SPAIN

(UPDATED 2011)

1. GENERAL INFORMATION

1.1. COUNTRY OVERVIEW

1.1.1. GOVERNMENTAL SYSTEM

Spain is a constitutional democracy in which the Head of State is the King. Executive power is vested in the President of the government. According to the Constitution, which was adopted in 1978, political power in Spain is organized as a central government with devolved powers for 17 autonomous communities. There are also 2 autonomous cities.

1.1.2. GEOGRAPHY AND CLIMATE

Spain is situated in south west Europe, occupying the greater part of the Iberian Peninsula, the Balearic and Canary Islands and a small part of northern Africa (Ceuta and Melilla), and bounded on the north by the Bay of Biscay, France and Andorra; on the east by the Mediterranean Sea; on the south by the Mediterranean Sea and the Atlantic Ocean; and on the west by Portugal and the Atlantic Ocean. The area of Spain is 505,990 km^2 large.

The climate of Spain is marked by extreme temperatures and, generally, insufficient rainfall. The variegated physical features of the country ensure pronounced climatic differences. The climate is most equable along the Cantabric and Atlantic coasts, which are generally damp and mild. The central plateau is dry and hot. Most of Spain receives less than 610 mm of precipitation per year, the northern mountains get considerable more moisture. By contrast, the southern Mediterranean coast has a subtropical climate. The average precipitation in Spain is 627 mm.

1.1.3. POPULATION

The historical population data are given in Table 1. The population in Spain in 2009 was about 46,74 million people; the overall density was 92,38 persons per km^2. Spain is increasingly urbanizing with more than three-fourths of the population in towns and cities.

TABLE 1.POPULATION INFORMATION

	1970	1980	1990	2000	2008	2009	Average annual growth rate (%) 2000 to 2009
Population (millions)	33.8	37.5	39.3	40.8	46.15	46.74	1.52
Population density (inhabitants/km^2)	66.9	74.4	77.9	80.7	91.22	92.38	
Urban Population as % of total	66.49	73.21	75.51	76.05	78.61	78.85	
Area (1000 km^2)						505.9	

Source: Statistical Yearbooks (several years). See web INE.

1.1.4. ECONOMIC DATA

In general terms, the Gross Domestic Product (GDP) has risen since the early 90's due to an increase in the service sector. In 2009, GDP was 1.051,151 million euros. Table 2 shows the historical GDP statistics in US$.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	1980	1990	2000	2005	2008	2009	Average annual growth rate (%) 2000 to 2009
GDP (millions of current US$)	224.495	520.709	582.377	1,132.132	1,601.408	1,467.889	10.82
GDP (millions of constant 2000 US$)			582.377				

GDP per capita (PPP* US$/capita)	7,280.837	14,193.394	22,349.063	27,508.771	30,858.357	29,625.481 (***)	3.18
GDP per capita (current US$/capita)	6,004.775	13,407.890	14,464.320	26,305.400	35,364.440	32,030.39 (***)	9.23

(***)
Estimated

*PPP: Purchasing Power Parity

Source: IMF WORLD ECONOMIC OUTLOOK (WEO) DATABASE.

1.2. ENERGY INFORMATION

1.2.1. ESTIMATED AVAILABLE ENERGY

The main indigenous energy sources in Spain are coal and hydro (Table 3).

TABLE 3. ESTIMATED AVAILABLE ENERGY SOURCES

	Estimated available energy sources					
	Fossil Fuels			Nuclear	Renewables	
	Solid	Liquid	Gas	Uranium	Hydro	Other Renewable
Total amount in specific units*						
Total amount in Exajoule (EJ)	10.40	0.08		3.66	13.3	

* Solid, Liquid: Million tons; Gas: Billion m^3; Uranium: Metric tons; Hydro, Renewable: TW

Source: IAEA Energy and Economic Database (EEDB).

1.2.2. ENERGY STATISTICS

In 2009, the primary energy consumption in Spain reached 130.5 Mtoe, which represented a decreased of 8.3% in relation to the precedent year, in line with the decrease initiated in the second semester of 2008, due to the international crisis context.

The final energy consumption decreased about 7.4% in the same year, reaching 97,776 ktoe, due to the decrease in the economical activity of all sectors (specially industry and transport), as well as mild climate conditions.

The national energy production in the same year was about 29.9 Mtoe, which represented a decrease of 2.8% in relation to 2008. Increases in renewables have not compensated the decrease of nuclear and fossil fuels.

Table 4 shows the historical energy statistics.

TABLE 4. ENERGY STATISTICS

							Average annual growth rate (%)
	1970	1980	1990	2000	2008	2009	2000 to 2009
Energy consumption (EJ)							
- Total	1.73	3.03	3.71	5.41	6.02	5.51	0.20
- Solids***	0.47	0.56	0.85	1.20	0.59	0.43	-10.67
- Liquids	1.00	2.07	1.88	2.57	2.86	2.67	0.44
- Gases		0.08	0.23	0.72	1.46	1.31	6.84
- Nuclear					0.65	0.58	
- Hydro					0.08	0.09	
- Other Renewables					0.38	0.42	
- Primary electricity ****	0.26	0.32	0.75	0.92	1.11	1.09	1.90
Energy production (EJ)							

- Total	0.66	0.85	1.40	1.53	1.301	1.255	-2.18
- Solids***	0.37	0.45	0.54	0.57	0.18	0.16	-13.25
- Liquids	0.01	0.07	0.05	0.02	0.01	0.004	-15.29
- Gases			0.06	0.02	0.001	0.001	-33.57
- Nuclear					0.65	0.58	
- Hydro					0.08	0.09	
- Other Renewables					0.38	0.42	
- Primary electricity ****	0.28	0.33	0.75	0.92	1.11	1.09	1.90
Net import (Import - Export) (EJ)							
- Total	1.22	2.34	2.54	4.29	5.17	4.71	1.04
- Solids***	0.08	0.17	0.29	0.62	0.45	0.38	-5.29
- Liquids	1.14	2.09	2.08	2.95	3.09	2.84	-0.43
- Gases		0.08	0.17	0.72	1.63	1.49	8.41
- Nuclear							
- Hydro							
- Other Renewables							

* Latest available data

** Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.

*** Solid fuels include coal, lignite and commercial wood

**** Primary electricity = Nuclear + Hydro + Other Renewables (for old data)

Source: Libro de la Energía 2009 (tables 2.2.1, 2.3.2, 5.1.1) and Boletín Estadístico de Hidrocarburos (various years).

1.2.3. ENERGY POLICY

The objectives of Spanish energy policy are to guarantee supply and ensure a larger contribution of energy in increasing the competitiveness of the Spanish economy, the reduction of energy consumption and compliance with the environmental objectives. Taking the above into account, the priority is established on progressing in the use of renewable energy sources and in technical developments possibly contributing to energy saving and efficiency.

The legal framework is based on Law 54/1997, of November 27th, on Electric Sector, and Law 34/1998, of October 7th, on Hydrocarbon Sector, and the rules in relation with them.

Law 54/1997 established a division between regulated activities (transport and distribution) and non-regulated activities (production and commercialization), and imposed electricity companies to separate these activities both accountably and legally. Law 54/1997 was modified by Law 17/2007, of July 4th, to adapt the Spanish electric sector to Directive 2003/54/EC concerning common rules for the internal market in electricity. The objective of this Directive was to create conditions more conducive to genuine, fair competition and to put in place a true single market. It placed an obligation on Member States to take the measures necessary to attain clearly defined objectives such as to protect vulnerable customers, to protect consumers' fundamental rights and to promote economic and social cohesion.

One of the main changes introduced in the electric Sector by Law 17/2007 was the elimination, as from July 1st 2009, of the tariff supply. From that date, the electricity supply is carried out by traders on a free market basis. The tariff supply has been substituted by “the last resort supply”, and the Administration establishes maximum prices called “last resort tariffs” to guarantee the universal service, addressed to final consumers with electric power equal or below 10 Kw. Royal Decree 485/2009, of April 3rd, regulates the start-up of the mentioned last resort supply. Law 17/2007 also established different dates to reduce the last resort suppliers.

Law 34/1998 was also modified (by Law 12/2007, of July 2nd) to adapt the sector to Directive 2003/55/EC concerning common rules for the internal market in natural gas. This Directive established common rules on the storage, transmission, supply and distribution of natural gas, and laid down detailed rules on the organization and functioning of the natural gas sector, including liquefied natural gas (LNG), biogas and gas from biomass and other types of gas. Law 12/2007 substituted the integral tariff supply by the last resort supply for the gas market as well. It also introduced a calendar to reduce gradually the number of last resort consumers from January 2008 to July 2010.

Other important issues concerning current energy policy in Spain are:

- The 2008-2012 Action Plan of the Saving and Efficiency Strategy in Spain 2004-2012 (PE4+, available at http://ec.europa.eu/energy/demand/legislation/doc/neeap/es_neeap_en.pdf) is the continuation of the plan run during the period 2005 to 2007 and materializes for the new period the development of the Spanish Saving and Energy Efficiency Strategy established for the period 2004-2012 (known as E4). It aims at generating an accumulated primary energy saving of about 88 MToe (equivalent to 60% of the whole consumption of primary energy of the year 2006) and it will involve a 238 million-ton reduction in CO_2 emissions into the atmosphere, and emissions of other atmospheric pollutants such as SO_2, NOx or particles produced in the combustion of fossil fuels. This Plan concentrates its efforts around 7 main sectors: Industry, Transport, Construction, Public Services, Residence Equipment, Agriculture and Energy Conversion, for which it defines 59 action measures (36 are economic incentive measures for investment, 3 refer to promotion activities, 4 refer to training, and 16 are regulatory actions).

