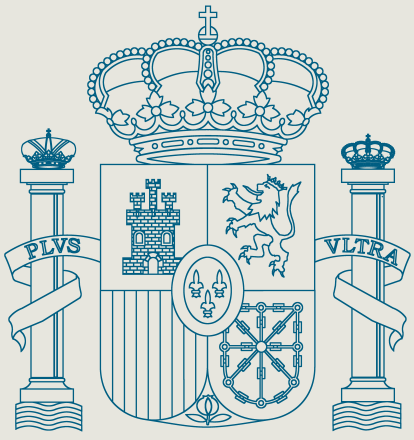
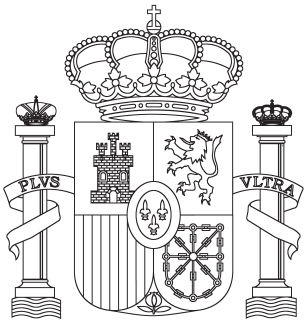



# SPAIN

# Convention on Nuclear Safety

## Sixth National Report




# SPAIN

# Convention on Nuclear Safety

# Sixth National Report

## August 2013

**Edita y distribuye:**
Consejo de Seguridad Nuclear
C/ Pedro Justo Dorado Dellmans, 11. 28040 Madrid (España)
www.csn.es
peticiones@csn.es

**Imprime:** Fareso, S. A.

Depósito Legal: M-23.174-2013

# Table of contents

# Introduction

## Presentation of the Report

This document is the sixth Spanish National Report which has been prepared to comply with the obligations derived from the Convention on Nuclear Safety, done in Vienna on 20 September 1994, in accordance with the provisions of articles 5, 20, 21 and 22 of said Convention. Its content refers to the data and circumstances arising from January 2010 to January 2013 (both inclusive).

## Drawing up of the Report

The report was drawn up by the Nuclear Safety Council, the body which is solely responsible for nuclear safety and radiation protection within the Spanish State, is independent from the Government and reports exclusively to the Spanish Parliament. In compliance with the commitments made during the second review meeting, the licensees of Spanish nuclear power plants, coordinated by the Spanish Electricity Industry Association (UNESA), and the Ministry of Industry, Energy and Tourism (MINETUR) took part in the drafting of this report.

The report has been drawn up following the same structure as that used for the articles of Chapter 2 "Obligations" of the text of the Convention, starting from Article 6. Each article includes relevant information on the content of each obligation, the activities of the licensee and those of the regulatory body having been divided into separate sections, and a brief assessment of the degree of compliance in Spain with the requirements established therein.

A chapter on conclusions has been added whose aim is to summarise the commitments made during the fifth review meeting, as requested in the guidelines, and to point out the challenges for the future and the initiatives that are expected to be implemented in the near future. Likewise, a subchapter has been included in said chapter where the actions which have been carried out by Spain as a result of the accident that took place at Fukushima Daiichi nuclear power plant (NPP) have been set out, in compliance with the commitment made by the Contracting Parties during the second extraordinary review meeting of the Convention on Nuclear Safety.

**The National Report includes several Annexes that expand on and detail the information set forth in the articles.**

The content and scope of this sixth report for the Convention are based on the recommendations established in INFCIRC/572/Rev 4 "Guidelines regarding national reports under the Convention on Nuclear Safety," which was approved during the second extraordinary review meeting of the Contracting Parties held in August 2012. This report also includes the commitments made by the Contracting Parties, which were set out in the summary Report, and the technical aspects identified in the abovementioned second extraordinary meeting.

## Basic description of the Spanish nuclear programme and of the role of nuclear energy in the Spanish energy policy

In Spain there are currently eight light water nuclear reactors in operation located at six mainland sites, representing an installed power of 7,864.7 MWe, which amounts to 7.41% of the total

installed electricity generating capacity and around 20% of the total national energy production. Six of the units are pressurised water reactors (PWRs) and the other two are boiling water reactors (BWRs). The average life of the units currently in operation is 30 years.

In addition, there are two reactors in the dismantling stage. José Cabrera NPP ceased to operate in 2006; and in 2010 its ownership was transferred to ENRESA (the Spanish Radioactive Waste Management Agency), which was granted the authorization to dismantle it – a process which is expected to take 6 years. For its part, Vandellós I NPP, which ceased operation in 1989, is currently in the dormancy period after having reached the second phase of the dismantling process.

The purpose of the Spanish energy policy is to guarantee the safety of supply, to improve the competitiveness of the Spanish economy and to meet the environmental goals, striving to achieve a balanced and diversified contribution of the different available energy sources.

Thus, given that Spain is one of the European Union's member States with greater dependency on external energy supplies, provided that the Spanish NPPs currently in operation fulfil the safety requirements which are imposed on them by the Nuclear Safety Council (CSN) and as long as their licensees maintain their interest in their operation, the Spanish Government considers that they must continue to contribute to the safety of energy supply in Spain, the optimisation of energy costs and the reduction of the emission of greenhouse gases.

As regards the fuel cycle, ever since the 1983 National Energy Plan, spent fuel has been considered a waste and the option of reprocessing is not contemplated, the only exception being the spent fuel from Vandellós I NPP, for technical reasons.

# Chapter 2. Obligations

## a) General provisions

## Article 6. Existing nuclear installations

This article describes the most relevant safety issues that have arisen and improvement programmes that have been developed since the last national report in relation to the Spanish fleet of nuclear power plants in operation. Appendix 6.A contains updated data on the nuclear installations existing in Spain which fall within the scope of the Convention.

### 6.1 Most significant nuclear safety issues, including the events which have occurred at Spanish nuclear installations in the last three years and the measures adopted to correct them

**Almaraz NPP**

On 7 June 2010, the Ministry of Industry, Tourism and Trade (MITYC) granted Almaraz NPP the renewal of its Operating Licence (OL) for a period of ten years. The OL included a requirement for the plant to implement a series of safety improvements – which are set forth in section 6.2.

On 27 December 2010, the MITYC approved an 8% power uprate in Unit II to 2,947 MWt (the same uprate had been approved for Unit I on 18 December 2009).

No events above Level 0 in the INES Scale occurred during the three-year period which this report covers.

However, the CSN identified an inspection finding, which it categorised as White according to its Integrated Plant Supervision System (SISC). The Finding, from the first half of 2012, consisted in the plant not having an appropriate dedication system for components installed in safety systems. Consequently, a series of components installed in safety systems were listed whose (seismic, environmental) qualification had not been previously checked. These components belonged to the following types: electrolytic capacitors, cables, relay bases, bearings, connectors, ventilation unit belts, pulleys, pigtails, filters, fuses, diodes, relays, and so forth. After analysing the situation, Almaraz NPP issued an anomalous condition for each type of component and arrived at the conclusion that the plant could still operate with all of them, although it immediately launched a plan to complete the replacement or dedication of all of them.

**Ascó NPP**

On 27 September 2011, the Ministry of Industry, Tourism and Trade granted the renewal of the plant's Operating Licence (OL) for a period of ten years. The OL included a requirement to implement a series of safety improvements – which are set forth in section 6.2.

During the time period which is the subject of this report, all reported events were of Level 0 in the INES Scale, except five Level-1 events, two of which were dual events, that is, they affected both Unit I and Unit II. The five events are listed below:

- On 21 January 2011 the CSN discovered a non-compliance with Ascó I's and Ascó II's Plant Technical Specifications (PTSs) due to a gate exceeding the allowed weight being moved above

spent fuel assemblies stored in the spent fuel pool. The gate is used to separate the spent fuel pool from the transfer channel. This manoeuvre had always been performed at the plant but in the last few cycles it involved going over a part of the pond which housed spent fuel. The calculations and estimates showed that there would not have been any loss of fuel integrity if the gate had fallen on top of the spent fuel elements. Nevertheless, administrative measures were taken to prevent this from happening again.

- On 25 January 2011, during a test on the essential service water system, Ascó NPP discovered that the valves through which the water is supplied from the pond to the system's cooling towers could not open the whole way. The reason for this opening restriction was that the valve plugs had become stuck due to the water having frozen as a result of below-freezing temperatures.

  The analysis which was performed to calculate the flow rate which could have flowed past the partially opened valves concluded that the safety function had not been compromised at any time. The water level in the essential towers remained at all times above 88%, a value which is greater than that required by Plant Technical Specifications.

  A design modification was made to guarantee the operability of these valves in said conditions, and the procedure to check them in extreme weather conditions was revised. The CSN carried out a reactive inspection and issued a generic requirement to ensure that the other Spanish NPPs applied the lessons learnt from this experience.
- On 27 April 2011, while Unit I was undergoing its refuelling outage, a procedure was conducted to verify the proper actuation of safety systems in the event of a loss of coolant. One of the valves that connect the residual heat removal system with the sumps in the containment was opened by mistake, which caused reactor cooling water to be transferred from the primary circuit to the containment sumps. The event was caused by the execution of a surveillance procedure without having checked whether the necessary initial conditions were satisfied, in particular, without de-energising the actuator of the valve connecting the reactor coolant system and the containment sumps. The CSN performed a reactive inspection and required the licensee to take a series of corrective actions, mainly to increase equipment clearance/tagout management verifications during refuelling outages.
- On 16 August 2010, Ascó I reported a wiring deficiency which could have prevented the essential cooling pumps from being automatically started by a safety injection signal, even though they would have started thanks to another process signal.
- On 9 November 2012, the licensee reported that there had been a failure in the pressuriser's low-pressure safety injection signal interlock, when the reason for the actuation had been the low pressure in the secondary circuit (which affected both plant units).

**Cofrentes NPP**

On 10 March 2011, the Ministry of Industry, Tourism and Trade (MITYC) renewed the plant's Operating Licence (OL) for a period of ten years. The OL included a requirement to implement a series of safety improvements – which are set forth in section 6.2.

An important improvement made during this three-year period was the replacement of the Emergency Response Information System (ERIS)-plant computer integrated system with a more advanced system.

During the time period which is the subject of this report, all reported events corresponded to Level 0 in the INES Scale save one – a Level-1 event. The CSN's resident inspectors noticed that the level transmitters in the borated water storage tank of the standby liquid control system were indicating a level greater than the actual one because their calibration did not consider the correction for the density of the liquid held in the tank (a solution of sodium pentaborate in water); once said correction was applied, the resulting volume was slightly below the limit required in

the Plant Technical Specifications. However, it was verified that the mass of sodium pentaborate dissolved in the water was greater than that required to guarantee the system's function.

**Santa María de Garoña NPP**

During the time period which is the subject of this report, the plant operated according to its Operating Licence, which was granted by the Ministry of Industry, Tourism and Trade on 3 July 2009 and whereby 6 July 2013 was set as the date for the permanent cessation of the operation of Santa María de Garoña NPP, its operation being authorised until that date.

No events above Level 0 in the INES Scale took place during the three-year period which this report covers.

On 16 December 2012, the licensee moved all the fuel in the reactor core into the irradiated fuel pool; according to what it told the Ministry of Industry, Energy and Tourism and the Nuclear Safety Council, this decision was motivated by the new legislation on the tax regime that now applies to the nuclear fuel present in the Plant.

On 28 December 2012, the licensee requested the Ministry of Industry, Energy and Tourism to declare the permanent cessation of operation.

**Trillo NPP**

As set out in the previous Convention on Nuclear Safety report, Trillo NPP has experienced since it started operating excessive noise in the neutron flux, as other plants of KWU-Siemens-AREVA design, particularly those fitted with steam generators provided with an "economiser" to improve the performance of the thermodynamic cycle, as is Trillo's case.

After the analyses performed by the licensee and the CSN it was concluded that, apart from the base noise associated with stochastic fluctuations of the local neutron population, the noise was mainly the result of the temperature stratification in the coolant on leaving the reactor, which becomes amplified at the steam generators' outlet due to the presence of the economiser, which causes local power variations owing to the effect of the moderator's temperature coefficient of reactivity. Since this coefficient becomes more negative as the fuel burns up, this noise increases as the cycle advances. The noise has been becoming louder in successive cycles due to the gradual increase of the fuel's enrichment. Nevertheless, the CSN considers that not all mechanisms behind this noise are accurately known yet.

The neutron flux signal has an electronic filter set to 6%; in 2012 the licensee requested to raise it to 8% but the CSN decided not to allow this increase until it had more precise information about all the mechanisms that generate the noise and, hence, their possible associated consequences.

Apart from that, no events above Level 0 in the INES Scale occurred during the three-year period covered by this report.

As a result of an inspection conducted on July 2011, the CSN detected the use of non-qualified spare parts which had not been subjected to a dedication process to guarantee that all applicable safety requirements were fulfilled. The components installed in safety equipment without having been subjected to a dedication process belonged to the following kinds: bearings, drive belts, battery charger electrolytic capacitors, several (water, oil and filter mats) filters, relays, magneto-thermal switches, boron analysis electrode (pH), and various items installed in I&C equipment. The reason for this was that there was no appropriate procedure in place that included a process for checking the dedication of commercial-grade components which were going to be used as safety components; this deficiency was classified by the CSN as a white inspection finding in accordance with its Integrated Plant Supervision System (SISC).

When there were spares available, the components were replaced with other qualified components; otherwise, they were dedicated and, in certain cases, the corresponding anomalous conditions were opened and the existence of a "reasonable operability expectation" justified.

**Vandellós II NPP**

On 21 July 2010, the Ministry of Industry, Tourism and Trade (MITYC) renewed the plant's Operating Licence (OL) for a period of ten years. The OL included a requirement to implement a series of safety improvements – which are set forth in section 6.2.

Two Level-1 events according to the INES Scale happened during the time period covered by this report; the rest were Level-0 events.

The first Level-1 event consisted in the detection by the CSN's resident inspectors that the safety valve setpoint verification tests did not satisfy all of the applicable requirements of the ASME Code; in particular, a test fluid different from the process fluid (air instead of water) was being used, a deficiency which was immediately corrected.

The second Level-1 event was the result of the CSN's resident inspectors detecting that a series of small-diameter instrumentation line connections to pipes of safety systems were left permanently open instead of being isolated once the corresponding pressure, flow rate or other such check was completed, something which could have compromised the safety system's operability in case of an earthquake, since these lines lack seismic qualification downstream from their isolation valve. This deficiency was also corrected at once.

Both incidents gave raise to two reactive inspections by the CSN to gather more information about the extent of the problems and to make sure they were solved.

## 6.2 Planned measures and plans for the continuous improvement of safety, where appropriate, of the different-generation installations

**Almaraz NPP**

Almaraz's OL includes all conditions relating to the programmes for the continuous improvement of safety set by the CSN, among which the following can be pointed out:

- Completing the life management studies according to the regulations recently issued by the CSN (Council Instruction IS-22, on Life Management).
- Installing a remote shutdown panel for each Unit (Unit I in 2013 and Unit II in 2014) to guarantee the plant can operate in the event of a fire anywhere in the plant.
- Making a series of improvements in the fire protection systems. The most important one is the installation of a water makeup and distribution system which can withstand the design-basis earthquake in areas containing systems important to safety.
- Installing an additional air ventilation and filtering system in each unit's fuel building and making improvements in different air ventilation and filtering systems around the plant.
- Making different improvements in electrical systems.

Additionally, the CSN issued a series of Complementary Technical Instructions (ITCs) whereby it called for another set of improvements, the following among them:

- Improvements in the containment building's sumps in order to prevent them from clogging in case of a LOCA.
- Different improvements regarding the management of severe accidents.

On the other hand, and at its own initiative, Almaraz NPP replaced the obsolete Mechanised Operation Support System [Sistema de Ayuda Mecanizada a la Operación (SAMO)] with new equipment and components fitted with microprocessors and digital electronics, which provide communication, self-diagnosis, processor redundancy and other capabilities that result in more precision, reliability, ease of maintenance management, and operation support.

**Ascó NPP**

Ascó NPP's OL contains all conditions relating to the programmes for the continuous improvement of safety set by the CSN, among which the requirement to complete by 2012 the introduction of its Cultural and Technical Organisational Reinforcement Plan [Plan de Refuerzo Organizativo Cultural y Técnico (PROCURA)], which was launched to tackle the root causes of the event involving the release of radioactive particles outside the controlled area of Unit 1 – reported to the CSN on 4 April 2008 and already mentioned in the Fifth Convention on Nuclear Safety Report, stands out.

This Plan, which was approved by the CSN, began to be applied in 2009 and lasted until 2012, and consisted of six lines of improvement:

- Safety policies, in order to institute a proactive culture at the plant's installations and reinforcing the commitment of all personnel to said safety policies.
- Technical resources and training, to strengthen the human resources in areas that have weaknesses.
- A decision-making process, for management to base its decisions on conservative assumptions based on the WANO methodology.
- Teamwork and inter-departmental communication.
- A problem identification and resolution process.
- A cultural and behavioural reinforcement programme.

Among the activities which were carried out as part of the PROCURA Plan it is worth mentioning that the licensee completely decontaminated the plant's site and the fuel building's ventilation system, save for those system ducts which were impossible to take apart, which were replaced in 2012 with new ones; therefore, the system was fully decontaminated.

The implementation of the Plan, which was closely watched by the CSN by means of inspections, ended in December 2012. The only pending task is the assessment of the effectiveness of the measures taken, which is currently under way and is expected to be completed by June 2013.

Additionally, the CSN issued a series of Complementary Technical Instructions (ITCs) whereby it required the licensee to make another round of improvements, the following among them:

- Replacing the SAMO-SPDS (Sistema de Apoyo Mecanizado a la Operación-Safety Parameter Display System) process computer system with a system with up-to-date technology.
- Thoroughly checking the qualification and obsolescence of spare parts for nuclear-class equipment.
- Improving the management of severe accidents.
- Making improvements to the ventilation, spent fuel pond temperature and Class-1E DC systems.

**Cofrentes NPP**

Cofrentes NPP's OL contains all conditions relating to the programmes for the continuous improvement of safety set by the CSN, among which the requirement for revising the operational dose reduction plan so that it includes quantifiable goals and precise milestones –given that operational doses in this plant are excessively high, even though they are still within legal limits– is worth mentioning. The new plan was revised by the Electric Power Research Institute (EPRI), which made a series of recommendations to improve it, and evaluated by the CSN, which is monitoring its implementation by means of inspections.

Additionally, the CSN issued a series of Complementary Technical Instructions (ITCs) whereby it required the licensee to make another round of improvements, the following among them:

- Completing the dossiers on the environmental qualification of electrical penetrations and cables, which the licensee had been compiling during the Periodical Safety Review Process but had not finished since the Operating Licence had been renewed.
- Making different improvements regarding protection against on-site flooding.
- Making improvements regarding the management of severe accidents.

**Santa María de Garoña NPP**

The licensee had carried out before 1 March 2012 all improvements associated with the Operating Licence from July 2009, among which the following design modifications can be mentioned:

- Instrumentation and control of the emergency core cooling systems (ECCSs), to optimise the protection logic of the high pressure injection system turbine-driven pump and the initiation logic of the automatic depressurisation system; the manual actuation of the entire system comprising all ECCSs was introduced.
- Instrumentation and control of the containment isolation system: the manual actuation of the different isolation groups making up this system was introduced, and a new isolation group was created.
- Ventilation systems: all air conditioners in the rooms of the ECCSs were replaced with new units in keeping with currently applicable regulations.
- Fire protection systems: detection systems and isolation dampers were installed in those areas which had none; the physical separation between components running on liquid fuels was improved; and the possibility of isolating the fire protection water supply ring by sector was improved.
- Containment isolation devices: new isolation devices were installed and currently existing devices were improved and tested.
- Electrical separation: improvements were made in the separation of redundant components of safety systems, which complemented the separation of the components for safe shutdown in the event of a fire which was the plant had before.

**Trillo NPP**

The most significant safety improvement action consisted in the CSN requiring Trillo NPP to introduce a design modification for the installation of a primary feed & bleed system to prevent the vessel from failing in certain accident scenarios beyond the plant's design basis. The modification consisted in qualifying the mechanisms for manually opening and closing the pressuriser's relief and safety valves from the control room so that they are able to actuate under beyond-design-basis accident conditions. This is expected to take place during the refuelling outage of 2013.

**Vandellós II NPP**

Vandellós NPP' OL includes all conditions relative to the programmes for the continuous improvement of safety set by the CSN, among which the following requirements can be highlighted:

- Completing the life management studies according to the regulations recently issued by the CSN (Council Instruction IS-22 on Life Management).

- Introducing design modifications to do away with the pipe that supplies fire protection water to the different areas in the control building, the rupture of which could cause flooding that would entail an unacceptable risk for the plant's operation. The modification consisted in taking the main pipe out of the building; now only small-diameter pipes that protect each specific area go into the building. Until this modification was implemented in 2012, the licensee had a procedure for detecting the water level in the control building and manually closing the Fire Protection isolation valve; drills were performed frequently enough to guarantee that actions would be taken timely should it had been necessary.

Additionally, the CSN issued a series of Complementary Technical Instructions (ITCs) whereby it required the licensee to make different severe accident management-related improvements.

