ESPAÑA

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

First Spanish National Report

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May 2003

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Section A

Introduction

A.1. Presentation of the report

The present document constitutes the First National Report of Spain, drawn up in order to meet the requirements of Article 32 of the Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management, adopted in Vienna on 5th September 1997. This Convention, which was signed by Spain on 30th June 1998 and ratified on 11th May 1999, entered into force on 18th June 2001.

This Report will be examined during the review meeting among the Contracting Parties, foreseen in Article 30 of the Convention, which will begin on 3rd November 2003, as agreed during the preparatory meeting held in accordance with article 29 on 10th-12th December 2001.

The Ministry of Economy (MINECO), the Nuclear Safety Council (CSN), the national radioactive waste management agency (Empresa Nacional de Residuos Radiactivos - ENRESA) and the Spanish Electricity Industry Association (UNESA) have participated in drawing up this report.

Unless otherwise expressly specified, the information and data contained in this report are those available as of 31st December 2002.

The Report has been drawn up taking into account the IAEA document INFCIRC/604 "Guidelines regarding the form and structure of national reports", adopted by the Contracting Parties in accordance with Article 29 of the Convention. The order and grouping of the articles by sections adheres strictly to the requirements of the said document, and attempts have been made to ensure that the contents comply with the aforementioned directives to the extent possible.

At the end of the section corresponding to each article there is an assessment of compliance by Spain of the requirements established therein, and Section K identifies those aspects that are thought to require improvement, along with the measures that are to be adopted in this respect.

Except where expressly indicated to the contrary, the terminology of the Convention has been used throughout the present Report.

Specifically, it should be pointed out, as regards what the Convention includes under the generic name of "nuclear facility", that according to the Spanish legislation, and throughout this Report, this corresponds not only to what are known under the said legislation as "nuclear facilities" - which includes nuclear power plants, nuclear reactors, nuclear fuel manufacturing facilities, installations for the treatment of nuclear sub-

stances and installations for the storage of such substances – but also those others that the Spanish legislation calls "radioactive facilities", when these are used for the production, handling or storage of radioactive material.

A.2. Spent fuel and radioactive waste management in Spain

The spent fuel to be managed by Spain arises during the operation of the nine nuclear reactors currently existing in the country, located at seven sites constituting nuclear power plants, the general data for which are indicated in the following table.

Unit	Site (Province)	Electrical output (MW)	Type	Year entry service
José Cabrera	Almonacid de Zorita (Guadalajara)	160	PWR	1968
Sta. Mª. de Garoña	Valle de Tobalina (Burgos)	466	BWR	1971
Almaraz I	Almaraz (Cáceres)	973	PWR	1981
Almaraz II		983	PWR	1983
Ascó I	Ascó (Tarragona)	1,028	PWR	1983
Ascó II		1,027	PWR	1985
Cofrentes	Cofrentes (Valencia)	1,025	BWR	1984
Vandellós II	Vandellós i L´Hospitalet del Infant (Tarragona)	1,087	PWR	1987
Trillo	Trillo (Guadalajara)	1,066	PWR	1988
Total		7,815		

At present, the spent fuel from these nuclear power plants is being stored on-site in the plants' storage pools, except in the case of the Trillo plant, which also has a dry storage facility constructed on the plant site.

At the moment there is no nuclear power plant construction project in Spain.

As regards dismantling activities, this type of activity is currently being performed at the Vandellós I nuclear power plant. This plant operated from 1972 to 1989, its dismantling being authorised in 1998. The spent fuel from this plant was originally sent to France for reprocessing. The Argos (1963-1977) and Arbi (1962-1974) research reactors, located in Barcelona and Bilbao, respectively, are also in the dismantling phase.

Likewise, and as regards radioactive wastes, Spain has fundamentally to manage those generated by the seven nuclear power plants, those arising from the dismantling of

Vandellós I nuclear power plant, those from reprocessing of this plant's fuel, which will be returned to Spain in the future, and those generated at the Juzbado nuclear fuel manufacturing facility (Salamanca), as well as those from the 1,308 installations authorised in Spain, as of 31st December 2001, to use radioactive material.

The main radioactive waste management installation in Spain is the low and intermediate level radioactive waste disposal facility of El Cabril, located in the province of Córdoba. There are also radioactive waste conditioning facilities at each nuclear power plant, the Juzbado fuel manufacturing facility and the Centre for Energy-related, Environmental and Technological Research (Ciemat).

A.3. Safety of spent fuel and radioactive waste management in Spain

Generally speaking, it may be said that the management of spent fuel and radioactive wastes includes a series of different stages, all interrelated, which range from generation to definitive disposal. The siting, design, construction, operation, closure and post-closure stage of the facilities that cover the different phases of management are required to meet objectives relating to the protection of society and the environment against radiological risks. The applicable safety requirements must, on the one hand, be proportional to the magnitude of the risk and, on the other, take into account the period of time over which this risk lasts. The time issue is particularly relevant for definitive disposal facilities, since the radiological risk exists not only during the operating phase of the installation but also following its closure, depending on the typology of the wastes disposed of.

This consideration marks the difference between safety as applicable to waste and spent fuel management overall and that applicable to other nuclear fuel cycle facilities, and must necessarily be taken into account within the applicable legal framework and corresponding regulatory enactment process, especially in the assignment of responsibilities, the financing system and safety standards.

As is established in this First National Report, Spain currently possesses an administrative structure, a regulatory framework, a system for the assignment of responsibilities and a financing system that allows us to state that spent fuel and radioactive waste management is carried out under safe conditions. Although to date no specific regulations have been developed in relation to aspects fundamentally affecting the long term, they have been defined by the regulatory authorities in the process of licensing those facilities for which they have been required.

Although, as is pointed out in Section K, a series of initiatives has now been implemented with a view to completing the regulatory framework, particularly as regards the aspects to be taken into account in the long-term management of spent fuel and radioactive wastes, it is generally considered that the Spanish system as it currently exists meets the requirements of the Convention.

Section B

Policies and practices

This section covers the obligations included in Article 32, paragraph 1 of the Convention. The national report will deal with spent fuel and radioactive waste management policies and practices and with the criteria used to define radioactive wastes and classify them by categories.

In meeting this obligation, and in view of the fact that this is the first report, there is not only an overall description of the management policy and practices for both spent fuel and radioactive wastes, including their classification, but also a description of the organisational and financing system set up in Spain.

B.1. Organisational and financing aspects

Spain possesses a significant infrastructure for the management of spent nuclear fuel and radioactive wastes, from the administrative, technical and economic and financial points of view. From the administrative standpoint there is an organisation, based on a relatively far-reaching legislative framework developed in keeping with the evolution of international regulatory requirements, that contemplates and includes the main responsibilities of the different parties participating in the process (Figure 1: Institutional Framework).

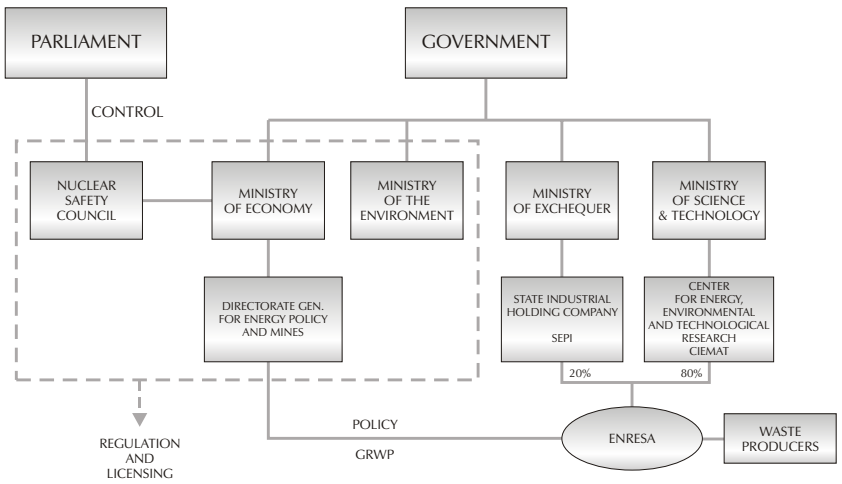


Figure 1. Institutional Framework

- ✓ The Ministry of Economy (MINECO) carries out the main role in the control of nuclear activities, and is the body responsible for the issuing of the corresponding permits and licences. The Government is also responsible for defining policy in relation to radioactive waste and spent nuclear fuel management. A more detailed description of its functions and organisation may be found in Section E, point 20.1.

- ✓ The Nuclear Safety Council (CSN) is solely responsible for nuclear safety and radiation protection. The license awarded by the MINECO is subject to a mandatory and binding CSN report. For more information on the functions and organisation of the CSN, refer to Section E, point 20.1.

- ✓ The Ministry of the Environment (MIMA) participates in the licensing process by drawing up the Environmental Impact Statement, with CSN participation in radiological aspects, in accordance with the standards in force (Section E, point 19.1.2.)

- ✓ The Empresa Nacional de Residuos Radiactivos (ENRESA) is responsible for spent fuel and radioactive waste management. This is a state company, set up by Royal Decree in 1984. Its shareholders are Ciemat, a national research centre that reports to the Ministry of Science and Technology, and the industrial holding company Sociedad Española de Participaciones Industriales (SEPI), which reports to the Ministry of the Exchequer. ENRESA's responsibilities are described in Section E, point 19.5.

The main waste producers in Spain are the 7 nuclear power plants (NPP's), with their nine reactors, the Juzbado Fuel Manufacturing Facility in Salamanca, (owned by ENUSA, a public company in charge of uranium mining activities and the manufacturing of fuel assemblies), Ciemat and the 1,308 radioactive facilities (RF's) authorised as of 31st December 2001.

From the technical and economic point of view, the strategies and actions to be undertaken in the different areas of radioactive waste management activities are included in the General Radioactive Waste Plans (GRWP).

Companies owning electricity-generating reactors, and in general the licensees of nuclear and radioactive facilities working with radioactive substances, are required, in accordance with Royal Decree 1899/1984, of 1st August, to have special facilities for the storage, transport and handling of radioactive wastes, or to establish by way of contracts or any other lawfully valid instrument, the use of special installations belonging to duly authorised companies. This R.D. authorises ENRESA to carry out these activities and, in its article 5, establishes that the contracts entered into by this company with the nuclear and radioactive facilities shall be performed on the basis of the following principles:

a) the term of the contract shall extend to the end of the lifetime of the facilities, including their dismantling, and

b) the payment for the services rendered shall be in accordance with one of three possible methods: prices, either as a percentage of the value of production of uranium concentrates and fuel assemblies or as a percentage on electricity sales, or billing to radioactive waste producers for generation in the use of radioisotopes in industry, medicine, agriculture and research.

From the economic-financial point of view there is, therefore, a system guaranteeing the financing of the costs of radioactive waste management, the basic principle of which consists of generating funds beforehand, throughout the operating lifetime of the nuclear power plants, collected by applying a percentage fee on total electricity billing. For other waste producers (ENUSA, Ciemat and the RF's) the financing system is based on payment for the services rendered, by way of established tariffs. The prices are established in accordance with criteria set out in a Type Contract approved by the former Ministry of Industry and Energy. Point 22.2 of Section F of this report provides greater detail on the financing system.

Consequently, there is a consolidated system that has allowed Spain to undertake spent fuel and radioactive waste management through deployment of the necessary resources.

B.2. General radioactive waste plan

The Royal Decree by which ENRESA was created requires the company to draw up an annual Report on its activities, for approval by the Government through the Directorate General of Energy Policy and Mines of the MINECO. This report includes a description of activities during the previous year and a revised version of the GRWP. This Plan is a basic document that describes the strategies and main actions in the different areas of responsibility. It is a document that is proposed annually by ENRESA and submitted by the Ministry of Economy to the Government for approval, where appropriate, with subsequent notification to Parliament.

The GRWP currently in force is the 5th, approved in July 1999. The Plan contains figures on current and foreseen spent fuel and radioactive waste generation, technical approaches and economic and financial aspects, and constitutes the framework of reference for national strategies regarding the management of spent fuel and radioactive wastes.

B.3. Classification of radioactive wastes

The latest revision of the definition of radioactive waste appears in the Electricity Industry Act, Law 54/1997, of 27th November, and is defined as "any waste material or product for which no further use is foreseen and containing or contaminated by radionuclides in concentrations or levels of activity in excess of those established by the Ministry of Industry and Energy (currently the Ministry of Economy), following a report by the Nuclear Safety Council."

In accordance with the IAEA Safety Series No 111-G-1.1, "Classification of radioactive wastes. Safety Guide. Vienna, 1994" and the Recommendation of the European Commission of 15th September 1999 on a system for the classification of solid radioactive wastes (1999/669/EC, EURATOM), in practice the classification of radioactive wastes in Spain is based on two main categories, depending on the definitive disposal option foreseen or applied. These categories are as follows:

✓ Low and Intermediate Level Wastes (LILW)

This category includes all wastes open to disposal at the El Cabril facility and that consequently meet the acceptance requirements approved by the Regulatory Authorities, the CSN and MINECO. In accordance with the current operating permit, LILW are wastes whose activity is due mainly to the presence of beta or gamma-emitting radionuclides with a short or medium half life (less than 30 years) and whose content of long-lived radionuclides is very low and limited.

✓ High Level Wastes (HLW)

This includes all wastes that are not open to disposal at the aforementioned El Cabril facility and for which the definitive disposal method foreseen is deep geological disposal.

Table 1 shows the simplified classification of radioactive wastes in Spain, with consideration given to the initial specific level of activity and half life of the most widely present radionuclides. Also indicated is the current situation of their respective management paths in Spain.

It should be pointed out that, in view of their highly specific characteristics and conditioning methods, uranium mining and milling tailings are treated separately. Annex I of Section L of this report describes the situation of uranium mining and milling activities in Spain.

B.4. Generation of spent fuel and radioactive wastes

The 5th GRWP reflects the situation of the disposal facilities existing in Spain, differentiating between the quantities of low and intermediate level wastes (LILW) from nuclear power plants, the Juzbado fuel assembly manufacturing facility and the RF's and the spent fuel generated by the nuclear power plants.

As of 31st December 2001, the LILW stored in Spain amounted to some 29,000 m^3, of which 22,000 are already disposed of at the El Cabril facility. As regards spent fuel, 2,735 tU are being stored in the reactor pools.

For the purposes of economic calculation and planning, the 5th GRWP is based on the following hypotheses: no consideration of new reactors, a 40-year service lifetime for the NPP's, an open cycle configuration and the beginning of complete dismantling work on the NPP's currently in operation as from 3 years after their definitive shutdown.

Table 1

Radioactive period Initial activity	Short and medium half life Main elements <30 y	Long-lived Main elements >30 y
Very Low (LILW)	Surface disposal under study	In situ stabilisation at mining sites.
Low and Intermediate (LILW)	Existing surface disposal facility: El Cabril.	Under study according to 5th GRWP
High (HLW)	Under study according to 5th GRWP	

The total estimated volume of conditioned LILW to be managed in Spain amounts to some 190,000 m^3 and the total equivalent volume of spent fuel generated, based on the type of cask assumed for definitive disposal, is estimated at some 10,000 m^3 (6,750 tU plus some 80 m^3 of vitrified wastes from Vandellós I). To this last quantity should be conservatively added the technological wastes arising from the dismantling of nuclear power plants and others that, in view of their characteristics, could not be disposed of along with the LILW, such as the wastes from the reprocessing of spent fuel from Vandellós I NPP, certain sources, etc. Consideration should also be given to the minor amounts of fissionable materials recovered during the reprocessing of fuel from the Sta. María de Garoña plant, which was sent to Great Britain prior to 1983. For the purposes of calculation, the total estimated volume of these other wastes amounts to some 5,000 m^3.

B.5. Spent fuel management policies

In accordance with the National Energy Plan (PEN) approved by the Government in 1983, the public company responsible for radioactive waste management would initially consider the irradiated fuel from light water nuclear reactors a waste and would not undertake its reprocessing.

This statement is the only reference to the treatment of spent fuel as a waste form, although the underlying reason was to establish an open cycle policy (without reprocessing) for the nuclear fuel cycle. The basic hypotheses on which the first GRWP, approved in 1987, was drawn up were based on the aforementioned PEN 1983-1992: "The spent fuel from nuclear power plants shall be considered high level waste an its reprocessing will not be addressed, with the exception of that generated by the Vandellós I plant, which will be sent to France for such treatment".

The 5th GRWP, approved in July 1999, however makes a clear distinction between spent fuel (SF) and HLW, establishing that as regards spent fuel, reference should be made to the possibilities for its being managed directly as such (open cycle) or to its reprocessing to recover fissionable materials and reuse them as new fuel (closed cycle). Reprocessing abroad is an option that is still considered to be open, although the only spent fuel reprocessed to date has been that generated by the Vandellós I nuclear power plant, sent to France, and certain amounts sent to Great Britain by the José Cabrera and Sta. Mª de Garoña plants prior to 1983.

For the purposes of economic calculation and planning, the 5th GRWP is based on the open cycle scenario.

As regards the direct management of spent fuel, a distinction should be made also between two aspects: temporary storage and definitive disposal.

The objective of temporary storage is to provide sufficient capacity to house all the spent fuel generated by the Spanish nuclear power plants until such time as a definitive solution is available. The strategy is based on a stepwise approach made up of the following phases:

- ✓ Maximum advantage taken of the space existing in the nuclear power plant pools, by re-racking to the extent to which it is technically and economically feasible.

- ✓ Complementing the storage capacity of the pools, as specifically necessary and depending on each individual case, with dry storage technologies, until such time as a centralised temporary storage facility is available.
- ✓ Construction of a centralised temporary storage facility at which to accumulate all the spent fuel and store the long-lived radioactive wastes not suitable for dispatch to the existing LILW disposal facility, along with the reprocessing wastes returned from abroad.

As regards the definitive management of spent fuel, HLW and long-lived wastes, the different GRWP's have contemplated disposal in deep geological formations as being the solution for this type of materials. Having said this, the 5th GRWP currently in force postpones any decision regarding a definitive solution to the year 2010. Meanwhile, work will continue along two paths: disposal in deep geological formations (DGD) and the use of new technologies such as separation and transmutation (S-T), which are attracting increasing attention in most countries, driving a process of tracking and suitable participation in the most important international programmes. In this way, and in view of the results obtained, the Government should be provided by that date with the information required to take decisions and with the basic capacity to implement them.

As a result, the decision has now been taken to interrupt activities relating to selection of sites for a future deep geological disposal facility in Spain, to maintain the technological capabilities developed to date and to adapt R&D activities to the new approaches.

It should be pointed out that any action taken in this field will require far-reaching communication campaigns, aimed at providing the public with all the necessary information. This is especially important in view of the high level of social sensitivity of all issues relating to radioactive wastes.

B.6. Practices relating to spent fuel

The 5th GRWP makes a distinction between the technological solutions to be applied in the temporary and definitive timeframes. In certain aspects this implies a significant change of approach with respect to what was indicated in the previous Plan, due to the fact that it is now considered necessary that there be a period of analysis prior to the detailed establishment of the strategies and actions required in this field.

The spent fuel generated by the nuclear power plants is currently stored on site at their pools. These pools are either located in a building alongside containment or in the reactor building itself.

Actions have been taken in Spain to increase temporary spent fuel storage capacity, such as re-racking of the NPP pools. These actions implied changing the previous storage racks for other more compact units.

Despite this increased storage capacity, the pools of certain plants will become saturated before the end of their foreseen operating lifetime (see Table 2).

This problem first arose at the Trillo nuclear power plant, for which reason a facility has been constructed for storage of that plant's spent fuel in metallic casks for dry transport and storage.

Four further plants will progressively have to face the same problem as from the year 2013, this added to the need to remove the fuel from the storage pool of the José Cabrera plant for dismantling of the facility. Another factor to be taken into account is the return from France of the high level wastes from reprocessing of the fuel from the Vandellós I plant, as well as return, at a time still to be determined, of the minor quantities of fissionable materials recovered during the reprocessing of spent fuel from the Santa María de Garoña plant, sent to Great Britain prior to 1983. Consideration will also have to be given to other types of wastes and certain spent sources that, in view of their characteristics, cannot be disposed of at the El Cabril facility, and which will require a temporary storage facility for whatever period might be necessary. In view of the above, the strategy is based on the availability of a centralised temporary storage facility by the year 2010, although this might be complemented with individual facilities in the case of certain of the nuclear power plants, or with a centralised facility serving various plants.

Taking into account the postponement to 2010 of decisions regarding the definitive management of spent fuel and HLW, the Plan currently in force is adapted to the new timeframe and proposes the following courses of action:

- ✓ For the time being no further site selection activities will be carried out. The only work to be performed in this area will relate to the maintenance and summarising of the geological information available for use in safety and performance assessments and its preparation for the moment at which the site selection process is re-initiated. The previous plans identified a sufficient number of areas in the national territory as being valid, from the geological point of view, to house a deep geological disposal facility.

Table 2
Spent Fuel Pool Storage Capacities prior to and following Re-racking (RR)

Nuclear Plant	Entry into operation	End of design lifetime (40 years)	Total capacity (No of fuel assemblies) – CCR[a]		Year of saturation	
			Prior to RR	After RR	Prior to RR	After RR
José Cabrera	1968	2008	241	479	1999	—
Sta. Mª Garoña	1970	2010	1327	2209	1998	2015
Almaraz I	1980	2020	455	1647	1992	2021
Almaraz II	1983	2023	455	1647	1993	2022
Ascó I	1983	2023	431	1264	1993	2013
Ascó II	1985	2025	431	1264	1995	2014
Cofrentes	1984	2024	2414	3912	2000	2014
Vandellós II	1988	2028	415	1437	1997	2021
Trillo	1988	2028	415	628	1996	2003

[a] *Net – without counting the Complete Core Reserve (CCR) capacity – in the fuel positions*

- ✓ The previous Plans included basic designs that were not specific to any particular site for a deep geological disposal facility in granite, salt and clay formations, along with basic tools and methodologies for assessment of the performance and safety of the installations. The only work foreseen as regards design is related to consideration of the concept of waste retrievability.
- ✓ Safety assessments will continue to play an important role in the HLW programme, integrating geological information, repository design and R&D programme data, and will be used to illustrate the evolution of the repository, guide R&D activities and optimise the design of the facilities.
- ✓ The R&D Plans have served to partially develop basic technologies for site characterisation and modelling of the relevant processes corresponding to the engineered barriers to be used for safety assessment of the installations. The new R&D Plan will include research in the area of S-T, in addition to continuous efforts in relation to geological disposal. International collaboration will be promoted in relation to underground laboratories and S–T.

B.7. Radioactive waste management policies

Given that HLW and long-lived wastes have been dealt with in the previous sections on SF, this section will refer only to the management policy for low and intermediate level wastes (LILW), which are basically those that, as defined in the operating permit for the facility, meet the acceptance criteria for disposal at the El Cabril facility. The policy established for other wastes that, in view of their characteristics regarding activity levels and half life, cannot be disposed at El Cabril have been described in section B.5.

Mention should be made of the specific management system that is to be implemented for certain waste streams arising from the operation of Vandellós I NPP and that cannot currently be disposed of at El Cabril, such as graphites, stirrups, etc. from the fuel assembly sleeves, which to date have been stored in silos on site. The management policy established consists of temporarily storing these wastes inside the reactor building, with consideration given to a latency period of 25 years before work begins on the last stage of dismantling.

The model adopted for the management of low and intermediate level wastes (LILW) and contemplated in the first GRWP in 1987 is based on the development of an integrated system, such that the basic standards are followed by the generation of waste acceptance criteria, characterisation of the wastes and the design and operation of facilities for their definitive disposal. The strategy is based on the selection of a model disposal facility for wastes meeting the acceptance criteria.

The El Cabril facility is the fundamental basis of the management policy for this type of wastes in Spain. Around this facility there is an integrated management system that includes waste removal, transport, treatment and conditioning, along with precise information on waste inventories, radiological characterisation and verification of quality, all compatible with the type of definitive disposal used. As regards waste characterisation and acceptance for subsequent disposal at El Cabril, the policy established is based on compliance with the Technical Specifications and with the acceptance criteria referenced in the operating permit for the facility.

The El Cabril facility has been designed and constructed to fulfil two fundamental objectives: to ensure the immediate and deferred protection of persons and the environment, using a multiple barrier system, and to allow for free use of the site following a period of at most 300 years. Another basic objective adopted in the El Cabril Project was incorporation of the concept of possible waste retrievability if circumstances were to make this advisable.

Since the end of 1992, LILW have been disposed of at the El Cabril installations, in accordance with the limits and conditions established in the facility's successive operating permits.

The set of actions to be carried out in each stage, depending on the origin and characteristics of the wastes, is what configures LILW management in Spain. The management policy for this type of wastes is based on a clear definition of responsibilities between the waste producers and ENRESA, a distinction being made as regards the former between the nuclear power plants and the Juzbado fuel assembly manufacturing facility, on the one hand, and Ciemat, the RF's and other minor producers on the other.

The current LILW management policy focuses on the rationalisation and possible improvement of the different processes involved and on their adaptation to future situations. Within these activities, those aimed at optimising the available capacities should be underlined, among them certain programmes that have already got under way, such as waste volume reduction at the nuclear power plants, thanks to joint efforts by the operators and ENRESA, from which highly satisfactory results have already been obtained, and other measures that are under study, such as the specific management of very low level wastes, including analysis of the foreseeable generation of this sub-category of wastes. An aspect of vital importance maintained in this respect is the clearance of radioactive materials, among them those arising from dismantling.

In this respect, the clearance system, which is explained in greater detail in point 12.2.3. of Section H, consists of an administrative authorisation preceded by a process of decision-making on the subsequent management of these waste materials, without radiological restrictions.

B.8. Radioactive waste management practices

As in the previous section, the practices applied to management of those wastes that cannot be disposed of at the El Cabril facility are described in point B.6.

The management of low and intermediate level wastes is based on the El Cabril facility. This site, located in the province of Córdoba, was formerly a State-owned property at which uranium ore was exploited until the end of the 1950's. From the 1960's, LILW generated by the RF's were stored in a mine and in other temporary storage areas. This situation lasted until 1985, when, following the construction of three prefabricated concrete modules, the wastes stored in the old installations began to be moved and new shipments were received. When ENRESA was set up in 1984, the company undertook responsibility for LILW management and established as a priority the improvement and extension of the El Cabril installations. Performance of the so-called Cabril Project, the design of which was based on compliance with certain safety objectives and criteria to ensure the absence of any significant impact on persons or the environment over the necessary time period, culminated in October 1992 with awarding of the first provi-

sional operating permit, this marking the beginning of a new phase in the field of LILW management. Subsequently, following the awarding of another provisional operating permit in 1996, valid for five years, in October 2001 ENRESA obtained the operating permit for this Sierra Albarrana nuclear facility for the disposal of solid radioactive wastes, which will remain valid until such time as the available storage volume of the existing cells is completed.

The facility is made up of three clearly differentiated parts: the previously existing temporary storage modules, the definitive disposal area and the buildings area, consisting mainly of the conditioning building, the quality verification laboratory and auxiliary buildings, including a transient store. The facility consequently has the capacity to undertake treatment of wastes from RF's and certain wastes arising from the plants or events, the volume reduction of compactable wastes, the conditioning of wastes generated at the facility itself and the immobilisation of waste packages in concrete containers prior to disposal. For volume reduction, the facility is equipped with a drum compactor developing a force of 1,200 tons, and for conditioning with a mortar injection system for the immobilisation of waste packages or wastes compacted in concrete containers, along with a manufacturing plant for the latter.

Except in the case of the RF's, the preliminary treatment and conditioning of LILW is the responsibility of the producer, who is required to generate waste packages satisfying the acceptance criteria defined by ENRESA for subsequent conditioning and disposal at El Cabril, which are set out in the type contracts signed between the parties. For the RF's, waste treatment and conditioning is carried out at the El Cabril installations, since given the large number of producers and their different characteristics, there is no justification for each having its own such installations. These consist of technical resources for the classification, crushing, segregation and sacking of wastes, along with an incinerator for the treatment of biological and organic wastes, although other waste streams from the facility itself or from the NPP's (e.g., oils) are also treated.

The nuclear power plants are equipped with systems for the treatment of radioactive wastes. Once concentrated via purification operations, liquid wastes are desiccated in special plants to reduce their final volume or are solidified using cement, mainly in 220 litre drums. The conditioning procedure used for wastes arising from the treatment of gaseous wastes and filtration and adsorption elements is based on immobilisation in cement or on pre-compacting, as in the case of solid radioactive wastes. The only conglomerant element currently used is cement. The drums conditioned with cement or pre-compacted are provisionally stored at the NPP temporary storage facilities awaiting removal by ENRESA.

It is important to underline the joint activities of ENRESA and UNESA, the Spanish Electricity Industry Association, for reduction of the volume of radioactive wastes generated during NPP operation. Since this work began in 1995, a 50% reduction has been achieved with respect to production at that time. These activities have focused on waste minimisation through improvements in the processes of segregation, decontamination and clearance, the rearrangement of drains and optimisation of waste treatment and conditioning.

The radioactive wastes (technological wastes) generated at the Juzbado fuel manufacturing facility (Salamanca), which is the property of ENUSA, are pre-compacted, in the case of compactable wastes, or are directly stored in 220-litre drums. The drums generated are stored temporarily at the facility awaiting removal by ENRESA.

Within the nuclear facilities, mention should be made of the specific case of the Ciemat installations, since in accordance with the Resolutions of the Directorate General for Energy of 15th July 1980 and 3rd February 1993, the nuclear and radioactive installations at the former "Juan Vigón" Nuclear Energy Centre are considered to constitute a single nuclear facility. As established in the 1993 Resolution, this Ciemat centre is made up of 17 operating RF's plus a further 7 that are shut down, 5 nuclear and 2 radioactive facilities, in the dismantling phase. In accordance with the contract signed with ENRESA, Ciemat, as a waste producer, sends its wastes to the El Cabril facility, but is also authorised to condition solid radioactive wastes at one of its installations and to temporarily store radioactive material and these wastes, as well as providing support for ENRESA through its laboratory in LILW characterisation.

In accordance with the Resolution of 24th October 1996 of the Directorate General for Energy of the Ministry of Industry and Energy, the radioactive facility (RF-17) "Conditioning of Solid Radioactive Wastes" is made up of conditioning plants and auxiliary services, a waste package store and a store for machinery and waste package manufacturing, and the services to be undertaken are as follows: conditioning of LILW generated at Ciemat or managed by ENRESA, the reception and storage of sources of Ra-226 confiscated by order of the D.G. for Energy and the provisional location of sources or other radioactive materials in transport packages meeting the requirements of the National Regulation on the Road Transport of Dangerous Merchandise (TPC), and, as regards their location, these packages may be housed inside 200-litre drums. In accordance with this Resolution, prior to the end of 1999 Ciemat submitted a management plan for provisionally located sources and radioactive materials, which contemplates their removal from the installation.

In its relations with ENRESA, Ciemat, as a waste producer, has a contract for the removal of the wastes it produces, and as regards their management the acceptance methodology applied is the same as for the wastes from the NPP's.

In addition to these streams of radioactive waste generation, since 1998 there has been another in Spain to be taken into account in the LILW management strategy, the wastes from the dismantling of Vandellós I NPP. The Dismantling Plan prepared by ENRESA, the company responsible for the decommissioning and dismantling of nuclear and radioactive facilities in Spain, includes a materials management plan whose priority objective is to minimise the volume of conventional or radioactive wastes, identifying for the rest some use on or off site. This implies the need to implement a system guaranteeing a correct destination for the approximately 296,000 tons of materials to be generated during level 2 dismantling, including exhaustive control of all the materials from the site in order to segregate those that might be managed conventionally from those others that are to controlled and managed as radioactive wastes. For the materials arising from the active parts – areas having radiological implications - ENRESA has drawn up an action plan based on five mandatory controls applicable to both equipment and components and to the structures and walls of the buildings in which they were housed, candidates for clearance.

By the end of 2002, the dismantling of Vandellós I had generated some 1,500 tons of LILW, of which almost 1,150 have now been sent to El Cabril in various types of packages, the one most widely used being the metallic transport cask (MTC) with a capacity of 1,320 l, these being licensed for disposal in the El Cabril disposal cells following immobilisation in containers with concrete. Furthermore, the basement of the reactor building has been adapted for the storage, in specifically designed containers, of the

operating radioactive wastes that, in view of their level of activity, cannot be sent to the El Cabril facility (such as graphite, stirrups, etc.).

Transport is the responsibility of ENRESA, and is accomplished using either the company's own resources, as is the case for the removal of wastes generated at the RF's, or the services of specialist companies, in the case of conditioned wastes. Prior to their removal the LILW are temporarily stored in the installations authorised at the producer's site. The programmes for the removal of LILW and their transport to the El Cabril facility are drawn up on the basis of the foreseen levels of production and the capacity of the El Cabril installation.

Waste characterization is an important stage in management, since it allows the quality of the wastes to be verified and the activity of the packages to be determined, by way of the corresponding tests. In order to provide support for these acceptance and characterisation activities, as well as for the technical verification of the waste packages, the El Cabril facility has a verification laboratory arranged in two buildings (active and inactive laboratory).

Outside the contractual framework described above, there are a series of wastes, such as those from radioactive lightning rods, ion smoke detectors, certain sources, etc., that because of their characteristics require special management. Also, there are the wastes from contaminated scrap, unowned wastes, etc. The strategy adopted for the most significant of these, the radioactive lightning rods, was to send them to Great Britain for the recycling of the corresponding isotope. The massive removal and shipping of these lightning rods concluded at the end of 1996, although some 800 units continue to be removed annually.

Having a definitive management facility like El Cabril has proved to be important to address management of the LILW from radiological incidents occurring in the recycling of scrap. In 1998 a radioactive source of Cesium-137 was molten at a Spanish steelyard, contaminating the blast furnace and auxiliary plant. ENRESA took charge of the radioactive wastes generated, obtaining permission first to store these solid wastes at El Cabril and subsequently to implement the Action Plan, which foresees the construction of a building for the handling and crushing of sludges, inert wastes, soils and refractory wastes for their incorporation in the immobilising mortar, the rest of the wastes generated (plastics, metallic parts, etc.) being treated in accordance with the management process already established. The same procedure will be applied to the wastes arising as a result of another similar incident that occurred in 2001.

Section C

Scope of application

This section includes the requirements contemplated in Article 3 of the Convention, regarding the scope of application.

In the case of Spain, the scope of the Convention includes the following:

1. Spent fuel arising from the operation of commercial nuclear power plants and research and training reactors.
2. Radioactive wastes arising from the nuclear fuel cycle and wastes derived from the application of radioisotopes in industry, agriculture, research and medicine or arising as a result of past activities, incidents and accidents involving radioactive materials.
3. Releases from nuclear and radioactive installations.

In the past, certain amounts of spent fuel have been sent abroad for reprocessing, as a result of which different products to be returned to the country will be considered to be within the scope of application.

Radioactive materials containing natural radioisotopes and arising from practices within the nuclear fuel cycle are included in the scope of application for the purposes of this Convention (data on uranium mining and milling activities are dealt with in Annex I, Section L).

Radioactive materials containing natural radioisotopes and generated in practices outside the nuclear fuel cycle are not included in the scope of application for the purposes of this Convention.

Spain, which is party to the Treaty on Non-Proliferation of Nuclear Weapons, does not have any radioactive wastes or spent fuel from military or defence programmes.

Section D

Inventories and lists

This section includes the obligations contemplated in article 32 of the Convention. The national report will include information on spent fuel and radioactive waste management facilities and on the inventories of both spent fuel and radioactive wastes, with clearly defined categories of wastes.

D.1. Spent fuel management facilities

The only spent fuel management facilities existing in Spain are those used for the storage of such fuel in the nuclear power plant pools. In addition, at Trillo NPP a dry storage facility has been built to complement the existing capacity of its pool. Annex A, Section L includes a list of these facilities, their location, purpose and main characteristics. More information on the Spanish nuclear power plants is available in the first and second reports on the Nuclear Safety Convention, which may be consulted via the website of the Nuclear Safety Council: www.csn.es.

The new racks, designed to keep the assemblies under subcritical conditions, are made of borated stainless steel and the pools have been divided into two regions: one for fresh fuel or irradiated fuel without burnup limits, with a reserve capacity equal to one core load and space for the storage of other components, and the other for irradiated fuel, with consideration given to burnup limits. The pool water cooling and purification systems have been adapted to the increased thermal load that the re-racking process has implied.

The Trillo NPP dry spent fuel storage facility is capable of housing 80 especially designed casks for the fuel produced by this plant. The dual-purpose transport and temporary storage cask, known as the DPT, has been licensed in Spain and has a capacity for 21 fuel assemblies.

These storage installations are described in greater detail in point 5.1 of Section H.

D.2. Spent fuel inventory

Spent fuel is currently stored in the nuclear power plant pools and, in the case of Trillo NPP, in a dry storage facility constructed at the plant, which entered operation in 2002.

Annex D, Section L shows the inventory of irradiated fuel existing in Spain as of 31st December 2001.

D.3.
Radioactive waste management facilities

In Spain there are seven nuclear power plants with nine operating reactors, plus another plant currently in the dismantling phase. Also related to the front end of the nuclear fuel cycle is the Juzbado fuel assembly manufacturing facility and activities relating to uranium mining and milling. As regards research activities, mention should be made of the nuclear facility belonging to the Centre for Energy-related, Environmental and Technological Research (Ciemat), which encompasses both nuclear and radioactive installations. As regards the back end of the fuel cycle, there is the El Cabril facility for storage and disposal of low and intermediate level wastes (LILW). Furthermore, the 1,308 facilities authorised as of 31st December 2001 are potential producers of radioactive wastes on a small scale, these constituting what are known as the "minor producers".

Given the definition of "Radioactive Waste Management Facility" included in article 2 of the Convention, the "minor producers" are not included within the scope of this list of facilities, since their radioactive waste are collected and processed by ENRESA at the El Cabril installations. Consequently, the radioactive waste management facilities are as follows:

- ✓ NPP's (processing and temporary storage installations)
- ✓ Fuel manufacturing facility (processing and temporary storage installations)
- ✓ Ciemat (processing and temporary storage installations)
- ✓ El Cabril low and intermediate level waste storage and disposal facility

Vandellós I NPP has not been included as a radioactive waste management facility since it is a nuclear installation in the dismantling phase. Consequently, it is included in sub-section D.5., although it is planned that the radioactive wastes not currently open to disposal at the El Cabril facility will be left on site during the latency phase.

As has been explained in Section B.8 on radioactive waste management practices, the treatment facilities at the nuclear power plants usually consist of plants for the treatment of liquid wastes, through desiccation or immobilisation in cement, and of solid wastes by precompacting or immobilisation in cement. The El Cabril facility has an incinerator and a compactor, as well as a conditioning system for all the radioactive wastes entering or generated at the installations and destined for definitive disposal in the vaults.

Annex B, Section L contains a list of the radioactive waste management facilities, including their location, purpose and main characteristics.

Annex I, Section L also considers the uranium mining and milling facilities.

D.4.
Radioactive waste inventory

Annex E., Section L shows the inventory of radioactive wastes as of 31st December 2001.

D.5. Facilities in decommissioning phase

The only nuclear power plant in the decommissioning phase in Spain, as defined by section b) of article 2 of the Convention, is Vandellós I. This French technology plant was the first and only graphite-gas type facility built in Spain. It entered commercial operation in 1972 and was in operation until 19th October 1989, when a fire broke out in the main turbine-alternator. As a result of this accident, the power operation of the plant was temporarily suspended, by Ministerial Order of 27th November 1989. Subsequently, it was agreed to definitively suspend the operation of the facility, this being established in a Ministerial Order issued on 31st July 1990. A Resolution of the Directorate General for Energy of 27th November 1992 accepted the alternative proposed by ENRESA for the Decommissioning and Dismantling Plan (DDP). The dismantling project will allow the site to be partially released, leaving practically only the reactor pile, and following a waiting period of 25 years complete dismantling will be initiated, leading to the full release of the site. This Plan was submitted in May 1994, and in 1997 obtained a favourable report by the CSN and the Environmental Impact Statement, later receiving authorisation for project performance in January 1998.

In Spain there are also other nuclear research facilities in the dismantling phase, such the two "Argonaut" type experimental reactors, Argos (University College of Industrial Engineering, Polytechnic University of Catalonia (UPC), in Barcelona) and Arbi (Industrial Testing and Research Laboratories (Labein), in Bilbao), and a pool type reactor, JEN-1 (Ciemat, in Madrid).

The Argos (1963-1977) and Arbi (1962-1974) facilities are heterogeneous thermal reactors initially designed for intermittent operation at a thermal power of 10 kW. They were designed to operate safely and flexibly, at low power, at centres for research and for the training of qualified personnel, and used Uranium with a minimum degree of enrichment of 20%, in plate type assemblies with Aluminium cladding. Moderated by light water and graphite, they also used graphite as the reflector, were cooled by light water at ambient pressure and temperature and were controlled by Cadmium rods. The similarity in their design and operation mean that the safety and radiation protection conditions of their respective dismantling operations are also similar.

The activities of these facilities finalised due to their not being able to meet the new administrative requirements established by the former Regulation on Nuclear and Radioactive Installations (Decree 2869/1972, of 21st July). In 1987, both licensees began the arrangements required to undertake the decommissioning of the reactors, the first activity consisting of removing the fuel assemblies, which took place in 1992. The UPC obtained authorisation to undertake the dismantling of its reactor by a Ministerial Order issued on 20th April 1998, from the Ministry of Industry and Energy, while this was awarded to Labein on 14th May 2002. Given the characteristics of these reactors and their operating history, neither requires an Environmental Impact Statement, this being corroborated by the experimental measurements performed and on the basis of the provisions of Royal Decree Law 9/2000 on the Assessment of Environmental Impact.

The objective of both dismantling projects is to decommission the facilities and release the site from any radiological restriction, thereby leaving it available for any other use. The dismantling of the Argos reactor is under way, the operations not having yet been initiated in the case of the Arbi facility. In order to obtain the decommissioning statement, following the conclusion of operations, the licensees have to submit a final dismantling report, a final radiological report and a report on the exit of cleared materials.

The situation of the JEN-1 reactor (1958-1984) is different, since it is part of the set of installations existing at Ciemat, which is authorised as a single nuclear facility. In addition to the JEN-1 reactor (IN-01), Ciemat has a further three nuclear facilities: a liquid HLW-MTR waste store RAA-MTR (IN-07), metallurgical hot cells (IN-04) and a fuel assembly development plant for research reactors (IN-03); as ell as two radioactive facilities (RF's), a liquid waste conditioning plant (IR-16) and the M-1 research reactor fuel assembly reprocessing plant (IR-18), which are in the definitive shutdown situation.

The Juan Vigón centre began to operate in the 1950's as part of the former Nuclear Energy Board (Junta de Energía Nuclear - JEN) and, in accordance with the Resolution of the Directorate General for Energy of 15th July 1980, was considered single nuclear facility then made up of 14 nuclear and 38 radioactive installations. With the application of the so-called "Science Law" in 1986, this Centre was transformed into today's Ciemat, which is implementing a policy of shutdown, decontamination and modernisation of the installations. The first phase of this process concluded with the Resolution of 3rd February 1993, which specified that the nuclear facility comprises two groups: one made up of 17 operating RF's, and the other of 7 facilities, 5 nuclear and 2 radioactive, these being shut down and in the dismantling phase.

Since its creation, Ciemat has maintained an active programme for the continuous adaptation of its installations to its needs and objectives. The last, known as the Integrated Plan for the Improvement of the Ciemat Installations (PIMIC), was approved by Ciemat in January 2002, in order to address the dismantling of obsolete shut down installations, the modernisation of buildings and facilities, the rehabilitation of areas with residual contamination and the cleansing of infrastructures. The activities subject to regulatory control are: the decontamination and recovery of facilities and areas with residual contamination from previous practices, within the framework of the Rehabilitation Project, and the dismantling of shut down installations in the decommissioning phase, including the recovery of surrounding contaminated terrain, within the Dismantling Project.

This dismantling project requires an environmental impact statement, and also has to meet the licensing requirements of the RNRI in force.

A list of facilities in the decommissioning phase is included in Annex C, Section L.

Section E

Legislative and regulatory system

Article 18. Implementating measures

In Spain the management of radioactive wastes is regulated by the same legal and regulatory framework as other activities implying a risk of exposure to ionising radiations. As will be described in the following article, this legal and regulatory framework, which is applicable to spent fuel and radioactive waste management activities, introduces the basic principles of nuclear safety and radiation protection, establishes a system of authorisations for the operation of facilities, sets out the basic functions of the regulatory body in charge of the institutional control of such facilities, defines a clear distribution of responsibilities and establishes the enforcement measures required to ensure compliance with the pertinent legal standards and the conditions established in the corresponding authorisations.

Equally important when evaluating the correct management of spent fuel and radioactive wastes is determination of whether the economic resources necessary for the financing of this management task exist. In this respect, and from the economic-financial point of view, there is a system that guarantees the financing of the costs involved in managing radioactive wastes, the basic principal of which rests on the generation of funds before the event, during the operating lifetime of the nuclear power plants, collected via a percentage fee on total electricity billing. Likewise, the radioactive facilities (RF's) guarantee the system for financing of the removal and management of the radioactive wastes as from the moment at which they enter operation, through contracts with the national radioactive waste management agency (Empresa Nacional de Residuos Radiactivos, S.A. - ENRESA).

However, the very nature of safe radioactive waste management, especially in the long term, clearly differentiates this type of facilities from the rest, in which the associated risk is a predominant reality in the present. In view of this, and of the fact that their legal regulation is not set out in any specific and harmonious framework, there are certain aspects of regulation that are either not explicitly included or are difficult as regards legal and regulatory interpretation. Indeed, the regulatory framework has been completed as new regulatory challenges have emerged in the day-to-day practice of waste management.

Nevertheless, in ratifying the Convention Spain has, through its institutions expressed its determination to perfect the regulatory framework and standards in relation to spent fuel and radioactive waste management, and the pertinent actions have been initiated. At present, the Nuclear Safety Council (CSN), in collaboration with the Ministry of Economy (MINECO) and ENRESA, is working on a Standards Development Plan that, in-

spired by the general justification principles of the Convention itself, allows the problem of spent fuel and radioactive waste management to be addressed in a single and systematic manner.

Consideration is being given in this work to the national standards already applicable, to international experience and standards – in particular to analysis of the applicability of the IAEA programme of standards on safe waste management – and to all those elements that, although not reflected in the standards, have made it possible to successfully address aspects that have ensued with respect to the authorisation awarded to date for the management of radioactive wastes.

Assessment of compliance

The current legal framework for nuclear facilities is sufficient to guarantee the safety of spent fuel and radioactive waste management at the current facilities. The necessary measures are being taken to fulfil the obligations deriving from the Convention as regards aspects relating to the installations involved in the management of these materials, as indicated in Section K of this report.

Article 19.
Legislative and regulatory framework

Spain currently possesses a framework of standards that is sufficient for the safe management of spent fuel and radioactive wastes. The Nuclear Energy Act of 1964 establishes the basic structure of the regulatory system to be applied and the responsibilities of the main agents involved. It also defines basic safety principles and criteria and sets out the procedures for the awarding or cancellation of the administrative authorisations required, establishing mechanisms for inspection, assessment and penalties designed to verify that the licensees meet the requirements established in the legal and regulatory provisions. The Act also establishes that the existence of radioactive materials or wastes not under the responsibility of authorised licensees must immediately be reported to the competent authorities.

The Nuclear Energy Act established that the former Nuclear Energy Board (Junta de Energía Nuclear - JEN), created in 1951 and reporting to the Ministry of Industry, would be responsible for verifying correct compliance with the standards in force and with the conditions imposed by the authorisations issued in areas relating to nuclear safety and radiation protection.

As the use of nuclear energy developed, the need arose for different Companies or Organisations capable of responding to the new needs that were emerging. In this context the following were set up:

- ✓ ENUSA, in 1971, which undertook responsibility for all functions relating to the front end of the fuel cycle.
- ✓ CSN, in 1980, as the sole competent authority in relation to nuclear safety and radiation protection, and responsible for aspects relating to the control and inspection of nuclear facilities. (It should be remembered in this respect that the responsibility of the organisation extends to what the Spanish legislation described as "radioactive facilities"; these are not specifically referred to in the

Convention, which groups all the installations under the generic title of nuclear facilities).

- ✓ ENRESA, in 1984, for functions relating to the management, storage and disposal of radioactive wastes, including spent fuel.
- ✓ Ciemat, in 1986, which replaced the JEN.

As a result, the CSN, created by Law 15/1980 as the sole competent authority in relation to nuclear safety and radiation protection, undertakes functions relating to control, assessment and inspection, while the JEN, converted in 1986 into the Centre for Energy-related, Environmental and Technological Research (Ciemat), is responsible for activities relating to the promotion and development of nuclear energy.

The legislation in force also establishes the responsibilities of the operators of nuclear facilities or activities in relation to nuclear damage, setting out a system of indemnities that corresponds to the International Treaties and Conventions in this area.

Issued, among others, in enactment of the aforementioned fundamental system were the Regulation on Nuclear and Radioactive Installations (RNRI) of 1999, which annulled those set out in 1972, and the Regulation on Protection against Ionising Radiations (RPIR), of 2001, which annulled and derogated the regulations of 1982, 1987 and 1992 on the same subject.

19.1. Main legal and regulatory provisions on the management of spent fuel and radioactive wastes

19.1.1. Constitution and international Agreements

In the Constitution of 1978, Spanish law sets out the fundamental principles underlying peaceful co-existence and the political organisation and principles governing the legal system. In the same way, once ratified by Spain, international treaties become a part of the country's legal system, annulling whatever standards in force might be contrary to them and preventing such opposition by future standards. For this reason, and to the extent that Spain's legal system is inspired by them, we feel that both the Spanish Constitution and the international Agreements influencing nuclear law should be set out below.

Furthermore, by joining the so-called "European Atomic Energy Community (EURATOM)", through the Treaty of Adhesion signed on 12th June 1985, Spain was obliged to apply the standards dictated by the Institutions of this Organisation (basically the Council and the Commission). For this reason, this report will include references to both the Spanish standards and to standards emanating from EURATOM and applied or enacted by Spain within its internal legal framework.

Spanish Constitution of 1978

The Spanish Constitution, on which the country's legal system is based, contemplates these principles in Chapter Three of Section I under the heading "On the principles governing social and economic policy". From the point of view of this report there are three provisions requiring fundamental adherence by the State legislators and governors when establishing standards and managing interests: article 43, which recognises the

right of the citizens to health protection; article 45, which establishes the right of all to an environment adequate for personal development and the obligation to conserve it, and article 51, which requires that the official authorities guarantee the defence of consumers and users, protecting their security, health and legitimate economic interests by way of efficient procedures.

Convention on Physical Protection of Nuclear Material (Vienna/New York, 3rd March 1980).

The instrument of ratification was published in the Official State Gazette on 25th October 1991.

Convention on Early Notification of a Nuclear Accident and Assistance in the Case of a Nuclear Accident or Radiological Emergency (Vienna, 26th September 1986).

The instrument of ratification was published in the Official State Gazette on 31st October 1989.

Convention on Nuclear Safety (Vienna, 20th September 1994).

The instrument of ratification was published in the Official State Gazette on 30th September 1994.

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Vienna, 5th September 1997).

The instrument of ratification was published in the Official State Gazette on 23rd April 2001.

Treaty constituting the European Atomic Energy Community (EURATOM), subscribed on 25th March 1957 and ratified by Spain by way of Organic Act 10/1985, of 2nd August.

19.1.2. Legal standards

Nuclear Energy Act (Law 25/1964, of 29th April)

The Nuclear Energy Act, Law 25/1964, has, since its appearance, regulated the development and control of nuclear energy in Spain. The Act introduces and defines basic concepts, among which the following warrant special mention:

- ✓ *Identification of administrative authorities and organisations*. The Act points to the Ministry of Industry, currently the Ministry of Economy, as the most significant authority as regards administration of the Law, and to the JEN, now the CSN, as the competent technical organisation for control.
- ✓ *Definitions*. The Act establishes a series of definitions for the purposes of its own regulation, these including "Radioactive products or residues" and "Radioactive waste".
- ✓ *System of authorisations for nuclear and radioactive facilities and for the possession and use of radioactive materials.* The Act establishes the causes and circumstances that require a specific authorisation or permit to be obtained for the development, storage and use of radioactive materials, radiation

sources and nuclear fuels, as well as the verification and inspection system, responsibility for which falls to the CSN.

- ✓ *Measures for safety and protection against ionising radiations*. One of the objectives of the Act is to protect life, health and property against the risks deriving from the use of nuclear energy and the harmful effects of ionising radiations, and states that facilities and activities subject to authorisation should be carried out without undue risk to the health and safety of the workers and the general public.
- ✓ *Civil liability deriving from nuclear damage*. The Act recognises that in spite of the preventive and protective measures taken, third-party nuclear damage might occur, compensation for which should be guaranteed by means of policies, with the intervention of the State where necessary.
- ✓ *Infringement and administrative penalties*. The Act establishes the infringements and administrative penalties deriving from the incorrect use of radioactive materials, nuclear substances and radiation sources, especially if such use implies damage to persons.

All the aforementioned aspects have subsequently been developed and updated by way of the corresponding legal and regulatory provisions.

Law Creating the Nuclear Safety Council (Law 15/1980, of 22nd April)

This Law constitutes the CSN as the sole organisation responsible for nuclear safety and radiation protection, the Council being independent from the Government and the rest of the Administration and having the power to carry out the necessary inspections and assessments of nuclear facilities, in order to guarantee nuclear safety and radiation protection.