- The 2008-2011 Activation Plan for Energy Efficiency and Savings, is an ambitious initiative of the Government which includes 31 measures, classified in 3 strategic cores (sustainable mobility, sustainable building and energy sustainability), with the view of intensifying the energy efficiency and saving in Spain. Some of these measures are the strengthening of the measures established in the PE4+, while others become a novelty. These measures will imply total estimated energy savings in the range of 5.8 to 6.4 MToe for the period, which is equal to savings between 42.5 and 47 million barrels of crude oil (equivalent to 10% of the country's annual oil imports) by the end of the period. Some of the measures included in this Plan are the promotion of the energy service market and the pilot project MOVELE designed to the introduction of electrical vehicles.

- According to Directive 2009/28/EC, on the promotion of the use of energy from renewable sources, Spain has adopted a National Renewable Energy Action Plan (NREAP) for the period 2011-2020 (available at http://www.mityc.es/energia/desarrollo/EnergiaRenovable/Documents/20100630_PANER_Espanaversion_final.pdf in Spanish, and at http://ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_spain_en.pdf in English). The document includes national targets for the share of energy from renewable sources consumed in transport, electricity, heating and cooling in 2020. As for Spain, the national objectives established in the Directive consist of achieving, by 2020, a target for share of energy from renewable sources in gross final consumption of energy of 20% (the Spanish share in 2005 was 8.7%), and a 10% share of renewable

energy specifically in the transport sector. The NREAP includes a brief description of the national policy for renewable energy, objectives and trajectory to be followed, and the measures to be considered in order to meet those objectives (which include regulatory, financial and information campaign measures).

- According to the 2005-2010 Renewable Energy Plan (REP), approved by the Council of Ministers in 2005, 12.1% of the primary energy consumption for the year 2010 would be supplied with renewable energies. The Plan was elaborated with a view of reinforcing the priority objectives of the Government's energy policy, which are a guarantee of safety and quality in the electric supply, and respect of the environment. The Plan was also determined to meet Spain's engagements in the international scope (Kyoto Protocol, Spanish National Emissions Allocation Plan), and those derived from Spain's membership of the European Union. A new REP for the period 2011-2020, which is being drafted, will include some of the essential elements of the NREAP as well as additional analyses not included in the latter and a detailed sectorial analysis which will contain, *inter alia*, the outlook for technological progress and expected cost trends. As a preliminary estimate, the share of energy from renewable sources in gross final consumption in 2020 could be of 22.7%, almost three percentage points above the compulsory target set by the European Union. As an intermediate estimate, the contribution of renewable sources could be of 15.5% in 2012 and 18.8% in 2016. Furthermore, the contribution from renewable energies to electrical power generation could reach 42.3% in 2020.

1.3. THE ELECTRICITY SYSTEM

1.3.1. ELECTRICITY POLICY AND DECISION MAKING PROCESS

As indicated in other sections, the energy policy in Spain has tended to liberalize progressively the markets with the main target of decreasing the energy prices, ensuring the energy supply and the quality, also improving the energy efficiency, reducing the consumption and protecting the environment. This position is expressed by Law 54/1997, its amendment and the regulation in relation with it. This Law establishes regulations to guarantee the electric supply, the quality of it and try to get the lowest cost. It creates a liberalized wholesale market (seen precedent section) where the Government is responsible for approving the specific regulations and the prices are established by the economic agents.

The electricity system planning is thus indicative, as established in Law 54/1997, and not binding, except for transport installations, which are subject to a central binding planning. In the same way as for the electricity system, Law 34/1998 establishes an

indicative planning for the gas system, except for the gas pipelines belonging to the basic grid, regasification capacity and installations for the storage of hydrocarbon strategic reserves, which are binding in order to ensure the supply. On May 30th 2008, the Council of Ministers approved the current electricity and gas sectors' planning for the period 2008- 2016, that includes the planning of the current transport grids.

The aforementioned document (available at http://www.mityc.es/energia/planificacion/Planificacionelectricidadygas/Desarrollo2008/DocTransportes/planificacion2008_2016.pdf) assumes an annual raise in the Spanish primary energy consumption of 1.4% between 2006 and 2016, reaching about 165 MToe in 2016. This increase would be inferior to the increase in the final energy (1.6%), due to a better performance of the foreseen electricity generation structure. A reduction of 1.6% (annually) in the energy intensity (primary energy consumption/GDP) is expected in the same period, and values below those of the 90's could be reached, confirming last years' trend and thus implying a trend change in respect of the continuous increase improved from 1990 to 2004.

As for the supply structure, a relevant increase in renewable energies and gas and a decrease in coal and oil are expected.

1.3.2. STRUCTURE OF ELECTRIC POWER SECTOR

In Spain, there are five large electricity producers: Iberdrola, Endesa, Gas Natural Fenosa, Hidrocantábrico (EDP) and Viesgo (E.ON). The most important are the first three mentioned companies; their energy share accounting for about 63% in 2009.

Iberdrola was created in 1991when Iberduero and Hidroeléctrica Española merged.

Endesa was created in 1958, owned by the State of Spain, with the objective of promoting electric generation in power plants fed by national coal. In the 1990's the private participation in the company was increased, and in 1998 the company became totally private. During its life, Endesa has bought other smaller electric companies, like ENHER, GESA, Electra de Viesgo, UNELCO, FECSA, ERZ and Compañía Sevillana de Electricidad. In October 2007, after some takeover bids from different electricity companies, ENEL and Acciona acquired Endesa, and two years later, ENEL agreed to buy out Acciona's stake, and has currently 92% of its shares.

In 2009, Gas Natural acquired Unión Fenosa, which has led to the creation of Gas Natural Fenosa, the first integrated gas and electricity company in Spain and the third utility. The two companies began to operate as an integrated entity in September 2009.

There are also "special producers", which, with the targets of energy saving and efficiency, produce electric energy using cogeneration (production of heat and electricity) or wind, biomass and wastes energies. In 2009, they produced about 30.5% of the national electric generation, representing an increase of 11% from the precedent year.

Another important company in the Spanish electrical sector is Red Eléctrica de España, S.A. (REE), which is the Spanish TSO (Transmission and System Operator), being consequently responsible for the technical management of the Spanish electricity system. REE, as the system operator, guarantees the continuity and security of the power supply and the proper coordination of the production and transmission system, performing its functions in coordination with the operators and clients of the Iberian power market. As the manager of the transmission grid, REE acts as the sole transmissioner and, as such, must guarantee that facilities are adequately developed and enlarged as needed, that they are maintained and enhanced on the basis of uniform and consistent criteria, that the transmission of power between external systems using the Spanish power system is properly managed, that the managers of other interconnected grids receive the information they need to guarantee safe operations, and that third party access to the grid is guaranteed under equal conditions.

REE was created in 1985, when the electric companies changed the majority of their installations in relation with electricity transportation, and they got a participation in the capital of this company. At the beginning, the majority of the capital of the company was owned by the State. At present, the shareholding structure of the company consists of a 20% stake held by the SEPI (Sociedad Estatal de Participaciones Industriales), with the remaining 80% being free float. Law 17/2007 introduced several modifications in the functioning and structure of REE, in order to guarantee the independence of the company as regards the other activities and participants in the electricity sector, since the activities pursued by REE are considered to be an essential service. Apart from the SEPI, the rest of shareholders can not own more that 5% of the shares.

The "Compañía Operadora del Mercado Español de Electricidad" (OMEL) (Market Operator), created by Law 54/1997, is in charge of the necessary functions for the financial management of the system referring to the efficient development of the electricity market. Specifically, it is in charge of the management of the system for the buying and selling of electrical energy with the functions outlined in the said Law, and the making of the corresponding settlements and payments and collections and,

consequently, including the results of the daily and intraday electricity markets. In parallel to the Market Operator, the same Law on the Electric Sector set up the already mentioned System Operator (which is REE), to take charge of the technical management. Together with Portugal, Spain has set up the common Iberian electricity market (MIBEL), a governmental initiative whose integration started in 2008, and which is still being developed.

The National Energy Commission (CNE, Comisión Nacional de Energía), created by Law 34/1998, is the regulatory body of energy systems. Its aim is to regulate the energy systems, to maintain free competition and transparency of the performance, to benefit all the organizations working in the system and the consumers. The Commission is a public authority with independent legal identity, its own assets and full operational capacity. It is assigned to the Ministry of Industry, Tourism and Trade, which controls the effectiveness of its activity. The Commission is governed by a Board of Directors, made up of a Chairperson, a deputy Chairperson, a Secretary and seven members. All of them stay in the Commission for a six-year period and can be renamed for the same period. The Commission has advising organizations.

1.3.3. MAIN INDICATORS

TABLE 5. ELECTRICITY PRODUCTION, CONSUMPTION AND CAPACITY

							Average annual growth rate (%)
	1970	1980	1990	2000	2008	2009	2000 to 2009
Capacity of electrical plants (GWe)							
- Thermal	6.88	13.48	19.67	25.5	49.00	48.18	7.33
- Hydro	10.88	12.83	16.23	17.99	18.62	18.42	0.26
- Nuclear	0.15	1.09	7.51	7.57	7.72	7.72	0.21
- Wind				1.88	15.71	17.25	27.92
- Solar					3.33	3.34	
- other renewable				0.02	0.80	0.75	49.50
- Total	17.91	27.40	43.41	52.96	95.18	95.66	6.79
Electricity production (TW.h)							

- Thermal	27.61	74.49	73.68	125.98	194.03	167.79	3.24
- Hydro	27.78	29.53	26.18	31.81	26.12	29.08	-0.99
- Nuclear	0.92	5.19	51.9	59.31	58.97	52.76	-1.29
- Wind					32.50	37.16	
- Solar					2.56	6.17	
- other renewable					3.70	3.88	
- Total (1)	56.31	109.21	151.76	221.82	317.88	296.84	3.29
Total Electricity consumption (TW.h)				73.06	99.69	94.12	2.85

(1) Electricity transmission losses are not deducted.