## 6.3 Identification of those installations for which a decision for closure has been made

During the time period which is the subject of this report, Santa María de Garoña NPP operated according to its Operating Licence, which was granted by the Ministry of Industry, Tourism and Trade on 3 July 2009 and whereby 6 July 2013 was set as the date for the permanent cessation of its operation, its operation being authorised until that date.

In June 2012, according to the corresponding report from the CSN, the Ministry of Industry, Energy and Tourism issued the Ministerial Order IET/1453/2012, of 29 June, which partially revoked the Ministerial Order ITC/1785/2009, of 3 July, setting 6 July 2013 as the date for the permanent cessation of the operation of the Santa María de Garoña nuclear power plant and authorising its operation until said date. This partial revocation means that the licensee is allowed to apply for a new Operating Licence for a new period of six years starting 6 July 2013 if certain conditions are met.

## 6.4 Position with regard to extending the operation of Spanish NPPs, including those that do not comply with the requirements of the articles 10 to 19, the way safety and other aspects were taken into account during the decision-making process being explained

Spanish nuclear power plants are subjected to a regime of operating licence renewal for a given time. Likewise, every 10 years the plants carry out Periodic Safety Reviews (PSRs) as a result of which they update the status of the ongoing safety assessment programmes which are systematically carried out and analyse the applicability of those regulatory changes that have taken place during the ten-year period that has elapsed (Analysis of Conditional Application Regulations).

Given the safety level at which Spanish NPPs are operating, the initial position of the licensees of nuclear power plants in operation is to apply for the renewal of the respective Operating Licences upon the expiration thereof. According to this view, the Licences of Almaraz, Ascó, Cofrentes and Vandellós II NPPs were renewed during the period of time covered by this report. The other plants intend to proceed accordingly at the right time. However, the continuity of their operation must be studied in view of its economic feasibility given both the conditions imposed, where appropriate, on operation during the contemplated period of time and the Spanish economic framework in which their operation takes place.

# APPENDIX 6.A

## Basic characteristics of Spanish NPPs

## Basic characteristics of Spanish NPPs

| | Almaraz | Ascó | Vandellós II | Trillo | Santa María de Garoña | Cofrentes |
|---|---|---|---|---|---|---|
| Type | PWR | PWR | PWR | PWR | BWR | BWR |
| Number of units | 2 | 2 | 1 | 1 | 1 | 1 |
| Thermal power (MW) | Unit I: 2,956.6<br>Unit II: 2,955.8 | UII: 2,940.6<br>2 | 2,940.6<br>UII: 2.940,6 | 3,010 | 1,381 | 3,237 |
| Electrical power (MW) | UI: 1,049.43 (1)<br>UII: 1,044.45 (2) | UI: 1,032.5<br>UII: 1,027.2 | 1,087.1 | 1,066 | 466 | 1,092.02 |
| Cooling | Open: Arrocampo Reservoir | Mixed: River Ebro – cooling towers | Open: Mediterranean sea | Closed: cooling towers, makeup from the river Tajo | Open: river Ebro | Closed: cooling towers, makeup from the river Júcar |
| Preliminary permit | UI: 29-10-71<br>UII: 23-05-72 | UI: 21-04-72<br>UII: 21-04-72 | 27-02-76 | 04-09-75 | 08-08-63 | 13-11-72 |
| Construction permit | UI: 02-07-73<br>UII: 02-07-73 | UI: 16-05-74<br>UII: 07-03-75 | 29-12-80 | 17-08-79 | 02-05-66 | 09-09-75 |
| Commissioning permit | UI: 10-03-80<br>UII: 15-06-83 | UI: 22-07-82<br>UII: 22-04-85 | 17-08-87 | 04-12-87 | 30-10-70 | 23-07-84 |
| Operating Licence | UI & UII: 08-06-10 | UI: 02-10-11<br>UII: 02-10-11 | 26-07-10 | 17-11-04 | 05-07-09 | 20-03-11 |
| Year of fuel pool saturation | UI: 2021<br>UII: 2022 | N/A (*) | 2020 | N/A (*) | 2015 | 2021 |

(1) By resolution of the Ministry of Industry, Energy and Tourism's Directorate-General for Energy Policy and Mines of 11 October 2012, the new gross output of Almaraz NPP's Unit I was set to 1,049.43 MW, effective on 6 February 2011.

(2) By resolution of the Ministry of Industry, Energy and Tourism's Directorate-General for Energy Policy and Mines of 13 June 2012, the new gross output of Almaraz NPP's Unit II was set to 1,044.45 MW, effective on 7 May 2011.

* It has a warehouse for the dry storage of irradiated fuel containers.

## b) Legislation and regulations

# Article 7. Legal and regulatory framework

## 7.1. Establishment and maintenance of the legal and regulatory framework

### 7.1.1. General legislative framework

Within the field of Nuclear Safety, the following laws were officially approved and published in the period between January 2010 and January 2013:

- Law 6/2010, of 24 March, modifying the revised text of the Law on Environmental Impact Assessment of Projects, approved by Royal Legislative Decree 1/2008, of 11 January.

  The modifications introduced by the Law 6/2010 do not entail changes in the activities that must be subjected to an environmental impact assessment, which are included in Annex I of the Royal Legislative Decree 1/2008. Among these activities are those carried out at nuclear power plants and other nuclear reactors (including the dismantling or decommissioning thereof), as well as at irradiated nuclear fuel reprocessing installations and other installations designed for the production or enrichment of nuclear fuel, the management of spent fuel or high-level waste, the disposal of spent fuel, the disposal of radioactive waste and the planned storage, for a period exceeding ten years, of spent fuel or radioactive waste in a place different from where they were generated.

  The modifications made by the Law 6/2010 are due, on the one hand, to the requirements of the economic activity (streamlined procedures, increased transparency in the actions in which several administrative bodies are involved, and greater efficiency in the performance of the environmental impact assessment) and, on the other, to the deregulation of the service sector regulated by the Directive 2006/123/CE of the European Parliament and of the Council, of 12 December 2006, on services in the internal market.

- Law 2/2011, of 4 March, on Sustainable Economy. The Fifteenth Additional Provision of this Law modifies Section 9.4 of the Sixth Additional Provision of the Law 54/1997, of 27 November, on the Electricity Sector, regulating the fee for the provision of management services for radioactive wastes generated by radioactive installations and other installations, which envisages the types of taxes and fees for a series of new kinds of radioactive wastes, in addition to the types of wastes which were already contemplated.

- Law 12/2011, of 27 May, on third-party liability for nuclear damages and damages caused by radioactive materials. The purpose of this Law is to fall in line with the Protocols of February 2004 modifying the Paris and Brussels Conventions, which were ratified by Spain. However, it has not come into effect yet with regard to the substantive regime of nuclear third-party liability, it being conditional on the entry into force of said Protocols.

  This Law modifies the Law 25/1964, of 29 April, on Nuclear Energy, in order for the aspects regulated in its Chapters VII to X, relating to the legal regime of third-party liability derived from nuclear damages, the coverage for the nuclear risk, the indemnification for nuclear damages, and the intervention of the State in the reparation of nuclear damages, to be regulated from the moment the new Law comes into force.

  One of the basic aspects of this Law is the setting of a licensee liability limit of €1,200 million for damages caused within the Member States of both the Paris and the Brussels Convention. In all other cases the limit is set at €700 million; additionally, the reciprocity

principles are applied. The Law sets an expiry limit for the right to claim for injuries of 30 years from the date of the accident and for any other type of nuclear damage of 10 years. Likewise, a prescription period of 3 years from the moment the injured party became aware of the damage and the party responsible therefore is set in which to submit a claim to the Courts. This Law expressly establishes the obligation on the part of the installation's licensee to obtain a financial guarantee by means of any of the procedures it details, among which the most important are: the taking out of an insurance policy, the setting-up of another financial guarantee with a body authorised by the Ministry of Economy and Finance, or a combination of both.

The liability of the operators of radioactive installations for damages inside Spanish territory caused by accidents therein or during the transport of these materials is regulated, the sums of obligatory coverage being graduated according to the activity of said materials.

- Law 25/1964, of 29 April, on Nuclear Energy [Ley sobre Energía Nuclear (LEN)]. This is the main law regulating nuclear energy in Spain. During the time period covered by this report a series of modifications have been made to this Law through the Third Additional Provision of the Law 12/2011, of 27 May, on third-party liability for nuclear damages and damages caused by radioactive materials:
  - The concept of "holder of an operating permit, or operator," of a nuclear or radioactive installation has been redefined to mean the natural or legal person who is fully responsible for said installation and whose responsibility may not be delegated.
  - The concept of "nuclear safety" is introduced, in accordance with the definition given by the Council Directive 2009/71/EURATOM establishing a Community framework for the nuclear safety of nuclear installations. "Nuclear safety" is defined as the attainment of the appropriate operating conditions in a nuclear installation, the prevention of accidents and the mitigation of their consequences, the result of which is the protection of workers and the general public from the risks entailed by the ionising radiations from nuclear installations. The new definition is consistent with that given in said Directive.
  - By means of the new wording of Article 28, this Law stipulates that the holder of an operating permit of a nuclear power plant must be a single legal person such that the regime of technical, economic and legal responsibilities in the operation of the power plant is clearly defined, cannot be delegated, gives precedence to safety over any other consideration, and promotes a fluid and direct communication between the Regulatory Body and the licence holder. Likewise, in order to stimulate operational transparency and guarantee that the holders of the operating permit of nuclear power plants have the necessary resources for the safe operation thereof, the Law requires these licensees to have as their only corporate purpose the management of these installations in such a way that they keep the revenue and expenses ascribable to each power plant in separate books. Licensees are also required to inform of their investments and available human resources and of their future estimates about the former.

    In order to adapt to these new requirements, licensees are given a maximum period of time of one year. To this end, the Directorate-General for Energy Policy and Mines must have previously approved the adaptation plan submitted by the licensee, which is subject to a favourable report from the Nuclear Safety Council.

### 7.1.2. Ratification of nuclear safety-related conventions and legal instruments

The Council Directive 2011/70/EURATOM, of 19 July 2011 (OJEU, 2 August 2011), establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, was approved during this period of time.

### 7.1.3. Implementation of WENRA's terms of reference

In its study on Harmonization of Reactor Safety – published in January 2006, WENRA established the conditions that must be fulfilled by the different regulatory bodies in order for them to be able to be considered "national requirements." Taking this study as a starting point, every WENRA member State devised an action plan for carrying out the pledged harmonisation. Both the CSN's Instructions and the Regulation on Nuclear and Radioactive Facilities [Reglamento de Instalaciones Nucleares y Radiactivas (RINR)] fall squarely within the Spanish regulatory framework; in addition, they comply with WENRA's requirements to be able to be considered "national requirements".

The action plan set up by the CSN envisages issuing fifteen Council Instructions and making some small modification to the RINR and covers different safety topics established in the WENRA reference levels.

In compliance with the global action plan established by the CSN, twelve of the expected fifteen Instructions have already been issued, six of which were prepared during the review period covered by this report. Two of them are in an advanced degree of preparation (or in the phase of external comments) and the last one is in its initial drafting stage.

## 7.2. Spanish nuclear safety requirements and regulations

### 7.2.1. Secondary legislative framework (decrees, instructions, etc.)

In addition to the laws listed in the preceding section, different Royal Decrees affecting the field of Nuclear Safety were approved in the period between January 2010 and January 2013:

- Royal Decree 1440/2010, of 5 November, approving the Statute of the Nuclear Safety Council.

  It replaces the previous Royal Decree 1157/1982, of 30 April, approving the Statute of the Nuclear Safety Council, which needed to be updated in order to tailor the Statute to the changes introduced by subsequently passed legislation (Law 33/2007, of 7 November, reforming the Law 15/1980, of 22 April, creating the Nuclear Safety Council).

  This Royal Decree systematises and harmonises the CSN's functions and transfers the assignment of its administrative powers to a single text.

  It makes changes to the CSN's structure, which are described in more detail in Article 20.2. The Council's Plenary Board and Presidency are defined as top management organs of the Body, which are related on the basis of the principle of cooperation and respect for the legitimate exercise of their respective competences.

  Apart from a new organisational structure for carrying out the functions which both the Law 33/2007 and other regulations of legal standing assign to the CSN regarding making its actions public, informing the public opinion, and citizen participation, the Statute implements the provision of the Law 33/2007 on the functions, composition and functioning of the "Advisory Committee on Public Information and Participation." Once they were designated by means of the Resolution of the President of the CSN of 15 January 2011, its members, which are regulated in Article 15.2 of the Law 15/1980, of 22 April, began to act for the first time and represent civil society, the business world, the trade unions, and the local, regional and national administrations. The Committee is in charge of making non-binding recommendations to the CSN to ensure and improve transparency and of putting forward non-binding measures to stimulate the public's access to information and civil participation in those matters which fall within the CSN's competences. It meets at least once every six months in ordinary session, but it can also meet in extraordinary session.

  As for the duty to inform both the Public Institutions and the General Courts, the Statute also includes the need to inform the Regional Parliaments of those Autonomous Communities

in whose territory nuclear installations are sited of the performance of their activities and regulates the obligation to keep all concerned Regional Governments and Town Councils informed of circumstances or events which affect the safety of nuclear and radioactive installations or the radiological quality of the environment.

Furthermore, the CSN's power to perform Instructions, Safety Guides and technical circulars is expounded in its Statute, something which was already envisaged in the Law 15/1980.

On the other hand, and as a result of the new feature introduced by the Law 33/2007, the obligation of natural or legal persons in the service of nuclear and radioactive installations to report nuclear safety- or radiation protection-related events to the CSN is included in its Statute. The Technical Directorate that is competent owing to the matter shall open, conduct and solve proceedings aimed at verifying the reported events and adopting, where appropriate, corrective measures, always guaranteeing the confidentiality of the informant. To this end, any inspections or investigations that are needed to shed light on the events shall be conducted.

- Royal Decree 1439/2010, of 5 November, modifying the Regulation on the Protection of Health against Ionising Radiations, approved by the Royal Decree 783/2001, of 6 July. This Royal Decree modified the Regulation on Protection of Health against Ionising Radiations in relation to the protection against natural radiation, particularly Article 2.4 (Scope of application) and Articles 62 and 63 under Title VII (Natural sources of radiation).

  Said Title VII refers to natural radiation sources and identifies work activities in which workers and, where appropriate, members of the public might be exposed to this type of radiation, such as thermal establishments, caves, mines, subterranean or aboveground work places in identified areas; work activities involving the storage or handling of materials or which generate wastes which are usually not deemed to be radioactive but contain natural radionuclides; and work activities involving an exposure to cosmic radiation during the operation of airships.

  The purpose of this reform is to clarify the obligations of the affected companies (work activities in which there are natural radiation sources) and to define the competent authorities in this process, in order for which the licensees of work activities in which natural sources of radiation are used are obliged to do the following:

  – Performing the necessary studies to determine whether exists a significant increase in the exposure of workers or users which cannot be considered negligible from the point of view of radiation protection.

  – Declaring these work activities before the competent organs as regard industrial activities of the Autonomous Communities in whose territory said activities are carried out.

  These declarations will be included in a register entitled "Register of work activities entailing an exposure to natural radiation" to be set up in each Autonomous Community. A central register will also be kept at the Directorate-General for Energy Policy and Mines of the Ministry of Industry, Tourism and Trade (hereinafter, MINETUR).

- Royal Decree 1564/2010, of 19 November, approving the Basic Directive for Civil Protection Planning in case of Radiological Risks. Its purpose is to reinforce the planning of population protection and information measures during radiological emergencies. It envisages a wide variety of possible accidents, events and circumstances with potential radiological repercussions.

- Royal Decree 1308/2011, of 26 September, on the physical protection of nuclear installations and materials and of radioactive sources. It derogates the previous Royal Decree 158/1995, of 3 February, and is the culmination of the process of adaptation of the Spanish legal system to comply with the international obligations contracted by Spain after it ratified in 2007 the amendment (of 8 July 2005) to the Convention on the Physical Protection of Nuclear Materials.

In acceptance of the proposal made by the CSN, its second Final Provision includes a modification to the RINR, which adds a new Section 4 to Article 8 implementing the provision of Article 37 of the Law on Nuclear Energy on the authorisation for conducting medical analyses to detect alcohol consumption and drug use by the people who render services at nuclear facilities.

It also adds, to Section h) of Article 38.1 of the RINR, the Physical Protection Plan, if necessary, as one of the documents required to apply for the operating permit for radioactive facilities.

Finally, its single Derogatory Provision eliminates Articles 20.k) and 38.2.c) of the RINR and derogates Article 6 of the Royal Decree 229/2006, of 24 February, on the control of high-level sealed radioactive sources and of orphan sources.

### 7.2.2. Regulations and guides drawn up by the regulatory body

During the time period covered by this report, the CSN has approved several Council Instructions by virtue of the legal authorisation granted to it in Article 2.a) of the Law 15/1980, of 22 April. These Instructions are binding technical standards which are obligatory for their intended parties and become part of the legal system.

Thus, the CSN has approved the following Council Instructions since the fifth national report:

- Nuclear Safety Council Instruction IS-24, of 19 May 2010, regulating the filing and periods of retention of the documents and records of nuclear installations (BOE 133, 1 June 2010).
- Nuclear Safety Council Instruction IS-25, of 9 June 2010, on criteria and requirements on the performance of probabilistic safety assessments and their applications for nuclear power plants (BOE 154, 24 June 2010).
- Nuclear Safety Council Instruction IS-26, of 16 June 2010, on basic nuclear safety requirements applicable to nuclear installations (BOE 165, 8 July 2010).
- Nuclear Safety Council Instruction IS-27, of 16 June 2010, on general nuclear power plant design criteria (BOE 165, 8 July 2010).
- Nuclear Safety Council Instruction IS-28, of 22 September 2010, on the technical specifications that second- and third-category radioactive installations must observe (BOE 246, 11 October 2010). Correction of errors (BOE 281, 20 November 2010).
- Nuclear Safety Council Instruction IS-29, of 13 October 2010, on safety criteria at spent fuel and high-level radioactive waste storage facilities (BOE 265, 2 November 2010).
- Nuclear Safety Council Instruction IS-30, of 19 January 2011, on the requirements of the fire protection programme at nuclear power plants (BOE 40, 16 February 2011)[1].
- Nuclear Safety Council Instruction IS-31, of 26 July 2011, on the criteria for the radiological control of residual materials generated in nuclear installations (BOE 224, 17 September 2011).
- Nuclear Safety Council Instruction IS-32, of 16 November 2011, on Plant Technical Specifications of nuclear power plants (BOE 292, 5 December 2011).
- Nuclear Safety Council Instruction IS-33, of 21 November 2011, on radiological criteria for protection against exposure to natural radiation (BOE 22, 26 January 2012).
- Nuclear Safety Council Instruction IS-34, of 18 January 2012, on criteria in relation to radiation protection measures, the notification of non conformities, the availability of people and means during emergencies, and load surveillance during the transport of radioactive material (BOE 30, 4 February 2012).

1 It has been recently derogated and replaced by the Nuclear Safety Council Instruction IS-30, Rev. 1, of 21 February 2013, on the requirements of the fire protection programme at nuclear power plants (BOE 63, 14 March 2013).

The full list of all Nuclear Safety Council Instructions is available at the body's website (www.csn.es).

The Nuclear Safety Council's Safety Guides are documents of a recommendatory nature – unless a regulation makes them obligatory. The purpose of the Guides is to achieve better compliance with regulatory requirements and precepts by tailoring the decisions to the administrated party instead of imposing them to it.

Among the new Guides published by the Nuclear Safety Council during the period of time corresponding to this report and relating to matters which are the subject of this Convention, the following is worth mentioning:

- GS-1.19. Requirements of the Fire Protection Programme at Nuclear Power Plants. CSN 2011[2].

### 7.2.3. Processes for establishing and revising regulatory requirements, including the involvement of stakeholders

The CSN has prepared the following management procedures:

- Management Procedure PG.IV.07, on the Integrated Plant Supervision System (SISC) (2010), whose aim is to describe the systematic inspection and control programme carried out by the CSN at Spanish NPPs in operation, as well as the methodology to evaluate their operation, and to establish the necessary regulatory actions according to the results of this evaluation.
- Management Procedure PG.IV.11 "Manual for CSN's Resident Inspectors at Nuclear Power Plants Being Dismantled" (2010), whose purpose is to describe the duties and activities of the CSN's Resident Inspectors at nuclear power plants being dismantled and to regulate the technical and organisational aspects related to the performance of their work at Spanish NPPs for their interfaces with the rest of the CSN's organisation, licensees, authorities in charge of «off-site» emergency plans, and local authorities.

  This procedure is applicable to all activities of Resident Inspectors at NPPs being dismantled and to their interfaces with the rest of the CSN's organisation, licensees, authorities in charge of «off-site» emergency plans, and local authorities.

