

SPAIN

1. NATIONAL AND REGULATORY FRAMEWORK

1.1 National framework

Spanish electricity output from nuclear energy is around 7 600 MWe, accounting for about 30% of total electricity production. Spain has an almost complete nuclear fuel cycle including uranium mining, production of uranium concentrates, fabrication of nuclear fuel assemblies, generation of nuclear power and radioactive waste management. Fuel enrichment is performed overseas. There is no nuclear production for military purposes in Spain.

Spain has no reprocessing facilities. The fuel is presently stored at the nuclear power stations. However, in the early days of its nuclear power programme, Spain reprocessed its fuel in France and the UK. Low and Intermediate-level waste (LILW) generated in nuclear and radioactive facilities, including waste arising from decommissioning, are disposed of in a near surface repository.

1.1.1 National policy

National policy for radioactive waste management is established in the General Radioactive General Plan (GRWP), drawn up by the Radioactive Waste Company (ENRESA) on a yearly basis which is submitted by the Ministry of Economy to the government for approval, where appropriated, and subsequently presented to the Parliament. According to the legal provisions regarding the GRWP, the document shall include the necessary actions and technical solutions to be developed throughout the period of validity of the Plan and the economic and financial aspects, aimed to the proper management of radioactive waste. The 5th edition of the GRWP approved in 1999 is presently in force.

The licensing and control of the safety of radioactive waste management (RWM) activities are carried out in Spain within the same regulatory framework as the rest of the nuclear and radioactive activities. No specific safety regulations exist for RWM, except those defining responsibilities for the implementation and regulation of the financial aspects of the RWM activities.

Spain is a member of the European Union since 1986, and as a consequence, European regulations are in force in Spain and the Council Directives must be transposed to the national regulations. On the other hand, Spain has ratified the Convention on the Environmental Impact Assessment in a Transboundary Context and the Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the Nuclear Safety Convention, and other relevant Conventions.

1.1.2 Institutional framework

The following institutions have responsibilities for RWM in Spain:

- The *government* which, as the executive political power, is empowered to direct and approve RWM policy and establish the objectives and goals of the Administration, issuing mandatory regulations.
- The *Ministry of Economy* (MINECO) assumed in 2000 the responsibilities formerly attributed to the *Ministry of Industry and Energy* (MINER) in the area of nuclear activities, being responsible, via the Directorate General for Energy and Mines, for rule making, for granting the licenses, and enforcing actions. Concerning the RWM, the MINECO is also responsible for controlling the technical and economic actions and plans.
- The *Ministry of Environment* is responsible for issuing the Environmental Impact Declaration of certain public and private industrial projects and activities specified in the Environmental regulations, including spent fuel and radioactive waste storage facilities outside the nuclear power plants and radioactive waste disposal facilities.
- The *Nuclear Safety Council* (Consejo de Seguridad Nuclear, CSN), created in 1980, is the regulatory body in charge of nuclear safety and radiation protection control. The CSN is *required* to issue mandatory and binding reports prior to any authorisation of nuclear and radioactive facilities by the MINECO, including those related to the licensing of radioactive waste installations.
- ENRESA, the *Spanish National Company for Radioactive Waste*, a state-owned company constituted in 1984 by Royal Decree, is in charge of radioactive waste management and decommissioning of nuclear facilities.

1.2 Regulatory framework

Nuclear and fuel cycle facilities need authorisation for siting, construction, start-up, operation, modification and decommissioning. Small radioactive facilities only require starting up, modification and decommissioning authorisations. Radioactive waste repositories and temporary storage are considered as nuclear facilities.

Site and dismantling authorisations of nuclear facilities also require a formal Environmental Impact Declaration. A public inquiry must be carried out prior to granting a siting authorisation.

1.2.1 Regulatory function

The CSN, created by Law 15/1980, as the sole institution responsible for nuclear safety and radiological protection, is an independent public institution that reports on its activities directly to the Parliament yearly, via the Parliamentary Commission for Industry, Energy and Tourism.

The CSN main functions are:

- To propose regulations and advise the government on subjects of its competence, including the criteria for siting nuclear facilities once the autonomous regions have been informed.