Source: : IAEA Energy and Economic Database, Libro de la Energía 2009 and Libro de la Energía 2008 (tables 3.2.1.3, 3.2.1.1 and 2.1.1).

TABLE 6. ENERGY RELATED RATIOS

	2000	2005	2008	2009
Energy consumption per capita (GJ/capita)	92.67	103.22	95.80	87.57
Electricity consumption per capita (kW.h/capita)	4567.87	5590.65	5605.85	5225.58
Electricity production/Energy production (%)	60.7	82.1	88.7	85.2
Nuclear/Total electricity (%)	27.6	19.6	18.6	17.8
Ratio of self-sufficiency (%)	26.3	21.1	21.7	23

Source: Libro de la Energía 2009, Libro de la Energía 2006 and Libro de la Energía 2001 (tables 2.1.1, 3.1.2., 3.2.1.2, 3.2.1.3, 2.3.2 and 2.3.3). Statistical Yearbooks (several years). See web INE.

2. NUCLEAR POWER SITUATION

2.1. HISTORICAL DEVELOPMENT AND CURRENT ORGANIZATIONAL STRUCTURE

2.1.1. OVERVIEW

Nuclear Energy in Spain was developed in the early 50's. At that time, the main organization responsible in this field was the Nuclear Energy Board (Junta de Energía Nuclear - JEN), a subordinate organization of the Ministry of Industry and Energy, with full powers for nuclear matters (in charge of personnel training, raw materials procurement, basic scientific research and technology development, among others). In view of the growth of nuclear activities, and with it the multiplication of regulations in this area, the functions attributed to the JEN by the Spanish legislation, and especially the Nuclear Energy Act (Law 25/1964, of April 29th), were transferred to the other organisations or entities that currently play an important part in this area, such as the Nuclear Safety Council (Consejo de Seguridad Nuclear - CSN), the Empresa Nacional de Uranio, S.A (currently, ENUSA Industrias Avanzadas, S.A.), or the Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA), and the Board was finally replaced by the Centre for Energy-Related, Environmental and Technological Research (CIEMAT) by virtue of Law 13/1986, of April 14th, on the Promotion and General Coordination of Scientific and Technical Research.

In the late 60's, the construction of the first generation nuclear power plants José Cabrera, Santa María de Garoña and Vandellós I started. In the early 70's the construction of the second generation NPPs as Almaraz I and II, Lemóniz I and II, Ascó I and II and Cofrentes started.

In 1972, ENUSA, a state owned company, was established, taking charge of all the nuclear fuel cycle front-end activities. Its shareholders are the SEPI, holding 60% of the capital, and the CIEMAT, holding the remaining 40%. Law 15/1980, of April 22nd, created the Nuclear Safety Council, the only organization competent in nuclear safety and radiological protection matters in Spain.

In the early 80's, the construction of the NPPs Valdecaballeros I and II, Vandellós II and Trillo I, NPPs started, and preparatory studies for Trillo II were initiated.

In 1983, a moratorium was established (construction pause) for Lemóniz I and II Valdecaballeros I and II, and Trillo II. In 1994, the definitive cessation of the nuclear power plants under the moratorium was decided.

In 1984, ENRESA was established. The State owned company is responsible for the radioactive waste management and the dismantling of nuclear installations in Spain.

2.1.2. CURRENT ORGANIZATIONAL CHART(S)

Figure 1 shows the current institutional framework of Nuclear energy in Spain:

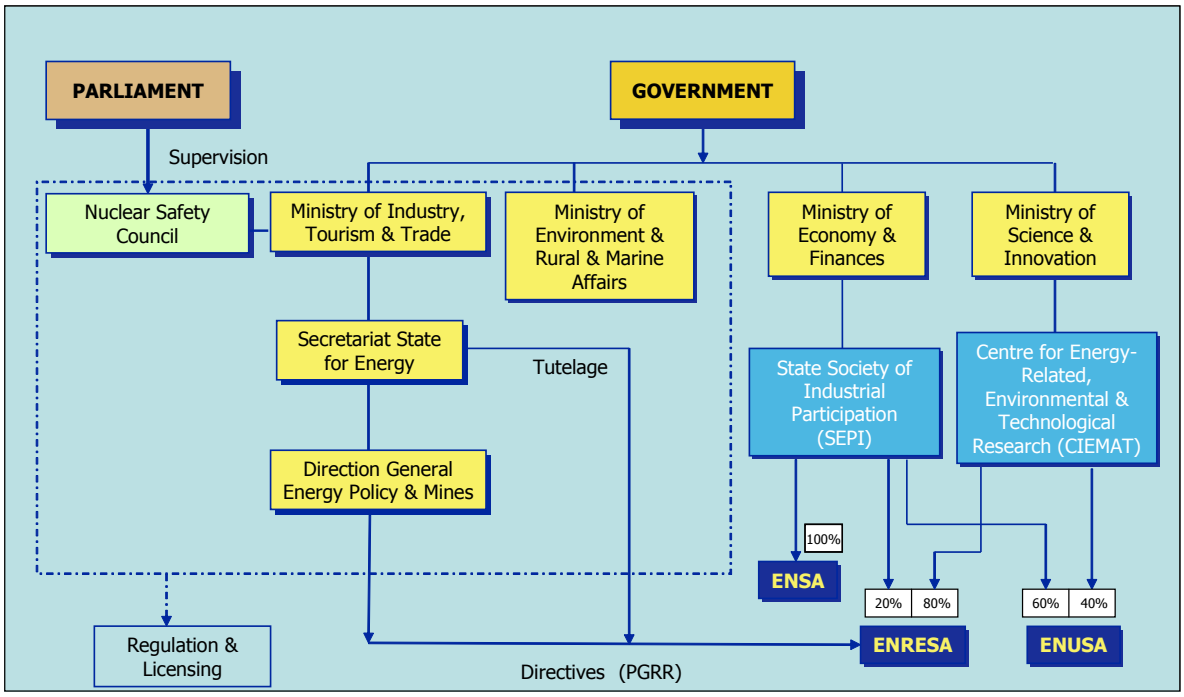

FIG. 1. Institutional Framework

For information about licensing authorization, see section 3.1.2 of this document.

2.2. NUCLEAR POWER PLANTS: OVERVIEW

2.2.1. STATUS AND PERFORMANCE OF NUCLEAR POWER PLANTS

Nuclear generation amounted to 61,914 million kWh in 2010, which has meant a 17% increase with regard to the previous year. Likewise, Load and Time Availability Factors have increased to 90.8% and 92.97% respectively, compared to 2009's values (78.13 and 80.14%).

In 2010, 4 nuclear reactors have had outages (Garoña, Almaraz II, Ascó II and Trillo), compared to the 7 refuelling outages carried out in the precedent year. Both planned and unplanned energy capability loss factors have decreased to 5.47% and 3.20% respectively. With all this, the unit capability factor was 91.33%, as against 78.86% of the previous year.

In 2010, there have been 10 unplanned shutdowns in Spanish nuclear power plants as a whole, compared to the 13 of 2009; thus a slight improvement is appreciated in this sense. Of these 10 shutdowns, 4 have been unplanned scrams and 6 have been carried out by operators following normal shutdown procedures. None of these shutdowns has had any impact on the safety of the facilities or on the radiological protection of the operating personnel, the public or the environment. Thus, shutdown ratios per reactor and year have improved, hitting very low values (0.75 unplanned manual shutdowns/reactor·year and 0.5 scrams/reactor·year).

TABLE 7. STATUS AND PERFORMANCE OF NUCLEAR POWER PLANTS

Station	Type	Net Capacity	Operator	Status	Reactor Supplier	Construction Date	Grid Date	Commercial Date	Shutdown Date	UCI for yea 201
ALMARAZ-I	PWR	1008	CNAT	Operational	WEST	02/07/1973	01/05/1981	01/09/1983		90.2
ALMARAZ-II	PWR	955.7	CNAT	Operational	WEST	02/07/1973	08/10/1983	01/07/1984		85.4
ASCÓ-I	PWR	995.8	ANAV	Operational	WEST	16/05/1974	13/08/1983	10/12/1984		93.5
ASCÓ-II	PWR	991.7	ANAV	Operational	WEST	07/03/1975	23/10/1985	31/03/1986		85.9
COFRENTES	BWR	1063.9	IB G	Operational	GE	09/09/1975	14/10/1984	11/03/1985		99.0
SANTA MARÍA DE GAROÑA	BWR	446	NUCLENOR	Operational	GE	02/05/1966	02/03/1971	11/05/1971		93.9
TRILLO-I	PWR	1000	CNAT	Operational	KWU	17/08/1979	23/05/1988	06/08/1988		88.7
VANDELLÓS-II	PWR	1045.3	ANAV	Operational	WEST	29/12/1980	12/12/1987	08/03/1988		94.2
JOSE CABRERA	PWR	141.7	Gas Natural SDG[1]	Shutdown	WEST	24/06/1964	14/07/1968	13/08/1969	30/04/2006	
VANDELLÓS-	PWR	508	HIFRENSA	Latency	CEA	21/06/1968	06/05/1972	01/08/2972	19/10/1989	

[1] The transfer of plant's ownership from Unión Fenosa Generación to Gas Natural SDG was authorised by Order of October 29th 2009. The further transfer of licence ownership from Gas Natural SDG to ENRESA for dismantling was authorised by Order of February 1st 2010.

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Source: *Spanish Power Nuclear Power Plants in 2009-UNESA* and individually provided by operators for 2010 data

* UCF (Unit Capability Factor) (only applicable to reactors in operation).