  The procedure explains the following topics related to Resident Inspectors:

  - Functions.
  - Work and administrative aspects.
  - The activities to be carried out by them.
  - The material and logistical means available.
  - Their relations with other CSN units, the installation's licensee and local and regional authorities.
- Management Procedure PG.IV.12, on the control of radioactive material transport (2010). The aim of this procedure is to describe and standardise the regulatory actions to be performed by the CSN according to the results of the inspections related to the transport of radioactive material or other control processes carried out by the CSN regarding this matter, or as a result of the notification or reporting by other Bodies of deviations in the performance of said transports, which are related to the CSN's competences.
- Management Procedure PG.IV.02, on compulsory CSN reports sent to the Administration (radioactive installations) (2011). Its purpose is to establish the systematic approach to be followed

2 This revision of the Safety Guide corresponds to Rev. 0 of the Instruction IS-30. It is pending revision so as to adapt it to IS-30, Rev. 1.

by the CSN in the issuance of compulsory reports for the Administration regarding the granting of permits of radioactive installations, (except those belonging to the nuclear fuel cycle), and other regulated activities, specified in Article 2.b) of the Law creating the CSN, and the permits corresponding to the entities or companies which provide services in the field of radiation protection, specified in Article 2.i) of said Law.

This procedure applies to all activities leading to the issuance of reports by the CSN, from the moment it receives the documentation from the holders of the permits until its sends the corresponding assessment reports, together with their technical proposals, to the Technical Directorate for Radiation Protection (DPR).

- Management Procedure PG.IV.09 "Inspection in the Transport of Nuclear Substances and Radioactive Materials" (2011). Its aim is to describe the activities which must be carried out to fulfil the inspection functions on the transport of nuclear substances and radioactive materials assigned to the CSN in Article 2 of the Law 15/1980, of 22 April, creating the CSN, such that compliance with current legislation and the terms and conditions of the permits is guaranteed.

  Th s Procedure implements that which is envisaged in the CSN's Inspection Model Document and delimits the responsibilities of the different organisational units involved in the performance of the inspection function. It applies to all CSN personnel who carry out any kind of inspection – planning, execution or follow-up – and to the following installations and activities:

  Installations:

  - Carriers
  - Nuclear installations
  - Radioactive installations
  - Waste management companies
  - Engineering firms
  - Manufacturers
  - In-transit storage companies

  Activities:

  - Packaging design
  - Packaging manufacturing
  - Packaging maintenance and repair
  - Preparation of packages for transport
  - Shipping
  - Loading of packages on conveyances
  - Carriage (in-transit storage) of packages
  - Package unloading
  - Package receipt

The following management procedures have been subjected to changes:

- PG.III.03. Development of Regulations (2010)
- PG.IV.03. Inspection and Control of Nuclear and Radioactive Installations belonging to the Nuclear Fuel Cycle (2011)
- PG.IV.13. System for the Supervision and Monitoring of the Juzbado Factory (2011)

- PG.IV.14. Authorisation of Radiation Protection Services and Technical Units (2012)
- PG.IV.05. The CSN's role in Disciplinary Proceedings Relating to Nuclear Safety and Radiation Protection (2012)

## 7.3. Licensing system

### 7.3.1. Types of licences included in the licensing system

As stipulated in Article 12 of the Royal Decree 1836/1999, of 3 December, approving the Regulation on Nuclear and Radioactive Facilities (RINR), nuclear facilities shall require the following authorisations depending on each individual case:

a. *Preliminary or site authorisation:* this constitutes an official recognition of the proposed objective and of the suitability of the chosen site; after obtaining it, the licensee may apply for the construction permit for the facility and initiate the preliminary infrastructure works that are authorised.

b. *Construction permit:* it entitles the licensee to start building the facility and apply for the operating permit.

c. *Operating permit:* it authorises the licensee to load nuclear fuel in or bring nuclear substances into the facility, to carry out the programme of nuclear tests and to run the facility under the conditions set out in the licence. At first, it will be granted on a temporary basis until all nuclear tests are satisfactorily completed. Likewise, this license authorises the licensee to carry out, once the operation for which the facility was conceived has ceased, those operations which the Administration imposes on it prior to obtaining the dismantling permit.

d. *Authorization for modifications:* it entitles the licensee to make modifications to the facility's design or operating conditions in those cases when the criteria, standards and conditions on which the operating licence is based change.

e. *Modification execution and assembly permit:* it authorises the licensee to start carrying out and implementing those modifications which, in the opinion of the Directorate-General for Energy Policy and Mines or the Nuclear Safety Council, and by virtue of their large scope or because they involve significant work and assemblies, require express authorisation.

f. *Dismantling permit:* it authorises the licensee, once the operating licence expires, to start the decontamination, equipment disassembly, structure demolition and material removal activities to ultimately allow the site to be fully or restrictedly released. The dismantling process will end with a decommissioning declaration, which will free the licensee of a facility from its responsibility as operator thereof and define, in the case of the restricted release of the site, the restrictions of use which are applicable and the entity responsible for upholding them and ensuring they are observed.

Additionally, the following must be authorised:

g. The storage of nuclear substances in a facility under construction which does not have an operating licence.

h. The change of ownership of nuclear facilities.

These permits are granted by the Ministry of Industry, Energy and Tourism, subject to a favourable report from the CSN, as envisaged in the RINR.

### 7.3.2. Involvement or commitment of the Stakeholders or the public with the Contracting Party

It should be pointed out that, as stipulated by Article 15 of the RINR, there is a specific public information step as part of the processing of the preliminary permit application according to

which the Ministry of Industry, Energy and Tourism will send a copy thereof to the respective Regional Government Office so that it may open a public information period, which will start with the publication in the Official State Gazette (BOE) and in the journal of the corresponding Autonomous Community of a short announcement summarising the purpose and main characteristics of the facility. The announcement will specifically state that the people and entities which consider themselves to be affected by the project may submit within thirty days those statements of objections which they deem appropriate to the corresponding Regional Government Office.

Once said public information period has expired, the Regional Government Office will issue a report about said objections and the submitted documentation and will send the file to the Ministry of Industry, Tourism and Trade and a copy thereof to the Nuclear Safety Council.

Likewise, the RINR stipulates that, prior to the granting of the abovementioned licences (except those indicated in subparagraphs e) and g) above), a copy of the corresponding documentation shall be sent to those Autonomous Communities with authority regarding environmental and regional planning issues in whose territory the facility or the planning area envisaged in the basic regulations on nuclear and radiological emergency planning is located, for the purpose of lodging complaints within one month.

### 7.3.3. Legal provisions to prevent nuclear installations from operating without a licence

Finally, it is worth mentioning that the performance of activities without a licence shall entail the assumption of the sanctions envisaged in the disciplinary regime laid down in the Law on Nuclear Energy, reformed, as already mentioned, by the Law 33/2007, of 7 November.

## 7.4. Regulatory system of inspection and enforcement

Since January 2007 the Integrated Plant Supervision System (SISC), inspired by the USNRC's Reactor Oversight Programme (ROP), has been running as planned, with the exception of the security pillar, which was started in pilot mode in January 2011. After one year in said pilot mode, in January 2012 it began to work in normal mode, as the other pillars of the SISC, with the peculiarity that the inspection findings and the quarterly results of the indicators are not published on the CSN's website. Likewise, when it comes to determining in which column to put each power plant, the findings of this pillar do not interact with those of the other pillars since the published results would not be in keeping with reality given that the results of the security pillar are confidential.

Simultaneously to the development of the SISC, licensees have been implementing an Integrated Safety Management System and other measures, among which the self-assessment programme and the problem identification and resolution programme (PAC) stand out owing to their impact on the CSN's activities[3].

The SISC is described, with a reasonable level of detail, in Section 19.3 of the Fourth National Report (September 2007) on the Convention on Nuclear Safety.

It is worth pointing out that the CSN did not make an automatic translation of the ROP; instead, it took into account both the regulatory and organisational differences between both countries and their regulatory bodies and those good plant inspection and control practices which had become ingrained in the CSN over the years.

The main goals of the SISC are to:

- Focus the inspecting effort on those areas with a greater potential risk.

3 Corrective Action Programme.

- Pay greater attention to the worst performing plants.
- Use objective measurements of plant operation.
- Provide fast, understandable and predictable assessments of plant operation.
- Reduce the unnecessary regulatory load at the plants.
- Respond to deviations or non-compliances in a predictable and risk-proportionate manner.
- Increase the transparency of the CSN's supervisory processes.

After 7 years running, it can be said that the SISC has fulfilled the expectations of both licensees and the CSN in a very acceptable manner. After the first two years of its application, a self-assessment exercise –already envisaged in the programme itself– was carried out which allowed to conclude that, generally speaking, the results were acceptable and that there were some aspects to be improved, from which the corresponding action plan was derived. Subsequently, a second SISC self-assessment process was undertaken in 2010, which consisted in polling the licensees and CSN specialists and using a set of objective numerical indicators to determine their degree of satisfaction with the SISC and how well it had met their expectations.

By the end of 2012 there were already tools available to apply the new criteria on cross-sectional aspects, and the training of the personnel of both the CSN and the NPPs had already begun.

The training aspect has posed a significant challenge for both the CSN and the nuclear sector since it requires CSN inspectors to not only identify potential findings as a result of licensee non-compliances that could have been prevented but also to determine the root causes which are behind said non-compliances. The CSN will supervise the following three cross-sectional areas –human and organisational performance (AHO); problem identification and resolution (IRP); and safety-orientated work environment (ATOS)– through the licensee's performance in thirteen cross-sectional components associated with said areas. This change in the supervision of SISC cross-sectional elements is expected to take place in 2013.

An important conclusion is that the CSN's inspecting activity has quantitatively increased and the plant supervision function greatly changed as a result of the introduction of the SISC.

The coercive process, not understood exclusively as a sanctioning activity, has become much more effective, its aim being the systematic and continuous identification of problems and the application –whenever possible, by the licensee itself– of the best corrective actions to solve them, without requiring any oversight by the CSN. Furthermore, the SISC has helped to objectify the sanctioning process since in most cases in which the licensee has committed an infraction that is deemed to be minor and the finding associated with the non-compliance is green according to the SISC, a coercive process is automatically started to warn the licensee instead of the Ministry of Industry bringing disciplinary action against it at the CSN's request.

Although there is not enough data to conduct a statistical study of the results from the SISC, it can be said that 137 inspection findings were identified in 2010, all of them green; in 2011, 3 white findings and 154 green findings; and in 2012, 5 white findings and 121 green findings. These last 5 white findings actually correspond to two different non-compliances; one of them affected two plants at the same time, and the other, three plants, which is why they appear as 5 findings.

In the last three years, 6 additional inspections have been carried out due to the existence of findings and/or indicators classed as greater than green; in all cases, the root cause analyses performed by the licensees and the application of corrective actions were checked. No additional inspections were conducted in 2011 because no findings greater than green were identified the previous year.

Even though during the first years after the corrective action programme (PAC) was launched it was very difficult to develop and properly manage its applications, it is now considered an

essential SISC support tool as regards the activities to be carried out by licensees to correct deficiencies and identify and solve problems before they result in incidents with greater consequences. At any rate, it still requires a significant deal of effort on the part of both licensees –to implement it –and the CSN– to properly monitor it.

Finally, it can be said that, with the exception of the last quarter of 2012, when a white finding regarding the management of spare parts was identified which simultaneously affected three units owing to its being handled in a corporate manner by the owners of the plants, five of the eight nuclear reactors have remained for the last three years in the licensee response column without findings or indicators greater than green. One nuclear power plant has spent all three years out of the licensee response column, and two have spent half of the time in the licensee response column and half of the time in the regulatory response column. The public can find all this information, as well as the particular details of every inspection finding and/or operation indicator, on the CSN's website; it is updated on a quarterly basis.

## 7.5. Compliance with the regulations applicable to licences

In the event of possible non-compliances, the CSN, in accordance with the provisions of the Law 15/1980, of 22 April, creating the CSN, and the Law 25/1964, of 29 April, on Nuclear Energy, can propose to bring any disciplinary proceedings it deems appropriate, within the scope of its power according to current legislation, against any licensee.

During the time period covered by this report, the CSN brought 5 disciplinary actions against nuclear power plants, of which those brought against Ascó NPP owing to its non-compliances due to the loss of traceability during the control of disused sources stand out.

# Article 8. Regulatory body

In Spain several authorities carry out the regulatory function as regards nuclear safety and radiation protection.

The Government is in charge of energy policy as well as of passing mandatory statutory regulations.

The Ministry of Industry, Energy and Tourism (MINETUR) is the Department of the General Administration of the State which is competent as regard nuclear energy, it being responsible for granting the different licences relative to nuclear facilities, subject to the mandatory and binding reports from the Nuclear Safety Council and, where appropriate, other ministerial departments, and submitting regulatory proposals, adopting provisions to implement current regulations and applying the disciplinary regime with regard to nuclear energy.

The Nuclear Safety Council is the only competent body of the State with regard to nuclear safety and radiation protection. It is a legal entity under public law, independent from the General Administration of the State, which informs Parliament of its activities and is in contact with the Government through the MINETUR.

## 8.1. Functions and responsibilities of the MINETUR

In accordance with Royal Decree 344/2012, of 10 February, the Ministry of Industry, Energy and Tourism (MINETUR) performs the following functions within the framework of the Convention on Nuclear Safety:

- To grant licences for nuclear and radioactive installations[1], following a mandatory report from the CSN, which shall be binding if negative or if it sets safety conditions.
- To draw up regulatory proposals and apply the enforcement regime.
- To collaborate in the definition of the R&D policy.
- To monitor compliance with the international commitments made by Spain in the field of nuclear energy, in particular with regard to non-proliferation, the security of nuclear materials and installations, and third-party liability for nuclear damage.
- To maintain relations with the International Bodies specialised in the subject.

Pursuant to the provisions of the Royal Decree 344/2012, of 11 February, the CSN is in contact with the Government via the MINETUR.

### 8.1.1. Organisational structure

The structure of the MINETUR was established by means of the Royal Decree 344/2012. Within the MINETUR, the Secretariat of State for Energy is the top ranking body with regard to energy, and, within it, the Directorate-General for Energy Policy and Mines, to which the Sub-Directorate-General for Nuclear Energy reports, is the governing body that performs the functions referred to in the previous section which are specifically applicable to nuclear energy.

1 Except for second- and third-category radioactive installations located in the territory of Autonomous Communities to which the corresponding administrative functions have been transferred.

### 8.1.2. Coordination of nuclear R&D&I activities

The MINETUR, through the Sub-Directorate-General for Nuclear Energy, participates in the coordination of certain research, development and innovation activities in the field of nuclear energy in Spain.

### 8.1.3. Involvement in international bodies and activities

The MINETUR, through the Sub-Directorate-General for Nuclear Energy, actively participates in nuclear energy-related activities promoted by the International Organisations to which Spain belongs.

It collaborates in the conclusion of bilateral agreements with other countries in relation to the peaceful use of nuclear energy and represents the Spanish Government in the Meetings of Contributors to different International Funds to which Spain contributes.

Within the framework of the European Union, the Ministry provides advice to the Permanent Representation of Spain for its participation in the Council's working groups dealing with issues regulated by the EURATOM Treaty.

Within the framework of the International Atomic Energy Agency, the Ministry is part of the Spanish Delegation to its General Conference.

It is part of the Spanish Delegation before the Governing Committee of the OECD's Nuclear Energy Agency (NEA) and participates in several of the NEA's Technical Committees.

## 8.2. Functions and responsibilities of the CSN

The CSN's main functions in connection with nuclear and radioactive installations and related activities are the following:

- To propose to the Government the necessary regulations within its sphere of competence and to issue Instructions, Guides and Circulars of a technical nature on said matters.
- To send mandatory reports to the MINETUR for it to reach decisions regarding the granting of the legally established licences; these reports will be binding if negative and when they impose necessary safety conditions.
- To control and inspect all installations in all their phases, especially during design, construction, commissioning and operation, as well as the transport, manufacture and homologation of equipment incorporating radioactive sources or generating ionising radiations.

  In this sense, the CSN has the authority to suspend the operation of the activities and installation for safety reasons.
- To collaborate with the competent authorities in the drawing up of the criteria with which «off-site» emergency plans and security plans of the nuclear and radioactive installations must comply and to participate, once these plans have been drafted, in their approval, as well as to coordinate emergency response and support measures.
- To propose bringing disciplinary proceedings in the event of infringements relating to nuclear safety and radiation protection, in accordance with the legislation currently in force, as well as to issue technical reports for the adequate qualification of the facts, in the terms set out in Section 5 of Article 7 of this report.
- To control of the measures for the radiation protection of exposed workers, the public and the environment. As regards the radiation protection of the environment, the CSN controls and monitors radiological quality throughout Spanish territory and assesses the environmental

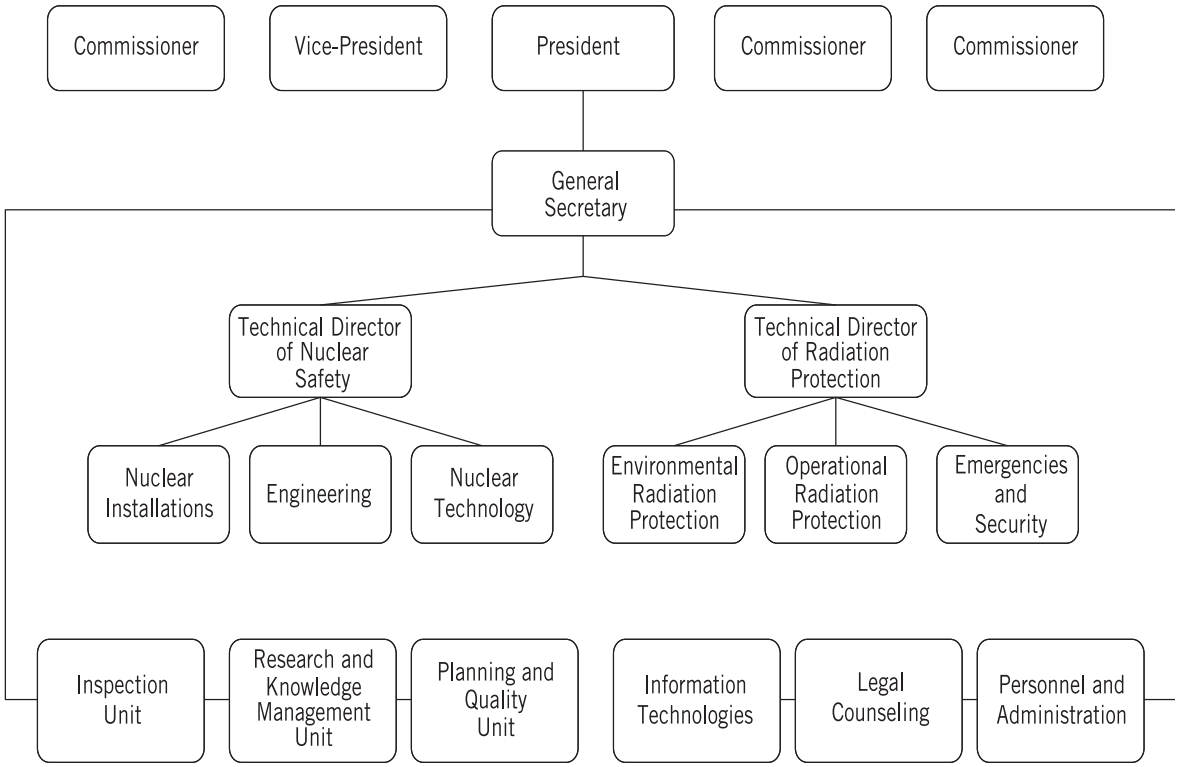
radiological impact of nuclear and radioactive installations and of activities involving the use of ionising radiations.

- To collaborate with the competent authorities in relation to programmes for the radiation protection of individuals subjected to diagnostic procedures or medical treatments using ionising radiations.
- To issue declarations on the favourable assessment of new designs, methodologies, simulation models and verification protocols related to nuclear safety and radiation protection.
- To grant and renew nuclear and radioactive installation operator and supervisor licences, Head of the Radiation Protection Service diplomas and radiodiagnostics accreditations.
- To conduct studies, assessments and inspections of the plans, programmes and projects for all radioactive waste management phases.

In summary, the functions and responsibilities of the CSN have not been substantially modified with respect to the previous report. The CSN continues to work according to the changes that have taken place in the legislation in recent years.

### 8.2.1. Structure of the CSN

The organic structure of the CSN, which was modified through the approval of Royal Decree 1440/2010, of 5 November, is currently as follows (Figure 8.1):




**Plenary Board of the CSN**

The renewal of the President and of three of the Commissioners that make up the CSN's Plenary Board took place in December 2012 in accordance with the Law Creating the Nuclear Safety Council and the CSN's Statute.