- To carry out assessment and issue mandatory and binding report prior the authorisations for siting, construction, start-up, operation, modification and closure of nuclear installations and for the transportation of radioactive material.
- To inspect and control the different stages of the lifetime of the nuclear and radioactive installations.
- To control and monitor environmental radiation levels in and around the facilities.
- To approve Radiological Protection Services and Personal Dosimetry Services, assess Medical Services and control radiation doses to professional workers.
- To issue and review the personal licenses for operators of nuclear and radioactive facilities.
- To report to both Houses of Parliament, give advice to other public institutions, like municipalities, regional governments and Courts of Justice, and inform the public and the media.
- To establish and promote research and development plans on safety and radiological protection.
- To collaborate in the drawing up of emergency plans and to provide technical support.
- To carry out official relations with similar institutions and International Organisations.

In 1999, a specific mission was assigned to the CSN by Law 14/1999, “*to perform studies, reviews and inspections relative to the plans, programmes and projects developed during all the phases of radioactive waste management*”. This new responsibility defines more clearly the role of the CSN during the pre-licensing phases of interim spent fuel storage and disposal of radioactive waste.

The owner, ENRESA in case of a RWM facility, is responsible for its own facility safety and it is obliged to submit an application to the Ministry of Economy (MINECO) for each authorisation required in the legislation. The application must be supported by a number of licensing documents, including a Safety Assessment Report. Before answering the applicant, the MINECO needs the opinion of the CSN.

The CSN reviews the Safety Assessment Report and other licensing documents, and issues its report about the nuclear safety and radiation protection aspects. The CSN opinion is binding when it is negative or when it establishes safety limits and conditions, in case of positive judgement.

Finally, the MINECO grants the authorisation under the limits and conditions imposed by the CSN. Once the license has been granted, the CSN controls the compliance of the limits and conditions by performing audits, inspections, periodic reports, and independent assessments.

Prior to the site authorisation, the owner of a nuclear facility is obliged to perform an environment impact assessment and submit it to the Ministry of Environment. The Ministry of Environment and the MINECO conduct a public enquiry, according to the procedure set up in the environmental and the nuclear regulations. Then, the Ministry of Environment, taking into account the results of the public enquiry, elaborates jointly with the CSN the Environmental Impact Declaration, which is enclosed to the authorisation.

1.2.2 *Organisation and resources*

The CSN has its own technical staff and its own equity and budget, independent from those of the government and the rest of the Administration. Until the beginning of 2000 financial year, the organisation was entirely self-financed through the revenues coming from the fees applied by services rendered. New functions attributed by law in 1999 for the radiological surveillance of the environment in the whole territory does not attract any fee, being financed by funds charged to the General State Budget. The staff of CSN consists of about 400 employees (200 technical expert plus 200-administration personnel).

The CSN's basic structure, as modified on 7 April 2000, establishes a Technical Direction on Nuclear Safety (TDNS) and a Technical Direction of Radiation Protection (TDRP). According to this new structure, the CSN's spent fuel and radioactive waste management activities are divided between these two technical directions. The Deputy Direction of Nuclear Technology, under the TDNS, includes a High-level waste Department, which is in charge of the activities related to the storage and disposal of spent fuel and high-level waste. The Deputy Direction of Environmental Radiation Protection, under the TDRP, co-ordinates a Dismantling Department and a Low-level waste Department.

ENRESA is a public company, responsible for waste management, nuclear facilities decommissioning and related research. Management of waste arising from nuclear power plants (NPP) is financed by a fee of the total electricity consumption, and management of waste coming from small radioactive facilities is financed by a tariff approved by the MINECO.

2. LEGISLATION AND REGULATION

2.1 Legislation

Spanish basic nuclear legislation is composed of a number of national acts and international conventions ratified by the Parliament. The following acts are directly applicable to the RWM:

- *Nuclear Energy Law (L 25/1964):*

The basic Law L 25/1964, regulating the use of the nuclear energy and radioactive substances, established the responsibilities and the regulatory framework for the licensing of nuclear and radioactive installations, defined measures for the safety and protection against ionising radiation, and contained provisions for civil liability derived from nuclear damage and penalties and administrative sanctions. This Law stipulated that nuclear and radioactive installations should have special facilities for handle, storage and transport of radioactive waste. The Nuclear Energy Act has been modified and developed by other Laws, Royal Decrees, and Ministerial Orders.

