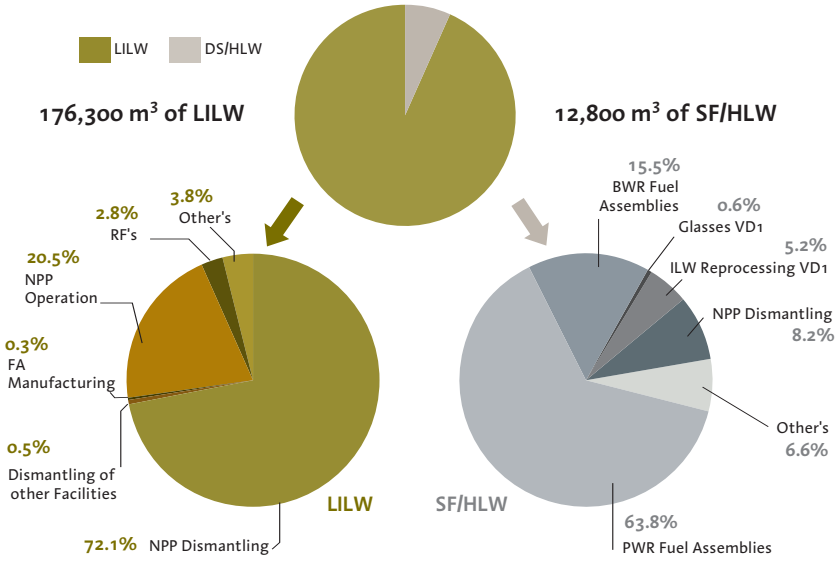
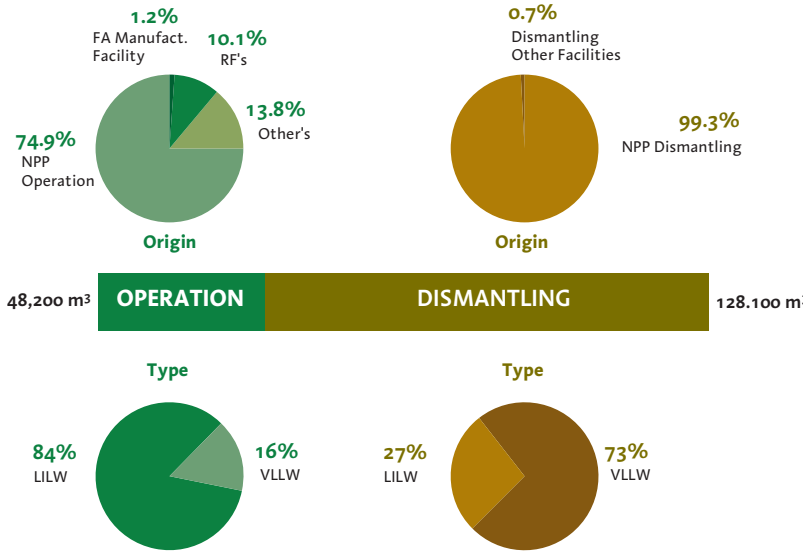


Figure B.4. Low and intermediate level waste (LILW/VLLW)



HLW, the values are similar, with a slight increase in the volume of intermediate level wastes not susceptible to disposal at El Cabril, resulting from the availability of more detailed information for their assessment.

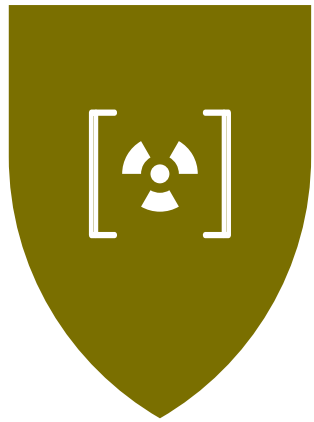
Finally, table B.3 shows the tailings from uranium mining and milling as of 31/12/05 from the specific installations referred to in Section C.III. Decommissioning of Facilities.

Table B.3. Tailings from uranium mining and milling (31-12-2005)

Facilities	Mining tailings (x 106 t)	From beds (x 106 t)	From sludges (x 106 t)	From classification (x 106 t)
Saelices el Chico (SEC) Salamanca	68			
Elefante Plant (SEC) Salamanca		7.2	0.3	
Quercus Plant (SEC) Salamanca		1.15	0.8	2.65
Lobo-G Plant (La Haba) Badajoz	6.3		0.28	
Andújar Uranium Mill (FUA) Jaén			1.20	
Disused uranium mines Several	0.3			

Annex C

Courses of action



The present ANNEX describes the COURSES OF ACTION in the four major sections into which management has been divided: Low and Intermediate Level Waste (LILW), Spent Fuel and High Level Waste (SF/HLW), the Decommissioning of Facilities and Other Activities, followed by a specific section on Research and Development (R&D). In each of these sections reference is made first to the situation internationally and in Spain, followed by development of the strategic solutions foreseen throughout the entire period of management and the detailed actions mapped out for the next 4-5 years.

C.I. Management of low and intermediate level waste (LILW)

LILW management includes a series of activities that cover from the collection and transport of these wastes to their disposal, with all the necessary intermediate stages, such as treatment, conditioning, characterisation and temporary storage.

C.I.1. General considerations and the international panorama

This type of waste is produced in nuclear electricity generation and in a wide range of non energy-related applications of radioactive materials, for which reason a large number of countries have had to establish systems for its management for one reason or another. The solutions considered are very diverse; quite a number of countries have already adopted definitive management modes, while others have addressed only temporary storage.

Among the countries that have implemented solutions of a definitive nature, practically all have adopted what is known internationally as "near-surface disposal". This generic category may be sub-divided into two major groups: a) facilities on the surface, and b) facilities in underground galleries at tens of metres in depth. It should be remembered that since 1994 the dumping of wastes at sea has been prohibited by an International Convention established in 1972. This kind of dumping was a practice previously used by certain countries, but never by Spain.

In the surface disposal solution, the technological decision may vary from simple trenches to installations incorporating engineered barriers, such as those existing in Spain. Among the countries possessing installations of this type, special mention should be made of the USA, with three commercial facilities apart from those belonging to the DOE for defence wastes; Great Britain; France, with once installation completed and sealed and another in operation; the Russian Federation; Japan; China; India; South Africa; Norway, etc. The solution consisting of galleries at shallow depths has been selected by Sweden and Finland. A separate case is that of Germany, where the use of an abandoned iron mine is in the process of final approval and where another deep geological facility has been completed in the former Eastern Germany.

In view of the international experience accumulated it may be stated that the technologies and know-how required for the safe definitive management of this type of wastes exist and are available.

The above is applicable also to the European case, where all the countries may be said to generate LILW in varying quantities, and where their management is necessary. Several of these countries have addressed the definitive management of these wastes directly and have established integrated systems for this purpose, while others have preferred to fully resolve the issue of temporary management pending more definitive decisions. The approach adopted in France is especially relevant for the case of Spain, since it implies a clear decision regarding the implementation of definitive solutions and systems contemplating the entire process integrally and completely, from generation to disposal. This served as a pattern for the development of the Spanish system.

In this context mention should be made also of the recent start-up in France of a disposal facility especially designed for VLLW, located some two kilometres from the existing LILW facility at l'Aube.

At present an appreciable number of countries are immersed in the process of integrating and improving their national management systems. Spain has collaborated with some of these countries in various ways, on the basis of the experience acquired in recent years.

On the international scene, and in addition to the activities performed within the different national programmes, mention should be made of those performed by the various international organisations. In the European Union standards are available in various areas of relevance for this type of management (RP, the environment, etc.), these having repercussions for national decisions, the approaches adopted and the programmes of activities. In addition, the improvement of the LILW characterisation and analysis methods and techniques used in different European countries is promoted, and forums are set up for the exchange of experiences and information on nuclear power plant dismantling and its implications for LILW generation. Within the OECD's Nuclear Energy Agency (NEA) there is information exchange in relation to dismantling projects and work is on-going on the development of capabilities and methodologies for safety assessment in the management of HLW, which may be used also for LILW. Finally, the activities of the IAEA in this field are oriented towards consolidating the experiences of the most advanced countries and promoting and helping in the implementation of solutions for safe management in those countries requiring such aid.

C.I.2. Analysis of the national situation

As has been indicated above, LILW is produced in different activities and at different installations, and mechanisms are in place to guarantee its control and safe management. At a general level the national regulations contemplate the transfer of this type of materials from the owner to ENRESA, while in certain cases, such as radioactive lightning rods, ion smoke detectors or radioactive scrap, specific mechanisms are set up as required.

The existence of these administrative mechanisms allows us to state that Spain has resolved the management of all these wastes overall, that it possesses a complete and integral management system encompassing all the necessary capacities and that is configured on the basis of clearly identified agents operating in a structured manner. The operating mode of the system is well established as regards both its legal aspects and the operating practices defined for its application.

Within this system, the nuclear facilities have capacities allowing them to treat their wastes and condition them in accordance with the acceptance specifications of ENRESA for transfer to the El Cabril facility. In all other cases the producers deliver their wastes to ENRESA in the manner agreed on, and the latter mainly carries out the necessary conditioning tasks.

The radioactive waste management services provided by ENRESA to the operators of Nuclear and Radioactive Facilities are governed by contracts based on model type contracts to be approved by the MITYC.

The LILW disposal facility at El Cabril is an essential part of the national system, and indeed its central axis. Its fundamental objective is the definitive disposal of this type of waste in solid form, although it also has various technological capacities, including installations for waste treatment and conditioning, where the wastes from radioactive facilities and those arising from interventions at non-regulated installations and those special wastes indicated in point C.IV are treated. Likewise, certain complementary treatments are performed on nuclear facility wastes. The El Cabril facility also has laboratories for the characterisation and verification of wastes, which are the basis for the performance of the tests foreseen for acceptance of the different types of wastes and the verification of their characteristics. The centre also has temporary storage capacities, as well as the workshops, laboratories and auxiliary systems required for its operation.

The national integral system provides the solidity and operability required to guarantee the safe management of LILW, while being sufficiently flexible to allow for its optimisation.

The operability and flexibility of the system have been put into practice and reinforced with the experience acquired from the dismantling of fuel cycle facilities and Vandellós I NPP, with interventions in incidents in the "non-regulated" industry and with the response to new legal demands (the case of the ISD's); these have been assumed by the system and have led to the establishment of principles for its future optimisation.

C.I.3. Strategic lines of action

The experience accumulated in Spain in the management of LILW has also made it possible to identify areas for improvement and to define ideal actions for its optimisation, intervening in those elements of

the system that are most needed at present or that most increase its operability.

The first objective consists of continuation of the normal operation of integrally managing the wastes, including the control, acceptance, removal and transport to El Cabril of the low and intermediate level wastes, as well as the operation of this facility under conditions of maximum safety for the workers, the public and the environment.

The basic axes for improvement activities in LILW management are as follows:

- The coordination of efforts to minimise waste generation and volumes, along with optimisation of the occupation of the available volume at El Cabril.
- Management of VLLW at a complementary facility specifically designed for this sub-category of wastes, as part of the El Cabril facility.
- On-going improvement of knowledge of wastes and of the performance of the system and safety assessment.
- Improvement of the available technological capacities, with a view to optimising the aforementioned processes and preparing resources to address future situations, foreseen and unforeseen but possible.

Following the efforts coordinated in recent years, the most significant example of which has been the reduction to less than one third in the volume of LILW to be managed, from both nuclear power plants and RF's, it is foreseen that such coordinated efforts will be continued and reinforced in the future with the waste producers, in order to reduce even further the final volume of the wastes. This would include continuation of the policy of collaborating in projects on volume reduction, decontamination and the characterisation of materials for their recycling. Innovation and research efforts are also foreseen in the development of new treatment techniques allowing for the improvement of waste volume reduction and decontamination and measurement techniques.

Mention should be made also of the recent entry into operation of the systems implemented at El Cabril for the treatment of contaminated aggregates, basically those generated during incidents in

the metal industry, through immobilisation in the containers in which the drums received from the NF's are usually blocked.

VLLW is the sub-category of LILW that has the lowest values of activity, in many cases close to the regulatory exemption levels. The occurrence of the aforementioned incidents in the metallurgy industry, along with the future dismantling of the nuclear power plants, point to the future existence of important volumes of radioactive wastes with very low levels of radioactivity, for which use of the capacity existing in the concrete cells constructed at El Cabril, designed for higher level wastes, might be inappropriate. For this reason, there are imminent plans to build a complementary installation specifically for this type of waste at El Cabril, as described in the section on activities scheduled for the short-medium term.

It is appropriate to maintain the lines of improvement of understanding of waste and safety assessment. In this respect the efforts in research and in continuously perfecting radionuclide characterisation techniques should be underlined, as should the on-going improvements in the processes of waste activity verification, optimisation of the methodology applied in assessment of the safety of the disposal system, the periodic safety review of the installation, the revision and updating of final disposal unit acceptance criteria, on the basis of the on-going R&D work on the performance of the isolating barriers and the studies of the acceptability of different waste types existing or arising as a result of improvements to the conditioning systems.

As regards improvements to the capacities of El Cabril and in the availability of resources to address future situations, since 2006 a new "Auxiliary Conditioning" building has become available, designed to allow for the implementation of LILW characterisation and decontamination techniques or, if necessary in the future, systems for the treatment of wastes possible appearing as a result of incidents. Mention is made also of the capacity that will be made available for the management of the small radioactive sources present in ISD's, when these have to be collected at the end of their service lifetime, in compliance with recent standards in this area. Likewise, a storage facility is included for radioactive sources that is more functional than the one currently existing.

In addition to these lines of management improvement, mention should be made of the following activities:

- ➜ Permanent analysis of the evolution of LILW generation and the subsequent adaptation of the facility to potential future needs.
- ➜ Maintenance of collaboration with the operating agents of the National Authorities in all matters relating to LILW, with special attention to whatever standards developments might be required and to the management of whatever wastes might be generated outside the regulated system.
- ➜ Maintenance of participation in the activities of the International Organisations and collaboration in the technical assistance provided to specific countries or activities, in all cases evaluating the cost of such collaboration and the benefit for the national agents or for the country.

C.I.4. Activities scheduled in the short-medium term (4-5 years)

Normal operation of the system

Aside from the activities scheduled for the forthcoming years and referred to in the following points of this section, the LILW management system will continue to operate normally and under conditions allowing for an adequate response to the management requirements of this type of waste, generated by the NF's and RF's or arising as a result of incidents.

In this respect, El Cabril will maintain all the operating capacities available at the facility and the corresponding operating support for the installation, oriented fundamentally towards improvement of the systems and compliance with the conditions of the operating permit.

As regards LILW removal forecasts, ENRESA will continue to maintain all the operating capacities required to fulfil its commitments, among which priority should be given to the removal and storage of LILW from José Cabrera NPP, in order to ensure that the temporary storage installations of this plant are practically empty at the time of its definitive shutdown in April 2006.

Minimisation of waste generation and volumes, for optimisation of the occupation of the available capacity

Continuation and reinforcement of the policy of collaboration between ENRESA and the main waste producers, in particular the NPP's, on waste volume reduction, with the participation of joint working groups;

development and use of treatment, decontamination and characterisation equipment for use at the plants, and performance in collaboration of projects for the development and application of volume reduction techniques and equipment. Outstanding among these is the development of a plasma-based treatment system at semi-industrial scale, completion of the on-going implementation of waste desiccation systems at several plants and the treatment required for certain old wastes from the Garoña and José Cabrera plants.

Within the R&D Plan, the appropriate lines of action will be contemplated, with emphasis on projects shared between the different national agents.

Normal operation in 2006, at El Cabril, of a system for the treatment of aggregates – crushing, transfer, leaching, electrolysis, preparation and injection of mortar, etc. – which will allow certain wastes from incidents and others of a similar nature to be stabilised inside the concrete containers used for the final conditioning of waste packages, thus optimising occupation of the available volume.

Achievement of operating results applicable to the on-going studies on the configuration of waste from the dismantling of major NPP components.

Licensing and application of treatment techniques based on the incineration of compactable NPP wastes, following the final evaluation of the results obtained from the tests performed.

Very low level wastes (VLLW)

In May 2003, in the wake of the resolutions from the Commission for Economy and the Exchequer of the Spanish Congress, urging the Government to promote the development of specific solutions for VLLW management in order not to use for these wastes the strategic value that the capacity available at El Cabril meant for the country, ENRESA requested the authorisations required for the development and construction of a complementary installation at El Cabril for the storage of VLLW, the corresponding ministerial authorisation being granted in February 2006. Likewise, the necessary municipal works licence and environmental impact statement are available.

This complementary facility is designed in accordance with the basic criteria for this type of installations, approved by the CSN, which consist in summary of the construction of tanks fulfilling the

technical requirements of the Spanish and European regulations on the disposal of hazardous wastes.

The complementary facility will include a technological building, already constructed, for the treatment systems foreseen – compacting, stabilisation – and four cells or tanks with a joint capacity of some 120,000 m^3. The first of these cells to be constructed, in 2006, will have an approximate capacity of 33,000 m^3, the objective being that it enter into operation in 2007. The rest of the cells will be carried out in the medium term, adapting to the needs deriving from the generation forecasts for this sub-category of wastes.

Improved understanding of waste and of the methods and techniques for understanding of the performance of the disposal system and safety assessment

Efforts in this area will focus on the following lines of activity:

- ➜ Improvements to the techniques for the characterisation and measurement of radioactive waste packages.
- ➜ Acquisition of information and methodological and instrumental improvements for optimisation of the safety assessment of these installations.
- ➜ Continuation of studies on the durability of engineered barriers of the disposal system.
- ➜ Study of new Disposal Unit configurations suitable for use.
- ➜ Design and testing of new transport packages.

Improvement of the capacities of El Cabril and availability of resources for future situations

The main activity in this area is the equipping and subsequent progressive operation of the aforementioned "Auxiliary Conditioning" building. The initial equipment includes resources for handling and decontamination, for extension of the capacities for gamma spectrometry verification of real packages, the provision of greater capacities in the radiochemistry laboratory, a specific storage facility for sources, etc. This building has been designed to allow for flexible adaptation in the future to whatever needs might arise as a result of incidents or the appropriateness of performing pilot R&D experiences in relation to LILW.

The installation will be provided with special equipment for the management of the small radioactive sources in ISD's, when they have to be collected at the end of their service lifetime, all this being in application of the most recent standards on such equipment, corresponding to early 2005. In addition, the transfer of various encapsulated sources temporarily stored at CIEMAT is foreseen, as part of performance of the PIMIC and on the basis of the supplementary technological capacity with which the installation has been provided.

A particularly significant aspect as regards the RF's is the growing application of the ORDER ECO/1449/2003, of 21st May, on the management of solid materials with radioactive contents generated at RF's, which should lead to a reduction in the volume of such wastes delivered to ENRESA. The support provided to the facilities to help them to optimise their production continues, as do the systematic technical visits to the facilities on the basis of the documentation available on each and analysis of the experience of their production, the objective being to support them in their internal tasks for system optimisation.

LILW transport

The transport of LILW is a routine activity in Spain, performed in accordance with the applicable standard and with the frequency and under the conditions required for compliance therewith. A total of some 200 transport operations are carried out annually from the producers, the destination being almost exclusively El Cabril.

There is a Contingency Plan, including the participation of the CSN, Civil Defence and ENRESA, that covers the actions required in the event of an incident during the transport of LILW to guarantee a sufficient response to protect persons and the environment.

Consequently, the activities performed in this field will be aimed at maintaining the operability already established and demonstrated for the safe and efficient performance of the necessary transport operations.

C.II. Management of spent fuel and high level waste (SF/HLW)

The production of SF is inherent to the operation of a nuclear power plant. Every 1 or 2 years, the NPP's replace between a third and a quar-

ter of the fuel assemblies in the reactor core with new assemblies, due to their having practically spent their capacity to produce energy. The management of this SF, which following unloading from the core is stored under water in a pool adjacent to the reactor, may be addressed from the perspective of the closed cycle or the open cycle. In either case a distinction may be made between two clearly differentiated stages: an initial temporary stage, always necessary in any management scenario relating to the back end of the nuclear fuel cycle, and a later stage of definitive management.

In the closed cycle scenario, and following a few years of cooldown in the plant pool, the SF is sent to the commercial reprocessing installations in the country or abroad. The by-products of this treatment are, on the one hand, the materials still having an energy content (fundamentally uranium and plutonium), which may be reused in the nuclear fuel cycle, and, on the other, fission products, other actinides and other technological wastes. When reprocessing is carried out in a country different from the one in which the SF is generated, it is normal for the contracts to stipulate that all these substances be returned, duly conditioned, to the country of origin, which will be responsible for their temporary and definitive management.

In the case of the open cycle, the SF remains in temporary storage in the plant pools, complemented as necessary with other temporary storage systems, pending final management.

Choosing the open cycle or the closed cycle is fundamentally an energy option, and consequently a strategic and economic issue, and has repercussions on radioactive waste management.

Among those countries that have opted for the closed cycle for all or part of the SF from their commercial reactors are France, Great Britain, Japan, India and the Russian Federation (all with reprocessing plants in operation or in the design phase), along with Holland and Belgium. Other countries in which reprocessing was largely carried out, such as Germany and Switzerland, and several countries in Eastern Europe (Hungary, Czech Republic, Bulgaria, Lithuania, Slovakia, etc.) have abandoned this practice or are planning to do so in the near future as a result of political decisions, of economic considerations or due to their not having their own reprocessing plants.

It should be pointed out that just as both cycles share a more or less prolonged stage of temporary storage of the SF, they also both

require a stage of definitive management, of the SF itself considered as a waste in the case of the open cycle and of the non-reusable materials from reprocessing in the case of the closed cycle.

From an international perspective, much effort has been made in studying the final management of long-lived waste, and it may be concluded that the disposal of this type of waste in deep geological formations is a feasible and safe technique. There are also other management options complementary to disposal, such as separation and transmutation, which warrant consideration for the establishment of long-term strategies, although at present they cannot be conceived as being real alternatives.

However, all the countries have experienced important delays in the implementation of their policies regarding definitive management, due fundamentally to the existence of safe temporary solutions and to the difficulties encountered in the decision-making processes.

From the point of view of the international organisations, it should also be pointed out that to the noteworthy activities of the OECD Nuclear Energy Agency (NEA) in the field of definitive management are to be added those carried out by the IAEA in the development of safety standards, in particular those relating to the storage of SF/HLW, and the special attention that this Agency pays to multilateral aspects relating to the safety of the nuclear fuel cycle, and the activities of the EC, which currently focus on promoting research, development and demonstration projects on the definitive management of SF/HLW through its Framework Programmes (see section C.V), which fundamentally include activities relating to deep geological disposal and separation and transmutation technologies.

C.II.1. Temporary storage

C.II.1.1. General considerations and the international panorama

All the Spanish NPP's currently in operation are of the light water type and by design have a pool connected to the reactor cavity in which the fuel unloaded from the reactor core is stored for varying periods of time, in racks especially designed for this purpose.

The temporary storage of SF may be undertaken using different technologies (under both wet and dry conditions), either in facilities linked to the operating plants themselves or independently at a new nuclear facility.

The world's largest SF storage facilities are the reception pools at the reprocessing plants at La Hague (France), Sellafield (Great Britain), Mayak-Chelyabinnsk (Russian Federation) and Rokkasho (Japan). These same complexes house large temporary storage facilities for the different types of waste arising from this treatment.

Furthermore, practically all the countries that have commercial NPP's possess different SF and HLW temporary storage installations, both centralised and individual, in addition to the pools included in the initial design of the reactor. Among the most significant of the first are the CLAB facility in Sweden, which houses the SF from the country's 12 nuclear groups in an underground pool, the HABOG installation in Holland, ZWILAG in Switzerland and the storage silos of the reprocessing plants, all using different technologies for dry storage on the surface.

C.II.1.2. Analysis of the national situation

In Spain the option initially taken was to reprocess the SF from the Vandellós I, José Cabrera and Santa Mª de Garoña nuclear power plants. This practice was interrupted in 1982, except for the first of these plants, which ceased to operate in 1989 and whose fuel had to be entirely reprocessed for technical reasons. The following products will have to be returned to Spain as a result of the commitments deriving from the different reprocessing contracts:

- In relation to the fuel from Vandellós NPP I, reprocessed at the COGEMA facilities in France:
  - 84 capsules of 150 l with high level vitrified waste
  - 1,022 drums of 210 l with liquid waste conditioned in bitumen
  - 126 containers of 1.2 m^3 with technological wastes
  - 1,320 drums of 225 l with graphite and magnesium wastes
- In relation to the fuel from Santa Mª de Garoña NPP, reprocessed at the BNFL facilities in Great Britain: the fissile materials (U, Pu) recovered.

Since 1982, all the SF generated by the Spanish light water reactor plants has been stored on site in the plant pools.

In view of the foreseen saturation of the capacity of these pools, throughout the 1990's the original storage racks were progres-

sively replaced with other more compact units. In most cases this has allowed the need for an SF storage capacity additional to that provided by the pools to be deferred significantly over time.

A unique case is that of Trillo NPP, at which, despite the reracking carried out and as a result of characteristics intrinsic to its design, the storage capacity was to become depleted in 2003 (conserving the capacity to unload a complete core). The solution adopted in this case was to extend the SF storage capacity by means of metallic casks to be housed at a facility constructed on the plant site. This has been in operation since 2002 and, as of the end of 2005, there were 98.3 tU stored in 10 metallic casks (DPT).

As regards wastes other than SF and not to be definitively managed at the El Cabril facility, these are normally stored temporarily at the production sites themselves, and even at facilities abroad (reprocessing wastes).