Through this Law, subsequently modified by Law 14/1999, the CSN assumes responsibility for all the functions relating to nuclear safety and radiation protection formerly assigned to the JEN and furthermore:

- ✓ the areas of competence of the Council are established;
- ✓ the relationship between the CSN and the Upper and Lower Houses of Parliament is established, as is the obligation to report annually to the Parliament;
- ✓ the collegiate structure of the CSN is created;
- ✓ the appointment of the Chairman and members of the Board is defined;
- ✓ the system for the adoption of agreements is established;
- ✓ the Technical Division for Nuclear Safety and Radiation Protection is set up;
- ✓ the authorities responsible for the enforcement of penalties are identified and the amount of such sanctions is established;
- ✓ the tariff for services rendered is created, this serving for financing of the CSN.

Law on Public Fees and Prices for services rendered by the CSN (Law 14/1999, of 4th May)

In addition to establishing a new framework for regulation and an updating of the rates for services rendered by the Organisation, the CSN Tariffs Law implies an important extension of the powers attributed by the original Law by which the Council was created, among them functions aimed at reducing the risk implied by the existence of radioac-

tive materials outside facilities subject to nuclear legislation. These activities are closely linked to the existence of so-called orphan sources, which arise from the voluntary or involuntary loss of control over sources or from the existence of sources prior to the regulation. Likewise, it empowers the CSN to issue instructions on technical matters within its realm of competence.

Furthermore, through this Law the body authorised for this purpose may, under certain conditions, manage the wastes generated as a result of the existence of radioactive material outside facilities subject to nuclear legislation, the costs being applied to the financial yield on the fund for the management of radioactive wastes from nuclear facilities.

Finally, the CSN is responsible for the performance of studies, assessments and inspections of the plans, programmes and projects required for all the phases of radioactive waste management.

Electricity Industry Act (Law 54/1997, of 27th November)

Additional provision No 4 of this Act establishes that the Ministry of Industry and Energy (today the Ministry of Economy) shall, following a report by the CSN, define the levels of concentration or contamination above which a waste material should be considered to constitute a radioactive waste. Furthermore, this Act modifies and updates the system of penalties established originally in the aforementioned Nuclear Energy Act.

This Act establishes the bases for management of the fund for financing of activities included in the General Radioactive Waste Plan (GRWP), i.e., the financial resources required for radioactive waste management.

The sixth additional provision of this Act, which specifically regulates the Fund for financing of activities included in the GRWP, has been reworded through the fourteenth additional provision of Law 24/2001, of 27th December, on Fiscal, Administrative and Social Measures (Official State Gazette 31/12/2001).

Law on right of access to information on the environment (Law 38/1995, of 12th December)

This Law transposes Community Directive 90/313/CEE to the national legal system, and is of maximum interest as regards the participation of the citizens in decision-making in relation to radioactive waste management.

Royal Legislative Decree on Assessment of Environmental Impact (RLD 1302/1986, of 28th June), modified by Law 6/2001, of 8th May

This standard, which is complementary to those described above, also transposes Community directives relating to this issue and attributes the function of performing Environmental Impact Assessments to the licensee of the activities and, to the Ministry of the Environment, the function of drawing up the Environmental Impact Statement. It likewise establishes the applicable procedure and the participation of citizen organisations in the process. In the case of activities relating to nuclear facilities, the Ministry of the Environment bases its decision on the CSN, which takes charge of the radiological aspects of the Environmental Impact Statement.

19.1.3. Regulatory standards

This type of provisions responds to the need to enact the legal standards described above , on which they are hierarchically dependent. Regulatory powers are attributed by the Constitution to the Government, in other words to the administrative authorities in the widest sense, and though their enactment complement the requirements established in the laws. The most significant regulatory standards are the following:

Regulation on Nuclear and Radioactive Installations (Approved by Royal Decree 1836/1999, of 3rd December)

This Regulation is the most important of the standards for enactment of the Nuclear Energy Act. It establishes the procedure for the licensing of facilities at which nuclear and radioactive activities are carried out. It defines in detail the types and categories of such facilities and establishes as a general standard that the installations are subject to a system of authorisations to be awarded by the Ministry of Industry and Energy (today the Ministry of Economy) following a report by the CSN on nuclear safety or radiation protection issues relating to the facility.

Likewise, the Regulation regulates other types of activities, such as the authorisation of radioactive equipment and apparatus, the removal and treatment of radioactive substances, the transport of radioactive materials, spent fuel storage and disposal, the approval of new models and designs, the restoration of uranium mines, organisations providing radiation protection services and the clearance and exemption of materials and installations.

Regulation on Protection against Ionising Radiations (Approved by Royal Decree 783/2001, of 6th July)

This Regulation is the necessary complement to those dealt with previously from the point of view of healthcare, and constitutes the other major pillar on which rests enactment of the Nuclear Energy Act. It partially transposes Community Directive 96/29/EURATOM and is aimed at establishing standards relating to the protection of workers and the members of the public against the risks arising from exposure to ionising radiations.

It sets out the radiation protection standards to be applied in waste management and specifically establishes that the release of such wastes to the environment may be carried out only within the limits authorised by the CSN, which are in turn required to guarantee that the basic limits of protection of the individual be met under all circumstances.

Royal Decree authorising the constitution of the Empresa Nacional de Residuos Radiactivos (ENRESA). (Royal Decree 1522/1984, of 4th July).

The Royal Decree constituting ENRESA is without doubt the most transcendental specific regulatory standard as regards radioactive waste management in Spain. This legal provision assigns different functions to ENRESA, which will be dealt with in greater detail in point 19.5 of this same section.

This Royal Decree has subsequently been updated and developed in a series of standards of lower rank and specific application.

The practical achievement of the objectives assigned to ENRESA by this Royal Decree is set out in the so-called GRWP's, which are drawn up by ENRESA itself and submitted to the Government for its approval. These Plans (at present the Fifth is in force) contain a review of all the activities required and technical solutions applicable over the timescale of activity of radioactive wastes, including updated economic and financial study of the cost of such activities.

Regulation on coverage of nuclear risk (Approved by Decree 2177/1967, of 22nd July). This Regulation enacts the Nuclear Energy Act and establishes civil liability for nuclear damage and the way in which such liability is guaranteed.

Royal Decree on the ordering of activities within the nuclear fuel cycle (Royal Decree 1899/1984, of 1st August)

This Royal Decree updated a previous such standard, 2967/1979, of 7th December, and conferred upon ENRESA the function of managing wastes from the back end of the nuclear fuel cycle, in particular spent fuel. For this purpose it establishes the ENRESA financing method, which is basically configured along two routes:

- ✓ a percentage on electricity consumed, which will provide the fund for the management of wastes from nuclear power plants, and
- ✓ a fixed price for management of the radioactive wastes from the RF's, which is to be authorised by MINECO.

As a result of approval of the Electricity Industry Act 40/1994, annulled by the Act passed in 1997, this last Royal Decree was updated by Royal Decree 404/1996, of 1st March, which accurately defines the mechanisms for management and control of the fund for the financing of activities relating to the back end of the nuclear fuel cycle.

One way or another, in each case ENRESA establishes agreements with the waste producers, these determining the basis for action and the obligations of the parties in relation to waste management.

Regulation on Environmental Impact Assessment (Approved by Royal Decree 1131/1988, of 30th September)

This Regulation, which has subsequently undergone modifications, enacts the Royal Legislative Decree on the assessment of environmental impact, establishing the procedure for the assessment and declaration of such impacts to be adhered to in all cases by the State Administration and, in a supplementary manner by certain of the Autonomous Communities in view of their respective scopes of competence in relation to environmental matters.

Royal Decree on the radiation protection of external workers subjected to the risk of exposure to ionising radiations due to their intervening in the controlled zone (Royal Decree 413/1997)

This Royal Decree incorporates the corresponding Community Directive into the Spanish legal system. Although it does not specifically refer to the area of waste management, the latter is of great importance in the Decree since most of these activities are carried out by collaborating organisations.

Royal Decree on physical protection of nuclear materials (Royal Decree 158/1998, of 3rd February)

The objective of this provision is to establish a system for the physical protection of nuclear materials, based on the Convention adopted in Vienna and New York in 1980 and ratified by Spain, a member of the EURATOM Treaty. From the point of view of waste management, the Royal Decree has a special impact on the management of spent fuel.

Royal Decrees on radioactive lightning rods (Royal Decrees 1428/1986, of 13th June and 903/1987, of 10th July)

These Royal Decrees came about in an attempt to resolve the situation that had existed since the 1960's due to the incorporation of a small radioactive source in certain conventional lightning rods, supposedly to increase their efficiency. This Royal Decree established that the owners of radioactive lightning rods were obliged either to register them as radioactive facilities within two years or remove them, ENRESA being in charge of the removal of existing lightning rods.

Royal Decree on the transfer of wastes between European Union member States (Royal Decree 2088/1994, of 20th October)

This Royal Decree transposed to the Spanish legal system the Community Directive 92/3/EURATOM, on the surveillance and control of transfers of radioactive wastes between Community States or having their origin or destination outside the European Union, and established the procedure of communications to be adhered to for the performance of such transfers.

Regulation (EURATOM) No 1493/93 of the Council, of 8th June 1993, on the transfer of radioactive substances between member States (DOCE 19/06/1993)

This Regulation complements the provisions of the aforementioned Directive 92/3/EURATOM, and is applicable to the transfer between member States of sealed and other pertinent sources when the quantities and concentrations exceed the values set out under letters a) and b) of article 4 of Directive 80/836/EURATOM.19.1.4.

19.1.4. Non-binding provisions. CSN Safety Guides

The CSN issues *Safety Guides*, which contain the methods recommended by the Organisation from the point of view of nuclear safety and radiation protection, with a view to orienting users and facilitating for them the application of the Spanish nuclear regulations in force.

These guides are not binding; in other words, their compliance is not obligatory, and the user may apply methods and solutions different from those contained in them, as long as these are duly justified.

At present, the Safety Guides are classified in 10 sections corresponding to the main areas of competence of the CSN. Of these, section 9 refers expressly to "Waste management", and currently has two sub-sections:

- ✓ 9.1 Control of the process of solidifying low and intermediate level radioactive wastes.
- ✓ 9.2 Management of solid waste materials with radioactive contents generated at nuclear and radioactive facilities.

19.2. Facility authorisation system

19.2.1. Facility licensing system

In keeping with the requirements of the Regulation governing Nuclear and Radioactive Installations, nuclear installations require different administrative authorisations or permits in order to operate. Mention should be made fundamentally of the "preliminary or site authorisation", the "construction permit", the "operating permit", the "authorisation for modifications" and the "decommissioning permit". Each of these authorisations requires a procedure that is regulated in the Regulation itself and that is briefly described below.

a) Preliminary authorisation

The preliminary or site authorisation, which is required for all first category nuclear and radioactive facilities, constitutes official recognition of the objective proposed and of the suitability of the site selected. It allows the holder to request a construction permit for the facility and to initiate the preliminary infrastructure works.

Applications for preliminary authorisation must be accompanied by the following documents:

- ✓ Declaration of the needs to be covered and justification of the facility and of the site selected
- ✓ Descriptive report on the fundamental elements of the facility and basic information on the latter
- ✓ Preliminary construction project, including performance stages and periods and a preliminary economic study of the financial investments and costs foreseen
- ✓ Characterisation study of the site and the zone of influence of the facility
- ✓ Organisation planned by the requesting party for supervision of the project and for quality assurance during construction
- ✓ Description of preliminary infrastructure works and activities to be performed following awarding of the preliminary authorisation and prior to the request for the construction permit

On reception of the request, the Administration will establish the opening of a period for public information, publishing in the Official State Gazette and in the gazette of the appropriate Autonomous Community an announcement indicating the objective and main characteristics of the facility, in order for those persons and organisations considering themselves to be affected by the project to submit whatever allegations they deem to be appropriate, within 30 days of the date of the announcement.

During this process, the CSN will receive a copy of all the documentation submitted by the future owner of the facility, and will issue a preliminary technical safety declaration on the planned installation.

Once the binding report from the CSN has been received, the competent Administration (MINECO) will adopt the opportune resolution, awarding or rejecting the preliminary authorisation requested.

b) Construction permit

This request, necessary for nuclear installations and all first and second category radioactive facilities, must be accompanied by the following documentation:

- ✓ General design of the facility
- ✓ Procurement programme
- ✓ Budget, financing, performance period and system of technical collaboration
- ✓ Economic study, updating the one submitted with the preliminary application
- ✓ Preliminary safety study, which in turn should include the following:

Description of the site and surrounding area, with current data on the parameters impacting nuclear safety and radiation protection, including demographic and ecological data and information on land and water use, as well as whatever other data might contribute to a better understanding of the site, long with plans for surveillance and verification of the basic parameters representative of the site.

- ➪ Description of the facility, including the criteria adhered to in designing the components or systems on which the safety of the installation depends.
- ➪ Analysis of foreseeable accidents and their consequences.
- ➪ Analytical radiological study theoretically estimating the potential radiological impact of the facility on the population and the environment.
- ➪ Updating of the organisation foreseen by the requesting party for supervision of project performance and quality assurance during construction.
- ➪ Organisation foreseen for the future operation of the facility and preliminary operating personnel training programme.
- ➪ Pre-operational environmental radiological surveillance programme, taking as a basis the conclusions obtained from the analytical radiological study, allowing the reference level or radiological background of the supervised zone to be established.
- ➪ Quality assurance programme for construction.
- ➪ Technological, economic and financing forecasts for decommissioning and dismantling.
- ➪ Administrative authorisations and concessions to be awarded by other Ministries and public Administrations, or documents accrediting the request for such authorisations with all the necessary requirements.

The CSN will receive a copy of the documentation submitted throughout the authorisation process and of the assessments and inspections performed and will issue the binding report referred to above.

During the construction and assembly of nuclear facilities, and prior to the loading of fuels or the acceptance of nuclear substances on site, the licensee is obliged to carry out a programme of pre-nuclear testing accrediting the adequate performance of the equipment or parts making up the installation, as regards both nuclear safety and radiation protection and the applicable industrial and technical regulations.

The pre-nuclear testing programme will be proposed by the licensee and will require the approval of the Directorate General for Energy Policy and Mining, following a report by the CSN. Regardless of whether performance of the tests and checks will be per-

formed under the responsibility of the licensee, the aforementioned Directorate General will determine, following a report from the CSN, what tests and checks should be carried out in the presence of inspectors belonging to the latter.

The results of the pre-nuclear tests will be submitted to the Directorate General for Energy Policy and Mining and to the CSN for analysis before the operating permit may be awarded.

c) Operating permit

This authorisation, applicable to nuclear facilities, is awarded in two phases, one provisional (Operating Permit) for the licensee to carry out a program of nuclear testing, and, depending on the results of such testing, one definitive (Definitive Operating Permit), which allows the licensee to operate the facility in accordance with its technical characteristics and the restrictions arising as a result of the nuclear testing programme. It is common practice for facilities to operate over prolonged periods of time with provisional operating permits with temporary periods of validity, which are periodically renewed on the basis of the experience acquired during such period of validity.

In order to obtain the provisional operating permit, the holder of the construction permit is required to submit the following documents to the MINECO:

- ✓ *Safety study*: which must contain sufficient information for an analysis of the installation to be performed from the point of view of nuclear safety and radiation protection, along with an analysis and assessment of the risks arising as a result of operation of the facility, under both normal and accident conditions. In particular, the documents should refer to the following:
  - ➪ Complementary data on the site and its characteristics acquired during construction.
  - ➪ Description of the facility as built, and of the processes that are to take place in it. This shall include a description of the nuclear and non-nuclear instrumentation, the control and protection systems, containment buildings or structures, auxiliary systems, radioactive waste collection and removal systems and any other system or component of significance for the safety of the facility.
  - ➪ Analysis of foreseeable accidents deriving from the malfunctioning of elements and apparatus, operating errors or agents external to the facility and their consequences.
  - ➪ Analytical radiological study of the facility.
  - ➪ Operational environmental radiological surveillance programme, in order to assess the impact of the facility.
- ✓ *Operating regulation*: This should contain the following:
  - ➪ List of job posts with nuclear responsibilities, from the Plant Manager or Head of Operations to the supervisors, operators, persons responsible for radiological surveillance and performers of nuclear tests.
  - ➪ Organisation: this will specify the organisation and operation of the personnel belonging to the facility, under both normal and emergency conditions.

- ➪ Standards for operation under normal and accident conditions, referring to the facility overall and to the systems of which it is made up.

✓ *Operating Technical Specifications (OTS's):* These shall contain the limit values of variables affecting safety, the actuation limits of automatic protection systems, minimum operating conditions, the schedule of system and component revisions, calibration and inspections and operating control.

✓ *Site emergency plan:* This will detail the measures foreseen by the licensee and the assignment of responsibilities respond to accident conditions, in order to mitigate their consequences, protect the facility personnel and immediately report on occurrence to the competent organisations, including an initial assessment of the circumstances and consequences of the situation. In addition, it will establish the actions planned by the licensee to assist in protection interventions off site, in accordance with the off-site emergency plans established by the competent bodies, when determined by the CSN.

✓ *Nuclear testing programme:* This will describe the tests, their objective, specific techniques and expected results. For each test there should be an indication of the procedure to be followed, the data to be acquired during performance and the maximum and minimum values expected for the variables of interest during test performance. It shall also include the safety criteria applicable to performance of these tests.

✓ *Quality assurance manual:* This will establish the scope and content of the quality programme applicable to the testing and operation of safety-related systems, structures and components, as well as the design, manufacturing, construction, testing and operation of modifications thereto.

✓ *Radiation protection manual:* This will include the radiation protection standards of the facility.

✓ *Radioactive waste management plan:* This will incorporate, where appropriate, the contracts drawn up with management companies and will include, among other concepts, a system for possible waste declassification.

✓ *Final economic study:* This will analyse compliance with the economic and financial forecasts and express the total and effective sum of the facility.

✓ *Decommissioning and dismantling forecasts:* This will include the final disposal foreseen for the wastes generated and a cost study and the economic and financial provisions planned to guarantee decommissioning.

The provisional operating permit will be granted for the time required to carry out the nuclear testing programme and analyse its results. The programme will include the set of tests, verifications and checks to be performed on each of the different systems of the facility. The official representatives of the CSN may at any time during testing suspend performance when, in their judgement, continuation thereof might be potentially hazardous. In this respect they shall report to the Directorate General of Energy Policy and Mining.

On completion of the nuclear testing programme, the licensee shall submit to the aforementioned D.G. and to the CSN the results of this programme and his proposal for modifications to the OTS's, if this were advisable in view of the tests performed.

The CSN will issue a report to the MINECO on the results of the tests and the modifications to be incorporated, where appropriate, as well as on the conditions for renewal of

the operating permit for the period established. The MINECO will then issue the new operating permit for the corresponding period.

d) Authorisation for modifications

This authorisation, which is applicable to all types of facilities, allows the licensee to carry out whatever modifications might be necessary, in accordance with the operating experience, affecting the design, operating conditions or radiation protection. If, in the opinion of the Directorate General for Energy Policy and Mines or of the CSN, the scope of the modification were of major significance, the licensee will be requested to apply for an authorisation for performance and assembly of the modification.

The putting into practice of these authorisations requires the performance of certain arrangements similar to those described in relation to the previous authorisation.

e) Decommissioning permit

Also applicable to all types of facilities, this authorisation allows the licensee to carry out the activities required at the end of the service lifetime of the facility in order to release the site at which it is located from all subsequent radiological controls.

Requests for such authorisation should be accompanied by the documentation referred to in dealing with the operating permit.

19.2.2. Specific authorisations relating to radioactive wastes

The criteria adhered to in the awarding of these authorisations, referring to radioactive waste management, are, where applicable, the same ones as those generally specified in the previous section. The vehicle via which these authorisations are normally instrumented consists of the Ministerial Orders approved by the competent Ministry, which as has been pointed out above is currently the MINECO.

Each of the Orders through which the authorisations are awarded usually contains annexes stipulating the limits and conditions in accordance with which the authorisation should be exercised.

Given their importance, the following authorisations awarded to date to radioactive waste management facilities or activities may be underlined:

- ✓ *Order of the Ministry of Industry and Energy of 31st October 1989, granting authorisation to the "Empresa Nacional de Residuos Radiactivos, S.A.", for construction of the extension to the Sierra Albarrana solid radioactive waste disposal nuclear facility (O.S.G. of 2nd November 1989).*
- ✓ *Order of the Ministry of Industry and Energy of 9th October 1992, granting to the "Empresa Nacional de Residuos Radiactivos, S.A." a provisional operating permit for the extension to the Sierra Albarrana solid radioactive waste disposal nuclear facility (O.S.G. of 21st October 1992).*
- ✓ *Order of the Ministry of Industry and Energy of 8th October 1996 granting to the "Empresa Nacional de Residuos Radiactivos, S.A." an extension to the provisional operating permit for the extension to the Sierra Albarrana solid radioactive waste disposal nuclear facility (O.S.G. of 22nd October 1996).*

- ✓ *Order of the Ministry of Economy of 5th October 2001 awarding an operating permit for the Sierra Albarrana solid radioactive waste disposal nuclear facility (O.S.G. of 6th November 2001).*
- ✓ *Resolution of the Directorate General for Energy of the Ministry of Industry and Energy, of 23rd October 1997, approving the dual-purpose ENSA-DPT cask as a transport package model, type B(U)F.*
- ✓ *Resolution of the Directorate General for Energy Policy and Mines of the Ministry of Economy, of 3rd June 2002, approving revision 1 of the certificate E/077/B(U) F-85 issued by Spain in relation to the ENSA-DPT transport package model.*
- ✓ *Resolution of the Directorate General for Energy Policy and Mines of the Ministry of Economy, of 18th June 2001, approving the design of the ENSA-DPT cask for the storage of irradiated fuel.*
- ✓ *Resolution of the Directorate General for Energy Policy and Mines of the Ministry of Economy, of 3rd June 2002, approving the revision of the technical conditions for approval of the design of the ENSA-DPT cask for use at irradiated fuel storage facilities.*
- ✓ *Order of the Ministry of Industry and Energy, of 25th April 1997, granting to the "Empresa Nacional del Uranio, Sociedad Anónima" (ENUSA), authorisation for the definitive start-up of the Quercus uranium concentrates manufacturing facility at Saelices el Chico (Salamanca). (O.S.G. of 16th May 1997).*
- ✓ *Agreement of the Cabinet of Ministers of 31st July 1999, authorising, in response to a proposal by the Ministry of Public Works, construction of the spent fuel storage facility at Trillo Nuclear Power Plant.*

19.3. Nuclear and radioactive facility inspection and assessment system

The CSN is empowered to carry out all types of inspections at nuclear facilities, this including disposal facilities, as has been indicated above, during all the different phases of start-up and subsequent operation. The CSN inspection mission is to ensure compliance with the conditions set out in the authorisation and correct application of the specifications established in the permits granted and the official operating documents approved.

In this respect, the functions of the CSN focus on the following activities:

- ✓ Periodic inspections to verify correct compliance with the conditions and requirements set out in the authorisations.
- ✓ Assessment and tracking of the operation of the facilities, checking the data, reports and documents submitted by the licensee or gathering new data.
- ✓ Warnings to or requirements of the licensees whenever non-compliance with obligations is detected or any deviation in compliance with the requirements of the authorisation not constituting a punishable infringement, informing the licensee of the mechanisms for correction.

- ✓ Possibility of suspending the operation of a facility or of interrupting an activity, for safety reasons, if the previous requirements have not been met or the corrective measures necessary to rectify safety faults have not been taken.
- ✓ Ultimately proposing to the competent authority of the Administration that penalty proceedings be initiated when any anomaly that might constitute an infringement of the nuclear safety and radiation protection standards is detected.

In Section IV, the RNRI includes a summary of the basic standards for the inspection of nuclear and radioactive facilities, as shown below:

- ✓ The performing personnel of the MINECO and of the CSN appointed to carry out the inspection are considered to be "agents of the authority" in everything relating to the exercising of their posts, and may be accompanied by whatever accredited experts they consider to be necessary.
- ✓ The licensee of the facility subjected to inspection shall be obliged to undertake as follows:

  a) Facilitate access for the inspectors to the parts of the facility that they consider to be necessary for the performance of their mission.

  b) Facilitate the positioning of the equipment and instrumentation required for the performance of the necessary tests and checks.

  c) Making available to the inspectors the information, documentation and technical resources required for compliance with their mission.

  d) Allowing the inspectors to take sufficient samples for performance of the relevant analyses and checks.

  e) Facilitate access for the inspectors to the work centres of the suppliers of equipment and services relating to the safety of the facilities and performance of their activities within the scope specified in previous sections b), c) and d).

- ✓ The result of the inspection shall be reflected in Minutes, which shall be considered to constitute a true and faithful document.
- ✓ The licensee of the facility, or person delegated by him, will be invited to witness the inspection and sign the corresponding Minutes. On signing, the licensee may include his comments and air his objections, although if he were not to sign the Minutes such comments would not be taken into account.
- ✓ If irregularities are detected during the inspection, and if these constitute a manifest hazard, the MINECO authorities and the CSN may, within their respective realms of competence, require the immediate ceasing of works, functioning or operations, and where appropriate the CSN shall inform the MINECO of this circumstance and explain the reasons for such action.

19.4. System of penalties applicable to nuclear facilities

Chapter XIV of the Nuclear Energy Act, Law 25/1964, in the wording given thereto by the fifth additional provision of the Electricity Industry Act, Law 54/1997, and the fifth additional provision of Law 14/1999 on Public Fees and Prices for services rendered by

the CSN, regulates a set of infringements and penalties in relation to nuclear safety and radiation protection.

The Nuclear Energy Act classifies infringements depending on their seriousness, using a range that makes a distinction between very serious, serious and slight infringements, depending on the nature of the risk implied by the action or omission of the licensee of the facility.

Depending on the legal qualification of the infringement committed, the penalties may consists of fines of up to three million, five thousand and sixty-one euros (3,005,061 €), combined where deemed necessary with the definitive or temporary cancellation of the authorisations. The magnitude of the fines will be graduated on the basis of criteria of hazard for the health and life of persons, the safety of property and the environment, intentionality, negligence in commission, the importance of the damage or deterioration caused to persons and property, etc.

The CSN is empowered to propose the initiation of penalty proceedings with respect to events that might be defined as infringements in relation to nuclear safety or radiation protection. For this purpose it identifies the infringement committed and the circumstances relevant to its assessment, issuing whatever reports it considers to be necessary to contribute to adequate qualification of the events to be penalised.

Consequently, the CSN performs an advisory and proposals function in relation to penalty proceedings, the Government or authorising administration (MINECO) having the power to enforce whatever penalty it deems to be legally appropriate, following the drawing up of an administrative penalty file to this effect.

Furthermore, in keeping with the modification made by the fifth additional provision of Law 14/1999, when the circumstances of the case make it advisable, and as long as there not be any direct damage to persons or the environment, the CSN may reprimand the licensee of the activity and propose the corresponding corrective measures. If this requirement were not fulfilled, the CSN may apply coercive fines, the amount of which shall not exceed 20 percent of the fine established for the corresponding infringement, and, where appropriate, propose the opening of penalty proceedings. In any case, the CSN shall inform the competent authority for the latter to enforce the corresponding penalties.

19.5. Assignment of responsibilities

The assignment of responsibilities in Spain for the different activities involved in the nuclear fuel cycle, and in particular the management of radioactive wastes and spent fuel, has evolved with time since the provisions of the Nuclear Energy Act, Law 25/1964, according to which "nuclear and radioactive facilities working with radioactive substances shall be obliged to have special installations for the storage, transport and handling of radioactive wastes". Royal Decree 2967/1979 on the Ordering of Activities within the Nuclear Fuel Cycle assigned the responsibility for the treatment of irradiated fuels to the Empresa Nacional del Uranio, S.A. (ENUSA), and the responsibility for the definitive disposal of radioactive wastes to the JEN. However, this regulation did not consider other aspects, such as the disposal of radioactive wastes arising from activities outside the fuel cycle, the dismantling of nuclear and radioactive facilities, etc.

Subsequently, in 1984, there was a re-ordering of the activities involved in the back end of the nuclear fuel cycle, leading to the situation currently in force. Royal Decree

1522/1984 authorised the constitution of ENRESA, to which the following functions were assigned:

- ✓ Treatment and conditioning of radioactive wastes in the cases and circumstances determined.
- ✓ Site selection and design, construction and operation of centres for the storage and disposal of high, low and intermediate level wastes.
- ✓ Management of operations deriving from the decommissioning of nuclear and radioactive facilities.
- ✓ Establishment of systems for the collection, transfer and transport of radioactive wastes.
- ✓ Acting, in the event of nuclear emergencies, in support of civil defence services, in the way and under the circumstances required.
- ✓ Definitive and safe conditioning of tailings from uranium mining and milling, when required.
- ✓ Ensuring the long-term management of all facilities serving as waste storage or disposal installations.
- ✓ Performance of the technical and economic-financial studies required, taking into account the deferred costs of radioactive waste management, in order to establish the adequate economic policy.
- ✓ Any other activity required for the performance of its corporate purpose.

Likewise, the aforementioned Royal Decree establishes for ENRESA the obligation to prepare a Report within the first six months of each year, this containing at least the following aspects:

- ✓ Activities performed during the previous year.
- ✓ GRWP, which shall include a revision of all the actions necessary and technical solutions applicable throughout the period of activity of the radioactive wastes, including an updated economic-financial study of the cost of such actions.

Finally, Royal Decree 1899/1984 authorises ENRESA to carry out the activities referred to in the Nuclear Energy Act, Law 25/1964 and regulates the terms of the contracts to be drawn up between ENRESA and the licensees of nuclear and radioactive facilities.

Furthermore, the financing of the back end of the nuclear fuel cycle has been developed by the Order of 12th May 1983, while Royal Decree 404/1996 regulates the composition, application and management of the Fund for financing of activities included in the GRWP. More recently, Law 24/2001, of 27th December, on Fiscal, Administrative and Social Measures includes an additional provision on the Fund for financing of GRWP activities.

All the above goes to make up the legal framework regulating the assignment of responsibilities for the management of radioactive wastes and spent fuel in Spain, as regards both areas of competence and financing.

19.6. Assessment of compliance

From the information presented in the previous sections it may be gathered that, as pointed out, Spain, although lacking a specific legal framework referring exclusively to the management of the spent fuel and radioactive wastes generated within its frontiers, possesses sufficient standards to guarantee correct practical treatment of radioactive wastes.

Article 20. Regulatory body

20.1. Regulatory body in charge of enforcement of the legislative framework

In Spain, the regulatory function as regards spent fuel and radioactive waste management is carried out by the following authorities:

- ✓ The Government, which as the executive political body of power directs policy in this area and establishes the objectives and goals of the Administration, drawing up regulatory standards on the matter.
- ✓ The Ministry of Economy, as an administrative department, in keeping with governmental strategies, adopts regulatory provisions in enactment of the parliamentary Laws and Regulations of the Government, and in short acts as the licensing authority. The organisational structure of this Ministry is established in Royal Decree 1371/2000, modified by Royal Decree 1099/2002.

  Likewise, in accordance with the stipulations of Royal Decree 1522/1984, authorising the constitution of ENRESA, the GRWP proposal is submitted to the Government by this Ministry for approval, this including a revision of all the actions required and technical solutions applicable throughout the period of activity of the radioactive wastes and an updated economic-financial study of the costs of such actions and developing the strategies established therein by virtue of the areas of competence defined in the aforementioned Royal Decree 1371/2000.

  Likewise, following approval of the General Radioactive Waste Plan, the Parliament is informed.

  In accordance with Law 15/1980, by which the CSN was created, the MINECO is the body responsible for the awarding of the authorisation required for nuclear and radioactive facilities, with the exception of second and third category RF's whose functions have been transferred to the Autonomous Communities, and for the transport of nuclear substances and radioactive materials, and has the authority to apply sanctions to operators infringing the requirements of the legal system.
- ✓ The Consejo de Seguridad Nuclear, as the sole body responsible for nuclear safety and radiation protection, created by virtue of Law 15/1980, of 22nd April, with its own legal standing and equity, the power to issue binding reports and advice and the responsibility for the permanent inspection and assessment of

such facilities throughout their construction, start-up, operation and closure. It is also responsible for the radiological control and surveillance of the workers and the general public. The Nuclear Safety Council has no relationship of hierarchy or guardianship with respect to the Government or organisations in charge of the scientific promotion of nuclear energy. It exercises its functions with complete independence from all the other agents participating in the nuclear field.

In addition to its consultant nature, the CSN also carries out executive functions, since it is empowered to suspend the operation of a facility or activity when there is any danger to health, and may grant or withdraw licences to or from the operating personnel of such facilities. Law 14/1999, of 4th May, on Public Fees and Prices for the services rendered by the CSN, modifies the realm of competence of the Council, attributing to it the capacity to draw up and approve instructions, circulars and guides of a technical nature in relation to nuclear and radioactive facilities and activities affecting nuclear safety and radiation protection.

The CSN reports directly to Parliament through the Commission on Economy and the Public Exchequer of the Lower House. This Commission analyses and studies the annual reports submitted by the CSN to the Parliament in order to inform of its activities. Following study and analysis of this report by the Commission, the Chairperson of the CSN appears before it in order to explain and clarify whatever doubts the members may have. The Resolutions adopted by the Commission normally include the assessments made in relation to the reports submitted.

New CSN functions and responsibilities

The legislative changes that have occurred in recent years have significantly altered the realm of competence and functional framework of the CSN. On the one hand, Law 54/1997, of 27th December, has economically liberated the activity of electricity generation and established a system of free access in which no recognition is given to the specific costs of generation by nuclear means, and on the other Law 14/1999, of 4th May, assigns new areas of competence to the CSN in relation to the radiological protection of the environment throughout the Spanish territory, the qualification and management of radioactive wastes, the coordination of nuclear and radiological emergencies, intervention in exceptional situations that might affect nuclear safety in activities not regulated by the nuclear legislation and the approval of technical standards, as well as the possibility of reprimanding the licensees and proposing corrective measures and, where appropriate, of applying coercive fines.

This strengthening of certain areas of CSN activity and the need to address the new attributes, especially in relation to the radiological surveillance of the environment and coordination and response to situations of radiological emergency, regardless of whether or not such situations might arise at authorised nuclear or radioactive facilities, brought with it the need to introduce certain changes in the organisational structure of the Council, with a view to achieving better adaptation of the existing resources to the new requirements, which are to receive specific attention, separating at organisational level issues relating to the safety of nuclear facilities from those relating to radiation protection, in keeping with the consolidated model of the more advanced European nations.

20.2. Ministry of Economy

Since the entry into force of Royal Decree 1371/2000, the Ministry of Economy (MINECO) has been the body of the General State Administration responsible for nuclear energy, and consequently for spent nuclear fuel and radioactive wastes. Within this Ministry, the Directorate General for Energy Policy and Mines exercises functions relating to nuclear energy.

Historically, since the beginnings of nuclear energy development in Spain, the Departments responsible for these issues have been the Ministry of Industry, the Ministry of Industry and Energy, the Ministry of Industry, Commerce and Tourism and, finally, the Ministry of Economy. Likewise, the Directorate General exercising functions relating to nuclear energy has been known first as the Directorate General for Energy and later as the Directorate General for Energy Policy and Mines.

The Report refers to certain of these Institutions in dealing with standards, authorisations, etc., depending on the title of the competent Institution at the moment of approval thereof.

20.2.1. Structure of the Ministry of Economy

Royal Decree 689/2000 established the basic organisational structure of the MINECO, determining its upper and executive bodies. This basic organisational structure has been subsequently modified and developed by Royal Decrees 1371/2000, 680/2002 and 1099/2002.

In accordance with the aforementioned standards, the MINECO is structured around the following high-level areas:

- ✓ Secretariat of State for Energy, Industrial Development and Small and Medium-sized Companies.
- ✓ Secretariat of State for Economy
- ✓ Secretariat of State for Commerce and Tourism

The Secretariat of State for Energy, Industrial Development and Small and Medium-sized Companies exercises competence in the area of energy policy, among others, these including those contemplated in the Convention in relation to the General State Administration.

Specifically, this Secretariat of State has attributes in the following areas:

- ✓ Energy policy development.
- ✓ Proposals for legislative and standards initiatives for development within its realm of competence.
- ✓ Proposals for the tracking of energy-related technology developments.

For compliance with these objectives, the Secretariat of State for Energy, Industrial Development and Small and Medium-sized Companies includes the Directorate General for Energy Policy and Mines, which is the body specifically assigned activities relating to nuclear energy and the management of radioactive wastes and spent fuel.

Section L, Annex K.1 includes an organisational flowchart of the MINECO, which shows only those bodies that have functions relating to the Convention.

20.2.2 Functions of the Ministry of Economy.

In relation to the Convention, the MINECO has the following functions:

- ✓ Drawing up and handling of standards-related initiatives and their tracking with respect to radioactive waste and spent fuel management, along with preparation of the proposals required for adaptation, where appropriate, to the standards of the European Union.
- ✓ Submittal to the Government of the proposal for the GRWP.
- ✓ Awarding of authorisations relating to spent fuel and radioactive waste disposal facilities. Preliminary or site authorisations, construction and operation permits, authorisations for modifications and performance and assembly thereof, dismantling authorisations and declarations of decommissioning, with the powers to require the immediate ceasing of works or operations in the event of manifest hazard.
- ✓ Awarding of authorisations for the transport of radioactive materials and for the approval or validation of package models for such transport.
- ✓ Instruction and, where appropriate, resolution of sanctions proceedings against the licensees of previous authorisations for infringement of the standards in force.
- ✓ Establishment of concentrations of radionuclides or levels of activity for a material or product to be considered a radioactive waste, following a report by the CSN.
- ✓ Tracking and control of the Fund for financing of activities contemplated in the GRWP.
- ✓ Tracking of the international commitments subscribed to by Spain in relation to nuclear non-proliferation, the physical protection of nuclear materials and facilities and civil liability for nuclear damage.
- ✓ Contribution to defining the technology research and development policy in relation to spent fuel and radioactive waste management.

20.3 Nuclear Safety Council

20.3.1. Functions of the Nuclear Safety Council

In its first additional provision, Law 14/1999, regulating the public fees and prices to be received by the CSN as payment for services rendered, establishes the functions and areas of competence of the Council:

- ✓ Proposals to the Government regarding the regulations required in relation to nuclear safety and radiation protection. The Council issues technical instructions, circulars and guides within its realm of competence.
- ✓ Submittal to the Government of binding reports prior to the resolutions of the latter regarding the awarding of authorisations for nuclear and radioactive facilities, the transport of nuclear substances and radioactive materials and, in general, all activities relating to the handling, processing, storage and transport of nuclear and radioactive substances.

- ✓ These reports are mandatory in all cases and are also binding when rejecting an award or as regards the conditions established when the award is accepted.
- ✓ Performance of all types of inspections at nuclear and radioactive facilities during the different phases of design, construction and start-up and during transport.
- ✓ Inspection and control of nuclear and radioactive facilities during operation and up to decommissioning.
- ✓ Proposals regarding the opening of sanctions proceedings when these are considered appropriate, within its realm of competence.
- ✓ Control of measures for the radiation protection of professionally exposed workers, the public and the environment.
- ✓ Surveillance of off-site releases of radioactive materials from nuclear and radioactive facilities and of their impact.
- ✓ Issuing on request by the interested party of favourable declarations regarding new designs, methodologies, simulation models or verification protocols relating to nuclear safety and radiation protection.
- ✓ Reporting to the MINECO on concentrations or levels of activity for materials containing or incorporating radioactive substances and for which no future use is foreseen to be considered radioactive wastes.
- ✓ Performance of studies, assessments and inspections with respect to the plans and projects required during all stages of radioactive waste management.
- ✓ Advising the Government, when requested to do so, in relation to nuclear safety and radiation protection.
- ✓ Maintenance of official relations with its overseas counterparts and participation in international organisations responsible for nuclear safety and radiation protection.
- ✓ Informing public opinion of issues within its realm of competence.
- ✓ Establishment and performance of tracking of research plans relating to nuclear safety and radiation protection.

20.3.2. Structure of the Nuclear Safety Council

The CSN is made up of two Technical Divisions, one on nuclear safety and the other on radiation protection.

In addition to these two Technical Divisions, three General Sub-Directorates and three Offices report to the Secretariat General:

- ✓ Sub-directorate General of Planning, Information Systems and Quality.
- ✓ Sub-directorate General of Personnel and Administration.
- ✓ Sub-directorate General of Legal Advisory Services.
- ✓ Inspection Office.
- ✓ R&D Office.
- ✓ Technical Standards Office.

Technical Directorate for Nuclear Safety

This Technical Division groups all functions relating to the safety of nuclear facilities, with the exception of those for the disposal of low and intermediate level radioactive wastes, which fall within the scope of the Radiation Protection Technical Division. It also undertakes responsibility for safety in the transport of nuclear substances and radioactive materials.

This grouping of responsibilities within a single, highly specialised management centre makes it possible to optimise the inspection, regulatory efficiency and control of nuclear facilities.

Three Sub-directorates General report to the Technical Directorate for Nuclear Safety:

- ✓ Sub-directorate General of Nuclear Installations.
- ✓ Sub-directorate General of Nuclear Technology.
- ✓ Sub-directorate General of Engineering.

Technical Directorate for Radiation Protection

In addition to the inspection and control of RF's, the radiation protection of workers and the management of low and intermediate level radioactive wastes, this Technical Division undertakes responsibility for new functions in relation to the radiation protection of the public and the environment and to radiological emergencies.

Three Sub-directorates General report to the Technical Directorate for Radiation Protection:

- ✓ Sub-directorate General of Environmental Radiation Protection.
- ✓ Sub-directorate General of Operational Radiation Protection.
- ✓ Sub-directorate General of Emergencies.

Section L, Annex K.2 includes an organisational flowchart of the CSN.

20.3.3. Training

All training activities have been grouped into five areas in keeping with the Strategic Plan currently in force:

- ✓ Area of Nuclear Safety and Radiation Protection.
- ✓ Area of management skills development, organisation and communications.
- ✓ Administrative and management area.
- ✓ Information systems area.
- ✓ Languages area.

The objectives are to achieve training at three major levels: general, specialist and communicational.

The "Training Plan" is assessed annually and different measures have been adopted in order to adapt it to the specific needs of the different units, in accordance with their demands.

The balance for the four-year period 1997-2000 and for the period 2000–2002 is considered to be positive, as regards both the number of courses offered, the attendance and the results obtained.

At present, over the period 2001-2002, the following courses have been scheduled and delivered: "Radioactive waste management, decommissioning and dismantling", known as "Managing Radioactive Waste" and delivered by IBC/UKAEA, "Transport of radioactive materials", delivered by the CSN, "Decommissioning and dismantling of nuclear and radioactive facilities", delivered by Ciemat / CSN / ENRESA", "Identification and quantification of radioactive material", delivered by Ciemat, and finally the working session on "Separation and transmutation of radioactive wastes", delivered by Ciemat.

20.3.4. Quality

The CSN has implemented a Quality System based on the ISO 9000 standards and on the model of the European Foundation for Quality Management (EFQM). Implementation of this system began in 1996, when the Council approved the Internal Quality Plan, establishing the reference models and the activities, objectives and responsibilities for system implementation.

In keeping with the ISO directives, the CSN has identified its basic processes and the relationships existing between them. These processes have been systematised and documented by way of management, technical and administrative procedures, with many members of the personnel having participated in their preparation.

The CSN Quality System incorporates on-going improvement methodologies. In this respect, improvement groups have been set up to promote participation by those working for the organisation in improvement-related activities, and during the year 2001 a survey was carried out among the users of the CSN services to gain insight into their needs and identify and implement opportunities for improvement.

The EFQM model has been used as a basis for two self-assessment exercises, completed in 1999 and 2001. These self-assessments have made it possible to identify the strong and weak points of the organisation and to assign priorities to activities aimed at improvement, integrating these into strategic planning.

A framework of command is being set up, containing a set of internal and external indicators allowing the achievement of objectives to be evaluated, with management of the Organisation resting on the tracking of the more important activities.

An Action Plan has been drawn up for modernisation of the CSN processes, this proposing a set of projects and activities. As a result, the Council has initiated a project under the title: Mission, Vision and Strategic Plan of the Organisation.

20.3.5. Improvement of regulatory efficiency

The aim of this improvement is to bring about a situation in which the activities of the CSN are performed with increasing efficiency, optimising the requirements made of regulated bodies and persons, the consumption of resources and terms and guaranteeing that the necessary levels of safety are maintained. Improvement of the regulatory process requires actions relating to the updating of standards, the identification of essential aspects of safety and of the operations indicators described in the section on new working methods, the planning and systematisation of CSN activities, improved assessment and inspection processes, the on-going training of the personnel and the updating of information and other systems described in the different chapters of the report.

Development of inspection model

In September 1998 the CSN approved a new model for the nuclear and radioactive facilities inspection system. The objective is to optimise and systematise the inspection activities carried out with respect to all the facilities and activities under the supervision of the CSN. This inspection model has been revised in 2000, incorporating all the lessons learned in recent years.

The aim of this new model is to increase the efficiency of the resources assigned to inspection activities, through the implementation of a single system introducing concepts such as inspection based on the risk of the facilities and activities, this making it possible to identify specific scopes for the different types of inspections, a frequency for action and, in short, a more systematic approach to inspection activities.

A basic inspection programme was established, systematically and periodically covering a series of basic activities involved in the operation of nuclear power plants and fuel cycle facilities, with 50% of the inspection resources dedicated to it.

Planning and control

The planning model implemented at the CSN aims to integrate strategic and day-to-day activities. For this purpose three levels of planning are established: strategic, annual work plan and task programming. The planning model includes integration with the budget, such that budgeting indicators and objectives are also contemplated in planning.

The CSN has a project under way for the implementation of a structure of command for the activities of the Organisation, constituted initially by a series of indicators associated with inspection processes and reports to the Administration, which will allow the degree of compliance with the approved planning to be assessed and the efficiency of the Organisation to be measured more accurately. As this project progresses, new indicators will be incorporated into this structure.

Information systems plan

This includes the actions to be performed by the organisation to keep its information systems updated, improving their availability and simplifying the work processes.

It contemplates activities relating to networks and communications, documentary management, planning and tracking systems, analytical accounting, personnel administration and management, technical management systems and information to be provided to the management.

20.3.6. Strategic Orientation Plan

This is a basic document that periodically identifies the strategic activities of the CSN and addresses the courses of action that allow the Body to carry out its functions more efficiently. This document attempts to adapt to the events that modify the environment in which the CSN's responsibilities are mapped out, and consequently orients its activities. The first plan began in 1995 and it is revised every three years.

It should be pointed out that in May 2002 the CSN initiated a modernisation project, through development of the Strategic Action Plan. This is an instrument for the improvement of processes, the optimisation of resources management and the adequate

use of information technologies, and favours communications between the different CSN units in the performance of their functions.

20.3.7. Financing

The CSN has its own equity and budget, independent from those of the State, which are integrated in the General State Budget and approved by Parliament.

Until the beginning of the 2000 financial year, the organisation was entirely self- financing, on the basis of the revenues from the tariffs applied for services rendered.

The first additional provision of Law 14/1999, of 4th May, on Public Fees and Prices for services rendered by the CSN modified article 2 of Law 15/1980, of 22nd April, by which the CSN was created, attributing to the body new functions relating to the coordination of emergency response and support measures, control of measures for the radiation protection of the general public and control and surveillance of the radiological quality of the environment throughout the national territory, outside what are typified as the areas of influence of nuclear or radioactive facilities.

The performance of these functions is not associated with the application of any rate, for which reason in 1999 and 2000 the Commission for Industry, Energy and Tourism of the Lower House of Parliament issued recommendations urging the Government to provide funding for the CSN for the performance of these functions, to be applied to the General State Budget.

The CSN has requested annual increases in this financing in order to adapt it to real costs.

This financing, which is complementary to that obtained by the CSN through the fees, amounted to 1.85 million euros in the year 2000, to 1.67 million euros in 2001, to a further 1.67 million in 2002 and to 1.706 million euros in 2003.

The CSN's current functions are fundamentally as follows, differentiated by financing routes:

- ✓ Financed via the fees:
  - ➪ Inspection and control of nuclear and radioactive facilities and related activities.
  - ➪ Performance of studies and reports prior to the authorisation awarded by the MINECO to the aforementioned facilities.
  - ➪ Awarding of licences for the personnel in charge of operating and supervising the facilities in question and homologation of courses.
- ✓ Financed in part through the General State Budget:
  - ➪ Coordination of emergency response and support measures.
  - ➪ Control of the radiation protection of the general public and the environment.

The initial CSN budget for the 2001 financial year amounted to 33.85 million euros, and to 36.05 millions in 2002. As regards costs, somewhat more than half correspond to the personnel and a quarter to general operating expenses.

20.3.8. Personnel

As of 31st December 2002, and not counting the eight upper management posts (Chairperson, four Commissioners, the Secretary General and two Technical Directors), the staff of the CSN was made up of 440 people, 195 of which are civil servants belonging to the Nuclear Safety and Radiation Protection Technical Corps, dedicated to the inspection, control and tracking of nuclear and radioactive facilities operation.

20.3.9. Research and Development (R&D)

The CSN has created a new administrative unit, the *Office of Research and Development (OFID)*, which has been commissioned to undertake the management and coordination of all CSN R&D activities, from the reception of research project proposals from the Technical Divisions to the diffusion and promotion of the application of their results.

Through its publications and working sessions, the CSN broadcasts the progress and results of the research projects, and at the end of every year a special session is held at its headquarters at which the most relevant projects currently under way are presented.

R&D activities in the field of radioactive wastes and spent fuel have meant an investment of 424,461.19 euros for the CSN. In accordance with the standards established in the CSN Research Plan, these activities have been carried out in collaboration with other institutions, the most noteworthy being collaboration with UNESA (Coordinated research plan) and with ENRESA and Ciemat, as well as with certain of the Spanish universities. Mention should also be made of the inclusion of certain of the projects in the Framework Research Programme of the European Community.

Briefly summarised below are the most significant R&D projects carried out in this field, along with their main objectives.

a) Characterisation of metallic waste materials with negligible levels of activity.

   Establishment of procedures and methodologies allowing the level of concentration of activity and/or surface contamination of waste materials having negligible levels of activity and potentially open to declassification to be characterised with rigour and flexibility, including levels of confidence and the quality of the declassification process.

b) Characterisation of matrixes for the optimum management of low and intermediate level wastes.

   Definition and characterisation of new matrixes of vitreous material incorporating low and intermediate level wastes, as an alternative to the current concrete matrix, for definitive disposal at El Cabril.

c) Natural analogues

   In-depth knowledge of existing natural analogues and of research projects carried out on them, to identify their contribution to the safety assessment of Deep Geological Disposal (DGD) systems for High Level Wastes (HLW) and to the communication of important safety aspects of these assessments to non-technical audiences, such that this might serve as a basis for definition of the future courses of action by the CSN in this area, contributing to the future developments of ENRESA.

d) Modelling

Performance of a study on the state of the art of conceptual and numerical modelling applicable to assessment of the performance and safety of high level waste disposal, serving as a basis for definition of the future courses of action of the CSN in this area.

It should be pointed out that the research projects undertaken contribute to improving knowledge and the methods and tools used by the CSN staff in the performance of their functions, helping to ensure that their activities be increasingly efficient and effective. They also make it possible to increase the level of competence of the organisations owning regulated facilities or activities and of those others, such as research centres or universities, that provide support to the CSN or to the licensees.

20.3.10. CSN public information policy

Article two of the Law by which the CSN was created establishes that one of the functions of the body is to "inform public opinion of issues within its realm of competence". With a view to complying with this function, the CSN has over the years carried out a far-reaching programme of public information and communication, performed by way of diverse activities.

These activities, aimed generally at bringing the CSN closer to the public, focus on the following:

- ✓ Spreading information on the activities of the institution.
- ✓ Promoting its presence in forums close to the population.
- ✓ Increasing the credibility of the body as a point of reference for nuclear safety and radiation protection-related questions.
- ✓ Placing the body within the reach of society, in order to reply with whatever information it might require.
- ✓ Contribute to training of the members of the public on issues within its realm of competence.

In order to achieve these objectives, the CSN has an information and communications department within the Technical Cabinet of the President that carries out work in the following areas, aware of the interest shown by society in the use of ionising radiations:

- ✓ Relations with the media. Direct and permanent contact is maintained with the media, organisations relating to environmental protection and professional associations, and specific request received are attended to. Press releases and other information are distributed on the situation of the country's facilities or on any safety-related event occurring.
- ✓ Publications. Every year the CSN draws up a publications plan that includes works of a technical and informative nature. In order to inform the two Houses of Parliament, the CSN is required by law to prepare an annual technical report summarising the activities of the body and the nuclear and radiological situation of the country, this representing an important data acquisition effort. Furthermore, technical works are published, along with the Council's annual report and safety guides facilitating the application of the nuclear regulations among users. In 1996, the publication of a quarterly journal, *Seguridad nu-*

clear, began, this containing articles of a technical nature on nuclear safety and radiation protection and news relating to the CSN's activities.

All the publications are distributed among the bodies, companies, entities and organisations involved in activities relating to the realm of competence of the CSN, these amounting to more than 3,000. Likewise, they are distributed at the trade fairs, congresses and exhibitions in which the CSN participates.

- ✓ Public information centre. 1998 saw the culmination of one of the most ambitious projects undertaken by the CSN in relation to public information and communication activities: the inauguration of the Information Centre. This is a permanent exhibition on radiation and its uses, is open to the public and is mainly aimed at schoolchildren and students. Designed and developed using interactive techniques, the centre is made up of 29 modules occupying an area of 350 square metres and distributed in four areas: the first dedicated to the history of radiation, the second to the use of radiation, the third to the problems and burdens implied by radiation and, finally, the fourth to the work of the CSN.
- ✓ Internet information service. The CSN maintains a direct line of communication with the public via an Internet website, which received daily visits for information on nuclear safety and radiation protection issues, as well as on the activities of the body. The structure of the site allows the visitor to learn what the CSN is like and in which areas it works, the values obtained by the environmental radiological surveillance stations, research and development projects, the legislation, publications, press releases and in general whatever information might be of interest. The number of consultations tends to remain constant throughout the year, although there are significant increases when any episode having a social impact occurs.