Currently, the Plenary Board of the CSN consists of the following persons:

- President: Fernando Marti Scharfhausen
- Vice-president: Rosario Velasco García
- Commissioner: Antoni Gurguí Ferrer
- Commissioner: Fernando Castelló Boronat
- Commissioner: Cristina Narbona Ruiz

**Units that directly report to the General Secretariat**

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

- Sub-Directorate for Information Technology
- Sub-Directorate for Personnel and Administration
- Sub-Directorate for Legal Counselling
- Inspection Unit
- Research and Knowledge Management Unit
- Planning, Assessment and Quality Unit

**Technical Directorate for Nuclear Safety**

All functions relating to the safety of nuclear installations are grouped under this Technical Directorate, except those relating to low and intermediate level radioactive waste storage facilities, which were assigned to the Technical Directorate for Radiation Protection. It is also in charge of safety in the transport of nuclear substances and radioactive materials.

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

- Sub-Directorate for Nuclear Installations
- Sub-Directorate for Nuclear Technology
- Sub-Directorate for Engineering

**Technical Directorate for Radiation Protection**

In addition to the inspection and control of radioactive installations, the radiation protection of workers and the management of low and intermediate level radioactive wastes, this Technical Directorate has assumed the competences with regard to the radiation protection of the public and the environment and to radiological emergencies.

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

- Sub-Directorate for Environmental Radiation Protection
- Sub-Directorate for Operational Radiation Protection
- Sub-Directorate for Emergencies and Security

## 8.3. Development and maintenance of human resources over the last three years

The CSN headcount stood at 457 as of 31 December 2012:

Table 8.2. Distribution of the Nuclear Safety Council's staff as of 31 December 2012

| | Council | General Secretariat | Technical Directorates | Total |
|---|---|---|---|---|
| Senior officials | 5 | 1 | 1 | 7 |
| Civil servants of the Nuclear Safety and Radiation Protection Force | 8 | 14 | 195 | 217 |
| Civil servants from other Public Administrations | 5 | 98 | 35 | 138 |
| Temporary staff | 24 | 0 | 0 | 24 |
| Contract staff | 2 | 50 | 19 | 71 |
| Total | 44 | 163 | 250 | 457 |

Table 8.3 shows the changes in staff in the 2009-2012 period.

Table 8.3. Structure of the CSN's staff from 2009 to 2012

| | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|
| Senior officials | 8 | 8 | 8 | 7 |
| Civil servants of the Nuclear Safety and Radiation Protection Force | 218 | 218 | 218 | 217 |
| Civil servants from other Administrations | 137 | 138 | 133 | 138 |
| Temporary staff | 26 | 26 | 26 | 24 |
| Contract staff | 84 | 79 | 77 | 71 |
| Total | 473 | 469 | 462 | 457 |

The number of women in the CSN represents 53% of the total staff, while men account for the remaining 47%.

The average age of the body's staff is 50 years of age.

As regards academic qualifications, as of 31 December 2012 the CSN's staff was distributed as follows: 67.83% of university graduates with a 5-year degree, 6.13% of university graduates with a 3-year degree, and 26.04% of people with other qualifications.

## 8.4. Measures or programmes to develop and maintain competence

Given its specific characteristics, the CSN attaches special importance to the training of its human resources. During the 2010-2012 period, the CSN continued to draw up training plans whose objectives were aligned with the Strategic Plan in force every year; they were grouped into seven areas, one of which was divided into three:

- Improvement and retraining:
  - Sub-programme for Nuclear Safety
  - Sub-programme for Radiation Protection
  - Sub-programme for Support Areas
- Development of managerial skills (soft skills)
- Administrative management
- Prevention
- Computer skills
- Languages
- Other skills

389 courses were delivered during this three-year period, which comes up to an average of 130 courses per year. Over 29,000 hours per year on average were devoted to training, or 4% of the working day. The expenses on training activities amounted to €1,447,827, which is equivalent to almost €500,000 per year.

In 2011, the biennial evaluation of 86.25% of the staff was performed in accordance with the competence-based management system applied to training. The data obtained allowed to develop training proposals for 2012 and 2013 that were suited to the real needs of each person according to the requirements of his post, needs which were previously defined for all the positions in the organisation.

Likewise, the CSN has continued to promote its presence in national and international forums (congresses, meetings, seminars) relating to its functions and competences.

Table 8.4. CSN training programme for the 2010-2012 period

| Year | Staff | Number of attendances to training actions | Average participation | Number of courses | Number of hours devoted to training | Percentage of training hours over working hours | Total cost |
|---|---|---|---|---|---|---|---|
| 2010 | 469 | 1,220 | 2.6 | 137 | 33,455 | 4.5 | 634,539.20 |
| 2011 | 465 | 1,045 | 2.25 | 110 | 30,457 | 4.24 | 491,521.91 |
| 2012 | 459 | 1,103 | 2.4 | 142 | 23,618 | 3.33 | 321,766.44 |
| Total | 1393 | 3,368 | 7.25 | 389 | 87,530 | 12.07 | 1,447,827.55 |
| Average from 2010 to 2012 | 464,00 | 1,123.00 | 2.42 | 130.00 | 29,177.00 | 4.02 | 482,609.16 |

## 8.5. Review of the CSN's funding over the last three years. CSN resources and personnel

Every year, the Plenary Board of the CSN prepares a budget proposal. This income and expense proposal is part of the General State Budget and it is approved by Parliament.

The budget approved for the 2013 financial year amounts to 47,311.67 thousands of euros.

The CSN obtains almost all of its economic resources through the collection of public prices and fees for the services rendered in compliance with its functions. The conditions are regulated

in the Law 14/1999, of 4 May, on Public Fees and Prices for services rendered by the Nuclear Safety Council. At present the funding routes are as follows:

**Funding by public fees and prices**

- Performance of studies, reports and inspections prior to the granting of licences for the operation and decommissioning of nuclear and radioactive installations by the Ministry of Industry, Energy and Tourism.
- Inspection and control of nuclear and radioactive installations in operation and related activities.
- Granting licenses to the personnel who are going to operate or supervise the operation of nuclear and radioactive installations.
- Reports, tests, or studies on new designs, methodologies, simulation models, or verification protocols related to nuclear safety or radiation protection.

In 2013 funding amounted to 46,578.23 thousand of euros, which is equivalent to 98.45% of the total budget.

**Transfers of the State**

The Nuclear Safety Council controls the radiation protection measures aimed at the general population and the environment. The performance of this function is not covered by the public fees and prices regulated by the Law 14/1999. Funding therefor is obtained from the General State Budget through the Ministry of Industry, Energy and Tourism.

The funding obtained for this item accounted for 400 thousand of euros in 2013 and represents 0.85% of the total budget.

As a consequence of the austerity policies imposed in the last few years, the budget approved for the 2011 financial year was reduced by –2,668.38 thousand of euros (–84.2%) with regard to the previous financial year. This negative trend continued in the 2012 fiscal year, decreasing 100.00 thousand of euros with regard to 2011 (-20%). However, this amount has stayed unchanged in the current 2013 financial year.

The rest of funding (0.70%) mainly corresponds to income derived from bank account interest rates.

The evolution of the most important budget items in the past three years is shown in the following table, in thousands of euros:

| Nature of the income | Year 2011 | Year 2012 | Year 2013 |
|---|---|---|---|
| Fees, Public Prices | 43,183.40 | 43,995.49 | 46,578.23 |
| Transfers of the State | 500.00 | 400.00 | 400.00 |

In the 2013 budget, 55.80% of the total funding is set aside to cover personnel costs, which in 2013 amounted to 26,338.52 thousand of euros, and 29.80% to covers costs of goods and services, adding up to 14,081.27 thousand of euros.

## 8.6. Information on the adequacy of resources

In 2011 there was a large modification in the list of jobs as a consequence of the Royal Decree 1440/2010, of 5 November, approving the Statute of the Nuclear Safety Council.

In accordance with Article 40 of the CSN's Statute, the Planning, Assessment and Quality Unit, the Inspection Unit and the Research and Knowledge Management Unit were created during this modification.

Additionally, 57 people were redistributed in order to adapt the CSN's organisation to the new functions conferred to it by the new Statute.

## 8.7. CSN's management system

The CSN has in place a process-oriented Management System based on the requirements of the IAEA (GS-R-3) and the Standard ISO 9001:2008. The processes, covering all activities carried out by the body, have been classified as follows:

- Strategic processes, including the operation of the Council, information and communication, and regulatory development.
- Operating processes, including the authorisation, evaluation, supervision and control of installations and activities (including transport); personnel licensing; the radiation protection of workers, the public and the environment; emergency management and security.
- Support processes, including institutional and international relations; research and development; economic and human resources management (including training); information systems; the documentation and administration of the Management System.

The documents describing the System are organised hierarchically: Manual System, Organisation Manual, process descriptions, and procedures.

The Management System is subject to ongoing improvement. In addition to the assessments of the fulfilment of plans and objectives, the CSN has an internal audit plan in place and systematically undergoes external assessments by national and international organisations. In this respect, the following is worth mentioning:

- The internal audit plan ensures that all the operating processes are audited every four years and other processes at least every five years.
- In addition to being subject to the economic and financial controls and audits required of all public bodies, the CSN must systematically inform to the Spanish Parliament and those of those Autonomous Communities in which there are nuclear installations. The Parliament is responsible for carrying out a continuous control of the activities of the CSN.
- The Council Directive 2009/71/Euratom, of 25 June 2009, requires European Union Member States to carry out self-assessments of their regulatory framework and authorities every ten years and to request an international peer review. The Management System instituted at the CSN and the experience gained from the performance of self-assessments and international peer reviews will facilitate compliance with this requirement. It is relevant to mention that the CSN underwent an IRRS mission from the IAEA in 2008 and that the corresponding follow-up mission took place in 2011.

## 8.8. Transparency of regulatory activities

The Nuclear Safety Council's transparency policy is defined by the Law 15/1980, of 22 April, creating the CSN, reformed by the Law 33/2007, of 7 November. The guarantee of the access to information on the environment, the participation of the public in the decision-making process, and the access to justice in relation to environmental issues were some of the major changes brought about by this legislative reform. These aspects were included in the Aarhus Convention, ratified by Spain in 2004, and materialised in the Spanish legislation through the Law 27/2006, of 18 July, regulating the rights of access to information, public participation and access to justice in relation to environmental issues.

The reform of the Law creating the CSN increased the requirements regarding public information, the objective being to increase the transparency of the body and to promote confidence among the citizens regarding the activities of the Nuclear Safety Council.

The obligations of this Law regarding information and communication are channelled along three routes:

- Transmission of information to the institutions of the State: Every year the CSN sends a detailed report on its activities to the Spanish Parliament and to the Regional Parliaments of the Autonomous Communities in the territory of which there are nuclear installations. The presentation of this report is the main purpose of the annual appearance of the President of the CSN before the Commission for Industry, Energy and Tourism of the Congress of Deputies. Also, as part of the relations with Parliament, the CSN responds to parliamentary initiatives (oral and written questions, non-legislative motions, etc...) and complies with the resolutions issued regarding the annual reports.
- Information forums in the surrounding areas of the nuclear installations: The legislation requires the CSN to promote and participate in information forums in the areas surrounding these installations, to discuss aspects related to the operation of nuclear and radioactive installations and to emergency preparedness. In addition, the Regulation on Nuclear and Radioactive Facilities (RINR) (Royal Decree 1836/1999, of 3 December) regulates the workings of Information Committees and public information and participation forums chaired by the Ministry of Industry, Energy and Tourism intended to inform the population of their surrounding areas on nuclear safety and radiation protection matters, on the basis of which a series of annual meetings is held. The CSN actively participates in these forums and annually presents relevant issues, such as the control and monitoring of the various facilities, and, recently, the results obtained within the framework of the stress tests adopted in the European Union as whole after the Fukushima accident, the measures that are being implemented and are envisaged in the Follow-up Action Plan, and the revision of the Basic Nuclear Emergency Plan (PLABEN), in coordination with the Directorate General for Civil Defence and Emergencies.
- Policy on information to the general public: Article 14 of the Law 15/1980 establishes the need to facilitate access to information and the participation of the individual citizens and civil society. This implies the obligation to inform of all relevant facts relating to the operation of the installations, putting special emphasis on safety and the possible radiological impact that they may have on people and the environment, but also of the events and incidents that have happened at these installations and the corrective measures which are susceptible of being implemented.

The CSN publishes on its website inspection reports, the minutes of Council meetings, technical reports supporting the decisions of the Council and all relevant facts related to the operation of nuclear and radioactive installations (operating states of the plants, information on the environmental quality measured by the Automatic Station Network and Environmental Radiation Monitoring Network), news, articles and press releases about events which have taken place in nuclear and radioactive installations, information from the Integrated Plant Supervision System (SISC), and so forth. In the field of information to the media and stakeholders, in addition to the contents of the institutional website, the CSN responds to the direct media requests by applying the transparency and agility criteria commensurate with rigorous technical standards.

Likewise, the legal requirement of transparency obliges the CSN to subject its draft instructions and safety guidelines to public comment, for which purpose it has a dedicated on-line space through which comments can be made. On the other hand, Article 13 of the Law 15/1980 established the procedure for the communications made by natural or legal persons. It also puts a form at the disposal of the workers of nuclear and radioactive installations for them to report any fact that affects the safety of said installations, confidentiality being guaranteed.

The CSN uses other communication channels, such as the organisation of conferences, seminars and training activities, the running of the Information Centre, and the publication of free materials which are generally available on its website in electronic format.

Significant among the communication actions carried out from January 2011 to January 2013 are those associated with the nuclear emergency at Fukushima Daiichi NPP (Japan) after the tsunami of 11 March 2011. The Communication Area launched a specific communication plan to meet the media's high demand for information, which were informed by means of: press releases, press conferences, statements from different speakers, interviews, and documents explaining the most relevant issues (questions of interest to citizens, FAQs about radioactivity, information on the radiological control of Spaniards evacuated from Japan, a nuclear glossary, environmental radiological monitoring values), as well as the creation of a specific dedicated space on the institutional website. Of special interest was the visit to Fukushima of the expert team sent by the IAEA and led by the former CSN's Technical Director for Radiation Protection, Juan Carlos Lentijo.

Particularly intense was the work related to informing the public about the stress tests the nuclear plants were subjected to after the aforementioned accident. Similarly, statements were issued, two press conferences were called, a breakfast with reporters was held, interviews and interventions in different media were carried out, and documents were prepared to explain, in an informative way, the process and the results from the stress tests of Spanish reactors as well as those from the rest of the European Union.

Another issue of great significance in 2011 was the presentation of the CSN's Strategic Plan for the 2011-2016 period. A communication plan was prepared to this end that included the following aspects: press releases, a breakfast with reporters, interviews, and the publication of the Plan on the CSN's corporate website.

The application for the renewal of the operating licence of Ascó NPP (Tarragona) and Cofrentes (Valencia) NPP also had special relevance, as well as the process concerning the location of the Centralised Temporary Storage Facility (ATC).

Another important matter was the management of the communication about the MINETUR's request to the CSN relating to the operating license of Santa María de Garoña NPP (Burgos).

**Other communication channels**

*Organisation of conferences, seminars and training activities:*

The CSN participates or collaborates with other institutions in the organisation of different events aimed at promoting understanding of issues directly or indirectly related to its functions. During the time period covered by this report, the following activities are worth pointing out:

- On 4, 5 and 6 July 2011, the Nuclear Safety Council organised, together with the National Radioactive Waste Company (ENRESA), the Ministry of Health, Social Policy and Equality and the Carlos III Health Institute, a summer course at Santander's Menéndez Pelayo International University on "Radiation Protection and Health." This course brought together more than 70 experts in the medical use of ionising radiations and on the radiation protection against the effects they might cause.
- On 22 and 23 May 2012, the CSN, in collaboration with the NEA, organised an International Seminar on Crisis Communication at Casa de América in Madrid. This event was part of a series of activities on this topic which were led by the CSN within the framework of the NEA's Public Communication Working Group. The CSN's active participation in the definition of the programme, the preparation of the meeting and the aspects of online broadcasting and media coverage, and the corresponding sending of periodic information to the Plenary Board of the CSN are some of the actions worth highlighting. Senior representatives from

nuclear regulators and international organisations, communication experts and members of key reference groups attended the event.

- In 2012 the CSN participated in an emergency drill organised by the Military Emergency Unit (UME) in Cogolludo (Guadalajara) by sending experts and a radiological intervention team, whose work consisted in setting the dosimetric control of those involved in the drill as well as to participate in the tasks for the radiological characterisation of the contaminated area and advise the Director of the drill on these matters.
- Public conference to present the results of the stress tests: on 25 October 2012, the CSN organised a ceremony at the Ministry of Industry, Energy and Tourism with the aim of informing of the stress test process and results and outlining future prospects and the participation of stakeholders, thereby heeding the Advisory Committee for Information and Public Participation's recommendation, which had been approved by the Council.

*Information centre*

The CSN has an interactive space about all the activities related to its functions and mission which is open to the public and free of charge and mostly receives visits from Spanish and foreign educational institutions and institutional delegations. Since 2011, the centre has undergone several upgrades, such as those to the medical module (new techniques have been integrated); in addition, a new panel on the transport of radioactive material and a new model of the ATC have been added.

*Publishing*

The CSN carries out an intense publishing activity of a technical and informative nature as part of its annual plan of publications. These publications are available free of charge on the CSN's website; they can also be ordered by e-mail or fax or picked up at the CSN's Publishing Service.

Furthermore, the CSN publishes a magazine devoted to nuclear safety and radiation protection entitled "Alfa, Revista de Seguridad Nuclear y Protección Radiológica" whose aim is to be a means of communication with the public so as to promote understanding of the issues related to its activities. This journal, in addition to fulfilling the CSN's objective of spreading knowledge on radiation protection and nuclear safety, includes a section which informs of the activities of the CSN and the decisions of the Plenary Meeting.

Finally, as laid down in the Law creating the CSN, an Advisory Committee for public information and participation in nuclear safety and radiation protection matters was set up. The purpose of this Committee is to make recommendations to the Council so as to improve transparency, access to information and public participation in matters within its competence.

## 8.9. Advisory committees

### 8.9.1. Advisory Committee for Public Information and Participation

The Advisory Committee for Public Information and Participation as regards nuclear safety and radiation protection (hereinafter, the Advisory Committee) was created in accordance with Article 15 of the Law 15/1980, creating the Nuclear Safety Council (CSN), as amended by the Law 33/2007, reforming said Law, with the mission to make recommendations to the CSN to promote and improve transparency, access to information and public participation in matters within the competence of the CSN.

This legal mandate was implemented with the approval of the new Statute of the CSN (RD 1440/2010) in 2010, which sets the rules applicable to the running of the Advisory Committee (Chapter VII, Articles 42-46, of the Statute).

The Advisory Committee was constituted during its first meeting held at the CSN's head office on 24 February 2011, the request of Resolution No. 24 of the Committee on Industry, Tourism and Trade of the Congress of Deputies thus being fulfilled.

The Advisory Committee for Public Information and Participation as regards nuclear safety and radiation protection held its first two meetings on 24 February and 20 October 2011, in which its working rules and methodology were laid down.

An Analysis Commission was created whose mission is to study the recommendations and prepare assessment reports thereon, which will serve as the basis for the Advisory Committee's decision making.

With regard to information on issues with important external impact, the CSN informed of its new 2011-2016 Strategic Plan, the accident at Fukushima NPP in Japan, the resulting stress tests of Spanish nuclear power plants, and the renewal of the operating licenses of Ascó I and II NPPs.

The third meeting of the Advisory Committee took place on 21 May 2012 and was divided into two sessions. The CSN presented, among others, the following issues:

- The application of the Protocol for the radiological monitoring of metallic materials (scrap)
- The eventual modification of the Ministerial Order on the cessation of operation of Santa María de Garoña NPP.
- The results of the stress tests to the Spanish nuclear power plants as a result of the Fukushima accident.
- The process of peer reviewing the results of said stress tests conducted by the European Union.

After the ensuing discussion, the Advisory Committee agreed the following recommendations:

- The CSN should carry out informative actions about the Palomares accident.
- The CSN should make the greatest effort to inform of the emergency plans of Spanish nuclear power plants, especially in their immediate vicinity.
- The CSN should organise a public meeting on the results of the stress tests of Spanish nuclear power plants.

The fourth meeting of the Advisory Committee was held on 25 October 2012. The CSN reported it had accepted the recommendations made by the Advisory Committee during its previous meeting and introduced an action plan to implement them.

The CSN also informed of the administrative situation of Santa María de Garoña NPP and of the problems found in the material of the vessel of Doel NPP in Belgium.

After a short discussion, in which the usefulness of this type of actions was debated, the Committee approved studies to identify the expectations of stakeholders in relation to the work of the CSN and define actions to increase its transparency, independence and credibility, in line with the provisions of the CSN´s 2011-2016 Strategic Plan.

## 8.10. Status of the Regulatory Body

Thirty years have passed since the creation of the Nuclear Safety Council. During this period all its competences and functions have been developed successively so that, today, the CSN has the necessary regulatory capacities and legal instruments to carry out its duties with full assurance that the regulated entities and activities are in accordance with the most stringent international standards, criteria and guidelines.

The Law creating the CSN establishes mechanisms to ensure its independence, among others, by the method of appointing of the members of the Plenary Board of the CSN, which have

to be persons of renowned solvency in the matters entrusted to the CSN, their independence and objectivity being particularly valued.