FIG.2 Location of Spanish NPPs

2.2.2. PLANT UPGRADING, PLANT LIFE MANAGEMENT AND LICENSE RENEWALS

The nuclear units in operation are 22 to 39 years old and there is no legal provision regarding lifetime extension. The current policy of the government as regards nuclear energy contemplates the progressive reduction of the share of nuclear power in the energy mix, while ensuring security of supply and nuclear safety at all times.

Since the beginning of nuclear power operation, the plants' power levels have been continuously upgraded, currently total net increase equals one medium size new plant.

Ascó I and II, Almaraz I and II, Cofrentes and Vandellós II were refurbished, up-graded and up-rated in the last decade.

On July 4th 2006, Nuclenor submitted the application for the 10-year renewal of the Santa María de Garoña NPP operating license to the Ministry of Industry, Tourism and Trade (MITYC). The MITYC awarded the renewal of the operation license until July 6th 2013 (a four-year license), establishing this date as the one of definitive shutdown of the plant. In renewing the license, the MITYC has taken into account aspects relating to energy planning or the socioeconomic development of the region, among other things, and has not questioned safety issues.

As for other NPPs, license renewals for Almaraz I and II and Vandellós II were granted in June and July 2010 respectively, for another 10 years, after favourable report by the Nuclear Safety Council. Operation licenses for Ascó and Cofrentes will be revised in 2011 and for Trillo in 2014.

2.3. FUTURE DEVELOPMENT OF NUCLEAR POWER (NOT APPLICABLE)

Note: This chapter is applicable to all countries planning future development of nuclear power, both those planning expansion of existing programs and those countries considering development of a nuclear power programme.

2.3.1. NUCLEAR POWER DEVELOPMENT STRATEGY

TABLE 8. PLANNED NUCLEAR POWER PLANTS

Station/Project Name	Type	Capacity	Expected Construction Start Year	Expected Commercial Year

2.3.2. PROJECT MANAGEMENT

2.3.3. PROJECT FUNDING

2.3.4. ELECTRIC GRID DEVELOPMENT

2.3.5. SITE SELECTION

2.4. ORGANIZATIONS INVOLVED IN CONSTRUCTION OF NPPS

Architect Engineers

The Spanish Engineering Companies which play the main role in the National Nuclear Sector are Empresarios Agrupados, Initec, Inypsa and Sener. These companies have collaborated solely or in consortium with others in launching the first generation NPPs and in successive projects, increasing progressively the nuclear installed capacity. The first NPPs were carried out as turn-key projects and only in the following projects were local engineering companies involved. The scope of each project has been different, having the engineering companies focused on different activities such as design, licensing, procurement operations and collaboration in start-up and in tests. At this moment, as there are no NPPs under construction, these Architect Engineers companies have concentrated on operational support, shutdown and decommissioning of NPPs, research and development and radioactive waste engineering activities.

NSSS Manufacturers

The main Spanish NSSS manufacturer is Equipos Nucleares, S.A. (ENSA), which designs, produces and inspects NPPs primary circuit equipment and components. Its manufacturing plant is located in Maliaño (Cantabria). This company is State owned through the SEPI, which controls 100% of its shares. ENSA is also constructing double purpose casks, called ENSA-DPT, to store and/or transport spent fuel assemblies.

ENSA has provided primary circuit equipment's as steam generators, reactor vessels, etc. and components to the second and third generation Spanish NPPs and has exported to several countries as Germany, Argentina, United Kingdom, India, United States of America, Belgium and others.

In 2007, ENSA formed, along with ENUSA, Tecnatom and Ringo Válvulas, the Spanish Nuclear Group for China (SNGC), whose aims is the marketing and supply of nuclear products and services abroad, particularly in China.

Other Main Component Suppliers

The last NPPs built in Spain enclosed a large range of domestically made equipment and components. The following list of national manufacturers aims to be useful and includes only the main companies:

Turbines: Eumynsa, Tamoin Power Services

Pumps: Chepro, Amara Vorkauf

Air compressor: Abrasivos y Maquinaria

Valves: Masoneilan, Ringo Válvulas.

Electric equipments: Cantarey Reinosa, Gamesa Energía.

Instrumentation & Control: Indra Sistemas, TSI.

2.5. ORGANIZATIONS INVOLVED IN OPERATION OF NPPS

Operators

The majority of the Spanish NPPs are co-ownership, and managed by Economic Interest Groupings (Agrupaciones de Interés Económico, AIEs). The following table shows the different owners and operators of Spanish NPPs:

NPP	**Lisense Owner**	**Operator**
Cofrentes	Iberdrola Generación, S.A.	Iberdrola Generación, S.A.
Sta. Mª de Garoña	Nuclenor, S.A. (Iberdrola Generación, S.A. 50%; ENDESA Generación, S.A. 50%)	Nuclenor, S.A.
Almaraz I Almaraz II	Iberdrola Generación, S.A. (52,7%); ENDESA Generación, S.A. (36%); Gas Natural SDG, S.A.[2] (11,3%)	Centrales Nucleares Almaraz-Trillo, A.I.E.
Trillo	Iberdrola Generación, S.A. (48%); Gas Natural SDG, S.A (34,5%); Hidrocantábrico	

[2] Due to the acquisition of Unión Fenosa Generación, S.A., by Gas Natural SDG. S.A., the duly transfer of ownership was authorised by Order of the MITYC in 2010.

NPP	Lisense Owner	Operator
	energía, S.A. (15,5%); Nuclenor, S.A. (2%)	
Ascó I	ENDESA Generación, S.A.	Asociación Nuclear Ascó-Vandellós, A.I.E.
Ascó II	ENDESA Generación, S.A. (85%); Iberdrola Generación, S.A. (15%)	
Vandellós II	ENDESA Generación, S.A. (72%); Iberdrola Generación, S.A. (28%)	

Operation Service Suppliers

There are several companies who offer operational services in the nuclear sector, as TECNATOM (participated by the principal electricity companies), LAINSA, ENWESA (participated by ENSA (75%) and Westinghouse Technology Servicies (25%)) and NUSIM.

TECNATOM provides training services to operational personnel of NPPs. It has PWR and BWR simulators. TECNATOM has also carried out several in-service inspection and maintenance activities giving support to the Spanish NPPs, and it is expanding its international presence to East Europe, Russia and Ukraine. LAINSA, ENWESA and NUSIM are focusing on maintenance and operational support to NPPs, quality assurance, radiological protection and various activities.

2.6. ORGANIZATIONS INVOLVED IN DECOMMISSIONING OF NPPS

According to article 38 bis of the Nuclear Energy Act, in the wording done by Law 11/2009, of October 26th, management of radioactive wastes, including spent fuel, and the dismantling and decommissioning of nuclear installations (NPPs included) is an essential public service corresponding exclusively to the State, and commissioned to the company ENRESA. In this respect, ENRESA is constituted as a vehicle and technical service of the Administration, responsible for carrying out whatever functions might be assigned to it by the Government.

Royal Decree 1349/2003, of October 31st, also establishes that the responsibility for the management of operations deriving from the decommissioning of NPPs corresponds to ENRESA. For its part, the Nuclear and Radioactive Facilities Regulation (Royal Decree 1836/1999, of December 3rd, as amended) indicates that on expiry of the operation permit of a nuclear facility, the responsibility for its decommissioning is initially to the licensee of the installation who, prior to the grating of the decommissioning authorisation, undertakes the pre-dismantling activities. In order for this authorisation to be granted, the licensee of the operation license must previously have conditioned the radioactive waste generated during its operation, and unloaded the fuel from the reactor and from the pools. Once the ownership transferred to ENRESA, it is responsible for the performance of the dismantling and decommissioning activities.

To date, two nuclear units have been shut down: Vandellós I (in 1990) and José Cabrera (in 2006).

- The Vandellós I NPP, a 480 MWe gas graphite reactor commissioned in 1972, is cancelled since 1990. In January 1998 Ministry of Industry and Energy authorized activities of plant dismantling. From year 2003, the plant is in latency period, after having reached level 2 of dismantling: the non-released parts of the site will remain under the responsibility and surveillance of ENRESA. This situation will be maintained for 25 years, a period during which the radiological activity of the internal structures of the reactor box will decay approximately 5% of the initial value.

  On completion of the latency period, around year 2028, the last level dismantling will begin, this including removal of the reactor box and its internals and the complete release of the site

- Since the beginning of May 2006, José Cabrera NPP remains shutdown in compliance with Order ITC/1652/2006, of April 20th, of the MITYC, which declared the definitive shutdown of the plant. The authorisation for dismantling and the transfer of license ownership to ENRESA was granted by means of Order ITC/204/2010, of February 1st, of the MITYC. The dismantling is expected to be finished in 2016.

  In 2008, the licence holder (Unión Fenosa at the time) received authorisation for the commissioning of the on-site spent fuel storage facility (Individual Temporary Storage, ATI in Spanish). From January 19th to September 3rd 2009, the spent fuel housed in the NPP pool (377 fuel assemblies) was loaded into 12 dry storage casks that were taken to its ATI.

2.7. FUEL CYCLE INCLUDING WASTE MANAGEMENT

Activities related to fuel cycle can be classified into front-end and back-end activities:

Front End Activities:

The front end of the nuclear fuel cycle is understood to include the processes relating to the production of nuclear energy, among them the acquisition and application of the nuclear materials used in operating nuclear reactors. The front-end activities are mining and milling, uranium conversion, uranium enrichment and the manufacturing of fuel assemblies:

- Mining and milling: There are no mining installations in operation in Spain. Due to the uranium lower market price, ENUSA's mining activities in Saelices el Chico (Salamanca) were finished at the end of 2000. The former uranium mining and milling facilities are at different stages of decommissioning and environmental restoration of the sites is ongoing. The uranium concentrates from ENUSA comes from COMINAK and from several foreign companies. COMINAK is a company from Niger, owned by several foreign companies including ENUSA, which holds 10% of its shares.