20.4. Assessment of compliance

The Spanish Regulatory Body satisfactorily meets the requirements of this Convention, since it is adequately equipped with the legislative and regulatory framework and with the financial and human resources necessary to undertake and fulfil all the functions and responsibilities assigned to it.

As a Body independent from the Central State Administration, the CSN also meets the requirements of the said Convention.

Section F

Other general safety provisions

Article 21. Responsibility of the license holder

Section 1 of this article is generally applied in Spain since, as has been explained in previous chapters, all activities relating to radioactive wastes and/or spent fuel require the corresponding authorisation. This authorisation or licence is awarded to the so-called licensees, and assigns to him the responsibilities described below. In the case of historic wastes or other non-regulated materials (e.g., scrap), specific measures are applied (see section J).

21.1. Legal precepts assigning fundamental responsibility to the licensee

The legal precepts assigning responsibility to the licensee of the facility are included in the Nuclear Energy Act and in the Regulation on Nuclear and Radioactive Installations (RNRI). From the point of view of coverage of the risk of nuclear damage, the licensee of the facility is also underlined as being responsible for its safety. Consequently, the Spanish regulations governing nuclear energy establish as a principle that the fundamental responsibility for the safety of the facilities is to the licensee.

The Nuclear Energy Act, Law 25/1964, defines the operator of a nuclear facility as the physical or legal person holding the authorisation required for its start-up.

The RNRI in force establishes hat in order to obtain the different authorisations, the requesting party must identify the organisation foreseen for supervision of the project and quality assurance throughout the different phases of the facility. It also requires that there be a detailed description of each of the posts in the operator's organisation and the responsibilities assigned to them in relation to nuclear safety and radiation protection, and that the organisation foreseen for the future operation of the installation be presented, along with a preliminary programme for operating personnel training.

The Resolutions by which the specific permits are awarded to the facilities:

- ✓ identify the entity or entities holding the licence, designating them as the Responsible Operator of the facility.
- ✓ approve or issue favourable reports, as appropriate, with respect to the revision in force of the official documents. These documents enter into force only once evaluated and approved by the Nuclear Safety Council (CSN).

- ✓ indicate the guarantees to be provided by the responsible operator with respect to civil liability for third-party damage, in accordance with the regulations governing the coverage of nuclear risk.

Although the legal documents mentioned above make no distinction between electricity generating nuclear facilities and those used for the management of radioactive wastes, and therefore apply the same criteria to the licensee, the creation of a public company responsible under law for the integral management of radioactive wastes introduces certain additional aspects that should be underlined.

In article 7, Royal Decree 1522/84 creating the Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA) to undertake the management of radioactive wastes includes the statement that "it shall be considered as the operator of the facilities required for the final management of the wastes...". It also points out, in article 10, that ENRESA shall receive technological advice and support from the Nuclear Energy Board (JEN)..." (now Ciemat).

Royal Decree 1899/84, governing the activities involved in the fuel cycle, authorises ENRESA to undertake activities relating to radioactive waste management and obliges the licensees of nuclear and radioactive facilities to have installations for waste storage, transport and handling. These installations may be the property of third parties as long as appropriate legal contracts are in place.

Consequently, it may be observed that in waste management there are responsibilities shared by the licensees of the facilities and ENRESA, which have been subsequently developed via contracts in order to specifically establish the interfaces between the parties involved.

In view of the above, it may be concluded that the Spanish regulations establish as a basic principle that the fundamental responsibility for the safety of waste management facilities is to the licensee.

21.2. Licensee's organisation with respect to safety

Given the specific situation existing in Spain, it would be advisable to make a distinction between the licensees of nuclear power plants, who are responsible for the storage of spent fuel while this remains on site, and the licensees of waste disposal facilities.

The Operating Regulations of the Facilities is an official and legally required operating document. This document contains a definition of the job posts and associated responsibilities, the organisation of the personnel of the facility, the personnel training programmes and the operating and radiation protection standards for normal and accident conditions. The fact that changes to this document are subject to a formal process of approval facilitates tracking and control by the regulatory body of any change in the organisation or in the management of the facility that might negatively affect its safety.

Special mention should be made of the facility Quality Assurance group (see Art. 23), since this unit reports directly to the management of the facility's owner company, this notably benefiting its independence of criteria, since it is not involved in the line management of the installation. This unit has to approve all procedures, manuals, modification proposals, etc. on safety-related activities.

The operator's emergency organisation and the missions and responsibilities assigned to each of the job posts are also established in detail in the Site Emergency Plan.

At the nuclear power plants, aspects relating to responsibility for spent fuel management are included in the operating organisation and suitably reflected in the official documents.

As regards ENRESA, two important aspects should be underlined: technical support and the interface with the waste producers, including nuclear power plant licensees. Article 10 of the Royal Decree by which ENRESA was created establishes that ENRESA shall receive technical support from the Centre for Energy-related, Environmental and Technological Research (Ciemat), formerly the Nuclear Energy Board (JEN). The procedural framework of this support is a collaboration agreement establishing the areas of work and products expected.

As regards interfaces with the waste producers, ENRESA has drawn up formal agreements with both the licensees of nuclear facilities and the minor producers, which clearly establish the responsibilities and scopes of action of the parties.

21.3. Responsibility for nuclear damage

According to the Nuclear Energy Act, the operator of a nuclear facility or of any other installation producing or working with radioactive materials or possessing devices that might produce ionising radiations, shall be responsible for nuclear damage. This responsibility shall be objective and limited in its amount to the coverage foreseen by Law.

Indeed, article 55 of the Nuclear Energy Act establishes that all operators of nuclear facilities shall, in addition to obtaining the necessary authorisation, establish coverage for whatever risks might arise in relation to the liability associated with nuclear accidents. The conditions and requirements of this coverage are established in the aforementioned Regulations on Coverage for Nuclear Risks.

The Electricity Industry Act of 1997 updated the amounts of coverage required of nuclear facilities, in accordance with the stipulations of article 57 of the Nuclear Energy Act. Thus, in the case of nuclear facilities, the required coverage shall amount to 150 million euros. Nevertheless, the Ministry of Economy (MINECO) may impose some other limit, of not less than 6 million euros, in the case of the transport of nuclear substances or of any other activity whose risk, in the judgement of the CSN, does not require greater coverage. Likewise, the amount may be increased when the international commitments made by Spanish State so require or when this is appropriate in view of the passing of time or variations in the consumer price index.

In accordance with the above considerations, a coverage of 6 million euros has been established for the El Cabril waste disposal facility.

21.4. Regulatory control activities

Regulatory control is undertaken fundamentally through the assessment and inspection activities performed by the CSN.

Although the operator is responsible for operating the facility under conditions of safety, the CSN has to exercise the surveillance and control in order to ensure that such

conditions are maintained, for which it may carry out the necessary inspections of the installations and equipment and suspend operation of the facility when it is insufficiently safe or when there are risks in excess of tolerable limits. In any case, compliance with the requirements imposed by the Regulatory Body does not exempt the operator from his fundamental obligation to guarantee the protection of the public, the workers and the environment.

As regards the licensee's organisation, the CSN is empowered to monitor its suitability and, in any case, any modification proposed by the licensee and affecting the contents of the licensing documents must be re-subjected to express authorisation by the MINECO, following a favourable report by the CSN.

In this context, and with a further-reaching objective than the one involved in responsibilities for waste management, the CSN has issued Safety Guide GSG-1.13, "Content of operating regulations for nuclear power plants". Its objective is to define criteria serving to make the contents of the operating regulations for operating facilities more uniform, since firstly, there were significant differences in the contents of the regulations governing the different facilities and, secondly, the effects associated with the liberalisation of the economic framework of the electricity industry reinforce the importance of the tracking and control of organisational changes at nuclear facilities.

Within this context of liberalisation of the electricity industry, and in view of the merger between the owner companies of the Almaraz and Trillo plants, on the one hand, and of the Ascó and Vandellós II plants on the other, organisational changes have been made at Almaraz and Trillo, in May 2000, and at Ascó and Vandellós II, in April 2001. These changes have led to a revision of their operating regulations. Once of the most relevant consequences of the audits performed by the CSN is that all the nuclear power plants were requested to draw up and submit to the CSN a document analysing the minimum demands in terms of technical capacity and resources of each department in their organisations in order to guarantee safe operation of the facility.

In addition, the CSN has established that the plant licensees should analyse, justify and document all reductions in the personnel performing safety-related functions at the facilities, even when such functions not require previous authorisation due to their not implying changes to the Operating Regulations in force at the corresponding installation.

As regards ENRESA, audits have been carried out on certain aspects of its organisation, with special emphasis on interfaces with the waste producers and the assignment of responsibilities.

21.5. Assessment of compliance

In Spain there is a regulatory framework that clearly assigns to the licensee the responsibility for activities relating to the safety of nuclear and radioactive facilities, including the management of spent fuel and radioactive wastes. Likewise, this framework establishes measures to cover liabilities for nuclear damage. The regulatory body undertakes surveillance and control of the maintenance of the conditions of the licence. Consequently, Spain is considered to suitably fulfil the obligations of this article.

Article 22.
Human and financial resources

22.1. Availability and qualification of human resources.

The availability of adequate human and financial resources is a key element for the maintenance of safe conditions at nuclear facilities. The RNRI, which regulates the system of administrative authorisations, both for nuclear and radioactive facilities and for other specific activities relating to the application of ionising radiations, establishes requirements regarding the organisations to be presented by the licensee in the different authorisations, as well as for personnel licences and accreditations.

Thus, during the preliminary authorisation requesting phase, the licensee is required to submit, among other documents, the organisation foreseen for supervision of the project and for quality assurance during construction. During the construction permit requesting phase, the licensee has to present the organisation foreseen for the future operation of the facility and a preliminary operating personnel training programme. Finally, the operating permit requires Operating Regulation for the installation, containing the licensee's organisation, this including the functions and responsibilities of all job posts relating to nuclear safety and radiation protection. Modifications to this document must be approved by the Directorate General for Energy Policy and Mines of the MINECO, following the mandatory report by the CSN.

The chapter of the Operating Regulation on organisation must specify the organisation of the facility personnel, including a definition of their job posts and associated responsibilities and the operating and radiation protection standards for normal and accident conditions and of the basic preparation and training programmes for licensed and non-licensed personnel, establishing the degree of technical competence required for each specific mission and the retraining programmes considered to be adequate. Likewise, the Site Emergency Plan establishes the responsibilities and human resources required to respond to emergency situations.

The fact that changes to the Operating Regulation of a facility are subject to a formal process of approval facilitates the tracking and control by the CSN of any organisational or management change that might negatively affect the safety of the installation.

Once a facility is in operation, the CSN carries out periodic inspections, aimed mainly at checking the academic background, experience and training required for each job post, the basic training on radiation protection of all the workers, the scope of the retraining programmes and the fact that they cover changes to the standards, design modifications and relevant operating experience. The licensees are required to submit an annual report to the CSN summarising the main personnel training and retraining activities relating to nuclear safety or radiation protection.

As regards the qualification of the personnel, the RNRI establishes that the posts of Head of the Radiation Protection Service, Supervisor and Operator of nuclear or radioactive facilities require that the individual hold a specific licence. Each such licence is personal, allows the holder to perform his work at a given facility and is granted by the CSN following an examination of candidates by a Tribunal appointed by the CSN (CSN Safety Guides 01.01., Qualifications for the awarding and use of NPP operating personnel licences, and 07.02. Qualification for recognition as expert in protection against ionising radiations for managerial positions at RP Services or Technical Units).

The system established for the awarding of operating permits ensures the availability of the qualified personnel required for the safe operation of the facility, and the system for renewal ensures a reassessment of safety and incorporation of the modifications required to maintain such safety throughout the lifetime of the nuclear facility.

In Spain, the responsibility for the management of radioactive wastes and for the decommissioning and dismantling of nuclear facilities was assigned to ENRESA in 1984 (R.D. 1522/1984). This company possesses an organisation and a staff that allow it to undertake the management programmes set out in the GRWP, approved by the Government. As of 31st December 2001, the company had a staff of 277 people, of which 149 worked at the head offices in Madrid, 117 at the centralised low and intermediate level waste disposal facility at El Cabril and 11 on the project for the decommissioning and dismantling of Vandellós 1 NPP.

In any case, as the operator responsible for these installations, ENRESA is also subject to the system of authorisations and controls that is derived from the existing regulations and that has been referred to above.

22.2. Availability of financial resources

The national system for the management of radioactive wastes and spent fuel not only has a clear assignment of responsibilities, but also a financing system that makes it possible to fulfil such responsibilities.

As regards the NPP's, the financing system is based fundamentally on collections via the application of a percentage fee on total electricity billing by the sector throughout the operating lifetime of the facilities, while for the front end of the fuel cycle it is based on a percentage of the value of uranium and fuel assembly production contracts. In the case of other waste producers (Ciemat and the radioactive facilities), it is based on payment for services rendered, through tariffs to be billed at the moment of waste removal. The prices are established in accordance with criteria set out in the Type Contract approved by the former Ministry of Industry and Energy.

The financing system in force establishes a system of payments on account, such that the revenues received through application of the percentage fees are accumulated in order to finance costs that will normally be incurred years after. In order to ensure financing in an automated fashion and in keeping with the system established, ENRESA makes transfers of the revenues from the aforementioned billing to a fund. The final economic balance of ENRESA's management should be zero. Both the income from the fee and the net surplus financial yield must be set aside to create a special fund, which may be used only for compliance with the corporate objective of ENRESA and for financing of the activities contemplated in the GRWP approved by the Government (additional provision of Law 24/2001, of 27th December, on Fiscal, Administrative and Social Measures).

Management of the Fund created is the responsibility of ENRESA, and a Tracking and Control Committee attached to the MINECO has been set up for the supervision, control and qualification of the financial investments of this Fund.

As part of the obligations arising from the R.D. by which it was created, ENRESA is required to submit annually to the MINECO an economic-financial report allowing the total foreseen costs of radioactive waste management and the decommissioning and dismantling of nuclear and radioactive facilities to be revised. The annual value of the

percentage fees is established by the Government in the R.D. on electricity tariffs, based on calculations made by ENRESA.

22.3. Assessment of compliance

From what has been pointed out in the precious sections it may be concluded that in Spain there is, on the one hand, a regulatory framework providing personnel qualified for the performance of safety-related activities during the operating lifetime of nuclear and radioactive facilities, including those designed for spent fuel and radioactive waste management, and, on the other, a clear financing system allowing for performance of the activities involved in the construction, operation, closure, dismantling and institutional surveillance of spent fuel and radioactive waste management installations. Consequently, Spain adequately complies with the obligations of this article of the Convention.

Article 23. Quality assurance

23.1. Regulatory requirements

Within the Spanish legal system, the RNRI is the instrument that establishes the system of authorisations to which nuclear and radioactive facilities are subject, and the requirements to be met by the licensees to obtain such authorisation.

Among the requirements for awarding of authorisations associated with the life cycle of nuclear facilities, which are the preliminary (or site) authorisation, the construction permit, the operating permit and the authorisation for the decommissioning and dismantling of nuclear fuel cycle nuclear and radioactive facilities, is the existence of an approved quality assurance programme.

Facilities for the storage of nuclear substances, except those used for incidental storage during transport, are considered nuclear facilities. Centralised storage facilities for low, intermediate and high level radioactive wastes are also treated as nuclear facilities, for which reason a quality assurance programme must be applied to them throughout the different phases of their life cycle.

Spent fuel and radioactive waste management activities carried out at the nuclear facilities themselves are also included within the scope of the quality assurance programmes applicable to facility operation.

Other activities that give rise to the generation of large quantities of radioactive wastes are those associated with the dismantling of nuclear and radioactive facilities belonging to the nuclear fuel cycle. In these cases the RNRI also requires the application of a quality assurance programme approved by the administration.

23.2. Quality assurance programme in spent fuel and radioactive waste management

Spain does not currently have a centralised spent fuel storage facility, for which reason the fuel is stored at the nuclear power plants themselves and, as has been pointed out

above, their management is included within the scope of the quality assurance programmes applicable to facility operation. This is also the case for the management of solid, liquid and gaseous radioactive wastes generated during operation.

Spain has the El Cabril centralised disposal facility for low and intermediate level solid radioactive wastes from nuclear power plants, research centres, industry, etc., which is managed by ENRESA. This facility is classified as a nuclear installation, and as such, and in accordance with the RNRI, quality assurance programmes have been applied during the phases of authorisation of the site, construction and operation.

The Vandellós I NPP, the Elefante plant for the treatment of natural Uranium concentrates and the installations of the Ciemat research centre, which are in different phases of dismantling, have quality assurance programmes that are applicable to these activities and that are submitted for approval by the CSN.

The philosophy and requirements of the quality assurance programme are set out in the Quality Assurance Manual, which in the corresponding authorisations is considered to be an official document of the facility, compliance with which is mandatory. This document requires approval by the regulatory authority.

The licensee of the facility may, under his own responsibility, introduce modifications in the Quality Assurance Manual, as long as the changes do not reduce the commitments contained in the quality assurance programme in force. Any changes implying a reduction of such commitments must be submitted to the CSN for its approval prior to their entry into force.

Commitments are understood to be those included in the Quality Assurance Manual in force, in the form of applicable standards and guidelines, and the very description of the programme, as specified in the complementary technical instructions issued by the CSN.

Revisions of the Quality Assurance Manual must be submitted to the CSN within one month as from their date of entry into force.

The CSN has issued various safety guides in order to recommend the standards on which the quality assurance programmes applicable throughout all the phases of the life cycle of the Spanish nuclear facilities should be based. Safety Guide GSG 10.01 "Basic quality assurance guideline for nuclear installations", recommends the application of the Spanish standard UNE 73-401 "Quality assurance at nuclear facilities", the requirements of which are in accordance with those of appendix B of the US 10 CFR50 and with those of the IAEA codes and guidelines on quality assurance. Also considered acceptable is the direct application of the basic standards of the country of origin of the project or the guidelines and codes issued by the IAEA.

The licensee of the facility is responsible for ensuring that a quality assurance programme is established and implemented for the safe operation of the installation. The licensee may have other organisations or specialists establish and put into practice such a programme, although he will continue to be responsible for the effectiveness of the programme overall.

The organisation that carries out the assessment of the efficiency of the quality assurance programme and verification that activities are performed in compliance with the requirements established should have the necessary authority, freedom and independence within the licensee's organisation to identify quality problems and verify the effectiveness of the solutions adopted.

In addition to independent evaluations, the licensees are introducing self-assessment activities to improve the efficiency of the programmes.

Safety Guide GSG 10.1 is applicable to all safety-related activities performed by and for the Spanish nuclear facilities. Included, therefore, are not only activities carried out at the nuclear facilities themselves, during the different phases of site selection, design, construction, start-up, operation and decommissioning and dismantling, but also those performed by external organisations, such as the engineering, manufacturing and inspection of structures, systems or components for such facilities.

As regards the transport of radioactive wastes, GSG-06.01 "Quality assurance in the transport of radioactive substances" has recently been issued. This establishes recommendations regarding the requirements that should form the basis of the quality assurance programmes of companies carrying out activities during any of the phases of radioactive material transport, in which – and in addition to the basic standards indicated above – consideration has been given to the IAEA Safety Series Guide No 113 " Quality assurance for the safe transport of radioactive material", US Nuclear Regulatory Commission (NRC) Regulatory Guide 7.10 "Establishing Quality Assurance Programs for packaging used in the transport of radioactive material" and UNE-EN 12798 "Quality system in transport. Transport by road, rail and watercourses. Quality system requirements complementary to Standard EN ISO 9002 regarding safety in the transport of hazardous merchandise".

The rest of the CSN guides on quality assurance cover specific aspects applicable to design, operation, start-up, testing and inspections, audits, procurement of supplies, etc.

23.3. Regulatory control activities

Regulatory control is exercised by way of the assessment and inspection activities carried out by the CSN.

As regards assessment activities, the CSN checks that the quality assurance manuals comply with the recommended nuclear standards criteria and that persons having responsibility for quality assurance have sufficient authority and freedom to identify conditions adverse to quality, recommend or provide solutions and verify the implementation of such solutions, and that mechanisms are established for such persons to have access to a level of management that guarantees the authority, freedom and independence required for them to perform their functions. Likewise, it assesses specific quality plans applicable to the design and manufacturing of transport and storage canisters for new and spent fuel.

The CSN's annual inspection programme includes the inspection of the quality assurance programmes in place at the El Cabril centralised low and intermediate level solid waste disposal facility and of the dismantling activities at the Vandellós I nuclear power plant. In addition, inspections are usually scheduled with respect to the quality assurance programmes of other activities, such as dismantling of the Elefante natural Uranium concentrates treatment plant, the Ciemat installations, the transport of radioactive materials, etc.

Independently of the inspections of quality assurance activities, the CSN inspection programme contemplates the systematic inspection of management of the spent fuel stored at the NPP's and of the solid, liquid and gaseous radioactive wastes generated at nuclear facilities, in order to verify compliance with the requirements of the licensing documentation.

23.4. Assessment of compliance

From what has been said in the previous sections, it may be gathered that in Spain there is a sufficient regulatory framework and that adequate quality assurance programmes are applied in relation to spent fuel and radioactive waste management.

Article 24. Operational radiation protection

The current Regulation on Protection against Ionising Radiation (RPIR) was published in July 2001. This constitutes a transposition to the Spanish standards of the EU Directive 96/29 EURATOM as regards protection of workers and the general public against the risks deriving from ionising radiation.

This standard is applicable, therefore, to facilities in which spent fuel or radioactive wastes are stored.

The Regulation establishes as basic principles of protection the concepts of *justification, optimisation and limitation*, establishing also the general standards and requirements applicable to the different groups and situations.

In Spain, spent fuel is temporarily stored at the nuclear power plants, for which reason the protection requirements are encompassed in the general requirements applicable to the installations. Low and intermediate level radioactive wastes are disposed of at the El Cabril facility, belonging to ENRESA, in Sierra Albarrana (Córdoba).

The measures implemented in Spain to protect the workers and the public during the operational lifetime of spent fuel and radioactive waste management facilities are described below.

24.1. Protection of workers

24.1.1. Measures adopted to ensure that exposure to radiation is kept as low as reasonably achievable

The concept of *optimisation* of protection, commonly known as the ALARA criterion, was introduced by the International Commission for Radiological Protection (ICRP) in its publication 26, and was subsequently maintained and strengthened in publication 60.

The ALARA criterion is included in the aforementioned regulation; thus, article 4 establishes that *Individual doses, the number of persons exposed and the probability of potential exposures occurring should be maintained at the lowest values reasonably possible, taking economic and social factors into account.*

The methods used to analyse and achieve an optimum level for protection vary from common sense to the most complex cost/benefit, multi-attribute analysis. The optimisation process is related essentially to the radiation source and should first be applied in the design phase. It is in this phase that dose reductions may be most efficiently achieved, via quantitative analysis. During the operational phase, on the other hand, in-

formal analysis predominates, based on experience, good practice and engineering judgment.

As regards compliance with the regulatory requirement that the doses received by exposed workers be maintained at the lowest levels reasonably achievable, the following should be pointed out:

- ✓ The rational application of this principle at the facilities consists of achieving a level of exposure to radiations sufficiently low to guarantee adequate protection of the workers (within a range of doses far below the established limits), but without the economic feasibility of the facility being put in jeopardy.
- ✓ One of the most indexes widely used at international level for evaluation of the degree of application of the ALARA criterion is the value of *annual collective dose.*
- ✓ The CSN regularly carries out a comparative analysis of the values obtained for this index at the Spanish plants and in the USA and OECD member countries.

The results obtained for the aforementioned index point to the fact that in overall terms the situation of the Spanish facilities, as regards application of the ALARA criterion, is in keeping with that existing in other countries. In order to ensure that this situation is maintained, the CSN is currently promoting greater development in implementation of the ALARA principle. There are two courses of action in this respect:

- ✓ The use of more complete and adequate indexes for effective assessment of the degree of implementation of the ALARA principle.

  In this respect, CSN Safety Guide GSG-01.05, *Documentation on refuelling activities at light water nuclear power plants,* has been published, this providing complete insight, as from 1991, into the collective dose associated with each of the tasks performed during refuelling outages, using a coding system compatible with that utilised in the EU.

  In this same context, the CSN participates actively in the Information System on Occupational Exposure (ISOE), promoted by NEA-OECD. This participation allows the CSN to have access to international information on collective dose data by tasks and on the dose reduction techniques applied in different countries.
- ✓ An in-depth revision of the content, structure and scope of the dose reduction `programmes implemented at the Spanish plants, based on three courses of action:
  - ➪ Extension of the responsibility for application of the ALARA principle (currently delegated to the Radiation Protection Services) to other organisational units, in particular to higher levels of management.
  - ➪ Strengthening the efficiency of application of the ALARA criterion through the existence of a specific and permanent structure for its management.
  - ➪ Homogenisation of dose reduction programmes.

In 1999 the CSN published its Safety Guide 1.12, "Practical application of the optimisation of radiological protection in nuclear power plants", which contains the general criteria to be considered by the organisation of companies participating in activities relating to nuclear power plant operation, in order to manage the optimisation of exposures to ionising radiations.

24.1.2. Measures adopted to ensure that no worker is exposed, in normal situations, to radiation doses exceeding the national dose limits, giving due consideration to internationally approved radiation protection standards

The dose limits for professionally exposed workers established in the new RPIR are based on the recommendations of ICRP- 60 and are as follows:

1. Effective dose limit (5 official consecutive years): 100 mSv, subject to maximum effective dose of 50 mSv in any official year.
2. Annual equivalent dose limits (official year)

Skin (averaged over 1 cm^2)	Lens	Hands, forearms, feet and ankles
500 mSv	150 mSv	500 mSv

For the prevention of exposure of the workers, the latter are classified depending on their working conditions; they are also classified by places of work in different areas, depending on the annual doses that it is possible to receive in these areas, and the standards and control measures to be applied in the different areas and to different categories of workers are established. Likewise, requirements are established for the determination of doses and their recording for medical surveillance of the workers.

As regards compliance with the dose limits established for professionally exposed workers, the radiation protection standards in force in Spain include the following requirements regarding the dosimetry of individuals that, because of their occupational activity, are exposed to ionising radiations:

- ✓ Adequate surveillance systems must be in place to determine the doses received by professionally exposed workers.
- ✓ Individual dosimetry must be undertaken by entities expressly authorised by the CSN.
- ✓ Work in the presence of ionising radiations must be performed such that the doses received by professionally exposed workers be lower than the dose limits established.

An analysis of the dosimetry situation of professionally exposed workers at Spanish nuclear facilities may be accomplished on the basis of assessment of the degree to which these regulatory requirements are met in practice.

The practice adopted by the Spanish facilities, as regards the radiological surveillance systems used to determine the doses received by their personnel, is in keeping with the directives issued in this respect by the International Commission for Radiological Protection (ICRP); indeed:

- ✓ Professionally exposed workers belonging to category A are equipped with individual physical dosimeters (*official dosimetry*) which is processed monthly and allows insight to be gained into the dose received by them in the set of activities performed during this period of time.

  In addition, for the performance of tasks inside the controlled zone, direct reading individual dosimeters are used (*operational dosimetry*), these allowing immediate insight to be gained into the doses received during the perfor-

mance of tasks, which allows for adequate task planning from the radiological point of view.

✓ Apart from these individual radiological surveillance systems, there are area, fixed and portable systems distributed around previously selected zones, which also allow for evaluation of the doses received by the workers during their stay in these areas.

✓ The individual doses received by professionally exposed workers belonging to category B may be assessed on the basis of the results obtained from the surveillance performed in the working environment as long as these make it possible to demonstrate that these workers are correctly classified as category B.

✓ The control of internal dosimetry for workers with the risk of incorporating radioactive material is performed at least annually, in the case of workers on the plant payroll, and controls are performed previous and subsequent to the operations carried out in the case of contractor workers.

The suitability of the surveillance systems used is evaluated by the CSN during the design phase of the installations. Also subject to assessment are aspects relating to the maintenance and operation of these systems, which are additionally verified during the periodic CSN inspections.

The situation of the Spanish nuclear facilities, as regards not exceeding the regulatory dose limits, may be said to be satisfactory, since:

✓ As regards external dosimetry, there has been no case of the regulatory dose limits having been exceeded. Furthermore, the results obtained show that a high percentage of the professionally exposed workers (more than 90%) systematically present doses lower than a tenth of these limits.

✓ As regards internal dosimetry, the experience acquired to date is satisfactory, since cases of internal contamination occur only very sporadically. Indeed, despite the fact that the recording level established by the CSN (1% of the regulatory Annual Incorporation Limit), in force until the end of 2000, is much lower than what is recommended in this respect by the International Commission for Radiological Protection (10% of the regulatory Annual Incorporation Limit), only in very few cases was this recording level exceeded. As from January 2001, the annual recording level established has been 1 mSv.

The dose values obtained from the official dosimetry systems are submitted periodically to the CSN, which is in charge of the management and maintenance of a national dosimetry bank. This makes it possible for the CSN to evaluate the dosimetry data and, if any anomaly is detected, to establish the appropriate corrective actions. Likewise, the licensees of the facilities are obliged to notify the CSN of any incident implying a potential overexposure to radiations, the suitability of the activities of the radiation protection services being evaluated and additional measures being required if necessary, in order to avoid the repetition of analogous incidents.

Specific dosimetry data for professionally exposed workers are presented below, these having been included in the CSN report to the Lower House of Parliament for the year 2001.

a) El Cabril radioactive waste disposal facility

The professionally exposed workers performing activities at the El Cabril radioactive waste disposal facility in 2001 amounted to 247. The dosimetry readings imply a collective dose of 23 mSv/person. If only workers receiving significant doses are considered, the average individual dose for this group is 0.66 mSv/year, 1.31% of the annual limit.

b) Nuclear power plants

As regards the dosimetry results for 2001 for the nuclear power plants overall, it should be pointed out that there were 6,532 professionally exposed workers in this area who were controlled dosimetrically. The dosimetry readings gave a collective dose of 4,559 mSv/person, the overall average individual dose for this group being 1.48 mSv/year, considering calculation of this parameter only for workers with significant doses. This average individual dose amounts to 2.96% of the annual dose limit (50 mSv/year).

The main contribution to the collective dose in this sector (3,741mSv/person) corresponded to contracted personnel, with a total 4,452 workers and an average individual dose of 1.57mSv/year. In the case of plant personnel, the collective dose was 818 mSv/person, with a total 2,142 workers and an average individual dose of 1.17 mSv/year.

As regards internal dosimetry, controls were applied by direct measuring of body radioactivity for all workers exposed to significant risk of radionuclide incorporation, and in no case were values in excess of the established recording level (1% of annual incorporation limit) detected.

24.2. Protection of the public

The RNRI expressly requires that the exposure of the members of the public as a result of justified practices be kept as low as is reasonably achievable, taking into account economic and social factors (ALARA). This philosophy is applied both during the licensing stage and during the operation, decommissioning and dismantling of the Spanish nuclear facilities in general, and in particular those used for spent fuel storage and radioactive waste management, as is reflected in their respective official operating documentation.

Rigorous application of the ALARA criterion requires the performance of optimisation studies for each facility, through the application of cost-benefit analysis techniques or other equivalent methods. In practice, and in view of the difficulties involved in assigning a monetary value to the Sievert-person, the reverse process is adopted in most countries; i.e., very low dose values have been established and, on the basis of these values the systems for liquid and gaseous radioactive effluent treatment have been designed. These values are generally very conservative, since they are established as a minor fraction of the public dose limits, for which reason is not to be expected that any specific optimisation study might result in a lower dose. The values established for the Spanish nuclear facilities come from the United States standards, since this is the country of origin of the technology used for all the Spanish nuclear power plants, except Trillo.

The Nuclear Regulatory Commission (NRC) carried out a series of generic optimisation studies for American technology light water reactors. These gave dose values that were incorporated into the US legislation (10CFR50 for nuclear power plants and

10CFR61 for radioactive waste storage facilities) as design objectives for radioactive effluent treatment systems. Consequently, all installations of these characteristics whose treatment systems satisfy these generic values may implicitly be considered optimised. Nevertheless, other ALARA values might be accepted, as long as they be the result of a specific optimisation process.

The RPIR establishes the following dose limits for members of the public:

- ✓ An effective dose limit of 1 mSv per official year. However, under special circumstances, higher effective dose limit might be authorised in a single official year, as long as the average over five consecutive official years dies not exceed the value indicated above.
- ✓ Without prejudice to the above, an equivalent dose limit per official year of 15 mSv is established for the lens and 50 mSv for the skin.

In order to guarantee compliance with these limits and ensure that the exposure of the population is as low as reasonably achievable, the following is also required:

- ✓ Practices be appropriately designed so as to avoid or reduce to the reasonable minimum the release to the environment of radioactive effluents.
- ✓ The levels of activity for the release radioactive effluents to the environment shall be such that both the concentrations of activity of the radionuclides present therein and the doses that the population might receive be as low as reasonably achievable, taking into account economic and social factors, and in any case lower than the limits specified for the members of the public.
- ✓ Facilities in which solid wastes and effluents implying a significant biological risk may be generated shall be equipped with independent specific storage, treatment and, where appropriate, disposal systems, the operation of which shall be subject to adequate revision in order to avoid uncontrolled discharges.

24.2.1. Limitation of releases from nuclear facilities

Releases of radioactive effluents are subject to express authorisation by the MINECO, following a report by the CSN. The operating permits of all the Spanish nuclear facilities establish a system for the limitation, surveillance and control of radioactive effluents as part of the Operating Technical Specifications (OTS's), a system that includes the following:

- ✓ release limits,
- ✓ sampling and analysis programme required to verify compliance with the limits,
- ✓ the obligation to perform monthly dose calculations and to estimate the doses over the last twelve consecutive months,
- ✓ the minimum instrumentation required for the surveillance and control of effluents, as well as the operability requirements, surveillance testing and determination of setpoints of monitors, and

- ✓ the operability requirements of effluent treatment systems, with the obligation to estimate doses for the planning of effluent treatment prior to their release off site.

In the case of the nuclear power plants, the detailed development of these OTS's is included in a specific document known as the Off-site Dose Calculation Manual (ODCM), while in the case of the El Cabril waste disposal facility it is part of the Technical Specifications themselves. The ODCM is an official nuclear facility operating document that contains the methodology and parameters used in estimating doses to the critical individual and in calculating the setpoints of effluent monitors.

The release limits are values derived from a process of optimisation, for which reason they are much more restrictive than the basic dose limits established in the RPIR. In 2001, following the entry into force of the current RPIR, the release limits were updated. Although this did not imply any modification of the values established, it did include a change to the limited dosimetric magnitude, which is now expressed in terms of effective dose. At the same time an in-depth revision of the ODCM was undertaken and both the activity to dose conversion factors and others, such as food intake rates, were modified, following a detailed study at national level. The new limits entered into force in January 2002.

At present, an effective dose limit of 0.1 mSv/year is applied to the nuclear power plants, both during operation and during the dismantling stage, this being considered for periods of twelve consecutive months. This value, which corresponds to the overall effluents issued by each of the units on a site, is distributed between liquids and gases depending on the specific characteristics of the site, and generally corresponds to 0.08 mSv/year for gaseous effluents and 0.02 mSv/year for liquid effluents.

The zero releases criterion is applied for liquid radioactive effluents at the El Cabril disposal facility, with the potentially contaminated waters generated being incorporated into the mortar used to backfill the waste containers. Consequently, this facility issues only gaseous radioactive effluents to the environment, for which the release limit is an effective dose of 0.01 mSv over twelve consecutive months.

In the Spanish limitation system, the application of the ALARA criterion goes even further, such that in addition to establishing release limits, the effluent treatment systems are required to be operable and used when the foreseen doses exceed a minor fraction of these limits; where this requirement were not to exist, releases of untreated effluents might be performed as long as the resulting doses were below these limits. In view of the above, there is a very wide safety margin to guarantee that no member of the public will receive significant doses as a result of the release of radioactive effluents during the normal operation of nuclear facilities or during their dismantling.

24.2.2. Verification of compliance with release limits

Given that the release limits are established in terms of dose, the licensees of Spanish nuclear facilities are required to estimate monthly the dose accumulated over twelve consecutive months. These calculations are carried out by considering the results obtained from the sampling and analysis programmes to constitute the source term and applying the procedures specified in the ODCM.

The objective of estimating doses due to radioactive effluents is to check that the release limits are adhered to even under the most unfavourable conditions, for which reason they are particularly conservative. For each facility a critical group is defined, as de-

scribed in ICRP-60. The critical groups are assumed to exist in the area in which the concentration in the air and the deposition of aerosols are estimated to be maximal. As regards the parameters involved in the calculations, and for local characteristics, the habits of the population and the use made of land and water are considered to be site-specific values; nevertheless, certain generic values are also used, such as the period of time during which animals graze, the time elapsing between food production and consumption, etc. The methodology used, described in the ODCM, is the same at all the Spanish nuclear facilities and considers the following assumptions:

- ✓ the calculations are performed for the maximum individuals, these being considered as those whose habits represent a reasonable deviation with respect to the population average,
- ✓ all foodstuffs consumed are produced in the area in which the critical group is located, and
- ✓ the critical group for gaseous effluents also consumes water, crops watered with and animal products contaminated by the water affected by the liquid effluents released.

The values obtained from these calculations are submitted monthly to the CSN, along with other relevant data on effluents, for verification of compliance with the authorised limits and analysis and assessment of release trends.

It is also established that the licensees should carry out environmental radiological surveillance programmes (ERSP) in the area of influence of their nuclear facilities. These programmes, which are previously evaluated and approved by the CSN, imply the collection and analysis of a large number of samples of air, water, soils and sediments, indicator organisms and foodstuffs. The results of the ERSP, which are sent annually to the CSN, allow insight to be gained into the real impact of releases on the environment.

In addition, the CSN carries out periodic dose estimates on the basis of both actual release data and environmental measurements.

24.3.3. Control of releases

In accordance with the regulatory requirements, the Spanish nuclear facilities are equipped with liquid and gaseous effluent treatment systems, in the design of which consideration has been given to the principle of optimisation; these systems incorporate the instrumentation required to exercise adequate surveillance and control over the effluents prior to their release off site. The systems make it possible to collect, store and process the different types of liquid and gaseous radioactive wastes that are generated during the normal operation of the facilities and during the foreseen operational incidents.

The operating permit for nuclear facilities requires the licensee to carry out a detailed study of releases and a radiological assessment of their consequences, and describes how the measures adopted for their treatment and control meet the national and international requirements.

During operation, the licensees have to demonstrate that all reasonable efforts are made, from the generation of the wastes to the operating procedures of the treatment systems, to reduce releases and keep their radiological impact as low as is technically and economically achievable. They are required to implement an on-going improvement programme in keeping with the evolution of the applicable standards, technologi-

cal progress and operating experience. Likewise, they are required to consider the applicability of new standards arising in the countries of origin of their projects.

For some years now, the licensees of nuclear power plants have also been required to carry out a periodic safety review including the following, on the basis of a period of ten years:

- ✓ analysis of the overall performance of the facility,
- ✓ demonstration that the lessons learned from analysis of operating experience have been correctly implemented, and
- ✓ assessment of whether the relevant changes made to new generation plants are applicable to their facilities.

Furthermore, the CSN carries out a systematic analysis of the trends observed in the radioactive effluents from all the nuclear facilities, and the licensee is required to justify any upward trend and to return to the original values if this is feasible, even though the values be far below the established release limits. In this respect, at the beginning of the 1990's the so-called "Reference levels" were established for the liquid and gaseous effluents from Spanish nuclear power plants, expressed in terms of the activity of groups of nuclides, which indicate the optimum operation of the reactor in relation to the generation of radioactive wastes and to releases to the environment. These values may be revised following detailed analysis of:

- ✓ historic releases and their relationship with the authorised limits
- ✓ the techniques used and operating procedures adopted by the plant for radioactive waste management.

Consequently, as regards the control of radioactive effluents the Spanish regulatory system is an adequate framework for the efficient application of a clearly established policy, which requires the implementation of the applicable technological breakthroughs, compliance with the requirements and recommendations of the competent international authorities and incorporation of the measures required to ensure that releases are limited and that the impact on the public and the environment is minimised.

This is underlined in the comparative studies performed at international level, from which it may be gathered that the releases from Spanish nuclear power plants are similar to those from European plants using the same technology.

In any case, the releases of radioactive effluents from the Spanish nuclear facilities represent a minimum risk for the members of the public and for the population overall, as may be deduced from the doses due to these releases. In spite of the particularly conservative approaches applied to their estimation, the values obtained for the effluents (liquid and gaseous) from the Spanish nuclear power plants represent 10% of the release limits, this value amounting to 1% (gaseous) in the case of the El Cabril disposal facility.

24.2.4. Non-scheduled or uncontrolled releases

In order to prevent the non-scheduled or uncontrolled release of radioactive materials to the environment, the Spanish nuclear facilities are equipped with the following:

- ✓ Surveillance instrumentation allowing such releases to be detected.
- ✓ Release isolation devices for cases in which the pre-established values are exceeded.

✓ The activation of alarms when abnormal conditions are detected.

✓ Administrative controls.

However, if in spite of these measures non-scheduled or uncontrolled releases were to occur, the licensees of the nuclear power plants are required to adopt the measures necessary to detain or control the releases if possible, and to minimise their impact off site. Likewise, they are required to identify the cause or causes of such releases and define the actions to be adopted to prevent their recurrence. All these aspects have to be reported to the CSN for analysis and approval; if considered necessary, the measures adopted are incorporated at the other facilities of the same type.

The ERSP's carried out by the licensees of nuclear facilities make it possible to identify increases in environmental activity as a result of releases and to check the efficiency of the measures adopted to mitigate their effects.

24.3. Assessment of compliance

In view of the workers radiation protection measures, surveillance programmes, limitation and control of effluents and environmental radiological surveillance programmes described above, along with application of the ALARA criterion, it is considered that the Spanish facilities correctly fulfil the requirements of this article.

Article 25. Emergency preparedness

25.1. Summary of laws, regulations and requirements relative to planning and preparation for emergency situations

The planning and preparation for nuclear emergency situations are governed within the Spanish State by the Basic Nuclear Emergency Plan (PLABEN) and by the RNRI. Also, the Law by which the CSN was created and the Basic Civil Defence Standard include general provisions on the emergencies that might occur at nuclear or radioactive facilities.

25.1.1. Basic Civil Defence Standard

This standard, approved by Royal Decree on 24th April 1992, determines the distribution of responsibilities regarding preparation and planning for emergencies of different types among the organisations making up the Spanish State: the Government of the Nation (State responsibility), the Autonomous Communities and the local authorities. It also determines different types of plans depending on the specific risks for which they are designed. Specifically, for emergencies implying a radiological risk, the standard determines that these fall within the realm of competence of the State and their planning in accordance with a Basic Plan.

25.1.2. Basic Nuclear Emergency Plan (PLABEN)

The Basic Nuclear Emergency Plan was approved by the Cabinet of Ministers, in response to a proposal by the Ministry of the Interior, on 3rd March 1989, following re-

ports from the CSN and the National Civil Defence Commission, and was published by an Order from the Ministry of the Interior on 29th March 1989.

The PLABEN constitutes the basic directive for planning of the response to nuclear emergencies within the State. Its objective is to protect the population against the adverse effects of ionising radiations, which might arise from the uncontrolled release of radioactive material as a result of a nuclear accident, and it defines the actions foreseen by the Public Authorities to afford this protection. The PLABEN contains fundamentally the radiological criteria defined by the CSN for planning of the response to emergencies at nuclear facilities.

Although the scope of the PLABEN is limited to nuclear power plants, the principles and criteria that this directive contains may be used to plan actions at facilities or for activities that might give rise to radiological emergencies, taking into account that the organisation foreseen therein and the mechanisms for availability, communication and mobilisation of human and material resources might be used for this type of emergencies, which are not necessarily associated only with nuclear plants.

As regards its practical application, the PLABEN is developed by way of:

- ✓ Provincial Emergency Plans,
- ✓ Nuclear Facility Site Emergency Plans,
- ✓ Municipal Emergency Plans

and the establishment of a Central (National) Level of Response and Support constituted by the Directorate General for Civil Defence (DGCD) of the Ministry of the Interior and the CSN, within their respective realms of competence. This is described in greater detail in the following paragraphs.

25.1.3. Law creating the Nuclear Safety Council

Law 15/1980, of 22nd April 1980, by which the CSN was created, assigns to this body among other functions the responsibility of collaborating with the competent authorities in preparing the criteria to be met by the emergency plans for nuclear facilities, and, following the preparation of such criteria, participation in their approval.

25.1.4. Regulation on nuclear and radioactive installations

This Regulation requires that, in order to obtain the mandatory operating permit for a nuclear facility, the requesting party draws up and submit an Emergency Plan, to be approved through the awarding of such permits.

In Spain there is no installation having as its main purpose the management of spent fuel; there is, however, a facility aimed mainly at the management of radioactive wastes that, in accordance with the Spanish Regulation, is classified as a nuclear facility. Consequently, this facility, like the country's nuclear power plants, is required to have a Site Emergency Plan, which is approved by the MINECO (Directorate General for Energy Policy and Mines) following a report by the CSN, the said Plan being evaluated in light of the national and international standards.

25.1.5. Royal Decree creating the national radioactive waste agency

Royal Decree 1522/84, which authorises the constitution of ENRESA, assigns to this company the function of providing support for the civil defence services in the event of nuclear emergencies, in the way and under the circumstances required.

25.2. Application of emergency preparedness measures, including the role of the regulatory authority and other organisations

25.2.1. Classification of emergency situations

Categories of emergencies

In the nuclear power plant Site Emergency Plans, the possible accidents that might occur during operation are classified in 4 emergency categories, established on the basis of the plant conditions and taking into account the maximum quantity of radioactive material that might be released off site, with consideration given to a pessimistic evolution of the emergency initiating event.

Analogously, at the radioactive waste management facility existing in Spain, emergency situations are classified in three categories, in increasing order of seriousness and decreasing order of probability: Category I (Emergency Prealert), Category II (Emergency Alert) and Category III (Site Emergency). This classification has been based on the accident and risk analyses performed with respect to this facility, from which it has been deduced that any release of radioactive materials off site would not be in quantities warranting the adoption an off-site emergency plan.

25.2.2. Radioactive waste management facility plan for on-site emergencies, including support organisations and systems

Site Emergency Plan

The objective of this Plan is to set out the actions foreseen by the licensee of the nuclear facility to reduce the risk of a radiological emergency and, were such an emergency to occur, to limit the release of radioactive material to the environment.

In this respect, the owner of the facility is responsible for correctly operating the plant in accordance with the technical specifications and operating procedures, under both normal and accident conditions, and for promptly and accurately notifying the Public Authorities in the event of the occurrence or imminent occurrence of a radiological emergency.

These actions are included in the Site Emergency Plan, which is a mandatory document for the application for and awarding of the operating permit for the nuclear facility, in accordance with the provisions of the current RNRI.

The Site Emergency Plan is drawn up by the licensee of the facility and submitted to the MINECO for consideration and approval where appropriate. The Directorate General for Energy Policy and Mines of the aforementioned Ministry is currently the National

Authority in charge of approving the Site Emergency Plans of Nuclear Facilities, following consideration of a mandatory report from the CSN.

Central Level of Response and Support

The Basic Nuclear Emergency Plan constitutes a model for response to emergencies at nuclear facilities, which is applied at national level and contemplates the mobilisation of all the resources and capabilities of the Spanish State required to configure such a response. Management of the national resources for support of the basic or provincial levels of response is accomplished via the so-called Central Level of Response and Support, which is made up of the following:

- ✓ The DGCD of the Ministry of the Interior, as the organisation coordinating all the support required from the different Organisations of the Central Administration and other Administrations, and
- ✓ The CSN for all aspects relating to nuclear safety and radiation protection, coordinating in turn the different public or private organisations and companies whose participation is necessary to respond to the specific functions attributed to this body.

25.2.3 CSN response and preparedness for emergency situations

The essential responsibilities of the CSN in the event of a radiological emergency are as follows:

- ✓ Tracking of the situation, obtaining and independent assessment thereof.
- ✓ Advising the Authorities on aspects relating to nuclear safety and radiation protection during the emergency.
- ✓ Issuing proposals to the Authorities on classification of the seriousness of the emergency off site and on protection measures for the population.
- ✓ Informing the Authorities, public opinion and the media, in coordination with the information provided at local or provincial level.

In order to comply with these responsibilities, the CSN should essentially carry out the following functions:

- ✓ gain insight into and estimate the evolution of the initiating event,
- ✓ measure and analyse the levels of radiation and contamination,
- ✓ estimate the radiological effects of the accident,
- ✓ determine the most suitable protection measures for the population.

With a view to fulfilling all these functions, the CSN has developed an Emergency Action Plan, which includes a special organisation of its human resources and specific tools designed to help with the processes to be performed by this organisation. The Emergencies Room (SALEM) is the location at which the CSN Emergencies Organisation performs its function and where the tools required for this function are located. This Room is permanently manned by technical and support personnel.

Annex J includes a description of the CSN Action Plan for emergency situations and the available facilities and resources.

25.3. Preparation and training: simulations and drills

The general aspects of the preparation and training of those persons who might intervene in an emergency are included in the PLABEN, the Provincial Emergency Plans and the Agreement of the Cabinet of Ministers transposing the European Union's Council Directive 89/618/EURATOM on public information.

Emergency response personnel preparation and training activities are subjected to a process of planning, developed through annual programmes for both the personnel of nuclear facilities and for the staff of public administrations required to intervene to address radiological emergencies. These programmes include theoretical and practical courses, training drills and partial and general simulations aimed at verifying the degree of preparedness of the personnel and support systems and equipment.

As regards the radioactive waste management facility, an obligatory annual site emergency simulation is performed. The objective of this simulation is to check the suitability of the facility's Site Emergency Plan through the performance of a series of activities that cover most of the radiological emergency response actions established in the Plan.

The CSN undertakes tracking of the performance of the annual emergency simulations at the aforementioned facility, through the activation and actuation of the emergencies organisation at the SALEM. The participation of the CSN's emergencies organisation in these simulations takes place under conditions of maximum realism, applying the existing procedures for the activation and intervention of the organisation's operational groups. Furthermore, these simulations include practising coordination between the CSN and the Provincial and National Authorities required, with a view to verifying the general efficiency of the procedures for coordination with the organisations involved.

Spain actively participates in the programmes of simulations and drills established at international level: exercises within the European Union's ECURIE system, the OECD's INEX.2 exercises programme and bilateral exercises with Portugal. The CSN coordinates Spain's participation in these exercises, in all cases activating its emergency response organisation. The emergency Civil Defence and National Government teams also participate, all in coordination with the CSN. In addition to verifying the international procedures for the notification of nuclear emergencies and the exchange of information, these exercises also put into practice the national procedures for the coordination of the different institutions, especially those relating to tracking of the situation, decision-making and information for the media and the population overall.

25.4. Arrangements at international level, including with neighbouring countries where necessary

The Spanish State has subscribed to the Convention on Early Notification of a Nuclear Accident and to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. As regards the Early Notification Convention, the CSN is the Competent National Authority and the SALEM the National Point of Contact. Within the Convention on Assistance, the Competent National Authority is the DGCD and the National Point of Contact its Operation Co-ordination Room (SACOP).

Furthermore, as a Member State of the European Union, Spain has to establish in its territory and with respect to other States and the Commission what is contemplated by the Decision of the Council 87/600/EURATOM, regarding Community arrangements for

the rapid exchange of information in the event of a nuclear accident or radiological emergency, known as the ECURIE arrangements. The CSN is the Competent National Authority for ECURIE and the SALEM the National Point of Contact.

In addition, the Spanish and Portuguese States have subscribed and maintain a Bilateral Agreement on the Nuclear Safety of Boundary Nuclear Facilities, which includes specific notification and information exchange actions to be taken in the event of a nuclear accident or radiological emergency occurring in or having effects on the respective national territories of the two States. The CSN is the Competent National Authority for the application, maintenance and development of this Bilateral Agreement and the SALEM the National Point of Contact.

25.5. Assessment of compliance

From what has been said above it may be deduced that in Spain the Planning for and Response to radiological emergency situations complies with the requirements of articles 25.1 and 25.2 of the Convention.

The Spanish Integrated Emergency Plan, constituted by the Central Level of Response and Support, the Site Emergency Plans of the nuclear facilities, the CSN Emergency Action Plan and the adequate instruments for coordination and interfacing between them, imply compliance with the requirements of article 25.1 of the Convention, given that these plans are regularly tested through the periodic performance of partial and integrated exercises and drills.

These instruments for planning and response and the International and Bilateral Agreements subscribed by the Spanish State in relation to emergencies guarantee compliance with the requirements of article 25.2 of the Convention.

In Spain there are currently on-going and planned actions aimed at improving the general nuclear emergency response capacities of the State. Certain of these actions refer to the following:

- ✓ Revision of the Basic Nuclear Emergency Plan to introduce the new radiological criteria defined at international level.
- ✓ Improvement and updating of the resources and capacities of the Provincial Plans.
- ✓ Incorporation of new decision-making aid systems.
- ✓ Improvement of aspects relating to application of the plans and procedures for public information.
- ✓ Establishment of generic guidelines for the performance of actions during the recovery phase.

Article 26. Decommissioning

26.1. Decommissioning and dismantling regulatory scheme

The reference regulatory framework for the dismantling and decommissioning of the Spanish nuclear facilities is included in the RNRI. Chapter VI of these regulations is ded-

icated fully to the system of administrative authorisations required for the dismantling and decommissioning of such installations. In most cases, the contents of the *Royal Legislative Decree 1302/1986* on the *Assessment of environmental impact* and of *Royal Decree 1131/1988* containing the *Regulation for the enactment of Royal Legislative Decree 1302/1986 on the Assessment of environmental impact* are also applicable.