The members of the Plenary Assembly of the CSN are appointed by the Government, at the suggestion of the Ministry of Industry, Tourism and Trade, following the candidates' appearance before the appropriate Commission of the Congress of Deputies. Congress, through the appropriate Commission, declares the acceptance or rejection of said candidates by a majority vote of two thirds of its members within one calendar month from receipt of the relevant communication. Should Congress not make any express declaration, it would be understood that the candidates have been accepted.

The independence of the Nuclear Safety Council is also reinforced by the fact that it funds itself by means of public fees and prices, with just an insignificant percentage of its budget coming from the State Budget and only to partially defray the cost of maintaining the nationwide environmental radiological monitoring network.

## Article 9. Responsibility of the licence holder

The Law 17/2007, of 4 July, requires that the cover for the risks that might arise in relation to the liability deriving from nuclear accidents be increased. For further details, please refer to Article 7.1.1 of this report.

### 9.1. Legislation assigning prime responsibility for safety to licence holders

The Law 25/1964 on Nuclear Energy, modified by Article 36 of the Law 33/2007, of 7 November, reforming the Law creating the Nuclear Safety Council, explicitly states that "the licensee of the nuclear or radioactive installations or of the activities relating to ionising radiations shall be responsible for their safety".

Article 8 of the Regulation on Nuclear and Radioactive Facilities (Royal Decree 1836/1999, modified by the Royal Decree 35/2008) establishes that "The holder of each licence shall be responsible for the safe operation of the facility or activity, in all cases in accordance with the requirements of the official documents under which the corresponding licence is granted."

Additionally, Section 3 of that same article establishes that the licensee must continuously strive to improve the nuclear safety and radiation protection conditions of its facility. To this end, it must analyse existing best practices and techniques, according to those requirements set by the Nuclear Safety Council, and introduce those which are suitable in the opinion of said body.

At any time, the Nuclear Safety Council may ask for the licensee's analysis for the implementation of improvements to nuclear safety and radiation protection.

### 9.2. Description of the systems or mechanisms by means of which the license holder complies with these obligations

The licensee complies with these obligations by operating the installation in accordance with the limits and conditions established in the Operating Licence granted by the Ministry of Industry, Energy and Tourism, following the mandatory and binding report from the Nuclear Safety Council (CSN).

These limits and conditions include all binding official operating documents: the Safety Analysis Report, the Plant Technical Specifications, the Operation Handbook, the On-site Emergency Plan, the Quality Assurance Manual, the Radiation Protection Manual, the Radioactive Waste and Spent Fuel Management Plan, and the Physical Protection Plan.

In addition, the operation of the plant must comply with the Instructions issued by the CSN in accordance with Article 2.a of the Law 15/1980 creating the CSN, according to which the CSN "may draw up and approve nuclear safety- and radiation protection-related instructions relating to nuclear and radioactive installations." "The instructions are technical standards on nuclear safety and radiation protection which shall be binding for the subjects affected by their scope of application, once notified or, where appropriate, published in the Official State Gazette".

One of the obligations of the licensee is to send a series of reports to the CSN, some of which are periodic in nature, others deal with specific activities, such as outage activities, and others inform of events that meet certain reporting criteria.

Additionally, as explained in Article 14.3.4., licensees have specific procedures, guides (occasionally of a sector-specific nature) and organisational aspects available that facilitate and guarantee compliance with the requirements and establish internal control mechanisms.

## 9.3. Description of the mechanisms by means of which the regulatory body ensures that the license holder complies with its obligations

The CSN has a series of instruments to verify that the licensee complies with its obligations. The first and most powerful one is the annual inspection plan, which is made up of the following:

- The Basic Inspection Plan, by means of which the CSN carries out at the plant specific checks of samples of all activities important to safety.
- The generic-issue inspection plan, about concerns that have arisen usually as a result of Spanish or international operating experiences.
- Reactive inspections, which are organised whenever a safety-significant event occurs, as a result of either its causes or consequences.
- Licensing inspections, which are organised within the framework of an authorisation, be it of a design modification, a replacement of a Technical Specification or the renewal of the Operating Licence.

An essential part of the inspection programme is carried out by the CSN's resident inspectors – two at each plant. They also review and assess incidents that take place during the plant's daily operation with the help, where appropriate, of a support organisation at the CSN's head office, which handles the technical collaboration with the rest of the CSN's organisation when the matter so requires it.

The CSN also receives each plant's performance indicators. In accordance with the procedures of its Integrated Plant Supervision System (SISC) in force, whenever these indicators exceed certain thresholds, they trigger a series of actions by both the licensee and the CSN.

The CSN analyses the periodic reports and the reports on specific activities or reportable events sent by the plants, in some cases in a subject-specific manner and in other cases as part of the documentation that it uses to prepare its inspections.

Regardless of whether it is a result of the inspections or of the evaluation of the information which licensees send to the CSN, when the CSN detects a plant's non-compliance with any in-house rule (an operating procedure, a maintenance error, etc.), it defines it as an "inspection finding" and categorises it according to its importance, from which the actions to be performed by the licensee and, where appropriate, the extent of the monitoring thereof to be performed by the CSN, according to the SISC methodology, are derived.

If the non-compliance is with a legal or regulatory requirement, the CSN proposes the bringing of disciplinary proceedings against the plant to the MINETUR, which has the authority to rule on said proceedings.

If, on the other hand, the non-compliance constitutes a minor infraction in which a series of attenuating circumstances concur, the Law allows the CSN to directly warn the licensee of the installation so as to point out to it the identified non-compliance and the corrective measures that it must take.

## 9.4. Description of the mechanisms by means of which the license holder maintains an open and transparent communication with the public

All Spanish nuclear power plants support a policy of open and transparent communication with the public for it to have enough truthful information about the activity of every installation.

### Information at nuclear power plants

1. **Communication and relations with the media.** Spanish nuclear power plants have organisations which are in charge of sending information about the state of each installation to the

media and the general public. This is done by issuing press releases, communiqués and news items, holding press conferences and meetings with the media, sending specific information, collaborating with the media on information campaigns and so on. The effort made to turn plant websites into effective communication tools is particularly noteworthy. There are also initiatives in motion about the use of other tools for direct or indirect communication with the public (e.g. the social networks, etc.), but they are not widespread yet.

2. **Publications.** NPPs have their own periodical publications (company magazines) which cover the main news about each installation and its surrounding area, as well as about the nuclear sector as a whole. They also publish specific publications, such as single-subject brochures, technical reports and so forth.
3. Some installations have programmes for **publishing information** about plant operation in local and regional newspapers. This type of initiative usually takes place on a monthly basis.
4. On the other hand, Spanish nuclear sites have **information centres**. These are installations where the operation of the plant and the measures to guarantee plant safety, environmental quality and radioactive waste management are explained in a practical and informative manner. The annual number of visitors ranges from 5,000 to 15,000 people – for the most part schoolchildren and university students.

## Information by other organisations

5. It is worth pointing out that the **Spanish Nuclear Industry Forum (Foro de la Industria Nuclear)** plays an important role in informing the public about the activities of the nuclear sector. The **Communication Committee** – for exchanging experiences and developing joint initiatives, the Publications Committee, and the Training Committee – in charge of relations with the educational world – stand out as part of its organisation. UNESA – the association that brings together the main Spanish electric utilities – publishes information of a general nature about the operation of Spanish NPPs.

## Information by public bodies and institutions

6. The **Information Committee** at each installation is a unique initiative as far as public information and participation are concerned. This is a forum where the national, regional and local institutions associated with each installation, the plants themselves, and the most representative entities and associations in each area, as well as the regulatory body, are represented. They are convened on a periodic basis to inform of the main aspects related to each plant, activities which are presented and discussed by all represented entities.

## Information for public institutions and representatives

7. On the other hand, plant and sector representatives go, on their own accord or when required to do so, to regional and national institutions –in particular, Congress and Senate commissions– to inform of and explain their activity and their plans and projects. In some cases, the nuclear power plants send monthly reports on their operation, including the most representative events, to these institutions (in addition to the CSN).

## Conclusion

In short, it can be said that Spanish nuclear installations and the entire Spanish nuclear sector carry out on their own initiative a series of activities which guarantee public information, public communication, and access to information by society and, consequently, the transparency of their activity. The purpose of all of this is for the public to trust the nuclear generation of electricity.

## c) General considerations regarding nuclear safety

# Article 10. The priority of safety

## 10.1. Regulatory requirements related to the policies and programmes used by the license holder to prioritise safety in design, construction and operation activities

As laid down by Article 8.3 of the Regulation on Nuclear and Radioactive Facilities (RINR), the licensee must continuously strive to improve the nuclear safety and radiological protection conditions of its facility. To this end, it must analyse existing best practices and techniques, according to those requirements set by the Nuclear Safety Council, and introduce those which are suitable in the opinion of said body.

Nuclear power plants have management systems in place in compliance with that laid down in the IAEA's GS-R-3 "The Management System for Facilities and Activities" and the CSN's Council Instruction IS-19, on the requirements of the management system of nuclear facilities. The way in which to set up, implement and continuously evaluate and improve a management system that integrates nuclear safety, occupational risk prevention, environmental protection, physical protection, quality, and financial aspects to guarantee that nuclear safety is properly taken into account in all the activities of the organisation is defined in these systems.

The purpose of the management system's requirements is to guarantee that safety is never compromised by considering the implications of all actions, not within the framework of different, separate management systems but in an integrated manner with regard to safety. The nuclear safety policy is one of the policies defined in the management system.

Management systems establish measures for the safe management of NPPs, starting from properly planning the activities and having enough financial resources and duly qualified human resources. They set indicators which allow to identify negative trends in the results obtained during the performance of the activities. Action plans are revised on a yearly basis according to the results obtained during the evaluation of the previous year and the new needs which have been identified. The most important activities to be undertaken in a 5-year period are identified in these action plans.

There have been set safety monitoring measures, by means of the performance of surveillance tests. In them, compliance with all the limits set in Plant Technical Specifications (PTSs) is verified.

Self-assessment programmes have been established in order for the people in charge of the activities or the process to be able to make a critical assessment of the results obtained relative to the defined expectation so as to identify non-conformities and suggestions for improvement that allow to improve the quality of the process.

The management system calls for the performance of in-house evaluations independent from safety-related activities and processes. These evaluations are made by employees who are not directly involved in the activity in question. The following are examples of independent evaluations: quality audits, independent supervisions, evaluations conducted by different committees (nuclear safety, ALARA, health & safety, etc.) and so forth.

External evaluations provide the organisation with information, by comparing the best industrial practices with the way activities are carried out at NPPs, and allow to identify areas for improve-

ment. The following are the evaluations made by WANO, by means of its Peer Reviews, and by the IAEA, through its OSART missions, at Spanish nuclear power plants during the time period under consideration:

| NPP | Evaluation | Date |
|---|---|---|
| Trillo | Peer Review Follow-up (WANO) | 2010 |
| Santa María de Garoña | Peer Review (WANO) | 2010 |
| Almaraz | Peer Review Follow-up (WANO) | 2011 |
| Vandellós II | Peer Review (WANO) | 2010 |
| Vandellós II | OSART Follow-up (IAEA) | 2011 |
| Ascó | Peer Review (WANO) | 2011 |
| Cofrentes | Peer Review Follow-up (WANO) | 2012 |
| Santa María de Garoña | Peer Review Follow-up (WANO) | 2012 |
| Vandellós II | Peer Review Follow-up (WANO) | 2012 |

Furthermore, even though they do not usually perform external evaluations, there are other bodies and forums apart from WANO which are a source of information and lessons for plants. For example, Spanish NPPs are part of owners groups such as BWROG and PWROG and groups such as EPRI, NEI, etc.

## 10.2. Measures taken by the license holder to prioritise safety, such as those indicated in the preceding section, and any other voluntary measures or good practices

Spanish nuclear power plants revise their Action Plans on an annual basis; the most important plant safety improvement activities in the medium- and short-terms are identified in said plans.

The management of the corrective action programme makes it possible to identify the priority of the actions to be carried out at plants according to their importance to safety. By observing the deadlines set for actions it is possible to eliminate the causes of an incident and, hence, the recurrence thereof.

Plants carry out activities to reinforce behavioural expectations and leadership at all levels while stressing that safety is paramount.

External evaluations are carried out to benchmark the performance of activities at the plants against best industrial standards. Thus, in 2010, 2011 and 2012 there have been WANO Peer Reviews at Santa María de Garoña, Almaraz, Ascó, Cofrentes, Trillo and Vandellós II NPPs; at least another nine such missions are planned for the next four years (until 2016).

Technical missions are performed at the plants and the plants take part in overseas technical evaluations and missions. In 2010, 2011, 2012 and up to January 2013, experts from Spanish NPPs participated in 31 WANO Peer Review missions to nuclear power plants in Argentina, China, France, Germany, Mexico, Sweden, Switzerland and the UK and in 30 WANO technical missions to stations in Argentina, Belgium, Bulgaria, China, France, Finland, Germany, Slovenia, Sweden and the UK.

## 10.3. Regulatory processes to supervise and monitor safety prioritisation actions by licensees

The CSN's supervision is part of the following activities:

- The Management Systems of Spanish nuclear power plants establish the long-term Strategic Planning processes, the analysis and prioritisation of the projects that define the Investments Plan in the medium term (5 years), and the Operating Plan or annual budget. The CSN is informed by the plants of their investment plans on a yearly basis and supervises their improvement plans to maintain and reinforce safety-related aspects. On the other hand, the CSN's annual inspection plan envisages the performance of Management System inspections; two such inspections at NPPs are planned for 2013.
- The scope of the CSN's Integrated Plant Supervision System (SISC) includes the supervision of the Safety Culture, which is done by means of the tools provided by this programme, in particular Supervision through programmes by means of Inspection Procedure PT.IV.224 *"Organisational and Human Factors (O&HF) Programmes,"* one of its current objectives being the inspection of the process set up at each nuclear power plant in its Safety Culture Programmes (specialists, means, evaluations, ongoing actions, etc.).

## 10.4. Measures taken by the regulatory body to prioritise safety in its own activities

Within the framework of its Safety Policy, the CSN's Management System Manual (MSG) establishes in the first place the need to give priority to aspects essential for safety and optimise the efficiency in the use of the resources of the CSN and the licensees.

The CSN defines its own global strategies, goals and results, and includes them in its Strategic Plan, which represents the commitment of the entire organisation in relation to the expected results. These goals are set out in annual plans, which are approved by the Council.

The general activity prioritisation lines of its NPP-related operating processes are indicated below.

**Regulatory development process**

Two of the CSN's strategic objectives are the development of the regulatory pyramid and the commitment made as part of WENRA to harmonise nuclear safety and radioactive waste and spent fuel management regulations, in collaboration with other Institutions of the Spanish State, by adapting the legislation in force to current needs, taking into account the international regulatory developments and the activities for the harmonisation of European regulations.

**Supervision and control process**

Another of the CSN's strategic goals is to have a **regulatory system** and a set of practices comparable to those of the most advanced countries, which are adapted to changing demands and guarantee a high level of safety of the installations and activities throughout their life cycle and which:

- Are focused on aspects essential for safety, reinforcing the responsibility of licensees.
- Harmoniously integrate deterministic and probabilistic methodologies, observing broad-enough safety margins and the principle of defence in depth.
- Are progressively geared towards a performance-based process aimed at monitoring processes important to safety and thus making all CSN actions systematic, comprehensive, predictable and risk-informed.

In order to achieve this strategic goal, the CSN has developed the Integrated Plant Supervision System (SISC), which has already been described in other sections of this report. This process is subjected to independent audits carried out by people who are not directly involved in the process; SISC results are published on the CSN's external website.

**Authorisation process**

With the aim of developing the specific integrated model for the licensing of nuclear installations – including the end of their service life, their dismantling, their decommissioning and the management of their wastes and irradiated fuel, the CSN has developed procedures to evaluate the applications (PG-IV-01 "Mandatory CSN Reports to the Management of Nuclear and Radioactive Facilities of the Fuel Cycle" and PG-IV-08 "Evaluation of Nuclear Facilities") which systematise the scope and content of the evaluations performed by the CSN. This process is subjected to independent audits carried out by people who do not take part in the process. Furthermore, the CSN publishes the reports on which its authorisation process-related decisions are based on its external website.

# Article 11. Financial and human resources

## 11.1. Financial resources

As regards the investments in safety by NPP operators, the Integrated Management System includes a series of procedures for the planning of safety-related investments. This system aims to ensure that all potential investment needs are detected and receive the appropriate attention, any unit of the organisation being capable of proposing actions that entail new investments. In order to prioritise them, they are classified according to the following criteria, in the order in which they are listed:

1) Requirements of the regulatory authorities.
2) Improvement of nuclear safety, radiation protection, risk prevention, and environmental protection.
3) Power plant retrofitting or upgrading.
4) Profitability.

On the other hand, in Spain the management of radioactive waste constitutes an essential public service for which the State is solely responsible and which is provided by the National Radioactive Waste Management Agency (ENRESA), which constitutes a resource and technical service of the Administration. The Government draws up the policy on radioactive waste management by means of the approval of the General Radioactive Waste Plan.

The management of radioactive waste, including spent nuclear fuel, and the dismantling and decommissioning of nuclear installations are charged to the fund for financing the activities included in the General Radioactive Waste Plan. Said fund comprises the sums from the collection of regulated fees and the yields derived from the transitory financial investments thereof.

## 11.2. Human resources

In this regard, the CSN has two Instructions, namely the Council Instruction IS-11, on nuclear power plant operating personnel licences, and the Council Instruction IS-12, defining the qualification and training requirements for non-licensed personnel of nuclear power plants whose duties are related to the safe operation of the plant, through the efficient and safe performance of the tasks assigned to each position. The term qualification includes the following: academic qualifications, experience, and initial and ongoing training.

The licensee of a nuclear power plant has to make sure that all employees have the right qualifications for the duties which are going to be assigned to them.

The entry into force of the abovementioned Council Instructions has meant the adaptation of the procedures and practices of NPPs to these new requirements, including permanent and sporadic contractors, the definition of standard profiles and the analysis of suitability and training requirement for all workers.

In 2008 the Spanish nuclear industry, through UNESA, decided to undertake an analysis of the quality of the training delivered at Spanish nuclear power plants. To this end, the decision was made to take the practices of the Institute for Nuclear Power Operation (INPO) as a reference; both entities entered into talks, which concluded in 2009 with an agreement between INPO and the Spanish nuclear industry, represented by UNESA, for the provision of this service.

The purpose of the analysis (which was termed Gap Assessment) was to evaluate the state of implementation of the training given to operating personnel of Spanish NPPs, including the training provided by the company Tecnatom. The INPO standards laid down in the ACAD Guides, in particular ACAD 02-002 "The Process for Initial Accreditation of Training in the Nuclear Power Industry" and ACAD 02-001 "Objectives and Criteria for Accreditation of Training in the Nuclear Power Industry", were taken as reference for said assessment.

After analysing the results of the Gap Assessment, Spanish plants devised specific action plans with the aim to upgrade all their training programmes, not only those of operations; these improvements were extended to maintenance, radiation protection (RP), chemistry and radiochemistry (CAR) and engineering training programmes. Some of the common activities are listed below:

- Seminars on SAT (Systematic Approach to Training) for managers, focused on the roles and responsibilities thereof during the training process.
- SAT seminars for NPP training staff and Tecnatom instructors, focused on providing them with an in-depth knowledge of the methodology.
- Training programme revision committees, with the participation of line personnel, training staff and workers (incumbents).
- Seminars for the professional development of Shift Managers, in order to improve the performance of their leadership and management tasks during plant operation.
- The effectiveness of simulator training has been enhanced by implementing, among other techniques, the discussion, lead by Shift Managers, of training scenarios after they are completed.

The On The Job/Task performance evaluation has been gradually introduced, especially for assistant plant operators.

Tecnatom signed a contract with INPO to receive assistance and support in the development of its work processes and methods and, of course, to improve the qualification of its instructors.

These activities have lead to a significant improvement of the Spanish nuclear sector's capabilities for providing quality initial training, as well as to the introduction of new techniques for the retraining of operating personnel, especially in the simulator. The maintenance, Radiation Protection, Chemistry & Radiochemistry and engineering training programmes have also been significantly upgraded.

It is also worth mentioning that the fleet of simulators which are replicas of the control rooms of Spanish NPPs also complies with the USNRC's RG 1149 "Nuclear Power Plant Simulation Facilities For Use in Operator Training and License Examinations and Applicant Experience Requirements" and the Standard ANSI 3.5 "American National Standard for Nuclear Power Plant Simulators for Use in Operator Training and Examination."

In order to evaluate whether Spanish nuclear power plants are properly staffed, several benchmarking exercises have been performed with respect to foreign NPPs in order to bring the workforces of the former into line with international standards. New recruiting is planned sufficiently in advance so that, in the case of the replacement of retiring personnel, there is enough time to schedule the necessary training and the appropriate overlap for the transfer of know-how during the replacement is as great as possible. In the case of an organisational reinforcement, new hires are given the necessary training before they fill in the vacant position.