- *Creation of CSN Law (L 15/1980 of 22 April):*

This Law created the CSN as the sole competent Authority for nuclear safety and radiation protection, independent from the government and from the rest of the Administration, and established its collegiate composition, defining its functions, actuation and financing procedures, and creating the Technical Body for Nuclear Safety and Radiological Protection.

- *National Electric System Law (L 54/1997):*

This Law regulates the operation of the electricity, and applies also to certain areas of the nuclear industry, since its additional provisions modify the Nuclear Energy Act and the Law creating the CSN. It updates the enforcement framework, introducing a new definition of radioactive waste and an additional provision regarding the financing system of the radioactive waste management.

- *Law on Public Fees and Prices for services rendered by the CSN (L 14/1999):*

The objective of this Law is to update the financial regime of the CSN, initially established by Law 15/1980, adapting it to the reality in order to cover a series of new functions undertaken by the CSN that were not previously specified. Through this Law, the dismantling of nuclear and radioactive installations are detailed for tax purposes, and the performance of studies and drawing up of reports relating to the management of spent fuel and high level radioactive waste are also contemplated. According to this law, the CSN may issue instructions itself.

- *Environment Impact Assessment Royal Legislative Decrees (RDL 1306/1986 of 26 June 1986 and RDL 9/2000 of 7 October 2000):*

These RLDs, with character of national basic legislation, incorporate the EU Directives 85/337/CEE and 97/11/CE respectively, setting up that any industrial project, which may have impact on the environment, need an Environment Impact Declaration. Projects specified in the Annexes include those related to NPPs, spent fuel treatment and storage facilities outside the NPPs sites and radioactive waste disposal.

Other aspects of the RWM activities and facilities like civil liabilities, industrial risk prevention, non-radiological hazards, and mining safety, are regulated by specific regulations, outside of nuclear regulatory system.

2.2 General regulations

Most important national regulations applicable to the RWM are:

- *Regulations of nuclear and radioactive facilities (Royal Decree 1936/1999):*

RD 1936/1999 replaces the previous Regulations approved by Royal Decree 2869/1972, introducing important modifications of the licensing procedure for all stages of the different nuclear and radioactive facilities. The Decree contemplates the following authorisations for nuclear installations: preliminary or site authorisation, construction permit, operating permit, authorisation for modifications to the installation, authorisation for decommissioning and dismantling, authorisation for the change of ownership. These regulations have been revised in December 1999 to update a former version (D 2869/1972) to make it compatible with the EU Directive 96/29/EURATOM.

- *Regulations on protection against radiation protection (Royal Decree 738/2001):*

These regulation, which replace the one issued in 1992, establish the radiation protection system based on the ICRP recommendations and constitutes the transposition of the EU Directive 96/29/ EURATOM. They introduce the concept of practice, maintain the principles of justification, optimisation and dose limitation for such practices, and go on to establish the fundamental principles governing the operational protection of exposed workers, and recognise clearance and exclusion concepts.

- *Regulations on Environmental Impact Assessment (Royal Decree 1131/1988):*
RD 1131/1988 defines the content and procedure to perform the Environmental Impact Assessment of relevant industrial projects, including radioactive waste management facilities.
- *Transport regulations:*
Safety aspects of transport of radioactive waste are covered by various Royal Decrees and regulations (road, railways, maritime, and aerial) developing the Nuclear Energy Act, and implementing the IAEA and the EU radioactive material transport regulations.

2.3 Specific regulations

Specific regulations are mainly focused on setting up a national system to manage the radioactive waste or to solve specific issues related to authorisation of particular facilities or activities.

- *Royal Decree of ENRESA's constitution (RD 1522/1984), as amended:*
ENRESA was established by this Royal Decree which defines its objectives and responsibilities. Royal Decree 404/1999, enacting the Law 40/1999 governing the National Electricity System, reaffirms the responsibility of the government for approving the PGRR, updates the financing system for the RWM and dismantling of nuclear installations and assigns its control to the MINER, currently assumed by the MINECO.
- *Royal Decree on the restructuring the fuel cycle activities (RD 1899/1984):*
RD 1899/1984 provides a frame for the development of ENRESA's work programme and financing provisions for RWM.