The aforementioned regulations establish two basic ministerial authorisations for the decommissioning of nuclear facilities to begin: the dismantling authorisation and the so-called decommissioning statement.

The dismantling of a nuclear facility is understood to be the set of activities performed following awarding of the corresponding authorisation that, on completion, allow the licensee to apply for the decommissioning statement and which will imply the total or restricted release of the site.

The dismantling authorisation, awarded by the MINECO following a favourable report by the CSN on the dismantling plan proposed by the licensee, and positive evaluation of its environmental impact by the Ministry of the Environment, allows the licensee to implement the said plan and to initiate activities relating to the decontamination and disassembly of equipment, the demolition of structures and the removal of materials, ultimately to allow for the total or restricted release of the site (art. 12 1.f).

If the dismantling plan for the facility presents different phases of performance, separated by intermediate periods of inactivity or dormancy period or by any other significant separation, the authorisation granted will regulate only the phase immediately following its issuing, new authorisations being required for the performance of subsequent phases (art. 32).

The process of dismantling a facility ends with the decommissioning statement, which frees the licensee from his responsibility as operator and defines, in those cases in which the release of the site is restricted by some kind of conditioning factor, the limitations on use that will be applicable in the future, while appointing the organisation responsible for their maintenance and for ensuring their compliance (art. 12 1.f).

The decommissioning statement is awarded by the MINECO on completion of the dismantling activities, following a report by the CSN, once the latter has checked that the conditions established in the dismantling programme have been met, especially the provisions of the waste management plan and the site restoration plan (art. 33).

26.2. Organisation and responsibilities for dismantling

Section c) of article 2 of Royal Decree 1522/1984, by which ENRESA was created, attributes to the latter the responsibility for the management of dismantling operations arising as a result of the decommissioning of nuclear facilities.

The operating permit for a nuclear facility having expired, the responsibility for its decommissioning is initially to the current licensee who, prior to awarding of the corresponding authorisation, undertakes what are known as the pre-dismantling activities.

The current licensee of the facility is responsible for conditioning the radioactive wastes generated during operation of the installation (art. 28). These radioactive wastes must be conditioned in such a way that they satisfy the acceptance criteria of the disposal facility to which they are to be transferred.

The current licensee is also responsible for unloading the fuel from the reactor and from the irradiated fuel storage pools or, where the latter does not exist, of preparing a spent fuel management plan approved by the MINECO, following a report by the CSN (art. 28).

The type contract between ENRESA and the nuclear power plants approved by the MINECO establishes in greater detail the responsibilities and the scope of the work to be performed by the current licensee for planning of the dismantling activities to be undertaken by ENRESA.

For its part, ENRESA is in charge of submitting the nuclear power plant dismantling and decommissioning plan to the MINECO and, on completion of the pre-dismantling activities, which are the responsibility of the former licensee, and following awarding of the corresponding dismantling authorisation, undertakes responsibility for the performance of the decommissioning and dismantling activities scheduled in the authorised plan, as well as becoming the owner of the facility.

Once ENRESA has completed performance of the dismantling and decommissioning plan, it is required to submit to the MINECO the request for the decommissioning statement for the facility.

26.3. Change of licence holder for the dismantling of nuclear power plants

The acceptance by ENRESA of the responsibility for the dismantling of nuclear power plants means that trusteeship of these facilities must be transferred from the operating licensee to ENRESA. The latter will then become the licence holder of the facility during the performance of dismantling activities and up to the moment of awarding of the decommissioning statement. At which moment the site, now free of the facility, is returned to its owner, the former licensee.

The transfer of trusteeship is authorised by the MINECO at the same time as the authorisation for dismantling, on completion of the pre-dismantling activities that are the responsibility of the plant operator (art. 31).

The procedures and mechanisms applied in performing this transfer of trusteeship of the facility are established contractually between the licensee and ENRESA, the terms being formalised in the so-called transfer of ownership transaction.

26.4. Financing of dismantling

The dismantling of nuclear power plants and of other facilities used for the manufacturing of concentrates of uranium and nuclear fuels is financed through part of the funds that the companies owning these activities transfer to ENRESA during the operating lifetime of their installations, as payment for the services provided by the latter in accordance with the Royal Decree by which it was created.

In this respect, Royal Decree 1899/1984 on the Ordering of fuel cycle activities requires and regulates the contracts drawn up between ENRESA and the companies owning this type of nuclear facilities.

The payment for the services rendered by ENRESA is expressed as a percentage of collections on electricity sales, in the case of the nuclear power plants, or on the basis of

the value of uranium and nuclear fuel assembly production in the case of facilities relating to the front end of the fuel cycle (art. 5 b) 1. and 2.).

In the case of other, non-commercial nuclear facilities, such as those dedicated to research, payment of the services rendered by ENRESA is by way of billing (art. 5 b) 3.).

26.5. Radiation protection and emergencies during dismantling

Nuclear facilities in the dismantling phase continue to be considered nuclear facilities up to awarding of the corresponding decommissioning statement. They continue to be subject to a system of inspection and control similar to that applied to other nuclear installations throughout the entire period of performance of dismantling activities. This control and inspection function is the responsibility of the CSN and of the other competent authorities.

What is established in the section on compliance with the requirements of articles 24 «Operational radiation protection and non-scheduled and uncontrolled discharges and emissions» and 25 «Emergency preparedness» of this Convention is fully applicable during the dismantling phase of nuclear facilities.

26.6 Decommissioning and dismantling documentary archive

The transfer of licence holder, from the operating licensee to ENRESA, for the facility to be decommissioned contractually establishes the mechanisms and procedures that allow access by the latter to all the operating archives of the facility. In this way, ENRESA is able to access all the available information that it considers relevant for both the design and the performance of the decommissioning and dismantling plan for the installation.

The need for the licensees of nuclear facilities to suitably compile and conserve information of relevance for decommissioning during the operational stage has been incorporated into the RNRI in force. This regulation requires that all authorised nuclear facilities keep, as part of the official operating documentation, a document specifically including forecasts for the decommissioning and dismantling of the installation (art. 20 j).

This document, the detailed content of which is still in the development phase, will include among other things references to records and archives containing important information that might facilitate the process of decommissioning of the nuclear facility in the future (design and construction characteristics and drawings, operating events and history, radiological characterisation, etc.), as well as the structure and mechanisms put in place by the licensee for the custody and future transfer of the aforementioned archives.

26.7 Assessment of compliance

To date no process of nuclear facility dismantling has been completed, and no decommissioning statement has been issued in this respect. All the nuclear facility dismantling projects currently under way were initiated prior to the entry into force of the regulatory framework required by the current regulations.

From what has been said in the previous text it may be concluded that Spain meets the requirements of this article of the Convention.

Section G

Safety of spent fuel management

Article 4. General safety requirements

Described below are the measures adopted in relation to compliance with the general safety requirements specified in points i) to vii) of this article.

4.1. Measures to guarantee the maintenance of subcritical conditions and heat removal

As has been indicated in Section E of this report, the legal framework existing in Spain establishes the licensing process for nuclear facilities and defines the obligations of the licensees of such installations and the responsibilities acquired with respect to their safety.

Spent fuel management facilities are classified as nuclear installations and, therefore, are subject to the normal process of licensing described in the Regulation on Nuclear and Radioactive Installations (RNRI).

The maintenance of subcritical conditions and the adequate removal of heat at these facilities are safety requirements that form part of the design bases and criteria, incorporated through the application of technical and administrative systems and subject to analysis, assessment and surveillance, a description of which must be included in the mandatory documentation to be submitted for the construction and operating permits. In this respect, and in accordance with the aforementioned regulations:

- ✓ The *Preliminary Safety Study* required to apply for the *construction permit* must contain the *criteria applied during the design* of the components and systems on which the safety of the facility depends and an *analysis of foreseeable accidents and their consequences*, this including the criteria and analyses for the prevention of criticality and the removal of heat. The *Safety Study* (SS) for requesting of the operating permit must contain the information required for performance of safety analysis and assessment and of the risks associated with operation of the facility, under both normal and accident conditions.
- ✓ The *Operating Technical Specifications (OTS)* to be submitted in order to request the *operating permit* must include the limit values of variables affecting safety, the actuation limits of automatic protection systems, the minimum operating conditions, the programme of revisions, calibrations and periodic inspections of the systems and components and operating control.

The spent fuel management facilities existing in Spain are:

a) the spent fuel storage pools at the nine reactors in operation, included in the initial design and licensing process of these installations, the storage capacity of which was increased by re-racking during the 1990's, and

b) the cask storage facility built on the site of Trillo NPP, which has been in operation since mid 2002.

The NPP safety studies include the design criteria, the standards and a description of the methods and systems used in developing these criteria, as well as the analyses performed to guarantee the maintenance of subcritical conditions and adequate heat removal.

Similarly, the SS for the Trillo cask storage facility, and for the casks themselves, contains the criteria and methods and the analysis of criticality and thermal conditions.

In general, the design criteria used at the existing spent fuel management facilities take as a reference the standards existing in the country of origin of the design of the nuclear power plants, or of the design of the casks in the case of the Trillo NPP dry storage installation, in addition to the IAEA standards, since they are not contemplated in the Spanish regulations. Thus:

✓ The reference standard in the case of the spent fuel storage pools at American technology plants is 10CFR50 (Appendix B), while in the case of the pool at Trillo NPP, which is of Siemens/ KWU technology, the reference consists of the design criteria issued by the BMI.

✓ The criteria used in the design of the Trillo NPP cask storage facility and in the design of the dual-purpose spent fuel storage and transport casks authorised for use at this installation, which are of American technology, are those contained in 10 CFR 72 and 10 CFR 71, respectively.

Methods for the maintenance of subcritical conditions

The design criterion adopted for both storage in the pools and storage in the casks is that the neutron multiplication factor (K_{eff}) be lower than 0.95 under normal operating and accident conditions and in the face of uncertainties and the most reactive situation.

In general, the methods used to maintain these conditions of subcriticality under normal, abnormal or accident conditions are as follows: maintenance of a safe geometric configuration, the use of neutron poisons (dissolved in the water or integrated in the structures of the storage racks), limitation of the initial degree of enrichment and credit for the degree of burnup. The application of these methods varies from on facility to the next, as specified below:

✓ At the PWR plants (Almaraz I and II, Trillo, Ascó I and II, José Cabrera and Vandellós II), the margin of 0.05 is maintained by means of a subcritical geometry, the presence of boron dissolved in the water, limitation of the initial degree of enrichment and credit for the degree of burnup (with the exception of boraflex region II of the Vandellós II pool, where no credit is given to the boraflex as a neutron absorbing material, and of region I of the pool at José Cabrera, where the spent fuel storage racks do not contain absorbent materials).

The credit for the degree of burnup of the spent fuel at the PWR plants was incorporated with the design modification aimed at increasing the capacity of the pools by replacing the racks with other more compact units. As a result of

this, the pools were divided into two regions. One of these (known as region II) is designed to give credit to the degree of burnup and is used to store fuel exceeding a given degree of burnup depending on initial enrichment. The other (known as region I) may be used to store both fresh fuel and fuel extracted from the reactor core and not meeting the conditions for storage in region II. At the BWR plants (Cofrentes and Santa María de Garoña) the 5% subcriticality margin is maintained by limiting the initial degree of enrichment of the fuel, by a safe geometric configuration and by incorporating poison in the stainless steel of the storage racks (with the exception of the Eastern region of the pool at Cofrentes, where the racks do not contain neutron absorbing materials).

✓ The methods used to prevent criticality in the storage casks currently being used at the storage facility at Trillo NPP consist of incorporating neutron poison material in the structure of the fuel rack, control of the geometry of relative fuel assembly positions and a design basis limitation on the degree of enrichment of the fuel to 4% by weight of U^{235}.

The description of the characteristics of these systems, data on the analyses and assessments carried out and the surveillance measures adopted are presented respectively within the framework of compliance with Article 5 on existing facilities, Article 8 on the safety assessment of the installations and Article 9 on the operation of the facilities.

Heat removal systems

A) Spent fuel storage pools

The spent fuel pool cooling system performs the safety-related functions of removing the decay heat generated by the spent fuel assemblies without exceeding the temperature limits established and of maintaining a minimum level of water above the spent fuel assemblies in all situations, this guaranteeing adequate shielding. They are designed to meet the applicable criteria of 10 CFR 50 (2, 4, 5, 44, 45 46, 61 and 63 of Appendix B of 10CFR 50).

The design modification carried out in the pools of all the plants between 1992 and 1998, in order to increase their storage capacity by changing the racks for more compact units, implied analysis and calculation of the decay heat and reassessment of the cooling systems. As a result of these reassessments, it was necessary to modify the cooling systems in certain cases (such as at the José Cabrera and Cofrentes plants, where one and two additional heat exchangers, respectively, had to be installed, along with other minor modifications affecting the layout of the cooling system discharge piping inside the pools at other plants). Following this modification, the cooling systems of the plant pools now have the necessary redundant measures.

The description of the characteristics of these systems, data on the analyses and assessments carried out and the surveillance and control measures adopted (contained in the OTS's) are presented respectively within the framework of compliance with Article 5 on existing facilities, Article 8 on the safety assessment of the installations and Article 9 on the operation of the facilities.

B) Removal of decay heat at the Trillo cask storage facility

The ENSA-DPT cask is designed to release the heat generated by the fuel assemblies to the environment by means of passive mechanisms of convection, conduction and radiation.

The cask, designed to house 21 fuel assemblies, is capable of releasing 27.3 kW of heat, although the maximum heat power generated by the stored fuel does not in fact exceed 24.36 kW. The aluminium disks of the rack and the 36 bimetallic fins of stainless steel and copper arranged radially at the neutron shielding shroud facilitate the removal of the heat generated by the fuel assemblies to the exterior of the cask.

The description of the characteristics of the design of the cask and of the storage facility regarding heat removal, data on the analyses and assessments carried out and the surveillance measures adopted are presented respectively within the framework of compliance with Article 5 on existing facilities, Article 8 on the safety assessment of the installations and Article 9 on the operation of the facilities.

In complying with the functions assigned to it in the Law by which it was created, the CSN evaluates the obligatory documentation submitted with each of the authorisations and approvals foreseen within the legal framework.

In addition to the evaluations of the Periodic Safety Reviews (PSR), and during refuelling outages, the CSN tracks the daily, monthly and annual information submitted by the licensees of the facilities, as well as carrying out periodic inspections within the Basic Inspection Programme and others associated with refuelling.

4.2. Measures to ensure that the generation of radioactive wastes associated with spent fuel management is kept to the minimum practicable

Given the current practice used for the storage of spent fuel in Spain, the requirement that waste generation be reduced affects the wastes from the reactor core and the secondary wastes resulting from purification of the water in the nuclear power plant spent fuel storage pools, as well as the filters of the pool building ventilation system.

The current practice of stretching out the reactor operating cycles to eighteen months has a direct impact on the reduction of the volume of spent fuel generated, but not on reduction of activity.

In addition, the also habitual practice of providing the fuel suppliers with feedback on the results of analysis of the causes of defects encountered during inspection of the irradiated fuel assemblies as part of the plant refuelling activities has an impact on improvement of fuel assembly design and of their performance in the core, this leading to lower degrees of deterioration of the fuel to be stored and to lower degrees of contamination of the pool water.

Notwithstanding the above, achievement of the objective of minimising the generation of wastes from spent fuel management, to the lowest possible levels, may require additional actions, which would be carried out via the Radioactive Waste Management Plan (RWMP), required as an obligatory document for nuclear power plant operation as indicated in Section F. In compliance with the above, the CSN required submittal of the said RWMP in the limits and conditions included in the Annexes to the Resolutions for

renewal of the Operating Permits for operating NPP's, as from the date of passing of the said regulations. Likewise, it required the submittal, during the first quarter of every year, of a report on activities performed as a result of this plan, to be sent to the Directorate General for Energy Policy and Mines and to the CSN.

The fundamental objective of the recently approved RWMP is to meet the safety requirements of the Convention, with attention paid fundamentally to those requirements that are not covered by other documents required for the operating permit, and specifically to ensure that the generation of radioactive wastes resulting from spent fuel management be kept as low as possible.

Among other measures, these plans include the development of procedures for the following:

- ✓ Minimisation of corrosion of the fuel assembly cladding and of other materials stored, as regards surveillance of the characteristics and chemistry of the pool water.
- ✓ Reduction of contamination of the pool water due to other components stored therein, and with it the generation of secondary low and intermediate level wastes.

These measures will contribute fundamentally to reducing the generation of secondary low and intermediate level wastes.

4.3. Measures to take into account the interdependence between the different steps of spent fuel management

Application of this safety requirement, oriented towards favouring the continuity of the stages of spent fuel management, such that decisions taken during one stage do not negatively affect subsequent stages, has an impact on the planning of the management and licensing of the facilities and on definition of the interfaces and responsibilities of the organisations involved, as well as on other technical and administrative aspects relating to transfer requirements.

The legal and regulatory framework currently existing in Spain does not contain any explicit provisions regarding this safety requirement and its implications in the widest sense of planning of the different stages of spent fuel management as from its generation, although it does establish the responsibilities and bases for the development of the interfaces between the responsible parties involved, as has been explained in Section E.

The organisations involved in fuel management are, on the one hand, the licensees of the nuclear power plants, responsible for management of the storage systems associated with reactor design, and, on the other, ENRESA, which is responsible for the subsequent stages of spent fuel management.

The interfaces and general relationships between the licensees of the nuclear power plants and ENRESA are based on the radioactive waste management contracts signed between 1989 and 1990, which establish the general obligations of both parties and the procedures to be applied to inform or exchange information on actions and options under consideration for the subsequent storage of spent fuels, via an ENRESA–Electricity Industry Parity Commission.

The information that the plant owners currently send to ENRESA every year on the storage of spent fuel and high level wastes is the result of the stipulations of Appendix F

"Preliminary Waste Generation Programme" of the aforementioned contract, which includes the inventories of assemblies in the pool, with an identification of these assemblies, degree of burnup and date of removal from the core, damaged fuel assemblies (with an indication of the date of unloading from the core, type of defect and burnup), and an inventory of other wastes stored in the pool.

Specific activities, such as the re-racking of the nuclear power plant storage pools to increase their capacity and the construction of the dry cask storage facility at Trillo NPP, are performed by way of specific agreements that establish the payment to be made to ENRESA and its intervention in specific technical aspects of implementation, although in both cases the responsibility for safety in fuel management remains with the licensees of the nuclear power plants.

Additional measures for the application and development of the requirement of interdependence between the different stages of spent fuel management, as from generation, have recently been initiated via the RWMP, an obligatory document for nuclear power plant operation in accordance with the updating of the RNRI, approved by Royal Decree 1836/1999 and as mentioned in the previous section.

These Plans give specific consideration to the following requirement:

- ✓ Guaranteed interdependence between the different stages of fuel and high level waste management, for which activities must be suitably coordinated with ENRESA, including a clear definition of the interfaces regarding the necessary technical and administrative aspects.

The measures contemplated include the development of procedures for optimisation of spent fuel behaviour, definition of the degree of characterisation and of the contents of the documentation required for compliance with the requirements of subsequent stages of spent fuel management.

4.4. Measure for protection of individuals, society and the environment

The legal framework existing in Spain in the nuclear area contains a set of provisions for the protection of persons and the environment against the risks arising from nuclear and radioactive facilities. These provisions are applicable to spent fuel management facilities, both those associated with the nuclear power plants and independent installations, since these would be considered as constituting nuclear facilities. Thus:

- ✓ Chapter six of the Nuclear Energy Act, on safety measures and protection against ionising radiations, underlines the obligation that the nuclear and radioactive facilities fulfil whatever provisions are established on the corresponding regulations in relation to protection against ionising radiations.
- ✓ Law 15 /1980 by which the CSN was created, modified by Law 14/1999 on Public Fees and Prices for the services rendered by the CSN, assigns to the CSN, among other things, the functions specified in point g) thereof:
  - ➪ Control of measures for the radiation protection of professionally exposed workers, the public and the environment (including control of radiation doses to the workers, off-site releases of radioactive materials and their cumulative impact on the areas of influence of the facilities).

- Assessment of the environmental radiological impact of nuclear and radioactive facilities, in accordance with the applicable legislation.
- Control and surveillance of the radiological quality of the environment throughout the national territory, in compliance with the international obligations of the Spanish State in this area, without prejudice to the responsibilities attributed to other administrations.
- Collaboration with the competent authorities in relation to environmental radiological surveillance outside the areas of influence of the facilities.

As has been pointed out in Section E, the standards relating to the protection of the workers and the public against ionising radiations are contained in the Regulation on Protection against Ionising Radiations, which transposes to the Spanish regulations the provisions of Directive 96/29 EURATOM.

The measures adopted to ensure that the exposure to radiations of the workers is kept at the lowest levels reasonably achievable have been described in Section F, Article 24 of this report, on radiation protection. Since the fuel storage installations in existence are the pools associated with the nuclear power plants and the Trillo cask storage facility, the measures are part of the measures applied to the plant.

However, as indicated in the aforementioned Article, one of the particularly significant measures adopted by the CSN for application of the ALARA criterion that impacts the operation of the spent fuel pools during the plant refuelling outages is the CSN Safety Guide 01.05 "Documentation on refuelling activities at light water nuclear power plants", which has made it possible to gain insight into the collective dose associated with each of the refuelling activities since it was published in 1991, including the dose deriving from the inspection of irradiated fuel. These measures for application of the ALARA criterion have become obligatory as a result of the CSN instruction number IS-02 of 10th April 2002, which regulates refuelling activities at Nuclear Power Plants.

Furthermore, as regards the re-racking activities carried out in the nuclear power plant pools between 1991 and 1999, it should be pointed out that in each case a radiological impact assessment was performed and measures were taken for application of the ALARA criterion during the operation.

As regards effluent control and surveillance measures, these are integrated like the general measures taken at the nuclear power plants in this area, whose procedure is governed by Safety Guide No 01.04 on "Radiological control and surveillance if liquid and gaseous radioactive effluents released by nuclear power plants".

Finally, as has been pointed out in Section E of this report, the currently existing standards for protection of the environment are those deriving from transposition to the Spanish regulatory framework of the Directives of the European Commission on the assessment of environmental impact, whose application to spent fuel management facilities is included in the following section of this article.

4.5. Measures for consideration of the biological, chemical and other risks potentially associated with spent fuel management

The prevention of risks other than radiological risks associated with the operation of spent fuel management facilities is regulated by the standards common to other industrial activities implying these types of risks, these basically consisting of the following, as has been explained in Section E:

- ✓ Royal Legislative Decree 1302/1986 on the assessment of environmental impact, with the rank of law, modified by Law 6/2001, transposing to the Spanish legislation the Directives of the Commission of the European Union 85/337/CEE and 97/11/CE, respectively, modifies the list of projects regulated by this standard and takes into account the Agreement on Environmental Impact Assessment in the transboundary context, adopted in Espoo (Finland).
- ✓ Royal Decree 1131/1988 approving the Regulation for enactment of the aforementioned Legislative Royal Decree.

In accordance with these standards, the designs of facilities for the following are subject to Environmental Impact Assessment (EIA):

- ✓ Reprocessing of irradiated nuclear fuel,
- ✓ Treatment of irradiated fuel and high level wastes,
- ✓ Storage of spent fuel or radioactive wastes , for a period in excess of 10 years, at a location other than that in which they were generated.

The process of EIA to be carried out prior to authorisation of the site for these facilities is associated with a process of public information, which is carried out in accordance with the requirements of the nuclear facility environmental and licensing standards. On completion of this process, and if the project is acceptable, an Environmental Impact Statement (EIS) is drawn up, including the non-radiological conditions and limits for protection of the environment, along with the measures for tracking of the environmental radiological surveillance programme.

In the case of nuclear facilities, and therefore of the installations for spent fuel management, the EIS is drawn up jointly by the environmental authority and the CSN, following the issuing of a favourable report by the latter on the application for site authorisation.

The existing spent fuel management facilities have remained outside the scope of these standards, due to their being associated with the design of the nuclear power plants (in the case of the storage pools) or located on the site of the Trillo plant (in the case of this plant's cask storage facility).

Furthermore, the prevention of non-radiological risks for the operating personnel of these installations is regulated by Law 31/1995 on the Prevention of Occupational Risks.

Finally, and as regards the above, it should be pointed out that any events that might, in the judgment of the licensee, have significant public repercussions (including environmental variations and occupational accidents) are subject to the process of notification described in CSN Safety Guide 1.6 on "Reportable events at Nuclear Power Plants".

4.6. Measures to prevent repercussions for future generations greater than those permitted for current generation

This principle, derived from ethical concern for the health of future generations, does not have a direct impact on the spent fuel management facilities currently existing in Spain, since these are temporary storage installations whose design lifetime, although not explicitly defined, is associated with that of the NPP's and is, therefore, limited.

As regards the additional temporary storage facilities considered in the General Radioactive Waste Plan (GRWP) in force for the storage of spent fuel, although the operating

period and service lifetime are not defined, they may be considered to be limited, similarly to other nuclear facilities, for which reason the principles of radiation protection currently in force with respect to the public will in principle be applicable.

The legal framework existing in relation to nuclear matters guarantees the protection of the public during the normal operating periods of the existing spent fuel management facilities and of others foreseen, although it does not contain provisions for the protection of future generations in the event of extension or prolongation of the lifetime of these installations beyond the periods considered normal for the operation of nuclear facilities.

As regards the direct disposal of spent fuel in geological formations, as a waste, the current framework does not contemplate measures to limit long-term repercussions. The only provision to this effect is the criterion of dose and risk defined by the CSN in 1987, when issuing its decision regarding the first GRWP, as specified in section 12 of this report, in relation to safety requirements in radioactive waste management.

4.7. Measures to prevent undue burdens on future generations

As has been indicated in the previous section, this requirement does not in principle have a direct impact on the spent fuel management facilities currently existing in Spain, due to their being only temporary storage installations associated with the nuclear power plants or constructed on their sites, and consequently installations with a limited lifetime and subject to the periodic renewal of the operating permits of the plants themselves.

As regards the solutions for the management of spent fuel in the medium and long term contemplated in the 5th GRWP currently in force, it is considered that the burdens on future generations inherent to the periods of time involved in developing these solutions will be related fundamentally to the assignment of responsibilities, the provision of funds for financing of the activities involved and forecasts regarding the needs for institutional surveillance and control. The following is underlined in relation to these aspects:

- ✓ The existing legal framework assigns to ENRESA the function of ensuring the long-term management of all installations serving as spent fuel and waste disposal facilities, and contemplates the constitution, application and management of a fund for financing thereof.
- ✓ However, as regards the strategy of direct geological disposal of the spent fuel considered to date, the existing legal framework lacks explicit provisions regarding the implications of the needs for institutional surveillance and control that might be involved.

4.8. Assessment of compliance

From what has been presented in each of the sections corresponding to the safety requirements included in this article, Spain may be said to meet the requirements relating to the maintenance of subcritical conditions and to heat removal, and possesses an appropriate legal framework for the safe operation of the currently existing spent fuel management facilities, as regards the protection of the workers, the public and the environment.

Likewise, the legal framework establishes the bases for consideration to be given to the interdependencies between the different stages of management and the minimisa-

tion of wastes generated as a result of spent fuel management, although the application of these principles might require additional actions, which are already under study.

Compliance with the safety requirements relating to consideration of future generations will need subsequent development within the legal and regulatory framework, as well as more detailed definition of the policies and strategies associated with solutions to the long-term management of fuel.

Article 5. Existing facilities

Given that this is the first report to be drawn up in compliance with the Joint Convention, this article includes a general description of the essential characteristics of the spent fuel management facilities existing, in relation to their safety functions, followed by data on the safety reviews performed during the operating lifetime of these installations and the measures under way or planned.

5.1. General description of existing facilities

The spent fuel management facilities currently existing are the pools associated with the nine reactors at the operating nuclear power plants and a dry storage cask facility recently constructed at the site of Trillo NPP, as a solution to the saturation of this plant's pool. Article 8 of this document explains in greater detail the measures taken to assess their safety.

5.1.1. General characteristics of NPP storage pools

The pools used to store spent fuel at the NPP's are located in a building adjacent to the containment and communicated with it by a transfer canal, in the case of the Almaraz I and II, Ascó I and II Cofrentes and Vandellós II plants, and inside the reactor building itself in the case of the Santa María de Garoña, José Cabrera and Trillo plants. The NPP's with two units, such as Almaraz and Ascó, have a fuel pool for each of the reactors. In the case of Cofrentes NPP, there is also a pool inside the rector building that is used to temporarily store fuel during refuelling periods.

The fuel buildings have a ventilation system of seismic category I and nuclear class 3, while in the case of Santa María de Garoña, José Cabrera and Trillo the ventilation is integrated into the reactor building ventilation and filtration system.

The reinforced concrete pools are lined internally with welded sheets of stainless steel to prevent leakage, and are designed as structures capable of withstanding extreme external events. Except in the case of the two first generation plants (José Cabrera and Santa María de Garoña), they are also provided with a system for the detection and collection of possible leakage. The dimensions of the pools vary from one plant to the next (between 7 and 14 metres in length, 3 and 9 metres in width and 12 and 13 metres in depth), a characteristic common to all being that the depth allows a minimum height of water of 3 metres to be maintained above the fuel during storage operations, thus guaranteeing the shielding necessary for protection against the radiation.

The borated stainless steel storage racks provide the structural support necessary to maintain a fixed configuration and incorporate in their structure plates of a neutron absorbing material (with a content by weight of natural Boron of between 1.6 and 2.0 %,

and thicknesses of 2 to 3 mm). Specific characteristics are the fact that the racks in region I of the José Cabrera pool and the Eastern region at Cofrentes do not contain neutron absorbent, that a part of region II of the pool at Vandellós II uses boraflex as a neutron absorbent and that zone B of the pool at the Garoña plant has combined racks made up of stainless steel and borated stainless steel baskets.

The spent fuel pools, whose initial capacity has been increased through replacement of the original racks with others of a greater density (as explained in greater detail in the following section), have a reserve capacity to house a complete reactor core load if necessary, this being an NPP operating requirement.

The pools are divided into at least two regions or zones, which are differentiated fundamentally, in the case of PWR type plants, by their accepting or not accepting a degree of burnup, as indicated in Section 4.1. In the case of the BWR plants, the difference between regions or zones depends on the maximum initial degree of enrichment of the fuel assemblies, which is associated with a content of rods containing consumable poison, generally gadolinium oxide.

All the pools are equipped with the following:

- ✓ A cooling system made up of two redundant trains that are not shared with any other plant safety system, except in the case of Trillo NPP, which uses an emergency cooling and heat removal system and also has a third loop designed exclusively as a fuel pool cooling train.

  In addition, all the plants have a Seismic Category I emergency water supply or make-up system and also the capacity the replace losses of water resulting from evaporation.
- ✓ A purification system designed to maintain the concentration of activity in the water below a pre-established level, such that in the accessible areas of the building the exposure rates for the operations personnel be as low as is reasonably achievable (ALARA) and that the clarity and cleanliness of the water be maintained, this system being able to operate continuously or intermittently when conditions so require. The system is fitted with various filters and ion exchange resin units that are aligned depending on the contamination of the pool water.
- ✓ A fuel storage and handling system comprising a gantry crane, short and long manipulation devices and interlocks to limit the speed and elevation of the fuel assemblies to maintain shielding conditions, as well as a system limiting the passage of heavy objects over the stored fuel assemblies.

The pools also incorporate a local indication and alarms for temperature, level and pump pressure, as well as building radiation level indicators. Furthermore, the Control Room of all the plants has at least spent fuel pool water temperature and level indicators and some of the plants have indications of system variables.

5.1.2. Description of the Trillo NPP cask storage facility and of the casks currently authorised for use

A) Description of the storage facility

The Trillo NPP cask storage facility, recently constructed and in operation since mid 2002, is a rectangular shed built on the surface whose external dimensions are 80.8 m

in length, 43.5 m in width and 21.7 m in height, with a capacity for 80 casks. The inside of the storage facility is divided by a shielding wall measuring 6.5 m in height into two different areas: the Storage Area (whose effective dimensions are 57.6 by 40.3 m) and an Access Area (whose effective dimensions are 21.5 by 40.3 m).

The Storage Area is equipped with a passive ventilation system and houses the casks, which are stored in the vertical position on a concrete slab.

The Access Area is made up of the following zones: Loading and unloading zone, Maintenance zone, Personnel access and control zone (including the control and electrical panels room, the instrumentation room, changing rooms, the Radiation Protection post and the decontamination room), Drains collection tank zone and storeroom for auxiliary equipment, utensils and tools.

The facility is equipped with a gantry crane for handling of the casks, with a capacity of 135 Tm, which runs along the entire length of the building and which is fitted with an auxiliary 10 Tm hook, as well as with a radiation surveillance system, maintenance devices and other auxiliary systems.

The only component of the facility that fulfils safety-related functions is the spent fuel storage cask, for which reason the installation is designed as a passive building ensuring that the functions of the cask are not affected.

The geological and environmental characteristics of the facility are site specific. The design criteria of the cask for geological and environmental conditions represent the credible risks of the site without prejudice to its safety function.

As a result, the Trillo NPP cask storage facility is designed to fulfil the following functions:

- ✓ Limitation of dose rate outside the facility
- ✓ Cask handling and storage
- ✓ Maintenance of the temperature below the limits required by the cask design

Compliance with these functions is achieved by means of the design of the shielding, the building and the cask-handling crane and through the use of a passive, natural convection ventilation system that guarantees at all times a maximum ambient temperature around the casks lower than the maximum conservatively contemplated in their design (54° C).

The design of the building is resistant to earthquakes and the building superstructure and support slab are classified a Safety Class (S). The handling system is designed in accordance with the requirements of the German standard KTA-3902, such that the casks not be dropped in the event of a safe shutdown earthquake (SE).

B) Description of the ENSA-DPT cask

The ENSA-DPT cask has been designed for the safe storage and/or transport of 21 PWR fuel assemblies of Kraftwerk Union (KWU) design basis, 16x16-20 light water reactor.

The design meets the requirements of 10 CFR 72, of IAEA Safety Series No 6 and of the Spanish transport regulations. The essential characteristics of the cask for compliance with subcriticality conditions, heat removal, confinement, shielding, materials and handling are as follows:

- ✓ The cask is a multi-wall cylinder made up of two wrappers – one interior and one exterior – separated by a layer of lead that acts as a primary gamma radia-

tion shield in the radial direction. The bottom is formed by two forged pieces separated by the neutron shielding material.

- ✓ The cask has a double cover system with redundant seals at each of the penetrations. The design of this system allows the leaktightness of the confinement barrier to be verified periodically during storage periods and prior to transport of the cask following periods of storage, where appropriate.
- ✓ The cask shell wrappers are welded to the upper forged part, in which are machined the seats for the inner and outer covers. To the outer part of the external wrapper is welded an annular chamber, made up of a polygonal surface and corresponding closure covers, inside which are 36 bimetallic cooling fins, arranged radially, the spaces between fins being filled with a solid synthetic polymer that acts as a neutron shielding.
- ✓ The frame, manufactured of high strength stainless steel, has twenty-one square section tubes inside designed to house the fuel assemblies and supported laterally by stainless steel discs (31). The fuel tubes incorporate plates of neutron poison (borated aluminium with a content of B^{10} of 0.020 gr/cm^2) on the four faces of the central tubes and on three faces of the peripheral tubes, the face oriented towards the outside of the cask having no such plates.
- ✓ The cask is fitted with a redundant hoisting system made up of four lifting lugs spaced at 90 degrees and rotation lug housings.

5.2. Safety measures associated with the pool design modification to increase storage capacity by re-racking

Between 1991 and 1999 the fuel storage racks were changed at the nine operating nuclear power plants, these being replaced with "high density" racks of borated stainless steel, in order to allow for the storage of a larger number of fuel assemblies than originally foreseen. This re-racking process was carried out completely in all the pools, with the exception of region I at José Cabrera and Trillo, the Eastern region of the spent fuel pool at Cofrentes and boraflex region II at Vandellós II, in which the original racks remain.

Previous to this, re-racking had been carried out at José Cabrera, which increased its capacity to 310 positions in 1981, and at Santa María de Garoña, which increased its capacity to 620 positions in 1982 through the use of high density racks of borated aluminium.

The operation mapped out and performed as a plant design modification was, in each case, subject to the corresponding modification request and authorisation, as contemplated in the RNRI.

The licensing dossier submitted with the application in each case contained a description of the modification, the rack materials, applicable standards, rack design criteria (neutron, thermohydraulic and mechanical design), the corresponding structural analyses, criticality analysis and an assessment of the capacity of the pool cooling system, taking into account the increase in temperature inherent to the increase in capacity.

The CSN evaluated the structural, criticality and decay heat generation and removal aspects and the capacity of the pool cooling systems, as well as the forecasts regarding handling of the fuel and the radiological consequences of the process during normal operation of the plant, along with the operational radiation protection measures to be taken during the re-racking operations (ALARA) for the new conditions.

In revising the documentation submitted, in relation to heat removal and the cooling system, compliance with the safety criteria was assessed, in accordance with the requirements of chapter 9.1.3. of the Standard Review Plan (NUREG-0800) and the standards referenced therein: 10CFR20, 10CFR50, R.G. 1.13, R.G. 1.26, R.G.1.29, R.G. 1.52, with the specific exceptions for plants of an older design.

As a result of the evaluations carried out, certain modifications were required to the pool cooling systems, mainly at the José Cabrera and Cofrentes plants, with the incorporation of additional heat exchangers, and other minor modifications were carried out in the pool cooling circuits of several of the plants, these being undertaken prior to initiation of the modification.

In all cases, the new configuration of the pool is within the safety limits, both structural and criticality-related, and the pool cooling system is capable of extracting the maximum thermal load following performance of the necessary modifications.

5.3. Safety review of existing facilities

5.3.1. General actions within the framework of the NPP review policy

The NPP pools have been subjected to the general review programmes carried out since the beginning of operation of the facilities (in order to maintain the level of safety required in the authorisations and improve safety in keeping with technological progress and new standards requirements), among which the measures included in the first Spanish report for the Convention on Nuclear Safety, indicated below, are particularly significant:

- ✓ Systematic review of the safety of the first generation plants, carried out at the beginning of the 1980's to take into account the changes that had occurred in the standards since their start-up.
- ✓ Continuous review of nuclear safety during plant operation, through the inspection and control function of the CSN, assessment of the periodic analyses required of the licensees regarding the applicability of new standards (six-monthly report), analysis of in-house and industry operating experience (annual report) and analysis of the safety of design modifications (six-monthly report).
- ✓ Analysis of the results of fuel inspections during refuelling outages (performed in accordance with a plan submitted previously by the licensees), included in the Final Refuelling Report, in accordance with CSN Instruction IS-02, describing the following aspects:
  - ➪ Assemblies inspected,
  - ➪ Faults or defects detected,
  - ➪ Structural problems, deformations, damage to grids, bowing, etc.

5.3.2. Specific safety reviews carried out at storage pools

In addition, specific review programmes have been carried out on the pools themselves, the following being particularly significant:

- ✓ Review carried out by the CSN in 1996 with regard to compliance by the NPP's with the requirements of the operating authorisations and documents, in rela-

tion to the spent fuel pool cooling systems and the level of safety and reliability of the residual heat removal systems under maximum thermal load conditions during refuelling.

This review was performed as a result of communication by the NRC (Information Notice 95-54 "Decay heat management practices during refuelling outages", on the suitability of refuelling activities and fuel pool cooling control procedures), in order to respond to questions posed by that regulatory authority.

✓ Programme carried out during the period 1995-2000 on the initiative of the licensees and in agreement with the CSN for design basis review, with the objective of correcting whatever inconsistencies might exist between the said design bases, the SS, the OTS's and the habitual procedures and practices of the facility.

This review occurred as a result of the detection in 1995 of practices performed in the spent fuel pools of unit 1 of the American the Millstone and Cooper NPP's, outside the design bases licensed in the SS.

In 1998 the Spanish nuclear power plants drew up and submitted to the CSN a document containing the criteria to be adhered to for maintenance of the SS and the safety design bases, serving as a basis for the performance of the detailed design basis review process.

As from that date the licensees have been carrying out review work, this having been completed for all the plants during the year 2000, while the CSN has been performing inspections and assessments. This review has generated documents containing the discrepancies detected, which have led to proposals for modification of the OTS's, as a result of the design basis modifications, and in review of the Safety Studies.

✓ During the year 1998, the CSN carried out a general inspection programme of the pools at all the plants with a view to reviewing the general status of the irradiated fuel and other radioactive waste stored in them and to analysing and comparing the following aspects, among others:

- ➪ Database systems for control of the inventories of irradiated fuel assemblies and other materials stored in the pools (associated with the fuel assemblies in the reactor) and documentary management.
- ➪ Documentary verification of surveillance of the irradiated fuel assembly storage conditions, especially those relating to their conservation, inspection and characterisation.
- ➪ Measures contemplated to ensure safety conditions during the possible period of storage of these fuel assemblies.
- ➪ Analysis and application, where appropriate, of national and overseas operating experience.
- ➪ Status of development of the interfaces with the company in charge of subsequent management of spent fuel and radioactive wastes.

This programme of inspections has served as a basis for the drawing up of directives on the contents of the nuclear power plant GRWP's, in relation to the sections on spent fuel management, subsequently required in 1999 by the RNRI as a document to be submitted for the operating permit.

5.3.3. Reviews associated with pool operating incidents

The following incidents that have occurred during the spent fuel storage pool operation period are worthy of special mention:

- ✓ In 1989, during preparations for the 5th refuelling of Unit II of Almaraz NPP, during the movement of a spent fuel assembly in the pool, the upper nozzle became separated, along with the linking bushings with the upper guide tubes of the rest of the assembly. As a result, a visual inspection was performed on all the fuel assemblies stored in Unit II and, the same problem having been observed in other elements, the inspection was extended to include Unit I of the plant. The total number of fuel assemblies discovered to have the upper nozzle separated in the two units was 11.

  From the studies performed it was concluded that the separation of the upper fuel assembly nozzles had occurred as a result of intergranular stress corrosion cracking of the linking bushings, this being due to the use of resins in the purification system different from those recommended by Westinghouse, this giving rise to water chemistry conditions outside those recommended (reduction in pH and increase in specific conductivity due to an increase in sulphate concentration).

  Almaraz NPP immediately changed the resins used in the spent fuel pool demineralisers and established a rigorous programme o surveillance of the chemical parameters of the pool. This experience has been analysed by the rest of the nuclear power plants of the same type in order to apply the lessons learned.

- ✓ In 1991, during work performed prior to re-racking of the pool at Unit II of Almaraz NPP, water leakage was discovered across the inner stainless steel liner. This leakage did not have any off-site radiological consequences, since the water was collected by the waste treatment system, a minor quantity becoming embedded in the concrete of the fuel pool building. This event was classified as category 1 on the International Nuclear Event Scale.

  The defects detected were initially plugged provisionally pending a definitive system, and in mid 1992 the problem was definitively solved through the application of epoxy-chingkoplast resins.

- ✓ The CSN carried out inspections for the tracking and control of the fuel pool incident and to check the radiation protection measures applied during the repairs. At the end of 1998, problems of deformation were detected in one of the attachment plates for the upper nozzle springs in three fuel assemblies that were to be extracted during the refuelling of Unit I of Ascó NPP. The cause of the failure was the application of a high adjustment torque to the attachment bolts of the upper header spring of AEF type fuel assemblies.

  Given that this fault also affected the fuel of the same type at the José Cabrera, and Almaraz I and II plants and Unit I of Ascó, inspections and replacements were carried out that same year on the attachment bolts of the upper nozzle and header springs affected during the refuelling outages of Units I and II of Almaraz and Ascó, respectively.

  For the other plants with the same type of fuel, ENUSA drew up a report explaining that these assemblies could remain in the core until the next refuelling outage without this implying any undue risk for safety, inspection thus being put off for the next scheduled shutdown for refuelling.

5.3.4. Plans for future reviews

The analyses and reviews planned for performance are those deriving from application of the RWMP's submitted by the nuclear power plants in compliance with the requirements of the RNRI.

These activities will be oriented fundamentally towards compliance with the objectives of the Convention, in order to strengthen the interfaces and reduce the quantity of wastes generated, as well as towards reinforcing actions favouring the conservation of the fuel during the foreseen storage periods and gaining insight into its behaviour.

5.4. Assessment of compliance

From what has been set out above it may be gathered that the existing spent fuel storage facilities provide the characteristics required for safe operation, and that measures have been taken to meet the general safety requirements derived from ratification of the Joint Convention as regards application to the existing installations.

Article 6. Siting of proposed facilities

6.1. Forecasts for new spent fuel management facilities

The 5th GRWP, currently in force, contemplates two phases for the temporary management of spent fuel: an initial phase that would cover up to the year 2010, during which additional SF storage capacity will have to be provided for Trillo NPP, and a second, from 2010 onwards, during which the pools of the rest of the plants will become sequentially saturated, or in certain cases decommissioning and dismantling will begin.

In order to respond to the needs of Trillo NPP, an individualised temporary storage facility has been built on the site to house the SF in dual-purpose metallic casks. This facility has been licensed as an extension to the existing installations and received the corresponding authorisation in May 2002.

The strategy contemplated as from the year 2010 consists of making available a centralised temporary storage facility capable of housing not only the spent fuel from all the NPP's, but also HLW and other radioactive wastes not suitable for disposal at the El Cabril facility. Alternatively, this facility might be complemented or replaced by individualised storage facilities if a site were not available for the former.

In summary it may be said that the facilities planned for spent fuel management will be used for the temporary storage of such fuel, either centrally or in individual installations. In general, the aspects to be considered will depend on whether a new site is used or whether use is made of the existing NPP sites and, in this last case, on whether the facility is constructed during plant operation or following definitive shutdown.

6.2. Description of licence awarding procedure

As is pointed out in Section E, point 19.2.1, the licence awarding procedure for new nuclear facilities includes consideration of the following authorisations: preliminary, con-

struction permit, operating permit, modification, performance and assembly of modification and dismantling. In all these cases specific conditions are required in relation to the site at which the nuclear facility is to be located.

The *preliminary authorisation* constitutes official recognition of the project and formal acceptance of the site proposed, for which reason it implies in practice genuine authorisation of the site.

The *construction permit* requires the requesting party to submit the following, among other documents: a Preliminary Safety Study, including among other things a description of the site and the surrounding area. The studies to be performed constitute a refinement of the information obtained during the previous phase, with greater detail on all aspects of site characterisation and definition of the design bases associated with off-site events.

The *operating permit* requires the requesting party to submit a Final Safety Study, containing among other things complementary data obtained during construction on the site and the site physical, seismological, meteorological, hydrological, ecological and demographic characteristics, and analysis of foreseeable accidents arising from the malfunction of elements and apparatus, operating errors or agents external to the facility, along with their consequences.

The *authorisation for modifications* to the facility must be requested whenever the design modifications imply a modification of the criteria, standards and conditions on which the operating permit is based. This authorisation requires a justification of modifications involving any factors relating to the site.

The decommissioning of a nuclear facility will require an authorisation for dismantling and a decommissioning statement. This authorisation requires a SS containing, among other things, a descriptive study of the current status of the facility, its site and area of influence, as well as the general dismantling project, including radiological characterisation of the facility and the site. Likewise, a site restoration plan will be required, which where appropriate shall include the plans for surveillance of the levels of radiation and contamination of the site to be released.

6.2.1. Criteria for the evaluation of all factors relating to the site and having an influence on safety

The criteria applied as regards the parameters of the site, to determine its acceptability, are those contained in the following Spanish standards:

- ✓ Nuclear Energy Act, Law 25/1964
- ✓ Law 15/1980, creating the CSN
- ✓ Royal Legislative Decree 1302/1986, on environmental impact assessment, and enacting Regulations (R.D. 1131/1988)
- ✓ Royal Decree Law 9/2000, modifying Royal Legislative Decree 1302/1986, on environmental impact assessment.

As regards technical aspects not contemplated in detail in the Spanish regulations, the criteria applied are those included in the standards of international organisations and ratified by the Spanish State, among which the Safety Standards of the International Atomic Energy Agency (IAEA), and in particular 50-SG-S1 to 50-SG-S11 are particularly

significant. Finally, compliance with the standards of the country of origin of the design may also be required.

The basic objective pursued in applying the assessment criteria is to check that the site of the nuclear facility contributes to protection of the population and of the environment against whatever radiological consequences might arise as a result of normal operation of the installation and of any accidental release of radioactive effluents.

The criteria for assessment of the site parameters used at the Spanish NPP's, which currently house the only SF management facilities existing in the country, are basically deterministic in nature, both for assessment of the maximum natural events foreseeable (earthquakes, flood, etc.) and for the maximum off-site events due to mankind (nearby industry, transport, etc.). Each of these maximum off-site events constitutes a design basis for the nuclear facility.

In recent years, the standards relating to consideration of site parameters have undergone noteworthy changes in certain aspects, particularly in the growing use of probabilistic methodologies. This has led to the recommendation that the quantification of certain design parameters (seismological, hydrological, etc.) be carried out by means of an adequate combination of deterministic studies (foreseeable maxima) and probabilistic studies (allowing work to be performed with uncertainties), linked to the judgement of experts. In this respect, in 1986 the CSN approved the Integrated Programme for the Performance and Use of Probabilistic Safety Assessments in Spain, the scope of which included the consideration of off-site events (earthquakes, flooding, winds, transmission lines and nearby industries) as initiators. The methodology applied in these studies is the one described in the USNRC's NUREG-1407.

The Spanish NPP's maintain Surveillance Programmes for the basic site parameters, those that were a determining factor on design and through which continuous practical information may be acquired on the behaviour of the site. These programmes are dynamic and adapted specifically to each site and facility, and their results are documented and submitted to the CSN via periodic reports for assessment.

6.2.2. Criteria for the evaluation of radiological repercussions on the environment and surrounding population

The specific criteria used to assess the effects of the Spanish NPP's on their surroundings are those specified in the US 10CFR100, and developed in the USNRC standards. These criteria were subsequently modified with the implementation of the Basic Nuclear Emergency Plan, and establish three zones around the facility, from the point of view of dose limitation in the event of an accident, the site parameters assessed being demography, meteorology, hydrology and ecology.

The only SF management facility built subsequent to the nuclear power plant has been the temporary cask storage installation at Trillo NPP, this resulting from the depletion in 2002 of the storage capacity of the plant pool. The facility, authorisation of which was dealt with as a modification to the plant, was constructed on the plant site. The facility SS has used all the data on the site of the plant and calculation of the dose to the general public as a result of the facility has included determination of the dose at the site boundary, with a view to checking compliance with the annual whole-body dose limit due to operation of all the fuel cycle facilities existing on the site, in accordance with the criteria of 10CFR72 "Licensing requirements for the independent storage of spent fuel and high-level radioactive waste" (December 1994).

Likewise, an analysis was performed of those events representative of altered and abnormal operating conditions that might occur throughout the service lifetime of the storage facility and imply a risk of release to the environment of part of the activity contained in the fuel assemblies. Also studied were the radiological consequences of conceivable very low activity, very low probability of occurrence or non-quantifiable events, including severe and catastrophic natural events and events induced by human activity, theoretically postulatable on the basis of the radiological consequences for the environment. In view of these assessments, the NPP radioactive effluent release limits are not altered by the new installation, and the consequences of hypothetical accidents do not imply an appreciable contribution over and above the accident analyses performed previously in reference to the original installation, for which reason no additional preventive and/or protective measures need be adopted.

6.2.3. Performance provisions for compliance with the aforementioned criteria

In each phase of the licence awarding procedure, the CSN revises the documentation submitted and assesses compliance with the established requirements. The final result of the assessment is the decision to award or deny the authorisation requested, and if awarded, the additional conditions or requirements applicable to the authorisation. These additional conditions or requirements are issued with the authorisation and are legally binding.

Through these conditions the CSN adapts the general criteria established in the standards of the country of origin of the project to the demands posed by the situation of each nuclear facility, on a case-by-case basis. In a sense, this constitutes development of the standards specific to each facility.

When the holder of an authorisation carries out the actions required in the set of conditions and submits the corresponding documentation, the CSN once again assesses the acceptability of the actions performed and of actual compliance with the conditions imposed. This assessment may lead to total or partial acceptance. If partial, new conditions will be derived for application to the licensee, and even new limits to the authorisation granted. In the extreme case of non-compliance, the authorisation awarded may be suspended.

In addition to the assessment of the licensee's studies and actions, the CSN may use inspections and audits to check at any time on the degree of compliance with an established requirement or the accuracy of the information included in the documents submitted for review by the licensee. The assessments and inspections performed are complementary as regards checking and demanding compliance with the safety criteria relating to the site.

6.3. Public information on facility safety

The Spanish regulations that govern the process of awarding licences, in particular the RNRI, and the Royal Decrees on Environmental Impact Assessment, require a process of public information during the arrangements made with respect to the application for the preliminary authorisation of a nuclear facility. Worthy of mention in this respect is Law 38/1995, of 12th December, on the right of access to information on the environment, which recognises the right of any physical or legal person to access information

on the environment in the hand of the Public Administrations, as well as the obligation for the latter to provide such information.

In particular, the process to be applied establishes that on reception of the request for preliminary authorisation, the Ministry of Economy (MINECO) shall send a copy of it to the corresponding Government Delegation for the latter to initiate a period of public information, starting with publication in the Official State Gazette and in the corresponding publication of the affected Autonomous Community of an extract announcement underlining the objective and main characteristics of the facility. This announcement establishes that persons and organisations considering themselves to be affected by the project shall have a period of thirty days in which to submit to the corresponding Government Delegation the written allegations that they consider to be pertinent. The arrangements regarding public information are carried out jointly with those foreseen for the Environmental Impact Assessment in the specific regulations. On completion of the thirty-day period for public information, the Government Delegation carries out the appropriate checks, as regards both the documentation submitted and the written allegations, and draws up a report, sending the dossier to the MINECO and a copy thereof to the CSN.