Listed below are the SF temporary storage needs additional to the NPP pools, including those required for the other intermediate and high level wastes that will have to be managed in Spain in the coming years:

- CG
  - Some 20 tU to be removed annually from the pool of Trillo NPP in order to maintain the capacity to unload a complete core.
  - The entire SF production of José Cabrera NPP (currently estimated at around 100 tU), in order to allow for the dismantling of this plant, which ceased to operate on 30-4-2006.
  - The periodic unloading (around 20 tU/year for each reactor) at different plants (Ascó and Cofrentes) as from the saturation of their respective pools, which will occur at the end of the present decade.

- HLW and ILW:
  - The high and intermediate level wastes from the reprocessing of the SF of Vandellós I NPP, which in accordance with the corresponding contract must begin to be returned to Spain before 31-12-2010.

- The fissionable materials from the reprocessing of the SF from Sta. Mª de Garoña NPP, which are in storage in Great Britain under a contract that covers up to 2011, for the U, and 2008 for the Pu, if they were to return to Spain following this period of storage.
- Various dismantling wastes from José Cabrera NPP, which are currently estimated at some 35 tons of material, fundamentally the reactor internals and other activated parts, which will be generated as from 2009 following removal of the SF from the plant pool.
- Minor volumes of wastes generated outside the facilities or the activities of the nuclear fuel cycle (from radioisotope application in medicine, industry, etc.), along with whatever others might have been generated in non-regulated situations or activities.

From what has been said above it may be concluded that in the coming years there will be a need for a sufficient complementary temporary storage capacity, most of these needs converging on the period 2009 - 2014.

C.II.1.3. Strategic lines of action

The basic strategy contemplated centres on the requirement that a CTS facility be in operation around the year 2010. In view of the analyses performed from the technical, strategic and economic standpoints, this solution is considered ideal for the Spanish case, and constitutes the basic priority objective for the coming years.

In this respect, and with a view to promoting the CTS facility, in December 2004, and in response to the General Report on the activities performed by the CSN in 2003, the ninth proposal of a resolution of the Congressional Commission for Industry, made up of representatives of all the Parliamentary Groups, "urges the Government to collaborate with ENRESA in the development of the criteria required for the installation in Spain of a Centralised Temporary Storage facility for spent fuel, in keeping with the National Waste Plan".

A potential alternative scenario to the above would be the complete or partial reprocessing of the SF abroad, although this option cannot be contemplated exclusively as being part of waste man-

agement but rather, and depending on the amount to be reprocessed, as part of an energy supply policy. In any case, it would be necessary to provide the corresponding storage installations for the wastes that would need to be returned to Spain following such treatment. This alternative consequently involves the NPP operators, since they would have to use the energy materials recovered.

The suitability of this strategy is based on the following fundamental considerations:

- ➜ It allows management to be addressed under optimum conditions and in a unified manner for all the SF, HLW and ILW, while making temporary management independent from definitive management. This would in turn allow progress to be made in relation to the prolonged temporary storage option without any condition other than this possibility being foreseen in the design of the installation and the performance of maintenance and updating tasks in relation to components requiring replacement.
- ➜ It provides the Spanish management system with a capacity to manoeuvre in the face of possible uncertainties possibly arising in the future, such as the need to prematurely dismantle a plant.
- ➜ A CTS facility would reduce the number of SF, HLW and ILW storage facilities in Spain, and consequently the number of nuclear sites distributed around the country, with the corresponding reduction of the risks and burdens associated with this type of installations. This reduction would become more significant as time went by and would be particularly important in relation to the security of the installation.
- ➜ It would allow the sites of decommissioned nuclear facilities to be used for other purposes, without restrictions.
- ➜ It would allow for compliance with the clauses on the repatriation of waste and materials from the reprocessing of SF abroad.
- ➜ From an economic point of view, a CTS facility would imply a reduction in the cost of the overall HLW and ILW temporary management system, compared to the option of storage at each plant and at the other temporary storage installations that would be necessary.

- It would allow operation and the necessary support services to be rationalised and optimised.

The site of the facility would not require any special characteristics, as a result of which the design might be adapted to a large number of potential locations in Spain.

The facility would be of the vault type and modular in nature, with a hot cell for the reception and conditioning of the spent fuel and other wastes, which would in turn allow the facility to perform its dual function as a storage installation and technology and research centre in the area of radioactive waste management.

One of the main impacts of the CTS facility would relate to the transport operations to be performed (2-3 expeditions per month), although it is estimated that this might be appreciably mitigated through the presence, or provision where appropriate, of a rail access to the facility.

However, having a CTS facility available before 2011 requires the establishment of information and participation mechanisms facilitating the achievement of the political and social consensus required for a decision to be taken regarding its location. This Plan considers that this debate and decision-making process should not extend beyond 2006, since beyond this date it would be necessary to develop projects and implement alternative solutions as the current capacities became saturated, with the necessary quantities stored "in situ" pending the availability of a CTS facility, thus increasing the cost of the overall management system.

C.II.1.4. Activities scheduled in the short-medium term (4-5 years)

Having a CTS facility available before the year 2011 implies the need to take the steps required to facilitate the decision-making process during this stage. In this respect, ENRESA should undertake the following:

- Establishment of the design basis for the facility and approval for the generic design of a CTS facility from the Competent Authorities.
- Consolidation and application of a methodology for the search for feasible solutions to projects involving difficulties in achie-

ving social acceptance, adapted to the characteristics of the CTS facility, which should lead to the achievement of a socially acceptable site fully contributing to the success of the project and its future long-term governability.

➜ Development of the detailed design, licensing, construction and start-up of the CTS facility within the terms established.

The CTS option is considered to be the basic choice as regards definition of the national strategy and as a support for economic calculation and planning of the present Plan. Nevertheless, alternatives have also been foreseen, through individualised storage solutions, which would make it possible to fulfil the commitments deriving from contracts governing the return of substances from reprocessing, ensure the continued operation of the plants close to pool saturation or address dismantling on termination of their operation.

In parallel with the above, activities of the following types would be undertaken if necessary:

➜ Specific studies to increase the SF storage capacity of the pool of some plants.

➜ Studies of options and, where appropriate, management alternative to storage for the fissile materials recovered during the reprocessing of the fuel Santa Mª de Garoña NPP.

➜ Like the other ENRESA installations, the temporary storage facility should consider the possibility of/need for the performance of associated R&D activities.

C.II.2. Final management

C.II.2.1. General considerations and the international situation

As has been indicated in the introduction to this chapter, there is ample consensus internationally regarding the option of disposing of SF and HLW in deep geological formations, the degree of development of other options (separation and transmutation) still being excessively preliminary for them to be considered real alternatives for the time being.

Within the general situation of delay in the implementation of solutions for the definitive management of SF/HLW, the countries that have most progressed in this respect might be Finland and the United States, inasmuch as they have sites in the characterisation phase (Olkiluoto and Yucca Mountain), the most favourable forecasts as regards the initiation of their operation being around the year 2020 and some time after the year 2010, respectively. Countries such as Sweden and France also have developed programmes but without a site having been selected (only laboratories) and with distant perspectives as regards the start-up of the facilities.

Other countries like Japan, which is still in the process of voluntary proposals for site selection; Canada, in the phase of drawing up strategic proposals with backing by society; and Great Britain, where a process of political and social discussion of this issue has been initiated, are examples of programmes in this field that are still far from reaching the situations described above.

The option of shared solutions proposed by certain countries, through the development of international or multinational repositories, offers clear advantages from the economic, technical and even security points of view for countries generating small amounts of waste or not having adequate geological formations. However, at present the socio-political problems associated with this approach are still very significant. The IAEA is paying special attention to this approach, due mainly to the security aspects of the nuclear fuel cycle.

As regards separation and transmutation, an option to which France and Japan are currently the countries dedicating most resources to development, the following should be taken into account:

- ➜ It is a promising option for reduction of the radiotoxic inventory of the wastes to be managed that requires important research and development efforts that should be addressed from the standpoint of international cooperation.
- ➜ It would not entirely remove the need to dispose of a significant quantity of waste and, therefore, would still imply the need for a geological disposal facility.
- ➜ It would imply previous reprocessing of the fuel, subsequent treatment and significant investments in transmutation ins-

tallations, which would be difficult to undertake at a purely national level.

C.II.2.2. Analysis of the national situation

Since 1985 work has been performed on the definitive disposal option in 4 basic areas:

- Site Selection Plan (SSP), which halted in 1996 and that has provided sufficient information to ensure the existence in the Spanish sub-soil of an abundance of granitic and clay, and to a lesser extent saline, formations capable of housing a definitive disposal installation, these being widely distributed geographically.
- Performance of conceptual designs for a definitive disposal facility in each of the aforementioned lithologies, searching for the maximum convergence (points in common) between them.
- Performance of Safety Assessment exercises with respect to the conceptual designs, integrating the know-how achieved through the works and projects performed on the basis of the successive R&D Plans, these underlining the fact that deep geological disposal facilities allow the safety and quality criteria applicable to this type of installations to be met.
- The R&D Plans that have evolved and adapted to the Spanish SF/HLW management programme. These plans have allowed technical knowledge to be acquired and national working teams to be trained in the development of the definitive disposal option, participating in international research projects and in demonstration projects in overseas underground laboratories.

In recent years there have also been important efforts in researching the different versions of the alternative of separation and transmutation (S&T), although the scope of these programmes and the absence in the country of installations adequate for the specific research programmes required make it essential to participate in the international context. Most of the work performed has been preliminary in nature, including the acquisition of basic data and feasibility analyses, and predominantly theoretical, although projects

aimed at demonstrating the actual feasibility of this option are scheduled for forthcoming EC Framework Programmes.

C.II.2.3. Strategic lines of action

The basic options contemplated for the adoption of a national long-term management policy are as follows:

- Limited temporary storage (periods of between 50 and 100 years) followed by a definitive disposal facility.
- Prolonged temporary storage (periods of more than 100 years) followed by a definitive disposal facility.
- Temporary storage followed by reprocessing (with possible S&T variants) followed by temporary storage and a definitive disposal facility.

For the purposes of the present Plan, the preferred basic option is limited temporary storage followed by a definitive disposal facility that, as regards economic calculation and planning, would enter into operation beyond the year 2050.

In relation to final management, and in the light of the new timeframe, the activities contemplated in previous plans will be significantly reduced, these being limited fundamentally to consolidation and updating of the knowledge acquired, taking advantage of international developments in the field. In this respect, the activities for the forthcoming years will be as follows:

- The knowledge acquired of techniques and methods for the characterisation from the surface of granitic and clay geological formations capable of housing a definitive disposal facility will be compiled. Site selection activities will not be renewed and documents will be drawn up summarising the information acquired to date.
- Generic designs for each host rock will be consolidated and alternatives will be contemplated as a result of improved knowledge of the components and processes and considering the criterion of recovery of the wastes deposited for a defined period.
- The corresponding safety assessment exercises will be revised in order to update them in accordance with the progress

made in the R&D programmes and in keeping with the revised designs. These studies should be updated and adapted to the new trends at international level (European Commission, IAEA, etc,) and to the regulatory framework developed in Spain, as well as to whatever new international criteria might arise in relation to this type of installations, including the scientific and technological progress occurring in the field internationally.

In parallel with the above, analysis and knowledge of the different alternatives to definitive disposal will be furthered, in close collaboration with the international progress and projects achieved and undertaken in this field, with a dimension and scope in keeping with the research capabilities existing in the country.

In the longer term, and only for the purposes of economic calculation and planning, a schedule will be mapped out for the start-up of a definitive disposal facility in the year 2050, which would imply putting back by 15 years the forecasts of the 5th GRWP, along with preliminary periods for decision-making, the characterisation of the site(s) and the construction of installations, from 2025 to 2040 and from 2041 to 2050, respectively.

C.II.2.4. Activities scheduled in the short term (4-5 years)

In order to be able to address the necessary initiatives, previously supporting the decision-making process, ENRESA will submit the following reports to the MITYC in the coming years:

- Report on management options contemplating the different alternatives considered at the international level and their adaptation to the Spanish case, including a programme for the development of each of the options.
- Report on the feasibility of new technologies, in particular the possibilities for separation and transmutation.
- Basic Generic Projects summarising the knowledge acquired in relation to definitive disposal.

Likewise, and with a view to being able to analyse the possible processes of coordination and potential mechanisms for public

participation facilitating the necessary debate in society, ENRESA will draw up a report including the experiences of decision-making processes in relation to SF and HLW management in countries having similar problems to Spain. This report will include the legislative initiatives, site selection procedures and methods for participation by the different stakeholders in the project, as well as the current situation of the respective programmes.

This information will serve as a basis for the analysis and formulation of possible parliamentary initiatives that might facilitate the decision-making process and the definition of a more adequate framework for participation.

In parallel with the above, R&D activities will be mapped out and developed in accordance with the premises, criteria and objectives indicated in Section C.V of this Plan.

In addition, the definitive management of SF and HLW requires the development of a legal and regulatory framework taking into account its specific characteristics and international developments in this area.

C.III. Decommissioningof facilities

C.III.1. General considerations and the international panorama

According to the most widespread definition, the term "decommissioning" encompasses the set of technical and administrative activities to be carried out at the end of the service lifetime of a regulated facility in order to remove all (or some) of the regulatory controls. Consequently, it includes activities relating to decontamination, dismantling, the removal of radioactive materials and waste and components and structures and the "release" of the site for other uses. "Decommissioning" would be the formal recognition of the new administrative and legal status of the facility.

The decommissioning of regulated facilities is another step, the last, in their lifetime, and in general is also included within the scope of the specific applicable regulations.

Especially significant, as regards LILW management, within the regulated facilities are those relating to the "fuel cycle", and in particular the NPP's and the irradiated fuel reprocessing plants (non-existent in Spain), since their dismantling implies the generation of very significant quantities of this type of radioactive waste.

The dismantling of nuclear fuel cycle facilities is an activity that is in a phase of clear growth in many countries, and this growth will continue over the next two decades. The world's operating NPP's are around 20 years old on average and, assuming a service lifetime of 40 years, this means that the number of reactors in the dismantling phase will increase rapidly as from the year 2010, reaching a maximum around 2015 and remaining at this level until 2025. However, the appearance and duration of this peak will vary from one country to the next, due fundamentally to the different nuclear programmes adopted.

The experience already accumulated indicates that the technical activities required for the dismantling and decommissioning of these facilities, including the NPP's, may be carried out on an industrial scale and within the most demanding parameters of quality and safety.

The basic national approaches for the performance of such activities vary from one country to the next, as a result of the different circumstances of each regarding a series of relevant aspects, such as the availability of sources of financing, the resulting waste management capacities, decisions regarding site usage, energy strategies, etc. The current trend at world level, or most common "strategy" for the NPP's, is towards full and early dismantling (Level 3), but not in all cases. For other facilities the national approaches tend to be more specific, although there is also a general trend towards not excessively delaying decommissioning activities once the end of the their service lifetime has been reached.

The availability of sources of financing and of adequate management capacities for the wastes produced are basic for the performance of this type of activities and may condition strategic decisions. In this respect, the management modes applied to waste materials containing minimum amounts of radioactivity take on special relevance. This aspect, known internationally as "clearance", is essential when determining the total volume of these materials that are to be managed as "radioactive waste".

As regards activities undertaken by the international organisations in the dismantling of nuclear facilities, it should be pointed out that this is an area of activity that has become increasingly important in recent years and is encompassed within new IAEA initiatives. Particularly significant in this respect is the development

of safety standards within the RADWASS programme on the decommissioning of nuclear and radioactive facilities; within NEA / OECD, where there is a forum for the exchange of technical information and industrial experience in the performance of dismantling projects – known as the Dismantling Cooperation Programme – endorsed by the Agency and with an increasing number of projects since 1985; and within the EU, where, after more than 20 years of research and with the technology having achieved industrial maturity, the Commission is planning to address other related aspects, since along with the waste generated dismantling projects imply environmental, technical, social and economic questions.

In addition to the situation described in relation to the most relevant international organisations, there are significant RF dismantling references in different countries. However, the action strategy of each country has specific characteristics and, in addition, the strategy is not always maintained steady over time, as may be observed in the French case, where a decision has recently been taken to speed up the dismantling programmes, and in the case of pressure existing in Great Britain to reduce the waiting times prior to full dismantling. The USA and Sweden tend to opt for immediate dismantling, unless there is an operating reactor on the site.

The international experience in NPP dismantling may be summarised as follows:

- A large number of complete commercial reactor dismantling projects are in the performance phase.
- The technologies and methods to address the dismantling of any plant component or area are available and have been satisfactorily demonstrated in various projects.
- The strategies are influenced in each case by specific conditions (country-plant-owner site). In the case of plants not sharing a site with other groups, the tendency to undertake full short-term dismantling is much greater than in the case of shared sites.

C.III.2. Analysis of the national situation

In Spain there is currently a system established for performance of the activities leading to the decommissioning of regulated facilities and the agents involved are also defined.

The operating mode of the system contemplates: a) the general framework of the activities; b) the legal framework; c) the role of the agents, and d) the basic conditions of safety and operability to be fulfilled and guaranteed in application, including the financing mechanisms. The licensees of regulated facilities generating radioactive waste must have the capacities required for their management and this may be arranged for by means of contracts with ENRESA, the scope of which should include up to dismantling, in the case of the NPP's and, where appropriate, for the RF's.

A relevant element, in a sense different from the situation existing in other countries, is that ENRESA has direct responsibilities assigned to it in the decommissioning of certain of these facilities, and this is included in the applicable standards.

In the case of the NPP's, the responsibility for such dismantling corresponds directly to ENRESA, and this is established in the contract between the Parties, which is complemented by the necessary operating agreements. Also completely defined by the authorities and fully operative are the financing mechanisms inherent to the process.

In the case of Uranium concentrates mining and milling, the responsibility is to the Licensee, unless otherwise determined by the authorities in view of the circumstances, as has been the case for the "historic" facilities.

The responsibility for dismantling of the Juzbado fuel assembly manufacturing facility lies with ENRESA, this being established in the corresponding contract. This contract also establishes the mechanism for annual contributions to the fund throughout the operating lifetime of the installation to cover the foreseen costs of dismantling.

In the case of CIEMAT, the responsibility is to the Licensee, the technical and financial aspects of ENRESA's participation having been set out.

The contract between the RF's and ENRESA for the management of the radioactive wastes generated by these facilities allows the Licensees to reach agreements with ENRESA regarding performance and ways to cover the associated costs, although it should be pointed out that the decommissioning of this type of installations does not normally imply any special difficulties once the last operating wastes have been removed.

Also to be underlined is the fact that the current standards contemplate the basic aspects of the regulatory process governing projects for the dismantling and decommissioning of regulated facilities, and that they recognise the need to plan dismantling from the initial stages of the design of these installations. However, a development process would be appropriate in this respect to increase its specific nature and facilitate optimum application to these projects. An aspect to be addressed in this process is that referring to the definition of the scope and responsibilities and the manner in which the long-term institutional surveillance associated with the decommissioning of certain of these installations might be resolved.

The dismantling of large facilities produces significant quantities of waste materials containing radioactivity, mainly LILW, which in the case of Spain may be managed at El Cabril, often as VLLW. NPP dismantling and decommissioning activities may be seriously hampered (or even rendered impossible) depending on the availability or otherwise of a sufficient capacity for management of the spent fuel. Likewise, the decommissioning of these facilities, and of other relevant fuel cycle installations, even certain specific RF's, leads to the generation of moderate (but appreciable) quantities of radioactive waste, the definitive management of which, in the Spanish case, is not possible or is not contemplated in the same way as current LILW.

In recent years a considerable amount of experience has been acquired in this field in Spain, including the following projects:

- Dismantling of the existing installations and restoration of the site at the Andújar Uranium Mill (AUM);
- Environmental restoration of the areas affected by uranium mining prospecting and works at various sites;
- Dismantling and environmental restoration of the site at the La Haba uranium ore treatment facilities (now completed) and of those existing at Saelices El Chico, which includes mining and the large-scale manufacturing of uranium concentrates;
- Partial dismantling (IAEA Level 2) of the 460 MWe graphite-gas Vandellós I NPP;
- Decommissioning of research reactors in the university environment (ARGOS and ARBI).

Outstanding among the aforementioned projects, for its scope and relevance, is the partial dismantling undertaken at Vandellós I NPP, which has placed Spain among the group of countries having integral experience in this area. The performance of this project on schedule and to the necessary scope has been possible thanks to the existence of an infrastructure in the country sufficient to guarantee the financing of the costs, application of the necessary technologies and adequate management of the waste generated.

The aforementioned experience, and especially that acquired during the dismantling of Vandellós I, has allowed a set of capacities of different types to be developed, these now being fully available. Linked to the above, generic and specific tools have been developed for the management and optimisation of dismantling activities and databases of actual experiences. All this experience will now be applied to the different projects to be performed in the near future, such as: a) the direct dismantling and decommissioning of José Cabrera NPP; b) the dismantling and decommissioning of different CIEMAT facilities (PIMIC), and c) the dismantling of installations and restoration of mining works at Saelices el Chico and other uranium mines.

Table C.1 shows the current status of facility decommissioning and dismantling activities in Spain, with a distinction made between NF's and installations relating to uranium mining and milling. In addition, the country's RF's pass to the situation of decommissioning in the usual manner.

C.III.3. Strategic lines of action

In view of the experience acquired in recent years, the basic future approach for ENRESA's activities in this field, focussing fundamentally on the nuclear power plants, is as follows:

- Maintain cooperation between the different agents involved and the Authorities in whatever standards-related or other developments they wish to undertake. Special attention should be given to the transition from the operating stage and to incorporation of the necessary degree of flexibility in the mandatory documents and the licensing process during project performance, in order to take into account the changing reality of the facility as the project progresses.

- Maintain coordination and cooperation between the operating agents (Licensees and ENRESA), for optimisation of compliance with the basic national strategy defined, which consists of total dismantling to be initiated three years after definitive shutdown, unloading of the fuel and removal of operating LILW.

  As regards Vandellós I NPP, and with Level 2 dismantling having been completed, this plant becomes a passive installation that will remain in this mode for the next 25 years (dormancy period), until such time as total dismantling (Level 3) is undertaken.

  At present the Authorities are evaluating the methodology and the tests performed by ENRESA to release a part of the land that was previously part of the site, from the regulatory point of view.
- Design and address the dismantling of José Cabrera NPP, which definitively ceased to operate on 30/04/06, taking advantage of the experience acquired from Vandellós I

  The alternative of complete and immediate dismantling has been selected as optimum for this project, releasing practically all the site (except the SF temporary storage facility, where appropriate) and thus allowing it to be used without restrictions.
- Maintain efforts in optimisation of the practical process of "clearance".
- Participate with the Licensee in dismantling and restoration activities at Saelices El Chico and other uranium mines, on the basis of the experience acquired.
- Maintain the necessary support for CIEMAT, Universities and RF's in the necessary dismantling activities, contributing the experience acquired.
- Maintain lines of activity and cooperation for optimisation of the future dismantling of the Juzbado nuclear fuel manufacturing facility.
- Satisfy whatever approaches are decided on by the Authorities for long-term institutional surveillance.

C.III.4. Activities scheduled in the short-medium term (4–5 years)

Dormancy of Vandellós I.

The activities foreseen for performance during the dormancy period of Vandellós I are as follows:

Table C.1. Current status of facility decommissioning and dismantling activities in Spain

Nuclear facilities in the decommissioning and dismantling process			
Facility Name	Location (Province)	Current Situation (31/12/2005)	Decommissioning and dismantling milestones
Vandellós I NPP	Tarragona	Partial dismantling (IAEA Level 2 in stages) concluded	1990. Expiry of the operating permit for the natural uranium /graphite-gas NPP after 17 years of operation 1992. Approval of the Decommissioning alternative by MINER/CSN 1994. Submittal of the Decommissioning and Dismantling Plan 1997. Environmental Impact Statement 1998. Approval of the plan and initiation of activities 1999. CSN authorisation for dismantling in active areas 2003. Completion of dismantling (Level 2) 2005. Authorisation of dormancy
Argos Research Reactor	Barcelona	Dismantled in 2002	1977. Definitive shutdown 1992. Removal of fuel 1998. Ministerial Order authorising dismantling 2003. Declaration of decommissioning
Arbi Research Reactor	Bilbao	Dismantled in 2004	1972. Definitive shutdown 1992. Removal of fuel 2002. Ministerial Order authorising dismantling 2005. Declaration of decommissioning
CIEMAT Installations	Madrid	In the licensing process	2001. Approval of Master Plan for Improvement of the CIEMAT facilities 2002. Submittal of the Dismantling Plan to MINECO, CSN. Submittal of the Environmental Impact Study to the MINMA. Request for works licence to the City Council of Madrid 2005. Authorisation for dismantling

Table C.1. (Cont'd.)

Uranium mining and milling facilities in the decommissioning and dismantling process

Uranium mining and milling facilities	Location (Province)	Current situation	Process milestones
Andújar Uranium Mill (AUM)	Jaén	Long-therm surveillance phase	Dismantling and restoration works completed in 1994. The surveillance period began in 1995
19 disused uranium mines	Extremadura and Andalusia	Restored	The restoration works began in 1997 and were completed in 2000
Lobo-G Plant (La Haba)	Badajoz	Long-term surveillance phase	Dismantling and restoration works completed. The decommissioning declaration was obtained in 2004.
Elefante Plant (Saelices El Chico)	Salamanca	Dismantled	Dismantling and restoration works began in 2001 and were completed in 2004.
Saelices El Chico (Mining works)	Salamanca	Definitive restoration phase	2004. Initiation of definitive restoration works
Quercus Plant (Saelices el Chico)	Salamanca	Definitive shutdown of crushing and classification	To be dismantled in 2008
Other disused uranium mines	Salamanca	2 mines authorised and the rest pending authorisation	To be restored as from 2006

- Characterisation of the land to be released and certification of the final status of the released areas of the site. This activity will be carried out interactively with the regulatory body in charge of guaranteeing compliance with the radiological criteria applicable to the released land.
- The Vandellós I dormancy installation has static and passive systems entailing minimum operating needs; these are particularly simple since the parameters to be monitored evolve slowly and do not require any immediate intervention. Only surveillance and maintenance activities are foreseen, among which special mention should be made of the five-year check of the leaktightness of the reactor shroud.

