Spain

a) National framework for management of spent fuel and radioactive waste

Radioactive waste generation began in Spain during the 1950s with the first use of radioactive isotopes in industrial, medical and research institutions. The spent fuel managed in Spain currently arises from the operation of the eight operating nuclear reactors, located at six sites, and from the decommissioning of two shutdown reactors. There are also other nuclear facilities in operation: the Juzbado fuel manufacturing facility in the province of Salamanca, the CIEMAT (Centre for Energy-Related, Environmental and Technological Research) facility in Madrid and the Sierra Albarrana ("El Cabril") solid radioactive waste disposal facility in the province of Córdoba. In addition, radioactive wastes may be generated as a result of the presence of radioactive sources and other materials at installations or in activities not declared within the regulatory system.

Radioactive waste management and planning strategies and the scheduling of major related activities must be approved by government. Accordingly, the Royal Decree that led to creation of the Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA), the body responsible for radioactive waste management activities in Spain, requires the company to draw up every four years or when requested by the Government a revised version of its current General Radioactive Waste Plan (GRWP). Such Plan, once approved by the Government, defines the strategies and main activities to be carried out by ENRESA in regard to its remit.

The definition of radioactive waste is included in the Electricity Industry Act - Any waste material or product for which no further use is foreseen and which contains or is contaminated with radionuclides in concentrations or levels of activity in excess of those established. Waste is categorized in Spain along the lines of the categorization of management facilities, which are authorized for a determined volume, radiological inventory and certain limits of concentrations of activity according to the nature of the different radionuclides present. In practice, the different categories of facility are assimilable with the classification criteria for radioactive waste adopted by the IAEA and the European Commission2:

- Low and Intermediate Level Waste (LILW) includes waste whose activity is due mainly to the presence of beta- or gamma-emitting radionuclides with short or intermediate half-lives (less than 30 years), and whose content of long lived radionuclides is very low and limited. This group comprises waste that may be temporarily stored, treated, conditioned and definitively disposed of at the El Cabril facilities (Córdoba),including the sub-category of Very Low Level Waste (VLLW).

- Special Waste (SW), in accordance with Nuclear Safety Council Instruction IS-29 on safety criteria in temporary storage facilities for spent fuel and high level radioactive waste, includes the following: nuclear fuel attachments; neutron sources; used in-core instrumentation or substituted components deriving from the reactor vessel system and reactor internals, generally metallic and presenting a high level of radiation through neutron activation; and other waste which, because of its radiological characteristics, is not eligible for management in the existing near surface level definitive disposal facility for LILW in Spain. Its management is connected to that of High Level Waste.

- High Level Waste (HLW) is waste that contains long lived alpha emitters with half-lives of more than 30 years in appreciable concentrations that generate heat as a result of radioactive decay, due to their high specific activity. The primary component of this waste is spent fuel (SF) discharged from nuclear reactors and considered as waste in accordance with Spanish policy. It is currently stored in pools in nuclear power plants and in the Independent Spent Fuel Storage Installation (ISFSI) facilities belonging to some of them. Storage in the Centralised Temporary Storage facility (CTS) is planned once it becomes operational.

b) National legal and regulatory framework

From the administrative point of view, the legal and regulatory framework for the management of spent fuel and wastes is integrated in the general framework regulating nuclear energy in Spain, this being a far-reaching framework developed in accordance with the evolution of international regulatory requirements. This framework clearly establishes the responsibilities of the different parties involved, as well as the distribution of functions among the competent authorities responsible for each area, functions that although exercised separately and independently, are integrated in a coordinated fashion within a common administrative framework.

By law, the Ministry of Industry, Energy and Tourism (MINETUR) is responsible for enforcing nuclear legislation and for granting licenses, subject to a mandatory and binding report from the Nuclear Safety Council (CSN). The CSN was set up in 1980 as the only competent body in matters of nuclear safety and radiological protection, and is generally responsible for the regulation and supervision of nuclear installations. This body, governed by public law, is independent of the state administration and reports directly to Parliament.

The Ministry of the Agriculture, Food and Environment, (MAGRAMA), participates in the licensing process, in collaboration with the CSN, by providing and environmental impact statement, as do regional and local governments in the areas under their competence.

With regard to the technical, economic and financial infrastructure for the management of radioactive waste, as stated above, ENRESA is the company authorized in Spain to provide public services for the transport, handling, treatment, conditioning and disposal of radioactive waste and spent nuclear fuel as well as for the decommissioning of nuclear installations after shutdown. This company, entirely public in nature, was set up by Royal Decree in 1984 and its shareholders are SEPI (the State Industrial Holdings Corporation), a public law entity attached to the Spanish Ministry for Finance and Public Administrations, and CIEMAT, a National research centre reporting to the Ministry of the Economy and Competitiveness. ENRESA operates under the aegis of the MINETUR, through the Secretariat of State for Energy, which undertakes the strategic management, monitoring and control of its technical and economic actions and plans.