Furthermore, the regulations also require that during the construction, operation and dismantling of NPP's there be an "information committee", a collegiate organisation whose functions are to inform the different entities represented of performance of the activities regulated in the corresponding authorisations and to jointly deal with questions of interest to such entities. The members of the committee are appointed by the Director General for Energy Policy and Mines of the MINECO, the committee being presided over by a representative of the said Ministry and made up also of representatives of the licensee of the facility, the CSN, the Government Delegations, the Autonomous Communities and the Municipal areas in whose territory the facility is located. Other representatives of the Public Administrations may also sit on this committee when the nature of the issues to be dealt with so requires.

At another level of information and in general terms, one of the functions commissioned to the CSN is that of informing the public of subjects within its realm of competence, without prejudice to the advertising of its administrative actions in the legally established terms.

6.4. International arrangements

By virtue of Article 37 of the Treaty constituting the European Atomic Energy Community (EURATOM), of which Spain is a member, the European Commission is provided with general data on any radioactive waste storage project, regardless of form, making it possible to determine whether the performance of the said project might give rise to the radioactive contamination of the waters, soil or airspace of any other Member State. In accordance with the Recommendation of the European Commission of 6th December 1999 on the application of Article 37 of the EURATOM Treaty (1999/829/EURATOM), the aforementioned general data must be sent to the Commission with a year's notice where possible, and in no case with less than six months' notice prior to awarding of the operating permit by the competent authorities. Consequently, this requirement is part of the licensing process of any radioactive waste storage project, and in particular is applicable also to spent fuel management facilities.

In this respect, Trillo NPP requested authorisation of a design modification in February 1996, for construction of the storage facility described above, and in April 2001 the Spanish Government – in compliance with Article 37 of the EURATOM Treaty – submitted to the European Commission general data on the project. It should be pointed out that Trillo NPP had already provided general data on the plant, in 1988, prior to its start-up, with respect to which there was already a decision by the Commission. This decision, reached on 30th January 2002, considers that application of the project for storage of radioactive wastes of any form arising from modification of Trillo NPP, located in Spain, cannot give rise under normal operating conditions or in the event of an accident of the type and magnitude foreseen in the general data to radioactive contamination of significance from the point of view of health or of the waters, soil or airspace of any other Member State.

6.5. Assessment of compliance

The information on the site parameters drawn up during the different stages of licensing, in accordance with the regulations in force, applying the criteria established in the Spanish standards, those drawn up by the international organisations and those existing in the standards of the country of origin of the design, reasonably guarantee the safety of spent fuel management facilities.

Likewise, the licensing process and the regulations in force contemplate both public information on and the mechanism for assessment, by the European Commission, of the possible impact of radioactive waste storage at a nuclear facility on other Member States.

Consequently, it may be deduced that Spain has adopted the measures necessary to comply with the requirements of article 6 of the Convention.

Article 7.
Design and construction of facilities

This article includes a presentation of the basic principles of safety and of the procedures adhered to in Spain for requests for and analysis and awarding of construction permits for the licensees of spent fuel management facilities, along with the methods used for the surveillance of construction and to guarantee compliance with the design requirements.

It should be pointed out at this juncture that the only SF management facilities existing in Spain ate the storage pools of the operating NPP's and the cask storage installation at Trillo NPP. The pools of all the plants have been evaluated and authorised within the framework of the licensing processes of the plants themselves, and, therefore, the design requirements and operating limits and conditions are part of the authorisations awarded to their owners. In addition, the increase in the SF storage capacity of the plants, through re-racking or through the metallic casks in the case of the Trillo NPP facility, have been proposed, evaluated and authorised as modifications to the installation, within the framework of the plant operating permits in force.

In what follows, reference is made to the process involved in the construction permit, the authorisation of modifications to the installation, the provisions for decommissioning included in the design stage and considerations regarding validation of the technologies used.

7.1. Construction permit awarding process

Although in Spain there is no experience of any licensing process for spent fuel management facilities, since the installations existing at the sites of the NPP's were designed and assessed within the licensing frameworks of the plants themselves, the process of awarding authorisations is similar in general terms to that of the plants, for which contrasted experience is available.

Outstanding among the more significant stages of this process is the need for a construction permit, as specified in the RNRI. These regulations specify all the documentation that is to accompany the request for the construction permit, among which is the Preliminary Safety Study, the most significant of the documents to be submitted by the licensee in support of his application. The format and content of this document are based on the following fundamental principles:

- ✓ Consideration of the criteria and specifications contained in the Ministerial Order by which the preliminary authorisation is awarded to the facility analysed.
- ✓ Attention to the applicable national standards and to the appropriate recommendations of the international institutions, fundamentally those of the IAEA, of which Spain is a member country, and where these do not exist to the set of standards of the country of origin of the design.
- ✓ Where appropriate, accurate tracking of the details of the reference facility.

During the phase of preliminary authorisation, special attention is paid to the parameters that define the site and that are relevant to the design of the facility, especially seismicity and extreme meteorological phenomena. In this respect the Ministerial Order by which such preliminary authorisation is granted requests that the "licensee justify the resistance to earthquakes of the design" and establishes the basic parameters, maximum accelerations, for the design, which depend specifically on the parameters of the site. The same occurs with off-site meteorological parameters, especially flooding. Consideration is given also to environmental impacts, which must be formally assessed and accepted by the Ministry of the Environment, and clauses regarding the architectural concept and integration into the landscape are established.

The Ministerial Orders by which preliminary authorisations are awarded establish the standards to be used during the design and construction of the facility, and require that the criteria, codes, standards and provisions used in the design be reflected in the Preliminary Safety Study.

The concept of the reference facility, where it exists, aims fundamentally to take advantage of the experience acquired during the testing and operation of the reference installation proposed.

The documentation received from the party requesting the construction permit, in particular the Preliminary Safety Study, is assessed by the CSN. During this process of assessment, the CSN may request from the licensee whatever additional information, clarifications, analyses and estimates it considers to be appropriate, all of which is formally added to the construction permit dossier. On completion of the process a report is drawn up, along with a proposal decision, accompanied by one or several annexes, that govern the activities of the licensee during the construction process, regulate this process and include specifications on performance of the pre-nuclear verification of the facility.

Among the more significant requirements governing the construction of the facility, it should be pointed out that "the licensee shall at all times have an adequate organisation sufficient for supervision of the project and for the guarantee of quality during con-

struction", which must be approved by the regulatory authority. Furthermore, the documentation that is to accompany the request for the construction permit must include technological, economic and financing forecasts regarding decommissioning and dismantling. Likewise, the licensee is obliged to submit periodic reports to the CSN with details of the progress of the project in relation to everything affecting nuclear safety, as well as whatever incidents and variations might have occurred. Apart from this, the CSN inspectorate makes generic and specific visits.

The pre-nuclear testing programme must include the general tests referred to by the RNRI, to which must be added those specific to each case, which are described in the Ministerial Order by which the construction permit is awarded. The pre-nuclear testing programme, submitted by the licensee to MINECO, must be favourably assessed by the CSN, which also establishes those tests that are to be carried out in the presence of official inspectors. The satisfactory performance of the pre-nuclear tests and their formal acceptance by the CSN mark the end of the construction permit process.

7.2. Facility modification authorisation process

As has been indicated above, the increase of the storage capacity of the SF management facilities existing in Spain (re-racking of the NPP pools and Trillo NPP cask storage facility) was authorised as a modification to the facility in question, within the framework of the plant operating permits in force.

The RNRI establishes that modifications to design or to the operating conditions and affecting the nuclear safety or radiation protection of a facility, and the performance of tests at such a facility, must be analysed previously by the licensee in order to check for continued compliance with the criteria, standards and conditions on which the authorisation is based. If as a result of such analyses the licensee were to conclude that the aforementioned requirements continue to be guaranteed, he may carry out the modifications, periodically informing the competent regulatory authorities. If, on the contrary, the design modification were to imply a modification to the criteria, standards and conditions on which the authorisation is based, the licensee shall be required to request authorisation for the said modification from the regulatory authorities prior to its performance. Regardless of the aforementioned authorisation, when in the judgment of the regulatory authorities the modification is major in scope or requires significant construction or assembly works, the licensee must necessarily request authorisation for the performance and assembly of the modification.

Requests for modification authorisations must be accompanied by the following documentation:

- ✓ Technical description of the modification, identifying the underlying causes for it.
- ✓ Safety assessment.
- ✓ Identification of the documents that would be affected by the modification, including the proposed text of the SS and OTS's, where applicable.
- ✓ Identification of the tests required prior to reinitiation of operations.

Requests for modification performance and assembly authorisations, when required, shall be accompanied by the following documentation:

- ✓ General description of the modification.

- ✓ Standards to be applied in the design, construction, assembly and testing of the modification.
- ✓ Basic design of the modification.
- ✓ Quality assurance programme and organisation foreseen for project performance.
- ✓ Identification of the scope and content of the analyses required to demonstrate the compatibility of the modification with the rest of the facility and to guarantee that its safety levels continue to be maintained.
- ✓ Destination of equipment to be replaced.
- ✓ Procurement plan and budget in the case of major modifications.

7.3. Technologies used for spent fuel storage

7.3.1. Storage in pools

The option of storing spent fuel in pools is used by practically all the light water plants. The benefits of this technology are associated mainly with the efficiency of water as a coolant and shielding, and with the flexibility that is provided to the operator as regards his reactor core management policy, plus the fact that it facilitates nuclear material safeguards and the inspection and examination of the spent fuel.

The accumulated experience of pool storage exceeds 50 years. For light water reactors and spent fuel with zircaloy and zirlo cladding there would appear to be no time limit applicable to this method of storage, other than the possibility of adverse chemical conditions contributing to deterioration by corrosion of the cladding, which constitutes the primary barrier to the radioactive material as regards confinement.

7.3.2. Trillo NPP cask storage facility

The dry storage option (in an atmosphere of inert gas, typically Helium, Nitrogen or Argon) is used as a complement to pool storage once the capacity of the pools has been depleted. There are more than 20 years of experience of this technology for power reactor fuel, and more than 30 for the assemblies from research reactors.

Dry storage is accomplished typically in casks, metallic cylinders that are tightly welded or fitted with bolted seals and that provide a leaktight confinement barrier, enclosed in turn in an additional metallic or concrete wrapper providing the overall assembly with shielding properties and structural support against external loads. Some of the casks are used for both the storage (outdoors or in a building) and transport of spent fuel.

The technology selected in Spain for Trillo NPP is based on the use of metallic dual-purpose (storage and transport) casks. The design is a multi-wall concept (stainless steel – lead – stainless steel – neutron shielding – stainless steel) and guarantees confinement of the system, ensuring maintenance of the pressure in the space between the two main covers of the cask. These casks are temporarily stored at the plant itself, in a storage facility built for this purpose.

7.4. Assessment of compliance

From what has been said above, it may be deduced that Spain has adopted the measures required to meet the requirements contemplated in this article of the Convention, since the Spanish legislation includes a formal procedure for the awarding of nuclear facility construction permits and authorisations for modifications, this including design review, surveillance of construction and checking of the suitability of performance through pre-nuclear testing programmes.

Article 8. Assessment of safety of facility

8.1. Legal and regulatory requirements

As has been indicated in Section E, the licensing procedure for each of the nuclear facility authorisations requires submittal by the licensee of a series of documents, including the corresponding SS, with the contents specified in each case, this being indicated below for the authorisations referred to in this article:

- ✓ In the request for the construction permit the licensee is required to submit a Preliminary Safety Study containing, among other things, a description of the facility, with the *criteria applied in the design* of the components or systems on which the safety of the facility depends and an *analysis of foreseeable accidents and their consequences.*
- ✓ In the request for the operating permit the licensee is required to submit, among other documents, an SS containing the information required to analyse and assess the safety of the facility and the risks arising from its operation, under both normal operating and accident conditions.
- ✓ In addition, design modifications implying a change to the criteria, standards or conditions on which the operating permit is based require an authorisation for modification accompanied by the corresponding technical description, the *safety assessment performed* and an identification of the operating documents that will be affected by the modification.
- ✓ Furthermore, article 80 of the 1999 RNRi establishes that the manufacturing of spent fuel storage casks will require approval of the design, following a mandatory report from the CSN. Although this legislation does not specify the documentation to be submitted in this case, in practice a precedent has been set in the associated safety study, with approval of the design of the ENSA-DPT cask, authorised for the Trillo NPP spent fuel storage facility, as detailed in the following section.

Each of the safety studies referred to generally contains the analyses required to demonstrate compliance with the safety functions and design criteria of the installations under normal and accident conditions, accompanied by a study of the consequences or radiological impact, as detailed in Section 8.3.

As regards environmental assessment, referred to in this article of the Convention, it is pointed out that in accordance with the Spanish legislation, the assessment of non-radiological environmental impact is associated with the preliminary or site authorisation, as has been explained in point 4.4 of this Section.

As may be deduced from the functions attributed to the CSN by the law underlying its creation, described in Section E, the documentation submitted by the licensee, and specifically the safety studies submitted for the construction and operating permits, are systematically evaluated by the CSN for issuing of its mandatory report prior to the awarding of such authorisations.

8.2. Process of licensing of existing facilities

8.2.1. Application to NPP storage pools

The licensing of the pools associated with the design of the NPP's is integrated into the licensing of the plants themselves, and currently subject to the process of Periodic Safety Review.

Modifications to the design or operating conditions carried out in the pools themselves have been performed in accordance with the requirements of the applicable legal framework, and have been subject to a specific process of authorisation when so required.

Particularly significant among the design modifications subject to authorisation has been the replacement of the previously existing storage racks with more compact units, in order to increase the storage capacity, carried out generally at all the operating plants between 1991 and 1998.

Requests for these modifications subject to authorisation were accompanied by the corresponding safety studies and by all the documents affected thereby.

8.2.2. Procedure for licensing of the Trillo NPP cask storage facility

The licensing of the Trillo NPP cask storage facility, initiated in February 1996, has been dealt with as a plant design modification, in accordance with the procedure established for this purpose in the legal framework, following submittal of the SS.

Authorisation for start-up of the facility was awarded in May 2002, following a favourable report from the CSN. This authorisation was followed by approval of the revisions of the SS and of the Plant Operating Specifications, for inclusion of the modifications deriving from implementation of the facility and of the approved storage casks, as well as of other documents affected.

Both the design of the cask storage facility and the corresponding SS are based on the characteristics of the ENSA-DPT cask, although other duly authorised casks may be stored as long as the necessary checks and analyses are first performed.

8.2.3. Approval of storage cask design

The ENSA-DPT casks currently in use at the Trillo storage facility have been designed for the storage and transport of spent fuel.

Consequently, and given that the licensing requirements for storage and transport are clearly separated and bound, the licensing process has been carried out in two separate stages for each of the necessary approvals:

- ✓ Approval of the design for storage, as required by the Regulations on Nuclear and Radioactive Facilities.
- ✓ Approval of the model of the package for transport type B(U), in accordance with the applicable Spanish transport regulations.

Manufacturing of the cask has been subject to a quality assurance programme and has been tracked by the CSN by means of the following:

- ✓ The inspections performed to verify compliance with the design and quality procedures specifications, as well as with the verification tests carried out on the two first casks manufactured.
- ✓ Evaluation of the documentation corresponding to the design modifications carried out for adaptation to the manufacturing requirements.
- ✓ The approvals for storage and transport initially issued in 1997 were revised in June 2002 in order to incorporate the design modifications required as a result of manufacturing and verification testing and for updating in accordance with the practices and standards of the country of origin of the design of the cask, the operating limits and conditions being adapted to the NUREG standards1745 "Standard *Format and Content for Technical Specifications for 10CFR 72 Cask Certificate of Compliance".*
- ✓ All the above has been incorporated into the approval for use of the casks at storage facilities, issued in June 2002, which follows the format of the Certificates of Compliance contemplated in 10CFR 72, due to the fact that this was not defined in the Spanish legal framework and that there were no precedents. This approval:
- ✓ Establishes ownership of the design of the cask.
- ✓ Identifies the documentation used as a basis for awarding of the approval and the system to be applied for subsequent design revisions and modifications.
- ✓ Specifies the standards considered to be applicable in relation to the manufacturing, testing and use of the cask.
- ✓ Limits the period of validity of the licence to 20 years and defines the procedure and conditions for its extension.
- ✓ Includes a description of the essential characteristics of the model of cask.
- ✓ Specifies the basic design parameters of the fuel to be stored.
- ✓ Specifies that the cask may be stored at facilities meeting the conditions of use, the limits and the operational controls (or technical specifications) of the cask.
- ✓ Subjects all cask design, manufacturing and operating activities, including testing, maintenance and surveillance, to Quality Assurance Programmes.
- ✓ Requires that loading and unloading, surveillance and maintenance operations be carried out in accordance with written procedures consistent with the Operating and Maintenance Manuals.
- ✓ Defines the minimum information to be submitted annually to the CSN, including data on operating experience.
- ✓ Defines the procedure for the periodic updating the cask safety study.

8.3. General framework for safety analysis and assessment

The Final Safety Studies submitted by the licensees of the nuclear power plants contain several sections on spent fuel storage, the cooling system and the handling systems, which include the design bases, acceptance criteria, applicable standards, the description of the systems and methods used and the analyses performed to demonstrate compliance with the acceptance criteria by all the essential functions (prevention of criticality, heat removal, confinement of activity, shielding).

The document used for analysis and assessment in this respect has been NUREG-0800 "Standard Review Plan", sections 9.1.2 "Storage of Spent Fuel", and 9.1.3 "Spent fuel pool cooling and cleaning system", along with the associated standards.

In the case of Trillo NPP, whose technology is of German origin (Kraftwerk Union Aktiengesellschaft), the information on storage is to be found in the Final Safety Study. The criteria of the German standards have been used and contrasted for assessment with the requirements referred to above. Thus, for example:

- ✓ The analyses relating to criticality take into account the Spanish standard UNE 73-501-92 "Criticality requirements for the design of fuel pool storage racks" and the directives of the Standard Review Plan (NUREG-0800), chapter 9.1.2, specifically general design criterion 62, which as regards compliance refers to Regulatory Guide 1.13 *"Spent Fuel Storage Facilities Design Basis*" and ANS 57.2 *"Design Objectives for LWR Spent Fuel Storage Facilities al NPS"* and Regulatory Guide 3.71 *"Nuclear Criticality Safety Standards for the Fuel and Material Facilities".*
- ✓ Analyses relating to the cooling system take into account the directives mapped out in the Standard Review Plan (NUREG-0800), in chapter 9.1.3 of the standards referenced therein: 10CFR20, 10CFR50, R.G. 1.13, R.G. 1.26, R.G.1.29, R.G. 1.52, with the exceptions corresponding to plants of older designs.

As regards the storage casks, the final safety study adheres to the format of NUREG-1536, and includes a general description of the cask, the main design criteria, structural assessment, thermal assessment, assessment of the shielding and analysis of criticality, in addition to the operating procedures, acceptance criteria and maintenance procedures, protection against radiation, a chapter on accident analysis, another on quality assurance and one on operating limits and conditions, drawn up in accordance with the aforementioned NUREG document.

The documentation has been evaluated by the CSN in order to check for compliance with the acceptance criteria of the reference standards in each case, prior to the issuing of decisions for the corresponding approvals.

As has been pointed out, the Trillo storage facility SS is based on the design of the cask and has also been evaluated by the CSN.

8.4. Assessment of compliance

The legal framework existing in Spain for the licensing of facilities requires a safety assessment during the stages of construction and operation referred to in this article of the Joint Convention. This has been accomplished systematically for the existing facilities, creating a basis for application to other future installations. As a result, Spain may be said to reasonably comply with the requirements of this article.

Article 9.
Operation of facilities

9.1. Operating permit

The operating permit for spent fuel storage facilities existing in the country refers to the spent fuel storage pools (SFSP) at the NPP's and the Cask Storage Facility at Trillo NPP. The SFSP's at all the operating plants have been evaluated and authorised within the process of licensing of the plants themselves, for which reason the design requirements and operating limits and conditions included in the safety assessments and environmental assessments are part of the Operating Permits awarded to the licensees on completion of the Start-up programme (pre-nuclear and nuclear testing) that demonstrates that the facility, as built, meets the design and safety requirements.

The Operating Permit in force allows the licensee to possess and store slightly enriched fuel assemblies, in accordance with the technical limits and conditions contained in the SS for the refuelling outage for each cycle, and with the limits and conditions associated with the Specific Authorisations for the storage of fresh and irradiated fuel.

The spent fuel operations are carried out at each NPP in accordance with the Operating Permit for each facility, established as determined in the RNRI in force, which considers the OTS's and the RWMP to be documents necessary for operation.

Furthermore, the extension of the storage capacity of the NPP pools, Either through re-racking in the pools themselves or through the construction of the new dual-purpose metallic cask storage facility at Trillo NPP, has been proposed, assessed and authorised in the form of a modification to the plant itself, within the framework of the Operating Permits in force and following the same licensing process as used for the original permit.

9.1.1. Spent fuel storage pools

During the operation of the nuclear power plants, and as regards the spent or irradiated fuel storage pools, consideration is given to a number of aspects, such as those indicated below.

- ✓ Movements of heavy loads over the spent or irradiated nuclear fuel.

  The restriction on the movement of loads exceeding the nominal weight of one fuel assembly and the associated handling tool over the other spent or irradiated fuel assemblies in the storage pool ensures that in the event of this assembly being dropped: (a) the release of radioactivity would be limited to that considered for the fuel assembly drop accident, and (b) any possible distortion of the storage racks would not give rise to a critical configuration. This hypothesis is in accordance with the release of activity assumed in accident analysis. In the case of nuclear power plants at which the fuel pool is in the Containment Building itself, there are interlocks on the building crane that prevent loads from being moved over the pool.

- ✓ Level of water in the storage pool

  The restrictions on the minimum level of water ensure the availability of a depth of water sufficient to eliminate 99% of the radioactivity that would be released in the event that 10% of the iodine contained in the fuel rod gap es-

caped as a result of the breaking of an irradiated fuel assembly. The minimum depth of water is in accordance with the hypotheses of accident analysis. The level of water ensures that there is a sufficient amount of water for correct operation of the cooling of the fuel assemblies located in the pool.

The design of the facility prevents the accidental drainage of the pool. Water make-up systems are in place to recover the level, as well as redundant level indications in the Control Room.

✓ Fuel storage area ventilation system

The limitations on the fuel storage area ventilation system ensure that all the radioactive material released from an irradiated fuel assembly would be filtered by the high efficiency particulate (HEPA) filters, in the case of airborne particles, and by activated carbon absorbent prior to being released to the atmosphere. The operability of this system and the resulting iodine removal capacity are in accordance with the hypotheses of accident analysis. The system is equipped with the radiation monitors necessary to prevent off-site releases in excess of the established limits.

✓ Control of Boron concentration and of Burnup in the spent fuel pool

The required boron concentration (only PWR type plants) and the degree of burnup required for the assemblies stored in the spent fuel pool ensure that subcriticality is maintained under the worst conditions foreseen during the storage and handling of the fuel assemblies.

Criticality analysis is use as an acceptance criterion for the subcriticality margin recommended in 10CFR50.68 and KTA 3602. The effective neutron multiplication factor, K_{eff}, of the fuel handled and stored in the pool must be equal to or lower than 0.95, with a probability of 95% for a 95% level of confidence, under all the conditions to be analysed.

✓ Radiation surveillance in the fuel storage pool area.

The level of water in the pool and the pool purification system limit the doses produced by the stored fuel and the radioactive contamination of the water.

Radiation detectors are located in the pool area, with local indication and indication on the panels of the Radiation Surveillance System in the Control Room, with high radiation level visual and acoustic alarms.

✓ Fuel pool temperature range and limit.

The temperature of the water in the pool is limited to a maximum value during normal operation. A maximum limit is established for pool water temperature in order to guarantee at all times that the temperature of the surface of the fuel rods is kept at adequate levels and that boiling temperatures are not reached at any point in the mass of water. Likewise, this guarantees that the mechanical properties of the structural concrete of the pool are not modified.

There is a redundant measurement of the temperature, with indications in the Control Room and high temperature alarms. The pool cooling system is redundant, with each cooling train having a 100% capacity.

✓ Fuel pool leakage detection system.

The fuel storage pool has been suitably designed as a Class 1 structure capable of withstanding the seismic loads foreseen. The stainless steel liner prevents leakage, even in the improbable event of cracks appearing in the con-

crete. In order to avoid the unintentional drainage of the pool, there are no penetrations allowing for such drainage in its lower part.

✓ Operability of fuel pool cooling and filtering systems.

The functions of the system are: (a) keep the water in the Spent Fuel Pool below a given temperature and (b) filter and demineralise the water in the Spent Fuel Pool in order to ensure an acceptable level of radiation and the degree of clarity required for refuelling and reactor service.

✓ Fuel handling systems.

The fuel handling equipment and tools are fitted with resources designed to prevent their incorrect use (excessive hoisting, load limits, etc.), and with safety mechanisms to prevent the dropping of fuel assemblies.

✓ Systems guaranteeing containment at the fuel pool location and administrative standards for access control.

The design of the building, structures and systems for storage of the spent fuel has been developed to withstand the seismic loads corresponding to the operating base and shutdown earthquakes, as well as applicable natural loads and phenomena (wind, seaquakes, etc.). The building is designed to minimise any escape of radioactive material that might result from an accident.

9.1.2. Dry spent fuel storage facility (Trillo NPP)

The Trillo NPP cask storage facility is designed to house 80 casks containing the spent fuel assemblies from the Plant. The storage and transport cask has a capacity for 21 fuel assemblies of the 16x16 type in inert gas (Helium).

The cask is the only element with safety functions, the storage facility being a passive element with no such functions, the only requirement being that its collapse does not affect the casks.

The supervision and control system watch over the performance of the casks by means of pressurestats that control the pressure between the covers of the cask.

Cask operations implying the verification of safety parameters are carried out on the basis of the Trillo NPP OTS's and the Surveillance Procedures. These are as follows:

✓ Cask Loading

This procedure ensures that the fuel assemblies to be loaded meet the design basis of the cask, the safety functions being guaranteed during cask storage operations.

✓ Fuel integrity during helium discharge and filling operations.

Surveillance of the time during which the aforementioned manoeuvres are performed ensures that the integrity of the cladding is guaranteed and that the temperature remains sufficiently below the Short-Term Cladding Temperature Limit, while providing a reasonable amount of time for performance of the additional actions required in the Operating Specifications.

✓ Checking of cask pressure transducers.

This procedure ensures the correct operation of the pressure transducers o casks loaded with fuel.

✓ Verification of pressure between cask covers.

This procedure ensures the confinement of the fission products in the fuel stored in the cask. For this purpose a maximum leak rate limit has been established for leakage across the cask confinement barrier. Compliance with this limit is ensures through monitoring of the pressure variation between the covers.

There are also various procedures aimed at ensuring all cask operations and maintenance manoeuvres.

9.2. Limits and conditions regulating operation

The OTS's establish the Operational Limit Conditions, applicability, the necessary actions and the surveillance requirements necessary to ensure compliance with the limit conditions regarding the storage of spent fuel, as indicated in the points of Section 9.1.

Likewise, the OTS's contain the limit values for the variables affecting safety, the actuation limits for automatic protection systems, the minimum operating conditions, the programme of revisions, calibrations and inspection or periodic testing of various systems and components and their operational control.

In order to develop and detail the surveillance requirements of the OTS's, surveillance procedures are drawn up for performance by the different departments involved in plant operation.

In addition, the SS includes sections referring to the following:

i. The spent fuel storage pool and types of racks used, specifying the Design Bases relating to Safety and additional Design Bases, the codes and standards applicable to design, a description of the installations, the Safety Assessment and the periodic tests and inspections where appropriate. The Safety Assessment indicates the analysis of criticality, the design of the fuel storage racks used and the protective characteristics of the irradiated fuel storage facility.

ii. The spent fuel pool cooling and purification system, specifying the safety-related design bases and those relating to energy generation, a description of the system, the Safety Assessment and the periodic tests and inspections where appropriate.

iii. The Fuel Handling system, specifying the Design Bases and including a description of the system with maintenance tools and equipment, description of the use of the main maintenance tools and equipment, project safety aspects where applicable (e.g., irradiated fuel coffer, fuel handling platforms, etc.), the Safety Assessment, periodic tests and inspections where appropriate and the instrumentation associated with the maintenance tools and equipment.

The SS includes Analysis of the Fuel Handling Accident in the building housing the SFSP. Also indicated are the applicable tests included in the construction, pre-nuclear and nuclear testing programme (e.g., pre-nuclear testing of the fuel handling equipment, pre-nuclear testing of the SFSP cooling and purification system, etc.).

9.3. Procedures relating to spent fuel storage

The NPP's have various procedures regulating the performance of the different activities relating to the operation, maintenance, radiological surveillance and inspection of the structures, systems and equipment involved in spent fuel storage. The following are particularly significant:

- ✓ Operating procedures for the Spent Fuel Pool Cooling and Purification System. These cover the different operating modes of this system, including temperature and level indications and alarms, level recovery methods, etc.
- ✓ Procedure for pool leakage checking
- ✓ Procedures for handling of the fuel. These cover all the equipment and tools intervening in the handling of the fuel at the plant, and also possible incidents.
- ✓ Radiation Protection procedures. These cover all the aspects of radiation protection associated with the Controlled Zone and applicable to the Spent Fuel Storage Area, as well as the actions to be taken in the event of a fuel handling accident.
- ✓ Procedures for the surveillance of pool water chemistry. In addition to the concentration of boron in the pool water, which has its own procedure, the presence of certain chemical compounds is monitored, these being limited to the values recommended by the standards in order to preserve the integrity of the fuel.

The facilities have detailed inventories of the fuel assemblies arranged in the spent fuel pool, with the following information on each of the assemblies stored:

- ✓ Identification and technical characteristics (manufacturer, model and type).
- ✓ Burnup history and value of burnup reached.
- ✓ Isotopic balance of the assembly.
- ✓ Storage position.
- ✓ Physical status of the assembly, existence of fuel rod failures and inspection performed.
- ✓ Defective rods removed from the fuel assemblies.

This information is updated at the end of each operating cycle and meets the requirements of the relevant OTS and the Annual RWMP Report.

9.4. Technical supports

The nuclear power plants have engineering and technical support services to facilitate compliance with and verification of the safety criteria in the area o spent fuel storage, within the scope described in the corresponding Operating Regulations.

The contracts established with the suppliers and/or manufacturers of nuclear fuel contemplate technical support in relation to the fuel assemblies supplied, his including the transmission of the characteristics and design of the assemblies, their operating limits to guarantee the fuel and the drawings and data that the nuclear power plant requires as a result of the contracts drawn up between it and the companies providing irradiated fuel services (ENRESA, transport of irradiated fuel, storage, etc.).

9.5. Reporting

The nuclear power plant OTS's establish the conditions under which special reports are to be drawn up in the event of incidents with a significant impact on the safety of spent fuel storage installations.

The CSN and the governmental authorities are to be notified of Reportable Events through use of the format included in Appendix II, III or IV of CSN Safety Guide GSG-1.6. Special Reports are to be sent to the CSN as established in the OTS's.

The monthly operating report submitted to the CSN includes information on the storage status of the sent fuel pools and possible variations with respect to the previous such report, including indications of the list of existing assemblies, accumulated burnup and the date of unloading from the reactor.

Every year each plant sends to EURATOM / IAEA a declaration, for each fuel assembly, on the fissionable material existing in the spent fuel storage pool.

Specifically, the following reports and periodic notifications are drawn up:

i. Fuel accounting.

ii. Confinement of the fuel by means of seals at key measuring points and fuel movement monitoring units.

iii. Periodic accounting and confinement inspections.

iv. Monthly report to the CSN (IMEX): Current pool capacity and inventory.

v. Monthly report to the MINECO: Variations in fuel inventory.

vi. Annual report to ENRESA: Waste inventory (list of assemblies in pool).

vii. Reports to EURATOM: Fundamental Technical Characteristics, Inventory Changes Report (monthly), Materials Balance Report (annual), Physical Inventory Report (annual) and General Activities Schedule Report (annual).

9.6. Operating experience

The procedures of the nuclear power plants contemplate the analyses of in-house and industry operating experience, carried out by the corresponding specialists, which may lead to actions for improvement in both design aspects and operating procedures.

As regards In-House Operating Experience, the Reportable Events Report and the Special Reports re analysed.

As regards Industry Operating Experience, the analysis covers the following reports, among others:

i. Reports generated by the Spanish NPP's or required by the CSN.

ii. Reports generated by INPO/WANO: SER, SOER, SEN/O&MR (INPO) and ENR/EAR/MER (WANO).

iii. Experience published by the USNRC.

iv. Suppliers: Reports required by 10CFR21 and Technical Bulletins.

9.7. Decommissioning

Decommissioning plans will be prepared and, whenever necessary, updated in reference to spent fuel management facilities, using the information obtained during the operational lifetime of the installation, these being examined by the Regulatory Body.

9.8. Assessment of compliance

From what has been set out above in each of the sections on safety requirements that make up this article, it may be deduced that in Spain the operations carried out at spent fuel management facilities fulfil the characteristics necessary to ensure compliance with the different measures required by article 9 of the Convention, applicable to the existing facilities.

Article 10. Disposal of spent fuel

As has been indicated in Section B, the different GRWP's have contemplated deep geological disposal as the final solution for the spent fuel from operating light water reactors. However, the 5th GRWP currently in force postpones any decision regarding a final solution to the year 2010. The studies currently under way address deep geological disposal and analysis of the impact that Separation and Transmutation techniques might have on such disposal in the future, in terms of volume and the radiotoxicity of the source term to be disposed of.

Section H

Safety of radioactive waste management

Article 11. General safety requirements

11.1. Measures to guarantee the maintenance of subcritical conditions and heat removal

In addition to the spent fuel (SF) from the Nuclear Power Plants, in Spain it will be necessary to manage the high level vitrified wastes from the reprocessing in France of the SF from the Vandellós I plant, which will be returned as from the year 2010, and minor quantities of fissionable materials recovered during the reprocessing in Great Britain of fuel from Sta. María de Garoña NPP, generated prior to 1983 and to be returned to Spain at a date that has not yet been specified.

Likewise, in accordance with the classification of wastes and the strategies for their final disposal, described in Section B (section B.3) of this report, consideration should be given within the group of wastes that are to be disposed of in a deep geological facility to those other wastes that, in view of their characteristics regarding activity and half life cannot be sent to the El Cabril facility.

The measures taken to guarantee the maintenance of subcritical conditions at the currently existing temporary spent fuel storage facilities, located at the sites of the nuclear power plants, have been described in Section G (section G.1) of this report. Given their nature, the rest of the aforementioned wastes cannot reach subcritical conditions, with the exception of the fissionable materials recovered during the reprocessing of Spanish fuel in other countries, which are not currently in Spain.

As regards the measures to guarantee heat removal, the situation is similar to that described above. The measures adopted at the temporary spent fuel storage facilities are those described in Section G of this report, while of the wastes mentioned only the high level vitrified wastes (80 m^3) currently in France generate heat in considerable quantities, which will have to be taken into account when they are returned to Spain.

The rest of the wastes referred to above and destined for disposal in deep geological facilities do not generate significant quantities of heat.

11.2. Measures adopted to ensure that the generation of radioactive wastes is kept to the minimum practicable

The measures adopted to ensure that the generation of radioactive wastes as a result of spent fuel management is kept at the lowest possible level have been included in Section G, point 4.2 d) of this report.

In keeping with the Spanish policy for management of the currently existing spent fuel and high level wastes identified in Section B of this report, no consideration has yet been given to measures to reduce their generation.

As regards the management of low and intermediate level radioactive wastes, although there are to date no specific requirements in the Spanish standards that oblige the producers to minimise the volumes produced, the principle of minimisation of production has been promoted by the Nuclear Safety Council (CSN) in practice through action requirements made of the Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA) in relation to the optimum use of the definitive disposal capacity of the El Cabril facility.

In recent years, these requirements have led the nuclear power plants and ENRESA to make joint efforts to reduce the volume of low and intermediate level radioactive wastes generated at the Spanish plants. These efforts are governed by an Agreement, drawn up within the framework of the UNESA-ENRESA Parity Commission and signed in June 1994, which has led to joint analysis tasks and investments in specific projects. This Agreement establishes a financing system that may include economic participation by ENRESA in the costs of the project, the limit being the economic saving implied, within ENRESA management, by the quantity of packages reduced through implementation of the project.

In January 1995, following signing of the Agreement and as a result of a study of the possible actions at each nuclear power plant, ENRESA drew up a global volume reduction action plan that, being considered to constitute an initial phase, included exclusively a series of straightforward projects implying few uncertainties. This global plan was revised in July 1997, the projects considered in this second phase being more complex. The majority of these are currently implemented or are in the final phase of installation.

It should be pointed out that the reduction provided by the volume reduction projects is only a part of the total reduction, since there has been improvement in operating practices, which has been additionally undertaken by the nuclear power plants and has also provided satisfactory results.

The volume reduction projects implemented at the nuclear power plants have had a fundamental impact on the following aspects:

- ✓ Rearrangements of the drains, preventing radioactively clean fluids from entering the radioactive waste treatment system and avoiding the need to condition them as a result of their mixing with active fluids, producing low and intermediate level waste packages. These are projects that have been performed during the 1st and 2nd phases of the Action Plan, and have been implemented at the Ascó (saving of 400 packages), Cofrentes (saving of 228 packages) and Trillo (saving of 280 packages) plants.
- ✓ Conditioning of wastes from evaporator concentrates, as a replacement for the water accompanying the ion exchange resins, thus avoiding the production of packages of concentrates. This is an action plan 1st phase project that

has been implemented at practically all the nuclear power plants. It implied a significant economic investment only in the case of the Trillo plant, where the corresponding volume reduction project was formalised, this currently amounting to a saving of 156 packages.

- ✓ Segregation of decontamination treatments and wastes, where it has been possible to manage conventionally materials that would otherwise have been introduced in radioactive waste packages. Except for occasional 1st phase projects, most of these belong to the 2nd phase of the action plan. It has been implemented at Garoña (saving of 766 packages), Almaraz (saving of 1,114 packages), Ascó (saving of 1,000 packages), Cofrentes (saving of 1,210 packages), Vandellós II (saving of 510 packages) and Trillo (saving of 594 packages).

- ✓ Improvement to the plant treatment systems, in order to minimise the volumes of waste generated. This is the case for Cofrentes NPP, with a 2nd phase action plan project that to date has achieved a reduction of 254 packages.

- ✓ Implementation of concentrate and sludge desiccation equipment, with a view to significantly reducing the volume of wastes to be conditioned. This is a 2nd phase project that has already been installed at Cofrentes NPP, with a saving to date of 225 packages, and is scheduled to enter operation this year at the Almaraz and Trillo plants, and next year at Garoña and Vandellós II.

ENRESA is currently continuing joint analysis with the nuclear power plants and the implementation of volume reduction actions at these facilities, including economic participation, the main milestones sought in the short term being completion of the concentrate and sludge desiccation equipment implementation project, expected during the year 2002, and the performance of clearance projects for certain waste streams at the nuclear power plants overall. It is estimated that with the maintenance of the on-going projects and the adoption of these new projects the overall production of low and intermediate level wastes (LILW) at the NPP's will amount to approximately 2,000 packages a year (equivalent to 440 m3).

Also worthy of special mention are the joint efforts being made by ENRESA and the radioactive facilities (RF's) to reduce the quantities of wastes removed. In the last ten years the annual volume of wastes collected from these producers has been practically halved, dropping from some 140 m^3 to the current 70 m^3, with values close to 100 m^3 in 1999 and 2000. During this period, the previous 400 contracts between ENRESA and the RF's have risen to the 650 currently in force, the number of RF's in the country having remained practically constant.

Figure 1 shows the production trend for low and intermediate level wastes. Noteworthy in this respect is the investment of more than 6 million euros made by ENRESA in volume reduction at the nuclear power plants, within the framework of the agreement drawn up for this purpose between ENRESA and UNESA.

11.3. Measures adopted to take into account the interdependencies between the different stages of radioactive waste management.

The measures adopted to take into account the interdependencies between the different stages of radioactive waste management are specified in Section G, point 4.3.

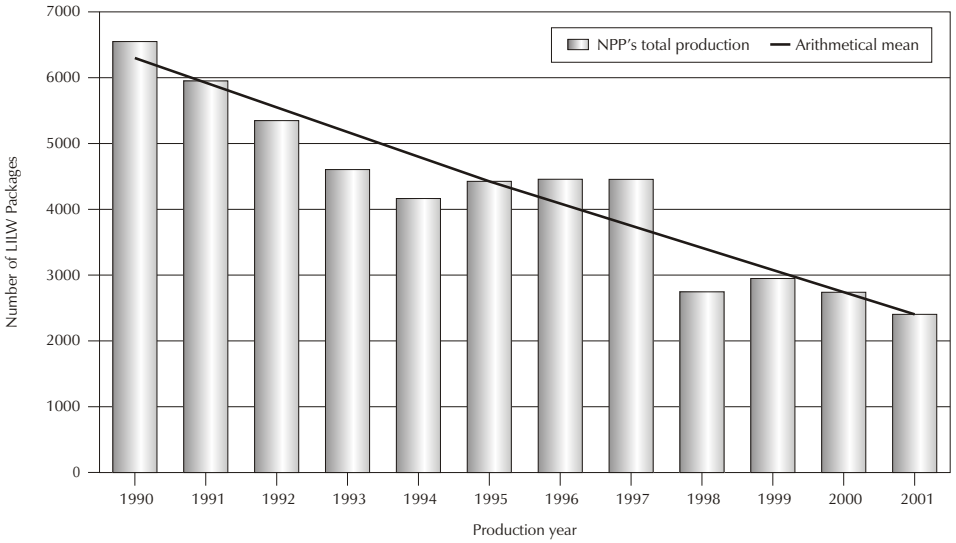


Figure 1. Annual production of LILW packages at NPPs.

In accordance with the Spanish policy for the management of currently existing spent fuel and high level wastes, identified in Section B of this report, no specific measures have been adopted in relation to this requirement.

As regards the management of low and intermediate level wastes, the main objective of all the technical and administrative operations associated with radioactive waste management is to limit exposure to radiation for the operating personnel and the public, minimising the possible long-term effects for the environment and the generations of the future.

With this objective in mind, the requirements made of an overall radioactive waste management system, of its components and of the final products obtained are defined in terms deriving from the safety and radiation protection conditions established by the Spanish regulatory authority.

As regards the stages of low and intermediate level radioactive waste management carried out at the Spanish nuclear power plants, these are subject, among other things, to the regulatory licensing process prior to operation. During this process, the licensee is specifically required to draw up and apply the so-called Process Control Programme (PCP) in operating systems for the conditioning wastes for final disposal.

In 1991, the CSN published Safety Guide 09.01: "Control of the process of solidifying low and intermediate level radioactive waste", in which are established the objective, scope and contents of the PCP.

The objective of the PCP is to reasonably guarantee that the waste conditioning systems will operate in accordance with previously determined parameters, such that the quality of the solidified end products obtained is acceptable and that the acceptance criteria established for their reception at the El Cabril Disposal Facility are met.

For achievement of the objective of the PCP, its contents are based on compliance with two basic criteria:

- ✓ Identification and bounding of the parameters governing the solidification process, especially those by which the operation of the system is related to the

quality of the end product obtained, as regards guarantees in relation to long-term performance and stability.

✓ Assurance that the conditioning system will always operate within the process parameters established.

The inspection programmes carried out by the CSN at the nuclear power plants include control and verification of the correct implementation of the PCP with regard to the conditioning systems for moist wastes (resins, concentrates and sludges), based on the acquisition of end products in the form of cemented monolithic solids.

The acceptance criteria for low and intermediate level waste packages were established in accordance with the Ministerial Order of 9th October 1992. The operating permit for the El Cabril disposal facility currently in force, awarded by Ministerial Order on 5th October 2001, determines that the waste acceptance criteria for this installation are part of the official operations documents.

The existence in Spain of a clearly defined concept of a facility for the definitive management of low and intermediate level radioactive wastes provides advantages from the technical point of view and as regards safety and radiation protection, since it is possible to undertake integrated management through the optimisation of each component and taking into account the overall result.

Especially interesting as regards the interdependencies between the different stages of LILW management is the study and determination of their physical, chemical and radiological properties, knowledge of which is necessary for assessment of compliance with the safety conditions of temporary storage and final disposal.

ENRESA must, therefore, guarantee that all radioactive waste packages accepted for disposal at the El Cabril facility be accompanied by documentation accrediting that the wastes have passed the process and tests established for their acceptance.

The CSN required ENRESA to draw up a methodology for the acceptance of waste packages at the El Cabril disposal facility, along with a set of technical and administrative procedures for practical implementation, as regards both the relations between ENRESA and the waste producers and activities for which ENRESA is exclusively responsible in relation to the acceptance of different types of waste packages.

ENRESA has established an acceptance methodology that implies the establishment of acceptance criteria and the performance, following the appropriate tests, of a process of characterisation and acceptance of the different types of packages from the different producers, with surveillance based on inspection on reception, documentary and in-the-field controls on waste production and the performance of scheduled verification tests on the real packages received.

One of the most relevant inspection activities carried out by the CSN in this area is the periodic verification of compliance by ENRESA with the acceptance and process traceability procedures established.

As regards the wastes from the RF's, ENRESA invites these producers annually to working sessions on radioactive wastes, in order to inform them of management processes, including a description of the activities performed at the El Cabril disposal facility and their optimisation. The result of these activities is a considerable and progressive improvement in these producers' waste management processes.

11.4. Measures for the efficient protection of individuals, society and the environment

11.4.1. General measures

The provisions of the Spanish regulations on the protection of people and the environment are included fundamentally in the Nuclear Energy Act, Law 15/1980, of 22nd April, creating the Nuclear Safety Council (CSN), the Regulation on Nuclear and Radioactive Installations (RNRI) and the Regulation on Protection against Ionising Radiations (RPRI).

Nuclear Energy Act, Law 25/1964, of 29th April

Chapter six of this Law, on "Safety and protection measures against ionising radiations", establishes the obligatory requirement that nuclear and radioactive facilities fulfil whatever provisions might be established in the corresponding regulations in relation to protection against ionising radiations, as well as the obligation that such facilities have special installations for the storage, transport and handling of radioactive wastes.

Law creating the Nuclear Safety Council

This law assigns to this organisation the functions of monitoring and controlling levels of radioactivity on and off site and their impact, specific or accumulative, on the areas in which they are located, controlling the doses received by the operating personnel, assessing the environmental radiological impact of the facilities and learning from the Government and advising the latter on commitments with other countries and international organisations in relation to nuclear safety and radiation protection.

Regulation on Protection against Ionising Radiations

This regulation transposes to Spanish law the requirements of Directive 96/29/EURATOM, in relation to basic radiation protection standards to prevent the appearance of certain biological effects and limit to acceptable values the appearance of stochastic effects for the members of the public and professionally exposed workers, as a result of activities implying a risk of exposure to ionising radiations.

As basic principles of protection it establishes those recommended by the International Commission for Radiological Protection (ICRP-60), justification, optimisation and limitation, including general standards and fundamental surveillance measures for the protection of professionally exposed workers and the members of the public.

The Regulation establishes the obligation that the licensees of the facilities perform an assessment of the doses that might be received by the population as a result of the normal operation of the installations and in the event of an accident, this being a requirement for the administrative authorisation of the facility in question.

The Regulation also establishes certain specific provisions regarding systems for the confinement of radioactive wastes and their temporary storage, including also requirements relating to the recording of the more relevant data on their content.

Regulation on Nuclear and Radioactive Installations

This regulation also transposes to Spanish law the requirements of Directive 96/29/EURATOM, as regards aspects relating to the process of authorising nuclear facilities, which is the one applied in Spain to radioactive waste management facilities for awarding of the operating permit.

The Regulation establishes (Art. 20 h) that the request for the operating permit for any nuclear facility must be accompanied by certain obligatory documents, among which are the so-called RWMP, which will incorporate where appropriate the contracts drawn up with the management companies and include, among other concepts, a system for possible clearance.

11.4.2. Limits and conditions imposed upon low and intermediate level radioactive waste management facilities

The Spanish nuclear legislation and the aforementioned regulations establish mechanisms for the direct protection of people and the environment. However, the different stages of radioactive waste management, and especially final disposal, need to be analysed from the point of view of deferred safety, since the remaining radiological risk for people and the environment will need to be controlled over long periods of time.

At present, the Spanish nuclear legislation lacks specific provisions relating to control of radiological risk in the long term, and the standards relating to the safety principles and criteria to be met by the waste management facilities over time periods different from those dedicated to normal operation are not fully developed.

The non-existence of Spanish legal provisions relating to long-term safety and radiation protection has been made up for, especially as regards the low and intermediate level waste disposal facility, through the direct application of the safety principles and criteria emanating in this respect from the international organisations, on the one hand, and, on the other, with the specific application of safety requirements set out in the standards of other countries for the regulation of facilities based on similar technological concepts and that have served as a reference in the safety assessments of the Spanish installations.

The safety principles and criteria relating to radioactive waste management and recommended by international organisations such as the ICRP and the IAEA have occasionally been specifically incorporated as conditions for the construction and operation of waste management facilities.

As regards the incorporation of safety requirements established in the standards of other countries, certain conditions have been imposed by the regulatory authorities for the operation of the low and intermediate level waste surface disposal facility, taking as a reference the safety requirements applied at installations with similar technology existing in other countries (France, Great Britain, United States).

11.5. Measures for consideration of biological, chemical and other risks potentially associated with radioactive waste management

Consideration is given in Spain to risks other than the radiological and possibly associated with radioactive waste management through two courses of action. On the one

hand, the standards establish the need for certain activities not to be authorised until such time as their environmental impact is assessed, and on the other the very technology used in managing radioactive wastes takes into account and attempts to minimise the potential presence of risks other than the radiological, to the extent that the radiological safety margins existing at radioactive waste management facilities might be reduced.

The aforementioned standards-related side to the issue is reflected in the Spanish provisions emanating from Council Directive 85/377/CEE, of 27th June, on Environmental Impact Assessment (EIA), which was transposed to the Spanish legal system by means of Royal Legislative Decree 1302/86, of 28th June, and Royal Decree 1131/88, of 30th September. The aforementioned Directive was modified by Council Directive 97/11/CE, of 3rd March.

The EIA is an administrative process that allows the authorities to assess the impact on the environment of a given activity, prior to awarding of the authorisation for its performance.

As regards radioactive waste storage and disposal, Directive 97/11/CE specifies that EIA's will be required for the final irradiated nuclear waste repository, the radioactive waste repository and the storage (projected for periods in excess of 10 years) of irradiated nuclear fuels or radioactive wastes at locations other than that at which they were produced.

The EIA requires the drawing up by the licensee of the activity of an environmental impact study referring, among other things, to the measures foreseen to reduce the impact deriving from causes other than the radiological, indicating possible alternatives, and an environmental surveillance programme during performance of the activity.

The Environmental Impact Statement (EIS) is drawn up jointly and in coordination by the Ministry of the Environment and the CSN, within their respective realms of competence. The EIS for extension of the El Cabril waste disposal facility was granted by a Resolution of the Directorate General for the Environment on 17th August 1989, and is part of the Order of the Ministry of Industry of 31st October 1989, via which the construction permit for the aforementioned extension was awarded.

The presence in low and intermediate level radioactive wastes of substances whose toxicity and hazardous nature are associated with causes other than ionising radiations is an unarguable fact. However, Law 10/1998, of 21st April, on Wastes excludes from its scope of application (Art. 2) radioactive wastes regulated by the Nuclear Energy Act, Law 25/1964.

From this standards-related point of view, in managing radioactive wastes that may pose biological, chemical or other risks, measures are applied specifically to protect the workers, the public and the environment against such risks, but in all cases with consideration given primarily to the radiological risk associated with the wastes.

In addition, and as a preventive measure, limitations are established on the content of such chemical or biological substances potentially present in the LILW disposed of at the El Cabril facility.

The waste acceptance criteria at the aforementioned disposal facility include, among other restrictions, those relating to the minimisation of the presence of substances whose main potential risk does not arise as a result of radioactivity and to those capable of producing exothermal chemical reactions.

Responsibility for declaring the presence of toxic chemical or biological substances is to the producers, who are required to identify them, minimise their production and, in

the event of a significant presence, undertake their specific treatment to remove them or inhibit their properties.

11.6. Measures to prevent repercussions for future generations greater than those permitted for the current generation

As has already been pointed out, the Spanish nuclear legislation currently lacks specific provisions relating to the control of radiological risk in the long term, and the standards relating to the safety principles and criteria to be met by the waste management facilities over time periods different from those dedicated to normal operation are not fully developed.

This shortcoming has made it necessary for the competent authorities to make specific announcements in those cases in which it has been considered necessary to establish measures for the protection of the generations of the future with a view to avoiding impacts greater than those considered acceptable for the present generation.

In this particular area are the criteria issued by the CSN in its Six-Monthly Report to the Upper and Lower Houses of Parliament, on 31st December 1985, according to which:

"The basic objective of radioactive waste disposal facilities, from the point of view of nuclear safety and radiation protection, is to guarantee that the radioactive wastes are isolated from mankind and from the environment, in such a way that potential releases of nuclides do not give rise to unacceptable exposure to radiation for persons. In this respect, consideration shall be given to the following: 1) That the basic objective should be met by the disposal system overall, including the site, the engineered barriers and the very physical and chemical form and packaging of the wastes, 2) That the degree of isolation required, in terms of technical complexity and the period of time over which its effectiveness is to be maintained, depends directly on the quantities and radiological characteristics of the wastes to be disposed of, especially their radionuclide inventory and half life."