- Remaining dispatches of radioactive waste generated during the performance of the Dismantling and Decommissioning Plan (DDP) and characterisation of waste materials.

José Cabrera NPP

In addition to the activities to be performed by the Licensee and ENRESA relating to the remaining operation period of the Plant and management of the SF (see section C.II.1.4), the activities foreseen with respect to the DDP of José Cabrera NPP are as follows:

- Preparation of the basic and detailed engineering and of the licensing documentation relating to the plant DDP (2004 to 2006).
- Activities for preparation of dismantling (2006 to 2009), in collaboration with the licensee.
- Acquisition of authorisation and initiation of dismantling activities in 2009, the duration of which is estimated at 6 years.

Dismantling optimisation studies

Among the activities mapped out for the next 5 years is the completion of the studies for the progressive updating of the knowledge available for the dismantling of the Spanish nuclear power plants. Within these, the generic study on the dismantling of PWR type plants has now been concluded and the generic study on BWR plants is under way.

In addition, and given that the dismantling of Vandellós I has generated a large volume of information and know-how, both in technical and economic areas and in relation to organisation and planning, an activity of suitable scope and detail will be undertaken to assimilate and structure the knowledge arising from the experience acquired at V-1 in the form of action guidelines applicable to the design, licensing, organisation and performance of new dismantling projects.

Research Centres and Reactors

The decision to dismantle certain obsolete CIEMAT installations for which no further use is foreseen and use the space released for the performance of other activities gave rise to the Integrated Plan for

the Improvement of CIEMAT Facilities (PIMIC), which includes collaboration from ENRESA as a company specialising in and having experience of this field of management.

The Plan, which will extend to the year 2009, is subject to the control and supervision of the CSN, in accordance with the standards in force, and once the necessary authorisations have been obtained from the Administration, CIEMAT will continue to be responsible as the licensee of the installation and ENRESA will carry out the dismantling activities, on the basis of a contractual relationship with CIEMAT. In December 2005 the MITYC granted the corresponding permit authorising the performance of the works contemplated in the project. At the end of February 2006 the Municipal Works Licence was also awarded.

Nuclear fuel cycle facilities

In this field of management work continues on the restoration of the mines that, until the end of the year 2000, fed ENUSA's QUERCUS plant at Saelices El Chico (Salamanca), the project covering the time period 2001 to 2008.

Two phases are considered in the restoration of Saelices el Chico: the Decommissioning of the Mining Works, in accordance with a contract between ENUSA and ENRESA dated 15th December 1999, and Definitive Restoration, submitted to the Administrations in May 2003 for their approval and included in a contract signed during the first quarter of 2004, which contemplates the budget for the works and payment of 60% to the Fund for the financing of activities included in the GRWP.

The Decommissioning phase (dismantling of the Elefante Plant and restoration of the leaching beds) began in January 2001 and ended in 2004. Definitive Restoration commenced in the last quarter of 2004 and is scheduled to finish during 2008. The initial phase of earth movement concluded in 2005, slightly ahead of the initial schedule, and a second and last phase is foreseen for initiation in 2006, with a performance period of 3 years.

Furthermore, site surveillance tasks continue at the AUM, in accordance with the conditions established in the set of conditions of the CSN, included in the Resolution by the Ministry of Industry and Energy of 17th March 1995. Once the period of compliance has been

favourably concluded, it will be necessary to consider the issue of long-term institutional surveillance.

The decommissioning statement for the site of La Haba was issued in August 2004, as from when the long-term surveillance programme started.

C.IV. Other activities

Protocol on collaboration in the radiological surveillance of metallic materials

In 1998 an incident occurred at a steelyard located in the province of Cádiz, this consisting of the smelting of a high level radioactive source of Cs-137, that had been processed due to its being included in a batch of the metallic scrap used in the process. The incident did not have any appreciable effects for persons or the environment, but did hinder operations and imply high costs for the factory, for the performance of all the necessary cleaning and recovery tasks, as well as generating a very significant volume of LILW.

As a result of this incident, the national Authorities promoted initiatives to prevent the repetition of this type of events and, in any case, reduce their effects were they to occur. The first result was the signing in November 1999 of a "Protocol" for voluntary collaboration between the different "agents" involved one way or another in the issue. Since then other industrial and trade union associations involved in the metal industry have joined the "Protocol".

Since the signing of the Protocol, there have been a significant number of detections of radioactive material contained in or accompanying metallic materials of various types, and ENRESA has undertaken their removal and corresponding management.

As a result of the incidents referred to above, ENRESA has removed approximately 2,500 m^3 of radioactive wastes, which have been transferred to El Cabril.

Support for emergency response

One of the tasks assigned to ENRESA by the regulations is that of providing support for the competent Authorities, in the manner established, in the event of a radiological emergency. The scope of this support is defined at a very basic level in certain national plans and programmes, such as the PLABEN, and should be mapped out for other circumstances and assumptions, such as those that would arise

in the case of other emergency situations not due to an event at an NPP and that might occur in any area of the country. In any case, ENRESA would intervene in response to requests from the competent Authorities, and specifically within the framework of the PLABEN, as a member of the "Radiological Response Group" directed by the CSN.

In order to be able to fulfil the tasks assigned to it, ENRESA has developed a series of operating capabilities complementary to those pertaining to it habitually, among which the following may be singled out:

- Mechanism for integrated coverage of activation.
- Support Service with complete chronological coverage to perform interventions and the removal of radioactive materials.
- Support Services with radiological measuring and analysis capacities.

The national system includes the periodic performance of preparatory exercises and drills, in which ENRESA regularly participates.

Complementary to the above, ENRESA cooperates in the training activities on radiation protection and radioactive waste management of the State Security Forces and other institutional groups, whose participation in this type of situations is in all cases essential.

Recently ENRESA has joined the national operating system for response to the detection of radioactive materials, within the framework of the action plans included in the international initiatives in which Spain participates.

Management of radioactive lightning rod headers

The national Authorities have established a standard requiring the formalisation of the existence of this type of apparatus in accordance with the specific regulations governing radioactive materials or arrangements for ENRESA to remove them as radioactive waste.

In recent years ENRESA has been removing and managing these headers and the radioactive sources they contain, exporting them for recycling. For all intents and purposes, this process may now be considered complete, with a total 22,264 headers having been removed as of 31/12/05. However, the operating capacity is still in place for any occasional lightning rod of these characteristics that may be found in the future.

No incidents worthy of mention have occurred during this process.

Management of ion smoke detectors (ISD's)

This type of detector incorporates a small radioactive source and its commercialisation (not its use) is regulated. The use of this type of detectors is very widespread and there are several million installed throughout the national territory.

Up to February 2005, there were in principle two ways in which these detectors could be managed: delivery to ENRESA as a radioactive waste or definitive management via conventional routes, as long as the apparatus fulfilled a series of requirements regarding manufacturing and use. Since that date a new procedure has been put in place for the definitive management of ISD's at the end of their service lifetime, inasmuch as they are "electrical and electronic devices" (RD 208/2005 on electrical and electronic apparatus and the management of their wastes).

By virtue of the above, as from 2005 the manufacturers and suppliers, along with the local entities, as established in the standards, are responsible for setting up and financing systems to ensure the management of the radioactive sources that such devices incorporate, which are to be handed over to ENRESA.

ENRESA is currently preparing a new Action Plan, in close contact with the Authorities, taking into account the provisions of the aforementioned RD 208/2005.

Within the framework existing at that time, as of 31-12-05 ENRESA had removed a total of some 84,000 detectors, of which almost half were sent directly to El Cabril and the other half to CIEMAT, from where a small proportion containing sources of Ra-226 were sent to the United States. The sources corresponding to the rest have been or are being disassembled, following which they have been (or will be) fully transferred to El Cabril.

Management of other radioactive materials arising outside the regulatory system

In addition to the specific cases described in the previous sections, the national system has established two basic mechanisms for the removal and safe management of any radioactive material arising

beyond the scope of regulatory control. The Authorities implement these mechanisms through the issuing of "Intervention orders" or "Transfer resolutions", involving ENRESA as appropriate in each case. Especially relevant in this respect is Royal Decree 229/2006 on the control of high level encapsulated radioactive sources and stray sources.

ENRESA has undertaken a limited number of actions in response to "Intervention orders", these having included the removal and management of radioactive sources for medical applications, used during the first half of the 20th century, and certain cases of companies commercialising consumer goods that had been confiscated by the Administration and others involving regulated installations of other types whose Licensees could not be located.

Interventions relating to "Transfer Resolutions" are more common and refer essentially to sources and other radioactive materials existing at installations (regulated or otherwise) as a result of activities performed some time ago and not originally following the established procedures or doing so inadequately.

The type of radioactive sources and materials that are removed via these mechanisms are varied and the volumes are not generally significant.

C.V. Research and development

C.V.1. General considerations and international situation

R&D is one of the basic elements in the generation of the know-how and technologies required to guarantee the safety and feasibility of the different stages of radioactive waste management, thereby playing a relevant role in this management.

Like most countries that generate radioactive waste, Spain has developed systematic R&D programmes applied to both the different types of waste (high, intermediate, low and very low level) and the activities involved in the dismantling of nuclear facilities, environmental restoration and radiation protection. The efforts dedicated to such activities focus both nationally and internationally on those areas and activities for which industrial solutions have not yet been implemented, without forgetting the optimisation and ongoing improvement of the safety and operability of the operating facilities through the incorporation of the technological and scientific progress made.

In general, R&D in radioactive waste management should:

- Supply the capacities and knowledge required to contribute to the development of safe, feasible and acceptable management strategies for society, for all types of radioactive waste.
- Develop and verify the technologies required for the development of such strategies, to the extent that they are not industrially implemented.
- Continuously and systematically improve and optimise ongoing management activities and ensure the availability and operability of the technologies that, once developed, would be necessary for such actions.
- Contribute to the acceptance of the management strategies by scientific, social and political groups through transparent communication of scientific and technological progress in this field, and the difficulties encountered.
- Ensure that the progress made in relation to know-how and technology is transferred to radioactive waste management such that safety is improved through the reduction of uncertainties and that costs are optimised through the application of increasingly efficient technologies.

These premises are generally followed in the R&D programmes of the different European countries, adapted in each case to the strategy selected and the implementation schedule.

At international level there is close collaboration in the field of R&D through both the EU Framework Programmes – specifically within EURATOM – and bilateral or multinational agreements.

As regards high level waste, the European R&D programmes focus on Deep Geological Disposal as the definitive solution, regardless of whether or not there might be some reuse or re-elaboration of the fuel prior to such final management, or even with specific considerations regarding the feasibility and application of transmutation techniques, aspects that also carry with them important R&D programmes, both specific in certain countries and within the EU Framework Programmes.

In relation to disposal, the "underground laboratories" are currently the main centres generating knowledge and verification of tech-

nologies and methodologies for full-scale demonstration of the feasibility of constructing and operating a repository as the final solution and of the safety of such a facility. The European underground laboratories in operation are located in Mol (Belgium-Plastic Clays), Grimsel (Switzerland-Granites), Äspö (Sweden-Granites), Mt. Terri (Switzerland-Compacted clays), Meause (France-Compacted clays) and Tourneume (France-Compacted clays).

As regards separation and transmutation, important R&D efforts are being made, led by the countries that have fuel reprocessing capabilities, to obtain the basic data and technologies for the development of a prototype allowing the technical, industrial and economic feasibility of these systems to be analysed in relation to energy generation, along with their impact on radioactive waste management (reduction of the toxicity of radioactive waste).

R&D in the management of LILW, dismantling, radiation protection and environmental restoration is oriented internationally towards optimisation of technologies for the characterisation of the radioactive inventory of the wastes to be managed (waste packages), the durability of confinement systems, the improvement and optimisation of monitoring systems, waste volume reduction, the optimisation of decontamination and cutting techniques for materials to be dismantled, etc. In this field there is widespread collaboration and interconnection between the different programmes, with a view to sharing experiences and generating a common database, especially in the case of NPP dismantling.

The R&D carried out in Spain has led to active participation in all areas of management, although in view of the initial shortcomings the greatest efforts have been made in relation to the management of HLW and also in those projects whose results are immediately applicable to activities on-going at ENRESA (LILW management and dismantling).

C.V.2. Analysis of the national situation

Since 1986, radioactive waste management in Spain has been accompanied by five-year R&D plans. The fifth plan, covering the period 2004-2008, is currently in force, and will be adapted to the new strategic objectives of the GRWP. The main objectives of and resources assigned to these plans have been and will be the result of the strategies established in the successive GRWP's.

At present, and as a result of the R&D performed, there is an important scientific and technological infrastructure that ensures the availability of many of the capabilities and technologies required for management. These capabilities include both scientific groups and the analytical and numerical infrastructure developed, as well as the methodological experience acquired.

Taking into account the level of the technology and the experience and capabilities acquired, and considering also that in the current spent fuel and HLW management strategy temporary storage is ENRESA's main short-term priority, that geological disposal is not an urgent requirement and that important activities are foreseen in the fields of VLLW management and the dismantling of nuclear facilities, R&D should be oriented and developed such that:

- ➜ It provides systematic and preferential support for activities relating to temporary storage, dismantling and the management of VLLW and LILW.
- ➜ It includes an area of direct support for CTS, limiting activities relating to the definitive management of SF/HLW to the consolidation and updating of the knowledge acquired, in keeping with international developments.
- ➜ It ensures the maintenance and updating of capabilities and know-how associated with the characterisation of the behaviour of HLW (fundamentally spent fuel) and the isotopes it contains, as well as with the separation and transmutation of high level waste in support of the short and long-term management of irradiated fuel.

These activities should be carried out maintaining a level of investments similar to that currently in place and maintaining also international collaboration, adapted to the new timeframe for the performance of ENRESA's management activities.

C.V.3. Basis and criteria for R&D performance

The performance of R&D activities shall take the following criteria into account:

- ➜ Balanced combination of national capabilities and of those developed in other countries. International collaboration should be maintained in balance with other activities.

- Use of the installations required for the performance of research: conventional and radioactive laboratories and international research centres and underground laboratories, the latter being limited to the maintenance and assimilation of knowledge.
- Use of ENRESA's in-house installations or projects as generators of knowledge regarding both the behaviour of wastes and of the matrix containing them and of the synthesis of isolation and confinement, the sites and the environment surrounding the facilities.
- Maximum advantage taken of the collaboration agreements signed with other waste management agencies and research centres, to complete and strengthen progress in R&D, in accordance with the ENRESA strategy.
- Continue participation in the EU Framework Programmes for the verification and contrasting of in-house developments and acquisition of knowledge, adapted to the new criteria and strategies.
- Continue participation in other international projects or programmes, as long as this implies an added value to in-house developments, at a reasonable cost, and such projects or programmes are within the scope of the new strategy.
- Document, simply but rigorously, the know-how and technologies generated such that dialogue with the authorities is facilitated.
- This same knowledge, presented in a detailed and exhaustive manner, should constitute the basis for the scientific community and the nuclear regulatory body to analyse and evaluate waste disposal proposals.

In conclusion, the development of technological know-how and capabilities has undergone a considerable increase in Spain, acquiring in many fields a level similar to that achieved in the most advanced countries in the nuclear field. Nevertheless, continued R&D is, and will be, necessary, albeit with different objectives, until such time as the management facilities are put into operation.

C.V.4. Activities schedules (next 5 years)

The R&D activities for the next five years should provide support and coverage for the following:

- The drawing up and/or review of management strategies for the different types of radioactive wastes based on better understanding of these wastes, the matrixes in which they are contained and the physical, chemical, environmental and radiological properties of the isotopes they contain.
- Support for the detailed design, licensing and construction of temporary storage facilities and their operational and environmental surveillance, with special attention paid to the CTS facility.
- Drawing up of the "Basic Generic Projects", which will include summary documents on the status of the knowledge and technology achieved in relation to definitive disposal, resulting from R&D.
- Participation in the EU EURATOM programme in the areas of separation and transmutation and geological disposal and, to the extent that it affects radioactive waste management, of radiation protection.
- Continuation of the lines for improvement in environmental restoration technologies and in the environmental monitoring of facility sites, for both LILW, VLLW and CTS.
- In the case of LILW, improved understanding of the durability of concretes, volume reduction technology implementation testing and the characterisation of waste packages for the integral modelling of the operation of a disposal facility.
- Design, construction and licensing of the layers covering the disposal platforms at the El Cabril facility.
- Optimisation, improvement and documentary consolidation of the management of the scientific and technological assets generated by R&D, such that there be assurance of the immediate availability of these assets when required and their suitable transfer to the new objectives of the R&D.
- Development of the scientific, technological and methodological bases for the dismantling of nuclear facilities, taking advantage of the experience acquired in the dismantling of Vandellós I NPP and applying it to José Cabrera NPP or to other installations at which intervention might be necessary.
- The research and initial and on-going training activities to be carried out at the Mestral Technology Centre on the site of Vandellós I.

➜ Tracking at international level of the management modes for specific materials, such as graphite.

The integrated coordination and tracking of R&D projects is a systematic activity that allows for analysis of the progress of the plan and ensures the transfer of the results to day-to-day management. This coordination will be maintained systematically as a horizontal course of action within the R&D plans.

Annex D

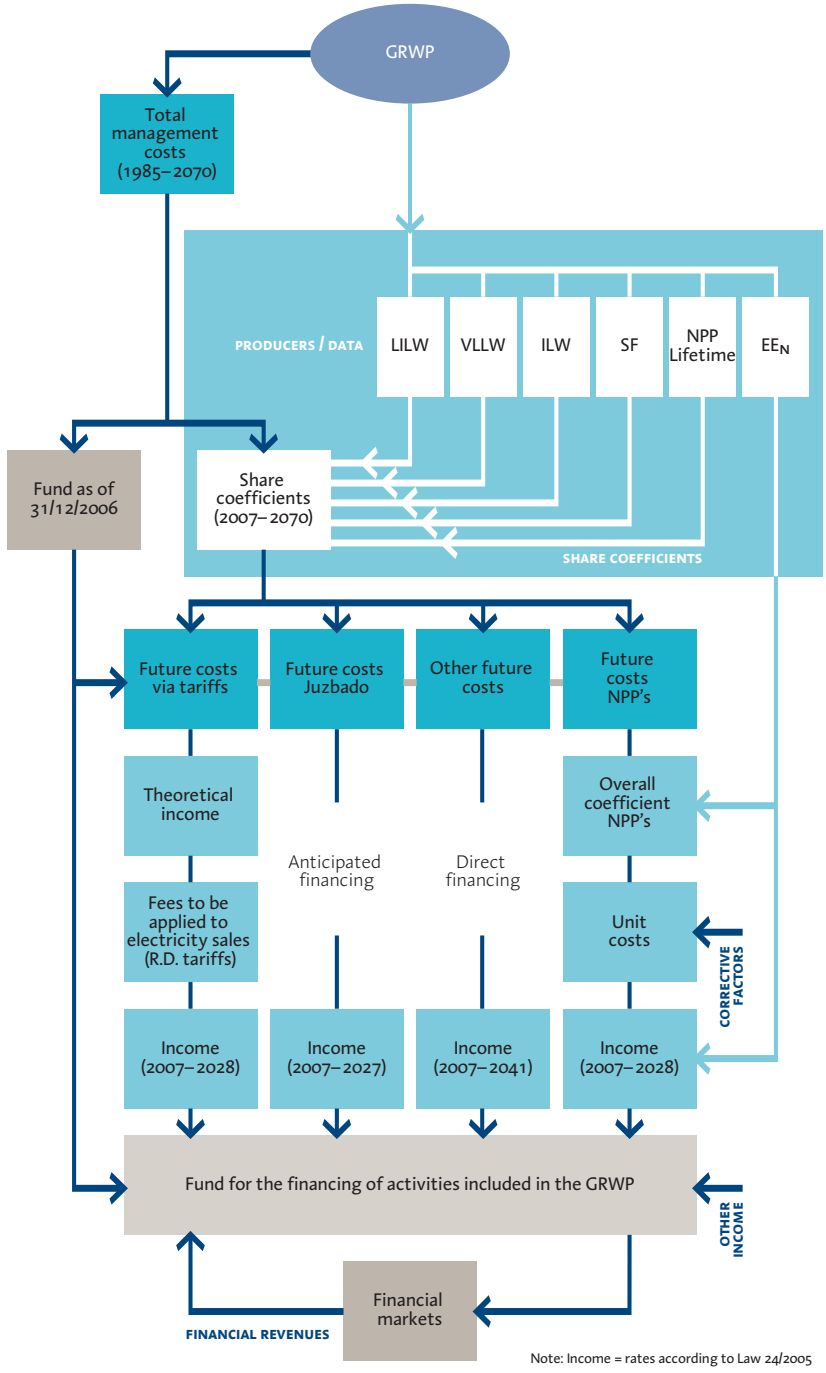
Economic-Financial Aspects

As is shown in the methodological flowchart in figure D.1, the overall costs of management are assessed on the basis of the scenario, strategies and action programmes contemplated in the GRWP as the sum of the costs of the different areas of performance: low and intermediate level waste, management of spent fuel and high level waste, the decommissioning of facilities, other activities and R&D, along with ENRESA's structural costs.

The costs of the past are separated from future management costs, the latter being broken down by applying a series of coefficients for sharing by producers. Subsequently, the revenues needed to finance these costs are determined, on the basis of the legally established systems, using a discount rate of 1.5% for the calculations.

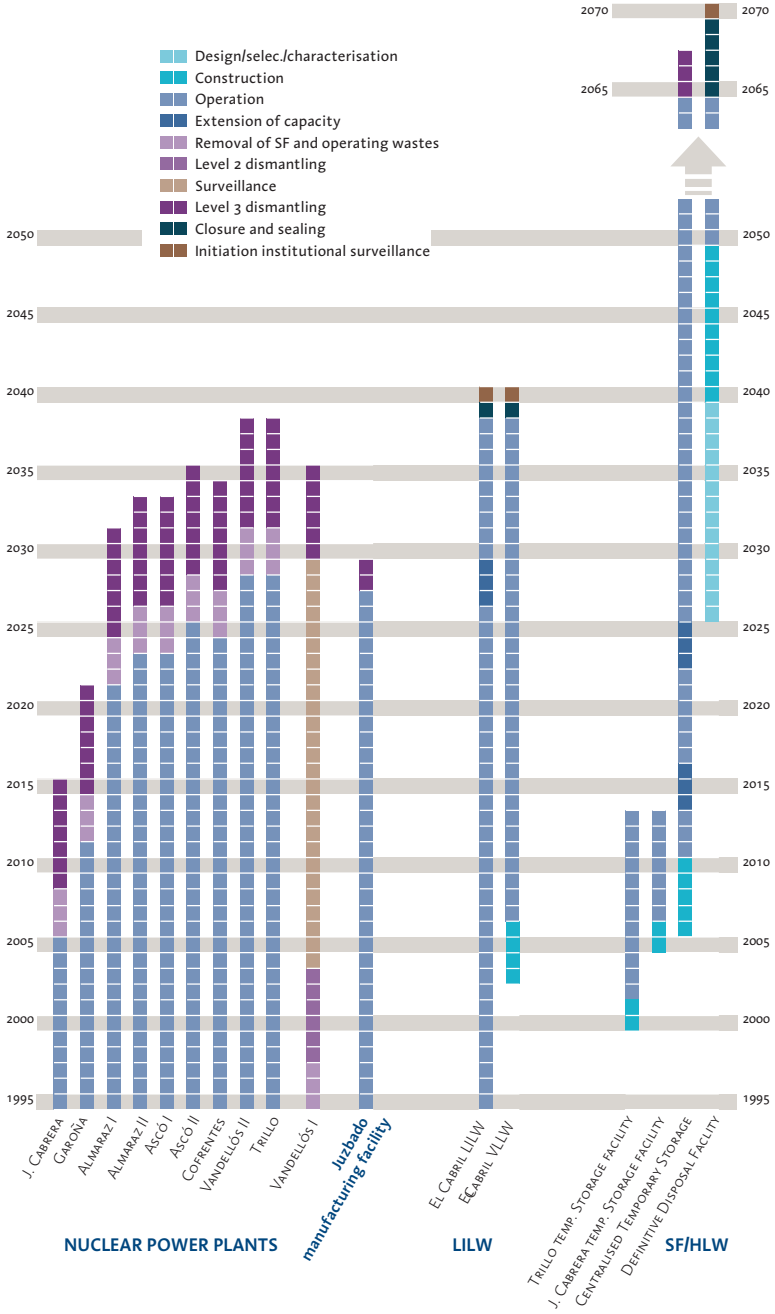
Figure D.2 shows the general schedule for spent fuel and radioactive waste management, derived from the basic planning scenario, which constitutes the basis reference for all the calculations. In the figure may be seen the dates and main milestones for the operation, decommissioning and dismantling of the nuclear power plants and the Juzbado fuel assembly manufacturing facility, along with those relating to the construction, operation, closure and sealing of the LILW disposal installations and those corresponding to the storage and disposal of SF and HLW.