- Uranium conversion and enrichment: There are no uranium conversion and enrichment facilities in Spain. ENUSA owns 11% of Eurodif, European consortium with enrichment factories in France. ENUSA is in charge of the uranium, enrichment and conversion services contracting, for the supply of enriched uranium to the Spanish nuclear reactors, acting as a procurement manager. ENUSA has signed several contracts with companies abroad for these activities.

- Fuel fabrication: ENUSA operates a nuclear fuel manufacturing plant located in Juzbado (Salamanca) that produces fuel elements for most PWRs and BWRs in Spain (all, except for Trillo NPP) and for some reactors abroad. In 2010, 934 fuel assemblies were manufactured, 496 PWR assemblies and 438 BWR assemblies, which in all are equivalent to 312.7 tons of uranium. From the total production, 561 fuel assemblies containing 178.6 tU have been exported to Belgium, France, Sweden and Finland, representing around 60% of the total production.

Back End Activities:

The back end of the nuclear fuel cycle is understood to include the processes relating to the interim storage of spent fuel, waste management, reprocessing and ultimate disposal. In Spain, except for the reprocessing, these activities are undertaken by ENRESA, a State owned company, which was set up in 1984. Spain has opted for an open cycle for the nuclear spent fuel, which means that the spent fuel remains temporarily stored in the plant pools, complemented with other transitory storage systems, pending its final management. Reprocessing is not undertaken in our country, although, in the past, Spain initially opted for the reprocessing of the spent fuel from some NPPs, and their spent fuel was sent abroad for reprocessing. As a result of this, various intermediate and high level wastes resulting from reprocessing are to be returned to Spain in the following years.

As commented above, ENRESA is in charge of the radioactive waste management activities and the dismantling of nuclear installations, as established in the Nuclear Energy Act, in the wording done by Law 11/2009 (for detailed information, see section 2.6). The tutelage of ENRESA corresponds to the Ministry of Industry, Tourism and Trade (MITYC), via the Secretariat of State for Energy. The State is the owner of radioactive wastes once these have been definitively disposed of. Likewise, it shall undertake whatever surveillance might be required following the decommissioning of a nuclear facility, following the period of time established in the corresponding declaration of decommissioning.

On the other hand, the Government is responsible for establishing the policy regarding 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).

ENRESA is assigned the following duties:

- Radioactive waste treatment and conditioning.
- Searching for locations, design, construction and operation of interim and final storage centres for high, medium and low level radioactive wastes.

- Management of the different operations related to the decommissioning of nuclear and radioactive installations.
- Establishing systems for collecting, transferring and transporting radioactive wastes.
- Giving support to civil protection services in case of nuclear emergencies.
- Final and safe conditioning of wastes derived from the mining and milling processes.
- Assuring of the long-term management of every radioactive waste storage facility.
- Carrying out the appropriate technical and economic studies, considering the deferred costs and to outline the proper economic policy.

ENRESA has a medium and low-level and radioactive waste storage installation located in "El Cabril" (Córdoba), in operation since 1992. On July 21st 2008, the MITYC granted the license of a new very low level waste disposal facility situated in the same site, consisting on 4 cells with a total capacity of 130,000 m^3. For the time being, only one cell with a total capacity of 33,000 m^3 has been constructed and is operating.

ENRESA draws up a proposal of GRWP, as established in the Royal Decree by which the company was constituted, and submits it to the MITYC for approval by the Government, following a report by the Nuclear Safety Council and after having heard the Autonomous Communities in relation to land planning and environment.

The GRWP itself is the basic reference document that deals with all the strategies and actions to be undertaken in Spain in the different fields of radioactive waste management and the dismantling of facilities, along with the corresponding economic-financial study. On June 23rd 2006 the Spanish Government approved the 6th General Radioactive Waste Plan. The basic reference scenario therein established may be summarized as follows:

- Current nuclear fleet with 6 NPP's in operation (8 reactors). The installed electrical power as of December 31st 2005, 7,876 MWe, was reduced to 7,716 MWe as a result of the definitive shutdown of José Cabrera NPP on April 30th 2006.
- 40 years service lifetime for the 6 operating NPP's with a production rate similar to that existing at present.

- Open fuel cycle; i.e., the option of reprocessing the spent fuel is not contemplated.
- Total dismantling (Level 3) of the light water NPP's, to be initiated 3 years after their definitive shutdown.

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

In terms of High Level Wastes (HLW), the spent fuel from the majority of the Spanish NPPs in operation is currently stored in the pools of the corresponding plants. In view of the forthcoming saturation of the storage capacity of these pools, the original racks were progressively replaced with other more compact units, this having allowed the need to provide a storage capacity additional to the pools to be significantly deferred in most cases. However, a storage facility for Trillo NPP is in operation since 2002. The saturation of the fuel pools at the Ascó NPP is expected by 2012, so another storage facility for this plant is being licensed.

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

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

- The R&D Plans that have evolved and adapted to the Spanish SF/HLW management programme. These plans have allowed technical knowledge to be acquired and national working teams to be trained in the development of the definitive disposal option, participating in international research projects and in demonstration projects in overseas underground laboratories.

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

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

As regards the ATC for SF and HLW, the MITYC published on December 29th 2009 in the Official Journal, a Resolution by which a public call for the selection of candidate municipalities to host the ATC was launched. The project will include a storage facility able to accept 6,700 tU of SF, as well as all other RW which are not suitable for disposal at "El Cabril" disposal site. In addition a Technology Centre is to be built in order to assure the technologies and knowledge for SF and HLW for final management following ENRESA's R&D Plan. The investment, in the range of 700 M€, will last 19 years in three phases. The project consists in a dry storage system with 12 vaults and natural convection air cooling. In 2006, the Nuclear Safety Council gave its favourable appreciation to the generic design.

Municipalities had one month to present their applications, which included a formal decision of the City Council. 14 applications were presented, out of them 8 were considered to comply with the criteria established in the public call. A great number of allegations were presented within the period established in the call; and a report on the assessment of the allegations was published. In September 2010, based on the sites suggested by the candidates, the final assessment report proposing the sites to host the ATC was approved by the Interministerial Commission created in 2006 for this purpose, and referred to the Government. The site decision by the Government will be the final stage of the process. All the information on this process is published in http://www.emplazamientoatc.es.

2.8. RESEARCH AND DEVELOPMENT

2.8.1. R&D ORGANIZATIONS

The Ministry of Industry, Tourism and Trade (MITYC), in collaboration with the Nuclear Safety Council, the electricity industry and other agents involved in the nuclear sector, set up in 2007 a Technology Platform on Fission Nuclear Energy (CEIDEN), in order to coordinate the different national programs and plans on R&D and foster also the participation of Spanish companies or institutions in international R&D programs. This Platform is the continuation of the Strategic Committee established in 1999, and is currently composed of around 70 members. The five main programs that CEIDEN is working on are:

- Nuclear industry capacities
- Dry storage and transport of spent fuel
- Study and use of materials coming from José Cabrera NPP: concrete
- Study and use of materials coming from José Cabrera NPP: internals (ZIRP)
- Jules Horowitz Reactor initiative

The Ministry of Science and Innovation elaborates each four years a Research and Development National Plan which defines the general framework of the Spanish R&D and innovation policy. The 12th July 2007 the R&D National Plan 2008-2011 was approved by the Interministerial Commission on Science and Technology. Nuclear Energy is included inside the Energy Sector.

CIEMAT is an institution attached to the Ministry of Science and Innovation. One of its duties is nuclear research. It collaborates with several institutions in Spain and abroad.

In the ENRESAS´s 2009-2013 R&D program (the sixth) five major areas have been defined:

- Waste technology
- Treatment, conditioning and dismantling technology and processes
- Confinement materials and systems

- Behaviour assessment, radiological protection and modelling
- Infrastructures and coordination

The content of the Plan is governed by the directives mapped out for these activities in the GRWP. The directives of the current GRWP are focussed on providing support for the CTS facility and ENRESA's operating installations, including those that are to be dismantled, on developing separation and transmutation capacities and on providing support for basic generic long-term storage projects. The total investment in R&D for this period amounts to 26 million euros, of which .5 million correspond to the completion of the previous ENRESA's R&D Plan (2004-2009), and the remainder (22.5 million euros) to the new Plan.

The Nuclear Safety Council develops a four-year R&D Plan (2008-2011). This plan includes 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. The current CSN's R&D Plan includes the following programmes:

- Nuclear fuel and reactor physics
- Modelling and methodologies of safety assessment
- Materials performance
- New technologies
- Radioactive waste
- Radiation exposures control
- Dosimetry and radiology
- Emergency management and incident analysis

2.8.2. DEVELOPMENT OF ADVANCED NUCLEAR TECHNOLOGIES

As for the R&D programs dealing with Advanced Reactors, see next Section.

In Spain there is no implementation plan on advanced nuclear technologies.

2.8.3. INTERNATIONAL CO-OPERATION AND INITIATIVES

Spain, as member of the European Union, carries out most of its international activities within the Community framework.

In the EU, one of the most important programmes is the R&D Framework Programme for nuclear research and training activities for the period 2007-2011 (see Council Decision 2006/970/Euratom, of 18 Dec 2006 concerning, the 7th FP of Euratom). Under the 7th FP, 2.7 billion euros is available for research activities in fusion energy, and nuclear fission and radiation protection.

Spain also participates in programmes for technical assistance to other countries. Until 2006, the TACIS Nuclear Safety Programme was the main instrument of the EU for improving the safety of nuclear installations in third countries, namely in Eastern and Central Europe. Since 2007, the Community assistance to third countries is being provided through the Instrument for Nuclear Safety Cooperation (INSC), which implies an extension of the geographical scope of the aids.