In addition, the criterion defined by the CSN for long-term waste disposal facility exposure situations, in its Decision on the Proposal of the 1st General Radioactive Waste Plan (GRWP) in 1987, establishes that:

"The level of risk used shall be less than 10^{-6}/year, or the risk associated with an annual equivalent dose to individuals belonging to the critical group lower than 0.1 mSv."

This criterion was included in the first GRWP in accordance with the requirements of the CSN, and used to assess the safety of the El Cabril facility, this giving rise to issuing of the operating permit in October 1992, and in assessing the uranium manufacturing tailings stabilisation project at the site of the former Andújar Mill.

Preventing actions that may have unacceptable repercussions on future generations implies planning and implementing preventive measures within an uncertain context, for which reason analysis of the uncertainties affecting the long-term performance of radioactive waste disposal systems and assessment of the consequences is a habitually considered aspect.

The measures adopted in Spain are directly reflected in the Ministerial Order of 5th October 2001, awarding the operating permit for the El Cabril radioactive waste disposal facility, and are directly related to the following:

- ✓ Definition, in terms of dose or radiological risk, of the objectives of protecting persons in the long term against the effects of radioactive waste disposal.

- ✓ The need for the wastes to be isolated over given periods of time by means of multiple barrier systems: the waste itself (chemical barrier), the engineered barriers and the geological barrier.
- ✓ The need for the process of authorising radioactive waste disposal facilities to include analysis of the performance of the facility in the long term and quantification of the radiological consequences, such that they may be compared to acceptable radiological objectives.
- ✓ The implementation of maximum time periods to guarantee that the radioactivity of the wastes will have decreased to values allowing for the free use of the sites of definitive disposal installations.
- ✓ The need for long-term safety assessment to include consideration of both naturally occurring phenomena and the scenarios that might arise from human intrusion (advertent or inadvertent).
- ✓ The design of the facilities, with consideration given to the objective of recovery of the radioactive wastes disposed of if circumstances were to make this advisable.
- ✓ Consideration in safety assessment of the uncertainties associated with the long-term performance of disposal systems and human activity, and their foreseeable evolution.
- ✓ The need for there to be complete traceability during the different stages of waste management, including final disposal, such that it be technically and legally possible for such activities to be historically remembered.

11.7. Measures adopted to prevent undue burdens on future generations

The measures existing for consideration of the requirement relating to the burdens for future generations, inherent to the periods of time involved in radioactive waste disposal and facilities, are considered to be fundamentally related to the assignment of responsibilities, the setting up of funds for financing of the activities involved and provisions regarding the need for institutional controls.

In this respect, the existing legal framework establishes ENRESA's responsibilities, assigning to it the specific task of ensuring the long-term management of all installations used for the storage of wastes and spent fuel, and contemplates the constitution and application of, and mechanisms for the management of, the economic fund for its financing.

The specific measures adopted in the case of the El Cabril LILW disposal facility are related to the concept of passive safety that will be adopted during the period of its lifetime that will follow closure. Passive safety means that after closure the facility will not depend on continuous and major active measures but rather that it will be subject to active and passive institutional controls reinforcing its safety and ensuring compliance with the safety criteria specified by the regulatory authorities.

The Ministerial Order of 5th October 2001, awarding the operating permit to the El Cabril waste disposal facility, establishes that following the operating phase of the installation and its closure a control phase will begin, the duration of which shall not exceed 300 years.

The Safety Study (SS) of the El Cabril facility analyses events occurring during normal evolution and those due to possible incidental situations during the aforementioned control period.

During this control phase there should be exclusively control of access to the disposal area and periodic control of the liquids that might be collected by the underground seepage control network designed for this purpose, to guarantee the safety of the facility.

The SS includes analysis of the consequences of the incidental events that might occur during the aforementioned control period, the basic hypothesis being that knowledge of the potential disturbance of the disposal system is not immediate.

It is postulated that there will occasionally be periods of more than one year during which the future generations will be unaware of damage that has occurred, this favouring the progressive degradation of the safety barriers and increasing the radiological consequences estimated for normal evolution. Even in these circumstances, the radiological impact on the population should be in a range acceptable for the present generations.

11.8. Assessment of compliance

In accordance with what has been established in each of the points of this section, Spain is considered to in compliance with the requirements of the Convention.

Article 12. Existing facilities and past practices

12.1. Measures adopted to examine the safety of the El Cabril facility

The El Cabril low and intermediate level radioactive waste disposal facility is the only such installation existing in Spain as of the date of entry into force of the Convention.

The El Cabril facility is based on the concept of definitive radioactive waste disposal on the earth's surface with engineered barriers.

From the point of view of safety, the design and construction of the El Cabril facility are based on the defence in depth requirement, this materialising in this case through a system of multiple and mutually redundant safety barriers.

The technology used for radioactive waste management at the El Cabril facility has been described in Section B.8 and H.4.Art.14 (14.4.2) of this report.

Since it began operation in 1992, the El Cabril disposal facility has been subject to continuous safety assessment, on the one hand through the granting of Provisional Operating Permits (POP), a system that was replaced in 1999 with approval of the RNRI currently in force, and on the other through inspection and control activities carried out by the CSN, that undertakes permanent monitoring of the operation of the facility, possible incidents and compliance with the Operating Technical Specifications (OTS's) and CSN requirements.

At present, the El Cabril nuclear facility holds an operating permit, awarded via the Ministerial Order of 5th October 2001, that will remain valid until the volume available for the disposal of low and intermediate level wastes in the existing cells has been completed.

12.1.1. Periodic safety reviews

The operating permit for El Cabril establishes a system of Periodic Safety Reviews (PSR), the frequency of their performance being ten years.

The PSR's do not replace the analysis, control and surveillance activities continuously carried out at the El Cabril facility, but are aimed at providing an overall assessment of the safety and radiation protection status of the installation and an analysis of the experience acquired and possible improvements that might be implemented, taking into account the current situation and whatever new technological or regulatory circumstances might arise.

In addition, in 2001 the CSN established, through the corresponding Complementary Technical Instructions, a set of specific criteria to be met by ENRESA, as licensee of the El Cabril facility, in preparation of the PSR's.

The scope and content of the PSR's should include the following:

- ✓ Analysis of the operating experience of the facility, in order to assess whether operation is performed in accordance with appropriate safety measures, whether the resources required to detect possible deviations are in place and whether suitable corrective measures are adopted.
- ✓ Analysis of experience relating to assessment of the radiological impact associated with operation of the facility, which should include analysis of the evolution of operational doses and of doses to individuals belonging to the general public.
- ✓ Analysis of experience in relation to the environmental radiological surveillance of the facility.
- ✓ Analysis of the experience acquired by the licensee in relation to application of the methodology for the quality assessment and acceptance of the radioactive waste packages that may be accepted at the site.
- ✓ Analysis of experience of the study of parameters having an impact on the long-term safety of the facility, with a view to achieving better knowledge of the existing engineered barriers and of the site itself.
- ✓ Analysis of the experience acquired by the licensee in the long-term safety assessment of the facility.
- ✓ Analysis of changes in the regulations and standards, in order to check that the licensee has adequately analysed the applicability of the new national standards, those issued by countries using similar technology and the international recommendations issued.
- ✓ Programmes for the continuous assessment and improvement of safety and radiation protection at the facility, either already implemented or scheduled for performance on the basis of the experience acquired, the results of R&D programmes performed, the demands and requirements posed by the regulatory authorities, international recommendations and the operating experience of installation using similar technology.

The operating permit of the El Cabril facility determines that the first PSR is to be submitted by ENRESA to the competent authorities before 31st December 2003, and that it should include analysis of the period between start-up (1992) and the permit in force.

12.1.2. Regulatory safety and radiation protection control activities at the El Cabril Disposal Facility

One of the functions of the CSN is to undertake assessment, inspection and control of the El Cabril disposal facility, in order to ensure compliance with the standards and conditions established in its operating permit.

The documentation submitted by ENRESA during the processes of authorisation described above and that corresponding to the SR's is assessed and analysed by the CSN, and the latter may require whatever clarifications, explanations and details it considers to be necessary. In order to revise in detail the calculations performed by the operator, the CSN may carry out alternative calculations or verification inspections at the offices of the engineering organisations at which such calculations have been performed.

The operating permit for the El Cabril facility requires ENRESA to submit a report during the first quarter of each calendar year to the Directorate General for Energy Policy and Mines, on design modifications planned, implemented or being implemented, along with an analysis of their impact on the safety of the facility in those cases in which this is applicable in accordance with the regulations.

On the basis of the experience acquired by the CSN in controlling the El Cabril facility, a safety guide is to be drawn up on design modifications, establishing the analyses to be carried out by the licensees to determine whether the modification in question affects safety or not and, if this were to be the case, to establish the scope of the safety assessment to be submitted to the CSN for evaluation and approval.

It should be pointed out that the facility operating permit establishes the need for the safety of El Cabril to be considered in any design modification, this affecting safety during the operating phase and aspect relating to the safety of the facility in the long term, following its closure.

Specifically, the operating permit has determined that ENRESA should carry out a revision of the El Cabril facility SS, incorporating the results and updated conclusions of the long-term safety assessment, and in 2001 the CSN issued Complementary Instructions to this effect.

12.1.3. Surveillance and control programmes

The operating permit for the El Cabril facility establishes that the licensee is obliged to measure the efficiency of the surveillance, control and inspection practices carried out at the installation with respect to previously established objectives, such that there be assurance that the structures, systems and components having an effect on safety and radiation protection during the operation of the facility and in the long term be capable of performing their functions, and that their performance meet the design basis specifications, in accordance with whatever complementary instructions might be issued by the CSN.

A process has been implemented at the El Cabril facility covering the surveillance, control and inspection activities performed at the installation, including aspects relating to the following:

a) Identification of the requirements applicable to structures, systems and components subject to surveillance, control and inspection, in accordance with their importance for safety and radiation protection.
b) The acceptance criteria for the different parameters subject to surveillance, control and inspection.
c) The frequency established for the performance of surveillance, control and inspection, indicating the criteria followed for its determination.
d) The organisation and responsibilities established for the performance of surveillance, control and inspection and for subsequent analysis and evaluation of the results obtained.
e) The manual with procedures applicable during the process.

12.2. Measures adopted to examine the safety of low and intermediate level radioactive waste management at Spanish nuclear facilities

The LILW management installations existing at the Spanish nuclear facilities respond, on the one hand, to the need to treat and condition the wastes in order to obtain end products satisfying the acceptance criteria for disposal at El Cabril and, on the other, to the need to store the wastes for variable periods of time prior to their delivery to ENRESA for transport to the said facility.

The term *safety in radioactive waste management* being understood in a broad context, the principles to be considered are as follows:

1. The responsibility of the waste producers.
2. The safety and radiation protection of persons and the environment in internal management and in waste disposal.
3. The traceability of the wastes and of the corresponding management operations.
4. Knowledge and control of the flow of the wastes at the installations and the evolution of their characteristics.
5. Within what is reasonably possible from the technical and economic point of view:
   - ✓ Minimisation of the wastes produced and disposed of.
   - ✓ Valuation of waste materials.

12.2.1.Treatment and conditioning of low and intermediate level radioactive wastes

The installations for the treatment and conditioning of low and intermediate level wastes existing at the nuclear power plants are based on the processes of cementation of moist solids and compacting to reduce the volume of dry compressible solids. Also

recently installed at the nuclear power plants are systems for the desiccation of concentrates and sludges, which have allowed important volume reductions to be achieved.

Examination of the safety of the LILW management facilities existing at the Spanish nuclear power plants is included in the on-going safety review programmes of the latter, the objective being to maintain the level required in the authorisations and to improve it in keeping with technological advances and new standards requirements.

Also established at the Spanish nuclear facilities is a Periodic Safety Review (PSR) programme, carried out every ten years, which includes analysis of the operating experience of the waste management systems and the foreseen improvement processes.

Furthermore, the objective of the obligatory RWMP document is to include criteria and instructions ensuring that the management of the radioactive wastes generated at these facilities is safe and optimised, considering the advances made in the standards and the technology and taking into account the following:

- ✓ The current situation as regards the production, management and, where appropriate, disposal of the wastes.
- ✓ Identification of the points of origin of the wastes
- ✓ Study of the management system and process alternatives and of improvements to them.
- ✓ Justification of the suitability of current management or of the need to implement improvements.
- ✓ Planning of studies for implementation of the improvements identified.

Section K of this national report describes the new developments that are being driven from the CSN for the RWMP, with a view to making a major contribution to the adoption of an overall approach to the safe management of all solid, liquid and gaseous radioactive wastes at the facility.

12.2.2. Temporary storage of low and intermediate level radioactive wastes

The nuclear facilities are equipped with temporary storage installations for housing of the conditioned wastes pending their delivery to ENRESA. At most of the facilities there are also temporary storage installations for wastes that have not yet been conditioned.

Generally speaking, the safety assessment of these installations will have been carried out during the process o licensing the main facility. In other cases, additional temporary storage facilities have been constructed, fundamentally because of the need to store wastes arising from plant design modifications and the replacement of components.

The Almaraz and Ascó nuclear power plants have temporary storage facilities on their respective sites for the storage of major items of equipment and materials from the replacement of their steam generators and associated equipment.

In general it may be said that the mandatory nuclear facility documents (Safety Study, Operating Regulation, Technical Specifications, Radiation Protection Manual, Emergency Plan) include the items required to examine the safety of the temporary storage facilities.

The safety and radiation protection requirements applicable to the design and operation of temporary storage facilities are based on the Spanish standards, on the recom-

mendations of the international organisations and, specifically in the case of the Spanish nuclear power plants, the standards and regulatory criteria of the country of origin of their reference installations.

The design solutions adopted in relation to the temporary storage facilities generally fulfil the following conditions:

- ✓ The storage capacity should be based on:
  - ➪ Waste generation forecasts.
  - ➪ Active volume reduction programmes.
  - ➪ Programmes for the minimisation of the quantities of wastes generated.
  - ➪ Possibilities of recycling and reusing wastes.
  - ➪ Additional needs for possible unforeseen increases.
  - ➪ Effective availability of definitive disposal options.

12.2.3. Safety in the management of very low level wastes open to conventional management through clearance

In accordance with the legal framework and taking into account the fundamental courses of action in relation to the management of very low level wastes by conventional routes (clearance), as carried out by countries of the European Union, the CSN has considered that the basic principles on which the Spanish clearance system should be based are as follows:

- ✓ Responsibility of the producer.
- ✓ Traceability of the process of managing declassifiable materials.
- ✓ Intrinsic safety of all the processes carried out with the materials following clearance.

These principles have materialised in the definition of an overall clearance strategy based on the following:

- ✓ The inventory of waste materials with radioactive contents produced at each facility, and their physical, chemical and radiological characteristics.
- ✓ Identification of the most appropriate management routes for each type of waste material, in strict compliance with the applicable standards.
- ✓ Rigorous regulatory control of the clearance process, with special attention to the reliability of the radiological characterisation processes prior to the removal of the materials to the conventional management facilities.

The clearance system adopted in the case of nuclear facilities is based on the preparation of Common Projects for the management of the different waste materials, by which the appropriate levels of clearance are determined, taking into account the specifics of and the standards applicable to the management of conventional wastes in Spain.

The system is completed with the authorisation for clearance specific to each nuclear facility and each stream of waste material.

The clearance of waste materials with radioactive contents is thus configured as an administrative authorisation preceded by a process of decision-making in relation to subsequent management, such that the latter may be undertaken without any type of radiological restriction.

In 1999, the CSN sent to the nuclear power plants a set of Complementary Instructions establishing the technical and administrative actions to be taken by the licensees in relation to the clearance of waste materials with very low levels of radioactive content.

These Complementary Instructions referred to the following:

1. The licensees were required to provide the CSN, within a maximum three months and in accordance with their needs, with a specific programme of actions, technical studies and forecasts regarding requests to the Ministry of Industry for the management of waste materials containing very low levels of activity by conventional routes (clearance).
2. The programme was to be based on the requests for clearance considering the following technical aspects:
   - ✓ The conventional management routes best suited for each stream of waste material considered, depending on the classification of the conventional waste in question.
   - ✓ The selection of clearance levels adequate for each stream of waste material, either through suitable international references or the performance of specific studies for each waste stream and management route.
   - ✓ The programme of characterisation and radiological control previous to removal of the materials, which will be specific for each stream of waste material.
   - ✓ The quality control programme applicable to the process of clearance.

The NPP's submitted the programmes required to the CSN, these being analysed and discussed by the mixed groups set up between the CSN and UNESA. On completion of this process, the technical and administrative actions were mapped out as follows:

In general, each stream of very low level waste materials selected would be the subject of a Common Project applicable to all the Spanish NPP's, which would be submitted to the CSN for its appreciation. The contents of the documentation to be included in each common project will cover the following aspects:

- ✓ Description of the origin and the physio-chemical and radiological characteristics of the waste stream.
- ✓ Classification of the waste from the conventional point of view and a description of the routes associated with its management on the basis of the standards in force.
- ✓ Proposal regarding levels of clearance: justification and underlying radiological fundamentals.
- ✓ Methodology and criteria to be applied for radiological characterisation of the wastes and for verification of compliance with the levels of clearance.
- ✓ Scope and methodology to be applied for the quality control applicable to the process of clearance of the waste stream selected.

Proposals regarding levels of clearance may be made on the basis of the following alternatives:

- ✓ By analysing international references on the assessment of radiological impact, providing levels for each management route and applicable for generic use by the Spanish facilities.

✓ Through a detailed study including analysis of the management alternatives existing in Spain and the possible radiation exposure scenarios, such that following assessment of the radiological impact associated with the practices, levels of clearance be obtained for application at the facilities.

The international references that might be selected should undergo a process of justification through the corresponding analyses of applicability (consideration of management routes and scenarios of exposure to radiations) and compatibility with the Spanish situation (standards governing the management of conventional wastes).

The methodology and the criteria proposed for radiological characterisation and for verification of the levels of clearance of each waste stream selected shall take into account analysis of the international standards in this area (ISO 11932, ISO11929, ISO7503) and of the specific standards of countries in which similar clearance systems have already been implemented (German standards DIN 25457, DIN 25482, DIN 25462 and applicable American standards)

Specifically, in cases relating to the particular wastes from a given installation or having specific proposals regarding management routes, requests may be proposed for the conventional management of very low level wastes without the need for a common project.

Following the favourable appreciation of a given common project by the CSN, each licensee interested in the clearance of a stream of waste materials will request a specific authorisation, demonstrating compliance with the technical conditions established in the common project.

At the NPP's there are currently waste materials with lo activity contents open to clearance, these normally being as follows: used oils, used activated carbon, spent ion exchange resins, metallic scrap, construction rubble, wood and cellulose derivatives.

Generally speaking, these wastes are stored at the plants themselves pending decisions regarding their management, and in most cases there is a detailed inventory of total quantities, activities and areas of location.

As has already been pointed out, since 1995 UNESA has been drawing up and submitting to the CSN common projects for the clearance of different waste materials generated at the nuclear power plants.

To date, the CSN has favourably appreciated and determined performance conditions for clearance in the case of used oils (by combustion), metallic materials, used activated carbon (except regeneration) and spent ion exchange resins.

Furthermore, the Ministry of Economy, in the wake of reports from the CSN, has specifically authorised the clearance of used oils with very low activity contents generated at the Trillo, Cofrentes, Almaraz and Santa Mª de Garoña nuclear power plants.

In short, the Complementary Technical Instructions issued by the CSN to the Spanish nuclear power plants in 1999 established a path that is proving to be adequate for the implementation at these facilities of a system for the clearance of waste materials with very low activity contents.

The Spanish NPP's responded to the Complementary Instructions with joint action programmes carried out through UNESA and with specific actions depending on their needs, determined by the inventories and types of very low level wastes stored at each plant.

The experience acquired in the implementation of action programmes in relation to clearance has underlined the fact that the characterisation of materials, in order to guar-

antee with a high level of confidence that their activity content is lower than the levels established, is one of the most relevant aspects of the process and may, on occasions, be a determining factor as regards its feasibility.

Following the favourable appreciation by the CSN of practically all the Common Projects for clearance, regulatory efforts will focus on improving the processes of characterisation and on the implementation of methodologies allowing for the optimisation of the resources required for their performance, in keeping with the necessary levels of quality.

12.3. Measures adopted to examine the safety of low and intermediate level waste management at Spanish radioactive facilities

The management strategies for the solid radioactive wastes generated at the Spanish 2nd and 3rd category radioactive facilities (RF's) are fundamentally based on temporary storage for radioactive decay, until such time as the radioactivity content is such that these wastes may be managed as conventional materials, outside the radiological regulatory framework. However, ENRESA also removes radioactive wastes and transfers them to the El Cabril facility for conditioning and disposal.

The large number of RF's has led to the consideration of general provisions that might be used by the licensees for the clearance of materials and their conventional management.

However, prior to clearance the licensees are required to ensure compliance with certain requirements relating to the radiological control of the materials, the reliability of the activity measuring methods and the quality controls applied to the process, and, furthermore, the CSN must be allowed to undertake the previous control and verification of the technical conditions under which the clearance of materials would be addressed at this type of facilities.

In order to take all these aspects into account, it has been considered appropriate, in the case of the RF's, to adopt an intermediate option between a general arrangement and the case-by-case assessment of the situation at each specific facility.

With this aim in mind, in December 2001 the CSN issued Safety Guide 09.02 on the "Management of solid waste materials with radioactive contents generated at radioactive installations", which incorporated the recommendations of the IAEA in this area (IAEA TECDOC-1000 (1998): "Clearance of materials resulting from the use of radionuclides in medicine, industry and research") and the basic principles that should orient the management of waste materials at these facilities.

Given that Safety Guide 09.02 is exclusively a CSN technical recommendation, it is necessary for the competent Ministry to issue a provision, of the regulatory standing considered to be appropriate, to specify the concept of radioactive wastes at such facilities, in accordance with the Nuclear Energy Act.

The scope of application of the proposed standard approved by the CSN is 2nd and 3rd category RF's used for medical, agricultural, commercial or industrial purposes and at which non-encapsulated radioactive isotopes are handled or stored.

Within this scope, and for the purposes of the requirements of Article 2, section 9 of the Nuclear Energy Act, the materials defined as solid radioactive wastes shall be those waste materials for which no subsequent use is foreseen and containing or contaminated by radionuclides in concentrations or with levels of activity exceeding the values established in CSN Safety Guide 09.02: "Management of solid waste materials with radioactive contents generated at radioactive installations".

Solid waste materials generated at these RF's for which no subsequent use is foreseen and contaminated by radionuclides in concentrations or with levels of activity equal to or lower than the values established in CSN Safety Guide 09.02 shall not be considered radioactive wastes, and their management may be undertaken in accordance with the applicable standards.

The licensees of RF's of these characteristics generating solid waste materials must possess the corresponding technical documents reflecting the methods and procedures implemented for the classification and management of the waste materials, in accordance with the basic principles and the methodology established in CSN Safety Guide 09.02.

In any case, the licensees of such facilities shall, in the annual report referred to in article 73.2.a of the RNRI, provide the CSN with information on the activities performed, indicating the quantities and characteristics of waste materials with radioactive contents and their process of subsequent management.

The management of solid waste materials with radioactive contents shall be undertaken within the framework of a quality control system guaranteeing the detection of possible deviations and ensuring the implementation of adequate corrective measures.

The traceability of the process of managing the solid waste materials, up to their delivery to the organisation in charge of definitive management, will be guaranteed by the licensee of the radioactive facility by way of the corresponding recording and filing system, which should at all times be updated and available to the CSN.

The waste management procedures will be applicable to all the wastes existing in Spain, regardless of their date of generation.

In short, the development of the concept of radioactive wastes in relation to these facilities will allow waste management activities in Spain to be simplified and optimised, and controlled by the CSN, within a framework of methodological rigour.

12.4. Previous practices relating to low and intermediate level waste management

As of the date of entry into force of the Convention, Spain has no low and intermediate level waste management facilities closed in the past and susceptible to decisions regarding interventions to reduce the existing radiological detriment.

12.5. Assessment of compliance

In accordance with what has been set out in each of the sections of this article, Spain is considered to have adopted adequate measures to examine the safety of the existing waste management facilities.

As regards the El Cabril waste disposal facility and the waste management installations existing at the nuclear power plants, the corresponding operating permit establishes the obligation to implement a periodic safety review (PSR) system in order to continuously assess the safety and radiation protection of the facility, analyse the experience acquired and assess the possible improvements that might be implemented.

Furthermore, the Spanish standards establish a series of safety and radiation protection control activities, commissioned to the CSN, in order to ensure compliance, and in addition the operating permits of the El Cabril facility and other Spanish nuclear facilities determine the obligation for the licensees to continuously measure the efficiency of the surveillance, control an inspection practices with respect to the previously established safety objectives.

Article 13. Siting of proposed facilities

13.1. Forecasts for new radioactive waste management facilities

13.1.1. Low and intermediate level wastes (LILW)

LILW management in Spain includes a series of stages that range from the previous treatment and conditioning of the wastes to their definitive disposal at the centralised installations at El Cabril. Until the wastes are transferred to El Cabril, they are stored temporarily at the licensees' on-site installations.

Since the end of 1992, the LILW generated by the NPP's and other producers are being disposed of at the new El Cabril installations, in accordance with the limits and conditions established in the operating permit of the facility. The current capacity of El Cabril will cover Spain's needs until approximately the year 2016.

The rationalisation and possible improvement of the different processes involved in LILW management, including the volume reduction programme currently under way at the NPP's and the management of very low level wastes, as well as the future dismantling of the NPP's, will determine the additional needs as regards the storage capacity for the system.

13.1.2. High level wastes (HLW)

In Spain it will be necessary to manage not only the spent fuel generated by the NPP's but also the vitrified high level wastes from reprocessing in France of the SF from Vandellós 1, as well as minor quantities of fissionable materials recovered during the processing in Great Britain of the fuel from the Sta. María de Garoña plant, prior to 1983. Consideration should be given also to other wastes that, in view of their characteristics as regards activity and half-life, cannot be disposed of at the El Cabril facility.

As has been explained in Section B, the temporary management of this type of waste and of the SF will require a centralised storage facility, scheduled for 2010. The definitive management of the SF and of this type of waste is expected to be accomplished in a deep geological repository, if this is the solution finally decided on by the Government as from 2010.

13.2. Description of the licence awarding procedure

Point 6.2. of Section G describes the procedure for the awarding of licences for SF management facilities, which is the same as the one used for radioactive waste management installations.

13.2.1. Criteria for assessment of all factors relating to the site and having an influence on safety

As an Annex to its Parliamentary report for the second six-month period of 1985, the CSN published thirteen objective criteria for selection of a site for the definitive disposal of radioactive wastes. These criteria are applicable to the selection of sites for disposal facilities in geological formations and were taken by ENRESA as a reference for both the degree of compliance in the El Cabril SS and to orient its Site Selection Plan for a geological repository.

These criteria are as follows:

- ✓ Criterion 1: "The shape and dimensions of the geological formations shall be adequate to house the radioactive waste disposal installations and a safeguards area sufficient to guarantee isolation of the wastes"
- ✓ Criterion 2: "The radioactive waste disposal installations shall be located in a geological medium having a lithology and a depth in keeping with the categories and quantities of wastes to be disposed of"
- ✓ Criterion 3: "The sites shall be located in geological formations capable of being characterised such that it be possible to identify and assess their potential favourable or adverse conditions for the location of the disposal facilities and the isolation of the wastes"
- ✓ Criterion 4: "The waste disposal sites shall be located in tectonically stable formations in keeping with the time required to meet the objectives of the installation, for which reason active structures and faults shall be avoided"
- ✓ Criterion 5: "The site shall be located in a area of seismic activity such that the movements of the terrain associated with potential earthquakes in the area not have an impact on isolation of the wastes"
- ✓ Criterion 6: "In the process of site selection, areas having an abnormally high geothermal gradient or evidence of recent volcanic activity shall be avoided"
- ✓ Criterion 7: "The characteristics of the site and of its surroundings, and of the medium overall, shall be favourable to waste isolation"
- ✓ Criterion 8: "The physio-chemical and geochemical characteristics of the geological medium in which the site is located shall be such as to restrict mobility in the transport of radionuclides to the biosphere"
- ✓ Criterion 9: "The geotechnical characteristics of the site shall not unfavourably affect the basic objective of disposal. Geotechnical stability shall be ensured taking into account the mutual influence between the installations, the radioactive wastes, the terrain and possible movements of the latter"
- ✓ Criterion 10: "The disposal installations, regardless of whether they are located on the surface or at depth, shall not be affected by phenomena and processes on the surface negatively affecting isolation of the wastes"
- ✓ Criterion 11: "The sites shall preferably be located in areas of low demographic density, taking into account the presence of urban, industrial and recreational areas, their foreseeable growth and future development, such that they do not affect the capacity of the facility to fulfil its objectives"
- ✓ Criterion 12: "In selecting the sites, areas containing natural resources currently or foreseeably of interest and whose exploitation might cause an unfavourable effect as regards isolation at a given time or place should be avoided,

and their use should be weighed against the need for and value of the current future resources"

✓ Criterion 13: "The siting of disposal facilities shall be accomplished in such a way as to prevent significant adverse alterations to the environment."

a) LILW

The suitability of the site housing the El Cabril LILW disposal facility as underlined in the Safety Study submitted by ENRESA, the licensee of the facility, to the Spanish safety and licensing authorities during the licensing process undertaken prior to start-up of the installations in 1992. Described below are the criteria and factors taken into account for this site, since they reflect the Spanish experience of analysis, assessment and approval of a site for a definitive disposal facility. Any new facility would undergo a similar methodology and systematic approach of assessment, taking into account the specific nature of the installation in question.

In keeping with international practice, the fundamental aspects of a radioactive waste disposal system, as regards safety and radiation protection, are directly related to the acceptability of the radiological consequences of potential releases to the environment, which depend on both the magnitude and nature of such releases.

The magnitude of potential releases of radionuclides depends both on the physio-chemical nature of the wastes stored and on the action of the natural and engineered barriers in place to prevent migration. Consequently, this magnitude is not determined by any single factor but by the action of several, considered overall. The level of demands as regards the concept and design of each individual barrier depends on its contribution to the limitation of potential radionuclide releases, such that the consequences be acceptable. As regards the nature of an eventual release, it should be pointed out that the different types of radioactive wastes show important differences in relation to the technical complexity of the necessary isolation and its required duration, this depending ultimately and fundamentally on the radionuclide inventory of the wastes, i.e. the quantities and types of the radionuclides contained therein.

In the SS for the El Cabril disposal facility, consideration was given to all of these basic aspects to determine the disposal capacity required, analyse potential radionuclide releases and, in short, justify the acceptability of the resulting exposures of people. The assessment was performed in accordance with practices and with the specific standards applicable to the reference facility, which, being French, is Fundamental Safety Rule 1.2. This Rule establishes the concept of intrinsic safety, which consists basically of requiring the first two isolation barriers (the wastes themselves and the engineered barrier), these being conceived to minimise the transfer of radionuclides to the environment in all plausible situations during the operating and surveillance phases. Furthermore, during the free use phase safety rests on limiting the initial activity of the radionuclides and on the characteristics of the geological barrier. This approach is supported by and fulfils the basic objectives for these facilities published by the CSN: "to guarantee that wastes are isolated from mankind and the environment, such that potential releases do not give rise to an unacceptable exposure to radiation for people", and furthermore meets the two general statements expressed in development thereof in the aforementioned criteria: that achievement of the objective should be ensured by the disposal system overall (packaging, physio-chemical form, engineered barrier and site) and that the degree of isolation depends directly on the quantities and radiological characteristics of the wastes to be disposed of.

Likewise, consideration has also been given in the assessment to the fundamental criteria to be fulfilled by a LILW disposal site according to the French 1.2 Fundamental Safety Rule, which are mentioned below.

- ✓ Good isolation capacity with respect to ground and surface waters and sufficient stability for this isolation capacity to be maintained throughout the entire surveillance period.
- ✓ Possibility of controlling eventual discharges in the event of releases of activity due to assumed failures.

b) HLW

As is indicated in Section B, any decision regarding the final situation of SF and HLW management has been put off until the year 2010, which has logically meant the need to readapt high level waste programme activities to this timescale. One of the tasks that have been affected is the Site Selection Plan for HLW repositories, which had been under way since 1986. Until such time as definitive management methods and the process that would regulate selection of a candidate site are established, specific site selection or location activities are suspended. Meanwhile, the work will be limited to maintaining and bringing value to the geological information acquired in the country, in order for it to be of use in an eventual selection process when the implementation decision is taken.

The Site Selection Plan carried out by ENRESA between 1986 and 1996 aimed to make available a sufficient geological infrastructure and technical elements for comparison, in order to identify various geologically simple sites open to modelling and to provide information for the performance assessment studies performed on different geological media. The site selection process includes a set of activities aimed at identifying and comparatively ever smaller areas, which are studied with an increasing level of detail as the process moves forward. The process is to culminate in confirmation or characterisation studies at the level of the site itself. The selection studies are oriented towards the identification of areas in which the favourable geological formations are best known, correspond to less complex geological situations, imply fewer uncertainties and are, therefore, easier to model.

The Plan has been performed in the following phases:

- ✓ National inventory of favourable formations (1986-1987)
- ✓ Regional studies. ERA Project (1988-1990)
- ✓ Study of favourable areas. AFA Project (1990-1994)
- ✓ Study of favourable zones. ZOA Project (1995-1997)

The Plan included the establishment and application of criteria of relative favourability on the basis of the objectives and knowledge accumulated in each phase. Although in Spain there is no specific set o standards that defines the requirements for site selection, the criteria used have been developed using as a reference the recommendations and directives developed within the framework of programmes carried out by international organisations, such as the IAEA, the Nuclear Energy Agency (NEA/OCDE) and the European Union Commission.

Notwithstanding what has been said above, it should be pointed out from the technical point of view that the current legal and regulatory framework does not contemplate administrative procedures for the designation of candidate sites. As occurs in other countries, public sensitivity towards this type of facility becomes a critical issue when ad-

dressing site selection. This has led to the analysis of possible initiatives that, logically, will require political consensus prior to their being put into practice and that will to a large extent shape the process of decision-making with regard to final management technologies for spent fuel and high level wastes, foreseen for the year 2010 according to the GRWP currently in force.

13.2.2. Criteria for assessment of the radiological repercussions on the environment and surrounding population

a) LILW

An important part of the Safety Study for the El Cabril disposal facility submitted to the regulatory authorities during the licence requesting process relates to assessment of the potential radiological impact of the site during the three phases of the installation: operation, surveillance and control and release for free use. In the first of these, the study includes activities relating to waste handling and treatment, while in the other two consideration is given to situations referring to the performance of the facility itself. Normal and accident operating scenarios have been analysed, along with human intrusion during the free use phase. In general, the selection of specific hypotheses for each of the situations has been carried out on the basis of maximising doses to the critical individual, such that these situations may be considered as implying the heaviest penalty from the point of view of impact and establish a maximum level for it.

b) HLW

At present there is no facility for the definitive disposal of HLW in Spain. Current policy and planning foresee decision-making regarding the final solution for this type of wastes, and for spent fuel, as from the year 2010.

The objective of the strategy developed by ENRESA for the definitive management of SF and HLW has been to make available detailed knowledge and scientific and technological capabilities. Among other things, the work performed to date has allowed for developments in generic design of the disposal system in each geological medium studied (granites, salts and clays), and the development and preliminary application of tools and methodologies for the assessment of performance and safety in the long term.

Both ENRESA and the CSN continue with their R&D programmes and with the tracking of the evolution of different aspects relating to deep geological disposal, through the international programmes and bilateral agreements with other countries.

13.2.3. Performance provisions for compliance with the aforementioned criteria

Point 6.2.3. of Section G briefly describes the review and authorisation mechanisms used by the CSN in the processes of assessment for licence awarding. In the specific case of the El Cabril LILW disposal facility, and by way of illustration, it would be appropriate to mention the following milestones in the project licensing process, as well as the historic evolution of the permits granted by the authorities to date.

- ✓ In May 1988 the request for a construction permit was submitted, in accordance with the RNRI. A novelty was the inclusion of an Environmental Impact

Study, in accordance with the Legislative Decree on environmental impact assessment of 1987.

- ✓ In July 1989, the CSN issued a favourable report and in August the Directorate General for the Environment issued the Environmental Impact Statement, in coordination with the CSN.
- ✓ The construction permit was awarded in November 1989.
- ✓ In April 1991 the request for approval of the Pre-Nuclear Testing Programme was issued, and in May the Provisional Operating Permit.
- ✓ The final inspection, prior to CSN authorisation, was performed in August 1992, culminating the 35 inspections and 48 audits carried out by hat organisation with respect to the project.
- ✓ On 9th October 1992 the Ministerial Order was signed granting ENRESA the Provisional Operating Permit for a period of four years.
- ✓ On 9th October 1996 the Ministerial Order was signed extending the Provisional Operating Permit for a further five years.
- ✓ On 8th October 2001 the Ministerial Order was signed authorising operation up to completion of the available volume for disposal of the existing cells.

13.3. Public information on the safety of the facilities

Point 6.3. of Section G briefly describes the process of public information contemplated in the Spanish regulations. It would be appropriate, however, to underline the experience of application of the standards in the specific case of the El Cabril installation.

For the El Cabril centralised LILW disposal facility ENRESA carried out an Environmental Impact Study, in accordance with the standards in force and applicable to the project, mainly Royal Legislative Decree 1302/1986, which transposed the Community Directive 85/377/CEE of 27th June and regulated the assessment of environmental impact, and the corresponding Regulation governing performance approved by R.D. 1131/1988, of 30th September. The first of these standards establishes the principles governing the administrative procedure of E.I.A. and also includes other important aspects such as public information and the necessary guarantees regarding the confidentiality of data referring to production processes or of a strategic nature, in all cases with consideration given to protecting the public interest. Furthermore, the Regulation develops the administrative procedure of environmental impact assessment, which culminates with the Declaration of Impact issued by the State organisation having competence in the area of environmental affairs.

In accordance with section e) of the fifth additional provision of the Regulation, referring to nuclear installations, such as the El Cabril radioactive waste disposal facility, the CSN is declared to be responsible for the assessment, monitoring and control of the environmental radiological impact of this type of activity, all other environmental impacts of such works being governed by the general stipulations of the Legislative Decree.

On 17th August 1989, the Directorate General for the Environment issued a Resolution including a Declaration of Environmental Impact, drawn up in coordination between the said D.G. for the Environment and the CSN, for ENRESA's El Cabril disposal facility, within the framework of the current standards (R.D.L.1302/1986 and R.D. 1131/1988) and on the basis of the agreement between the D.G. for Energy and the D.G. for the En-

vironment and between the latter and the CSN. This Resolution was formulated as being previous to the administrative Resolution to be adopted for authorisation of the construction of the facility, and was included as Annex II in the Ministerial Order of 31st October 1989 awarding such authorisation.

This Resolution was formulated on the basis of the regulatory dossier made up of (1) the Project technical document and Environmental Impact Study submitted by the D.G. for Energy, (2) the allegations and observations filed during the period of public information and ENRESA's responses thereto, (3) complementary information provided by ENRESA in response to requests from the D.G. for the Environment and the CSN, and (4) the CSN's mandatory and binding report.

The terms and procedure adhered to in this project are described in point 6.3 of Section G which, although referring to the request for the construction permit during the process of public information, are carried out jointly.

It should also be pointed out that the Ministerial Order of 31st October 1989 establishes the setting up, during the construction phase, of a "Coordination Committee", appointed by the D.G. for Energy and made up in accordance with the stipulations of the RNRI then in force.

This Committee was made up of representatives of the D.G. for Energy, the D.G. for the Environment, the Regional Government of Andalusia, the Provincial Directorate of the Ministry of Industry and Energy in Córdoba, the Town Council of Hornachuelos (Córdoba) and the licensee, ENRESA. Its main function was tracking of the works and coordination of the activities of all the authorities involved in the project.

13.4. International arrangements

According to point 6.4. of Section G, Spain is required to comply with Article 37 of the EURATOM Treaty, providing general data on all radioactive waste disposal projects in order to make it possible to determine whether the performance of such projects might give rise to radioactive contamination of the waters, soil or airspace of another Member State of the European Union.

The Spanish experience as regards radioactive waste management facilities is based on the licensing process of the El Cabril low and intermediate level short half-life radioactive waste disposal facility. Prior to the awarding of the operating permit, the Spanish Government informed the European Commission, providing general project data in accordance with article 37 of the EURATOM Treaty.

The report, submitted in October 1991, contained information on the following:

- ✓ The site and its surroundings, with data on its geographic and topographic situation, geology and seismology, hydrology and hydrogeology, meteorology and climate, agricultural economy and population.
- ✓ The installations of the facility, their main characteristics, ventilation and radioactivity confinement systems, operational schedule and decommissioning and dismantling.
- ✓ Radioactive emissions to the atmosphere and liquid radioactive effluent releases during normal operation, including the surveillance of emissions and assessment of transfers to mankind.
- ✓ Management of solid radioactive wastes, nature, treatment, conditioning and intermediate storage.

- ✓ Non-scheduled releases of radioactive effluents, accidents considered and reference accident, assessment of radiological consequences and emergency plans.
- ✓ Pre-operational environmental surveillance programmes and those implemented as from the start-up of other operational programmes.

The decision of the European Commission was issued in writing on 16th June 1992, an concluded that application of the plan for the treatment of radioactive wastes arising from operation of the facility, in accordance with article 37 of the EURATOM Treaty, would not cause significant radioactive contamination in relation to health, the waters, soil or airspace of any other Member State.

13.5. Assessment of compliance

The information relating to the parameters of the site, drawn up during the different stages of licensing, and its subsequent evaluation by the regulatory body, leads to the definition of design bases that reasonably guarantee the safety of radioactive waste management facilities during the design, construction and operation periods and during the surveillance and control and free use of sites for radioactive waste disposal.

Consequently, from what has been set out in the previous sections it may be deduced that Spain has adopted the measures necessary to meet the requirements of article 13 of the Convention.

Nevertheless, the regulatory framework does not currently include provisions relating to the process of designating sites for the definitive management of spent fuel and high level wastes, for which different initiatives are being analysed.

Article 14. Design and construction of facilities

This article deals with the basic safety principles and the procedures adhered to in Spain for the requesting, analysis and awarding of construction permits for radioactive waste management facilities, as ell as the methods used to watch over construction and ensure compliance with the design requirements.

It should be pointed out that the LILW management installations in Spain are the treatment and temporary storage installations at the nuclear power plants, the Juzbado fuel manufacturing facility and Ciemat "Juan Vigón" centre, and the centralised facility for the disposal of this type of wastes is the El Cabril installation. Given that the former are part of nuclear facilities whose main objective is not LILW management, they have been assessed and authorised within the licensing process of the said facilities, for which reason the design requirements and operating limits and conditions are part of the authorisations awarded to he licenses. Consequently, the process adhered to is the once included in Section G, point 7.

It is important, however, to focus on the licensing process for the installation for the treatment, conditioning, storage and disposal of LILW at El Cabril, since it is the only facility in Spain set aside for this purpose.

As has been indicated in other sections of this report, in Spain there is currently no facility licensed or in the licensing process for the management of HLW. However, any fu-

ture installation will have to meet whatever requirements, limits and conditions might be included in the standards in force at the time and enforced by the regulatory authorities during the process of authorisations.

14.1. Construction permit awarding process

The El Cabril disposal facility was awarded its construction permit by the Ministerial Order issued on 31st October 1989. The request was submitted in accordance with the previous Regulation on Nuclear and Radioactive Installations (Decree 2869/1972, of 21st July) in May 1988, although subsequently, in April 1989, Revision 1 of the General Project and Preliminary Safety Study (PSS) was presented, this incorporating the criterion of recoverability of the wastes, agreed on following various meetings with the regulatory authorities.

Prior to the issuing of the Order, ENRESA requested a municipal works licence from the Town Council of Hornachuelos (Córdoba), in May 1989, and in August the D.G. for the Environment, in coordination with the CSN, which had issued its favourable report in July of that year, issued the Environmental Impact Statement, as indicated in the previous section.

This authorisation was awarded to ENRESA following compliance by the latter with the arrangements required by the provisions in force and a favourable report by the Provincial Directorate of the Ministry of Industry and Energy in Córdoba, in accordance with the reports issued in this respect by the CSN.

In addition to the conditions imposed by the Environmental Impact Statement (Annex II), the Order included certain limits and conditions relating to nuclear safety and radiation protection, identifying the technical requirements and criteria applicable to this nuclear facility and the information to be submitted within a given timeframe (Annex I). This Annex I establishes that "on requesting the authorisation for start-up, the licensee shall, in addition to submitting the studies and documents contained in the RNRI in force, submit a documented declaration of its having met these limits and conditions".

The PSS includes the principles on which the concept of the facility was based, pointing out that the conceptual development of the installation was undertaken in consideration of the experience acquired in other countries having this type of facilities and on the basis of the establishment of basic safety objectives and technical options.

ENRESA selected a surface disposal model incorporating engineered barriers, developing a concept using the French La Manche and L'Aube centres as a reference. Of the disposal methods practiced at these centres, the option chosen was the one offering the highest level of isolation, with engineered barriers, along with the credit given to the site itself as an isolating barrier.

The general safety objectives defined for the El Cabril facility are indicated below:

- ✓ Immediate protection during the operating phase and deferred protection during the phases of surveillance and control and free use, for people and the environment. The deferred protection is what gives the disposal facility its specific nature. Immediate protection is afforded through application of both the Spanish regulations and the recommendation of the ICRP and other competent Organisations in relation to the protection of the public and the workers. Deferred protection is achieved by isolating the wastes and limiting their radioactive content, with consideration given to the expected scenarios of evo-

lution, in the event of low probability incidents or hypothetical accidents, and finally plausible intrusion.

✓ Allowing for the free use of the site within a reasonable period of time, this meaning the possibility of using the land for any purpose without limitations due to the facility.

The duration of the surveillance and control phase shall not exceed the design lifetime postulated for the waste isolation devices (engineered barriers), which is estimated to be at least 300 years, the period established in turn in the French Fundamental Safety Rule 1-2. However, this duration will be re-evaluated depending on the activity actually housed at the facility – lower than the envelope considered in the radiological impact assessments – at the end of the operating phase.

One of the objectives imposed and included in the construction permit for the facility is that of zero releases, for which reason the design is based on the reuse of the liquid radioactive wastes in the different conditioning processes. This criterion extends both to the buildings area and to the disposal cells, for which reason the facility is equipped with appropriate collection, treatment and conditioning systems.

As regards gaseous effluents, the El Cabril facility has been designed and constructed in compliance with the conditions of the construction permit, the objective being that the effective equivalent committed dose to the most exposed hypothetical individual in non-restricted areas, due to all airborne emissions be as low as reasonable achievable and in all cases lower than 10^{-2} mSv/year.

Compliance with the objectives is undertaken through the application of the following basic criteria:

✓ Isolation of the radioactivity housed from the surroundings (or biosphere) during the phases of operation and surveillance and control, thanks to the suitability of the site and to the elements of the facility (disposal units, consisting of the containers and immobilised wastes inside them, and engineered barriers, cover, disposal cells and seepage control network). In order to prevent human intrusion, access will be controlled until the end of the two phases.

✓ Limitation of the activity of the radionuclides present in the disposal units, such that the radiological impact be acceptable under any foreseeable set of circumstances and the residual activity be compatible with free use of the site.

✓ Simple recoverability of the stored wastes, with the final design incorporating disposal units or containers that, in addition to carrying out the function of confinement, allow for the handling of the wastes and their positioning inside the cells or disposal structures without any type of structural union. The packages made up of the containers with the wastes blocked in their interior may be transported since they meet the transport requirements.

The Provincial Directorate of the Ministry of Industry and Energy in Córdoba sent the file initiated on request by ENRESA on 29th May 1991, requesting the provisional operating permit and authorisation for the manufacturing of containers for LILW disposal.

On 20th January 1992, the D.G. for Energy issued a Resolution approving the Pre-Nuclear Testing Programme of the facility, in accordance with a report issued by the CSN. This Programme met the objectives established in the RNRI in force for accreditation of the suitable performance of the different items of equipment or parts of the facility, in

relation both to nuclear safety and radiation protection and to the applicable industrial and technical standards.

14.2. Technical provisions for the decommissioning of radioactive waste management facilities

The nuclear power plants currently operating in Spain were issued their construction permits during the 1960's (first generation plants: José Cabrera and Sta. Mª. de Garoña. Vandellós I is in the process of dismantling), the 1970's (second generation plants: Almaraz I and II, Ascó I and II, Cofrentes) and at the end of the 1970's and the beginning of the 1980's in the case of the last units. All the operating plants are based on light water technology (PWR and BWR), the validity of which has been demonstrated.

The preliminary authorisations already made reference to the standards to be used during the design and construction of the plant, quoting firstly the national provisions, criteria, codes and standards, along with the corresponding documents of the international organisations to which the Spanish State belongs, those of recognised validity in the nuclear industry and those established in the country of origin of the project.

In keeping with the Spanish standards referring to the licensing process, the RNRI of 1972 did not contemplate any provision on the future decommissioning of the facilities during the design and construction stage of nuclear facilities. However, the RNRI approved in 1999 introduced the requirement that the documentation to be submitted with the application for the construction permit should include technological, economic and financing forecasts for decommissioning and dismantling.

For the third generation plants, however, the construction permit stated among its safety limits and conditions that "the licensee shall be responsible for safely decommissioning the facility once it has ceased to operate for the proposed purpose. On requesting the provisional operating permit, the licensee shall describe the resources incorporated in the project to facilitate the decommissioning of the facility. In complying with this condition the licensee shall take into account the national standards in force, the standards recommended by the international organisations to which the Spanish State belongs and whatever standards might have been developed in this respect in the country of origin of the project".

The other two nuclear facilities, the Juzbado manufacturing facility and Ciemat, which have radioactive waste management plants or units, applied the standards in force at the time during the process of authorisation of construction. In the case of the Juzbado facility, this was the RNRI of 1972 that, as has been pointed out above, contained no reference to future decommissioning.

14.3. Technical provisions for the closure of the radioactive waste disposal facility

The PSS of the El Cabril disposal facility, submitted in applying for the construction permit, included the systems designed for closure of the installation and those that would have to be operable during the surveillance and control phase.

On completion of the facility operating phase, closure activities will be undertaken to prepare the installation for the next phase. It will be necessary to complete the disposal works and annexes (coverage, water networks), the evacuation and disassembly of the

operating installations (constructions and equipment) that will not be required and the installation of all the elements required for the surveillance and control phase that are not already in place.

Following the operating phase, the waste conditioning installations will be decontaminated and dismantled. In order to facilitate this task, all the areas susceptible to becoming contaminated are equipped with decontaminable linings. Likewise, the equipment is designed to allow for easy decontamination (choice of materials, installation of motors outside sensitive zones, etc.). Furthermore, the design of the different areas allows for the disassembly of heavy equipment (tanks, etc.).

The objectives of the design of the surveillance devices are, on the one hand to check the integrity of the disposal cells and, on the other, to undertake environmental radiological surveillance in the areas surrounding the facility.

In order to be able to meet the first of these objectives, the terrain will continue to be the property of ENRESA, thus avoiding any deterioration as a result of uncontrolled human intervention, and the surveillance and maintenance of the covering, the seepage control network and the surveillance devices will be ensured.

On completion of the operating phase, and before going on to the phase of surveillance and control, the disposal cells, once filled and closed, will be protected against the action of the weather through the installation of a long-term covering layer, designed and constructed in such a way as to minimise the maintenance required under normal conditions and provide protection against erosion, water and temperature changes.

The seepage control network, that will operate during the operations and surveillance and control phases with minimum maintenance, is designed to easily identify and locate any possible anomaly in any of the disposal cells. For this purpose, the network piping has been installed in accessible underground galleries of reinforced concrete that run longitudinally beneath the cells. These have been designed with sufficient dimensions and inclination to ensure drainage by gravity to the final control tank. Each cell is individually linked to the network by way of a transparent surveillance vessel with a sampling tap, that will be connected once the cell in question enters the operating phase, protected against rainwater (moving roof structure).

In order to meet the second objective, an Environmental Radiological Surveillance Programme will be drawn up, which will be subject to approval by the authorities prior to closure. This Programme will be based on the experience acquired, the checks performed and the resources used during the operating period.

14.4. Technologies used for radioactive waste management

14.4.1. Nuclear power plants

The radioactive waste management installations in place at the Spanish NPP's were designed and constructed as part of the plants themselves, in accordance with the standards applied to the reference plants in the United States and Germany. The introduction and development in the Spanish standards of the concept of the "reference plant" guarantees the incorporation of consolidated and proven technology, without preventing the introduction of consolidated innovations.

In certain of the plants, the installations were modified in accordance with the national and international standards, in order to improve the treatment or conditioning of the different streams of operational wastes and increase the available temporary storage capacity.

As a part of a nuclear facility, these installations were subject to the licensing process of the 1972 RNRI, which includes prior to start-up of the facility a design and construction verification plan and the performance of a programme of pre-nuclear testing previously approved by the authorities.

14.4.2. El Cabril disposal facility

The conceptual development of the facility was carried out on the basis of considering the experience acquired in other countries having such installations, and of establishment of the basic safety objectives and technical options.

ENRESA studied the existing options, the safety practices and the orientations chosen by the international community and opted for the surface disposal model with engineered barriers, developing a concept using the French disposal facilities as a reference.

Prior to start-up of the El Cabril facility, and in accordance with the 1972 RNRI, the installations were subjected to a pre-operational verification programme that included the checking and testing methods to be applied to guarantee the correct operation of the different installations and equipment in relation to both nuclear safety and radiation protection and the applicable industrial and technical regulations.