Besides activities specific to the management of spent fuel and radioactive waste and the dismantling of nuclear facilities, ENRESA fulfils other tasks. These include drawing up the drafts of the General Radioactive Waste Plans, which are subsequently sent to the MINETUR for review and submission to the Government, and the administrative and financial management of the Fund for the financing of activities included in the GRWP, under the supervision of a Fund Monitoring Committee and the competent economic and financial authorities of the State Administration. Detailed information on ENRESA's functions can be found in Article 19.2, on the

approval of the new Royal Decree 102/2014 of 21 February on the responsible management of spent nuclear fuel and radioactive waste.

c) **Radioactive waste management, decommissioning and spent fuel strategy**

Radioactive waste management

In accordance with Article 38a of Law 25/1964, the Nuclear Energy Act of 29 April (NEA), the Government is responsible for setting out the national programme and policy on radioactive waste management, including spent nuclear fuel, and the dismantling and decommissioning of nuclear facilities, through the approval of the General Radioactive Waste Plan (GRWP)

It may be stated that Spain has solved the overall issue of managing the LILW that it is estimated will be produced within the timeframe of the GRWP, since it possesses an integrated management system with the necessary capacities and configured on the basis of the activities of a series of clearly identified agents operating in a structured manner. Within this system, the nuclear facilities possess waste treatment capabilities for conditioning at the plants themselves in accordance with the waste acceptance specifications applied by ENRESA for the "El Cabril" disposal facility. In other cases the producers deliver their wastes to ENRESA in the form agreed on and the latter carries out the necessary conditioning tasks.

The "El Cabril" disposal facility in the province of Córdoba is the central axis around which the national LILW management system revolves. Its fundamental objective is the definitive disposal of this type of waste in solid form, although it also has various other technological capabilities, such as treatment and conditioning installations for the processing of wastes from radioactive facilities and of those removed from non-regulated installations. Certain complementary treatments are also carried out on wastes from nuclear facilities.

Decommisisioning

The GRWP defines a basic reference scenario for the National RWM programme that establishes general assumptions in this regard:

- ✓ 40 years service lifetime for the 6 operating NPPs
- ✓ Total dismantling of the LWR NPPs to be initiated 3 years after their definitive shutdown (immediate dismantling strategy)

Spain has an important amount of experience that has been acquired in recent years, including that corresponding to the dismantling of Vandellos 1 NPP and Zorita NPP. According the Spanish legal framework, ENRESA, as decommissioning organisation, will take over such units to implement the decommissioning project for which will become licensee. Such project will be solely funded by ENRESA through the Fund

SF

The main short term goal contemplated in current GRWP regarding SF management is to have available additional capacity for the temporary storage of spent fuel by means of the construction of a Centralised Temporary Storage (CTS) facility, which would house the spent fuel and HLW under dry storage conditions.

By means of the Council of Ministers' Agreement of 30 December 2011, the Government approved the designation of Villar de Cañas (Province of Cuenca) as the chosen municipality for the location of the Centralised Temporary Storage facility for spent nuclear fuel and high level waste and its associated Technological Centre. This was in accordance with a bill from the Commission for Industry, Tourism and Trade of the Lower House of the Spanish Parliament of April 2006, calling on the Government to designate the location and complete the process of site selection.

There is abroad international consensus on the option of disposal of SF and HLW in deep geological formations. The proposal for the 7th GRWP submitted by ENRESA considers that the basic and preferred option is storage, followed by a disposal facility, which for the purpose of economic calculations and planning would begin operation in 2063

Financing

In relation to the Fund for financing of the activities included in the General Radioactive Waste Plan, it is stated that the management of radioactive waste, including spent nuclear fuel, and the dismantling and decommissioning of nuclear facilities, shall be carried out with financing via the Fund for the financing of the activities included in the General Radioactive Waste Plan. This Fund is made up of the sums arising from the collection of the fees regulated, as well as of any compensation or income arising from the rendering of the said services. Also integrated in the Fund is the yield on its transitory financial investments.