Figure D.1. Flowchart of financing of activities included in the GRWP



Note: Income = rates according to Law 24/2005

Figure D.2. General schedule for spent fuel and radioactive waste management
Basic planning scenario



VLLW: Very Low Level Waste
LILW: Low and Intermediate Level Waste
SF/HLW: Spent Fuel and High Level Waste

D.I. Management costs by areas of performance

Detailed below are the costs of management for each of the areas of performance identified above, a distinction being made between two main periods:

- Historic period
  - Past 1985-2005
  - Current Year 2006
- Future period
  - Short-medium term: 2007-2010
  - Long term: 2011-2070

The past costs are obtained from ENRESA's accounting, escalated to euros as of 1st January 2006 (€2006), which is the monetary basis used to estimate costs.

The costs for the current year, as well as those relating to the short-medium term, which are detailed annually in the technical-economic budget, are obtained from the ENRESA budget for the year in question (POA-PM 2006-2010).

The long-term costs are assessed either on the basis of extrapolating current data (LILW management, R&D, structural) or of in-house estimates based on the specific studies performed (CTS, SF/HLW disposal, NPP dismantling).

D.I.1. LILW management costs

As regards costs, this area of management is presented sub-divided into the four sections described below. These include the costs of both LILW and VLLW.

- Preliminary management

  This refers to the mapping of inventories, acceptance, scheduling of removals, characterisation and verification of waste package quality, NPP operating waste volume reduction programmes performed at the point of origin and transport of LILW/VLLW from the producers to the treatment or disposal facilities.

- Definitive management

  This is the core of management and covers the treatment and,

where appropriate, conditioning and definitive management of wastes.

The treatment considers the physical or chemical processes to which the wastes are subjected in order to reduce their volume and/or incorporate them in a solid stable matrix (incineration, compacting, immobilisation, smelting,...). Conditioning takes into account the production of disposal units (basically the manufacturing of containers and their blocking) and disposal, which includes the construction of disposal cells or systems, the placing of the disposal units in these cells, closure, the definitive coverage of the disposal zones and the institutional surveillance subsequent to closure of the installation.

➜ Support services

Under this heading is included the set of activities directly or indirectly complementing the activities described in the two previous sections, fundamentally those performed at the El Cabril Disposal Facility, i.e. radiation and environmental protection, operation and maintenance of installations other than those used for definitive management (including temporary storage installations), security and administration of the disposal centre.

➜ Assignments to Town Councils

In view of its quantitative importance, this item is considered separately, and includes the costs deriving from the standards in force for the disposal of waste at El Cabril.

Table D.1 shows a summary of LILW management costs, on the basis of the aforementioned activities.

Table D.1. LILW management costs

LILW management	Actual as of 31/12/2005	Estimated 2006	Budget 2007-2010	Estimated 2011-2070	Total
Preliminary management	80,248	4,023	29,789	133,337	247,397
Definitive management	230,944	11,609	23,122	249,113	514,788
Support services	236,687	14,772	55,103	411,409	717,970
Assignments to town councils	35,519	1,282	7,197	102,534	146,532
Total	583,397	31,686	115,211	896,392	1,626,687

D.I.2. SF/HLW management costs

The costs in this area have been broken down considering the following items:

- **Preliminary management**
  Drawing up of inventories of SF, studies, generic project scheduling and tracking and the future transport of SF and vitrified waste from the point of origin to the CTS facility, and subsequently from here to the DGD facility.

- **Temporary storage**
  This refers to the reracking of the NPP storage pools, the temporary storage facilities at the Trillo and José Cabrera plants, including all the costs relating to these installations (design, construction and operation), and the casks used in both cases, as well as all the costs relating to the studies, design, licensing, construction, operation and decommissioning of a centralised facility for the storage of SF, HLW and other wastes not open for definitive management at El Cabril, along with any other activity necessary in this field.

- **Reprocessing**
  Operations or processes to which the SF may be subjected in order to separate the different families of radionuclides with a view to their possibly being reused (fissionable materials) or subsequently managed selectively (fission products, transuranic elements) either as waste (vitrification) or for subsequent treatment (transmutation). In the present Plan this activity refers basically to the reprocessing in France of the SF from Vandellós I NPP and the return of the wastes as from 2010, as well as to the pending costs for reprocessing in Great Britain of the SF from the Santa María de Garoña plant.

- **Definitive management**
  This includes all the activities relating to definitive disposal (site selection and characterisation, technical and safety-related studies, design, construction of installations, operation, closure, sealing and institutional surveillance), as well as the trac-

Table D.2. SF/HLW management costs

SF/HLW/ILW management	Actual as of 31/12/2005	Estimated 2006	Budget 2007-2010	Estimated 2011-2070	Total
Preliminary management	36,806	476	1.818	150,000	189,099
Temporary storage	165,330	18,026	419,738	785,306	1,388,399
Reprocessing	730,035	22,817	23,702	33,499	810,054
Definitive management	145,010	538	2,124	2,877,750	3,025,422
Assignments to town councils	322,552	17,981	72,951	418,242	831,726
Total	1,399,732	59,838	520,333	4,264,797	6,244,700

king of new technological developments at the international level and analysis of the feasibility and implications for definitive management of other options, such as the closed cycle with advanced reprocessing and the transmutation of actinides in accelerator-driven systems.

➜ Assignments to Town Councils
In view of its quantitative importance, this item is considered separately, and includes the costs deriving from the standards in force for the temporary storage of SF or intermediate level waste.

Table D.2 shows a summary of SF/HLW management costs, on the basis of the aforementioned activities.

D.I.3. Costs of Facility Decommissioning

A distinction has been made between the following items:

➜ Decommissioning of NPP's
These are the costs relating to the general studies, preparation and performance of the dismantling of all the Spanish NPP's (including the dormancy period of Vandellós I NPP), without consideration given to the definitive management of the wastes generated during decommissioning (included under LILW/VLLW management).

➜ Decommissioning of Nuclear Fuel Cycle Front End Facilities
This refers to the restoration of abandoned uranium mines and

the decommissioning of uranium concentrates manufacturing facilities (AUM, La Haba and Saelices el Chico), as well as to the future dismantling and decommissioning of the Juzbado Fuel Assembly Manufacturing facility, without including the management of the wastes generated at this last installation.

➜ Decommissioning of Other Facilities
This refers basically to the Integrated Plan for Improvement of the CIEMAT Facilities (PIMIC).

➜ Assignments to Town Councils
The costs deriving from the Decommissioning of Nuclear Power Plants, in accordance with the standards in force.

Table D.3 shows a summary of the management costs of facility decommissioning on the basis of the aforementioned activities.

D.I.4. Costs of other activities

This section includes the management of special wastes (radioactive lightning rods, ion smoke detectors, special sources, etc.), interventions (including the treatment of wastes deriving from El Cabril) and support for the emergency operations system.

Table D.4 summarises these costs.

D.I.5. R&D costs

Table D.5 shows the total costs for this item, in accordance with the Fifth R&D Plan (2004-2008), and its projection for the period 2009-2049, and on the basis of the activities foreseen in the basic areas for performance in waste management.

D.II. Summary of management costs

Table D.6 summarises the overall costs of management in accordance with what has been detailed in the previous sections, including those relating to direct or indirect support for the areas of activity described above – the so-called structural costs - these being undertaken basically at headquarters.

Figure D.3 and D.4 represent the distribution of these costs over time and by periods, for the different items considered.

Table D.3. Costs of facility decommissioning (thousands of €2006)

Decommissioning	Actual as of 31/12/2005	Estimated 2006	Budget 2007-2010	Estimated 2011-2070	Total
NPP decommissioning	182,358	8,202	38,436	2,,186,221	2,415,216
Decommissioning facilities front end nfc	100,759	8,215	14,779	6,163	129,916
Decommissioning of other facilites	8,169	4,908	115,20 0		24,597
Assignments to town councils	4,532	563	2,199	37,768	45,061
Total	295,818	21,888	66,933	2,230,152	2,614,791

Table D.4. Costs of other activities (thousands of €2006)

Other activities	Actual as of 31/12/2005	Estimated 2006	Budget 2007-2010	Estimated 2011-2070	Total
Management of special wastes	23,364	280	595	0	24,238
Interventions	9,633	260	1,057	0	10,950
Support emergency ops. System	4,199	238	950	14,250	19,637
Total	37,196	777	2,601	14,250	54,825

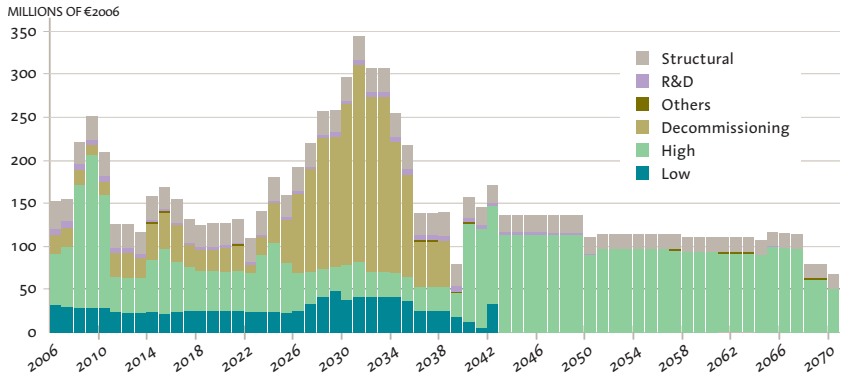
Table D.5. R&D costs (thousands of €2006)

R&D	Actual as of 31/12/2005	Estimated 2006	Budget 2007-2010	Estimated 2011-2070	Total
R&D	161,138	6,165	26,499	165,000	358,802
Total	161,138	6,165	26,499	165,000	358,802

Table D.6. Summary of costs (thousands of €2006)

Item	Actual as of 31/12/2005	Estimated 2006	Budget 2007-2010	Estimated 2011-2070	Total
LILW management	583,397	31,686	115,211	896,392	1,626,687
SF/HLW management	1,399,732	59,838	520,333	4,264,797	6,244,700
Decommissioning	295,818	21,888	66,933	2,230,152	2,614,791
Other activities	37,196	777	2,601	14,250	54,825
R&D	161,138	6,165	26,499	165,000	358,802
Structural	660,863	30,733	106,235	1,325,520	2,123,352
Total	3,138,144	151,088	837,813	8,896,111	13,023,156

Figure D.3.- Distribution of costs by periods



From the values presented it may be appreciated that SF/HLW management is the area implying the highest cost, 48% of the total. This would be followed, in descending order, by the decommissioning of facilities, with 20%, structural costs, with 16%, LILW management, with 12%, and R&D, with 3%, the remaining activities being below 1%.

An item that has a significant economic repercussion, included under the respective management activities relating to LILW, SF/HLW and decommissioning, is that of the assignments to Town Councils, which implies 8% of the total cost of management.

As regards the distribution over time of these costs, and as may be observed in bar diagram D.3, the profile is in keeping with the performance and economic valuation of the programmes and activities foreseen.

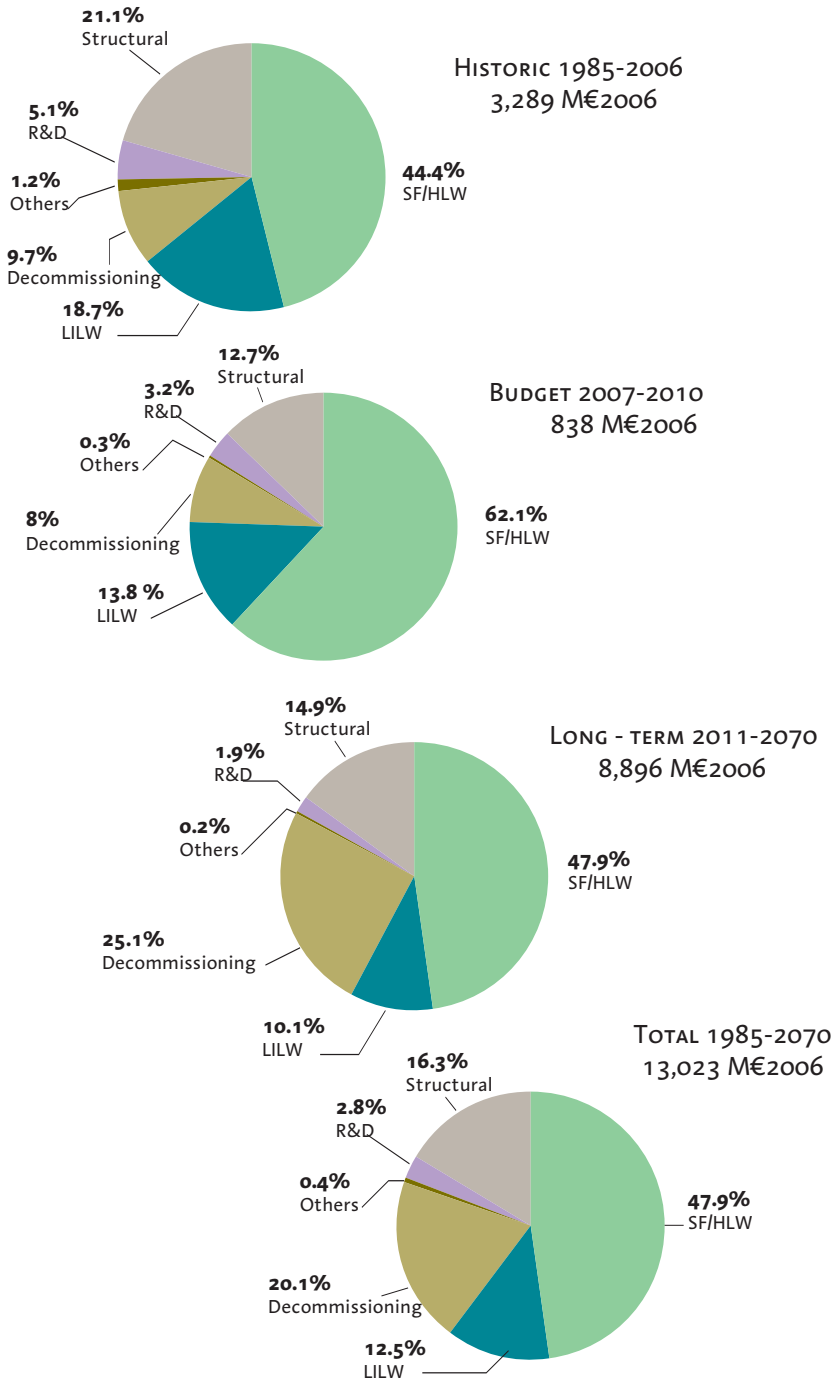
The highest cost values concentrate around the year 2030, since the dismantling of several nuclear power plants coincides with the years previous to and following this date.

The costs actually incurred up to the year 2005 would imply 24% of the total, the remaining 76% being the future costs to be incurred during the period 2006-2070.

Furthermore, comparison of the total costs estimated in the present Plan with those contemplated in the 5th GRWP, approved by the Government in July 1999 (12,276 M€2006 in equivalent monetary values), shows that the current costs of management is, in overall terms, 6% higher.

However, if the different items that make up these costs are analysed, significant differences may be observed in certain cases,

Figure D.4.- Distribution of costs by periods



such as the temporary storage of spent fuel, which increases by around 40%. This is a result of the greater scope and accuracy of the technical solutions adopted and of their economic assessment (metallic casks at the Trillo NPP temporary storage facility, metallic capsules and concrete containers in the José Cabrera NPP temporary storage system, vault CTS installations more in keeping with the latest technological designs and that will perform the dual function of storage and technological research centre, etc.).

The decommissioning of facilities other than the NPP's also reflects a cost that is somewhat higher, since this Plan includes the restoration of the mining facilities at Saelices el Chico and the PIMIC, which were not considered in the 5th GRWP.

The costs of other items, on the other hand, decrease or undergo hardly any variation, as a result of optimisation of their management or adjustments in their determination.

D.III. Financing of management costs

The costs of radioactive waste management referred to in the previous section are financed through the so-called Fund for the financing of activities included in the GRWP, which is fed by way of revenues collected via the channels indicated below, including the financial yield generated, as established in article 8 (point 17) of Law 24/2005 on reforms for the promotion of productivity.

➜ Charged to the electricity tariff

This financing system is based on the application of percentages to electricity sales based on tariffs and tolls, established such that the total amounts collected via this channel plus the financial yield generated cover the future costs of management of the radioactive waste and spent fuel generated by the nuclear power plants and of the dismantling and decommissioning of these facilities, attributable to plant operation prior to 1st April 2005.

Likewise, they should cover the costs of managing radioactive waste arising from research activities that the MITYC determines have been directly related to electricity generation by nuclear means and the dismantling and decommissioning operations to be carried out as a result of uranium mining and milling prior to 4th July 1984.

- Charged to the Nuclear Power Plants

  This is the system used to finance the costs corresponding to the management of radioactive waste and spent fuel generated by the nuclear power plants, and their dismantling and decommissioning, attributable to the operation of these facilities as from 31st March 2005, these being considered as those associated with the management of radioactive waste introduced in the plant storage facility after that date, those associated with the management of the spent fuel resulting from new fuel input to the reactor during refuelling outages concluding after that date, and the proportional part of dismantling and decommissioning corresponding to the plant operating period remaining as of that date.

- Charged to the Juzbado Fuel Assembly Manufacturing Facility

  The financing system applicable to Juzbado is similar to that applied to the nuclear power plants and is required to cover the costs corresponding to the management of radioactive waste arising as a result of the manufacturing of fuel assemblies, including the dismantling of the manufacturing facilities.

- Charged to other facilities

  This is the system applicable to the operators of radioactive facilities generating waste in the fields of medicine, industry, agriculture and research, through tariffs approved by the MITYC; to the services rendered to third parties, as is the case of CIEMAT for work relating to the PIMIC; or to certain companies as a result of contaminating incidents occurring at their installations. In all cases the costs are applied to them at the moment when the services are provided.

In addition to the above, the standards in force contemplate certain exceptional cases, such as the management of wastes not having any owner and the removal and management of radioactive lightning rod headers, the costs of which are financed through application to the financial yield relating to the part of the provision via electricity tariffs integrated in the Fund for the financing of activities included in the GRWP.

The amounts transferred to the Fund may be used only to finance activities contemplated in the GRWP, and on conclusion of the period for radioactive waste management and the dismantling of facilities contemplated in the GRWP, the total amounts transferred to the Fund, via the different financing channels, should cover the costs incurred in such a way that the final balance be zero.

Likewise, it should be pointed out that the provision existing as of 31st March 2005, valued for the purposes of planning at 1,710,738 k€2005, may be used only to finance costs applied to the electricity tariff, except the fund corresponding to the Juzbado facility, made up of the amounts contributed by ENUSA since 2000 for dismantling of the facility and those relating to the management of its operating wastes, since 2003, and the corresponding financial yields as established in the contract between ENRESA and ENUSA.

A preliminary step for calculation of the revenues required to cover future costs consists of breaking down the costs depending on the type of financing, this being accomplished by applying to the different cost items certain sharing coefficients relating to the historic and future productions of the different generators and waste types (LILW, VLLW, ILW), spent fuel and the service lifetime of the nuclear power plants, taking 31/03/2005 as a reference date. The results obtained are summarised in table D.7.

For the purposes of calculation, the historic period may be summarised in terms of the value of the Fund as of 31/12/06, i.e., the difference between the revenues and the costs incurred up to that

Table D.7. Future management costs and collections pending by type of financing (k€2006)

Item	Future cost (K€2006)	Future cost updated as of 1/1/2007	Funds available as of 31/12/2006	Collections pending as of 1/1/2007
Electricity tariff	6,339,729	4,338,835	1,634,857	2,703,978
NPP's	3,350,391	2,137,904	198,484	1,939,420
Juzbado manufacturing facility	16,304	12.190	1,428	10,762
Other facilities	27,500	24,387	0	24,387
Total	9,733,924	6,513,316	1,834,769	4,678,547

date. The estimated value of the fund is 1,834,769 k€2006, the breakdown by types of financing also being shown in table D.7.

Given that the calculation of income presented in D.IV. arises basically from the so-called pending collections or cost pending financing, that is to say the difference between the updated future cost and the funds available as of the date of calculation (in this case 1-1-2007), it is necessary to estimate these values, which are those presented in table D.7 for each route.

Put simply, the pending collections or future cost pending financing defined above would correspond to the sum that, collected as of 1-1-2007 would exactly finance the costs foreseen as from that date in this GRWP.

D.IV. Calculation of income

The calculation of the income for each of the four financing channels is accomplished on the basis of the basic data shown in table D.7 and the peculiarities of each.

➜ Calculation of income applied to the electricity tariff

Calculation of the theoretical amounts to be collected is accomplished such that, over the period in which electricity is generated by nuclear means, these provide annual revenues that, along with the corresponding financial yield of the surplus, guarantee the financing of the costs referred to above, up to the end of the period foreseen in the GRWP. In accordance with the reference scenario of an NPP service lifetime of 40 years, the collections period would, under this assumption, end in 2028.

In keeping with what has been set out above, and with the values shown in table D.7, any future flow of income whose value updated as of 1-1-2007 were 2,703,978 k€2006, that is to say that were equal to the pending collections, would be adequate for the financing of the costs corresponding to this channel.

The simplest model would be based on constant income throughout the period 2007-2028 (nuclear electricity production within the 40-year NPP service lifetime scenario). This average value amounts to 145,213 k€2006/year.

Another model, better adjusted to the actual recent trend of income, would be to consider a linear evolution of income from

the initial value foreseen for 2006, which in accordance with the content of R.D. 1556/2005 on electricity tariffs would be 40,000 k€2006. The application of this model leads to an annual increase of the initial value for 2006 of 9,651 k€2006. In other words, by increasing every year the income from the previous year (in constant currency) by this amount, the total flow of income would be that required (2,703,978 k€2006). Consequently, the sum required in 2007 would be 49,651 k€2006, although the amount to be collected via the tariff for 2007 would be given by the previous value scaled on the basis of the inflation in 2006.

In another order of things, it should be pointed out that according to the Resolution issued on 22nd July 1986 by the Directorate General for Taxes, the services rendered by ENRESA to the electricity utilities, the owners of the nuclear power plants, are subject to VAT, and ENRESA is required to fully apply the amounts corresponding to this tax to these companies.

To date ENRESA has been invoicing this VAT to the NPP-owning electricity utilities on the basis of the total amounts collected monthly by the CNE and transferred to ENRESA and by applying share coefficients for each of the plants, as established in the GRWP in force (the latest being the 5th GRWP of July 1999).

In order to establish the new share coefficients applicable, in view of the current situation and of the forecasts of the present GRWP, it is considered appropriate for these to be determined on the basis of the direct relationship between the electrical power of each of the plants and the total nuclear power installed.

In keeping with the above, the coefficients to be applied for VAT purposes to monthly billing via the electricity tariffs would be as follows:

NPP	%
Santa Mª de Garoña	6.04
Almaraz I	12.62
Almaraz II	12.74
Ascó I	13.32
Ascó II	13.31
Cofrentes	14.06
Vandellós II	14.09
Trillo	13.82

Calculation of income applied to the Nuclear Power Plants

The calculation of the theoretical amounts to be collected is also accomplished taking into account what is indicated in section D.III, such that throughout the period in which electricity is generated by nuclear means they provide annual income that, added to the corresponding surplus financial yields, guarantees the financing of the costs referred to, up to the end of the management period foreseen in the GRWP.

Calculation of the income is carried out using an average unit cost obtained as the coefficient between the cost pending financing, 1,939,420 k€2006 (see table D.7) and the electricity to be produced by the NPP's as from 1-1-2007 discounted as of that date (875,945 GWh). The value obtained is 0.221 cent€2006/kWh.

In order to take into account the specific characteristics of each plant, three corrective factors are applied to this overall coefficient, obtained on the basis of future generation of LILW and spent fuel and the cost of dismantling the facilities. The coefficients for each plant are obtained on the basis of the corresponding ratios of these parameters and their weights (10%, 60% and 30%, respectively). These are indicated below and would be applicable from 2007 to the date of plant closure, unless in the future the hypotheses and assumptions used for their calculation in this Plan were modified.

NPP	cent.€06/kWh
Santa Mª de Garoña	0,259
Almaraz I	0,219
Almaraz II	0,219
Ascó I	0,219
Ascó II	0,219
Cofrentes	0,241
Vandellós II	0,219
Trillo	0,219

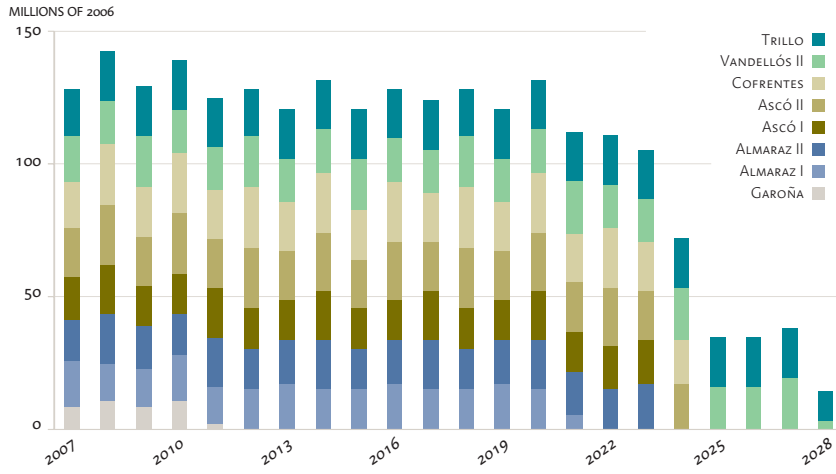
Figure D.5 shows the forecast income from the NPP's as a result of application of the aforementioned coefficients.