14.5. Assessment of compliance

Spain is considered to be in reasonable compliance with the safety requirements of Article 14 of the Convention, since the Spanish legislation includes a formal procedure for the awarding of the construction permit for nuclear facilities, this including design review, surveillance of construction and verification of the suitability of performance through a pre-nuclear testing programme, the results of which are subject to favourable appreciation by the CSN.

The design and technologies used at the radioactive waste management facilities existing in the country have been developed in accordance with the national and international safety regulations and standards, as well as with other applicable and widely used and recognised standards relating to this issue.

Article 15. Assessment of safety of facilities

15.1. Measures adopted prior to the construction of low and intermediate level waste management facilities

According to the RNRI in force, low and intermediate level waste management facilities may be classified as nuclear or radioactive installations.

The LILW management facilities currently existing in Spain are those located on the sites of the installations generating the wastes and the El Cabril facility, where definitive disposal is undertaken.

The authorisations required by nuclear and radioactive facilities for initiation of their operations are contemplated in the Regulation on Nuclear and Radioactive Installations

(RNRI), which establishes a sequential process of authorisations in which each such permit is regulated specifically.

The process of authorisations required of nuclear and radioactive facilities involved in the nuclear fuel cycle includes the successive awarding of the following authorisations:

- ✓ Preliminary or site authorisation.
- ✓ Construction permit.
- ✓ Operating permit.

As has been referred to above, before constructing a waste management facility belonging to the nuclear facility category, the licensee is required to have obtained a preliminary authorisation and, in accordance with the aforementioned Regulation, must obtain a construction permit prior to facility operation.

One of the documents that the holder of the preliminary authorisation must submit in support of his application for a construction permit is the PSS (Art. 17e).

The PSS will contain a description of the site and surrounding area, with current data on parameters having an impact on safety and radiation protection, including data on demography, ecology and water and land use, along with whatever additional data might contribute to better knowledge of the site and might have an impact on the plans for surveillance and verification of the aforementioned representative parameters.

The PSS will also contain a description of the proposed facility, including the criteria applied in the design of the components or systems on which the safety of the facility depends and an analysis of foreseeable accidents and their consequences.

Furthermore, prior to awarding of the construction permit for the installation, an analytical radiological study will be performed, which will theoretically estimate the potential radiological impact of the facility on the population and the environment. The results of this study will be incorporated into the PSS documentation and will serve as a basis for preparation of the Pre-Operational Environmental Radiological Surveillance Programme (PERSP), this allowing for the establishment of the reference or radiological background level of the monitored area.

In parallel with the arrangements for the construction permit, the licensee must have initiated the procedures corresponding to the administrative authorisations required in areas other than the nuclear.

In the case of radioactive waste management installations associated with RF's not involved in the nuclear fuel cycle, only the operating permit is required, the request for which should be accompanied by a Descriptive Report including, among other things, the solid, liquid and gaseous waste management systems.

The request should also be accompanied by a SS consisting of an analysis and assessment of the risks that might derive from operation of the facility under normal operating conditions or in the event of an accident. The data included should be sufficient for the competent authorities to be able to analyse the risks of the facility independently from the assessment of the requesting party.

15.2. Measures adopted prior to the construction of low and intermediate level waste disposal facilities

In Spain the installations for the disposal of low and intermediate level radioactive wastes are nuclear facilities, for which reason the system of authorisations and the

safety assessments prior to construction indicated in the previous section 1) of this Article would be applicable to them.

Although no explicit mention is made in the RNRI of the safety-related aspects of radioactive waste disposal facilities, in the Spanish licensing practice applied to the El Cabril facility (the only one of its kind in existence), the interpretation has been that all the requirements relating to the safety of the facility should be taken into account during both the operational phase and the phase that will begin following closure.

In its agreement of 3rd February 1987, the CSN also adopted as a radiological acceptance criterion, for application in long-term radiological impact assessment, a risk of less than 10^{-6} or an equivalent dose to individuals belonging to the critical group involved in the postulated scenarios of less than 0.1 mSv/y.

As part of the regulatory documentation submitted during the process of authorising the construction of El Cabril, the licensee submitted the PSS to the competent authorities, this including the corresponding analyses of the possible future evolution of the disposal system, with consideration given to the mechanisms of radioactivity release and migration, the paths of exposure of the members of the public and analysis of the radiological consequences of the human intrusion scenarios postulated.

As regards long-term safety assessment studies, there was already a high degree of consensus and sufficient international references regarding the methodological approach to be applied in such assessments, as a result of which the El Cabril PSS included a safety assessment based on a systematic methodology inspired by the international references existing at the time.

In particular, prior to construction of the facility, safety analyses were carried out with respect to the post-closure period, the study including various exposure scenarios contemplated by the French RFS-I.2 standard.

15.3. Measures adopted prior to the operation of low and intermediate level waste management facilities

As has been referred to in section 15.1 of this article, the authorisations required by nuclear and radioactive facilities to initiate operation are included in the RNRI of 1999, which establishes a sequential process of authorisations in which each such authorisation is specifically regulated.

Once the licensee of a nuclear facility has the construction permit and the pre-nuclear tests have been performed, he may request the competent authorities to issue the operating permit for the installation.

Article 20 of the aforementioned Regulation indicates that applications for nuclear facility operating permits must be accompanied by a series of documents updating, where appropriate, the contents of those submitted when requesting the construction permit. Among these documents will be the SS, which should include the information required for an analysis of the facility from the point of view of nuclear safety and radiation protection and an analysis and assessment of the risks deriving from operation of the facility under normal operating and accident conditions.

In particular, the SS shall include complementary data on the site and its characteristics, obtained during construction of the facility, as well as a description, including references to the radioactive waste removal and disposal systems and to any other system or component of significance as regards the safety of the installation.

The SS should include an analysis of the accidents foreseeable at the facility and of their consequences, an analytical radiological study and an operational environmental radiological surveillance programme, allowing for assessment of the impact of operation of the facility.

In addition to the documentation forming part of the SS, prior to operating any nuclear facility the holder of the construction permit must submit a RWMP on requesting the operating permit, which shall, where appropriate, incorporate the contracts established with management companies and include, among other things, a system for possible clearance.

In addition, the RNRI stipulates (Art. 20 j) that the documentation submitted in support of the operating permit application shall include forecasts regarding closure, indicating the disposal foreseen for the wastes and including a study of the costs and economic and financial provisions to guarantee closure.

As has been pointed out, and as regards the disposal of radioactive wastes, Directive 97/11/CE specifies that an Environmental Impact Assessment (EIA) shall be required for the irradiated nuclear fuel repository, the radioactive waste disposal installation and the storage (for projected periods in excess of 10 years) of irradiated nuclear fuels or radioactive wastes at locations other than that of their production.

The EIA requires that the holder of the construction permit draw up and submit an environmental impact study indicating the possible alternatives, along with an environmental surveillance programme for performance of the activity once authorised.

The Environmental Impact Declaration (EID) is drawn up jointly by the Ministry of the Environment and the CSN, in their respective realms of competence.

15.4. Assessment of compliance

In accordance with what has been set out in each of the sections of this article, and as regards low and intermediate level wastes, it is considered that Spain has adopted adequate measures for the safety assessment of facilities for the management and disposal of these wastes prior to their construction and their operation.

The Spanish legislation establishes a sequential process of authorisations in which each such authorisation is specifically regulated, as well as the obligation for the licensee to submit the safety studies specifically required.

Article 16. Operation of facilities

16.1. Operating permit and operating limits and conditions

On completion of the pre-nuclear testing phase and prior to start-up of the facility a provisional operating permit is issued, this having a period of validity sufficient for performance of the nuclear testing programme and for analysis of its results. The nuclear tests consist of the performance of checks and tests allowing basic data to be obtained for assessment of the nuclear safety of the facility.

After having completed the nuclear testing programme, the licensee is required to submit to the MINECO and to the CSN the results of this programme and the proposal for

modifications to the OTS's, if such modifications are considered to be advisable in view of the tests performed. Once it has received the corresponding report from the CSN, the MINECO will issue an operating permit for the appropriate period of time.

However, according to the RNRI of 1999, the operating permit of a nuclear facility, regardless of its purpose, must include a study of the forecasts for decommissioning and dismantling, which shall describe the disposal arrangement for the wastes generated and include a cost study and the economic and financial forecasts guaranteeing decommissioning, as well as a RWMP incorporating, where appropriate, the contracts established with management companies and including, among other things, a system for possible clearance.

16.1.1. Waste management at nuclear facilities

The nuclear power plant operating permits are similar as regards their structure and in their annexes contain the limits and conditions to be met, some immediately and others over fixed periods of time. The operation of the plants must be accomplished in accordance with the revision in force of the following documents: Final Safety Study, Operating Technical Specifications, Operating Regulation and Site Emergency Plan, in compliance with the Radiation Protection Manual, the Normal Operation Off-Site Dose Calculation Manual and the Quality Assurance Manual. Other conditions included in the OP are tracking of the new requirements requested by the regulatory body of the country of origin of the design of the installation and analysis of their applicability, analysis of in-house and industry operating experience and requirements regarding the transport of fissionable material and radioactive wastes.

However, as a result of approval of the new RNRI, the successive extensions to the operating permits are replaced with authorisations for a given period and the format and content of these authorisations is standardised for all the NPP's. One of the documents required in the documentation to be submitted with the request for authorisation is the RWMP. Modifications may be made to this Plan under the responsibility of the licensee, except in those cases that are identified in the CSN's complementary technical instructions. In these cases, the favourable appreciation of the CSN is required prior to their entry into force.

The operations and waste management procedures of each facility include the activities of segregation, conditioning and temporary storage, along with the methods to be applied to minimise waste production. This minimisation is based on the following concepts:

- ✓ Application of strict control in segregation at the point of origin, the materials being separated depending on their radioactive content and physic-chemical nature.
- ✓ Progressive elimination of disposable materials and replacement with reusable materials.
- ✓ Reduction and strict control of contaminated areas, such that the sources of waste materials with radioactive contents are reduced.
- ✓ Strict segregation of contaminated and non-contaminated materials, such that the quantity of wastes entering the subsequent treatment process is minimised.

The conditioning of the wastes covers the different stages leading to the acquisition of end products fulfilling the acceptance criteria of the disposal facility and for transport

off site. The treatment processes are related, on the one hand, to the physic-chemical and radiological characteristics of the wastes and, on the other, to the option chosen for their disposal. The systems for the compacting of compactable materials and for conditioning, which at all the NPP's consist of cementing and mixing in the drum itself or previous mixing of the cement and the wastes and subsequent filling of the drum, include specific requirements regarding the control of contamination and exposure to radiations and the quality criteria applicable to the final packages for their temporary storage at the plant and for their disposal.

From the regulatory point of view, the design requirements made of the conditioning plant are aimed at guaranteeing ALARA conditions in relation to the exposure of the personnel and physic-chemical and radiological control of the solidification process, through application of CSN Safety Guide GS-09.01 "Control of the process of solidifying low and intermediate level radioactive waste" by implementing a conditioning Process Control Programme (PCP). The objective of this procedure is to reasonably guarantee that the waste solidification systems are operated within the limits and conditions established and that the products obtained are in acceptable ranges and intervals with respect to certain quality requirements.

The provisional operating permit and authorisation for the manufacturing of uranium oxide fuel assemblies at the Juzbado facility was obtained following compliance with the requirements for nuclear facilities in accordance with the RNRI in force, by the Ministerial Order issued on 14th January 1985. The operation of the plants must be accomplished in accordance with the revision in force of the following documents: Safety Study, Operating Specifications, Operating Regulation and Emergency Plan, in compliance with the Radiation Protection Manual, the Safety Manual and the Quality Assurance Manual. As a result of the approval of the new RNRI (Royal Decree 1836/1999), the limits and conditions associated with the POP and the Manufacturing Authorisation were modified and brought together under a single condition approved by Resolution of the D.G. for Energy Policy and Mines on 3rd May 2002. One of the documents submitted by ENUSA for approval by the CSN is the RWMP, the activities of which include those relating to very low level wastes open to management as conventional wastes. Modifications may be made to this Plan under the responsibility of the licensee, except in those cases that are identified in the CSN's complementary technical instructions. In these cases, the favourable appreciation of the CSN is required prior to their entry into force.

However, in April 1999 ENUSA implemented an Environmental Management System at the Juzbado facility that included among its objectives the minimisation of radioactive waste generation, along with compliance with the limits established on the concentration of activity of the radioactive effluents released to the river and the total alpha activity for the emission of gaseous effluents.

The double objective of the solid waste treatment process at Juzbado is reduction of the quantities to be managed and treatment adequate for compliance with the ENRESA acceptance requirements.

16.1.2. Radioactive waste disposal facility

The El Cabril nuclear facility for solid radioactive waste disposal obtained its first POP by Ministerial Order on 9th October 1992. This Order established that "in view of the conclusions reached by the CSN as a result of assessment of the documentation sub-

mitted, and of tracking of compliance with the conditions of the construction permit, the design, construction and pre-nuclear testing of the facility, it may be stated that the buildings and structures, the systems and components and the operating organisation are adequate and allow for the operation of the El Cabril disposal facility, as long as the limits and conditions regarding nuclear safety and radiation protection annexed to this Order are fulfilled."

The performance of activities relating to operation of the facility shall be accomplished in accordance with the following documents:

- ✓ Safety Study
- ✓ Operating Regulation
- ✓ Operating Specifications
- ✓ Emergency Plan
- ✓ Nuclear Testing Programme
- ✓ Radiation Protection Manual
- ✓ Operations Quality Assurance Programme GC-32
- ✓ Physical Surveillance Programme
- ✓ Environmental Radiological Surveillance Programme

These documents will be subjected to revision during the first POP, as indicated in the Order, in compliance with the periods established for each. Any modification must be approved by the D.G. for Energy Policy and Mines of the Ministry of Economy, following a favourable report by the CSN.

The nuclear tests performed included the incineration, solidification, package maintenance and waste handling systems in the area of minor producers. Performance of the programme took place between 17th November 1992 and 27th May 1993, the final report on the nuclear tests being sent in July 1993 and the CSN declaring the Programme to have been fulfilled in February 1994.

In October 1996, ENRESA obtained an extension to the POP for a period of five years by the Ministerial Order issued on 8th October, which includes new limits and conditions regarding nuclear safety and radiation protection; the operation of the facility is to be accomplished in accordance with these new limits and conditions, with the legislation in force and with the duly updated mandatory documents listed above.

The currently valid operating permit, M.O. of 5th October 2001, will remain in force until the available disposal volume in the existing cells is completed. The licensee, ENRESA, is required to carry out periodic safety reviews making it possible to update the operating conditions if the operating experience or new technological or regulatory circumstances were to make this advisable, these being performed every 10 years.

The OP is awarded in accordance with the mandatory documents mentioned above (Safety Study, Operating Specifications, etc.) updated, to which are added as a mandatory document the disposal unit acceptance criteria.

The limits and conditions regarding nuclear safety and radiation protection establish that operation of the facility shall be performed in accordance with the corresponding revision of the documents listed above, the document on Disposal Unit Acceptance Criteria being included as a novelty. They also specify that the SS should contain, differentiated for the operating phase and the control and free use phases, all the information required to perform an analysis of the installation from the point of view of nuclear

safety and radiation protection, and an analysis and assessment of the risks deriving from its operation under normal operating and accident conditions, for the three phases of its lifetime.

16.2. Operating, maintenance, radiological surveillance, inspection and testing procedures

In accordance with the RNRI, the documentation to be submitted in applying for the operating permit for a nuclear facility should include the following:

- ✓ Operational Environmental Radiological Surveillance Programme, in order to assess the impact deriving from operation of the facility, as part of the SS.
- ✓ Operating Regulation. This includes the operating standards for normal and accident conditions and the procedures in which they are developed, in reference to the facility overall and its different systems.
- ✓ Operating Technical Specifications, containing the limit values for variables affecting safety, the actuation limits for automatic protection systems, the minimum operating conditions, the programme of revisions, calibrations and periodic inspections of systems and components and operating control.
- ✓ Quality Assurance Manual, establishing the scope and contents of the quality programme applicable to the testing and operation of safety-related systems, structures and components and to the design, manufacturing, construction, testing and operation of modifications thereto.

The CSN is empowered to carry out all types of inspections at nuclear facilities, in order to ensure compliance with the conditions set out in the authorisations and the correct application of the specifications established in the permits granted and official operating documents approved. During the year 2001, the CSN performed 177 inspections at operating plants, 16 at the Juzbado fuel assembly manufacturing facility, 13 at the El Cabril radioactive waste disposal facility and 15 at the Ciemat facilities, 6 at shutdown installations and 9 at those still in operation.

The CSN may temporarily or permanently station accredited personnel at nuclear facilities for the performance of inspection and control missions, as established in the RNRI. At present, the CSN has two resident inspectors at each operating NPP, whose main mission is the inspection and observation of the operating activities performed at the plants and the provision of information on these activities to the CSN.

Furthermore, the current Regulation establishes the operating permits having a period of validity, in replacement of the previous provisional operating permits. Prior to the expiry of the period of validity, the licensee is required to make arrangements for renewal of the permit using the same procedure as applied in awarding thereof, attaching updates to the documents on which such awarding was based or, where appropriate, the documentation determined for each authorisation.

In the case of El Cabril, as a LILW disposal facility, the operating permit issued in October 2001 contemplates the possibility of the D.G. for Energy Policy and Mines (MINECO) requiring the adoption of appropriate corrective actions in view of the experience of operation of the facility, of the results of other on-going assessments and analyses and of the results of inspections and audits.

The licensee, ENRESA, is required to carry out periodic safety reviews of the facility in order to allow for updating of the operating conditions if this were considered advisable

in view of the operating experience or new technological or regulatory circumstances. Likewise, revisions will be performed on the SS due to updates and improvements in long-term safety assessment and design modifications. These shall be sent to the D.G. for Energy Policy and Mines (MINECO) and to the CSN.

In addition, this authorisation establishes the obligation for reports to be submitted to the CSN during the first quarter of each calendar year including, among others, the following aspects: design modifications implemented or in the course of implementation, the results of the environmental radiological surveillance programme and personnel dosimetry controls and the measures taken to analyse the applicability of new national nuclear safety and radiation protection requirements and of the standards issued in this area in countries having disposal facilities of a similar design. In this last case, aspects relating to checks and tests contributing to better knowledge of the long-term behaviour of radioactive wastes are considered to be relevant.

16.3. Operating experience

16.3.1. Nuclear facilities

Since the beginning of operation of the Spanish NPP's on-going safety review programmes have been performed with a view to maintaining the level required by the authorisations and to improve safety in accordance with technological progress and new standards requirements. The set of conditions attached to the operating permit for each plant requires the licensee to analyse his own operating experience and the applicability to his installation of events reported by the other Spanish plants, as well as the main experiences communicated by the international nuclear industry, mainly the suppliers of safety-related equipment and services.

Each plant submits an annual report on in-house and industry operating experience, reflecting the results of such analyses for assessment by the CSN. Likewise, during the first quarter of each calendar year, each plant submits to the D.G. for Energy Policy and Mines and to the CSN a report on RWMP activities, including those referring to very low level wastes open to management as conventional wastes, high level wastes and irradiated fuel.

In the case of the Juzbado fuel assembly manufacturing facility, the licensee submits an annual report on RWMP activities, including those referring to very low level wastes open to management as conventional wastes. In addition to this, this report includes other aspects, such as operating experience applicable to the facility, describing the actions adopted to improve its performance or prevent similar events, the measures taken to adapt operation of the facility to new national requirements regarding nuclear safety and radiation protection and the standards of the country of origin of the two reference facilities.

16.3.2. El Cabril disposal facility

The facility has Operating Regulation that includes the main activities to be performed and the organisation foreseen for their performance, as well as the assignment of functions and the establishment of hierarchical and functional relationships.

The Regulation also contains the responsibilities deriving from the legal requirements in relation to certain job posts (supervisors, operators, heads of radiation protection, occupational health) and definition of Operating Modes and the personnel requirements relating to each.

The operation of the facility is the responsibility of supervisors and operators holding licences issued by the CSN, this being regulated by a set of administrative procedures that establish the functions and responsibilities of each of the services among which the activities of the facility are divided, along with their relationships and communications.

Another of the documents included in the operating permit for the facility is the one dealing with the Operating Specifications. This document describes the general operating conditions of the El Cabril disposal facility to be adhered to in order to guarantee compliance with the requirements on nuclear safety and radiation protection. A part of these conditions consists of the limit values, maximum or minimum values for given parameters, referring to the radiological capacity of disposal, the characteristics of wastes acceptable by the facility and for incorporation in containers to form disposal units, the properties of these units and the conditions imposed regarding effluent releases during the operating phase. Also indicated are the actions to be taken in the event of any limit condition or value being exceeded.

Also included are the operating conditions and surveillance requirements (revisions, checks, calibrations, etc.) to which the systems, equipment and components of importance from the point of view of safety and radiation protection should be subjected.

All activities relating to the treatment, conditioning and disposal of the wastes are regulated via the so-called Operations Sheets. These indicate the different operating Modes that will be carried out during a working day and the corresponding need for supervisors and operators.

Each of the individual treatment and conditioning activities is described in documents known as Operating Instructions (OI's), which include all the activities within the scope of the instruction, the initial conditions and conditions during system operation, operating limits and requirements, actions in the event of anomalies and alarms and actuation modes of each of the systems of the facility, both those relating directly to waste management and the auxiliary systems.

These documents are prepared and revised periodically in order to include the experience acquired and the modifications implemented in different systems. These updates are carried out jointly by the organisations responsible for design and operation.

As a complement to operations activities, the facility has a Maintenance Plan and an organisation in charge of its performance. This plan is articulated by way of a set of general procedures that establish the organisation, functions and responsibilities, technical procedures for the disassembly and repair of equipment and machinery and maintenance schedules that establish for specific activities (greasing, inspection of gaskets, etc.) the conditions under which certain maintenance activities are to be performed, the protective measures to be taken, the frequency of performance of the activity, etc.

All these tasks are supported by a data-processing system, SGIM, which facilitates and orders the different activities to be carried out.

Equipment maintenance is classified into three different types: preventive, predictive and corrective, and is divided into three main specialities: mechanical, electrical and instrumentation and control.

Using the data obtained from operating and maintenance experience, the organisations involved in the design of the facility and aforementioned activities hold periodic

meetings at which the facility improvement plans are drawn up. These activities are regulated in a procedure known as the "Design modification procedure", which establishes each of the aspects involved in this process.

The main activities included in a design modification are, on the one hand, definition of the modification requested, its justification and its description. This is followed by a preliminary analysis of the possible solution to be implemented and its impact on the mandatory documents, for example whether a safety assessment is required due to its implying the modification of the criteria, standards and conditions on which the facility's Operating Permit is based, this implying the need for assessment and approval of the modification by the Regulatory Body. Following this work begins on preparing the different specifications, calculations, reports, etc. required for definition and design of the modification, these making up the design change package (DCP) allowing the different structures, equipment or components required in the modification to be acquired. The process of managing a modification ends with the documentation provided by the different suppliers and the issuing "as built" of the project documentation, in addition to the revision and updating of the facility documents.

16.4. Availability of engineering and technical support services

Based on the RNRI, the Operating Regulation, a document included in the request for the operating permit or its renewal, contains information on job posts with nuclear responsibilities and on the organisation and the functions of the personnel attached to the facility, defining the basic initial and on-going training programmes.

The organisation of all the NPP's is very similar, with an off-site organisation providing support functions and the operations personnel that performs functions directly related to the activities on site. The size of the support organisation varies from one installation to the next, since some plants contract engineering work, although generally it is in charge of activities relating to analysis of the standards, licensing, analysis of in-house and industry operating experience and control of inspections during the manufacturing of nuclear components. In many cases this support organisation includes sections having responsibilities in relation to fuel management and radioactive wastes.

On site, the Operations Manager or Plant Manager is responsible for operating and maintaining the facility within the conditions established in the operating permit, and has under his charge the organisational units required for performance of the activities involved, among them waste and effluent management and operations technical support and engineering.

In the specific case of the El Cabril facility, the operations organisation is based on different organisational units reporting to the Facility Management. The Manager reports in turn to the ENRESA Operations Division, as shown in the organisational flowchart included in Annex K and in accordance with the organisational structure described in point 22.1. of Section F. These units are the technical division (security, radiation protection, maintenance, constructions and infrastructures, conditioning and disposal and laboratories services), the social communications service, administration, occupational health and quality assurance.

The personnel of the facility is selected on the basis of criteria of aptitude, level of training, academic background and experience, depending on the requirements applicable to each job post. They hold the titles or licences established by the legislation in force and undergo a training programme appropriate to each job post and depending on the

functions assigned to them. In compliance with the legislation in force, the facility has personnel holding Radiation Protection Service Manager, Supervisor and Operator licences, awarded by the CSN, in addition to a medical service authorised to undertake the monitoring of personnel professionally exposed to ionising radiations.

Depending on the functions assigned to each job post, a training programme is drawn up every year, with the collaboration of the Service Managers. This training aims to maintain basic knowledge in areas affecting Radiation Protection, Emergencies and Fire-Fighting. A distinction is made between four categories: Procedural, and consequently obligatory, training, Licensed personnel training, Job post-specific training and Generic training.

General technical support is provided for the facility from the Company's headquarters, through the LILW Engineering Department of the Operations Division. This Department is responsible for directing projects in relation to LILW, including the processes of engineering, procurement, construction, construction, assembly and testing of treatment, conditioning and disposal installations and equipment. Furthermore, the Safety and Licensing Department is responsible for directing safety and environmental impact studies and for establishing the general radiation protection system and the emergency plans of the facilities.

The LILW Engineering Department contracts facility operations support engineering services. Project Engineering is generally responsible for the performance and revision of both the design and the technical validity of modifications, in accordance with the requirements set out by the ENRESA Project Manager.

16.5. Waste characterisation and segregation procedures

LILW management in Spain is based on the El Cabril facility, whose first operating permit, issued in October 1992, establishes that the criteria for acceptance of wastes at the facility must be approved by the regulatory authorities, the corresponding document containing at least general criteria and specific technical criteria for nuclear facility operating wastes, wastes from radioactive facilities and, in general, for those generated or treated at the installation itself. In accordance with the successive operating permits for the El Cabril facility, ENRESA is authorised to dispose of conditioned LILW in the platform cells, as long as they meet the acceptance criteria established for their definitive disposal. It is also authorised to carry out the necessary checks and tests on LILW for characterisation.

The contracts drawn up between ENRESA and the waste producers include the acceptance criteria to be met by the wastes for removal by ENRESA and management at the El Cabril facility. That is to say that these contracts establish the responsibilities of the producers, making a distinction between nuclear and radioactive facilities.

For the RF's, which according to the RNRI are those installations that contain a source of ionising radiations, apparatus producing ionising radiations and operating at a difference of potential in excess of 5kV, or where radioactive materials are produced, used, possessed, treated, handled or stored, the minor producers must request the removal of their wastes on the basis of the existing agreement (type contract in force, approved by the D.G. for Energy Policy and Mines), optimise the volume of the wastes (segregation at the point of origin), carry out an estimate of the activity and facilitate subsequent management by adapting the way in which the wastes are presented to the treatment foreseen for them. These wastes will be conditioned at the El Cabril facility.

ENRESA supports these producers in the segregation tasks, organising educational and training courses and supplying them with storage containers for each radioactive waste stream. Prior to removal, ENRESA carries out a specific check on compliance with the acceptance criteria.

In the case of the nuclear facilities, the producers are required to request the acceptance of their waste packages, providing the information required on the wastes, the conditioning mode used, their activity and the characteristics of auxiliary materials.

The NPP operations and waste management procedures include, on the one hand, the methods usually applied to minimise waste production, as mentioned in Section 16.1.1., with the measures adopted for correct segregation, and, on the other, the acceptance criteria to be met by the packages for disposal at the El Cabril facility. ENRESA has implemented an inspection, production control and verification checking system that guarantees that the waste packages accepted at the El Cabril facility comply with the acceptance criteria, in which respect a methodology and quality criteria previously authorised by the regulatory authorities are applied to the different type packages generated at the NPP's.

The methodology for acceptance of LILW produced by nuclear facilities is based on the preparation of acceptance documentation specific to each type of package and producer, with a description of its physical and chemical characteristics, determination of the activity of the main beta-gamma emitters and alpha activity and the processes of package production, conditioning methodology and tests performed and characteristics of the auxiliary materials (drum, cement, etc.). Compliance with the acceptance criteria will be specifically checked by ENRESA through performance of appropriate tests.

In the case of production of waste packages subsequent to approval of the acceptance criteria for their disposal at El Cabril, ENRESA establishes a set of tests and measurements prior to conditioning at the installations of the nuclear facility, the aim being to determine the properties and characteristics of the type package as regards mechanical strength, the absence of free liquids, etc., to check the representative nature of the results with respect to those obtained previously by the producer, and compliance of both with the acceptance criteria in force, and to determine the concentration of activity in the package. These tests are additional to the production controls and the technical verification tests performed subsequently in the El Cabril facility's laboratory.

Finally, it should be pointed out that waste management at the El Cabril facility is designed to allow for the identification, monitoring and control of all the waste packages at the installation and to keep an updated inventory of the activity stored in the cells, such that this may be contrasted at all times with the maximum radiological capacity (reference inventory).

16.6. Reporting of incidents

In compliance with the RNRI, the nuclear facilities have a Site Emergency Plan that includes the measures foreseen by the licensee and the assignment of responsibilities to address accident conditions, the objective being to mitigate their consequences, protect the personnel of the facility and immediately notify the competent bodies of occurrence, including an initial assessment of the circumstances and the consequences of the situation.

This Regulation establishes that the licensees of both nuclear and radioactive facilities are obliged to submit reports to the D.G. for Energy Policy and Mines and the CSN on any event implying an alteration to the normal operation of the facility or that might affect nuclear safety or radiation protection.

Furthermore, the CSN has drawn up a Safety Guide, GSG-01.06 "Reportable events at operating nuclear power plants", that defines two types of events: abnormal events (accident situation) and others. Further information on the reporting of events by the Spanish NPP's is included in the National Report on the Convention on Nuclear Safety.

In the case of El Cabril, the facility has a regulatory "Site Emergency Plan". Emergency situations are classified in three categories, none of which contemplate the release of radioactive material in a quantity that would require protective measures to be implemented off site. Consequently, no Emergency more serious than the Site Emergency is defined.

In addition to the organisation for normal conditions, the Site Emergency Plan includes the activities and organisation for operation of the facility in Emergency situations requiring activities other than those normally performed. The basis of the Emergency Organisation is the operating organisation itself, although mechanisms have been established to ensure the location of one such person at any time, in accordance with an in-house procedure. Communication with the CSN is contemplated in all cases.

16.7. Assessment of compliance

In view of what has been set out in the previous sections, it may be concluded that the Spanish legislation provides reasonable assurance of the adoption of measures by the licensee of radioactive waste management facilities existing in Spain for compliance with Article 16 of the Convention.

The Spanish regulations require the licensee to draw up and submit a series of documents along with the request for the operating permit of a nuclear facility, containing a full safety assessment and the performance of a programme of nuclear tests under the supervision of the CSN and the MINECO. Furthermore, an annex to the permit includes the nuclear safety and radiation protection limits and conditions imposed by the CSN and to be fulfilled by the licensee during the operating period.

As is established in the Spanish regulations, the licensee of the nuclear facility is required to submit a study on foreseen decommissioning and dismantling activities in order to obtain the operating permit. Also established is the licensee's obligation to analyse the applicability of new technologies or new national requirements, as well as the standards on nuclear safety and radiation protection generated in countries having installations of a similar design.

Article 17. Institutional measures following closure

17.1. Documentary custody

According to Royal Decree 1522/1984, by which the Empresa Nacional de Residuos Radiactivos (ENRESA) was created, this public company shall be responsible for per-

manently keeping an archive with the inventory of wastes existing at radioactive waste disposal facilities. This responsibility for custody shall persist even after the closure of such facilities (art. 6).

17.2. Period of compliance following the closure of facilities

The RNRI establishes the reference regulatory system for the dismantling and decommissioning of nuclear and radioactive facilities and, for the purposes of regulation and control, places the nuclear facilities at the same level as the first category nuclear fuel cycle radioactive facilities (art. 37).

In Spain, all the disposal facilities for residual materials which have been conditioned and closed belong to the front end of the nuclear fuel cycle (tailings from mining and from the processes of disused uranium mills). These disposal installations are currently in the so-called period of compliance, pending a closure statement of the facility. See Annex I of Section L.

The aforementioned Regulation establishes that the process of dismantling of these facilities should finish with a closure statement, freeing the licensee from his responsibilities as the operator of the installations (art. 12 f).

The period of compliance is a temporary period prior to the closure statement, established by the Administration in order to verify, in the short term, the suitability of the conditioning performed on the disposed of wastes and the structural and functional maintenance of the engineered barriers implemented. During this period of compliance, the facility remains under the responsibility of the licensee and is subjected to the habitual regulatory control.

17.3. Forecasts regarding future institutional controls

The institutional controls that might foreseeably be imposed in order to restrict the use of the site following the closure of radioactive waste disposal facilities should be included in the closure statement issued, as specified in the RNRI (art. 12 f).

The closure statement of the disposal facility should include a definition of the use restrictions applicable to the site, along with the designation of the body or organisation responsible for maintaining such limitations and ensuring their compliance (art. 12 f).

Another of the functions established in section g) of article 2 of Royal Decree 1522/1984, by which ENRESA was created, is assurance of the long-term management of all facilities serving for waste disposal.

Article 2 of Law 15/1980, creating the CSN, in accordance with the wording of the first additional provision of Law 14/99, section g), attributes to the Council the function of control and surveillance of the radiological quality of the environment throughout the national territory, in compliance with the international obligations of Spain in this area, and without prejudice to the areas of competence attributed to the different public administrations.

The institutional controls, which are to be specified in the closure statement awarded in the future, are not yet defined from the point of view of the organisations that will be responsible for long-term control. It is expected that shared responsibilities will be as-

signed depending on the different objectives of the institutional controls imposed (security, documentary records archive, etc.).

17.4. Forecasts regarding possible remediation interventions

The possible remediation interventions at closed radioactive waste disposal facilities shall be contemplated in the closure statement awarded. For the reasons set out above, it would appear to be foreseeable that the practical performance of such remedial measures or actions will be assigned in the closure statement to the bodies or organisations responsible for long-term control.

17.5. Assessment of compliance

No radioactive waste management facility has undergone closure to date. Nevertheless, suitable measures are being taken to ensure full compliance with the requirements of Article 17 at the moment of closure of these facilities.

Section I

Transboundary movements

Article 27. Transboundary movements

27.1. Standards development

In Spain the transboundary movements of radioactive wastes are regulated by Royal Decree 2088/1994, of 20th October, which sets out the applicable provisions of the European Community Council Directive 92/3/EURATOM, on the supervision and control of shipments of radioactive waste between Member States and into and out the Community, this Royal Decree constituting the transposition of the said Directive.

Both the Royal Decree and the Directive establish the requirements of point 1 of this Article, which refer to cases in which Spain is the point of origin or destination of the wastes, as well as to cases in which the waste are returned when a movement is not or cannot be performed, with the exception of Community expert movements. As regards this case, an amendment to the Directive is currently in the study phase within the European Commission, to require the prior notification and approval of the State for which the wastes are destined.

As regards the transport of radioactive wastes and spent fuel, which evidently takes place in all those cases in which Spain is the point of origin or destination or of transit, Spain has included among its internal standards the international standard relating to the transport of hazardous goods by road, rail, sea and air. These standards are as follows:

- ✓ European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).
- ✓ Regulations concerning the International Transport of Dangerous Goods by Rail (RID).
- ✓ International Maritime Dangerous Goods Code (IMDG code).
- ✓ Technical Instructions for the Safe Transport of Dangerous Goods by Air.

The regulations in force in Spain and applicable to transport adapt fully to the edition in force of the Regulations for the safe transport of radioactive material of the International Atomic Energy Agency, TS-R-1 (ST-1, revised).

The objectives of the regulations on the transport of radioactive materials are as follows:

- ✓ To prevent the dispersion of the material and its possible incorporation by people in the surrounding area.
- ✓ To prevent the risk of the radiations emitted by such material.
- ✓ To prevent damage resulting from the heat emitted by certain transport packages.
- ✓ To prevent the possibility of a chain reaction (criticality) taking place during the transport of fissionable substances.

A series of measures is taken for this purpose:

- ✓ There is a guarantee that the containment of the material is the best suited to prevent dispersion; in this respect consideration is given to the mechanical strength of the packaging and to the nature and activity of the material transported.
- ✓ The level of external radiation is controlled through the use of package shielding materials and the external levels of radiation are identified by means of signposting labels.
- ✓ Damage caused by heat is avoided through the design of the packaging and the stowage conditions of the packages.
- ✓ Criticality is prevented through adequate design of the packaging and by limiting the contents of each package and the number of such packages in each dispatch.

The transboundary movements of spent fuel would, where applicable, basically be associated with fuel reprocessing. Given that at present the national strategy for spent fuel management does not initially contemplate reprocessing, and that no reprocessing installations exist in Spain, the transboundary movement of spent fuel is not foreseen.

As indicated above, the aforementioned standards on the transport of hazardous goods are applicable to the transport of spent fuel. In the administrative document of the regulatory body issuing the authorisation for transport in accordance with these standards, in the event of Spain being the State of origin, the prior notification and consent of the State of destination will be required, and accreditation will be demanded regarding the administrative and technical capacity of the latter, as well as the regulatory structure necessary for the adequate management of the fuel. Likewise, in the event that a movement is not or cannot be carried out, Spain will permit readmission to its territory.

In addition to what has been underlined above, the ENSA-DPT dual-purpose cask has been approved in Spain for the transport and storage of spent fuel. One of the conditions imposed in relation to this approval is that transport performed on Spanish territory using this cask will require issuing of an approval for transport by the regulatory body.

As regards point 2 of this Article, which determines that Spain shall not issue licences for the dispatch of spent fuel or radioactive wastes to any place of destination located further south than 60 degrees of latitude South for storage or disposal, this requirement is contemplated, as regards radioactive wastes, by the Royal Decree and the Di-

rective. In the case of spent fuel, if storage or disposal were contemplated, then in accordance with the Convention the fuel would be considered a radioactive waste.

27.2. Experience in Spain

The Spanish experience of transboundary movements has consisted solely of transfers of low and intermediate level radioactive wastes. Specifically:

- ✓ As the country of origin:
- ✓ Radioactive wastes for incineration in order to reduce volume.

As the destination:

- ✓ Radioactive wastes from the smelting of spent fuel pool racks.
- ✓ Incineration wastes.
- ✓ Wastes from the decontamination of Spanish nuclear power plant reactor coolant pumps.

In the control processes implemented no deviations have been detected in transport and no events have occurred in performance.

27.3. Assessment of compliance

As regards the transboundary movements of radioactive wastes, both the Spanish standards referring to international transport and the practices implemented meet the requirements of this article.

As regards the transboundary movement of spent fuel, an activity that is not currently performed in Spain, the standards on the transport of hazardous goods and the mandatory authorisation for spent fuel transport using the Spanish cask model allow for compliance with the requirements imposed by this article.

Section J

Disused sealed sources

Article 28. Disused sealed sources

28.1. Measures to ensure safe possession, re-elaboration or disposal

Article 31 of the Nuclear Energy Act, Law 25/1964, establishes that radioactive materials may not be used or stored within the national territory by persons not expressly authorised to do so, and indicates that the same requirements shall be applicable to transfer or resale.

This legal requirement is enacted in the Regulation on Nuclear and Radioactive Installations (RNRI). Article 36 of this standard establishes that radioactive facilities existing for scientific, medical, agricultural, commercial or industrial purposes will require an operating permit, a declaration of closure and, where appropriate, an authorisation for modification and change of ownership.

Article 34 of the aforementioned regulation establishes that radioactive facilities shall be any installation of any type containing a source of ionising radiations, along with those premises, laboratories, factories and installations at which radioactive materials are produced, used, possessed, treated, handled or manipulated. Article 35 of the RNRI establishes that installations meeting certain conditions described therein shall not be considered radioactive facilities, these conditions including the definition of levels of exemption on the basis of isotopic activity and isotopic activity by unit of mass.

The RNRI also establishes the conditions for exemption from consideration as radioactive facilities for certain apparatus (consumer goods) incorporating radioactive substances or generating ionising radiations. For these cases the Regulation establishes a system of approval of types of radioactive apparatus by the Ministry of Economy, following a report by the Nuclear Safety Council (CSN), which will establish the conditions for their removal.

These requirements are applicable regardless of whether the radioactive sources or materials are new, depleted or out of use.

Consequently, in Spain the possession or re-elaboration of any radioactive source or material requires administrative authorisation. In the process of licensing to be followed by the licensee in order to obtain such authorisation, it is necessary for the CSN to issue a mandatory report on safety and radiation protection, after having verified that the licensee will carry out all operations in compliance with the applicable safety and radiation protection standards and requirements. The corresponding authorisations is-

sued by the competent bodies will be accompanied by the applicable safety and radiation protection limits and conditions.

As regards the final disposal of disused radioactive sources, the provisions adopted in Spain are various and depend on the different situations that might arise.

In the case of radioactive sources for which the licensee has obtained authorisation as a radioactive facility, this implying permission for possession and use, the safety and radiation protection limits and conditions accompanying the authorisation establish the obligation that the licensee return disused radioactive sources to the supplier or, where this is not possible, that they be managed via the Empresa Nacional de Residuos Radiactivos (ENRESA).

In Spain there are no installations manufacturing sealed radioactive sources, as a result of which all the sources are imported from other countries. The importing of sealed radioactive sources is also subject to a system of authorisation, in accordance with the stipulations of article 74 of the RNRI. When the entity that is to import radioactive sources is authorised as a radioactive facility, this authorisation also allows it to import radioactive sources (single authorisation). The limits and conditions accompanying such authorisations establish the obligation that all entities importing radioactive sources from other countries establish agreements with the foreign suppliers for the return of such sources to their country of origin at the end of their service lifetime.

There are situations in which the holder of a permit for the possession and use of radioactive sources cannot return these to the supplier at the end of their service lifetime (for example, due to the supplier no longer existing as such). In these cases the limits and conditions of the authorisations establish that the licensee should contact ENRESA for the latter to undertake removal and management as a radioactive waste. In this case ENRESA, on the basis of the standards regulating its activity, shall be responsible for management of the radioactive sources and for their final disposal in accordance with the applicable regulations, transferring them to El Cabril low and intermediate level radioactive waste disposal facility or adopting other appropriate measures for their final management.

In the case of disused radioactive sources outside the regulatory control system (old sources or orphan sources), that is to say when there is no licensee authorised to possess them, the two aforementioned possibilities are also contemplated. If it is possible to identify the supplier, the person in possession of the source undertakes the arrangements necessary for their removal; if this is not feasible, the owner of the source contacts ENRESA. The removal by ENRESA of unauthorised disused sources requires a specific authorisation issued by the Ministry of Economy, following a report from the CSN.

A special case among stray sources is that of sources detected at installations for the processing or recovery of metallic scrap. The actions to be taken for the safe management of such sources are included in a Protocol drawn up between the companies of the sector, the Ministry of Economy, the CSN, ENRESA and the trade unions. This Protocol establishes the obligation of the licensee of the industry in which the source is detected to implement technical and administrative systems for isolation of the source and identification of the radioactive isotope and its activity and to keep it in a safe situation until such time as it is removed. This Protocol also establishes that when the radioactive source is domestic in origin it will be managed as a radioactive waste by ENRESA, which will cover the costs. In other cases, the sources shall be returned to the supplier of the scrap or, where this is not feasible, shall be transferred to ENRESA for

management as radioactive waste, in which case the derived costs shall be to the companies, without prejudice to these being applied by the latter, where appropriate, to the supplier or dispatcher of the scrap.

The safe possession, use, transfer and final disposal of radioactive sources in all the cases mentioned in the preceding paragraphs are guaranteed, since the different entities participating in these processes are obliged to meet the requirements of the Regulation on Protection against Ionising Radiations. This Spanish standard includes safety and radiation protection requirements equivalent to those of the International Standards on Radiation Protection and on the Safety of Sources of Radiation, of the International Atomic Energy Agency (IAEA), and of the European Union Directive 96/29/EURATOM.

28.2. Readmission to Spanish territory of disused sealed sources

As has been pointed out above, there are no facilities manufacturing or producing sealed radioactive sources in Spain. On the other hand, there is no provision in the Spanish standards preventing the readmission of radioactive sources exported by Spanish manufacturers.

The authorisation for Spanish licensees to import sealed radioactive sources from other countries requires them to meet the requirements of this article, admitting the return of disused sources to suppliers or manufacturers authorised in the national territory.

28.3. Assessment of compliance

In accordance with what has been set out in the preceding sections, the legal and regulatory provisions in Spain ensure adequate control of sealed radioactive sources, as regards both their use during their service lifetime at radioactive facilities and their final disposal when they are no longer in use.

Likewise, although no radioactive sources are manufactured or produced in Spain, the legal and regulatory provisions do not prevent the readmission of whatever radioactive sources might be exported by Spanish manufacturers.

Section K

Planned activities to improve safety

This first national report has explained the situation existing Spain with regard to the management of spent fuel and radioactive wastes, in the context of the safety requirements contemplated in the Joint Convention. In view of the information provided in relation to each article and its corresponding assessment, the Spanish system may generally be said to meet the requirements of the Convention.

Nevertheless, being aware of the fact that the very nature of safe radioactive waste and spent fuel management, in particular in the long term, has a different dimension, initiatives have been implemented with a view to developing and completing the legal and regulatory framework, taking into account international consensus in this area. The areas of improvement in which work is currently under way are described below.

K.1. Plan for safety-related standards development in relation to the management of low and intermediate level radioactive wastes

As has been explained in Section H of this national report, the Spanish nuclear legislation and the regulations through which it is enacted do not currently include provisions relating specifically to long-term radiological risk, and the areas of the standards relating to the safety principles and criteria to be met by waste management facilities over timescales other than the normal operating periods are not fully developed. These criteria have, however, been developed and taken into account in a specific manner during the licensing of the existing facilities, when this has been necessary.

At the end of the year 2001, the CSN started preparation of a Plan for the development of the Spanish standards framework in the area of safety in the management of low and intermediate level radioactive wastes,

The initial objective of this Plan is to analyse the Spanish standards relating to this issue and to identify the specific shortcomings existing, taking as a basis the performance and results of the IAEA's RADWASS programme.

This first stage of analysis and identification will be followed by the formulation of proposals regarding specific concepts and aspects considered to warrant treatment in the standards, and regarding determination of the most suitable legal instruments for support.

In addition to the CSN, the Ministry of Economy and the Empresa Nacional de Residuos Radiactivos (ENRESA) are involved in the aforementioned Plan for standards development.

K.2. Plan for safety-related standards development in relation to the management of high level radioactive wastes

As has been explained in Sections G and H of this report, the Spanish nuclear legislation currently lacks administrative procedures regulating the process of designating candidate sites for spent fuel and high-level waste disposal facilities. Similarly, the existing legal framework lacks a specific standard relating to the disposal of this type of wastes and, in particular, explicit provisions regarding long-term risk as well as the implications of institutional surveillance and control requirements to prevent undue burdens from being placed on the generations of the future, as required by Articles 4 and 11 of the Convention.

In this respect, analysis is being carried out on the most appropriate way of addressing such shortcomings. It should be pointed out, however, that in no case do these shortcomings compromise the safety of the existing facilities, as reflected in the aforementioned sections G and H.

K.3 Development and implementation of radioactive waste management plans at waste producing facilities

The Regulation on Nuclear and Radioactive Installations, in dealing with the documentation to be submitted by licensees of nuclear facilities in requesting the operating permit, establishes that they should submit a Radioactive Waste Management Plan (RWMP) incorporating, where applicable, the contracts drawn up with management companies and including, among other things, a system for possible clearance. Likewise, and as regards the documentation to be submitted in support of the request for authorisation for the decommissioning and dismantling of nuclear facilities, the Regulation establishes that a RWMP should be included, containing the waste inventory, characterisation, treatment, conditioning and disposal foreseen, as well as the criteria adopted for the clearance of materials. The requirements of these articles are applicable also to nuclear fuel cycle radioactive facilities.

As has been indicated in Section H, the CSN is driving new developments in relation to this mandatory document, contributing to an overall reflection on the management of all solid, liquid and gaseous radioactive wastes. Thus, with a view to analysing the most appropriate content and scope for the Waste Management Plans, a working group was set up in 2001, including representatives of the CSN, UNESA, ENRESA and ENUSA.

As a result of the activities of this working group, a joint document is being prepared establishing the following:

- ✓ The scope and detailed contents of the RWMP
- ✓ The scope and content of the support studies necessary for its preparation.
- ✓ The periodic information to be submitted to the CSN on Plan activities.

The objective of the RWMP is to include criteria and instructions ensuring that the management of the radioactive wastes generated at these facilities is safe and optimised, with consideration given to progress in the standards and technology and taking into account the following:

- ✓ The existing situation as regards waste production, management and, where applicable, disposal.
- ✓ Identification of the origins of the wastes.
- ✓ Study of the alternatives for the management systems and processes and improvements to them.
- ✓ Justification of the suitability of current management or of the need for the implementation of improvements.
- ✓ Planning of studies for implementation of the improvements identified.

Once developed as indicated above the RWMP will become the reference document for management of the wastes generated at nuclear and radioactive facilities involved in the fuel cycle, both during operation and during decommissioning and dismantling. In particular, it should contain the information required to allow for analysis of radioactive waste management at the facility, and will serve to guarantee that no radioactive wastes are disposed of conventionally, since the RWMP is applicable to the management of radioactive wastes regardless of their level of radioactivity, as well as of waste materials with radioactive contents and open to clearance.

This document is part of the objective of improving the management of the wastes produced at each installation. In particular, the licensee of the facility should keep the waste inventory updated, minimise production, recycle and valuate the wastes generated to the extent that this be technically and economically possible, and condition final waste materials for their disposal. Another objective is to guarantee that no radioactive wastes are disposed of as conventional materials.

The RWMP of a facility will consider the overall risk, both radiological and of other types, associated with radioactive wastes, in order to define overall solutions.

Similarly, and as indicated in Section G, the CSN is requiring the nuclear power plants to implement additional actions for them to include in this plan the measures taken to minimise the generation of secondary wastes as a result of spent fuel management and to guarantee interdependence between the different stages of spent fuel and high level waste management from generation onwards.

The existing forecasts indicate that by the end of 2003 the new Waste Management Plans will have been drawn up by all the Spanish nuclear facilities, and that their definitive implementation should take place during 2004.

K.4. Actions to improve the general nuclear emergency response capacity

As indicated in Section F, actions are currently under way or scheduled to improve the general nuclear emergency response capacity in Spain. Certain of these actions refer to the following:

- ✓ Revision of the Basic Nuclear Emergency Plan in order to introduce the new radiological criteria defined at international level, among them the philosophy

of levels of intervention based on the doses avoided. Furthermore, there are plans to incorporate a new structuring of the national Administration that was defined in Law 6/1997 on the Organisation and Operation of the General State Administration.

- ✓ Improvement and updating of the resources and capabilities of the Provincial Emergency Plans. The available resources are periodically revised and new lists of shortcomings are published for consideration in the appropriate budgeting assignments.
- ✓ Incorporation of new decision-making aid systems. Arrangements are being made for the incorporation of the RODOS system in the installations of the CSN's emergency room (SALEM).
- ✓ Improvement of aspects of application of plans and procedures for information for the population.
- ✓ Establishment of generic guidelines for the performance of activities corresponding to the recovery phase. As a starting point, there are preliminary technical studies on this issue carried out by ENRESA, among which is included a national inventory of resources applicable during this phase of an emergency.