Personnel –either plant or contracted– required for the management of severe accidents are given initial training on knowledge about the evolution of and the phenomenological aspects that concur in these situations, such as core heating and fusion, phenomena inside and outside the vessel, containment performance, and the transport of fission products. They are also trained in the use of Severe Accident Guides.

After they obtain their initial qualification, they receive continuous training on severe accidents, comprising theoretical and practical notions of the use of said Guides, on a yearly basis.

In order to comply with the CSN's requirement derived from the Fukushima accident, Spanish NPPs issued their Final Stress Test Report, where they identified a series of areas for improvement to increase the robustness of their installations in situations beyond their design bases, such as the one that took place at said Japanese plant.

These improvement suggestions took into consideration training all involved personnel, either from the plant or contracted, whenever this is necessary to ensure their successful implementation. The timeframes with regard to the initial and ongoing training and any other associated training have also been arranged and agreed with the CSN.

## 11.3. Regulatory review and control activities

The CSN is carrying out supervision and control activities in relation to the human resources of nuclear power plants, as set out below:

- Each plant is required to have analysed and documented every department's needs for technical capabilities and minimum staff to ensure the safe operation thereof.
- Any organisational and human resources change related to Nuclear Safety or Radiation Protection functions must be analysed and documented in order to guarantee that these functions will be performed properly thereafter.
- Every year Spanish nuclear power plants send the CSN a report with the modifications or updates related to the optimisation of the human resources of their organisation. The CSN carries out an annual supervision of the organisational changes that have taken place at these NPPs and reviews in greater detail the most significant changes at each installation.

Since 2008, and after several incidents/events that occurred at Spanish NPPs in 2007 and 2008, licensees undertook to perform an overall analysis of the situation at each plant in order to identify possible improvements and assign more resources to those areas that require it, including maintenance, personnel training, the analysis of operating experience, the retrofitting and replacement of equipment, and staffing.

# Article 12. Human factors

## 12.1. Measures of the Contracting Parties and regulatory requirements to take human factors and organisational aspects into account in the safety of nuclear installations

Spanish nuclear power plants have organisation- and human factors-related safety improvement programmes in place. These programmes allow to identify, control and reinforce "organisational" and "human" aspects before they can negatively impact the plant's safety and availability.

The goals of O&HF Programmes are as follows:

- To minimise or prevent, inasmuch as possible, that Organisation and Human Factors aspects have a negative influence of plant safety and availability, analysing the problems arising as a result thereof and identifying and carrying out the corrective actions required to prevent them from recurring.
- To carry out organisational activities related to external or internal assessments, including those belonging to Safety Culture.
- To comply with Safety Culture and Human Factors organisational requirements proposed by external bodies.
- To evaluate organisational changes according to the established systematic approach.
- To design equipment, systems and their human-machine interfaces, as well as design modifications, by taking into account human capacities and limitations, according to recognised Human Factors principles and practices.
- To monitor the activities which are being carried out by means of the supervision thereof.
- To collaborate in organisation and human factors-related training and research projects.
- To participate in external forums for discussing, exchanging and researching Organisation and Human Factors improvements

Additionally, O&HF Programmes aim to:

- Set goals and expectations with which to self-evaluate the Programme.
- Coordinate different projects and activities, unifying criteria.
- End up having specialists who are experts in human error minimisation techniques.
- Promote the continuity of the programme in the medium and long terms.

In order to make use of synergies among the NPPs, a coordination group made up of organisation and human factors specialists has been set up in UNESA to exchange information, coordinate relations with the Nuclear Safety Council, develop research projects and teach courses to organisation and human factors specialists.

## 12.2. Consideration of human factors in the design and modification of NPPs

The aim of human factors engineering in design modifications is for people's role in and contribution to the safe and reliable operation of installations to be taken into account, thus ensuring that the modifications that are designed are compatible with human characteristics and limitations.

The activities related to human factors in design modifications are: the revision of control room panels; the improvement of human-machine interfaces; the evaluation of changes in the location of items, changes in the working conditions, changes in systematic approaches; the use of new tools; work in simulators; and so on.

All aspects related to human-machine interfaces in the control room of Spanish NPPs have been analysed in depth, in compliance with that set forth in NUREG 0700 REV 2 "Human-System Interface Design Review Guidelines" and 0711 REV 2 "Human Factors Engineering Program Review Model".

## 12.3. Methods and programmes of the licence holder for analysing, preventing, detecting and correcting human errors in the operation and maintenance of the NPP

Licensees have introduced plans to strengthen behavioural expectations. One of the first steps was to revise behavioural expectations and benchmark them against the best nuclear industry standards. Next, plans to convey these behavioural expectations and raise personnel's expectations thereabout were set up. Once all behavioural expectations were defined and communicated, compliance therewith was monitored in order to identify weaknesses and take measures to correct them.

The use of human error minimisation tools such as the following has been promoted: adherence to procedures, pre-job meetings, post-job meetings, double verification, independent verification, the use of phonetic alphabets, the use of operating experience, and so forth.

Work is still being done on safety culture reinforcement programmes and organisation and human factors programmes. NPPs have common procedures for the performance of in-house safety culture assessments, which they have undertaken to carry out every two years.

NPPs undergo external safety culture assessments and take part in international conventions and groups on safety culture and organisation and human factors.

All activities which are common to Spanish NPPs are coordinated by a group of organisation and human factors specialists from UNESA for the exchange of experiences and the development of common projects.

Human factors simulators have been set up where behavioural expectations are reinforced and training is given on the use of error minimisation tools.

## 12.4. Self-assessment of managerial and organisational issues by the operator

Spanish nuclear power plants have set up self-assessment programmes to achieve the continuous improvement of the activities and processes carried out by their Organisation by identifying and assessing deficiencies and opportunities for improvement through the direct involvement of personnel in the critical examination and improvement of their own work and results.

A method has been introduced for the preparation, revision, approval and subsequent evaluation of organisational changes in the company which reasonably guarantees an appropriate identification and assessment of the potential impacts changes might have on the safe operation of plants prior to their implementation.

Spanish NPPs have set up periodic self-assessment programmes. Self-assessment is defined as the set of activities whose purpose is to compare the performance of a plant's processes and activities with those expectations which have been set; these activities are carried out by the individuals or groups who are responsible for the latter.

## 12.5. Measures for getting feedback on the experience with human factors and organisational aspects

The analysis of the inputs to the Corrective Action Programme makes it possible to identify negative trends in organisation- and human factors-related matters. Trend analysis is already being used in Spanish nuclear power plants.

UNESA has set up groups of specialists in corrective action programmes and in organisation and human factors to exchange information and set common criteria for the handling of the information obtained through trend analysis. As a result, common activities are designed which are directed towards making progress in the areas for improvement which have been identified.

The evaluation and report by licencees of internal and industry operating experience related to human and organisational factors enables organisations to become aware of the real issues that exist in these areas and take measures to improve them.

## 12.6. Regulatory review and control activities

As regards the organisational aspects of the regulator, since 1990 the CSN has a specific group of specialists in place in charge of issues regarding human and organisational factors, including safety culture aspects. The CSN keeps track of human and organisational factor-related requirements and standards in the country of origin of the projects and of international practices, therefore adapting its regulations and regulatory practices. NPP licensees are responsible for carrying out all actions needed to comply with the applicable requirements and to establish processes for the continuous improvement of safety in this area, the CSN being in charge of overseeing the appropriateness of these actions. Regarding this subject, the CSN has carried on with its evaluation and inspection tasks during this period.

Furthermore, in these disciplines the CSN continues to promote the organisation, qualification and initiative of licensees to undertake safety improvement projects. In other words, apart from the conventional regulatory control of the results from specific human and organisational factor projects, the CSN is stimulating the licensee's indispensable initiative to identify by itself, within the framework of a systematic programme, improvement projects in the following disciplines: organisational efficiency, human behaviour, knowledge self-assessment and management, job and task management, and so on. In short, the monitoring of that licensee's programme, that is, the regulatory control aimed at licensee processes, is becoming an additional or complementary approach in the field of human and organisational factors that the CSN is starting to value very highly.

Some of the main issues which have been tackled during this period in biennial human factors inspections have been: the monitoring of the state of development of the programmes themselves and the projects they encompass; the projects for the development of human factors simulators at Spanish NPPs; safety culture programmes; the analyses of human factors in operating experience; human factors engineering in design modifications; job monitoring and behaviour observation activities; the methodology for the verification of the effectiveness of improvement plans; the methodology for the human factors-related verification and validation of human actions in operating scenarios; the systematic approach for checking the alignment of components after testing and maintenance; and the on-site inspection of human factors-specific aspects everywhere at the plant, including the control room.

In the case of Ascó and Vandellós II NPPs, these inspections have been supported by a special supervision programme devised by the CSN to monitor the introduction of ANAV's Organisational, Cultural and Technical Reinforcement Plan (PROCURA), which is the direct result of the radioactive particle release event that took place in Ascó in 2008. During this period, the inspections of the PROCURA Plan have ranged from the supervision of the degree of progress and introduction of the plan (which ended in December 2012) to the supervision of the

mechanisms so as to verify the effectiveness of the PROCURA Plan, which the licensee (ANAV) was designing and beginning to apply in the first quarter of 2013. Additionally, they included the review of the sustainability processes the licensee plans to introduce, in order to ensure that the positive path the licensee has set upon with PROCURA is maintained in the future, and the review of the external safety culture assessment which was conducted in the autumn of 2012 – jointly, for the first time, for both plants. The effort made by the licensee to change the organisational culture so as to turn it into a driver and guarantor of the sustainability of the improvements under way is worth mentioning.

All Spanish nuclear power plants have organisational change management procedures in place which lay down the process for proposing, designing, planning, implementing and reviewing organisational changes at the installation so that they do not negatively impact its nuclear safety- and radiation protection-related functions. Among other cases, these procedures have also been applied to the changes in the operation handbooks which have been made during this period. This is a remarkable qualitative improvement in licensee safety analyses of organisational changes.

In 2009, the CSN wrote a conceptual document on the subject of making safety culture monitoring part of its Integrated Plant Supervision System (SISC).

In 2010 and the beginning of 2011, the CSN completed most of the activities envisaged in the work plan which implements said conceptual document. A relevant milestone was the organisation of a joint seminar with representatives from the Spanish nuclear industry with the aim to promote the development of a common language for and a shared vision of the new systematic approach for supervising cross-sectional components during SISC inspections.

By the second half of 2012, almost all inspection procedures had been revised; moreover, the training in the new SISC cross-sectional supervision systematic approach was designed and given. This training emphasised the added value of these new inspection approach such that, during inspections, apart from trying to detect potential non-compliances with technological regulations (inspection findings), the main organisational and cultural causes associated therewith are identified.

Therefore, all the tasks included in the work plan were completed in 2012, which allowed to start a pilot phase for the application of the new systematic approach. This pilot phase is expected to last twelve months, at the end of which the lessons learnt must be reviewed, and, where appropriate, the appropriate modifications made, before this new systematic approach can begin to be applied in earnest.

# Article 13. Quality assurance

## 13.1. Measures of the Contracting Parties and regulatory requirements to set up quality assurance programmes and quality management systems

The Nuclear Safety Council requests all nuclear power plants to have a quality assurance programme in place. The Regulation on Nuclear and Radioactive Facilities (RINR) calls for the establishment of a quality assurance programme. The Council Instruction IS-19, on the requirements of the management system of nuclear installations, sets forth that quality assurance systems must comply with the Spanish Standard UNE-73401:1995 "Quality Assurance at Nuclear Installations," which sets 18 criteria on which quality assurance manuals must be based on.

## 13.2. Use of integrated management systems at NPPs

Nuclear power plants have set up management systems in compliance with that laid down in the IAEA's document GS-R-3 and the Council Instruction IS-19. The way in which to set up, implement and continuously evaluate and improve a management system that integrates nuclear safety, occupational risk prevention, environmental protection, physical protection, quality, and financial aspects so as to guarantee that nuclear safety is properly taken into account in all activities of the organisation is defined in these systems.

## 13.3. Main elements of quality assurance, quality management and quality management programmes covering all aspects important to safety throughout the life of the NPP

The purpose of introducing a quality assurance programme is to reasonably ensure that the structures, systems and components, as well as the use made of them, are suitable for enabling their operation to take place in a safe, reliable and documented manner.

The quality assurance programme lays down the application of a set of systematic, documented and planned activities related to the safety of the installation. The programme is applied to any activity, such as designing, purchasing, manufacturing, handling, sending, storing, cleaning, building, assembling, testing, commissioning, operating, inspecting, maintaining, repairing and modifying, that might affect the quality of safety-related items.

The requirements set in the quality assurance programme are applied to all activities affecting the safety functions of safety-related SSCs. This programme applies to all in-house and external organisations that take part in safety-related activities.

## 13.4. Audit programmes of licence holders

The quality assurance programme introduced at nuclear power plants calls for the setting up of a planned and documented internal and external audit programme to verify that all aspects of the quality assurance programme are observed and that the programme is effective. These audits will be conducted according to written procedures or checklists.

Measures to monitor corrective actions and to verify that the deficiencies identified during the audits –and, whenever possible, their causes– have been corrected within the agreed timeframes have been adopted.

Under UNESA's coordination, Spanish NPPs have worked to develop common checklists for the performance of audits in different areas based on the best standards of the nuclear industry defined by INPO and WANO.

## 13.5. Audits of vendors and suppliers by NPP licence holders

The quality assurance programme lays down that equipment or services for safety-related positions must be purchased or contracted from evaluated and approved vendors. Thus, an annual external audits programme has been set up to check the capacity of vendors to supply items or provide services that meet the requirements set in the purchasing or procurement documents.

In order to optimise the vendor evaluation process, Spanish NPPs have in place a systematic approach, by means of written procedures, for the common evaluation of vendors such that the assessment made by a plant according to these procedures is acceptable to all other plants. There is a group in UNESA in charge of coordinating common evaluations for all plants. There is a software application which allows to control and monitor common evaluations and acts as a depository for all generated information. Spanish NPPs have collaboration agreements with international groups of nuclear power plant vendor evaluators.

## 13.6. Regulatory review and control activities

The CSN continues to evaluate and inspect quality assurance activities at nuclear installations. Following the requirements set in the Council Instruction IS-19, nuclear installations have introduced a management system according to GS-R-3 "The Management System of Facilities and Activities;" said system in general and the management of processes in particular are currently in the improvement phase.

The issues which in the past few years have received special attention within the area of quality assurance have been the following:

- The management and use of spare parts in safety systems: spare part purchasing; management of spares in warehouses; infra stocks; work orders postponed owing to a lack of spares; the use of nuclear-class spare parts in safety systems; commercial-grade spares; dedication processes, and so on.
- The contracting of safety-related services. The control and supervision of safety-related jobs carried out by contractors.
- Quality plans for the manufacture of spent nuclear fuel storage and cask containers.
- Quality plans for the construction of individualised temporary storage facilities (ATIs)

In addition, the activities included in the CSN's general monitoring activity programme have been carried out, the following among which:

- Participating in biennial inspections on the implementation of design modifications at nuclear power plants: PT-IV-215 "Permanent Design Modifications."
- Monitoring the application of the quality plans of some of the design modifications implemented during this period.
- Conducting two annual inspections of the activities carried out by licensees for the control of jobs performed by refuelling-outage contractors.
- Inspecting the use and management of nuclear-class spare parts and commercial-grade spare parts (dedication plans).
- Monitoring the application of the management system (IS-19).

# Article 14. Safety assessment and supervision

## 14.1. Introduction

Each operating licence lists the reports (periodic or otherwise) that licensees have to submit to the CSN. These reports are reviewed or supervised, as appropriate, by the CSN, giving rise to meetings, inspections, and audits with the owner of the installation, as applicable.

Among the faculties bestowed by law upon the CSN is that of directly sending to the holder of the licence complementary technical instructions to ensure the installation's safety conditions and requirements are maintained and the requirements set in each licence are best complied with.

Design modifications, or modifications to the operating conditions affecting nuclear safety or radiation protection, as well as testing, may require express authorisation.

Additionally, the safety assessments which have been performed at all Spanish NPPs by means of the so-called Stress Tests as a result of the accident at Fukushima NPP, which has lead to the verification of their compliance with their design and licensing bases, as well as their robustness against extreme natural events, stand out during the time period covered by this report. Furthermore, some areas for improvement have been identified, which are being dealt with by the NPPs so as to solve them before 2016. These activities were the subject of the second extraordinary meeting of the Convention on Nuclear Safety, which took place in the summer of 2012.

## 14.2. Safety assessment

### 14.2.1. Measures of the Contracting Parties and regulatory criteria for the performance of comprehensive and systematic safety assessments

The CSN has an in-house procedure to review the applications submitted by licensees. This procedure establishes a systematic approach to develop the process for assessing the different topics relating to nuclear installations, from the reception of the assessment documentation to the issuing of the corresponding assessment technical report. It is applied to all topics relating to nuclear power plants which are subjected to an assessment and require the Nuclear Safety Council's opinion, such as design modifications, changes in official operating documents, etc., as well as to the closure of the conditions associated with the operating licences, CSN initiatives and other subjects it might occasionally be considered should be reviewed.

In 2009 the CSN issued the technical Instruction IS-21, on requirements applicable to design modifications at nuclear power plants, which implements the requirements which are described in the Regulation on Nuclear and Radioactive Facilities regarding design modifications at facilities. The application of this Instruction makes it possible to determine when a licensee must apply for a design modification permit before it is put into service. This Instruction establishes the need to perform a preliminary analysis to identify whether, once that change has been made, the criteria, standards and conditions on which the original permit is based continue to be fulfilled. If these requirements are affected by the design modification, the licensee must request authorisation prior to its entry into service. On the other hand, if they are not affected, the modification can be carried out by the licensee, which is only required to provide information on the state of its execution.

Furthermore, as described in Article 14.3, nuclear power plants must carry out a Periodic Safety Review (PSR) every ten years, which is associated with the renewal of each licence.

During the time period covered by this report, Almaraz, Ascó, Cofrentes and Vandellós II NPPs completed their PSR, in accordance with that required in their respective operating licences. On the other hand, Trillo NPP started its Periodic Safety Review, whose assessment, which is associated with the renewal of its operating licence, is planned for 2014. The CSN has requested Trillo to conduct an analysis of the applicability of conditional application regulations (described below), which must be completed by the end of 2013.

Moreover, after the accident at Fukushima NPP, the stress tests agreed within the context of the European Union were carried out. The results of these tests and their subsequent evaluation have given rise to new Complementary Technical Instructions for each licensee, which include improvement suggestions, additional analyses and other upgrades which the CSN deems necessary, as well as the associated implementation deadlines.

### 14.2.2. Safety assessments within the licensing processes and safety analysis reports for the different stages of plant life (siting, design, construction and operation)

During the time period considered, the operating licences of all plants in operation and the renewal of those corresponding to Almaraz, Vandellós, Ascó and Cofrentes NPPs are of interest to the Spanish nuclear fleet. The order to close Santa María de Garoña NPP, the annulment of said order, and, subsequently, the notification of the cessation of operation by its licensee, owing to the new tax measures approved by the Spanish Government, also took place during this time.

Every licence indicates the revision in force of the official operating documents on the basis of which it is granted. These documents are: the Safety Analysis Report, the Operation Handbook, the Plant Technical Specifications, the Emergency Plan, the Quality Assurance Manual, the Radiation Protection Manual, the Radioactive Waste Management Plan, and –in those licences renewed during this period of time– the Physical Protection Plan. Any changes to the Safety Analysis Report only require approval if they are associated with design modifications which do require authorisation.

The existence of a requirement derived from the Royal Decree 1308/2011, of 26 September, on the physical protection of nuclear installations and materials and of radioactive sources, which replaces previous handling permits and has implications for the Physical Protection Plan.

During the 2004-2006 period, Santa María de Garoña NPP applied for the renewal of its operating licence for 10 years (from 2009 to 2019), this being the first time that this licence was requested in Spain for an accumulated operating period of more than 40 years (from 38 to 48 years of service life). The possibility of requesting the renewal for operation beyond 40 years was contemplated in the plant's then-in-force operating licence, which laid down the conditions for such a request. The plant submitted all the documentation, including the additional documentation required by the CSN in this case. The final result of the evaluation performed by this regulatory body was favourable to the granting of the licence for 10 years, and identified a series of conditions to be met, as is customary. However, the MITYC only granted an operating licence for four more years (until 6 July 2013). During the period of time covered by this report, the Government, on the basis of the CSN's favourable report on the safety conditions under which Santa María de Garoña's operation would take place, changed its opinion and allowed the licensee to apply in 2012 for a new operating licence. At the end of that year, in view of the changes made by the Government to the tax regime under which the plant's operation would have to take place, the licensee notified that it would cease operating the plant.

On the other hand, during this time period (2010-2012), Almaraz, Vandellós II, Ascó and Cofrentes NPPs were granted the renewal of their operating licence, for which they had applied during the previous period. For its part, Trillo NPP began to prepare the documentation which will support its application for the renewal of its current operating licence.