All of the values for the coefficients indicated above will need to be scaled on the basis of the inflation for 2006 for applica-

Table D.8. Future costs with direct billing to other facilities

Client	Future cost foreseen as from (K€ 2006)	Value updated as of 01/01/07 (k€2006)
RF's	12,423	9,705
Ciemat (PIMIC)	13,401	13,066
Interventions	1,216	1,173
Others	460	443
Total	**27,500**	**24,387**

Figure D.5. Forecast income from the NPP's



tion during that financial year, as has been commented in relation to the electricity tariff.

→ Calculation of income applied to the Juzbado Fuel Assembly Manufacturing Facility

A mechanism of annual contributions is established, to be made throughout the operating lifetime of the facility (foreseen until 2007 for the purposes of calculation and planning), such that this income, plus the financial yield, considering a discount rate of 1.5%, covers the costs foreseen for management of the facility's operating waste and the future dismantling of the installations (2028-2029), in accordance with the estimates of the GRWP.

The cost pending financing in this case amounts to 10,762 k€2006. In view of the fact that the production forecasts are 250 tU in 2007, 285 tU in 2008 and 280 tU during the period 2009-2027, this would imply a unit cost of 2,158 €2006/tU.

Calculation of income applied to other facilities

The clients or groups of clients considered are the RF's (hospitals, industry, research, ...), whose wastes are collected at the installations of the producer and managed at El Cabril, CIEMAT in relation to the services rendered by ENRESA in performance of the PIMIC, activities undertaken as a result of incidents at steelyards (interventions) and others referring basically to ISD's and special sources.

The management and settlement of the corresponding fee or payment is carried out directly by ENRESA at the moment of rendering the services, all the cost items billed to these generators being considered satisfied, for the purposes of calculation and planning, via the corresponding income shown in table D.8.

Interventions and Others refer to the period 2007-2010 and PIMIC to the period 2006-2009, which is when services rendered will be billed.

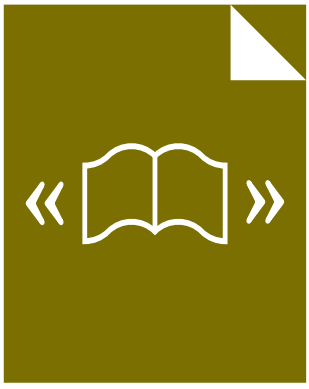
In the case of the RF's, removal of the wastes is continuous throughout the entire period of LILW management. It should be pointed out that the volume foreseen and the structure by waste types will change with respect to the situation in previous years due to the Order ECO 1449/2003 of 21st May regarding the management of waste materials with radioactive contents generated at 2nd and 3rd category radioactive facilities. As a result, the forecasts regarding the volumes to be removed will decrease to approximately a third of those forecasted in 2004, with liquid wastes and sources prevailing.

Taking the above into account, and in the wake of the corresponding studies, the tariffs applicable up to 2005 were revised, a set of new values being obtained and included in Law 24/2005 on reforms to promote productivity, these being subsequently updated by the Royal Decree governing tariffs for 2006, although these will not be put into practice until such time as the ENRESA is effectively constituted.

The application of these last values (fees) to the quantities of waste foreseen produces annual income whose updated value should be equal to the updated cost of management.

Anexe E

Statutory provisions



The following are set out, sorted by rank and chronologically, as the most significant statutory provisions relating to the management of radioactive waste:

- Electricity Industry Act 54/1997 of 27th November.
  - Additional provision four, section 2: Definition of radioactive waste and coverage.

- Taxes and Public Prices for services rendered by the Nuclear Safety Council Act 14/1999 of 4th May.

- Productivity Promotion Reforms Act 24/2005 of 18th November.
  - Section eight. Formation of State Business Entity, ENRESA, responsible for management of radioactive waste.

- Royal Decree Act 5/2005 of 11th March, on urgent productivity promotion reforms and Government procurements improvement, which under section twenty-five provides the new wording for additional provision six of the Electricity Industry Act, Law 54/1997 of 27th November, with regard to the Fund for financing of General Radioactive Waste Plan activities.

- Royal Decree 1349/2003 of 31st October, on regulation of ENRESA activities and funding.

- Royal Decree 1556/2005 of 23rd December, establishing the electricity tariff for 2006.

- Royal Decree 254/2006 of 3rd March, as amending Royal Decree 1554/2004 of 25th June, developing the basic structure of the Ministry of Industry, Tourism and Commerce.

- Order of 13th July 1998, amending the Order of 20th December 1994, developing Royal Decree 1522/1984 of 14th July, authorising the constitution of ENRESA, with regard to the assignment of funds to Councils whose municipal territories house nuclear power plants storing spent fuel generated on site, centralised facilities especially conceived for spent fuel or radioactive waste storage, power plants in the dismantling phase or those other municipal areas defined as a consequence of application of this Order.

- Order ECO/1449/2003 of 21st May on management of solid waste material with radioactive content generated at category 2 and 3 radioactive facilities where unencapsulated radioactive isotopes are handled or stored.

Official State Gazette – 28th November 1997

Electricity Industry Act 54/1997 of 27th November.

Additional provision four, section 2: Definition of radioactive waste and coverage.

"Additional provision four. Amendment to sections 2 and 57 of the Nuclear Energy Act."

1. Section 2.9 of the Nuclear Energy regulatory Act 25/1964 of 29th April is now worded as follows:

«Section 2. Definitions.

9. "Radioactive waste" is any waste material or product for which no further use is foreseen, containing or contaminated with radionuclides at activity concentrations or levels greater than those established by the Ministry of Industry and Energy, subject to a report from the Nuclear Safety Council.»

Official State Gazette – 5th May 1999

10035 Act 14/1999 of 4th May on Taxes and Public Prices for services rendered by the Nuclear Safety Council.

JUAN CARLOS I
KING OF SPAIN

Additional provision two.

Management of radioactive waste generated in exceptional situations provided for under section 2 of the Nuclear Safety Council Foundation Act 15/1980 of 22nd April, may be carried out against financial revenues integrated in the fund referred to by additional provision six of the Electricity Industry Act 54/1997 of 17th November, when the cost of such management cannot be passed on under current legislation and when so determined by the Ministry of Industry and Energy.

Official State Gazette – 19th November 2005
Productivity Promotion Reforms Act 24/2005 of 18th November.

JUAN CARLOS I
KING OF SPAIN

To whom it may concern.
Be aware: That Parliament has approved and I hereby endorse the following Act.

BACKGROUND

… … …

Consequently, it is necessary to adopt reforms promoting an increase in productivity in the economic system. Through this the aim is to place Spain's economy in a position to start to address shortcomings in its growth rate, as a means to ensure its sustainability.

With these objects, through this Act, reforms aimed at boosting and driving productivity, and forming part of a broader set, are introduced, in which a series of actions are structured and coordinated in different areas and subject to different performance deadlines, aimed at making the Spanish economy more dynamic and enhancing its productivity.

II

Through this Act a series of issues are regulated whose essential content is made up of deregulating reforms in goods and services markets pursuing, through the boosting of effective competition, a stimulation for increased productivity and thus contribute to addressing shortcomings specified in the economic growth model.

In addition, government measures are also covered, including public trust, whose purpose is to improve government operation in its dealings with the citizens.

III

… … …

Furthermore, in order to bolster stability and consistency in the system, it is necessary to set up a new State Business Entity to replace the current Empresa Nacional de Residuos Radiactivos, S. A., with sufficient funding to endow the Fund with cash to finance the General Radioactive Waste Plan.

… … …

Finally, reforms are introduced aimed at enhancing the regulatory framework of nuclear power generation. In this respect, it is clarified that Instructions given by the Nuclear Safety Council are binding; certain sections of the Nuclear Energy Act 25/1964 of 29th April are reworded, and a market mechanism is implemented to value the sites of nuclear power plants in moratorium.

… … …

HEADING I

Product and service markets

CHAPTER I

Energy markets

PART 1. HORIZONTAL MEASURES

… … …

Section eight. Formation of State Business Entity , ENRESA, responsible for the management of radioactive waste.

1. An additional provision six a) is added to the Electricity Industry Act 54/1997 of 27th November, with the following wording:
«Additional provision six a). Formation of State Business Entity ENRESA to manage radioactive waste.
1. Radioactive waste management, including spent fuel and the dismantling and decommissioning of nuclear and radioactive waste facilities, is an essential public service that under article 128.2 of the Spanish Constitution is reserved to the State.

This service will be managed directly by State Business Entity ENRESA to manage radioactive waste, under the Radioactive Waste Scheme approved by the Government.

2. State Business Entity ENRESA is set up to manage radioactive waste, as a government agency of those specified under section 43.1.b) of the General State Government Organisation and Operation Act 6/1997 of 14th April. This organisation reports to the Ministry of Industry and Energy through the Energy Secretariat.

3. State Business Entity ENRESA has its own legal status, full powers to act and its own equity under the terms of this additional provision, in its own charter, under aforementioned Act 6/1997 of 14th April and other applicable regulations.

4. State Business Entity ENRESA will manage, administer and dispose of the property and rights that form part of its equity, whereby it will hold, administer, acquire and sell any shares representing capital of the companies in which it has or might have a holding in the future.

To perform its purpose, the State Business Entity may enter into any administration and disposal undertakings specified under civil and commercial legislation. Furthermore, it may perform any commercial or industrial activity linked to such purpose, subject to agreements of its governing bodies. It may even act through companies in which it has a holding.

5. The purpose of the state-owned corporation ENRESA is to provide the public service of managing radioactive waste, including spent fuel, and the dismantling and decommissioning of nuclear and radioactive facilities, produce proposals for the General Radioactive Waste Plan, implement the provisions of such Plan and manage the Fund to finance activities included in the General Radioactive Waste Plan, all under the terms of such Plan's arrangement. To achieve its purpose, it will perform, among others, the following roles:

a) Treat and condition radioactive waste.

b) Seek out sites, design, build and operate centres for the storage and disposal of radioactive waste.

c) Set up systems for the collection, transfer and transport of radioactive waste.

d) Adopt measures to ensure the safety in transit of radioactive waste under the terms of specific regulations governing the transport of hazardous goods and whatever the relevant authorities and agencies may specify.
e) Manage operations involved in the dismantling and decommissioning nuclear and radioactive facilities.
f) In the event of nuclear or radiation emergencies, act in support for the national civil defence system and security services, in the manner and situations required by the relevant agencies and authorities.
g) Finally and securely condition steriles originated in the mining and manufacturing of uranium concentrates, in the manner and situation required by the relevant agencies and authorities, with due consideration, as appropriate, for the operator's plans and arrangements.
h) Set up systems to ensure the long-term safe management of its facilities for radioactive waste storage.
i) Draw up the research and development plans required to perform its roles.
j) Carry out the technical and commercial/financial studies required, which shall give due consideration to deferred costs derived from its roles, in order to establish the relevant financial needs.
k) Any other activity required to perform the foregoing roles.
6. State Business Entity ENRESA will be considered as the operator of its radioactive waste management facilities for the purposes specified under the legislation applicable to nuclear and radioactive facilities.

Furthermore, the organisation will act as operator of all activities it develops for which such status is established.
7. The radioactive waste management services provided by the State Business Entity ENRESA to nuclear and radioactive facility operators shall abide by technical requirements set out in relevant and current contracts, based on standard-form contracts approved at the time by the Ministry of Industry and Energy or those approved in the future by the Ministry of Industry, Tourism and Commerce.
8. The financial management of the Fund for financing of the General Radioactive Waste Plan shall be governed by principles

of safety, cost-effectiveness and liquidity. Such management may be outsourced by the State Business Entity ENRESA to a third-party, subject to a favourable report from the Fund Monitoring and Control Committee, following Government approval and under terms to be specified.

9. It falls to the Fund Monitoring and Control Committee to supervise and control the interim investments involved in the financial management thereof. Such Committee, reporting to the Ministry of Industry, Tourism and Commerce through the Energy Secretariat, will be chaired by the Energy Secretariat and its members will be the Government Administration General Auditor, the Director General of the Treasury and Financial Policy and the Director General of Energy Policy and Mines, and the Sub-Director General of Nuclear Energy will act as secretary.

By Royal Decree, the Government may change Committee membership. The Committee's roles are as follows:

a) Development of criteria on the makeup of the Fund's assets.

b) Monitoring of financial investment, checking for the application of the principles set out under item 8 above.

c) Drawing up of half-yearly reports on the situation of the Fund and financial management investments, as well as rating given by the Committee, stating any observations it deems appropriate. Such report will be supplied to the Ministries of Finance and the Exchequer and of Industry, Tourism and Commerce, as well as to the relevant Parliamentary Commission.

10. It falls to the Government to set policy on radioactive waste management and the dismantling and decommissioning of nuclear and radioactive facilities, by approving the General Radioactive Waste Plan, which will be forwarded by the Ministry of Industry, Tourism and Commerce after hearing the Regional Governments confident in matters of territorial regulation and the environment, which will then be reported to Parliament.

11. The State Business Entity ENRESA will submit a proposal for review of the General Radioactive Waste Plan to the Ministry of Industry, Tourism and Commerce every four years and, in any event, when required by the Ministry, this to include:

a) Required actions and technical solutions to be developed within the Plan's timescales, aimed at successful management of radioactive waste and spent fuel and the dismantling and decommissioning of nuclear and, as appropriate, radioactive facilities.
b) Economic and financial arrangements to carry out the foregoing.

12. The State Business Entity ENRESA's outsourcing regime will be governed by relevant provisions under government procurement legislation.

13. The State Business Entity ENRESA's equity regime shall be as laid down by the Government Equity Act 33/2003 of 3rd November, subject to section 56 of the General State Government Organisation and Operation Act 6/1997 of 14th April.

14. The budgetary, economic-financial, accounting, auditing and financial control scheme for the State Business Entity ENRESA will be as specified under the General Budgetary Act 47/2003 of 26th November, subject to the terms of section 58 of Act 6/1997 of 14th April.

15. The hiring of personnel by the State Business Entity ENRESA shall be compliant with employment legislation, subject to provisions of section 55 of Act 6/1997 of 14th April.

16. The financial resources of the State Business Entity ENRESA may come from any of those listed under section 65.2 of Act 6/1997 of 14th April. Such resources include the Fund for the financing of activities included in the General Radioactive Waste Plan existing at the time State Business Entity ENRESA is actually set up, and revenues under item 1 of additional provision six of this Act, to which shall belong the tax regulated in the following section.

17. Subject to the preceding item, the financing of State Business Entity ENRESA shall consist, among other things, of the following taxes for provision of services, whose collection shall be used to endow the Fund to finance the activities included in the General Radioactive Waste Plan.

One. Tax for provision of radioactive waste management services under item 3 of additional provision six.

a) Taxable event:

A taxable event for the tax charged for provision of services invol-

ving the activities under item 3 referenced in the preceding paragraph, in other words, management of radioactive waste and spent fuel generated at nuclear power plants, and the dismantling and decommissioning thereof, attributable to operation thereof performed before 1st April 2005, and management of radioactive waste from research activities directly linked to the generation of nuclear power and operations involving dismantling and decommissioning to be performed as a result of mining and production of uranium concentrates before July 1984.

b) Tax assessment basis:

The tax assessment basis consists of the total amounts collected through application of the electricity tariffs and tolls referenced by sections 17 and 18 of this Act.

c) Tax accrual:

Tax shall accrue on the last day of each calendar month during the period of power plant operation.

d) Obligors:

Obligors liable for the tax as taxpayers are the operating companies owning the nuclear power plants.

Obligors as taxpayer substitutes and liable for leading material and formal obligations of the tax are companies performing transport and distribution activities under the terms of this Act.

e) Levy and tax amount rates:

For electricity tariffs referred to under section 17 of this Act, the rate by which the tax assessment basis will be multiplied to arrive at the tax amount payable is 0.173%.

For tolls referred to under section 18, the rate by which the tax assessment basis will be multiplied to arrive at the tax amount payable is 0.508%.

f) Management standards:

The collection of tax for the penultimate preceding month will be paid by return/settlement to be made by the obligor substituting the taxpayer before the 10th day of each month or, as appropriate, on the very next business day.

Return/settlement forms and ways to pay the required amount is will be approved by Ministerial Order.

Agreements may be entered into with organisations, institutions and agencies representing tax obligors, in order to

simplify compliance with the formal and material obligations derived therefrom, as well as the settlement and collection procedures.

This tax will to all intents and purposes be integrated into the electricity and toll tariff structure laid down in this Act and its developing provisions.

Two. Tax for provision of radioactive waste management services under item 4 of additional provision six.

a) Taxable event:

A taxable event is the provision of services involving activities referred to under item 4 mentioned in the preceding paragraph, in other words the management of radio active waste and spent fuel generated at nuclear power plants and the dismantling and decommissioning thereof, attributable to operation after 31st March 2005.

b) Tax assessment basis:

The tax assessment basis consists of the gross nuclear power generated by each of the power plants in the calendar month, measured in gross kilowatts per hour (Kwh) and rounded down to the nearest whole number.

c) Tax accrual:

Tax shall accrue on the last day of each calendar month during the period of power plant operation.

In the event of early voluntary termination of operation by the owner, the tax will accrue at the time that such termination occurs under the applicable legislation.

d) Obligors:

The operating companies owning the nuclear power plants will be the tax obligors. In the event that a power plant has several owners, liability will be joint and several among all of them.

e) Ascertaining the amount:

The tax amount payable during operation of the facility will be the result of multiplying the tax assessment basis by the unit fixed tariff and the correcting coefficient specified below, in such a way that the payable amount will be the result of the following formula:

$$C = B.i. \times T \times Cc$$

Where:

C = Amount payable.
B.i. = Tax assessment basis in Kwh.
T = Unit fixed tariff: 0.188 € cents/Kwh.
Cc = Correcting coefficient applied using the following scale:

Nuclear power plant output (Mwe)	PWR	BWR
1 - 300	1,15	1,28
301 - 600	1,06	1,17
601 - 900	1,02	1,12
901 - 1.200	0,99	1,09

PWR = Pressurised water reactors. BWR = Boiling water reactors.

f) Management standards:
The tax will be paid by return/settlement to be carried out by the obligor within the next three calendar months from the accrual date.

Return/settlement forms and ways to pay the required amount will be approved by Ministerial Order.

In the event of voluntary early termination of operation of a nuclear power plant by the owner, with regard to arrangements specified in the General Radioactive Waste Plan, the financial shortfall, if any, at the time of termination shall be paid by the owner to the State Business Entity ENRESA within the next three years from the date of termination, in annual payments equal to the amount specified by the Ministry of Industry, Tourism and Commerce based on a financial study carried out by the Ministry.

Agreements may be entered into with organisations, institutions and agencies representing tax obligors, in order to simplify compliance with formal and material obligations derived therefrom, as well as settlement and collection procedures.

Three. Tax for the provision of management services for radioactive waste derived from the manufacture of fuel elements, including dismantling and decommissioning of their manufacturing facilities.

a) Taxable event:

This is the taxable event of the tax for the provision of management services for radioactive waste derived from the manufacturing of fuel assemblies, including the dismantling and decommissioning of the corresponding manufacturing facilities.

b) Tax assessment basis:

The tax assessment basis for the tax consists of the quantity of nuclear fuel manufactured every calendar year, measured in metric tonnes (mT) with two decimal places rounded down to the second decimal place.

c) Tax accrual:

The tax will be accrued on the last day of every calendar year in which there has been manufacturing of fuel assemblies.

d) Obligors:

Obligors for the tax will be the owners of the fuel assembly manufacturing facilities.

e) Levy and tax amount rates:

The tax amount to be paid will be the result of multiplying the tax assessment basis by the tax rate of 1,539.21 €/mT.

f) Management standards:

The tax will be paid by return/settlement to be carried out by the obligor within the next three calendar months from the accrual date.

Return/settlement forms and ways to pay the required amount will be approved by Ministerial Order.

In the event of voluntary early termination of operation of a fuel assembly manufacturing facility by the owner, with regard to arrangements specified in the General Radioactive Waste Plan, the financial shortfall, if any, at the time of termination shall be paid by the owner to the State Business Entity ENRESA within the next three years from the date of termination, in annual payments equal to the amount specified by the Ministry of Industry, Tourism and Commerce based on a financial study carried out by the Ministry.

Four. Tax for provision of management services for radioactive waste generated at other facilities.

a) Taxable event:

A taxable event is the tax for the provision of management ser-

vices for the removal of radioactive waste neither generated in any other facilities nor covered under the tax assessment basis for the foregoing taxes.

b) Tax assessment basis:

The tax assessment basis of the tax will consist of the amount or unit of waste delivered for management, measured in the relevant unit applicable across the companies specified under e) below subject to the nature of the waste and stated with two decimal places rounded down to the second decimal place.

c) Tax accrual:

The tax will accrue at the time that the State Business Entity ENRESA removes the waste from the facilities.

d) Obligors:

The obligors for the tax will be facility owners.

e) Levy and tax amount rates:

The tax amount to be paid will be the result of multiplying the tax assessment basis by the following tax rates for each type of waste.

Waste type	Description	Tax rate (€/unit.)
	Solids	
S01	Compactable solid waste (25-litre bags)	93.80
S02	Non-compactable solid waste (25-litre bags)	93.80
S03	Animal corpses. Bio-waste (25-litre bags)	242.47
S04	Hypodermic needles in rigid containers (25-litre bags)	93.80
	Special solids	
S05	S051: Waste with Ir-192 as active component (25-litre bags)	93.80
	S052: Uranium or thorium salts (25-litre bags)	175.35

	Mixed	
M01	Mixed waste consisting of organic liquids plus vials (25-litre containers)	201.93
M02	Plates and similar with liquids or gels (25-litre bags)	93.80
	Liquids	
L01	Organic liquid waste (25-litre containers)	205.54
L02	Aqueous liquid waste (25-litre containers)	174.81
	Sources	
	Encapsulated sources whose activity does not exceed the thresholds set by the ADR for Type-A packages and the source with its original container or with the equipment to which it will be fitted not exceeding 20 litres:	
F01	F011: F01 sources with elements whose half-life is less than or equal to that of Co-60	277.66
	F012: F01 sources with elements whose half-life ranges from that of Co-60 to Cs-137, including Cs-137	277.66
	F013: F01 sources with elements whose half-life is greater than that of Cs-137	277.66
	Encapsulated sources whose activity does not exceed the thresholds set by the ADR for Type-A packages and the source with its original container or with the equipment to which it will be fitted exceeding 20 litres and less than or equal to 80 litres:	
F02	F021: F02 sources with elements whose half-life is less than or equal to that of Co-60	515.66
	F022: F02 sources with elements whose half-life ranges from that of Co-60 to Cs-137, including Cs-137	515.66

F023: F02 sources with elements whose half-life is greater than that of Cs-137	515.66

f) Management standards:

Management and settlement of the tax will fall to State Business Entity ENRESA. Settlement forms and deadlines and ways to pay the required amount will be approved by Ministerial Order.

Amounts payable under such taxes will be subject to Value Added Tax levied on provision of services subject to tax under the terms laid down under the current legislation.

Tax rates and tax items for ascertaining the foregoing tax amounts may be reviewed annually by the Government through Royal Decree based on an up-to-date economic/financial report on the cost of activities specified under the General Radioactive Waste Plan.

18. The Ministry of Industry, Tourism and Commerce will have powers of expropriation as required to perform the purposes of State Business Entity ENRESA, which for such purposes shall be the beneficiary. Facilities required to comply with the relevant purposes are classified as for the public benefit for the purposes of compulsory expropriation.

19. The tax and duty regime in incorporation of the State Business Entity ENRESA is as follows:

One: The regime specified under chapter VIII of Heading VII of the Redrafted Corporation Tax Act, approved by Legislative Royal Decree 4/2004 of 5th March, will apply to the operation whereby all property, rights and obligations of the Empresa Nacional de Residuos Radiactivos, S.A. are transferred to the State Business Entity ENRESA, also with transfer from the former to the latter of all rights and obligations.

Two: They will be exempt from duties or fees arising from involvement of notaries and property and company registrars.

20. The State Business Entity ENRESA will succeed Empresa Nacional de Residuos Radiactivos, S. A. in its rights and obligations. By agreement of the Cabinet, winding up and liquidation of the company and integration of its equity into State Business Entity ENRESA is approved, following settlement of sha-

reholder rights. In particular, all employees of Empresa Nacional de Residuos Radiactivos, S. A. will be integrated into State Business Entity ENRESA, on the understanding that there is succession of companies between the two companies under the terms of section 44 of the Redrafted Workers' Statute, approved by Legislative Royal Decree 1/1995 of 24th March. Furthermore, all liquid and fixed assets of Empresa Nacional de Residuos Radiactivos, S. A. are incorporated into the equity of the State Business Entity ENRESA.

21. Until the actual incorporation of the State Business Entity ENRESA, which will take place upon entry into force of its Charter, to be approved by Royal Decree, the Empresa Nacional de Residuos Radiactivos, S. A. will continue to perform the activities specified under Royal Decree 1349/2003 of 31st October, which regulates the activities of the Empresa Nacional de Residuos Radiactivos, S. A. (ENRESA) and its funding.

22. The Government is authorised to lay down standards and take any steps required to apply the terms of this provision.»