Section L

Annexes

Annex A.
List of spent fuel management facilities

Name of the facility	Location (Province)	Storage type	Main characteristics
Almaraz I NPP	Cáceres	Pool	Integral part of the NPP
Almaraz II NPP	Cáceres	Pool	Integral part of the NPP
Vandellós II NPP	Tarragona	Pool	Integral part of the NPP
Ascó I NPP	Tarragona	Pool	Integral part of the NPP
Ascó II NPP	Tarragona	Pool	Integral part of the NPP
Cofrentes NPP	Valencia	Pool	Integral part of the NPP
Sta. M. Garoña NPP	Burgos	Pool	Integral part of the NPP
José Cabrera NPP	Guadalajara	Pool	Integral part of the NPP
Trillo NPP	Guadalajara	Pool	Integral part of the NPP
		Dry	Newly constructed facilitiy additional to the NPP

Annex B.
List of radioactive waste management facilities

Name of the facility	Location (Province)	Main purpose	Other characteristics
Almaraz I NPP	Cáceres	Treatment, preliminary conditioning and temporary storage	Installations for the management of nuclear power plant operating wastes
Almaraz II NPP	Cáceres	Treatment, preliminary conditioning and temporary storage	
Vandellós II NPP	Tarragona	Treatment, preliminary conditioning and temporary storage	
Ascó I NPP	Tarragona	Treatment, preliminary conditioning and temporary storage	
Ascó II NPP	Tarragona	Treatment, preliminary conditioning and temporary storage	
Cofrentes NPP	Valencia	Treatment, preliminary conditioning and temporary storage	
Sta. M. Garoña NPP	Burgos	Treatment, preliminary conditioning and temporary storage	
José Cabrera NPP	Guadalajara	Treatment, preliminary conditioning and temporary storage	
Trillo NPP	Guadalajara	Treatment, preliminary conditioning and temporary storage	
Juzbado Facility	Salamanca	Treatment, preliminary conditioning and temporary storage	Installations for the management of plant operating technological wastes
Ciemat	Madrid	Preliminary conditioning and temporary storage	Installations at nuclear Research Centre
El Cabril Facility	Córdoba	Temporary storage	3 concrete modules + Transitory Reception Building
		Final disposal	28 near-surface reinforced concrete vaults

Annex C. List of nuclear facilities in the process of being decommissioned

Name of the facility	Location (Province)	Current situation (31/12/2002)	Decommissioning and Dismantling Milestones
Vandellós I NPP	Tarragona	Dismantling activities to partially release the site (level 2 according to IAEA stages) during the first four months of 2003.	1990: Definitive shutdown of 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 Plan and initiation of activities
			1999: CSN authorisation for dismantling in active zones
			2000: Initiation of waste transport to El Cabril
			2001: CSN approval of materials clearance methodology
Argos Research Reactor	Barcelona	Decontamination and dismantling activities under way	1977: Definitive shutdown after a total 634 hours of operation at an average power of 4W
			1992: Removal of fuel
			1998: Ministerial Order authorising dismantling
Arbi Research Reactor	Bilbao	Pending initiation of dismantling activities	1972: Definitive shutdown after a total 1437 hours of operation at an average power of 47W
			1992: Removal of fuel
			2002: Ministerial Order authorising dismantling
JEN-1 Research Reactor	Madrid	In licensing process	1984: Definitive shutdown after operation since 1958
			2000: Integrated Plan for the Improvement of Ciemat Installations. Dismantling Project
			2001: Revision of Master Plan for actions in the IPICI
			2002: Submittal of Dismantling Plan to MINECO and CSN

Annex D.
Inventory of irradiated fuel (31/12/2001)

Name of facility	Characteristics of Fuel Assemblies	Total Capacity (tU)	Number of Fuel Assemblies	tU
Almaraz I NPP	PWR 17x17	760	816	377
Almaraz II NPP	PWR 17x17	760	808	373
Vandellós II NPP	PWR 17x17	663	584	269
Ascó I NPP	PWR 17x17	583	776	358
Ascó II NPP	PWR 17x17	583	692	319
Cofrentes NPP	BWR 8x8, 9x9	799	2332	434
Sta. M. Garoña NPP	BWR 8x8, 9x9	393	1524	271
José Cabrera NPP	PWR 14x14	127	256	68
Trillo NPP	PWR 16x16	294[1]	568	266
		786[2]	0	0

[1] Corresponding to the pool.

[2] Corresponding to the dry storage facility.

Annex E.
Inventory of radioactive wastes (31/12/2001)

Name of facility	Type of facility	Type of Waste	Volume (m^3)	Activity (MBq)	Main radionuclides
C.N. Almaraz I	Nuclear plant	LILW	1,600	1.0 E09 *	Co-60, Cs-137
C.N. Almaraz II	Nuclear plant	LILW			
C.N. Vandellós II	Nuclear plant	LILW	200	3.1 E07 *	Co-60, Cs-137
C.N. Ascó I	Nuclear plant	LILW	750	1.1 E08 *	Co-60, Cs-137
C.N. Ascó II	Nuclear plant	LILW			
C.N. Cofrentes	Nuclear plant	LILW	1,580	9.2 E07 *	Co-60, Cs-137
C.N. Sta. M. Garoña	Nuclear plant	LILW	910	7.3 E07 *	Co-60, Cs-137
C.N. José Cabrera	Nuclear plant	LILW	1,290	5.6 E07 *	Co-60, Cs-137
C.N. Trillo	Nuclear plant	LILW	210	7.4 E05 *	Co-60, Cs-137
Juzbado Facility	Fuel assembly manufacturing facility	LILW	460	1.3 E05	U-234, U-235, U-238
El Cabril	LILW Disposal Facility	LILW	40,800 **	1.4 E08 ***	Co-60, Cs-137

Note:

* *Corresponds to the total activity as of the date of waste generation, considering all the isotopes measured by the Plant, fundamentally Co-60 and Cs-137, with significant contribution by other short-lived isotopes.*

** *Corresponds to 3,678 containers stored in the cells. The wastes existing in the temporary storage installations at El Cabril amount to some 4,400 m^3*

*** *Corresponds to the total activity updated as of 31st December 2001, corresponding to the LILW stored in the cells of the facility.*

Annex F.
References to national laws, regulations, rules and guidelines

1.
Standards of legal status

- ✓ Nuclear Energy Act (Law 25/1964, of 29th April).
- ✓ Law Creating the Nuclear Safety Council (Law 15/1980, of 22nd April).
- ✓ Law on Public Fees and Prices for services rendered by the Nuclear Safety Council (Law14/1999, of 4th May)
- ✓ Electricity Industry Act (Law 54/1997, of 27th November).
- ✓ Law on rights to access to information on the environment (Law 38/1995, of 12th December).
- ✓ Royal Legislative Decree on Environmental Impact Assessment (Approved by RLD 1302/1986, of 29th June), modified by Law 6/2001, of 8th May.

2.
Standards of regulatory status

- ✓ Regulation on Nuclear and Radioactive Installations. (Approved by Royal Decree 1836/1999, of 3rd December)
- ✓ Regulation on Protection against Ionising Radiations. (Approved by Royal Decree 783/2001, of 6th July).
- ✓ Royal Decree authorising constitution of the Empresa Nacional de Residuos Radiactivos (ENRESA). (Royal Decree 1522/1984, of 4th July).
- ✓ Regulation on coverage of nuclear risk. (Decree 2177/1967, of 22nd July).
- ✓ Royal Decree ordering fuel cycle activities (Royal Decree 1899/1984, of 1st August).
- ✓ Regulation on Environmental Impact Assessment (Approved by Royal Decree 1131/1988, of 30th September).
- ✓ Royal Decree on the radiation protection of off-site workers with the risk of exposure to ionising radiations due to intervention in the controlled zone (Royal Decree 413/1997).
- ✓ Royal Decree on the physical protection of nuclear materials (Royal Decree 158/1995, of 3rd February).
- ✓ Royal Decrees on radioactive lightning rods (Royal Decrees 1428/1986, of 13th June and 903/1987, of 10th July)

- ✓ Royal Decree on the supervision and control of shipments of radioactive waste between Member States and into and out the Community (Royal Decree 2088/1994, of 20th October)
- ✓ Regulation (EURATOM) nº 1493/93, of the Council, of 8th June 1993, relating to the transfer of radioactive substances between Member States (DOCE 19/06/1993).

3. Non-binding provisions. Nuclear safety council safety guides

The CSN Safety Guides contain methods recommended by the CSN from the point of view of nuclear safety and radiation protection, their objective being to orient users and facilitate application of the Spanish nuclear regulations in force. Compliance with these Guides is not obligatory, and the user may apply methods and solutions other than those contained therein, as long as these are duly justified.

The collection of safety guides is divided into ten sections.

List of safety guides published up to December 2002.

POWER REACTORS AND NUCLEAR POWER PLANTS

- ✓ GS-G-01.01. Qualifications for the awarding and use of nuclear power plant operating personnel licences.
- ✓ GSG-01.02. Nuclear emergency dosimetry model.
- ✓ GSG-01.03. Nuclear power plant emergency plan (1987).
- ✓ GSG-01.04. Radiological control and surveillance of liquid and gaseous radioactive effluents released by nuclear power plants (1988).
- ✓ GSG-01.05. Documentation on refuelling activities at light water nuclear power plants (1990).
- ✓ GSG-01.06. Reportable events at operating nuclear power plants (1990).
- ✓ GSG-01.07. Information to be submitted to the CSN by licensees of nuclear power plants operation (1997).
- ✓ GSG-01.09. Emergency simulations and drills at nuclear power plants (1996).
- ✓ GSG-01.10. Periodic nuclear power plants safety reviews (1996).
- ✓ GSG-01.11. Design modifications at nuclear power plants.
- ✓ GSG-01.12. Practical application of the optimisation of radiological protection in Nuclear Power Plants (1999).
- ✓ GSG-01.13. Content of nuclear power plant operating regulations (2000).
- ✓ GSG-01.14. Criteria for the performance of Probabilistic Safety Assessment applications (2001).

ENVIRONMENTAL RADIOLOGICAL SURVEILLANCE

- ✓ GSG-04.01. Design and development of the Environmental Radiological Surveillance Programme for nuclear power plants (1993).

RADIOACTIVE INSTALLATIONS AND APPARATUS

- ✓ GSG-05.01. Technical documentation for construction and start-up of installations handling and storing non-encapsulated radioactive isotopes (2nd and 3rd category) (1986).
- ✓ GSG-05.02. Technical documentation for authorisation request for the construction and start-up of installations handling and storing encapsulated sources (2nd and 3rd category) (1986).
- ✓ GSG-05.03. Control of the leak-tightness of encapsulated radioactive sources (1987).
- ✓ GSG-05.05. Technical documentation for authorisation request for the construction and start-up of radiotherapy installations (1988).
- ✓ GSG-05.06. Qualifications for the awarding and use of radioactive installation operating personnel licences (1988).
- ✓ GSG-05.08. Bases for the preparation of information relating to the operation of radioactive installations (1988).
- ✓ GSG-05.09. Documentation for authorisation request for the registration of companies selling and providing technical assistance for X-ray equipment (1998).
- ✓ GSG-05.10. Technical documentation for authorisation request for installations using X-ray for industrial purposes (1988).
- ✓ GSG-05.11. Technical safety and radiation protection aspects of medical installations using X-ray for diagnosis (1990).
- ✓ GSG-05.12. Homologation of training courses for the supervisors and operators of radioactive installations (1998).
- ✓ GSG-05.14. Safety and radiation protection at industrial gammagraphy radioactive installations (1999).
- ✓ GSG-05.15. Technical documentation for requests for the approval of radioactive apparatus types (2002).
- ✓ GSG-05.16. Technical documentation required for authorisation requests for the operation of radioactive installations constituted by equipment for the control of industrial processes (2001).

TRANSPORT OF RADIOACTIVE MATERIALS

- ✓ GSG-06.01. Quality assurance in the transport of radioactive substances.

RADIATION PROTECTION

- ✓ GSG-07.01. Technical-administrative requirements for Individual Personnel Dosimetry Services (1985).

- ✓ GSG-07.02. Qualification for recognition as an expert in protection against ionising radiations for managerial positions at RP Services or Technical Units (1986).
- ✓ GSG-07.03. Bases for the establishment of Services or Technical Units for Protection against Ionising Radiation (1987) Rev.1 (1998).
- ✓ GSG-07.04. Bases for medical surveillance of workers exposed to ionising radiations (1986).
- ✓ GSG-07.05. Actions to be taken in relation to persons affected by radiological accidents (1989).
- ✓ GSG-07.06. Contents of the radiation protection manuals for nuclear installations and radioactive nuclear fuel cycle installations (1992).
- ✓ GSG-07.07. Radiological control of drinking water (1990).

PHYSICAL PROTECTION

- ✓ GSG-08.01. Physical protection of nuclear materials at nuclear and radioactive installations (2000).

WASTE MANAGEMENT

- ✓ GSG-09.01. Control of the process of solidifying low and intermediate level radioactive waste (1991).
- ✓ GSG-09.02. Management of solid waste materials with radioactive contents generated at radioactive installations (2002).

MISCELLANEOUS

- ✓ GSG-10.01. Basic quality assurance guideline for nuclear installations (1985) (Rev.2, 1999).
- ✓ GSG-10.02. System for documentation subject to quality assurance programmes at nuclear installations (1986).
- ✓ GSG-10.02. Rev.1. System for documentation subject to quality assurance programmes at nuclear installations (2002).
- ✓ GSG-10.03. Quality assurance audits.
- ✓ GSG-10.03. Rev.1. Quality assurance audits (2002).
- ✓ GSG-10.04. Quality assurance for the start-up of nuclear installations (1987).
- ✓ GSG-10.05. Quality assurance for processes, testing and inspections at nuclear installations (1987) (Rev. 1, 1999).
- ✓ GSG-10.06. Quality assurance in the design of nuclear power plants (1987).
- ✓ GSG-10.06. Rev.1. Quality assurance in the design of nuclear installations (2002).
- ✓ GSG-10.07. Quality assurance at operating nuclear installations (1988) (Rev.1, 2000).
- ✓ GSG-10.08. Quality assurance for the management of items and services for nuclear installations (1988) (Rev. 1, 2001).

✓ GSG-10.09. Quality assurance for computer applications related to the safety of nuclear installations (1998).

✓ GSG-10.10. Qualification and certification of personnel performing non-destructive tests (2000).

✓ GSG-01.11. Quality assurance at first category radioactive installations (2001).

4. Authorisations awarded to radioactive waste management facilities or activities

✓ Order of the Ministry of Industry and Energy of 31st October 1989, awarding to the "Empresa Nacional de Residuos Radiactivos, S.A." authorisation for construction of the extension to the Sierra Albarrana solid radioactive waste disposal nuclear facility. (O.S.G. of 2nd November 1989).

✓ Order of the Ministry of Industry and Energy of 1st February 1991, awarding to the "Empresa Nacional de Residuos Radiactivos, S.A." (ENRESA) authorisation for the performance of dismantling and site restoration activities at the Andújar uranium mill (Jaén), leading to its closure (O.S.G. of 5th February 1991).

✓ Order of the Ministry of Industry and Energy of 9th October 1992, awarding to the "Empresa Nacional de Residuos Radiactivos, S.A." (ENRESA) authorisation for the provisional operation of the extension to the Sierra Albarrana solid radioactive waste disposal nuclear facility. (O.S.G. of 21st October 1992).

✓ Order of the Ministry of Industry and Energy of 15th November 1995, authorising the Empresa Nacional del Uranio, S.A. (ENUSA) to perform decommissioning and dismantling activities at the Lobo G Plant at La Haba (Badajoz). (O.S.G. of 1st December 1995).

✓ Order of the Ministry of Industry and Energy of 8th October 1996, awarding to the "Empresa Nacional de Residuos Radiactivos, S.A." (ENRESA) an extension to the provisional operating permit for the Sierra Albarrana solid radioactive waste disposal nuclear facility. (O.S.G. of 22nd October 1996).

✓ Order of the Ministry of Industry and Energy of 28th January 1998 authorising transfer of ownership of the Vandellós I nuclear power plant from the company HIFRENSA to ENRESA and awarding the latter authorisation for the performance of plant dismantling activities (O.S.G. of 13th February 1998).

✓ Order of the Ministry of Economy of 5th October 2001 authorising the operation of the Sierra Albarrana solid radioactive waste disposal nuclear facility. (O.S.G. of 6th November 2001).

Annex G.
References to official national and international safety-related reports

✓ National Reports

- ➪ Annual CSN reports to the two Houses of the Spanish Parliament.
- ➪ Decisions regarding nuclear safety and radiation protection issued by the CSN to MINECO for the authorisation of nuclear and radioactive facilities.
- ➪ Reports on safety and radiation protection aspects of radioactive waste management, issued by the CSN to the Parliamentary Industry and Energy Commission.

✓ International Reports

- ➪ National reports on the Convention on Nuclear Safety
- ➪ National report on the Turkey Protocol deriving from the Barcelona Convention.
- ➪ National reports on the OSPAR Convention

Annex H. References to reports by international review missions performed at the request of a contracting party

No such reports have been drawn up to date.

Annex I.
Uranium mining and milling activities

I.1.
Existing facilities and current situation

The Nuclear Energy Board (JEN) began mining activities in Spain for the extraction of uranium in the 1950's, mainly at deposits located in Extremadura, Andalusia and the province of Salamanca. In 1973, responsibilities for uranium mining were transferred to the Empresa Nacional del Uranio, S.A. (ENUSA), now known as ENUSA Industrias Avanzadas, S.A..

At the end of the year 2000, and as a result of depletion, at current market prices, of economically exploitable mining resources in the area of Ciudad Rodrigo (Salamanca), ENUSA brought uranium mining in Spain to an end.

Over the years, some thirty uranium mines have been worked, the ore having been treated at the following plants: the Andújar Uranium Mill (AUM) in Jaén, the Elefante and Quercus Plants at Saelices el Chico (Ciudad Rodrigo) in Salamanca and Lobo-G (La Haba) in Badajoz. The AUM was operated by the JEN from 1959 to 1981, producing a total 1,350 t of uranium oxide (U_3O_8). In 1977 the JEN started up an experimental facility at La Haba, where ENUSA treated uranium ore from 1983 to 1990 at the Lobo-G plant, obtaining 167 t of U_3O_8.

In 1975, following the initiation of exploitation of the mining deposits discovered by the JEN in 1957 in the area of Saelices el Chico, ENUSA started up the Elefante plant, this being an industrial development of the ELE facility started up by the JEN in 1968. The Elefante plant remained in operation until mid 1993, producing 3,425 t of U_3O_8.

In 1993 ENUSA started operations at the Quercus plant, with an annual production level of 300 t of U_3O_8, although the nominal capacity of the facility is 950 t. As of the end of the year 2000, this plant had produced 2,249 t.

Since 1991, ENRESA and ENUSA have been undertaking closure and restoration programmes at disused mining exploitations.

ENRESA dismantled the uranium mill located in Andújar (Jaén), conditioned the tailings dyke and restored the site between 1991 and 1994. At present, and since 1995, this site is in the surveillance period, which is scheduled for a minimum ten years, and is required to fulfil the radiation protection limits and conditions imposed by the Administration.

From 1991 to 1997, ENUSA, under the supervision of ENRESA, carried out restoration works at the mining exploitations at La Haba (Badajoz). This site housed four open cast mines, operated between 1966 and 1990, rubble tips, leaching beds, tailings dykes and the Lobo-G plant. At present it is in the surveillance phase, the minimum duration of which was set by the CSN at 5 years.

Another project carried out jointly by ENRESA and ENUSA was the restoration of 19 disused uranium mines in the Autonomous Communities of Andalusia (6) and Extremadura (13), which provided ore for the AUM. Most of these were underground workings and two were open cast. The restoration works began in November 1997 and were completed in March 2000.

In January 2001, ENUSA, under the supervision of ENRESA, commenced restoration work at the mining exploitations in Saelices el Chico, with the dismantling of the Elefante plant and the reconfiguration of the static leaching beds, the scheduled duration of these tasks being 3 years.

The restoration of the mining deposits in this area and dismantling of the Quercus plant and restoration of the entire site is pending authorisation by the Administration, which is expected in 2002. The project will continue until the year 2008.

The situation of the different sites and data on the quantities of materials managed and to be managed as a result of these activities are shown in the tables attached hereto.

I.2. Decommissioning standards and criteria applied

In accordance with the RNRI, facilities producing uranium, thorium and their compounds and facilities for the manufacturing of natural uranium fuel assemblies are classified as radioactive facilities involved in the nuclear fuel cycle. Such installations are classified specifically as first category facilities and as regards the requests and arrangements for and the awarding of their authorisations (preliminary, construction, operation, modification, change of ownership, dismantling and declaration of decommissioning) the requirements applicable to the authorisation of nuclear facilities shall apply, the corresponding documents being adapted to the special characteristics of these installations.

Among the other legal texts applicable to uranium mines are the mining law and mining regulations, on the one hand, and the environmental legislation, on the other, such as Royal Decree 1131/1988, of 30th September, approving the Regulation for the execution of Royal Legislative Decree 1302/1986, of 28th June, on Environmental Impact Assessment, this having been modified in turn by Royal Decree Law 9/2000, of 6th October. The legislation on Environmental Impact is applicable also to concentrates plants.

On the basis of the conditions of the applicable legislation, the dismantling and restoration projects have been carried out with consideration given to generic and safety and radiation protection-related criteria.

I.2.1. Uranium mining

Generic Criteria

Any mining activity causes alterations to the surroundings and generally leads to large quantities of earth still containing ore remains stored on site in rubble tips.

The priority objective of decommissioning activities at mining exploitations is to allow for the unrestricted use of the land, through the performance of the corrective actions required in order to remove the need for subsequent institutional controls. In other words, the aim is to reduce the risks for health and the environment, prevent intrusion of the mines and tips and restore the site by integrating it into the surroundings.

Specific criteria

Given that the radiological risks associated with mining activities are lower than in the case of the concentrates plants, the criteria are less restrictive, and may be summarised as follows:

- ✓ Control of radiation and of radon, reducing gamma radiation and its flux and concentration to the levels of the natural radiological background of the area.
- ✓ Control of the dispersion of materials piled at the tips and control of possible human intrusion.
- ✓ Control of stabilisation, ensuring the long-term stability of the tailings dykes and undertaking the sealing and closure of shafts, trenches and other operations openings.
- ✓ Control of the quality of waters, minimising contact with and exposure to atmospheric agents and to groundwater flows, as well as access to mine waters.
- ✓ Restoration of operations areas, reducing the impact on the environment and the landscape and integrating the area into the surroundings.

I.2.2. Uranium concentrates plants

Generic criteria

The operation of a concentrates plant implies the generation of tailings, that are stored in dykes, and contamination of the installations of the mill itself during its operation. Both areas have to be treated jointly during the dismantling project, the wastes generated by demolition and dismantling of the facility being incorporated into the mass of tailings.

The criterion applied consists of minimising the risk associated with the unstabilised and unprotected tailings dykes, adopting solutions based on the conditioning and remodelling of the structure of the dykes to provide configurations stable in the long term, and on the placing of a multi-layer covering system designed to reduce water seepage and the emission of radon gas and to control and protect the overall assembly against erosion and water.

Specific criteria

The general criteria applicable to the dismantling of a site of this type are as follows:

- ✓ Control of dispersion, preventing intrusion and the dispersion of contaminated materials by erosion due to the wind or water.
- ✓ Long-term radiation protection, achieving an effective equivalent dose to an individual belonging to the critical group of less than 0.1 mSv/year (AUM) or 0.2 mSv/year (La Haba).
- ✓ Control of stability in the long term, guaranteeing stability for a period of at least 200 years.
- ✓ Decontamination of soils, reducing the residual concentration of Ra^{226} in the soil, taking the average for an area of 100 m^2, such that the background radiation is not exceeded by more than 195 mBq/g (average for a layer of 15 cm in

thickness below the surface) and is less than 555 Bq/g (average for the subsequent layers of 15 cm in thickness)

- ✓ Control of radon, reducing flux to an average value of less than 740 mBq/m^2*s (AUM) and 1,000 mBq/ m^2*s (La Haba)
- ✓ Protection of the quality of the groundwater, such that in the long term the maximum levels of concentration permitted are adhered to, and establishment of a control period subsequent to dismantling (surveillance phase).
- ✓ Maintenance of the covering layer, minimising the need for tasks in the long term.

I.3. Brief description of decommissioning and dismantling projects

I.3.1. Plan for the restoration of disused uranium mines

Initially the Plan included the restoration of 24 sites where mining activities had been carried out, either on the surface (in two cases) or underground, including buildings in some cases.

The first part of the Plan implied an assessment of the situation at the different sites, analysing the potential risks for the airborne, surface water, groundwater and soils routes and defining the main aspects to be taken into account in assessing the overall impact of the different sites. Likewise, a study was conducted comparing the differences between the original situation of the site prior to its exploitation and the current situation.

As a result of this study, the sites were classified on the basis of their associated radiological risk, five sites being left outside the scope of the work due to the consideration that, firstly the negative impact of the intervention might outweigh the benefits of the improvement, and secondly that no greater protection would be afforded to the public or the environment.

In general, the phases of the project included the following aspects:

- ✓ Incorporation of materials from the tips into the shafts, trenches and other operating spaces.
- ✓ Closure and sealing of the shafts and removal of the existing equipment and buildings.
- ✓ Protection for the surface and groundwaters in order to prevent contact with whatever traces of uranium ore might remain following the completion of the mining activities.
- ✓ Restoration of the terrain altered by mining activities.
- ✓ Replanting of the area in order to integrate it into the surroundings.

This project, directed by ENRESA and carried out by ENUSA, was approved by the Ministry of Industry and Energy, following a favourable report by the CSN and by the Autonomous Community, provincial and local authorities, in 1997. The works began in November 1997 and concluded in March 2000.

I.3.2. Andújar Uranium Mill (AUM) decommissioning plan

In 1986 ENRESA began preliminary studies for definition of the Decommissioning Plan for the AUM, and in 1987 submitted a proposal to the Ministry of Industry and Energy that included a detailed analysis of the alternatives for stabilisation of the tailings dykes, the solution proposed consisting of definitively stabilising the tailings on site. The Plan was authorised and work in 1991, these concluding in 1994 with the site restored.

The enclosure was divided into five zones: tailings dyke, process installations, water treatment installations, auxiliary services and administration zone and residential zone.

The final solution adopted was the confinement of all the materials existing at the AUM, along with the mass of tailings, in a remodelled dyke offering a stable configuration even in the event of an earthquake, the entire assembly being covered with a multi-layer system and the site being restored to integrate the works into the landscape. This solution is based on the following:

- ✓ The volume of tailings to be confined and stabilised was much greater than the volumes that might be generated in dismantling of the equipment and demolition of the buildings, for which reason the same stabilisation solution was considered to be acceptable for all the volumes, and requirements were established for the cutting of the equipment and structures that were compatible with the stability of the whole.

- ✓ The specific activities of the contaminated materials (mechanical equipment, buildings and soils) were much lower than that of the tailings, their physical, chemical and radiological characteristics being similar.

The objectives of the design criteria for the multi-layer covering system were to reduce or eliminate the potential risks associated with these materials, and may be summarised as follows:

- ✓ Prevention of the dispersion of contaminated materials and tailings.

- ✓ Guaranteed durability (minimum of 200 years and a design objective of 1,000 years)

- ✓ Control of emissions of radon gas to the atmosphere (average flux lower than 20 pCi/m^2 *s)

- ✓ Protection for groundwaters (concentration lower than 1.2 Bq/l of U^{238} + U^{234}, 0.18 Bq/l of Ra^{226} + Ra^{228} and 0.5 Bq/l of total alpha activity, excluding radon and uranium, and after 10 years of surveillance lower than 6.15 Bq/l at the site boundary and 3.5 Bq/l at the wells existing nearby).

- ✓ Restoration of contaminated terrain around the tailings dyke on site, such that the residual concentrations of Ra^{226} in the soils be lower than 0.2 Bq/gr in the first 15 cm and 0.5 in the following 15 cm-thick layers.

- ✓ Limitation of long-term individual effective equivalent dose by all exposure routes to values lower than 0.1 mSv/year.

- ✓ Minimisation of needs for maintenance in the long term.
- ✓ Performance of the works without unacceptable risk for the workers, the population and the environment.

In 1995, the Directorate General for Energy issued a Resolution declaring the period of performance of dismantling and restoration activities to have been completed and initiating the so-called surveillance period, with a minimum duration of ten years and subject to compliance with certain nuclear safety and radiation protection limits and conditions. Likewise, the Directorate General for Environmental Policy communicated compliance with the Environmental Impact Statement.

I.3.3. Integral Restoration Programme at the La Haba Mining works

This Programme was carried out between 1990 and 1997, the affected installations being four open cast mines and associated rubble tips, a uranium concentrates plant (the Lobo-G plant), leaching beds and tailings dykes.

The main objectives of the decommissioning and dismantling operations were: to use autochthonous materials (mining tailings) for backfilling of the cuttings and construction of the covering layers for the tailings dyke, dismantling of the installations and concentration of the resulting materials in the dyke in order to guarantee long-term confinement and stability.

According to the CSN assessment, the most relevant radiological criteria established are as follows:

- ✓ The radon exhalation rate in soils should be lower than 1 Bq/m2*s. This value is close to that of the natural background in the area.
- ✓ The gamma exposure rate, measured at a distance of 1 m from the surface of the terrain, should be less than 0.20 mGy/h over the natural background of the area, which is 0.23 mGy/h.
- ✓ The effective equivalent dose to the public should be lower than 1 mSv/year.
- ✓ The concentration of activity in the groundwaters should not exceed the reporting limits established in CSN Guide 7.7.
- ✓ The residual concentration of activity in the soil should not exceed by 1 Bq/g the natural background value, in order to allow for subsequent use as pasture or forest land.

The surface area affected by the decommissioning operations undertaken at these mining works amounted to almost 100Ha, and around 3 million tons of tailings were repositioned. This area is expected to be put to a similar use to the surrounding areas, with the exception of the zone in which the treatment wastes have been stored, which is subject to a period of 5 years of verification of compliance with the conditions of the Authorisation for Decommissioning.

The restricted use area of the dyke is subject to stricter parameters from the point of view of construction, in order to prevent long-term erosion without active maintenance. As a result, the treatment wastes have been covered with a layer of mine tailings with a minimum thickness of 3 m, protected in the embankments.

I.3.4. Elefante Plant decommissioning plan

Faced with the possible alternatives of "no action" or transfer, the decision was taken to undertake decommissioning *in-situ*, for radiological and economic reasons. This is because 7.2 million tons of low specific activity materials are involved, currently located above geological materials having identical characteristics and a similar content of uranium to the ore that fed the facility, this giving rise to a high natural background radiological value on the surface and in the groundwaters.

The most important radionuclides radiologically are natural U, Ra^{226} and Th^{230}, with a total inventory, including the scrap and rubble from the manufacturing sheds, leaching tailings and process sludges, of 13 x 10^{13} Bq.

The manufacturing sheds will be demolished and the scrap and rubble produced will be buried by the leaching tailings. The same tailings will cover the three process sludge dykes.

The tailings beds are being reconfigured and covered with layers in order to obtain a stable morphology against the design earthquake and erosion by water and wind and limit the release of Rn^{222} to the atmosphere and contamination of the groundwaters over periods of between 200 and 1,000 years, without the need for active maintenance. The repositioned beds will occupy a part of the tailing dyke of the Quercus plant, such that potential leachates arising as a result of rainwater will run to the pool of this dyke, where they will be retained due to low hydraulic conductivity, much lower than that required for the hydraulic covering layer (argillaceous material). Ultimately, the total approximate height of the beds will be 12.3 m, in order to reduce visual impact.

The dismantling works consist of the following:

a) Extending the depleted ores stored on site, following preparation of the land to be occupied, producing an embankment with a slope of 5h: 1v (5 horizontal, 1 vertical), that is to say 20%, and a cap with slopes of between 2% and 4%. The average height will be 10 m above the surface.

b) Covering of the surface of the new structure created with a multiple layer measuring some 2.30 m in thickness, made up of the following:

   ✓ 90 cm layer of argillaceous material (with a clay content) to protect against water seepage and the exhalation of Rn^{222}.

   ✓ 90 cm layer of mine tailing rock to protect the layer of argillaceous material against erosion.

   ✓ 50 cm layer of oil with autochthonous vegetation located over the layer of rock, the function of which is integration into the landscape and protection of the lower layers with respect to the emanation of radon, water seepage and erosion by wind and water.

The diameter of the mine tailing rock and the thickness of the layer were obtained using the values of seismic acceleration and maximum precipitation established for the design of the Quercus plant safety-related installations.

The repositioned beds will be protected against runoff from the upstream basin by a perimetric channel preventing the erosion of the foot of the embankments in the event of possible catastrophic flooding.

The duration of the works, which began in January 2001, will be three years. On completion of the operations, a Surveillance Programme will be established for the decommissioned areas in order to verify compliance with the basic criteria.

The decommissioning programme will have two phases, a specific phase lasting five years and a general phase to be implemented as from completion of the first, in which the surveillance programme for the Quercus plant will be integrated into the overall Surveillance Programme of Saelices el Chico.

Uranium mining and milling activities

1. Installations in the decommissioning and dismantling phase

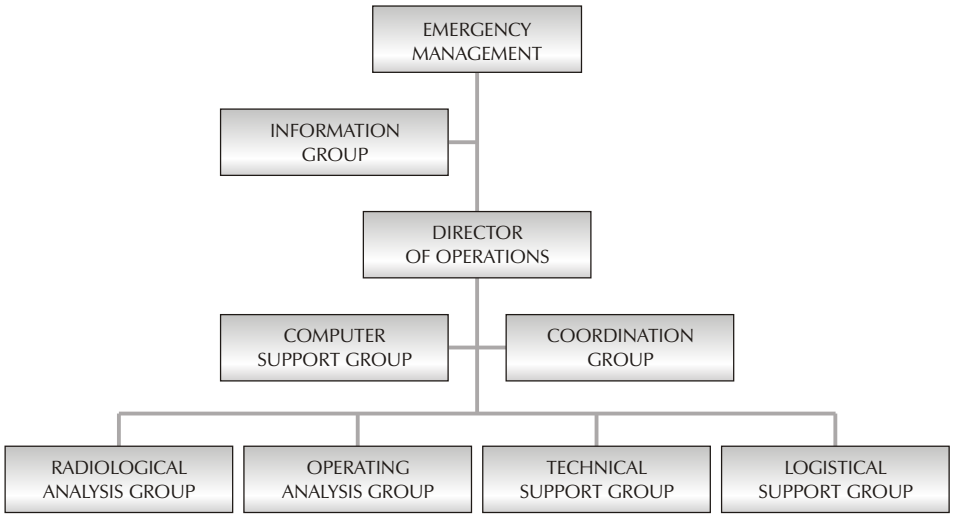
Uranium mining and milling facilities	Location (Province)	Current Situation	Process Milestones
Andújar Mill (AUM)	Jaén	Surveillance and Maintenance Phase	Dismantling and restoration works completed in 1994. The 10-year surveillance period began in 1995.
Lobo-G Plant (La Haba)	Badajoz	Surveillance and Control Phase	Dismantling and restoration works completed. The 5-year surveillance period began in 1998.
Elefante Plant (Saelices el Chico)	Salamanca	Dismantling Phase	Production suspended in 1993. Authorisation obtained in January 2001.
Saelices el Chico (deposits)	Salamanca	Temporary suspension	Extraction works at the deposits completed in 2000.
Quercus Plant (Saelices el Chico)	Salamanca	Definitive shutdown of crushing and classification	Residual effluent treatment production maintained.

2. Uranium mining and milling tailings (31/12/2000)

Facility	Location (Province)	Mining tailings (x 10^6 t)	From beds (x 10^6 t)	From sludges (x 10^6 t)	From classification (x 10^6 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 Plant (AUM)	Jaén			1.20	

Annex J.
Article 25. CSN Emergency situations organisation

The Organisation implemented at the CSN for emergency situations encompasses all the levels of authority of the Council. The organisation is made up of people employed by the CSN for the performance if its functions as the Regulatory Body, these being duly prepared and trained for performance of the functions assigned to them specifically in the event of a nuclear emergency. The organisation is shown schematically below:



The Emergency Manager is the CSN staff member ultimately responsible for any emergency situation declared at any nuclear or radioactive facility.

The CSN has a Press Bureau that, in the event of an emergency, would report to the Emergency Manager (Information Group), with support from whatever technical personnel were considered necessary.

The emergency Operations Manager is one of the two Technical Directors of the Organisation, and provides adequate coordination and management for execution of the decisions taken by the office of the Chairperson of the CSN.

The Emergency Room (SALEM) is the centre at which the CSN Emergency Organisation carries out most of its functions, focused on the activities of the personnel assigned to the different operative response groups.

The Radiological Analysis Group undertakes tasks relating to the tracking and assessment of the radiological consequences of the emergency situation and makes proposals to the Operations Manage regarding the protection measures to be adopted.

The Operating Analysis Group is responsible for tracking and assessing the emergency from the point of view of the nuclear safety of the facility involved, and consequently for

gaining insight into the original cause of the event, its evolution, the systems and equipment affected, the emergency operating procedures used and, in general, the operating status of the facility and characterisation of the source term.

The Technical Support Group is responsible for providing the necessary support to the different operative groups of the CSN Emergency Organisation and the Information Bureau, especially as regards contacting the national and international organisations that might collaborate in the event of an emergency and the off-site facility operating support agents.

There is a system of stand-by availability of the CSN emergency organisation personnel that guarantees the presence of a sufficient number of the organisation's employees within one hour of its activation. In addition, the CSN emergency centre, which is described below, is permanently manned by on-shift personnel.

Nuclear Safety Council Emergency Room (Centre) (SALEM)

The CSN has an Emergency Room known as the SALEM, designed in order for the different components of the CSN Emergency Organisation described above to be able to carry out the functions assigned to them in an efficient and coordinate manner. The name SALEM is an abbreviation of Sala de Emergencias (Emergency Room).

The Emergency Room is the national nerve centre for the notification, information, tracking, analysis and assessment of all the nuclear accident or radiological emergency situations that might occur in the national territory, or outside this territory but having real or potential repercussions on it.

The Emergency Room and the information, calculation and estimation systems available in it are briefly described below.

The central core of the SALEM consists of four operations rooms of approximately the same size and located adjacent one to the others, such that they form a cube with glass separating walls. They are located in the basement of the headquarters of the Organisation and constitute a controlled access zone.

The most important of these four rooms is the so-called Emergency Management Room and is the working area of the Emergency Manager. The other three rooms are the working areas of the three operational groups defined in the CSN Action Plan: radiological, support and analysis. The Information Group is also set up in this room.

The SALEM is complemented by a communications room annexed to the Emergency Management room and by a series of auxiliary areas designed to allow for the prolonged presence of the Emergency Organisation personnel. The communications room houses the telefax and telex terminals, a telephone concentrator, a device for the recording of telephone conversations, a photocopier, etc.

The SALEM is attended 24 hours a day, 365 days a year, by an On-Shift Technician qualified in Nuclear Safety and Radiation Protection and by a communications officer.

The voice transmission systems at the SALEM are classified as direct telephony (head of queue), switched (conventional) and radiotelephony types. In addition to this criterion of diversification, they fulfil a further criterion of redundancy, inasmuch as the communications are designed with at least two different systems in order to provide and ensure a permanent link between the SALEM and the different nuclear facilities, the rel-

evant radioactive installations, the Civil Defence Operational Coordination Centres and the different national and international bodies involved in the management of nuclear emergencies.

The SALEM is equipped with a series of surveillance, calculation and estimation systems constituting a specialist set of tools that is used by the Emergency Organisation experts for the performance of their functions.

This room is also equipped with a geographical information system that contains information on the entire national territory, structured in a logical manner, this being especially dense as regards the areas surrounding the different nuclear facilities.

The Radiological Analysis Group room has environmental radiological surveillance networks. These networks allow the CSN to address its responsibilities in relation to the measurement and control of radiation and contamination levels outside the nuclear and radioactive facilities. The CSN also has its own automatic network of environmental radiological surveillance stations known as REVIRA. This consists of 25 stations distributed across the country, each made up of an Automatic Radiological Station that measures radiation rates and radon concentrations, radioiodines and airborne alpha and beta radioactivity emitters, plus a Meteorological Station (belonging to the National Meteorology Institute) that measures the main meteorological parameters. The REVIRA network control centre located in the SALEM also receives data from the automatic stations networks implemented by the Governments of certain of the Autonomous Communities of the Spanish State. Installed in the SALEM is a terminal for consultations (Associated Centre) of the Radioactivity Alert Network belonging to the Directorate General for Civil Defence of the Ministry of the Interior, which is made up of 902 automatic radiation rate measuring stations distributed across the country.

The CSN currently has several calculation codes for dose estimation, these being of fundamental importance for determination of the radiological risks associated with the possible release of radioactive material that might occur in the event of a nuclear emergency. Most of these codes originate from the NRC and have been adapted to the Spanish nuclear power plants: IRDAM, RASCAL Y MESORAD.

For their operation these emergency dose estimation calculation codes require the values of different meteorological parameters as input, in order to be able to estimate or calculate the prevailing conditions of atmospheric dispersion. Consequently, the CSN has a system that links the SALEM to the meteorological towers of the different nuclear sites. Furthermore, there is a direct connection to the National Meteorology Institute via a data transmission line for reception of the parameters required for wide range dose estimation and of weather forecasts.

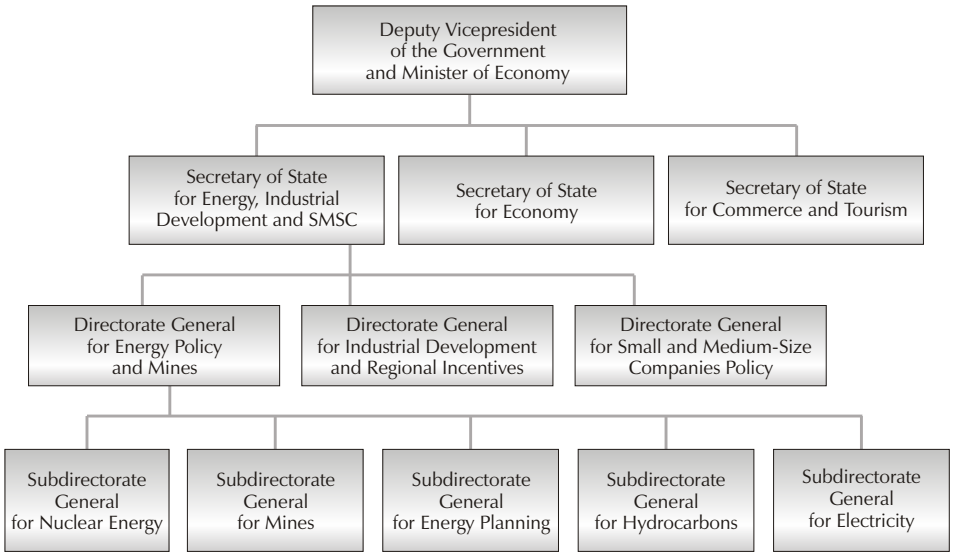
The Operating Analysis Group room is equipped with a safety parameter transmission system necessary to help the personnel of the CSN to gain insight into the operating situation of the plant and reliably assess the degree of safety of the facility in the emergency situation. The main function of this system is to identify anomalous operating conditions, supplying a continuous indication of safety-related parameters or other variables representative of plant operating status.

This room also has a real-time plant analysis system that incorporates the MAAP code, adapted specifically to each nuclear power plant, and that is connected to the safety parameter reception system of each plant. This system makes it possible to evaluate and predict the evolution of severe accidents. It is also used as a training tool for the CSN staff with respect to severe accidents, through the simulation of such events.

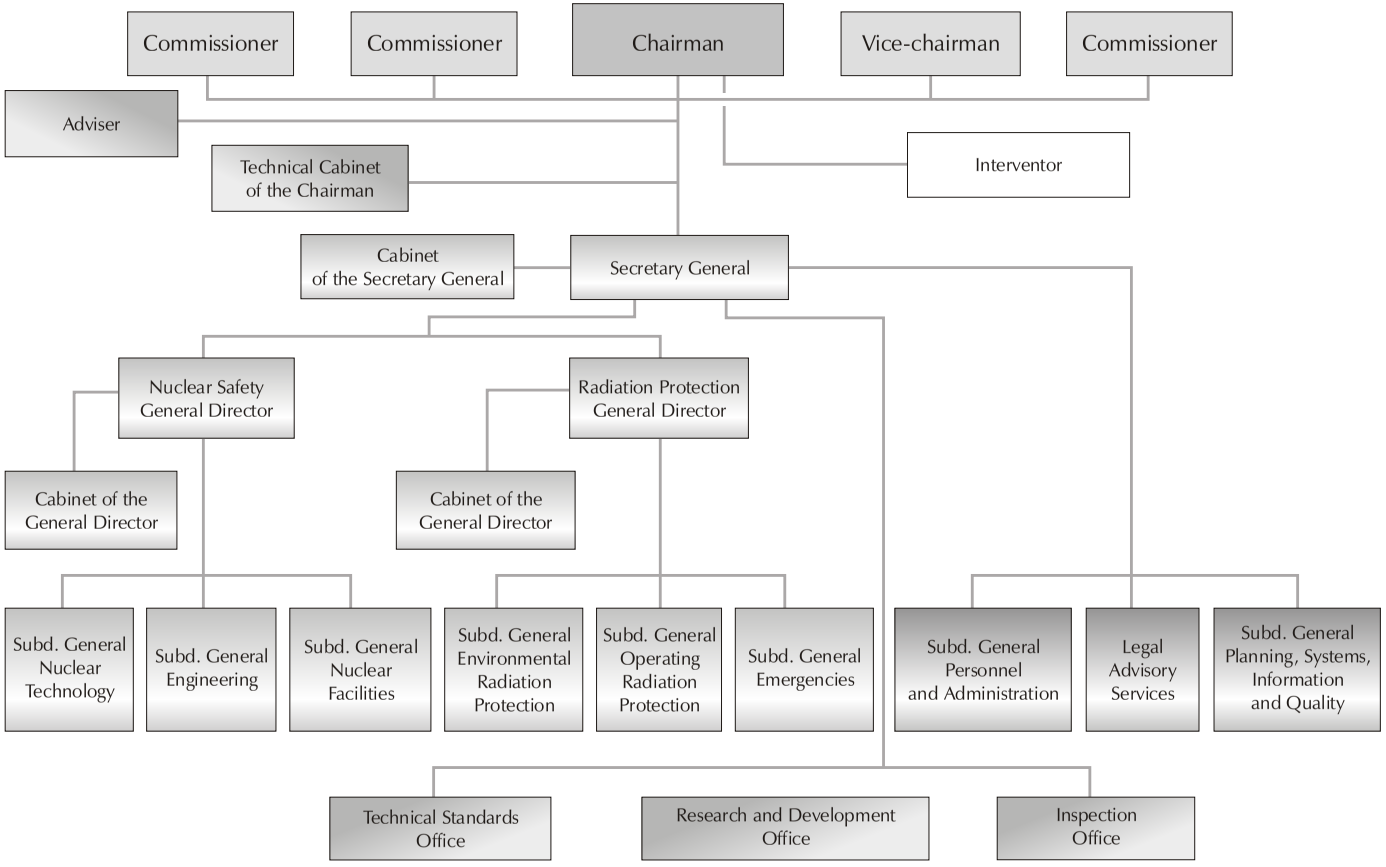
In order to allow it to carry out its functions of providing technical information on a given facility to the rest of the operative groups, the Technical Support Group room has an archive containing documentation on the emergency situations of each of the nuclear facilities, general and emergency operation plans and procedures, radiological surveillance plans, technical specifications, etc.

Annex K.
Organisational flowcharts

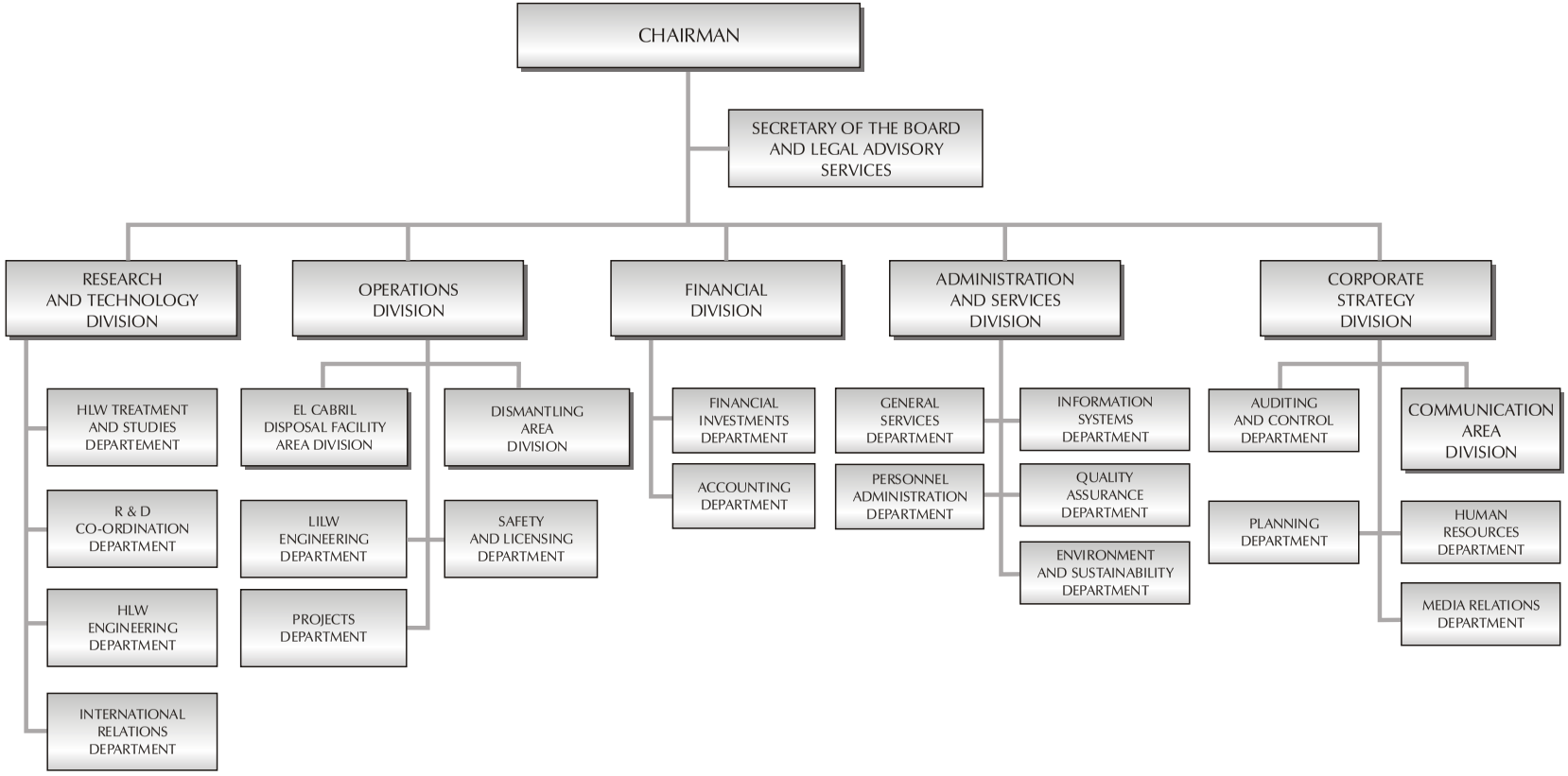
K.1 Organisational flowchart of the ministry of economy



K.2. Organisational flowchart of the CSN



K.3. Organisational flowchart of ENRESA



Annex L.
Acronyms and abbreviations used

ALARA	*As Low As Reasonably Achievable*
AUM	*Andújar Uranium Mill*
BMI	*German Federal Ministry of the Interior*
BNEP	*Basic Nuclear Emergency Plan*
BWR	*Boiling water reactor*
CFR	*US Code of Federal Regulations*
Ciemat	*Centre for Energy-Related, Environmental and Technological Research*
CSN	*Nuclear Safety Council*
D.F.	*Disposal facility*
D.G.	*Directorate General*
DCP	*Design change package*
DDP	*Decommissioning and Dismantling Plan*
DGCD	*Directorate General for Civil Defence*
DGD	*Deep geological disposal*
EAR	*Event analysis report*
EC	*European Community*
ECURIE	*European Community for the urgent radiological information exchange*
EEC	*European Economic Community*
EFQM	*European Foundation for Quality Management*
EIA	*Environmental Impact Assessment*
EIS	*Environmental Impact Statement*
ENR	*Event notification report*
ENRESA	*Empresa Nacional de Residuos Radiactivos, S.A.*
ENUSA	*ENUSA Industrias Avanzadas, S.A.*
ERSP	*Environmental Radiological Surveillance Programme*
EURATOM	*European Atomic Energy Community*
GRWP	*General Radioactive Waste Plan*
HIFRENSA	*Hispano Francesa de Energía Nuclear, S.A.*
HLW	*High level wastes*
IAEA	*International Atomic Energy Agency*
ICRP	*International Commission on Radiological Protection*
INEX	*International nuclear emergency exercises*
INPO	*Institute of Nuclear Power Operations*

IPICI	*Integrated Plan for Improvement of the Ciemat Installations*
ISO	*International Standards Organisation*
ISOE	*Information system on occupational exposure*
JEN	*Junta de Energía Nuclear (Nuclear Energy Board)*
KTA	*German nuclear technical standard*
KWU	*Kraftwerk Union A.G.*
LILW	*Low and intermediate level wastes*
M.O.	*Ministerial Order*
MER	*Miscellaneous event report*
MIMA	*Ministry of the Environment*
MINECO	*Ministry of Economy*
MINER	*Ministry of Industry and Energy*
NEA-OECD	*Nuclear Energy Agency - OECD*
NEP	*National Energy Plan*
NPP	*Nuclear Power Plant*
NRC	*US Nuclear Regulatory Commission*
NUREG	*NRC technical publication*
O&MR	*Operations and maintenance rule*
O.P.	*Operating Permit*
O.S.G.	*Official State Gazette*
ODCM	*Off-site Dose Calculation Manual*
ODEC	*Official Diary of the European Communities*
OECD	*Organisation for Economic Cooperation and Development*
OI's	*Operating instructions*
OSPAR	*Convention on protection of the north-eastern Atlantic marine environment*
OTS's	*Operating Technical Specifications*
PCP	*Process control programme*
PERSP	*Pre-operational Environmental Radiological Surveillance Programme*
POP	*Provisional Operating Permit*
PSR	*Periodic Safety Review*
PSS	*Preliminary Safety Study*
PWR	*Pressurised Water Reactor*
R&D	*Research and Development*
R.D.	*Royal Decree*
R.G.	*NRC Regulatory Guide*
REVIRA	*CSN environmental radiological surveillance network*
RF's	*Radioactive facilities*

RNRI	*Regulation on Nuclear and Radioactive Installations*
RPIR	*Regulation on Protection against Ionising Radiations*
RR	*Re-racking*
RWMP	*Radioactive Waste Management Plan*
SACOP	*Operative co-ordination room*
SALEM	*Emergency Room*
SEN	*Significant Event Notification*
SEPI	*Sociedad Española de Participaciones Industriales (State industrial holding)*
SER	*Significant event report*
SF	*Spent fuel*
SFSP	*Spent fuel storage pool*
SG	*Safety Guide*
SOER	*Significant operating event report*
SS	*Safety Study*
S-T	*Separation and Transmutation*
UKAEA	*UK Atomic Energy Authority*
UNESA	*Spanish Electricity Industry Association*
UPC	*Polytechnic University of Catalonia*
USA	*United States of America*
WANO	*World Association of Nuclear Operators*