Table 1 Radioactive Waste In Storage (including spent fuel that is considered waste)as of 31 December 2013

Route Waste Class	Processed (type)/Un processed	Total Current Volume (m3)	Estimated Disposal Volume (m3)	Distribution (%)							Planned Disposal Route (if known)
				RO	FFE	RP	NA	DF	DC/ RE	ND	
All Classes	No					0		0		0	
All Classes	Yes	12.585	12.585			0		0		0	
RAA	No	0				0		0		0	DGR
RE	No	0				0		0		0	DGR
RE	Yes	27	---			0		0	100	0	DGR
RBBA	No					0		0		0	Near surface
RBBA	Yes	5,064	5,064	19	3	0	4	0	14	60	Near surface
RBMA	No					0		0		0	Near surface
RBMA	Yes	7,494	7,494	84	4	0	6	0	6	0	Near surface

NEWMDB waste origin type codes:
RO – reactor operations
FFE – fuel fabrication & enrichment
RP – fuel reprocessing
NA – nuclear applications
DF - defence
DC/RE - decommissioning & remediation
ND - Not Determined

Table 2 Radioactive Waste Disposed (as disposed volume) as of 31 December 2013

Waste Class	Processed (not)	Total Volume (m3)	Distribution (%)							Disposal Route Used
			RO	FFE	RP	NA	DF	DC/RE	ND	
All Classes	Yes	37,214								
RBBA	Yes	7,612	24	4	0	8	0	4	60	Near surface
RBMA	Yes	29,602	83	3	0	6	0	6	2	Near surface

Table 3 Spent fuel in Storage (MTHM) as of 31 December 2013

Type	Current Amount (NPP)	Current Amount (Research Reactors)
Total Spent Fuel Storage	4,592	0
Wet storage (AR)	4,236	0
Wet storage (AFR)	0	0
Dry storage (AR)	356	0
Dry storage (AFR)	0	0
Total spent fuel held in storage for other countries (amounts also included above)	0	0

Table 4 Spent fuel sent for reprocessing (in the country or sent to another country) (MTHM) as of 31 December 2013

Type	Current Amount (NPP)	Current Amount (Research Reactors)
Total amount Spent Fuel sent to Reprocessing (in your country)	0	0
Total amount Spent Fuel sent to Reprocessing (in another country)	2,060	0
Total amount of Spent Fuel received from another country for reprocessing and recycling	0	0
Total amount of Spent Fuel (MTHM) or radioactive waste (cubic metres) returned to country of origin for storage/disposal	0	TBC

Table 5 Example of a translation matrix (from NEWMDB) that can be used for transition from a national classification system to IAEA classification

National Waste Classification Name	VLLW	LILW-SL	LILW-LL	HLW
RBBA	100	0	0	0
RBMA	0	100	0	0
RE	0	0	100	0
RAA	0	0	0	100

Table 6 Waste management facilities as of 31 December 2013

Type	Planned	Construct.	Commiss.	In Operation	Shutdown	Decomm.	Other	Total
Spent Fuel Storage	2	0	0	11	0	2	0	15
Spent Fuel Reprocessing and Recycling	0	0	0	0	0	0	0	0
Spent Fuel Conditioning	0	0	0	0	0	0	0	0
Spent Fuel disposal	1	0	0	0	0	0	0	1
Waste processing				13				12
Waste storage				13				13
Waste disposal	1	0	0	1	0	0	0	2

Table 7 Summary of major sources of waste as of 31 December 2013

Type	Planned	Construct	Commiss.	In Operation	Shutdown	Decomm.	Other	Total
Research reactors	0	0	0	0	0	4	0	4
Nuclear Power reactors	0	0	0	7	1	2	0	10
Spent Fuel Reprocessing and Recycling	0	0	0	0	0	0	0	0
Other	0	0	0	2	0	0	0	2

Table 8 Future prospects as of 31 December 2013

Type	Current amount	Estimated Current amount when prepared for disposal	Current Disposal Capacity	Total forecast at 2030	Disposal Capacity 2030	Total forecast at 2050	Disposal Capacity 2050
Spent Fuel Storage	4,592		0	6,794	0	6,794	0
Wet storage (AR)	4,236		0	963	0	0	0
Wet storage (AFR)	0	0	0	0	0	0	0
Dry storage (AR)	356		0	0	0	0	0
Dry storage (AFR)	0		0	5,831	0	6,794	0
Total amount Spent fuel sent to Reprocessing and Recycling	2,060	60	0	60	0	60	0
Total amount Spent fuel disposed	0	0	0	0	0	0	0
Waste in storage	27 RE 5,064 RBBA 7,494 RBMA	--- 5,064 RBBA 7,494 RBMA	TBD TBD TBD	TBD TBD TBD	TBD TBD TBD	0 0 0	TBD TBD TBD
Waste disposal	7,612 RBBA 29,602 RBMA	7,612 RBBA 29,602 RBMA	50,000 RBMA 35,000 RBBA	TBD TBD	50,000 RBMA 120,000 RBBA	50,000 RBMA 120,000 RBBA	50,000 RBMA 120,000 RBBA