2. Item 1 of additional provision six of the Electricity Industry Act 54/1997 of 27th November is amended (Fund for financing activities of the General Radioactive Waste Plan), which will now read as follows:

«1. Sums collected through taxes regulated under additional provision six. a), and any other means of funding of cost of work involved in management of radioactive waste and spent fuel, and the dismantling and decommissioning of facilities, including the financial yields they generate, will be used to endow a provision, whereby such endowment shall be treated as a Corporation Tax deductible item.

The sums specified in the foregoing provision may be invested only in charges, work, projects and fixed assets derived from actions under the General Radioactive Waste Plan, as approved by the Government.»

3. Item 5 of additional provision six of the Electricity Industry Act 54/1997 of 27th November on billing of owners of nuclear power plants is repealed.

… … …

Third final provision. *Coming into force.*
This Act will come into force on the day after it is published in the Official State Gazette.

Therefore, I command all Spaniards, individuals and authorities, to comply with and enforce compliance with this Act.
Madrid, 18th November 2005.

JUAN CARLOS R.

Official State Gazette – 14th March 2005

4172 Royal Decree Act 5 /2005 of 11th March on urgent productivity promotion reforms and Government procurements improvement.

Section twenty-seven. Fund for the financing of activities included in the General Radioactive Waste Plan.

«Additional provision six of the Electricity Industry Act 54/1997 of 27th November will have the following wording:

1. Sums collected through tariffs, tolls or prices and any other means of funding of cost of work involved in the management of radioactive waste and spent fuel, and the dismantling and decommissioning of facilities, including the financial yields they generate, will be used to endow a provision, whereby such endowment shall be treated as a Corporation Tax deductible item.

   Sums specified in the foregoing provision may be invested only in charges, work, projects and fixed assets derived from actions under the General Radioactive Waste Plan as approved by the Government."
2. The provision referred to by item 1 will constitute the so-called Fund for the financing of activities included in the General Radioactive Waste Plan.
3. Some is used to endow part of the provision for finance of costs involved in managing the radioactive waste and spent fuel generated at nuclear power plants, and the dismantling and

decommissioning thereof, attributable to operation of the said facilities prior to 1st April 2005 will be considered a supply diversification and assurance cost for the purposes specified under section 17.1.e).

Also considered as such it will be any sums used to endow part of the provision for financing costs involved in managing the radioactive waste from research activities that the Ministry of Industry, Tourism and Commerce considers have had a direct link to the generation of nuclear power, operations involved in the dismantling and decommissioning to be carried out as a result of the mining and production of uranium concentrates before 4th July 1984, and any other course specified under Royal Decree.

4. The sums used to endow part of a provision for financing the costs involved in managing the radioactive waste and spent fuel generated at nuclear power plants, and the dismantling and decommissioning thereof, attributable to operation after 31st March 2005 will not be considered supply diversification and assurance cost and will be funded by the owners of the power plants during their operation. For these purposes, the costs associated with the management of radioactive waste placed in power plant storage facilities from such date will be considered attributable to operation after 31st March 2005, as will the proportional part of the costs involved in dismantling and decommissioning relevant to the remaining operating period of the power plant at such date. As for spent fuel, the costs associated with managing the spent fuel resulting from new fuel placed in the reactor during refuelling outages completed after such date, will be considered attributable to operation after 31st March 2005.

All costs involved in the technical operations and support services required to perform such tasks, which include the relevant structural costs and R&D projects and activities will be allocated to the management of radioactive waste and spent fuel, and dismantling and decommissioning, all under the terms of the General Radioactive Waste Plan.

5. For the purposes of financing the costs to which the preceding item refers, Empresa Nacional de Residuos Radiactivos, S. A.

(ENRESA) will invoice the owners of power plants for sums resulting from multiplying the gross kilowatt hours (kWh) generated by each of them in a calendar month, from 1st April 2005, for a specific unit value for each power plant stated in eurocents. For year 2005, this unit value, based on up-to-date economic calculations, will be as follows:

José Cabrera:	0.216
Santa M.ª de Garoña:	0.220
Almaraz I:	0.186
Ascó I:	0.186
Almaraz II:	0.186
Cofrentes:	0.205
Ascó II:	0.186
Vandellós II:	0.186
Trillo:	0.186

Invoicing will be monthly during the next 30 to 45 days following the month in which the energy was generated, and the owners of the plants shall make the relevant payment within the next 30 days from the invoice date.

These unit values will be reviewed yearly under Royal Decree based on an up-to-date economic/financial report on the cost of the relevant activities.

6. In the event of early termination of operation in respect of the period established in the General Radioactive Waste Plan for reasons beyond the control of the owner, the funding shortfall, if any, will be treated as supply diversification and assurance cost. Otherwise the licensee shall cover such shortfall within the next three years following termination.
7. The provision existing as of 31st March 2005 may not be used to fund costs under item 4.
8. Costs involved in the removal and management of radioactive lightning rod headers and the management of radioactive waste generated in exceptional scenarios specified under section 2 of the Nuclear Safety Council Charter Act 15/1980 of 22nd April will be funded by the financial yields of the part of a provision to which item 3 refers, though in the latter case when they can-

not be passed on under current legislation and this is so decided by the Ministry of Industry, Tourism and Commerce.

9. The State will assume ownership of radioactive waste once it has reached final disposal. Furthermore, it will provide monitoring where and as required following the decommissioning of a nuclear or radioactive facility once the period specified in the relevant statement of decommissioning has elapsed.

10. The government is authorised to take any measures required to enforce the terms of this additional provision..»

Official State Gazette – 8th November 2003

20536 Royal Decree 1349/2003 of 31st October on regulation of activities of Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA), and funding thereof.

Under Royal Decree 2967/1979 of 7th December on the regulation of activities in the nuclear fuel cycle, its regulatory standards were reviewed and updated, though focusing on the first part of the cycle, in other words on the supply of nuclear fuel, not considering any other aspects involved in the storage of radioactive waste from activities other than the fuel cycle and in the dismantling of nuclear and radioactive facilities. This Royal Decree was the subject of development, in terms of the second part of the nuclear fuel cycle, by Ministerial Order of 12th May 1983.

Subsequently, Royal Decrees 1522/1984 of 4th July and 1899/1984 of 1st August authorised, respectively, the incorporation of Empresa Nacional de Residuos Radiactivos, S. A. (ENRESA), contrasting it with performance of activities referred to under section 38 of the Nuclear Energy Act, Law 25/9064 of 29th April, under which "nuclear and radioactive facilities working with radioactive substances are required to have special facilities for the storage, transport and handling of radioactive waste", thus enabling compliance by the licensees of nuclear and radioactive facilities with such obligation when under contract or through any other means accepted by law they may use special facilities of companies properly authorised for storage, transport and handling of radioactive waste.

In developing additional provision seven of Act 40/1994 of 30th December, regulating the National Electricity System, Royal Decree 404/1996 of 1st March regulated the makeup, application and management of the Fund for financing the activities involved in the General Radioactive Waste Plan, for such purpose setting up a monitoring and control Committee.

Given the experience acquired since the incorporation of ENRESA, and somewhat disburse legislation regulating activities developed by this company and its financing, it has been thought expedient to regroup it all into a single Act, adapting its requirements to today's reality and to include, in its sections, other provisions found in different laws on the subject matter under regulation, all for the purpose of facilitating awareness and enforcement.

Among the more significant aspects covered by this Royal Decree, it is worth noting that the duties of ENRESA have been updated, modifying the criteria regarding the frequency of drawing up of the General Radioactive Waste Plan, redefining schemes for financial compensation for services, based on the terms of additional provision 14 of the Tax, Administrative and Social Measures Act 24/2001 of 27th December , and reviewing the financial assets that may form the Fund for the financing of activities included in the General Radioactive Waste Plan.

Finally, and with regard to provisions found in other Acts, this Royal Decree covers the terms of additional provision two of the Public Taxes and Prices Act 14/1999 of 4th May, for services rendered by the Nuclear Safety Council, regarding the potential funding of the management of radioactive waste generated in certain exceptional scenarios, and under section 172 of the Tax, Administrative and Social Measures Act 13/1996 of 30th December, with regard to the funding of costs involved in removing and managing radioactive lightning rod headers.

Accordingly, at the suggestion of the Secretary of State for Finance, with the agreement of the Council of State and following the deliberations of the Cabinet at its meeting of 31st October 2003,

I DECREE AS FOLLOWS:

Section 1. Purpose.

1. The purpose of this Royal decree is to regulate certain aspects regarding the management of radioactive waste and spent fuel and the dismantling and decommissioning of nuclear and radioactive facilities, and funding thereof through the Fund for financing the activities included in the General Radioactive Waste Plan.
2. For the purposes of this Royal Decree, the reference to management of radioactive waste is considered, in general terms, to include actual management of radioactive waste and spent fuel, notwithstanding the consideration other statutory provisions might give to such fuel.

Section 2. Powers.

1. It falls to the Government to set policy on the management of radioactive waste and the dismantling and decommissioning of nuclear and radioactive facilities, by approving the General Radioactive Waste Plan, which will be submitted by the Secretary of State for Finance, which will then be submitted to Parliament.
2. It falls to the Ministry of Finance to monitor and control actions and plans, both technical and financial, with regard to the activities specified in the preceding item.

Section 3. General provisions.

1. The operators of nuclear and radioactive facilities working with radioactive substances are required to have special facilities for the storage, transport and handling of radioactive waste, under the provisions of section 38 of the Nuclear Energy Act 25/1964 of 29th April.
2. It is considered that the operators of nuclear and radioactive facilities also have facilities to which the preceding item refers when under contract or by any other means accepted by law

they are able to use the services of companies, who shall be authorised by Royal Decree, and which have facilities for the storage, transport and handling of radioactive waste, even if they are owned or in the name of third parties.

3. These companies will provide the required services subject to requirements arising from the public interest and assurance of service provision.

Section 4. Authorisation for the Empresa Nacional de Residuos Radiactivos, S. A. to provide services and establishment of its roles.

1. Empresa Nacional de Residuos Radiactivos, S. A. (ENRESA) is authorised to provide the services under section 3.2 and will have the following roles:

a) Treatment and conditioning of radioactive waste.

b) Site selection, design, construction and operation of centres for the storage and definitive disposal of radioactive waste.

c) Establishment of systems for the collection, transfer and transport of radioactive waste.

d) Adoption of measures to ensure safety in transit of radioactive waste under the terms of specific regulations governing the transport of hazardous goods and whatever the relevant authorities and agencies may specify.

e) Management of the operations involved in the dismantling and decommissioning of nuclear and radioactive facilities.

f) In the event of nuclear or radiological emergencies, act in support of the national civil defence system and security services, in the manner and situations required by the relevant agencies and authorities.

g) Finally and securely condition steriles originated in the mining and manufacturing of uranium concentrates, in the manner and situation required by the relevant agencies and authorities, with due consideration, as appropriate, for the operator's plans and arrangements.

h) Establishment of systems to ensure the long-term safe management of its facilities for radioactive waste storage.

i) Draw up research and development plans required to perform its roles.

j) Carry out technical and commercial/ financial studies requi-

red, which shall give due consideration to deferred costs derived from its roles in order to establish the relevant financial needs.

k) Management of the Fund for the financing of activities included in the General Radioactive Waste Plan under the provisions of this royal decree.

l) Any other activity required to perform the foregoing roles.

2. ENRESA will be considered to be the operator of its radioactive waste management facilities for the purposes specified under legislation and applicable to nuclear and radioactive facilities. Furthermore, ENRESA will act as the operator of all activities it develops for which such status is established.

Section 5. Standard-form contracts.

1. The radioactive waste management services provided by ENRESA to nuclear and radioactive facility operators will be governed by contracts based on relevant standard-form contracts to be approved by the Ministry of Finance.
2. Such contracts shall specify their term, which will last until the end of the lifetime of the facilities, to include the dismantling of nuclear facilities and, as appropriate, radioactive facilities, as well as financial consideration, where appropriate, for services to be provided, under the terms hereof.

Section 6. General Radioactive Waste Plan.

For compliance with the provisions of section 2, ENRESA will draw up and forward the following to the Ministry of Finance:

a) Every four years and, in any event, when so required by the Ministry of Finance, a review of the General Radioactive Waste Plan, comprising:

1.º Required actions and technical solutions to be developed within the Plan's timescales, aimed at successful management of radioactive waste and dismantling and decommissioning of nuclear and, as appropriate, radioactive facilities.

2.º Economic and financial arrangements to carry out the foregoing.

b) During the first half of every year:

1.º A report including technical and financial aspects on the previous year's activities, and comparison thereof with the current budget.

2.º An up-to-date economic/financial study on the cost of activities under the General Radioactive Waste Plan, including remuneration of the management activity of the plan, and the suitability of current financial mechanisms to such costs.

c) By 30th November every year, a technical-financial explanation of the suitability of the annual budget for the following year, and projection for the next three years, with regard to what is specified in the updated economic/financial study on the cost of activities included in the General Radioactive Waste Plan. In the event that exceptionally it is necessary to meet costs not anticipated in such economic/financial study, it shall provide the relevant justification.

Section 7. Fund for the financing of activities included in the General Radioactive Waste Plan.

1. The Fund for the financing of activities included in the General Radioactive Waste Plan referred to under additional provision six of the Electricity Industry Act 54/1997 of 27th November, amended by additional provision fourteen of the Tax, Government and Social Measures Act 24/2001 of 27th December, will be endowed through revenues from the channels specified below, including any financial yields thereof.

a) Amounts paid under tariffs for supply to end customers and access tariffs from applying percentages to revenues from electricity sales.

b) Amounts paid for management of radioactive waste from the manufacturing of fuel assemblies and for the dismantling of fuel assembly manufacturing facilities.

A mechanism for annual contributions will be established for the operating lifetime of the fuel assembly manufacturing facilities, such that these revenues plus financial yields cover the foreseen costs for such activities based on estimates of the General Radioactive Waste Plan.

c) Invoicing of operators of radioactive facilities generating

radioactive waste in medicine, industry, agriculture and research, through tariffs approved by the Ministry of Finance.

d) Any other revenue scheme not contemplated in the preceding paragraphs.

2. Fund endowments may be invested only in charges, work, projects and fixed assets derived from actions provided for under the General Radioactive Waste Plan, notwithstanding the provisions of section 9.

3. At the end of the period for management of radioactive waste and dismantling of facilities contemplated under the General Radioactive Waste Plan, total amounts paid into the Fund through the various funding channels shall cover costs incurred such that the final balance is zero.

Section 8. Funding from electricity tariff.

1. The percentages referred to under section 7.1.a) will be set out in the Royal Decree establishing the electricity tariff for every year under the Electricity Industry Act 54/1997 of 27th November, Royal Decree 1164/2001 of 26th October, establishing tariffs for access to the electrical energy transmission network, and Royal Decree 1432/2002 of 27th December establishing the methodology to approve or amend average or base electricity tariff and amending certain sections of Royal Decree 2017/1997 of 26th December, under which the procedure for settling transmission, distribution and marketing at tariff costs, the system's fixed costs and supply diversification and assurance costs is organised and regulated.

2. These percentages will be established based on the following criteria:

a) Total amounts from this channel, plus the relevant financial yields, shall cover costs that need to be met, from the time this Royal Decree comes into force, for:

1.º Management of radioactive waste generated in the production of nuclear power from production start date. For these purposes, the cost of managing radioactive waste at nuclear power production facilities will include only the cost for activities carried out by ENRESA and, as appropriate, third-party costs derived from such activities.

2.º Management of radioactive waste from research activities, which in the opinion of the Ministry of Finance have been directly involved in the production of nuclear power.

3.º Dismantling and decommissioning of nuclear power production facilities, and management of ensuing radioactive waste.

4.º Operations involving dismantling and decommissioning to be carried out as a result of the mining and production of uranium concentrates, before ENRESA's formation was authorised.

5.º Any other costs to be incurred by ENRESA in performance of its roles with regard to the foregoing activities.

b) Calculation of theoretical amounts to be collected shall consider the terms of paragraph a) above and in such a way that it provides throughout the time there is nuclear power generation annual revenues resulting from the economic/financial study referred to under section 6 paragraph b).2.

3. The procedure for collecting and settling amounts paid on applying percentages approved by the Royal Decree establishing the average or base electricity tariff for every year shall meet the terms of Royal Decree 2017/1997 of 26th December, which organises and regulates the procedure for settling transmission, distribution and marketing at tariff costs, permanent system costs and supply diversification and assurance costs.

Section 9. Funding from financial yields.

1. In exceptional circumstances the management of generating radioactive waste may be charged to financial yields from the Fund to finance the activities included in the General Radioactive Waste Plan when the cost of such management cannot be charged under current legislation and this is so decided by the Ministry of Finance, under the terms of additional provision two of Act 14/1999 of 4th May on Taxes and Public Prices for services rendered by the Nuclear Safety Council.
2. Furthermore, costs derived from the removal and management of radioactive lightning rod headers will be financed from financial yields from the Fund, as specified under section

172 of the Tax, Administrative and Social Measures Act 13/1996 of 30th December.

Section 10. Financial management of the Fund.

1. Financial management of the Fund shall be governed by principles of security, profitability and liquidity, and may be carried out using:

   a) Fixed income securities or equities quoted in an officially recognised organised stock market open to the public or, at least, to financial institutions, government stock, mortgage market securities and other financial assets and instruments.

   b) Derivatives for structuring, transformation or to hedge investment operations of the financial investment portfolio.

   c) Cash deposits with financial institutions, credits and loans to be executed by deed or by loan agreement witnessed by Notary.

   d) Fixed assets.

   e) Foreign securities listed on foreign stock markets or organised markets.

   f) Any other assets or investment instruments compliant with principles governing financial management of the Fund, which the monitoring and control Committee specified under section 11 considers appropriate.

2. Under section 72 of the Personal Income Tax Act 40/ 1998 of 9th December, and other Tax Rules, when Fund management investments are in financial assets, they will be considered to be held by ENRESA to ensure compliance with statutory and regulatory liabilities.

Section 11. Monitoring and control Committee.

1. Supervision, control and rating of interim investments involved in financial management of the Fund forward to the monitoring and control Committee, reporting to the Ministry of Finance through the Energy, Industrial Development and SME Secretariat, which, chaired by the Secretary of State, will consist of the Government Administration General Auditor, the Director General of the Treasury and Financial Policy and the

Director General of Energy Policy and Mines, and the Sub-Director General of Nuclear Energy will act as secretary.

2. The roles of the monitoring and control Committee are as follows:

a) Development of criteria on the makeup of the Fund's assets.

b) Monitoring of financial investment, checking for the application of principles set out under section 10.1.

c) Production of half-yearly reports on the situation of the Fund and financial management investments, as well as rating given by the Committee, stating any observations it deems appropriate.

This report will be delivered to the Secretaries of State of Finance and the Exchequer.

3. Notwithstanding the provisions of this Royal Decree, the committee's operation shall abide by the provisions of chapter II of heading II of the Government Administration and Common Administrative Procedure Legal Regime Act 30/1992 of 26th November.

Section 12. Remuneration of management activities included in the General Radioactive Waste Plan.

Remuneration for management activity under the General Radioactive Waste Plan will involve remuneration of capital of the company performing it, equivalent to the average yield of the financial assets that make up the Fund, which will be set annually in the report referred to under section 6.b).1.o

Sole repealing provision. Regulatory repeal.

The following are repealed: Royal Decree 1522/1984 of 4th July authorising the constitution of the Empresa Nacional de Residuos Radiactivos, Sociedad Anónima (ENRESA); Royal Decree 1899/1984 of 1st August amending Royal Decree 2967/1979 of 7th December on the regulation of activities included in the nuclear fuel cycle; and Royal Decree 404/1996 of 1st March developing Act 40/1994 regulating the National Electricity System. Royal Decree 1522/1984 of 4th July authorising the constitution of the Empresa Nacional de Residuos Radiactivos, Sociedad Anónima (ENRESA) is amended, as are all regulations

of equal or lower rank where they contradict or oppose the provisions of this Royal Decree.

First final provision. Party qualified for development.
The Ministry of Finance, within its powers, may issue the relevant provisions to develop and enforce this Royal Decree.

Final provision two. Coming into force.
This Royal Decree will come into force on the day after it is published in the Official State Gazette.

Given in Madrid, 31st October 2003

JUAN CARLOS R.

First Deputy Prime Minister and Secretary of State for Finance.
RODRIGO DE RATO Y FIGAREDO

Official State Gazette – 28th December 2005

21314 Royal Decree 1556/2005 of 23rd December, establishing the electricity tariff for 2006.

.....

Section 3. Costs with specific purposes.

1. The amount for costs with specific purposes under Chapter II of Royal Decree 2017/1997 of 26th December to be paid by electricity consumers for supplies at tariff are set for 2006 in the following percentages:

Percentages for 2006	Percentage on tariff
Permanent costs	
Extrapeninsular offsetting	2.129
System Operator	0.182
Market Operator	0.053
National Energy Board Tax	0.069
Supply diversification and assurance costs:	
Nuclear moratorium	1.724
2nd part of nuclear fuel cycle	0.210
Cost of offsetting for interruptibility, acquisition of energy from special regime facilities and other offsets	0.078

2. The amount for costs with specific purposes under Chapter II of Royal Decree 2017/1997 of 26th December to be paid by qualified electricity consumers and marketers under access agreements are set for 2006 in the following percentages:

Percentages for 2006	Percentage on tolls
Permanent costs	
Extrapeninsular offsetting	6.111
System Operator	0.523
Market Operator	0.153
National Energy Board Tax	0.201
Supply diversification and assurance costs:	
Nuclear moratorium	1.724
2nd part of nuclear fuel cycle	0.601
Cost of offsetting for interruptibility, acquisition of energy from special regime facilities and other offsets	0.223

... ...

Additional provision twelve. Updating of the specific value by plant to be applied by ENRESA for funding costs involved in managing radioactive waste and spent fuel.

Under the terms of additional provision six of the Electricity Industry Act 54/1997 of 27th November, amended by Royal Decree-Act 5/2005 of 11th March on urgent reforms to boost productivity and improve government procurements, the unit values to be applied and invoiced by ENRESA to owners of nuclear power plants in 2006 are updated as follows:

José Cabrera:	0.248 eurocents/gross generated kWh.
Santa M.ª de Garoña:	0.252 eurocents/gross generated kWh.
Almaraz I:	0.214 eurocents/gross generated kWh.
Ascó I:	0.214 eurocents/gross generated kWh.
Almaraz II:	0.214 eurocents/gross generated kWh.
Cofrentes:	0.235 eurocents/gross generated kWh.
Ascó II:	0.214 eurocents/gross generated kWh.
Vandellós II:	0.214 eurocents/gross generated kWh.
Trillo:	0.214 eurocents/gross generated kWh.

Additional provision thirteen. Review for 2006 of levy rate and tax items for ascertaining tax rates regulated under Act 24/2005 of 18th November.

Under the terms of section 8 "Creation of State Business Entity ENRESA to manage radioactive waste" item 17 final paragraph of the Productivity Promotion Reforms Act 24/2005 of 18th November, levy rates and tax items are reviewed for 2006 to ascertain tax amounts regulated under this Act as follows:

Levy rates are reviewed as applied, respectively, to electricity tariffs and to tolls of the tax for provision of radioactive waste management services referred to under section 3 of additional provision six of the Electricity Industry Act 54/1997 of 27th November, amended by section 25 of Royal Decree Law 5/2005 of 11th March, on urgent productivity promotion reforms and procurements improvement, setting them at 0.210% and 0.6 01%, respectively.

The fixed unit tariff is reviewed to ascertain the relevant amount for nuclear power plants of the tax for provision of radioactive waste management services referred to under section 4 of additional provision six of the Electricity Industry Act 54/1997 of 27th November, amended by section 25 of Royal Decree Law 5/2005 of 11th March, on urgent productivity promotion reforms and procurements improvement, setting them at 0.216 eurocents/gross generated hWh, while applicable corrective ratios stay the same.

The levy rate of the tax for provision of radioactive waste management services from manufacture of fuel assemblies, including the dismantling of fuel assembly manufacturing facilities, is reviewed, whereby its value for 2006 is 1,781.07 €/mT. Levy rates of the tax for provision of radioactive waste management generated at other facilities is reviewed, whereby its values for 2006 are as follows:

Waste	Description	Levy rate type (€/unit.)
	Solids	
S01	Compactable solid waste (25-litre bags)	96.61

S02	Non-compactable solid waste (25-litre bags)	96.61
S03	Animal corpses. Bio-waste (25-litre bags)	249.74
S04	Hypodermic needles in rigid containers (25-litre bags)	96.61
	Special solids	
S05	S051: Waste with Ir-192 as active component (25-litre bags)	96.61
	S052: Uranium or Thorium salts (25-litre bags)	180.61
	Mixed	
M01	Mixed waste consisting of organic liquids plus vials (25-litre containers)	207.99
M02	Plates and similar with liquids or gels (25-litre bags)	96.61
	Liquids	
L01	Organic liquid waste (25-litre containers)	211.71
L02	Aqueous liquid waste (25-litre containers)	180.05
	Sources	
	Encapsulated sources whose activity does not exceed the thresholds set by the ADR for Type-A packages and the source with its original container or with the equipment to which it will be fitted not exceeding 20 litres:	
F01	F011: F01 sources with elements whose half-life is less than or equal to that of Co-60	285.99
	F012: F01 sources with elements whose half-life ranges from that of Co-60 to Cs-137, including Cs-137	285.99
	F013: F01 sources with elements whose half-life is greater than that of Cs-137	285.99

	Encapsulated sources whose activity does not exceed the thresholds set by the ADR for Type-A packages and the source with its original container or with the equipment to which it will be fitted exceeding 20 litres and less than or equal to 80 litres:	
F02	F021: F02 sources with elements whose half-life is less than or equal to that of Co-60	531.13
	F022: F02 sources with elements whose half-life ranges from that of Co-60 to Cs-137, including Cs-137	531.13
	F023: F02 sources with elements whose half-life is greater than that of Cs-137	531.13

... ...