2.4 Guidance

CSN has published a series of about 40 Safety Guides giving recommendations on how facility owners can meet legal obligations and demonstrate compliance with the Spanish legislation. Safety Guidelines are not legal requirements, and cover such topics as:

- Operation of Nuclear Power Plants.
- Radiological Environmental Monitoring.
- Radiological Protection Standards.
- Radioactive Waste Management.
- Transport of Radioactive Materials.
- Control and Monitoring of Liquid and Gaseous Effluents Emitted from Nuclear Centres.

This activity is complemented with the participation in the IAEA RADWASS programme. In some cases, after a careful study, certain RADWASS documents could be endorsed as a Spanish Safety Guide.

2.5 Others

Other specific regulations have been issued regarding particular activities in Spain. Most important of them are the following:

- Royal Decree prohibiting the use of radioactive lightning rods and regulating its transference to ENRESA for its management.
- CSN's Resolution setting up the general safety criteria for geological disposal radioactive waste in Spain.
- El Cabril L&ILW facility Construction Permit. MINER Order (1989).
- El Cabril L&ILW facility Operation Permit. MINER Orders (1992 and 1996).
- Andujar Uranium Fabrication Plant dismantling and site restoration authorisation. MINER Order (1991).
- La Haba Uranium Fabrication Plant in situ dismantling and site restoration authorisation. MINER Order (1995).
- Vandellos I NPP Dismantling and License ownership transfer permit. MINER Order (1998).

These Ministerial Orders impose the safety and radiological protection limits and conditions for the corresponding authorisation, complementing the existing nuclear regulation with provisions on RWM specific aspects (such as those regarding to the waste acceptance criteria in the case of the El Cabril LLW disposal facility)

3. CURRENT STATUS

3.1 National status and issues

3.1.1 *Waste classification and sources*

No waste classification system has been formally adopted in Spain. However, RWM implementation is being carried out according to factual classification, based on the following waste groups:

- A. Residual material containing very low concentration of short-lived radionuclides.
- B. Tailing from uranium production facilities containing very low concentration of long-lived radionuclides.
- C. Radioactive waste containing low or moderate concentration of short-lived radionuclides and negligible concentration of alpha emitters (L&ILW), to be disposed of in the El Cabril disposal facility.
- D. Radioactive waste containing generally high concentration of all kind of radionuclides. There are two groups in this category: HLW vitrified waste arising from reprocessing in France of Vandellos I NPP spent fuel, and LWR spent fuel accounting a total expected of about 7 000 tU. In addition, other waste not acceptable in the El Cabril facility would be included in this category.

3.1.2 *Waste management strategy*

The 5th GRWP sets out a management system for radioactive waste that includes the following main technical activities and phases:

The mainlines of the RWM in Spain are:

- Residual material may be cleared after demonstration that the radiological risk is trivial.
- Tailings from uranium production are disposed of in land burial shapes *in situ*.
- L&ILW are disposed of in El Cabril facility. Predisposal activities are carried out in nuclear facilities or in El Cabril, in case of small producers.
- The strategy for storage of spent fuel considers an at reactor phase, using both wet and dry methods. At present, re-racking has been competed in the pools of all NPPs and a temporary dry storage facility for the Trillo NPP spent fuel has been built due to lack of capacity in its pool. A centralised away-from-reactor solution is foreseen to be implement before 2010 for the medium and long term. This solution might be complemented with the construction of individual temporary storage facilities at certain NPPs, or with another centralised facility serving various plants.
- The strategy adopted to date for the definitive management of spent fuel and HLW has been based exclusively on ensuring the availability of the scientific and technological know-how and capacity required for definitive disposal in deep geological formations. The present GRWP establishes the following highlights:
 - No decision for a final solution will be taken before 2010. The geological studies for the siting process will be limited to maintain the existing information and to ensure its value, so that it can be of use in a further selection process when a decision is finally taken and for the safety assessments to be prepared.
 - Additional work for the existing preliminary repository designs will be oriented to incorporate the criteria of retrievability.
 - The Safety Assessment capabilities developed should be maintained in the future through exercises incorporating the experimental data and models of the research groups susceptible to standardisation at international level.
 - In the meantime it will be necessary to carry out the widest possible campaigns, in order to facilitate better knowledge and understanding both of the problem to be solved and the technology to be used to achieve such solution.
 - The feasibility and implications of new technologies, specifically partitioning and transmutation, should be also evaluated during this period of time.