**Almaraz**

Safety assessment of the implementation of a Remote Shutdown Panel.

**Vandellós II**

The following activities are worth mentioning: the safety assessments carried out within the context of the modification of safety analyses to increase the tolerance (+3% vs +1%) of the setpoint of pressuriser safety valves, which has entailed the elimination of the hydraulic floor and the replacement of the internals thereof; the qualification of new hydrogen analysers in the containment; and the mitigation of the flooding risk in the control building were the fire protection pipe to burst. The analyses for requesting the CSN to authorise a change in the use of digital technology in the Class-1 radiation monitoring system have also began. All of this took place in addition to the abovementioned evaluation conducted within the framework of the Stress Tests.

**Cofrentes**

The following activities carried out during the time period which is the subject of this report stand out as the most significant projects undertaken at the installation: the upgrading and improvement of fire protection systems; the improvement of diesel generators; the backfitting of large motors; the backfitting of condensate booster pumps; the partial backfitting of the process computer; and the replacement of incore instrumentation.

**Ascó**

Given that the dates when the spent fuel ponds were expected to reach storage capacity saturation were nigh, Ascó NPP requested to increase their capacity by means of the use of dry containers in an Individualised Temporary Storage Facility. The corresponding evaluation was completed and the design modification has been operational since the beginning of 2013.

Additionally, a series of design modification evaluations are worth highlighting: the design modification which makes it possible to use RHRS relief valves as a protection against overpressures in cold conditions; the new toxic gas detection system for the habitability of the Control Room; the modification of interlocks and logic of the bridge crane of the Fuel Building; the relocation of post-accident radiation monitors in the Auxiliary Building; the backfitting of the Weather Tower; the installation of insulation valves to mitigate the risk of flooding in the Control Building were the fire protection system to rupture; and the installation of insulation valves or the modification of the sub-frequency trip logic of primary pump switches. All of this, as with the other plants, in addition to the evaluation conducted as part of the abovementioned Stress Tests.

**Operating licence renewals**

The CSN completed the evaluation of the operating licence renewal applications submitted by Ascó, Cofrentes and Vandellós II NPPs in 2010 and issued its compulsory favourable report to the Ministry of Industry, Energy and Tourism, which endorsed granting a new operating licence to Vandellós II, in July 2010, to Cofrentes, in March 2011 and to Ascó, in October 2011, for a period of 10 years. Since then, these plants have implemented those improvements which the CSN has identified and issued as conditions or Complementary Technical Instructions for their operating licence and considered necessary in order to adapt their operation to the latest safety regulation standards.

**Trillo**

Trillo NPP's operating licence expires in November 2014. Consequently, the plant is preparing the studies and reports needed to apply for the renewal thereof. In 2012 the station sent reports

to the CSN before the Complementary Technical Instruction on Conditional Application Regulations was issued, which it received in December 2012.

The plant conducted the following noteworthy safety assessments during the 2010-2012 period:

1. The design modification of the primary system bleed and feed. A commissioning permit was requested for this design modification.
2. An Individualised Temporary Storage Facility. The plant applied for an increase in the burnup of fuel assemblies susceptible of being stored therein, in keeping with the new permit for the containers used therein. The application takes into account the radiological impact aspects derived from the arrangement of containers in the Storage Facility.
3. The addition of the FP improvements from the fire PSA to the Plant Technical Specifications.
4. Raising the setpoint limit of the neutron noise filters and implementing the related design modifications.

**Santa María de Garoña**

The plant has been out of service since December 2012; all of the reactor's fuel is now inside the spent fuel pond. The current operating licence expires on 6 July 2013. In order to prepare for the official declaration of the cessation of operation, the plant has prepared the proposals of the Official Operating Documents (Safety Analysis Report, Plant Technical Specifications, On-site Emergency Plan, Operation Handbook, Radiation Protection Manual, Quality Assurance Manual, Radioactive Waste and Spent Fuel Management Plan, Physical Protection Plan and other supplementary documents) which shall be applicable during the time period between the cessation declaration and the dismantling permit. This documentation is being reviewed by the Nuclear Safety Council. In addition, the design documentation, the operation instructions and the monitoring tests are being revised so as to adapt them to the configuration the plant must have in the cessation-of-operation state.

As for the activities that will take place once the cessation of operation has been declared, the project to build an Individualised Temporary Storage Facility (ATI) for dry storage containers has been started in order to begin emptying the irradiated fuel pond in 2015. The projected containers are storage and freight containers, so they will be taken to the Centralised Temporary Storage Facility (ATC) once its installations are operational.

The conditioning of operational waste, as well as activities in preparation for dismantling, will be carried out during the period of time between the cessation declaration and the dismantling permit.

In relation to the results of the peer reviews performed at the NPPs, they host OSART and SCART missions from the IAEA.

Additionally, they actively take part in WANO by both being subjected to WANO Peer Reviews and Technical Missions and lending experts for WANO Peer Reviews and Technical Support Missions at the international level. The table in Section 10.1 lists the international missions hosted by Spanish NPPs during the period which is the subject of this report. At least 9 missions are expected to take place in the next for years (until 2016).

As mentioned in Section 10.2, from 2010 to 2013, experts from Spanish NPPs participated in 31 WANO Peer Reviews at nuclear power plants from 8 countries and in 30 WANO Technical Missions at nuclear power plants from 10 countries.

### 14.2.3. Periodic safety assessments of NPPs using, when appropriate, deterministic and probabilistic methods and according to suitable practices and standards

Periodic Safety Reviews intend, among other goals, to analyse the installation's performance with respect to the different aspects of nuclear safety over a sufficiently long period of time to

be able to identify trends; to analyse the installation's situation with regard to international standards and those of the country of origin of the project; and to assess the installation's nuclear safety based on the results obtained in the different aspects comprised in the scope of the Periodic Safety Review. For installations which apply for a licence for long-term operation (beyond their design life), the PSR must also include an Integrated Ageing Assessment and Management Plan containing the Ageing Management Reviews (AMRs) and the Time-Limited Ageing Analyses (TLAAs). One of the products of PSRs is the preparation of ongoing Safety Improvement Programmes, or new ones, should they become necessary in view of the results of the different analyses.

A noteworthy PSR activity –described below– focuses on benchmarking against regulations known as "conditional application regulations". The use of the regulations from the country of origin of the project has been defined since the beginning of nuclear power plant licensing. Thus, in previous operating licences it was laid down that installations had to be designed following the applicable national criteria, codes, standards and provisions. Failing that, those which apply in the country of origin of the project had to be followed.

This criterion has been given continuity in the different operating licences, which include a condition according to which, in the first quarter of each calendar year, the licensee must send a report on the measures which have been taken to adapt the operation of the plant to any new national requirements on nuclear safety and radiation protection and to the regulations of the country of origin of the project, including in the latter case an analysis of the applicability to the plant of the new requirements issued by the regulatory body of the country of origin of the project.

The basic parameters of applicability of these new regulations (design or operation, type of plant, and date of construction or commissioning) expressed in their publication will generally not coincide with those of the Spanish plant being considered, so their eventual application, in full or in part, is conditional on the performance of a preliminary selection and on the study of the improvements that their application might imply. The term *"conditional application regulations"* has been proposed for these cases, it being considered that the CSN must be responsible for performing this preliminary analysis and the selection of the most adequate standards to improve safety.

PSRs must also include an update of the Probabilistic Safety Assessment (PSA) where risk-informed design modifications are evaluated and the operating experience acquired since the last update is incorporated.

The scope of PSA updates must extend to Level-1 on-site events at power and during shutdown, Level-2 on-site events at power, and Level-1 on-site fires and flooding, in addition to other off-site events, although this scope will be progressively expanded by complying with the Council Instruction IS-25, of 9 June 2010, on PSAs and their applications, which will require a full Level-1 and Level-2 scope both at power and in other operating modes for both on-site and off-site events.

Each NPP's PSAs are reviewed every operation cycle to see whether they are still applicable and will be updated by the licensee every five years. On the other hand, the maintenance and updating of PSAs are inspected by the CSN every refuelling cycle as part of its Basic Inspection Plan, the result of which being an evaluation aimed at knowing the plant and methodological modifications –and their status– incorporated into the PSA since the previous inspection.

In addition, as part of its process for evaluating the applications for authorisation submitted by nuclear power plants for which their licensee has only included deterministic lines of argument, the CSN may require that the licensee analyse by means of PSA the impact on risk of the proposals included in the application.

### 14.2.4. Safety assessments performed and main results of those assessments for existing NPPs

The assessment conducted by the CSN to inform the applications submitted by the licensees of Almaraz, Ascó, Cofrentes and Vandellós II NPPs in order to renew their operating licence for another ten years have focused, on the one hand, on evaluating compliance with the conditions set in each operating licence in force and with the Complementary Technical Instructions associated with the granting of said licence and, on the other, on the documents submitted by each licensee in connection with the Periodic Safety Review, the update of the Radioactive Waste Management Plan and the analyses required in the Complementary Technical Instructions and related to conditional application regulations.

The analyses submitted by licensees in compliance with the CSN's Complementary Technical Instructions on conditional application regulations have resulted in each station applying for design modifications of a certain magnitude, with the corresponding implementation deadlines.

During the time period covered by this report, Almaraz NPP's power uprate of appropriately 8% (April 2010 in Unit 1 and March 2011 in Unit 2) or its request for a change in its licensing base to conform to NFPA-805[1] "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," stand out among the modifications which have been carried out and have required a licensing and authorisation process.

In the case of Ascó NPP, its request for a change in its licensing base to conform to the abovementioned NFPA-805, on fire protection, and the commissioning permit for the design modification of the spent fuel Individualised Temporary Storage Facility (ATI) for each of its units are worth mentioned.

Cofrentes NPP prepared a technical report for its application for authorisation for a maximum fuel pellet burnup increase to 70 MWd/kgU in 2012 and another for its application for the reracking of the spent fuel pond in February 2012 in order to add more positions to those authorised in 2008.

Vandellós II NPP requested the authorisation of its Waste Management Plan and evaluated the effectiveness of the safety management improvement action plan that it devised as a result of the August 2004 incident caused by the bursting of a pipe of the essential service cooling system.

In the case of Santa María de Garoña NPP, the measures derived from the PSR would have resulted in the implementation up to 2013 of many safety improvements focused on the instrumentation and control of the emergency core cooling systems and the containment isolation system, the ventilation systems, the fire protection systems, the electrical separation, and the containment isolation devices. The CSN favourably viewed the granting of the applied-for operating licence from the point of view of nuclear safety, which falls within its exclusive purview, but the Ministry of Industry, Tourism and Trade only granted it until 6 July 2013. At the beginning of 2012, the Spanish Government reconsidered its position and allowed the licensee to apply for the renewal of the operating licence until 2019, as initially planned. In view of the this new state of affairs, the CSN issued its binding report, which resulted in the partial revocation of the associated Ministerial Order; this opened the possibility of renewing the current operating licence for a new six-year period starting from its expiry date. This new Ministerial Order set a time period in which the licensee could apply for the renewal of the operating licence. Since this time went by without the licensee having made said application, the CSN requested it to submit the Official Operating Documents associated with the declaration of the permanent cessation of operation, which are currently being reviewed as a preliminary step for the declaration of cessation of operation envisaged in the RINR. Later, the licensee notified its intention

1 National Fire Protection Association (USA).

to carry out a planned shutdown of the plant in order to unload all the fuel into the spent fuel pond, thus bringing the cessation of operation forward in time, before 31 December 2012.

On the other hand, as already mentioned in the national report for the second extraordinary meeting of the Convention on Nuclear Safety in relation to the stress tests, on 25 May 2011 the CSN approved and sent to all nuclear power plants a series of Complementary Technical Instructions (CTIs) relating to their Operating Licenses, which required them to perform the stress tests agreed within the context of the European Union. These stress tests consisted in a re-assessment directed towards identifying the existence of safety margins at the NPPs against the occurrence of extreme natural phenomena that might jeopardise their safety functions and lead to a severe accident.

The CSN evaluated each station's response to all the extreme situations and verified the preventive and mitigating measures which had been chosen according to the defence-in-depth philosophy: initiating events, loss of safety functions, and severe accident management. The report corresponding to each plant included a detailed proposal of the planned measures and the associated schedule. As a result of the evaluation made by the CSN, the following conclusions were drawn:

1. The CSN verified that the reports submitted by licensees were written following the stress test specifications drawn up by WENRA/ENSREG and that they adequately comply with that required in the corresponding Complementary Technical Instructions (CTIs) issued by this body.

2. The CSN's evaluation did not identified any aspect entailing a safety-relevant weakness of these installations that might require the urgent adoption of measures thereat or even their immediate shutdown.

3. The reports from licensees concluded that the design bases and licensing bases set for each installations were currently fulfilled. The verification of these aspects is part of the continuous control and supervision programme.

4. The scope of the descriptions, analyses and proposals submitted by licensees were deemed to be appropriate. However, in the specific sections related to external events, design aspects, and severe accident management (in the reactor), particular aspects have been identified which licensees must solve by taking, where appropriate, the appropriate measures.

On 14 March 2012 the CSN approved and subsequently sent to each licensee a new Complementary Technical Instruction collecting the conclusions which were drawn, including improvement suggestions, the aspects identified in the assessment and the additional analyses or other upgrades deemed necessary by the CSN; the associated implementation periods were also been included.

All modifications which are going to be made at each installation, including the use of portable equipment, must entail the development (or adaptation) of the corresponding operating procedures, which must be verified and validated by licensees prior to their formal implementation. Moreover, the personnel who are assigned to operate the new equipment shall receive continuous training in their use.

Additionally and in relation to potential extreme accident situations derived from malicious acts, the CSN required all plants – by means of CTIs sent on 1 July 2011, which were supplemented by other CTIs from 27 July 2012 – to analyse whether they had suitable means for making sure they had:

- The capacity to fight large fires beyond the station's design basis.
- The capacity to mitigate potential damages to the fuel (both inside the reactor core and in the spent fuel storage installations).

Actions to limit or control radioactive emissions in the form of liquid or gas releases.

### 14.2.5. Regulatory review and control activities

The CSN devotes a significant portion of its resources to the inspection of nuclear power plants in operation and has in place an Integrated Plant Supervision System (SISC), which includes the requirement to perform self-assessments of the operation thereof. The first SISC self-assessment was completed in May 2008 and was carried out in accordance with the Self-Assessment Programme in place.

The second SISC self-assessment report prepared in 2010 underlined the fact that, in general, the objectives mapped out were being met and that there were no important deficiencies in the integrated supervision system.

The results are the same as those from the second self-assessment in terms of the convenience to continuously improve the training of inspectors, the advisability of revising and optimising inspection procedures and performance indicators, or the need to enhance the communication between the CSN and NPP licensees in order to improve response times in the interaction between the respective organisations.

An action plan has been devised which includes the update of the indicator calculation manual so as to minimise the likelihood of there being different interpretations; some changes to the inspection model by revising the corresponding procedure; an analysis of the effort dedicated to inspection in order to make it consistent with expectations; the setting up of a better mechanism for tracking and controlling issuance timeframes for finding categorisation reports; and improvements in in-house actions (among others, the finding categorisation committee in charge of evaluating individual categorisation proposals).

## 14.3. Safety verification

### 14.3.1. Measures of the Contracting Parties and regulatory criteria for the verification of safety

Since it was first set up, the CSN has supervised the ongoing assessment of the nuclear safety of nuclear power plants carried out by their licensees through the inspection and control of said assessment and the review of the periodic reports that licensees must submit in compliance with the conditions of their operating licence. These periodic reports refer to in-house and industry operating experience; design modifications; newly issued regulations; personnel training;, the Environmental Radiological Monitoring Programme; the dosimetry of plant personnel; the activities of the Waste Management Plan; the observance of the Maintenance Rule; and the activities of the Plant Service Life Management Plan.

The Basic Inspection Programme is a continuous supervision instrument that is equally applied to all installations every two years. Both specialists from the CSN's head office and the CSN's resident inspectors at the sites (two inspectors per site) –who in turn monitor plant operation and its incidents on a daily basis– carry out the Inspections of this programme by supervising how operational incidents are solved and compliance with Plant Technical Specifications and other CSN requirements. The Basic Inspection Programme includes a series of inspections in which specialists from different disciplines (maintenance effectiveness, component design, surveillance requirements, etc.) take part; the components to be inspected are chosen on the basis of their significance for the risk of the installation.

During this period the CSN kept on devoting a lot of work to this NPP inspection programme, both as regards the inspection proper and the evaluation of the results and the categorisation of the findings of these inspections according to their impact on risk, for which it continued to develop a comprehensive and systematic supervision programme similar to that applied by the USNRC, as described in Article 19 of this report.

### 14.3.2. Main elements of the programmes for the continued verification of safety (in-service inspection, monitoring)

During the period of time corresponding to this report, licensees carried on updating the design bases and license documents of each installation. The purpose of this activity was to compile the design bases and their licensing bases for each safety-related system. The update of the design bases requires to verify the hypotheses, data and results of the accident analyses included in the Safety Analysis Report, the identification of the design bases of the support components needed to carry out the safety functions, and the design modifications made to the safety systems. The review of the current physical reality of each of the systems and the operating procedures is also included in order to reconcile operational practices with system designs. The end product of this process is a content of the Safety Analysis Report which is up-to-date and has been sufficiently verified and reconciled with design-basis documents.

The set of periodic tests and trials carried out during the plant's service life on its structures, systems and components is known as *In-Service Inspection*, whose purpose is the verification of the structural integrity and the functional capacity of said SSCs.

Until the publication in November 2009 of the Council Instruction IS-23, on in-service inspections, and given that there was a lack of Spanish regulations with regard to these activities, Spanish nuclear power plants developed their own in-service inspection programmes in accordance with the standards defined in the regulations of the country of origin of the technology and accepted in their operating licences; Section XI of the Code of the American Society of Mechanical Engineers (ASME) and this Association's Operation and Maintenance Code (ASME-OM), required by Plant Technical Specifications, were considered basic regulations. Therefore, this code is considered to be an acceptable reference for the drawing up of the in-service inspection and testing programmes which are defined for said installations, which are included in the document referred to as the In-Service Inspection Manual (ISIM). The aforementioned Council Instruction endorses and consolidates this practice.

The inspection systems used in in-service inspections must be qualified in accordance with the methodology accepted by the CSN and the scope defined therein. The non-destructive testing (NDT) methods and techniques used must be selected considering the different characteristics and nature of the structures, systems and components, the types of defects, the conditions of accessibility, and the different levels of radiation, as well as the degree of automation of the equipment which are used to perform the tests. These methods and techniques are adequately described in the corresponding procedures.

The evaluation of the results of these inspections and their comparison with the applicable acceptance criteria allow the objectives of these in-service inspection programmes to be verified. The comparison of these results with those obtained in the basic reference (pre-service) inspection and previous in-service inspections makes it possible to analyse the trends observed, justify changes, and take the actions which are appropriate in each case.

The guide on Anomalous Conditions (degraded conditions and non-conformity conditions) which might arise during plant operation has been applied since 2007; it is expected to be reviewed in 2013 in view of the experience gained from its application.

In general, it can be said that the experience of coupling the performance of a Periodic Safety Review at a nuclear installation to its submittal prior to the granting of the renewal of the operating licence has positive aspects of unquestionable value for the safety of the installation. The overall inspection of an installation over long periods of time makes it possible to evaluate its operation with an approach that is complementary to the daily monitoring thereof. The results of the Periodic Safety Review may be used to improve plant operation during the following period.

This same systematic approach is deemed to be equally valid for those cases in which the renewal of the operating licence exceeds the lifetime originally contemplated in the initial design of the

installation. In this case, it is understood that special conditions – both administrative and relating to installation ageing management – must be included so that the operation of the plant may be extended beyond the initial design service life.

### 14.3.3. Elements for ageing management programmes

The control of the ageing of plant structures, systems and components (SSCs) is a fundamental part of NPP life management. In compliance with the limits and conditions of the operating licences, licensees prepare an annual report identifying new inspection, monitoring and maintenance activities for the detection and control of ageing processes. The methodology used is that described in the *LWR NPP Remaining Life Assessment System*, which was jointly developed by the plants associated under UNESA.

In July 2009, the CSN published the Instruction IS-22, on safety requirements for ageing management and the long-term operation of nuclear power plants, which establishes the terminology and criteria for NPP component ageing management and determines the scope of the activities to be performed during both the design life of the facility and its long-term operation. Said Instruction IS-22 establishes that the nuclear power plants must incorporate the conclusions of their analyses into a Life Management Plan (LMP).

This LMP is limited to the scope required by IS-22, identifies the ageing mechanisms for this scope and evaluates current maintenance practices, determining whether they should be extended or modified. In addition, when the period covered by the analyses partially or completely exceeds the initially considered design period, the analyses (studies, calculations) performed will be re-assessed by using defined design life hypotheses [Time-Based Ageing Analysis (TBAA)].