Spain also participates in the Chernobyl Shelter Implementation Plan and is Member of the Contributor Assembly Fund established in the European Bank for Reconstruction and Development (EBRD).

Our country is one of the 31 members of the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), whose objective is to support the safe, sustainable, economic and proliferation-resistant use of nuclear technology to meet the global energy needs of the 21st century.

On Sept 2007, an European Technology Platform on Sustainable Nuclear Energy (SNETP) was launched. This platform aims to support fully through R&D programmes the role of nuclear energy in Europe's energy mix, its contributions to the security and competitiveness of energy supply, as well as the reduction of greenhouse gas emissions. To achieve this objective, SNETP has elaborated a Strategic Research Agenda (SRA). It gathers over 75 members from industry, research, academia, technical safety organisations, etc, including some Spanish organisations or enterprises, as CIEMAT, Deloitte, Endesa, Iberdrola, Empresarios Agrupados, or Tecnatom.

In the context of the European Strategic EnergyTechnology Plan (SET-Plan), it is worth noting the formal launch in November 2010 of the European Sustainable Nuclear Industrial Initiative (ESNII), which is a major initiative to help develop a new generation of nuclear energy reactors designed to respond to Europe's growing energy needs. This

group of industry and research partners will promote Europe's leadership in the development of the so-called Generation IV Fast Neutron Reactor Technology. CIEMAT participates in the task force created under the umbrella of the ESNII.

Moreover, Spain participates in the programmes of Nuclear Energy Agency (NEA/OECD) and International Atomic Energy Agency (IAEA).

2.9. HUMAN RESOURCES DEVELOPMENT

The Spanish Nuclear Sector generates 9,000 direct employments (3,500 of which are superior) and about 10,000 indirect employments. The estimated average age of employers is 45-50 years, so next years a renewal of at least half of the workers will be needed.

Nowadays in Spain the specific nuclear postgraduate training is given to 100-150 people.

The Universidad Politécnica de Madrid in collaboration with Tecnatom, gives a Master on Electric Generation Technologies. The fifth part of this Degree is about nuclear energy subject.

The CIEMAT, which has a wide experience in training on nuclear energy, is developing together with Universidad Autónoma de Madrid the Master Degree on Nuclear Technology: Fission, Fusion and Nuclear Medicine.

Finally, In order to contribute to ensuring that NPP and other industrial facilities have optimally qualified operations, maintenance, engineering and technical support personnel whose performance serve to improve safety, availability and economic efficiency, TECNATOM provides overall training services in the following fields:

- Process technology
- Operation and maintenance
- Materials, non-destructive testing
- Human factors
- Management skills

2.10. STAKEHOLDER COMMUNICATION

Stakeholder communication is present in the activities accomplished by the different organisations related to nuclear energy.

The Nuclear Safety Council's most important mission is to guarantee that people and the environment are protected against radiation, but an essential part of this objective includes working with maximum transparency to ensure that the public is duly informed. The obligations for the Council regarding information and communication are channelled along three routes: information for the state institutions, in the neighbourhood of nuclear installations, and for the general public

With regard to communication, one of the most important means is its website http://www.csn.es, which provides interest groups and the general public with documents which offer detailed information on the work done, including the minutes of the plenary meetings, inspection reports and other useful information such as publications, current regulations, replies to parliamentary questions, operating status of NPPs, events reported by the licensees and the environmental values collected. Furthermore, since 2007 it is possible to access the Integrated Plant Supervision System (SISC), which has become a fundamental tool as regards the transparency of communication with the public on the assessment of NPP performance and the planning of its regulatory efforts.

In addition, Law 33/2007, of November 7th, which modified the Law 15/1980 creating the Nuclear Safety Council, was very ambitious as regards public information, the objective clearly being to increase the transparency of the organisation and promote confidence among the members of the public regarding the activities of the Council. The Law also contemplates the existence of an Advisory Committee for Public Information and Participation, made up of representatives of various social organisations and institutions, the mission of which is to make recommendations to improve transparency and propose measures to stimulate access to information and the participation of the public in areas for which the Council is responsible.

The Ministry of Industry, Tourism and Trade (MITYC), also provides information through its web page http://www.mityc.es. It provides that, prior of the granting of most of the licences for nuclear installations, the corresponding documentation must be transferred to the Autonomous Communities with responsibilities in relation to land planning and the environment whose territory houses the facility. Within the arrangements for the request for the preliminary license of a NPP, a specific public information process is envisaged. According to the Nuclear and Radioactive Facilities Regulation, the MITYC will send a copy of the request to the respective regional Government Office for the latter to open a period of public information, this being initiated through the publication in the Official State Gazette and that of the corresponding Autonomous Community of an extract announcement setting out the objective and the main characteristics of the facility. This announcement shall establish that those persons and entities that consider themselves to be affected by the project may, within 30 days, present whatever written allegations they deem to be appropriate.

As for nuclear regulatory matters, the MITYC publishes in its web page the bills and other general regulation provisions projects as part of the legislative process.

The Nuclear and Radioactive Facilities Regulation contemplates the operation of local information committees, which are forums for information and public participation whose objective is to provide information and education for the local population on nuclear safety and radiation protection, in which respect a programme of annual meeting is held. It is presided over by the MITYC.

As for environmental matters, Spain ratified in 2004 the Aarhus Convention, which is materialised in the national legislation through Law 27/2006, of July 18th, regulating rights of access to information, public participation and access to justice in relation to environmental issues.

3. NATIONAL LAWS AND REGULATIONS

3.1. REGULATORY FRAMEWORK

3.1.1. REGULATORY AUTHORITY(S)

In Spain, the regulatory function in nuclear matters is undertaken by several different authorities:

- The Government is in charge of energy policy and of issuing binding regulatory standards.

- The Ministry of Industry, Tourism and Trade (MITYC) is the Department of the General State Administration responsible for nuclear energy. Its main tasks and duties are:
    - to dictate norms and rules;
    - to grant licenses for:
        - nuclear and radioactive installations;
        - transport of radioactive materials;
        - nuclear materials commerce and trading.

  Other powers are:

- to suspend permits, in some specific cases;
- to sanction the law transgressions;
- to propose the radioactive waste policy;
- to follow up the complying of international commitments as non proliferation, physical protection or civil liability;
- to manage the Administrative Registers on Nuclear items.

- The Nuclear Safety Council (CSN) is the sole Organization competent in nuclear safety and radiological protection matters in Spain. The Council is formed by 5 Commissioners (one of which is the President) which are designated by the Government through a proposal of the MITYC. They must be accepted by a 3/5 majority of the Parliament.

  At present, the technical workforce of the Council consists of around 470 people. It has permanently two resident inspectors at every NPP site. The main tasks of the Council are:

  - to issue the perceptive Safety Reports, previous to the authorization by the MITYC;
  - to carry out all kind of inspections with capability to suspend the activity in case of risk;
  - to propose to the Government norms and rules concerning nuclear safety and radiological protection;
  - to propose to the MITYC sanctions in matters of nuclear safety and radiation protection;
  - to grant licenses for operators of nuclear and radioactive installations;
  - to inform the public about subjects of its competence;
  - to report every year to the Parliament about its activities.

3.1.2. LICENSING PROCESS

The nuclear installation licensing procedure in Spain is regulated by Law 25/1964, of April 29th, on Nuclear Energy, as amended. The provisions of this Law have been

developed by Royal Decree 1836/1999, of December 3rd, approving the Nuclear and Radioactive Facilities Regulation, on the procedure for licensing the nuclear and radioactive installations regulation. To license nuclear installations, the following successive authorizations are needed[3]:

- Preliminary or site authorization, which constitutes an official recognition of the proposed objective and of the suitability of the selected site;
- Construction authorization, which empowers the licensee to start up the construction of the installation;
- Operation authorization, which allows the licensee to load the nuclear fuel in the plant and to operate the installation in accordance with the conditions set out in the authorisation.

For plant dismantling and plant modification, an authorization is required prior to the activity. Figure 2 shows the nuclear installation licensing procedure. These authorizations and permissions are granted by the MITYC, under previous and perceptive report referring to nuclear safety and radiological protection issued by the CSN. This report is binding if negative in its findings or denying authorisation, or as regards the conditions established when positive.

To obtain these authorizations and permissions, the documents determined in the current regulations must be submitted to the licensing authorities and the suitable tests, analyses and validations must be performed. Nuclear installations require authorizations granted by other administrative bodies, belonging to local administrations, according to the rules of these bodies, although these can not be denied or conditioned for safety-related reasons. Before granting the preliminary or the decommissioning authorization, a 30 days period is established for public hearings. During this period anyone can present allegations. This public information process is developed jointly with the information process required for the Environmental Impact Assessment, which must be approved by the Ministry of the Environment and Rural and Marine Affairs.

[3] Other authorisations are requested during the lifetime of a NPP: authorisation for modification, authorisation for modification performance and assembly, dismantling permit and declaration of decommissioning.