Transitional provision two. Application of amounts for the Fund for financing of activities included in the General Radioactive Waste Plan.

Percentages under section 3 of this Royal Decree regarding the Fund for the financing of activities included in the General Radioactive Waste Plan and unit values referred to under additional provision twelve will apply until the rates set under section 8 of Act 24/2005 of 18th November for radioactive waste management services referred to under sections items 3 and 4 or additional provision six of the Electricity Industry Act 54/1997 of 27th November amended by section twenty-five of Royal Decree Law 5/2005 of 11th March, on urgent reforms to boost productivity and improve government procurements come into force, from which date such taxes shall apply, and therefore from this date the percentages established under section 3 of this Royal Decree on the Fund for the financing of activities included in the General Radioactive Waste Plan shall cease to apply.

... ...

Final provision two. Coming into force.

This Royal Decree shall come into force on 1st January 2006.

Given in Madrid, 23rd December 2005

JUAN CARLOS R.

Official State Gazette – 17th March 2006

4878 Royal Decree 254/2006 of 3rd March, as amending Royal Decree 1554/2004 of 25th June, as developing the basic organic structure of the Ministry of Industry, Tourism and Commerce.

Royal Decree 1554/2004 of 25th June, as developing the basic organic structure of the Ministry of Industry, Tourism and Commerce establishes the Ministry's management bodies up to organic level of general sub-directorate.

Since the approval of this Royal Decree several events have taken place that makes it advisable to amend it, in particular in terms of the scopes of the Secretariat of Tourism and Commerce and the Secretariat of Industry and the Secretariat of Energy.

Royal Decree 1456/2005 of 2nd December, which regulates Territorial and Provincial Directorates of Commerce, establishes that Territorial and Provincial Directorates are peripheral services of the Central Government, reporting organically and functionally to the Ministry of Industry, Tourism and Commerce, which sets their operating and running goals through the Secretariat of Tourism and Commerce.

The Territorial Commerce Network is a key element in the framework of the Central Government supporting internationalisation of Spanish enterprise and consists of 30 administrative units: 18 Territorial Directorates and 12 Provincial Directorates. Accordingly, it is necessary to have a specific unit responsible for managing this Territorial Network, which in turn, due to geographic and sectoral specialisation, may take on roles involving sectoral collaboration and cooperation, performed by Technical Secretariats of the inter-territorial membership and cooperation bodies that with regard to internationalisation of enterprise report to this Secretariat. Therefore the General Sub-Directorate of Territorial Coordination is set up, reporting to the Secretariat of Overseas Trade. Formation of this Sub-Directorate means that the current General Sub-Directorate of Economic and Commerce Offices Abroad and Territorial Coordination Offices lose roles regarding territorial coordination and, therefore becoming the General Sub-Directorate of Economic and Commerce Offices Abroad.

Additionally, in order to achieve greater efficiency in the gathering and use of information on development of the Spanish and overseas international sector and, consequently, for decision-making, the General Sub-Directorates of Overseas Sector and Competitiveness Studies and Strategy and Evaluation are merged into the General Sub-Directorate of Analysis, Strategy and Evaluation, which will perform roles of the former Sub-Directorates, reporting directly to the Secretary for Tourism and Commerce.

Furthermore, Royal Decree 1554/2004 of 25th June on the scope of the Industry Secretariat is amended. On the one hand to incorporate the new functions developed by the General Directorate of SME Policy on being allocated scheme 467C of the General Budget, whose main purpose is to boost technological innovation and development of small and medium enterprises through support for Technology Centres; in addition the roles of the General Sub-Directorates of this General Directorate actually carrying them out are modified. And, in turn, it is specified in this Royal Decree that the General Secretary for Industry is the Chairman of the Spanish Weights and Measures Centre, thus solving the problems that occur in the normal management of matters involved in exercising this past that have arisen so far. In turn, within the scope of the Energy Secretariat, new wording is given to sections 15 and 16 of Royal Decree 1554/2004 of 25th June, although the amendments to such sections are specific and involve, firstly, direct attachment of the General Sub-Directorate of Energy Policy and Mines to such Secretariat, and secondly, generic assignment to the Energy Secretariat of energy powers internationally, currently held by the aforementioned General Directorate , and thirdly, by reflecting the recent attachment of State Business Entity ENRESA for managing radioactive waste to the Ministry of Industry, Tourism and Commerce.

Change in reporting status of the General Sub-Directorate of Energy Plan rests on the consideration that it is a unit with horizontal powers whose roles extend, where appropriate, to a scope that is broader than that of the General Directorate of Energy Policy and Mines. In particular, powers and roles developed by

government agencies attached to the Energy Secretariat (Energy Diversification and Saving Institute, Coalmining Restructuring and Alternative Development of Mining Districts Institute, ENRESA, National Energy Board and Strategic Oil Product Reserves Corporation). In turn, the nature of its roles (essentially study and planning) are those appropriate to a unit directly tied to the most senior person in the Secretariat.

As for the second amendment, given that obviously the main responsibility and the exercising of powers in international relations reside in the General Secretary, the suggested amendment does nothing more than reflect reality, correcting the current wording, which is also inadequate in organisational terms.

Reflection of Royal Decree 1554/2004 of 25th June, on attachment of ENRESA to the Ministry is in response to the provisions of Act 24/2005 of 18th November, where under section eight it adds additional provision six. a) to Electricity Industry Act 54/1997 of 27th November, which under point 2 establishes that State Business Entity ENRESA for radioactive waste management is attached to the Ministry of Industry, Tourism and Commerce.

Accordingly, at the initiative of the Secretary of State for Industry, Tourism and Commerce, at the behest of the Secretary of State for Government Administrations, and following deliberation by the Cabinet at its meeting of 3rd March 2006,

I DECREE AS FOLLOWS:

Sole section. Amendment to Royal Decree 1554/2004 of 25th June, as developing the basic organic structure of the Ministry of Industry, Tourism and Commerce.

Royal Decree 1554/2004 of 25th June, as developing the basic organic structure of the Ministry of Industry, Tourism and Commerce is amended in the following terms:

One. Section 2.3 will have the following wording:

«3. The following bodies report directly to the Tourism and Commerce Secretary with the rank of general sub-directorate:

a) Cabinet Office, as immediate assistance agency for the Secretary, with the structure specified under section 17 of Royal Decree 562/2004 of 19th April.

b) The General Sub-Directorate of Analysis, Strategy and Evaluation, which will perform the following roles:

1.ª Management, running and supervision of the editorial content of Información Comercial Española (ICE) publications, and coordination and production of the annual report on the Spanish overseas sector, in cooperation with other agencies of the Tourism and Commerce Secretariat.

2.ª Monitoring, study, strategic analysis and production of economic forecasts on development of the Spanish overseas sector in its various components, for the purpose of making decisions, and study and monitoring of effects thereof of any national and EU commercial policy.

3.ª Management, analysis, running and broadcasting of the Export Situation Survey, and production and broadcasting of the competitiveness indicators of the Spanish overseas sector.

4.ª Gathering, analysis and assessment, by producing regular reports, of available economic information on the various strategic areas of overseas Commerce, and on analysis of export sectors.

5.ª Design, monitoring and assessment of actions developed by the Tourism and Commerce Secretariat to ensure it achieves its goals.

6.ª Technical coordination of Commerce policy, notwithstanding powers in this area of other managing agencies of the Tourism and Commerce Secretariat.

c) The General Sub-Directorate of Information Technology, which will provide support to the Secretariat in terms of managing information systems, notwithstanding powers attributed to other management agencies of the Ministry.»

Two. Section 4.1.ñ) becomes section 4.1.p).

Three. Two further paragraphs ñ) and o) are added to section 4.1, with the following wording:

«ñ) Economic/financial and technical management of the Territorial and Provincial Commerce Directorate Network, technical inspection, assessment of its operation, organisation and performance, as well as devising and development of actions aimed at improving the Network, notwithstanding the powers

attributed to other Ministry agencies. Furthermore, it will be responsible for coordinating the Territorial and Provincial Commerce Directorate Network, notwithstanding the powers of the General Sub-Directorate of Inspection, Certification and Technical Support for Foreign Commerce.

o) Performance of Technical Secretariats of inter-territorial membership and corporation bodies with regard to internationalisation of enterprise, reporting to the Tourism and Commerce Secretariat.»

Four. A further paragraph i) is added to section 4.2, with the following wording:

«i) The General Sub-Directorate of Territorial Coordination, which will perform the roles listed in paragraphs 4.1.ñ) and o).»

Five. Section 5.1.c) will have the following wording:

«c) Economic/financial and technical management of the Economic and Commercial Office network abroad. Furthermore, technical inspection and assessment of their operation, organisation and performance, as well as devising and developing actions conducive to improving such network of Economic and Commercial Offices.»

Six. Section 5.2.d) will have the following wording:

«d) The General Sub-Directorate of Economic and Commercial Offices Abroad, which will perform the roles listed in 5.1.c).»

Seven. Section 12.7 will have the following wording:

«7. The Spanish Weights and Measures Centre is attached to the Ministry of Industry, Tourism and Commerce through the Industry Secretariat, whose most senior person is its chairman.»

Eight. Two further paragraphs n) and ñ) are added to section 14.1, whereby the current paragraph n) becomes paragraph o), with the following wording:

«n) Development of actions aimed at simplifying relations between government and SMEs, and extension of using e-Government, particularly in processes involved in the constitution of companies.

ñ) Management of government aid established in the scheme for supporting Technology Centres.»

Nine. Section 14.2.a) and c) will have the following wording:

«a) The General Sub-Directorate of Support for SMEs, which will perform the roles listed in paragraphs 14.1.a), b) and o).

c) The General Sub-Directorate of Company Formation, which will perform the roles listed in paragraphs 14.1.h), j), k), i), n) and ñ). »

Ten. Sections 15 and 16 will have the following wording:

«Section 15. Energy Secretariat.

1. The Energy Secretariat, under the higher management of the Ministry of Industry, Tourism and Commerce, will have powers relevant to:

a) Development of energy and mining policy.

b) Proposal of legislative initiatives and developing regulations within the remit of the Secretariat.

c) Production of planning proposals for energy matters under current legislation.

d) Production of proposals for conservation and energy-saving, and encouraging renewable energy sources.

e) Monitoring of technology breakthroughs in the field of energy and mining.

f) Production and, as appropriate, enforcement of measures aimed at ensuring energy supplies.

g) Production of proposals for regulation and, as appropriate, approval of the structure for tariffs, prices for energy products and tolls, as well as remuneration for activities carried out within the framework of the energy sector under current legislation.

h) Processing of coal subsidies under EU legislation and involvement in taskforces and other activities involved in the coal industry, in coordination with the Institute for Restructuring of Coal Mining And Alternative Development of Mining Districts.

i) Monitoring of energy and mining policies in the sphere of the European Union and other international organisations. Involvement in activities arising from Spain's membership of international organisations and, in general, in international relations both bilateral and multilateral in the sphere of energy and mining policy, as well as boosting and developing the required activities to ensure compliance with international

commitments and international cooperation and technical support schemes relevant to these matters, and monitoring thereof. Specifically, represent Spanish interests in the International Energy Agency, reporting to the Organisation for Economic Cooperation and Development.

j) In general all initiatives, proposals and actions that in the sphere of the energy and mining sector fall to the central government, under current legislation, notwithstanding the powers that fall to the Institute for Restructuring of Coal Mining And Alternative Development of Mining Districts.

k) Any roles attributed by current legislation to the Ministry of Industry, Tourism and Commerce in the energy and mining sectors.

2. The General Directorate of Energy Policy and Mines reports to the Energy Secretariat.

3. The following bodies report directly to the Energy Secretary with the rank of general sub-directorate:

a) A Technical Cabinet, as immediate support agency for matters entrusted by the General Secretary.

b) The General Sub-Directorate for Energy Planning, which in respect of renewable energy sources, rational use of energy and energy efficiency, will perform the roles listed in section 15.1.j) and section 16.1 b), c), i), l), m) and q).

4. Functional Areas of Industry and Energy, integrated in Government Delegations, will perform the roles attributed by regulation, reporting to the Energy Secretariat, subject to their remit.

5. The following agencies report to the Ministry of Industry and Energy through the Energy Secretariat.

a) The Institute for Restructuring of Coal Mining and Alternative Development of Mining Districts, whose chairman will be the Energy Secretary.

b) The Institute for Energy Diversification and Saving, whose chairman will be the Energy Secretary.

c) State Business Entity, ENRESA, responsible for management of radioactive waste.

6. The National Energy Board is attached to the Ministry of Industry and Energy through the Energy Secretariat.

7. A Permanent Advisory Board reports to the Energy Secretary.
8. The Energy Secretariat is responsible for overseeing the Strategic Oil Product Reserves Corporation.

Section 16. General Sub-Directorate of Energy Policy and Mines.

1. The General Sub-Directorate of Energy Policy and Mines is Responsible for the Following:

   a) General regulation of the energy and mining sectors, under current legislation.

   b) Devising of regulatory initiatives and monitoring within the framework of the remit of central government, with regard to mining, hydrocarbons, electrical energy, nuclear energy, renewable energy sources, rational use of energy and energy efficiency, as well as production of the required proposals for adaptation, as appropriate, to European Union legislation.

   c) Production of planning proposals for energy and safety in mining.

   d) Production of proposals for regulation of the structure for tariffs, prices for energy products and tolls, as well as remuneration for activities carried out within the framework of the energy sector under current legislation.

   e) Production and processing of permits for facilities and subjects operating in the energy sector, as well as radioactive facilities, controlling obligations required of them and instruction and, as appropriate, resolution of fines imposed due to breaches provided for under current legislation on energy matters, when it is within the remit of central government.

   f) Proposal to grant and process approvals, permits and concessions to exploit hydrocarbons and monitoring and control thereof, as well as actions with regard to research and leveraging of mineral other geological and hydrogeological resources, within the framework of the remit of central government.

   g) Management of government registries that fall to central government, under current legislation on energy and mines, as well as issuance of certificates on their content.

   h) Those regarding organisation and operation of the electricity production market.

   i) Receipt, monitoring and production of information on the

energy and mining sectors, survey, monitoring and analysis of energy market behaviour, parameters affecting these sectors, as well as comparison with other country markets.

j) Monitoring and control of actions and plans, both technical and economic, with regard to activities contemplated under the General Radioactive Waste Plan and production of proposals for approvals regarding shutdown nuclear power plants, under the terms of the Electricity Industry Act 54/1997 of 27th November and its developing provisions.

k) Monitoring of international commitments signed by Spain, in particular in terms of nuclear non-proliferation, the security of nuclear materials and facilities and public liability for nuclear damage.

l) Coordination, proposal and monitoring, both domestically and internationally, of initiatives and schemes regarding matters concerning the rational use of energy and energy efficiency, as well as monitoring and proposals with regard to energy policies within the sphere of environmental impact and sustainable development of energy, including the production of certificates of conformity for equipment associated with these spheres.

m) Analysis of evolution and monitoring of technology breakthroughs in the field of energy and mining, as well as contribution to defining technological research, development and demonstration policy within the realms of energy and mining, in cooperation with the Ministry of Education and Science.

n) Analysis and monitoring of the supply of mineral raw materials, in general, and any that are significant to national defence.

ñ) Improvement to safety in mines within the sphere of the remit of the Ministry of Industry, Tourism and Commerce and, in particular, encouragement of technological research, development and competitiveness in mining.

o) Those regarding explosives, cartridge making and pyrotechnics, within the sphere of the remit of the Ministry of Industry, Tourism and Commerce.

p) Production of proposals regarding the establishment of specifications and quality of hydrocarbons; basic regulation on technical conditions and safety assurance at energy and mining

facilities, as well as production, monitoring and development of schemes and actions regarding the quality and safety of equipment and products used in mining.

q) Production and coordination of statistical research in energy and mining

2. The General Sub-Directorate of Energy Policy and Mines will consist of the following General Sub-Directorates:

a) General Sub-Directorate of Hydrocarbons, which will perform the roles listed in section 16.1.a), b), d), e), g), i) and p) in the hydrocarbons sector, as well as the roles listed in paragraph f) within the scope regulated under the Hydrocarbons Act 34/1998.

b) The General Sub-Directorate of Electrical Energy, which will perform the roles listed under section 16.1a), b), d), e), g), h) and i) within the sphere of the electricity sector.

c) The General Sub-Directorate of Nuclear Energy, which will perform the roles listed under section 16.1a), b), c), d), g), i), j), k) and m) within the sphere of nuclear energy, as well as the roles listed in paragraph e) with regard to nuclear and radioactive facilities and those relating in general to nuclear energy.

d) The General Sub-Directorate of Mines, which will perform the roles listed under section 16.1a), b), c), f), g), i), m), n), ñ), o), p) and q), within the sphere of the mining sector.

3. The following fall to the Director General of Energy Policy and Mines:

a) Chair of the Advisory Board for thermal facilities in building, created by Royal Decree 1751/1998 of 31st July.

b) Chair of the Mining Safety Board.

c) Chair of the Settlement Board of the electrical energy offsetting office (OFICO).»

Additional provision one. Removal of agencies.

The following units with General Sub-Directorate organic level are removed:

a) The General Sub-Directorate of Overseas Sector and Competitiveness Studies.

b) The General Sub-Directorate of Analysis and Strategy.

c) The General Sub-Directorate of Economic and Commerce Offices Abroad and Territorial Coordination Offices.

Additional provision two. Provincial Directorate for La Coruña.
The La Coruña Provincial Directorate of Commerce is created, which will be endowed with the job posts currently allocated to the city within the current List of Jobs of the Territorial Directorate of Commerce in Vigo.

Additional provision three. No increase to government spending.
Decree and performance of measures it specifies will not involve any increase in government spending.

Transitional provision one. Units and jobs with organic level lower than general sub-directorate.
Units and jobs with organic level lower than general sub-directorate affected by organic modifications established in this Royal Decree shall subsist and will be remunerated from the same budgetary credits, until the relevant job lists adapted to the organic structure of this Royal Decree have been approved.

The units and jobs within the agencies affected by this Royal Decree, or whose organic reporting level has been modified by this Royal Decree, shall be attached provisionally, by resolution of the Deputy Secretary, until the new job list comes into force, to agencies regulated under this Royal Decree subject to powers assigned to them.

Transitional provision two. Economic/ financial management.
Until the required budgetary amendments have been made, the economic/financial management of the Territorial and Provincial Commerce Directorates will continue to be provided by the organic units that currently do so.

Sole repealing provision. Regulatory repeal.
Any provisions of equal or lower rank that contradict or oppose the provisions of this Royal Decree are hereby repealed.

First final provision. Power for development.
The Ministry of Industry, Tourism and Commerce is hereby authorised to take any necessary steps to develop and enforce this Royal Decree.

Final provision two. Coming into force.
This Royal Decree will come into force on the day after it is published in the Official State Gazette».
Given in Madrid, 3rd March 2006

JUAN CARLOS R.

The Secretary of State for Government Administrations,
JORDI SEVILLA SEGURA

Official State Gazette – 17th July 1998

17168 Order of 13th July 1998 amending Order of 20th December 1994, developing Royal Decree 1522/1984 of 14th July, as authorising the constitution of the "Empresa Nacional de Residuos Radiactivos, Sociedad Anónima" (ENRESA).

By Order of 20th December 1994 ENRESA was authorised to allocate funds to Councils in whose municipal territory facilities were located specifically conceived for the storage of radioactive waste, or nuclear power plants storing spent fuel generated by them at their own facilities, and those other municipal areas defined as affected under such Order.

This Order in turn replaced Orders of 30th December 1988 and 1st December 1989, in compliance with the Decision of the Court for Judicial Review of the Branch of the Supreme Court, dated 6th July 1993, regarding an appeal filed against Order of 1st December 1989, by a series of Councils. The Decision declared that Such Order was contrary to law and it was cancelled with regard to the criteria of the main population nucleus as a decisive factor with regard to entitlement to receive the specified funds, whereby the government as defendant was ordered to adopt a criterion that was compliant with the law.

Considering the suitability of assuring receipt of minimum revenues for those councils that, either because they are near nuclear facilities, or because their population centre is closest

to them, should bear to a greater extent their existence and the relevant infrastructure, as well as the need to contemplate new situations, such as dismantling of nuclear power plants, this Order is drawn up.

In turn, it is worth noting that allocations derived from applying this Order should be understood to be without prejudice to amounts that might apply to municipal areas as a result of internal agreements.

Accordingly, this Ministry has decided to provide as follows:

One.— ENRESA is authorised to allocate funds to Councils in whose municipal terminus nuclear power plants are located that store spent fuel generated by them on their own site, centralised facilities specifically conceived for the storage of spent fuel or radioactive waste, nuclear power plants being dismantled and in those municipal areas defined as a consequence of application of this Order.

Two.— Among the facilities considered for the purposes of One above, the following categories are established:

1. Nuclear power plants storing spent fuel generated by them on their own site, either in the pool, or under dry conditions by using storage casks.

2. Centralised temporary storage facilities, understood to be facilities storing spent fuel from several nuclear power plants and which also allow for the storage of high level or long-lived radioactive waste.

3. Nuclear power plants not storing spent fuel generated by them on their own site, which are in the process of being dismantled.

4. Centralised storage facilities for low and intermediate level waste.

Three.— Municipal areas entitled to allocation established under One above, subject to facility category.

Categories 1 and 2:

1. Those that have in their territory or part thereof included

in the area defined by a circle with a radius of 10 km where the facility is in the centre.
2. Those not considered in the preceding paragraph, provided that they have some population nucleus, whether or not the main one, whose distance to the centre of the facility is no more than 20 km.

Categories 3 and 4:
1. Those that have in their territory or part thereof included in the area defined by a circle with a radius of 8 km where the facility is in the centre.
2. Those not considered in the preceding paragraph, provided that they have some population nucleus, whether or not the main one, whose distance to the centre of the facility is no more than 16 km.

For the foregoing purposes, a population nucleus is considered to be the one defined under the Nomenclature of cities, villages, places, hamlets and other population entities with specification of their nuclei, as published by the National Statistics Office.

Four.— The fund for each site will be apportioned to municipal areas entitled to allocation, subject to the distribution and quantity criteria specified below.

a) Fund distribution.

1. Any municipal area in whose terminus the facility is based will be allocated the following percentage of the fund: 5% for category 1 facilities, 10% for category 2 and 4 and 25% for category 3.
2. The remainder of the fund will be distributed among all municipal areas entitled to the allocation, including the one where the facility is based, in proportion to the following coefficient:

$$C_i = 0{,}6 \times S_i + 0{,}4 \times (h/d^2)_i$$

where:

S_i = Percentage of surface area occupied by municipal area I in the circle defined under 1 above for each category, of item Three.

And,

$$(h/d^2)_i = \frac{H_i/D_{2i}}{\sum(H_i/D_{2i})}$$

where:

$H_i = \sum H_j$ = Number of inhabitants of municipal area i belonging to those population nuclei j whose distance from the facility is no greater than 20 km or 16 km, subject to whether it involves categories 1 and 2 or 3 and 4, respectively under Three above.

H_j = Total number of inhabitants of population centre j. For these purposes, the number of inhabitants of a population nucleus will include those of the connurbation associated therewith in the Nomenclature. When the connurbation is associated in the Nomenclature with several population nuclei, the number of inhabitants of such connurbation will be distributed among them in proportion to each one's inhabitants.

$D_i = \frac{\sum H_j D_j}{\sum H_j}$ = Weighted average distance of such population nuclei of municipal area i, from the facility.

where:

D_j = Distance from population nucleus j to the centre of the facility.

3. No municipal area will receive more than 20%, 40% or 50% of the fund, subject to whether the facility is of category 1, 2 or 3 and 4, respectively.

b) Fund amount accrued every year, subject to facility category.

Category 1:

Fixed term, T_f = 284,848,018 pesetas.

Variable term, T_V = 3,524,000 pesetas per ton of heavy metal by which storage of spent fuel increases in the year.

Category 2:
Fixed term, T_f = 284,848,018 pesetas.
Variable term, T_{V-1} = 3,524,000 pesetas per ton of heavy metal by which storage of spent fuel increases in the year, and T_{V-2} = 500,000 pesetas per cubic metre of radioactive waste by which the volume of stored waste increases in the year.

Category 3:
Fixed term, T_f = 80,000,000 pesetas.

Category 4:
Fixed term, T_f = 102,545,286 pesetas.
Variable term, T_V = 111,589 pesetas per cubic metre of radioactive waste entering the facility in the year.

c) Maximum guaranteed amount: For category 1 and 2 facilities, for as long as there is spent fuel at the site, payment of a minimum sum of 10,000 pesetas per inhabitant and year will be guaranteed for municipal areas under point three 1, regarding such categories, and a minimum amount of 5000 pesetas per inhabitant and year for those municipal areas where, while not meeting the previous requirement, the weighted average distance of all their population nuclei to the centre of the site is less than 15 km. The amount earmarked to guarantee these minima shall be no greater than 35 million pesetas per municipal area, in compliance with the thresholds specified under a).3 above.

Five.— Allocation of funds will commence:

1. For category 1, 2 and 4 facilities, from the time authorisation for the operation is granted.
2. For category 3 facilities, from the time authorisation for dismantling is granted.

Six.— 1. Category 1 facilities:

For the transfer of spent fuel off site, the relevant weight of heavy metal of removed fuel will count as negative for the purposes of calculating the variable term for each year.