3.1.3 *Current issues/problems*

No specific safety issues are identified in the management of L&ILW. However, the existing capacity of El Cabril facility is quite limited and important efforts are being taken to optimise it. This requires both technological and regulatory action to implement it.

In this way, several actions have been launched:

- To carry out a volume reduction programme performed jointly by ENRESA and producers.
- To implement a plan of action for managing residual material.
- To perform a new assessment of the El Cabril Facility safety based in a better knowledge of the plant and surroundings, using a more realistic methodology.
- To update the waste acceptance criteria in order to diversify the kind of containers accepted in El Cabril Facility.

Specific considerations are being taken for the characterisation of historic waste and waste arising from old facilities dismantling.

General problems for siting new storage or disposal facilities are being faced, mainly due to public opposition. According to the 5th GRWP, the activities related to the selection of specific sites for a deep geological repository are suspended until the definitive management methods and the corresponding regulatory process are established, and a better social acceptance can be reached.

The major objectives of the ENRESA's Action Plan (2002-2010) for the definitive management of spent fuel and high-level waste are the following:

- To make available by the end of the period the necessary documents reflecting the level of knowledge acquired, aiming at presenting recommendations to the government for the decision making process.
- To integrate both, the acquired knowledge and capacities, aiming at orienting the strategic needs and definition of priorities for the activities to be developed in the future.
- To promote the dialogue with the different stakeholders to facilitate the proposed solutions.

3.2 Regulatory issues

During the last few years, the national regulatory system of RWM has been reconsidered. The necessity to develop a specific regulatory frame for RWM arises as a major conclusion of this analysis. In this sense two lines are being launched:

A first line will be oriented:

- To establish a clear frame for managing very-low-level waste, clarifying the definition of radioactive waste.
- To adequate the general requirements of nuclear safety and radiation protection to the management of L&ILW.
- To define a specific frame for the decommissioning of nuclear power plant.

A second line will be oriented to the development of regulatory framework for the management of spent fuel and HLW. In doing so, two previous considerations have been taken into account:

- An important effort must be paid to increase the CSN technical and scientific capabilities.
- Significant effort should be dedicated to the licensing of spent fuel and HLW temporary storage solutions.
- No regulatory decision will be needed in the next years in order to authorise facilities to dispose of HLW. Consequently, a close dialogue and collaboration between CSN and ENRESA should be very useful and do not compromise future actions.

Under these consideration a number of initiatives, initiated at the end of the 1990s according to the successive CNS's Strategic Plans, are being carried out:

- The CSN is prospecting the international developments and assessing their potential application to the Spanish programme, and fostering participation in the development of the pertinent safety assessment methodologies for these facilities. Performing these activities must be coherent in time with the schedule and objectives laid down in the GRWP.
- A general co-operation agreement between CSN and ENRESA was signed (2nd June, 1998) in order to: encourage the exchange of information and experiences, facilitate the analysis and discussion of safety related issues, and promote R&D plans and projects of mutual interest. The possibilities for the implementation of common initiatives under such agreement are presently under study in both organisations.
- The CSN work programme includes a number of specific projects oriented to obtain a wide view of the regulatory state of the art in order to the further review the safety assessment exercises of repository concepts that ENRESA is preparing in compliance with the 5th GRWP. Examples of these projects are the study of modelling techniques, intercomparison of safety analysis performed by regulators and implementers, study of techniques for aiding in the decision making process and study of safety indicators.

3.2.1 *Current issues/problems*

The main issue in the Spanish regulatory frame of RWM is the lack of a specific regulation. This lack is presently solved by a decision system based in a case by case solution spending a lot of efforts and resources. In particular, the following topics are very frequently on the table and represent and important workload for the regulatory authority:

- Clearance implementation.
- Modification of L&ILW management practices.
- Management of residues containing NORM.