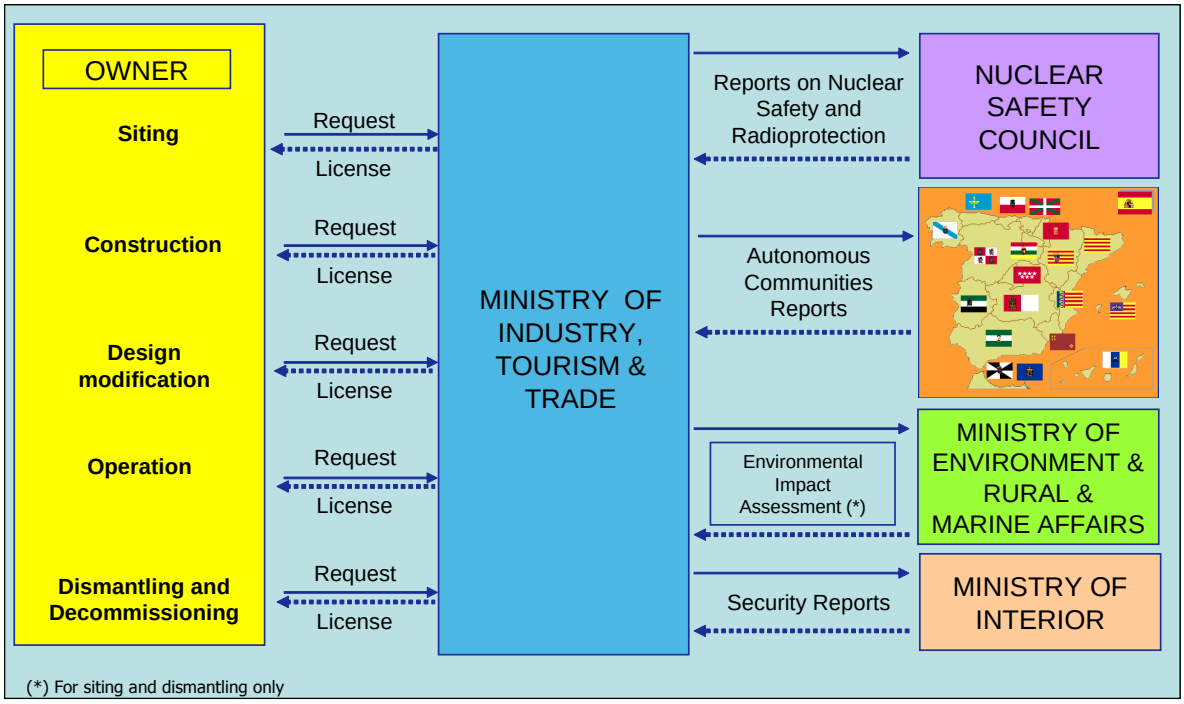

FIG. 2. Licensing of nuclear installations

3.2. MAIN NATIONAL LAWS AND REGULATIONS IN NUCLEAR POWER

In Spain, nuclear power is governed by a large number of provisions in the form of Laws, Royal Decrees and Ministerial Orders. In a more detailed level, the CSN approves instructions, which are binding technical standards, as well as other non binding documents.

The main provisions are the following:

- The Nuclear Energy Act, as amended (Law 25/1964, of April 29th, on Nuclear Energy; Official State Gazette 04.05.1964). It defines basic concepts: identification of administrative authorities and organisations, system of authorisations of nuclear and radioactive facilities and for the possession and use of radioactive materials, measures for safety and protection against ionising radiations, nuclear third party liability for nuclear damages or sanctions regime. Recently, this law has been modified by Law 11/2009, of October 26th (Official State Gazette 27.10.2009) in order to regulate some provisions related to the radioactive waste management, which are detailed in other sections of this document.

- The regulatory body (CSN) is governed by the provisions of Law 15/1980, of April 22nd, creating the Nuclear Safety Council (Official State Gazette 25.04.1980), and by its Statute, approved by Royal Decree 1440/2010, of November 5th (Official State Gazette 22.11.2010). Several acts and regulations have amended some of the initial provisions, particularly Law 14/1999, of May 4th, governing Public Tariffs and Prices for its services (Official State Gazette 05.05.1999). More recently, Law 15/1980 has been amended by Law 33/2007, of November 7th (Official State Gazette 08.11.2007) in order to take into account: the acquired experience during the last years, add all the amendments from 1980, adapt it to the increasing social sensibility related to environment, add the required mechanisms that manage to guarantee the effective independence and reinforce both transparency and efficiency of such Council.

- The Nuclear Energy Act has been developed by Royal Decree 1836/1999, of December 3rd, approving the Nuclear and Radioactive Facilities Regulation (Official State Gazette 31.12.1999) and by Royal Decree 783/2001, of July 6th, which formulates the Regulation of Sanitary Protection against Ionised Radiation (Official State Gazette 26.07.2001), and substitutes the previous one, in force since 1992. Nuclear and Radioactive Facilities Regulation was recently amended by Royal Decree 35/2008, of January 18th, (Official State Gazette 18.02.2008). For its part, Royal Decree 783/2001 has been recently amended by Royal Decree 1439/2010, of November 5th (Official State Gazette 18.11.2010), in order to modify some provisions related to natural sources of ionising radiation.

- In addition to the Nuclear and Radioactive Facilities Regulation, there are other more specific Regulations governing radioactive substance or facilities, in particular Royal Decree 1085/2009, of July 3rd, approving the Regulation on the installation and use of medical diagnosis X-ray devices (Official State Gazette 18.07.2009), or Royal Decree 229/2006, of February 24th, on the control of high activity encapsulated radioactive sources and orphan sources (Official State Gazette 28.02.2006).

- In addition to the Regulation of Sanitary Protection against Ionised Radiation, the Spanish legislation includes other standards relating to radiation protection, in particular: Royal Decree 1132/1990, of September 14th, which establishes fundamental measures for the radiological protection of persons submitted to medical examinations and treatments (Official State Gazette 18.09.1990); Royal Decree 413/1997, of March 21st, on operational protection of off-site workers exposed to ionising radiations as a result of their intervention in the controlled zone (Official State Gazette 16.04.1997); or Royal Decree 815/2001, of July 13th,

on justification of the use of ionising radiations for the radiological protection of persons submitted to medical exposures (Official State Gazette 14.07.2001).

- The provisions related with nuclear fuel cycle, initially contained in a Royal Decree of 1979, are at present covered by different legal texts. Royal Decree 1464/1999, of September 17th (Official State Gazette 05.10.1999), governs the front-end of nuclear fuel cycle and tends to liberalize the supplies, according to Law 54/1997, of November 27th, on the Electric Sector (Official State Gazette 28.11.1997).

- Several Acts and Decrees are applicable to the back end of the fuel cycle (apart from the Nuclear Energy Act), among others the following:

    - Royal Decree 1349/2003, of October 31st, on regulation of ENRESA activities and funding (Official State Gazette 08.11.2003).

    - The sixth additional provision of Law 54/1997, of November 27th, on the Electric Sector (Official State Gazette 28.11.1997), recently amended by Law 11/2009, regulates the fund for the financing of radioactive waste and spent fuel management, including the dismantling and decommissioning of nuclear facilities, known as the "Fund for the financing of activities included in the General Radioactive Waste Plan".

- Civil nuclear liability for nuclear damage, currently regulated under the Nuclear Energy Act, is ruled in accordance with the principles on International Conventions in this field in which Spain is Contracting Party (Paris and Brussels Conventions). In year 2004, these Conventions were modified. In order to adapt these modifications to Spanish regulation on this item, a new bill on nuclear third party liability is being discussed in the Parliament, which is expected to be approved in 2011. In the past years, the amount imposed to operators to cover the civil liability has been modified in accordance with the OECD recommendations. Currently, this amount is established in of 700 million euros, according to the modifications introduced by Law 17/2007. A lower limit can be imposed by the MITYC to installations and transports of lower risk, provided that the amount is not inferior to 30 millions euros. The new bill will presumably impose an obligation upon the operators of 1.200 million euros.

- Spanish regime in relation to safeguards and non-proliferation is governed by the Euratom Regulation nº 302/2005, which enacts chapter VII on the control of

security of the Euratom Treaty. The Additional Protocol to the Safeguards Agreement signed jointly between State, Euratom and the IAEA, is adapted by means of Royal Decree 1206/2003, of September 19th, for the application of the commitments undertaken by the Spanish State in the Additional Protocol to the Safeguards Agreement deriving from the Treaty on the non-proliferation of nuclear weapons (Official State Gazette 08.10.2003).

- As for physical protection, Royal Decree 158/1995, of February 3rd, on the physical protection of nuclear materials (Official State Gazette 04.03.1995), establishes the basis for the creation, implementation and maintenance of a complete control and security system for nuclear facilities and materials, considering that Spain is party to the IAEA Convention on the Physical Protection of Nuclear Material. This Royal Decree is currently being revised in order to adapt it to the 2005 Amendment of the mentioned Convention.

- The commercial regime for imports and exports is determined by the EU regulations and specific national legislation, as Law 53/2007,of December 28th, on the control of overseas trading of defence and dual-use materials (Official State Gazette 29.12.2007), and developed by Royal Decree 2061/2008, of December 12th (Official State Gazette 07.01.2009).

- Mining regime is regulated by the Mines Act (Act 22/1973), of July 21st, (Official State Gazette 24.07.1973), and by Royal Decree 2857/1978, of August 25th, approving the General Regulation for the Mining Sector (Official State Gazette 11.12.1978), as well as by the Nuclear Energy Act.

- As for emergency response, the planning and preparation for nuclear emergency situations is regulated basically by the Basic Nuclear Emergency Plan (PLABEN), approved by Royal Decree 1546/2004, of June 25th (Official State Gazette 14.07.2004), and modified by Royal Decree 1428/2009, of September 11th (Official State Gazette 12.09.2009), and by the Nuclear and Radioactive Facilities Regulation.

- Transport of radioactive materials is regulated in a great number of provisions, including, among others, the Nuclear Energy Act, the Nuclear and Radioactive Facilities Regulation, as well as other more specific standards applicable to the transport of hazardous goods.

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APPENDIX 1: INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

In 1985, Spain adhered to the Treaties that constitute the European Communities and in January 1st 1986 Spain became a European Communities Member State. From this moment, international and national legislation applicable in Spain is accomplished according to the rules of the European Union.