Once shutdown of the facility has been declared, in the event that the spent fuel has been removed from the site, from that time the facility will be treated analogously to a category 3 facility for all intents and purposes, until the facility is ultimately dismantled.

For as long as spent fuel is held at the site, even following dismantling of the power plant, the fixed term of the fund relevant to category 1 facilities shall subsist.

2. Category 2 facilities:

For the transfer of spent fuel or radioactive waste off site, the relevant weight of heavy metal of the fuel or volume of waste removed will count as negative for the purposes of calculating variable term for each year.

Once shutdown of the facility has been declared, in the event that the spent fuel or radioactive waste have been removed from the site, from that time the facility will be treated analogously to a category 3 facility for all intents and purposes, until the facility is ultimately dismantled.

Seven.— Allocation of funds will cease:

1. For category 1 facilities once the facility has ultimately been dismantled and all fuel removed from the site. For all other facilities, once the facility has ultimately been dismantled.
2. Due to stoppage of activity for which the facility was conceived for longer than one year and provided that it is due to causes other than:
   a) Those provided for under section 2.2.d) of the Nuclear Safety Council Formation Act 15/1980 of 22nd April.
   b) Voluntarily by the facility's operating company.

Octavo.— Every year the General Directorate of Energy will set, by Resolution, allocations to be distributed for each facility subject to criteria laid down in this Order, and will review the amounts specified under Four b) and c) above, based on chan-

ges in the CPI during the previous year, as published by the National Statistics Office, minus one point, provided that such CPI is greater than or equal to 1. Otherwise, the previous year's amounts shall subsist.

Nine.— Given that the allocation for each year comprises the fixed term of the relevant fund for the year and the variable term for the previous year, the amounts referred to under Four above shall apply to the calculation of the variable term for 1997, and the fixed term for 1998.

Ten.— The General Directorate of Energy, under criteria specified in this Order, will set the required performance standards to develop its provisions.

Eleven.— The Order of 20th December 1994, which replaces the Orders of 30th December 1988 and 1st December 1989, developing Royal Decree 1522/1984 of 14th July, as authorising the constitution of the "Empresa Nacional de Residuos Radiactivos, Sociedad Anónima" (ENRESA), is hereby repealed.

Twelve.— This provision will come into force on the day it is published in the Official State Gazette.

Madrid, 13th July 1998.

PIQUÉ I CAMPS
Energy and Mineral Resources Secretary

Official State Gazette – 11th August 1998

19462 Correction of errors in the Order of 13th July 1998 amending the Order of 20th December 1994, developing Royal Decree 1522/1984 of 14th July, authorising the constitution of the "Empresa Nacional de Residuos Radiactivos, Sociedad Anónima" (ENRESA).

Having noted errors in publication of the Order of 13th July 1998 amending the Order of 20th December 1994, developing Royal

Decree 1522/1984 of 14th July, authorising the constitution of the "Empresa Nacional de Residuos Radiactivos, Sociedad Anónima" (ENRESA), as published in the Official State Gazette issue number 170 dated 17th July 1998, such errors are transcribed below in order for them to be corrected:

On page 24138, right-hand column,

Point Four, where it says: «$(h/d^2)_i = \frac{H_i/D_{2i}}{\sum(H_i/D_{2i})}$ »

it should say: «$(h/d^2)_i = \frac{H_i/D_i^2}{\sum(H_i/D_i^2)}$ »

On page 24139, left-hand column, first and second lines, where it says

«where:
$H_i = \sum H_j$ = Number of inhabitants of municipal area i belonging to those population nuclei j whose distance from the facility is no greater than 20 km or 16 km, subject to whether it involves categories 1 and 2 or 3 and 4, respectively under Three above.»

It should say

«where:
$H_i = \sum H_j$ = Number of inhabitants of municipal area i belonging to those population nuclei j whose distance from the facility is no greater than 20 km or 16 km, subject to whether it involves categories 1 and 2 categories 3 and 4, respectively under Three above.»

On page 24139, left-hand column,

Four a) 3, where it says: "No municipal area will receive more than 20%, 40% or 50% of the fund, subject to whether the facility is of category 1, 2 or 3 and 4, respectively" it should say:

"No municipal area will receive more than 20%, 40% or 50% of the fund, subject to whether the facility of category 1, category 2 or categories 3 and 4, respectively».

Official State Gazette – 5th June 2003

11269 Order ECO/1449/2003 of 21st May on the management of solid waste material with radioactive content generated at category 2 and 3 radioactive facilities where non-encapsulated radioactive isotopes are handled or stored.

Section 2.9 of the Nuclear Energy Act 25/1964 of 29th April, amended by additional provision four of the Electricity Industry Act 54/1997 of 27th November, includes the definition of "radioactive waste" concept in line with international organisations such as the International Atomic Energy Agency (IAEA).

In accordance with the current statutory definition, the concept of radioactive waste has to be set by the fact that it exceeds certain concentrations or levels of activity to be established by the Ministry of Finance, following report from the Nuclear Safety Council.

Council Directive 96/29/EURATOM, laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation, introduced the concept of the clearance of waste material and noted that radiological criteria governing the process to authorise management of these materials by conventional means of disposal, recycling or reuse.

Article 76 and Annex I, both in the Regulations on nuclear and radioactive facilities, approved by Royal Decree 1836/1999 of 3rd December, translate the radiological goals and criteria of Directive 96/29, by linking disposal, recycling or reuse processes for waste material to the statutory definition of radioactive waste.

Article 51 of the Regulations on health protection against ionising radiation, approved by Royal Decree 783/2001 of 6th July, provides that all discharges of solid radioactive waste into the environment require specific authorisation from the Ministry of Finance, following a report from the Nuclear Safety Council.

As regards the specific sphere of category 2 and 3 radioactive facilities where non-encapsulated radioactive isotopes are handled or stored, the IAEA has in recent years developed technical recommendations aimed at specifying concentrations or levels of activity present in waste material, in such a way that it is possible to establish a quantitative scope of the definition of radioactive waste, considering quantities and features of waste material generated at these facilities and relevant specific subsequent management means.

In this context, the Nuclear Safety Council has approved Safety Guide 9.2 on the management of solid waste material with radioactive contents generated at radioactive facilities, which includes such IAEA recommendations and basic principles governing the management of waste material at these facilities.

Development of the concept of radioactive waste in the sphere of these facilities will enable, within the strict methodology framework, simplification and optimisation of activities involved in management of these materials in Spain and control by the Nuclear Safety Council.

Therefore, following report from the Nuclear Safety Council, and with the agreement of the Council of State, I decree as follows:

Section 1. Scope.

1. This Order applies to category 2 and 3 radioactive facilities, where non-encapsulated radioactive isotopes are handled or stored.
2. The procedures for managing waste laid down in this Order shall apply to all waste existing in Spain irrespective of the date when it was generated.

Section 2. Classification and management of solid waste material with radioactive content.

1. Within the application scope of this Order and for the purposes of the provisions of section 2.9 of the Nuclear Energy Act, the definition of solid radioactive waste is any waste material or product, for which no further use is foreseen, which contains or is contaminated with radionuclides at concentrations or activity levels higher than the values specified in the Annex to this Order.

2. Solid waste material generated at radioactive facilities referred to by section 1 above, for which no further use is foreseen use and which are contaminated by radionuclides at concentrations or activity levels less than or equal to those specified in the Annex to this Order will not be considered radioactive waste and may be managed under the relevant applicable regulations.

Section 3. Basic principles for classification and management.

Owners of radioactive facilities referred to by section 1 above, which generate solid waste material with radioactive content, shall have the relevant technical documents setting out the methods and procedures implemented to perform the classification and management of waste material, subject to the following basic principles:

a) Minimising waste production.

b) Segregation of waste with different characteristics subject to how it will ultimately be managed.

c) The management of waste by the most suitable means, subject to activity content.

d) Traceability of the waste management process.

Section 4. Annual report.

The licensees of radioactive facilities included in the application scope of this Order shall specify in the annual report that they are required to submit to the General Directorate of Energy Policy and Mines and the Nuclear Safety Council, as specified under section 73.2.a) of the Regulations on nuclear and radioactive facilities, all information relevant to action taken regarding solid waste materials with radioactive content they have generated, specifying their quantities and characteristics, and subsequent management process.

Section 5. Quality control system.

The management of solid waste material with radioactive contents will be carried out within the framework of a quality control system to ensure the detection of potential deviations and to ensure the implementation of suitable corrective measures.

Section 6. Traceability of the management process.

The traceability of the management process for solid waste material with radioactive content, up to its delivery to those ultimately responsible for its management, will be assured by the licensee of the radioactive facility using the relevant logging and filing system, which at all times is to be updated and available to the Nuclear Safety Council.

Sole repealing provision. Regulatory repeal.

Upon entry into force of this Order, all provisions of equal or lower rank opposing the provisions hereof shall be repealed.

Sole final provision. Coming into force.

This Order will come into force on the day after it is published in the Official State Gazette.

Madrid, 21st May 2003.

DE RATO Y FIGAREDO
Energy, Industrial Development and SME Secretary.

Annex

1. Table of activity values per unit of mass (N_i):

Radionuclide	Activity by unit of mass (kBq/kg)
H-3	10^6
C-14	10^4
Na-22	10
Na-24	10
P-32	10^3
S-35	10^5
Cl-36	10^4
K-42	10^2
Ca-45	10^4
Ca-47	10
Cr-51	10^3
Co-57	10^2
Co-58	10
Fe-59	10

Ga-67	10^2
Se-75	10^2
Sr-85	10^2
Sr-89	10^3
Y-90	10^3
Mo-99	10^2
Tc-99	10^4
Tc-99m	10^2
Ln-111	10^2
I-123	10^2
I-125	10^3
I-131	10^2
Pm-147	10^4
Er-169	10^4
Au-198	10^2
Hg-197	10^2
Hg-203	10^2
Tl-201	10^2
Ra-226	10
Th-232	1

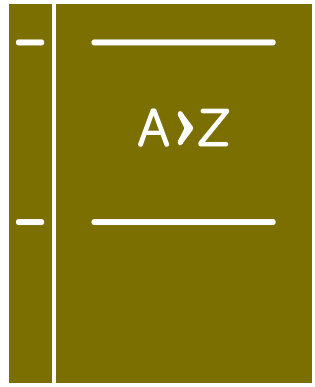
2. For those radionuclides not included in the above Table, the activity values by unit of mass (kBq/kg) that should be considered are those specified in Annex I, Table A, column 3 of the Regulations on nuclear and radioactive facilities, as approved by Royal Decree 1836/1999 of 3rd December.
3. In the event that the waste material is contaminated with a mixture of radionuclides, it shall be necessary for the following condition to be met in order for it to be managed as conventional waste:

$$\sum_{n=1}^{n} = \frac{C_i}{N_i} \leq 1$$

where:
"C_i" is activity by unit of mass in kBq/kg of each radionuclide i present in the waste material.
"N_i"is the value established in the Table for radionuclide"i".
"n" is the number of radionuclides in the waste material.

Annex F

Glossary of terms and abbreviations



Presented below is a glossary of the terms most frequently used in the present document, these having a specialist acceptance in the world of radioactive waste management.

Given that the fundamental objective of this glossary is to contribute to better understanding of the text, it has been considered necessary to attach special importance to criteria of clarity and general usage rather than to excessively technical definitions that might be foreign to the specific and exclusive area of the document in question.

Also included is a list of commonly used abbreviations and their meaning, in alphabetical order.

AGR: "Advanced gas-cooled reactor".

ALARA: "As Low As Reasonably Achievable". The basic principle of radiation protection, on which is based the recommendation that all exposures be kept as low as is reasonably achievable, taking into account social and economic factors.

ANDRA: French National Agency for Radioactive Waste management.

AUM: Andújar Uranium Mill. A disused facility, in commercial operation from 1959 to 1981, designed to extract low grade ore and obtain a concentrate of uranium of high richness. The facility is currently in the surveillance and maintenance phase, its dismantling and the restoration of the site having been completed.

Barriers: Natural or artificial feature placed between wastes and mankind in order to prevent or delay the release of radionuclides to the environment, until such time as they have lost their activity. Commonly used terms are chemical – physical barrier (waste immobilisation and confinement in containers), engineered barrier (installation in which the wastes are placed) and geological barrier (the Earth's crust in which wastes are placed).

BNFL: "British Nuclear Fuel, Ltd.". British company responsible for Fuel Cycle activities (Front end and Reprocessing).

BOE: Boletín Oficial del Estado, the Spanish official state gazette.

BWR: "Boiling water reactor".

CABRIL: Name by which the facility in Sierra Albarrana (Córdoba) is known, authorised for the disposal of duly conditioned low and intermediate level solid waste),

Cask: Container designed to house irradiated fuel or radioactive material in order to facilitate its transport and/or storage.

CASSIOPEE: Consortium formed by the radioactive waste management agencies of Germany, Belgium, France, Holland, Great Britain and Spain for projects and studies proposed by the European Commission within the framework of technical assistance programmes.

CEA: French Atomic Energy Commissariat.

Chamber: See vault

CIEMAT: Centre for Energy-Related, Environmental and Technological Research, formerly known as the Nuclear Energy Board or JEN (Junta de Energía Nuclear).

Closed fuel cycle: Term used in relation to the nuclear fuel cycle when the irradiated fuel is sent to a reprocessing plant for the non-burned U and the Pu generated to be separated from the rest of the materials.

CNE: Comisión Nacional de Energía (National Energy Commission), the organisation in charge of collecting the percentages applied to the billing of electricity sales, to be transferred to the Fund for the financing of activities included in the General Radioactive Waste Plan.

COGEMA: "Compagnie Générale des Matières Nucléaires", a company belonging to the French Atomic Energy Commissariat (CEA) and involved in the manufacturing and commercialisation of nuclear fuel.

Conditioning and immobilisation: A special treatment for the preparation of a radioactive waste, consisting of introducing it in a container and stabilising it for storage and/or disposal.

CORWM: UK Committee on Radioactive Waste Management.

COWAM: European Project of Community Waste Management. The Spanish Cowam steering committee is made up of ENRESA, AMAC (Association of Municipal Areas housing Nuclear Power Plants), the CSN and EPSI-UAB (College of Integral Safety and Prevention of the Autonomous University of Barcelona).

CSN: Spanish Nuclear Safety Council (Consejo de Seguridad Nuclear). Created by Law on 22nd April 1980 as an Entity existing under Public Law, independent from the Central State Administration, with its own legal standing and equity independent from those of the State, and as the sole body in Spain responsible for nuclear safety and radiation protection.

CTS: Centralised Temporary Storage facility for the spent fuel and high level waste of all or several nuclear power plants and from other origins.

DDP: Dismantling and Decommissioning Plan.

Discount rate: Actual interest rate or difference between the nominal interest rate and the rate of inflation. Although these last two parameters may vary in the short term, the differential tends to be stable in the long term. The discount rate is used to make the flows of costs and income comparable, expressed in constant monetary values, through the calculation of updated values. For example, if a payment of 100 euros is to be made in ten years time, then considering a discount rate of 3%, the sum that would currently be necessary would be 74.4 euros, which would be the so-called updated value (100/1,0310). In other words, with an initial capital of 74.4 euros and the financial yield accumulated over ten years, the final capital would be 100 euros.

Disposal: The placing of radioactive waste in installations providing adequate environmental protection, without the intention of recovering them.

DOE: Department of Energy (USA).

DPT: Name given to the metallic casks used for the temporary storage of the spent fuel from Trillo NPP, and valid also for its transport.

DR: Discount rate.

€: Euro.

EC: European Commission.

EDRAM: Association formed by the organisations responsible for the spent fuel and high level radioactive waste management programmes in Germany, Belgium, Canada, the United States, Finland, France, Japan, Great Britain, Sweden and Spain.

ENRESA: Empresa Nacional de Residuos Radiactivos, S.A., constituted by Royal Decree 1522/1984, of 4th July, with a view to its undertaking the management of radioactive waste in Spain. Its shareholders are CIEMAT, with 80% and SEPI, with 20%

ENUSA: Empresa Nacional del Uranio, S.A., the company responsible for guaranteeing the supply of fuel to the Spanish nuclear power plants, it is also the operator of the Spanish uranium mines and the Juzbado Fuel Assembly Manufacturing Facility in Salamanca.

EU: European Union.

EURATOM: Treaty of the European Atomic Energy Community (EAEC).

FEBEX: "Full-Scale Engineered Barriers Experiment in Crystalline Host Rock".

The name given to an experiment on the performance and feasibility of the system of engineered barriers for the disposal of high level radioactive waste in granitic formations, performed at the Grimsel underground laboratory (Switzerland on the basis of a specific agreement signed between ENRESA and its Swiss counterpart NAGRA.

Fuel storage rack: Storage structure that keeps irradiated fuel assemblies in a given configuration to facilitate heat removal and handling of the fuel and prevent criticality and damage caused by earthquakes.

Fund: In economic-financial terms and in relation to the GRWP, this refers to the monetary surplus existing as a result of the time lag between ENRESA's revenues and the future costs to be financed. (At the end of the management period, the fund should have a zero balance).

Geological disposal: The disposal of spent fuel and other radioactive wastes in a geological formation considered to possess the stability and properties required to satisfy the corresponding criteria.

GRWP: General Radioactive Waste Plan.

GWe: Gigawatts electric. Unit of power = 109 watts.

Half-life: In reference to a radioactive substance, the time taken for the number of radioactive atoms to decrease to half the initial number.

HIFRENSA: Compañía Hispano-Francesa de Energía Nuclear, S.A., the company owning Vandellós NPP.

High Level Waste (HLW): Waste having a high specific activity in short-lived emitters, containing long-lived alpha-emitting radionuclides in appreciable concentrations and producing large quantities of heat.

HLW: High Level Waste.

Hot: In the nuclear world this term is normally used to identify or define areas and enclosures in which work is performed with highly radioactive materials. In general it is associated with high radiation levels.

Hot cell: Installation for the handling, processing and/or research of irradiated materials, providing radiological shielding and remote manipulation and fitted with observation windows.

IAEA: International Atomic Energy Agency, an inter-governmental agency of the United Nations.

ICRP: International Commission for Radiation Protection. An independent, non-governmental body of experts that periodically establishes recommendations or fundamental principles regarding safety in working with radiations.

ILW: See intermediate level waste.

Intermediate level waste (ILW): For the purposes of this GRWP, waste having intermediate levels of activity and that, in view of its characteristics, cannot be disposed of at El Cabril, for which reason it is included in HLW management.

Intermediate storage of spent fuel: Storage in which isolation, radiological surveillance, environmental protection and human control are established, including subsequent measures for treatment, transport and disposal (or reprocessing where appropriate). This may be accomplished under dry conditions (casks with gas, etc.), under wet conditions (under water in pools), at the reactor (inside the perimeter of a nuclear power plant site) or away from the reactor (centralised).

Irradiated fuel: Fuel used for electricity generation at nuclear power plants and that has ceased to provide the desired energy yield, as a result of which it is not destined to be reintroduced into the reactor.

ISD: Ion smoke detector.

Isotopes: Atomic species having the same number of protons (atomic number) as the original atom but a different number of neutrons (different mass number). They are, therefore, chemically identical but have different nuclear characteristics.

ITS: Individualised Temporary Storage facility for nuclear power plant spent fuel and high level waste.

JEN: Former Spanish Nuclear Energy Board (Junta de Energía Nuclear). Now CIEMAT.

K€XX: Thousands of constant € corresponding to year XX.

Level 1: This defines the period immediately following the definitive shutdown of a nuclear power plant and covers the process of leaving the plant in safe conditions and removing the spent fuel, the operating wastes and the auxiliary buildings that will not subsequently be needed.

Level 2: The objective of this stage is to dismantle the buildings and plant outside the biological shield of a nuclear power plant. The resulting radioactive wastes are stored off site and the reactor is sealed until such time as Level 3 dismantling is initiated.

Level 3: This includes the removal of the reactor and its biological shield from a nuclear power plant and the final rehabilitation of the site, leaving it in safe conditions for future use.

Low and Intermediate Level Waste (LILW): Waste having a low specific activity, beta/gamma-emitting radionuclides with half-lives lower than 30 years and a limited content of long-lived alpha emitters (half-lives of several thousand years).

LILW: Low and Intermediate Level Waste.

LWR: "Light Water Reactor".

m^3: cubic meters. Unit of volume = 1,000 litres.

M€XX: Millions of constant € corresponding to year XX.

MIMA: Ministry of the Environment.

MITYC: Ministry of Industry, Tourism and Commerce.

MWe: Megawatts electric. Unit of power = 106 watts.

NEA: OECD Nuclear Energy Agency.

NF's: Nuclear facilities.

NFC: Nuclear Fuel Cycle.

NPP: Nuclear Power Plant.

Nuclear fuel cycle: Processes relating to the production of nuclear energy, the first part or front end including the acquisition and use of the nuclear materials used in the operation of nuclear reactors and the second part, or back end, including the storage, reprocessing and disposal of such materials.

NUMO: The company responsible for the management of spent fuel and high level waste in Japan.

NWMO: Agency responsible for the strategic decisions regarding the spent fuel and high level waste management programme in Canada.

OECD: Organisation for Economic Cooperation and Development.

Open fuel cycle: Term used in relation to the nuclear fuel cycle when the spent fuel is considered to be a high level waste and is destined for disposal.

PA: Performance Assessment.

PIMIC: Integral Plan for Improvements to the CIEMAT Installations.

PLABEN: Spanish Basic Nuclear Emergency Plan (national in nature and scope).

POSIVA: Agency responsible for the management of spent fuel and high level waste in Finland.

Pu: Plutonium.

PWR: Pressurized Water Reactor.

R&D: Research and Development.

Radioactive isotopes: Unstable isotopes whose different nuclear structure gives rise to radioactive emissions. Not all the isotopes of an element are radioactive.

Radioactive Waste: Any waste material or product for which no further use is foreseen and that contains, or is contaminated with, radionuclides in concentrations or levels of activity higher than those established by the Ministry of Industry, Tourism and Commerce, following a report from the Nuclear Safety Council.

Radioactive Waste Management: Set of technical and administrative activities required for the handling, treatment, conditioning, transport, storage and disposal of radioactive waste, the ultimate objective being to protect persons and the environment against the radiations emitted by the radionuclides contained in the waste and minimise the burdens of such protection on future generations.

RADWASS: Radioactive Waste Safety Standards. Standards programme via which the IAEA contributes to the coherent and comprehensive establishment and promotion of the basic safety philosophy for the management of radioactive waste and to the steps required to ensure compliance therewith.

R.D: Royal Decree.

Reracking: Operation consisting of increasing the capacity of reactor storage pools by reducing the distance between fuel assemblies through the installation of new racks made of materials having a higher neutron absorption capacity than the original units (densification).

Repository: Facility or site for the storage or disposal of radioactive waste.

Reprocessing: This refers to the re-elaboration of irradiated fuel or the recovery from it of fissionable and fertile material, through the chemical separation of the fission products and other radionuclides (e.g., activation products, actinides).

RF's: Radioactive facilities.

RP: Radiation Protection.

RW: Radioactive Waste.

SEC: Saelices el Chico (Salamanca). Nuclear fuel cycle front end facilities (uranium mining and milling) in the decommissioning phase.

SBE: State Business Entity

Storage: The last phase of management, consisting of placing the radioactive waste in a facility providing suitable environmental, thermal, chemical and physical protection, including provisions for surveillance. Depending on the time period in question, this may be short or long term.

SF: Spent fuel.

SKB: "Swedish Nuclear Fuel and Waste Management Co., the Swedish company in charge of nuclear fuel and waste management.

SOC: State-owned corporation.

Specific Activity: The specific activity of a radioactive material is the number of nuclear disintegrations that it experiences per unit of time and unit of mass. It is expressed in Curies/gr. or Becquerels/gr.

Spent fuel (SF): Fuel used for electricity generation at nuclear power plants and that has ceased to provide the desired energy yield, as a result of which it is not destined to be reintroduced into the reactor.

SSP: Site Selection Plan designed to identify sites capable of housing a Deep Geological Disposal (DGD) facility.

ST: Separation and Transmutation.

Surface disposal: Disposal in an engineered facility on the Earth's surface.

Sv: Sievert". Unit used to measure "dose" or the effect of radiations on matter, equivalent to depositing 1 Joule for each kilogram of mass of the organism. The Sievert/h or corresponding sub-multiples are used to measure "dose rate".

Tailings: Waste materials from uranium mining and milling that require special management since, although the specific radioactivity is very low and natural in origin, the volumes treated are very large.

Tc: Technological centre.

tU: Tons of Uranium.

U: Uranium.

UK: United Kingdom.

Underground disposal: Disposal in an engineered facility below the Earth's surface.

UNESA: Unidad Eléctrica S.A., the association of the Spanish electricity industry.

UNSECAR: United Nations Scientific Committee on the Effects of Atomic Radiation.

USA: United States of America.

Vault: Chambers or vaults allow for the storage of one or several fuel assemblies in metal tubes that are normally arranged vertically in semi-buried concrete structures cooled by natural convection.

Vitrified: Final product resulting from the immobilisation in glass of the high level liquid waste arising from the reprocessing of spent fuel, following the separation of U and Pu.

VLLW: Very Low Level Waste.

Very Low Level Waste (VLLW): Due to its characteristics and low management requirements, this is considered in this GRWP s as constituting a sub-category of LILW.

Waste package: The waste form and any container or containers prepared for its handling, transport, storage and disposal. The assembly consisting of conditioned waste plus its corresponding packaging.

MINISTERIO
DE INDUSTRIA, TURISMO
Y COMERCIO