Issues regarding the safety of extended periods of storage of spent fuel are beginning to be studied at the CSN in order to characterise the spent fuel and analyse the behaviour of the spent fuel and associated facility components during long-term storage, taking into account the management interdependencies.

Issues regarding the safety of geological disposal include:

- The adoption of a step-wise regulatory review process that does not compromise the independence of the CSN.
- The definition by the CSN of the degree of review of the performance assessments (PA) made by the proponents.
- The need for an early development of guidance and criteria for the regulatory process.
- More specific technical issues are: treatment of uncertainties; confidence building, mainly relative to the modelling strategy; the question of completeness of scenarios; the handling of future biosphere and human intrusion; the impact of retrievability; and the use of complementary safety indicators. Some examples of the ongoing studies include:
 - *Intercomparative analysis of the more significant integrated PA studies.* Initiated in 1997 in order to: a) obtain vision of the state-of-art; b) analyse the differences and similarities in the treatment of key issues of the different PAs; c) identify issues requiring further examination; d) identify future lines of work in this area. In the first phase of the study already finalised, fourteen PAs in crystalline rock have been examined. PAs in clay rock and other host rocks are being studied at present, in the second phase of the project.
 - *Application of the concept of retrievability to geological disposal* in order to determine its implications on the regulatory and the safety evaluation aspects.

3.2.2 Policy and regulations developments

In the near future, a significant effort will be paid for developing new Safety Guides or endorsing IAEA Safety Guides from RADWASS Programme.

With regard to spent fuel and HLW management, the effort will be paid to develop a national regulatory framework.

3.3 Research and development programme

3.3.1 Functions

According to the L 15/1980, as amended by L 14/1999, the CSN must promote, supervise and finance research and development plans in areas related to nuclear safety and radiation protection. According to RD 1522/984, ENRESA is responsible for research and development in nuclear waste safety.

CSN and ENRESA issue periodically their own R&D plans. These plans include a number of projects which are undertaken in collaboration with different national and international organisations, among which special mention might be made of the Spanish universities, public centres and companies. Part of these R&D activities are implemented under the general co-operation agreement between CSN and ENRESA.

3.3.2 Contents of research and development plans

The current CSN's Five Years Research Plan includes the following lines of work in the field of radioactive waste safety:

R&D activities for improving safety aspects of LILW are oriented to select a most specific methodology for assessing safety of near surface repositories and implement it to the El Cabril safety case, to study new immobilisation matrix, and to develop instrumentation applicable to the measurement of very low concentration of radionuclides.

The R&D Programme related to the safe management of HLW is focused on developing safety assessment and site evaluation methodologies and tools

- Research activities in the *area of site evaluation* aim at: 1) the development of methodologies for a better knowledge of siting impact on the safety of the facilities, mainly in the fields of hydrogeology and sismotectonics; 2) the improvement of siting characterisation techniques; and 3) the detailed mapping of background radiation in Spain. Examples of ongoing project include:
 - *Hydrology of low permeability rocks*: the methodology for the characterisation of flow and transport process in fracture media designed and tested in a previous phase will be applied to the site of the El Berrocal uranium mine.
 - *Reactive transport*: the main objective of this project is the development, adaptation and verification of numerical models for the study of reactive transport of radionuclides in the geosphere at different scales.
- Research activities in the *area of safety assessment* aim at: 1) assimilating the lessons learnt from previous national and international R&D Programmes and projects, 2) increasing the CSN technical capability and 3) drawing some practical conclusions that may be suitable for the development of the Spanish regulatory framework in this field. Special mention should be made of the projects:
 - *Modelling*: “An intercomparative analysis of the modelling approaches used in the safety assessment (SA) of deep geological repositories for HLW”. Initiated in 1999 the project is aimed at: 1) providing the CSN with updated information on the status and practical capabilities of modelling strategies applied in SA and the approaches used for validation and confidence building.
 - *Natural analogues*: “A study of the role of natural analogues (NAA) in the safety assessment (SA) of deep geological repositories for HLW and the communication to non-technical audiences”. Launched in 1999, the first phase of the study, recently finished, includes the compilation of information for the most significant and best characterised NAA in a database with over 1 300 references, as well as a preliminary classification of the results obtained from each NAA regarding their potential applications to the SA of repository concepts contemplated in the Spanish programme.