Moreover, Spain is a Member State of the IAEA and of the OECD/NEA, whose Constitutive Treaties, Conventions and additional Treaties have been ratified.

Area	Treaty	Document	Signature	Spanish Signature	Effect Date	Effect Date for Spain
Euratom	Euratom		25.03.1957		01.01.1958	01.01.1986
Safeguards	NPT (Nuclear Non-Proliferation Treaty)	INFCIRC/140	01.07.1968		05.03.1970	05.11.1987
	Agreement between the European Atomic Energy Community and the Agency in implementation of Article III (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons	INFCIRC/193	05.04.1973		21.02.1977	05.04.1989
	Protocol additional to the Agreement between the European Atomic Energy Community and the International Atomic Energy Agency for the Application of Safeguards	GOV/1998/30	22.09.1998	22.09.1998	30.04.2004	30.04.2004
Physical Protection	Convention on the Physical Protection of Nuclear Material	INFCIRC/274/Rev1	03.03.1980	07.04.1986	08.02.1987	06.10.1991
	Amendment to the Convention on the Physical Protection of Nuclear Material		08.07.2005		Not yet	Not yet
Civil Liability	Vienna Convention on Civil Liability for Nuclear Damage and its Protocol to Amend (IAEA)	INFCIRC/500 INFCIRC/566	21.05.1963 Revised: 12.09.1997	Signed 1963 convention (not the amendment)	12.12.1977 Revised: 04.10.2003	
	Paris Convention on Civil Liability for Nuclear Damage 1960,1964,1982 (OECD)		29.07.1960 28.01.1964	29.07.1960 28.01.1964	01.04.1968 07.10.1988	07.10.1988

Area	Treaty	Document	Signature	Spanish Signature	Effect Date	Effect Date for Spain
			16.11.1982	16.11.1982		
	Protocol to Amend the Paris Convention on Civil Liability for Nuclear Damage (2004) (OECD)		12.02.2004	12.02.2004	Not yet	Not yet
	Brussels Supplementary Convention to Paris Convention on Civil Liability for Nuclear Damage (OECD)		31.01.1963 28.01.1964 16.11.1982	31.01.1963 28.01.1964 16.11.1982	Dec-74 01.08.1991	01.08.1991
	Protocol to Amend the Brussels Supplementary Convention (2004) (OECD)		12.02.2004	12.02.2004	Not yet	Not yet
	Convention on supplementary compensation for nuclear damage (IAEA)	INFCIRC/567	29.09.1997	No signature	Not yet	
	Joint Protocol relating to the application of the Viena Convention and the Paris Convention (IAEA & OECD)	INFCIRC/402	21.09.1988	21.09.1988	27.04.1992	Not yet
Nuclear Safety	Convention on Nuclear Safety	INFCIRC/449	20.09.1994	15.10.1994	24.10.1996	24.10.1996
	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	INFCIRC/546	05.09.1997	30.06.1998	18.06.2001	18.06.2001

Area	Treaty	Document	Signature	Spanish Signature	Effect Date	Effect Date for Spain
Nuclear Tests	CTBTO (Comprehensive nuclear test ban treaty organization)		10.09.1996	24.09.1996	No yet, waiting for the signature of some required states, such as India, Pakistan or USA	No yet, waiting for the signature of some required states, such as India, Pakistan or USA
	Partial test ban (Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water)		05.08.1963	13.08.1963	10.10.1963	17.08.1964
Nuclear Accidents	Convention on Early Notification of a Nuclear Accident	INFCIRC/335	26.09.1986	26.09.1986	27.10.1986	14.10.1989
	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	INFCIRC/336	26.09.1986	26.09.1986	26.02.1987	14.10.1989
IAEA	Agreement on the Privileges and Immunities of the International Atomic Energy Agency	INFCIRC/9 Rev2	01.07.1959	Approved by Border Governors	29.07.1960	21.05.1984
	Revised Supplementary Agreement Concerning the Provision of	RSA	not apply	10.06.1980	not apply	10.06.1980

Area	Treaty	Document	Signature	Spanish Signature	Effect Date	Effect Date for Spain
	Technical Assistance by the IAEA					
	Agreement on the Privileges and Immunities of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project	INFCIRC/703	21.11.2006	EURATOM	24.10.2007	24.10.2007
Nuclear Terrorism	International Convention for the suppression of International Terrorism		13.04.2005	14.09.2005	07.07.2007	07.07.2007
Others	Antarctic Treaty		01.12.1959		23.06.1961	31.03.1982
	Sea-bed treaty		11.02.1971		18.05.1972	15.07.1987
	Outer Space Treaty…Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space…		27.01.1967		10.10.1967	
Groups	Zangger Committee	INFCIRC/209	24.05.1905	01.05.1993		
	Nuclear Suppliers Group (NSG)	INFCIRC/254 parts I y II	27.05.1905	10.06.1905		
	Wassenaar Agreement		19.12.1995	19.12.1995		

APPENDIX 2: MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

Name of report coordinator

Institution

Contacts

NATIONAL ATOMIC ENERGY AUTHORITY

Ministerio de Industria, Turismo y Comercio	Tel: +34 902 44 60 06
Paseo de la Castellana, 160	Fax: +34 91 457 80 66
E-28046 Madrid	http://www.mityc.es

Consejo de Seguridad Nuclear (CSN)	Tel: +34 91 346 01 00
Nuclear safety and radiological protection	Fax: +34 91 346 05 88
Justo Dorado Dellmans, 11	http://www.csn.es
E-28040 Madrid	

MAIN POWER UTILITIES

Trillo	http://www.cnat.es
Vandellós II	http://www.anav.es
Almaraz	http://www.cnat.es
Ascó	http://www.anav.es
Santa María de Garoña	http://www.nuclenor.org

Cofrentes	http://www.cncofrentes.es/

OTHER NUCLEAR ORGANIZATIONS

CIEMAT	
Research and development centre	Tel.: +34 91 346 60 00
Avenida Complutense, 22	Fax: +34 91 346 60 05
E-28040 Madrid	http://www.ciemat.es
UNESA	
Asociación Española de la Industria Eléctrica-	Tel.: +34 91 567 49 00
Francisco Gervás, 3	Fax: +34 91-567 49 88
28020 Madrid	http://www.unesa.es
TECNATOM, S.A.	
Service inspection and maintenance	Tel.: +34 91 659 86 00
Avenida Montes de Oca, 1	Fax: +34 91 659 86 77
28703 San Sebastián de los Reyes (MADRID)	http://www.tecnatom.es
EMPRESARIOS AGRUPADOS A.I.E.	Tel.: +34 91 309 80 00
Architect-Engineering	Fax: +34-91 591 26 55
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ENRESA	
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ENUSA

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Tel.: +34 91 347 42 00

Fax: +34 91 347 42 15

http://www.enusa.es

The EURATOM-CIEMAT

Association for fusion (Spain)

http://www-fusion.ciemat.es

CEIDEN

Technology Platform on Fission Nuclear Energy

http://www.ceiden.com

Nuclear Engineering Department

Polytechnic University of Madrid

http://www.din.upm.es

Iberdrola

http://www.iberdrola.es

Endesa

http://www.endesa.es

Gas Natural Fenosa

http://www.gasnatural.com

Spanish Nuclear Industrial Forum

http://www.foronuclear.org

Spanish Nuclear Society (SNE)

http://www.sne.es

Attachment 1: PREFIXES AND CONVERSION FACTORS

TABLE 1. PREFIXES

Symbol	Name	Factor
E	exa	10^{18}
P	peta	10^{15}
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
K	kilo	10^{3}
H	hecto	10^{2}
da	deca	10^{1}
D	deci	10^{-1}
C	centi	10^{-2}
M	mili	10^{-3}
µ	micro	10^{-6}
η	nano	10^{-9}
P	pico	10^{-12}
F	femto	10^{-15}
A	atto	10^{-18}

TABLE 2. CONVERSION FACTORS FOR ENERGY

To:	TJ	Gcal	Mtoe	MBtu	GWh
From:	Multiply by:				
TJ	1	238.8	2.388×10^{-5}	947.8	0.2778
Gcal	4.1868×10^{-3}	1	10^{-7}	3.968	1.163×10^{-3}
Mtoe	4.1868×10^{4}	107	1	3.968×10^{7}	11630
Mbtu	1.0551×10^{-3}	0.252	2.52×10^{-8}	1	2.931×10^{-4}
GWh	3.6	860	8.6×10^{-5}	3412	1

TABLE 3. CONVERSION FACTORS FOR MASS

To:	kg	T	lt	st	lb
From:	Multiply by:				

kg (kilogram)	1	0.001	9.84×10^{-4}	1.102×10^{-3}	2.2046
T (tonne)	1000	1	0.984	1.1023	2204.6
Lt (long tonne)	1016	1.016	1	1.12	2240.0
st (short tonne)	907.2	0.9072	0.893	1	2000.0
lb (pound)	0.454	4.54×10^{-4}	4.46×10^{-4}	5.0×10^{-4}	1

TABLE 4. CONVERSION FACTORS FOR VOLUME

To:	**US gal**	**UK gal**	**bbl**	**ft^3**	**L**	**m^3**
From:	Multiply by:					
US gal (US gallon)	1	0.8327	0.02381	0.1337	3.785	0.0038
UK gal (UK gallon)	1.201	1	0.02859	0.1605	4.546	0.0045
bbl (barrel)	42.0	34.97	1	5.615	159.0	0.159
ft^3 (cubic foot)	7.48	6.229	0.1781	1	28.3	0.0283
l (litre)	0.2642	0.22	0.0063	0.0353	1	0.001
m^3 (cubic metre)	264.2	220.0	6.289	35.3147	1000	1