On a yearly basis beginning in 2010, the plants send during the first half of every year to the CSN the activities they have carried out within the scope of the LMP, specifying their suggestions for improvement. During the design life of the installations, the scope of LMPs coincides with that described in Articles 54.3, 54.4 and 54.21 of the US Regulation 10CFR54 "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." Beyond this period, the requirements of this regulation which are associated with the applicable TBAAs must also be fulfilled. Furthermore, plants must submit a revision of the LMP within the framework of the PSRs.

### 14.3.4. Measures for the in-house review by the license holder of the applications to be submitted to the regulatory body

The operating licences of nuclear power plants have a series of conditions attached under which the operation thereof must be conducted. Likewise, the CSN has the authority to issue Complementary Technical Instructions which supplement the corresponding licences. As a whole, they establish the need and define the general criteria to be followed in order for the licensee to be able to decide which modifications it can unilaterally make after having made the corresponding safety assessments and which modifications require a modification permit from the Administration (the Ministry of Industry, Energy and Tourism, following a favourable report from the CSN) prior to their entry into force or service.

Thus, any change in any Official Operating Document, such as the Plant Technical Specifications, the On-site Emergency Plan, the Operation Handbook, and the Physical Protection Plan, has to be previously authorised by said bodies. Changes to other documents, such as the Quality Assurance Manual, the Radiation Protection Manual or the Radioactive Waste Management Plan, only require a preliminary permit if they meet certain criteria defined in the Technical Instructions. Additionally, the Safety Instruction IS-21, of 28 January 2009, on the requirements applicable to modifications at nuclear power plants, contains the detailed criteria which apply to any other design modifications, either to the operation documentation or the physical design of the installation.

Nuclear power plants have procedures for the implementation of the different analysis stages established by this Instruction (Preliminary Analysis, Safety Assessments, and Safety Analysis) by means of which the safety of all the changes to be made is analysed. If it is concluded from its analysis that no authorisation from the Administration is required, the licensee can unilaterally implement or put into service the modification. Otherwise, the licensee has to put the modification forward to the Administration for consideration and request its express approval. The procedures define different rungs in the organisation in charge of the technical evaluation and approval of the changes, the plant's Safety and Quality Departments being among them in all cases. Additionally, in those cases which require requesting the Administration's authorisation, the modification is studied by the corresponding Plant Nuclear Safety Committee (PNSC) and Operator Nuclear Safety Committee (ONSC), which conduct an independent review of the technical and safety analyses to be submitted in support of the request. Occasionally, either systematically or depending on the importance and magnitude of the requested changes, an independent review will be carried out by organisations different than the one that is behind the change. This independent review may be performed by in-house licensee organisations or by entities outside the licensee's organisation.

The information provided by the probabilistic methodologies included in the Probabilistic Safety Assessments (PSAs) at the disposal of the plants to evaluate the impact on safety of the requests made is a valuable tool which is sometimes used as an additional guarantee of said requests. NPPs have updated PSA models which are regularly checked by the CSN.

## 14.4. Regulatory review and control activities

NPP licensees carry out routine assessments of new methodologies and analyses of operating experience or of the applicability of new regulations with a view to upgrading the installations. Some of these reviews are not specifically required by regulations but are incorporated voluntarily by licensees. Examples of these upgrades are the replacement of analogue instrumentation with digital equivalents. The regulatory structure included in the abovementioned RINR and in the different Instructions which are published by the CSN requires NPP licensees to have an integrated management system in place and, within it, a quality assurance programme guaranteeing the systematic performance of the actions required to reasonably ensure that the structures, systems and components will be capable of performing their functions.

Operating licences have been renewed up to date by taking into consideration the results from the continuous evaluation and the periodic safety reviews. In Spain there is no legal or administrative limitation for the setting of the service life of nuclear power plants, which currently do not have a fixed period set.

Moreover, the abovementioned stress tests agreed within the context of the European Union after the accident at Fukushima NPP were carried out during the time period corresponding to this report. The results of these tests and their subsequent evaluation have given rise to new Complementary Technical Instructions for each licensee, which include improvement suggestions, additional analyses and other upgrades which the CSN deems necessary, as well as the associated implementation deadlines.

# Article 15. Radiation protection

## 15.1. Summary of Laws, regulations and requirements regarding radiation protection at nuclear power plants

### 15.1.1. Regulation on Health Protection against Ionising Radiations

The basic standards for radiation protection of exposed workers and the members of the public against the risks resulting from exposure to ionising radiations are established in the Royal Decree 783/2001, approving the Regulation on Health Protection against Ionising Radiations, which transposes Directive 96/29 EURATOM to Spanish legislation and has been modified by the Royal Decree 1439/2010.

### 15.1.2. Other provisions

The aspects related to radiation protection of exposed workers from contractor companies (outside workers) at nuclear power plants receive special attention by the CSN, since experience shows that more than 80% of the occupational doses registered at these installations correspond to these workers.

The radiation protection of outside workers running the risk of exposure to ionising radiations is specifically regulated by the Royal Decree 413/1997, of 21 March 1997, which transposes the content of the Directive 90/641/EURATOM.

As additional implementation, the Nuclear Safety Council has published various Instructions on the procedures to be adhered to in order to comply with certain requirements laid down in the Spanish legislation.

## 15.2. Regulation whereby license holders integrate the optimisation of radiation doses and the implementation of the ALARA principle into their processes

The three basic principles of justification, optimisation and limitation of individual dose on which the radiological protection system is based are incorporated into the Spanish legislation by means of the Regulation on Health Protection of against Ionising Radiations.

In the nuclear power sector, the practical application of the optimisation principle (or ALARA principle) constitutes the basic objective to be achieved, which is accomplished through the implementation in the different nuclear power plant organisations of the criteria and systematic approach defined in the CSN's Safety Guide GS-1.12 "Practical Application of the Optimisation of Radiation Protection in Nuclear Power Plant Operation."

This guide establishes the general framework to be considered by NPP organisations to comply with the ALARA principle, which contemplates, among other, the following criteria:

- Compliance with the ALARA principle must be an objective during the operation of the plant and the planning of all its activities, and must be part of the plant modification and upgrade plans, including the dismantling and decommissioning processes. In particular, it has been applied to the projects for the design or modification of the spent fuel Individualised Temporary Storage Facilities.
- Plant Management must pledge to implement the ALARA principle during all its phases, from design to decommissioning, as part of its safety culture.

- The Management's commitment must extend to all levels of the plant's organisation, as well as to those external companies involved in the performance of the most significant tasks from a radiological point of view.
- Adequate means must be established to inform, train and motivate all plant workers to adhere to the ALARA principle.

The aforementioned Safety Guide lays down that the plant's organisation's commitment to the ALARA principle must materialise through the implementation of an ALARA Programme that:

- Defines radiological indicators to verify the degree of effectiveness in the implementation of the ALARA principle.
- Establishes a systematic approach for the ALARA review of the most significant tasks from a radiological point of view.
- Defines the plant's policy in all aspects related to the reduction of the source term.
- Establishes a systematic approach for the ALARA review of design modifications.
- Establishes training programmes for the implementation of the ALARA principle.
- Defines the content and scope of the internal audit programme to be set up in order to verify the degree of implementation of the ALARA Programme.

Since the beginning of the 1990s, the implementation of this doctrine has led to important modifications in the operating organisations of Spanish nuclear power plants in order to ensure that all members thereof are formally and seriously committed to complying with the ALARA principle.

These premises are reflected in the official operating documents, specifically the Operation Handbook and the Radiation Protection Manual.

## 15.3. Use of radiation protection programmes by the license holder

The following dose limits are established in the Regulation on Health Protection against Ionising Radiations.

**Exposed workers**

- Effective dose limit: 100 mSv in five consecutive official years, subject to a maximum effective dose of 50 mSv in any one official year.
- Skin dose limit (averaged over 1 $cm^2$): 500 mSv per official year.
- Lens dose limit: 150 mSv per official year.
- Dose limit for the hands, forearms, skin and ankles: 500 mSv per official year.

**Members of the public**

- Effective dose limit: 1 mSv per official year. Under special circumstances the CSN may authorise a higher effective dose value in a single official year, as long as the average over five consecutive official years does not exceed 1 mSv per official year.
- Skin dose limit (averaged over 1 $cm^2$): 50 mSv per official year.
- Lens dose limit: 15 mSv per official year.

**Special protection during pregnancy and breastfeeding**

- As soon as a woman informs the license holder of the practice of her pregnancy, the protection of the foetus must be comparable to that of any member of the public.

- The CSN has laid down by means of Technical Instructions that the dose limit to the foetus (1 mSv from the moment the pregnancy is declared) shall be considered to be equivalent to a 2-mSv dose value recorded on a dosimeter placed on the pregnant woman's abdomen for dose limit monitoring purposes.
- From the moment a woman tells the licensee of the practice she is breastfeeding, no work involving a significant risk of radioactive contamination shall be assigned to her.

**Dose limit for trainees and students**

- Dose limits for trainees and students of legal age who have to use sources in the course of their studies are the same as for exposed workers.
- The dose limit for trainees and students between 16 and 18 years of age who have to use sources in the course of their studies shall be 6 mSv per official year. Without prejudice to this dose limit:
  - Lens dose limit: 50 mSv per official year.
  - Dose limit to skin (averaged over 1 cm2): 150 mSv per official year.
  - Dose limit for the hands, forearms, feet and ankles: 150 mSv per official year.

**Administrative dose controls**

Nuclear power plants have administrative effective dose controls in place for all exposed workers which do not have the regulatory implications of dose limits. These are internal controls to ensure the dose limits set by the law are not exceeded and to achieve the dose optimisation goal of keeping doses as low as reasonably achievable.

The Radiation Protection Manual defines administrative dose controls for the different plant operating modes: normal operation, special work, and outages.

Annex 15.A includes information on the dosimetry of exposed workers in 2012.

**ALARA exposures**

The implementation of the ALARA principle in the different operating organisations always follows the same structure:

1. A management or managerial level that drives and approves the ALARA culture and target doses, providing the necessary resources.
2. An executive level that proposes the ALARA policy and target doses, analyses the results, and takes corrective actions.
3. A technical level that analyses, plans and monitors work, checks the results, and proposes actions for improvement.

An operational tool to help the licensee to implement the radiological protection programme is the Radiation Work Permit (RWP), a work order that states the job to be done, the estimated duration thereof, the radiological conditions in the work area, and the dosimetry and radiation protection requirements.

The regulatory control of the radiation protection of the population is carried out through the programmes for the limitation, monitoring and control of nuclear power plant effluents and the environmental radiological monitoring programmes in a plant's area of influence.

**Compliance with conditions for the emission of radioactive substances**

Spanish regulations establish that the release of radioactive effluents into the environment has to comply with the established limits and, furthermore, be as low as possible taking socioeco-

nomic factors into consideration. Additionally, the Nuclear Safety Council laid down in its Council Instruction IS-26, of 16 June 2010, on basic nuclear safety requirements applicable to nuclear installations (BOE 165, 8 July 2010), that the best available techniques for radioactive effluent release minimisation be considered in addition to the aforementioned socioeconomic factors.

The effluent limitation, monitoring and control system of nuclear power plants has led to actual discharge values that are far below authorised limits, and perfectly in line with valves at the international level.

Table 15.B.1 shows the activity released by Spanish NPPs in 2012. The radiological impact associated with the releases is negligible, the discharged activities representing a minor fraction of the authorised limits.

The effective doses –calculated for the most exposed individual and considering highly conservative hypotheses– have in no case exceeded the limit of 0.1 mSv authorised for radioactive effluents, the maximum estimated value being 0.004 mSv/year.

**Environmental radiological monitoring**

Every nuclear power plant has a programme for the environmental radiological monitoring of its surrounding area, in keeping with CSN guidelines, the annual schedule and results of which are evaluated by the CSN. Annex 15.C describes the content of the environmental radiological monitoring programmes and shows the most significant results in 2011.

It can be gathered from the evaluation of these results that the radiological impact of Spanish NPPs on the environment continues to be far below the established limits and that the environmental quality in the areas surrounding the installations is in acceptable condition from a radiological point of view, without there being any risk for people as a result of their operation.

## 15.4. Regulatory review and control activities

Since 2007 the CSN has been using an Integrated Plant Supervision System (SISC) that covers the following:

- The inspection of the radiological protection of exposed workers, the public and the environment.
- The application of the methodology established to categorise findings.
- The supervision of the performance indicators defined by the programme.

Furthermore, the aspects related to Occupational RP and the application of the ALARA principle during refuelling outages are evaluated by means of the revision of the final refuelling reports sent by licensees in accordance with that laid down in the Council Instruction IS-02. Likewise, the CSN has defined the scope and content of the effluent monitoring and control programmes and of the environmental monitoring programme for each nuclear power plant, inspects their application, and evaluates their results. In addition, the CSN carries out an environmental radiological monitoring programme, independent from the licensee's, in the area surrounding each station, for result comparison purposes.

Annex 15.C describes these programmes in more detail.

Owing to the evolution of occupational doses at Cofrentes NPP in the past few years, the CSN required the plant during the last renewal of its Operating Licence in 2011 to revise its Dose Reduction Master Plan in order to upgrade it and the facility's ALARA practices. The collective dose at the plant was 2,971 mSv.person in 2011 and 334 mSv.person in 2012.

# APPENDIX 15.A

## Information on personal dosimetry included in the report submitted by the CSN to the Congress and the Senate corresponding to 2012

## A. External exposure

The statistical results for doses accumulated in 2012 for all Spanish nuclear power plants are as follows:

**Collective doses**

The following table shows the overall annual collective doses for every Spanish NPP in 2012. There were refuelling outages at all PWR stations except Ascó II. BWR plants did not undergo a refuelling outage that year.

| | | |
|---|---|---|
| Santa María de Garoña | 170 | mSv.person |
| Almaraz I & II | 989 | mSv.person |
| Ascó I & II | 698 | mSv.person |
| Cofrentes | 334 | mSv.person |
| Vandellós II | 757 | mSv.person |
| Trillo | 362 | mSv.person |

These data mean that the average collective dose per reactor throughout 2012 amounted to 413.75 mSv.person. By type of reactor, the value of this parameter was 504 mSv.person for BWRs and 2,806 mSv.person for PWRs.

Figures 15.A.1 and 15.A.2 show, for reference purposes, charts comparing the evolution of the average triennial collective dose in Spain, Europe, Asia and USA according to reactor type. International data have been taken from the database kept by the Information System on Occupational Exposure (ISOE).

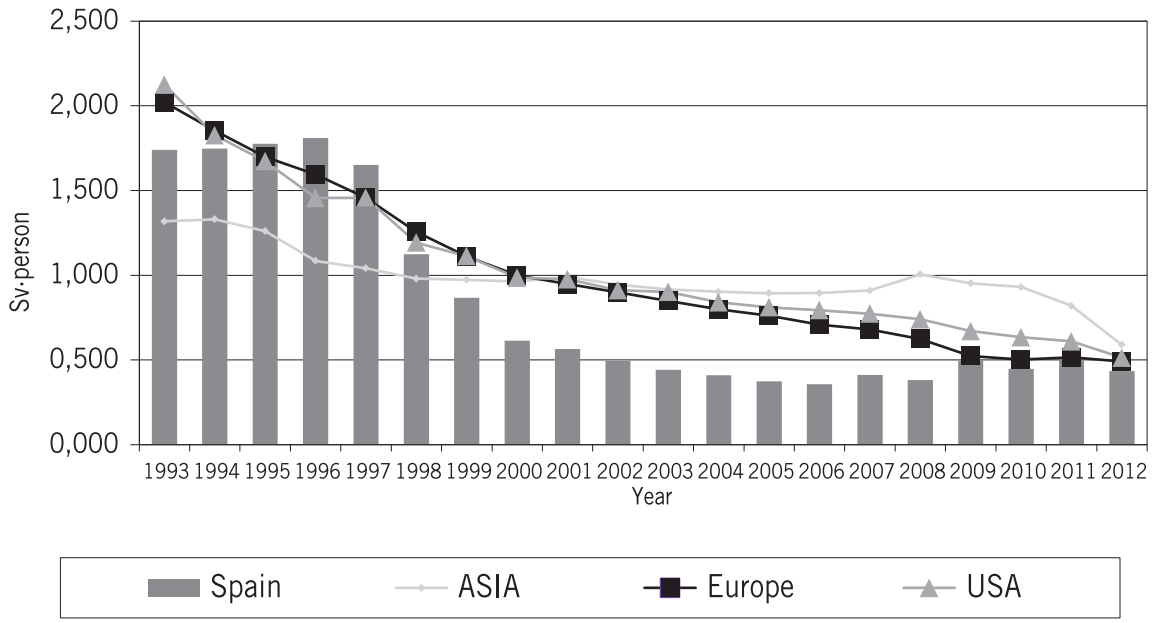



Figura 15.A.1 Average triennial collective dose (Sv/person) for PWRs. International comparison.

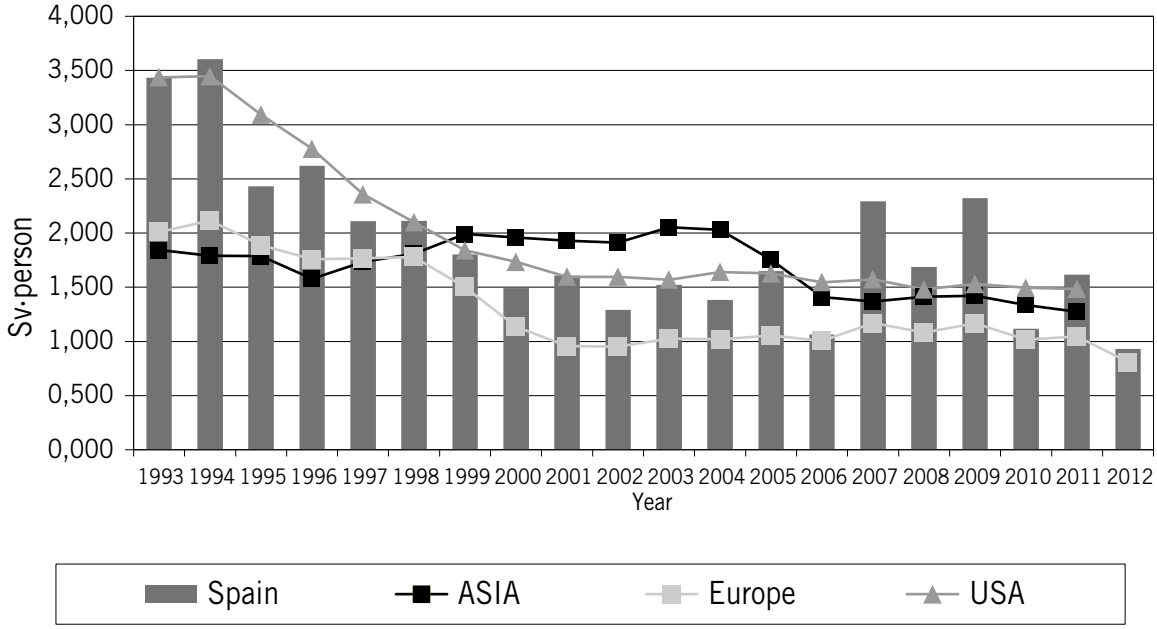



Figura 15.A.2. Average triennial collective dose (Sv/person) for BWRs. International comparison.

## B. Internal exposure

Direct whole body radioactivity measurements were carried out on 10,679 workers. No internal contamination in excess of the recording level (1 mSv/year) was detected.

# APPENDIX 15.B

## Limitation, monitoring and control of discharges of radioactive substances at Spanish nuclear power plants

The system for the limitation, monitoring and control of radioactive discharges from nuclear power plants is based on the same principles, criteria and practices that were described in previous reports.

Discharge limits for NPPs – defined as a collective dose of 0.1 mSv/y for each reactor's liquid and gaseous effluents as a whole – guarantee, with a very wide safety margin, that the doses the members of the public might receive as a result of the emission of said radioactive effluents during the normal operation of nuclear power plants will not be significant and, in any case, manifestly lower than the dose limits for the public set in the Regulation for Health Protection against Ionising Radiations: an effective dose of 1 mSv/y and an equivalent skin dose of 50 mSv/y.

As a result of the application of this discharge limitation system, the actual values of the discharges continue to be far lower than the authorised limits and are perfectly in line with values at the international level. Table 15.B.1 shows the effluents which Spanish NPPs discharged in 2012. The doses received by the members of the public as a result of these discharges represent at the most 4% of the authorised integrated limit for radioactive effluents.

Table 15.B.1 Radioactive effluents from nuclear power plants. Activity discharged in 2012 (Bq)

| | **PWR NPPs** | | | | | |
|---|---|---|---|---|---|---|
| | José Cabrera [2] | Almaraz I & II | Ascó I | Ascó II | Vandellós II | Trillo |
| Liquid effluents | | | | | | |
| Total effluents except tritium and dissolved gases | $2.92\ 10^{7}$ | $7.57\ 10^{9}$ | $7.19\ 10^{9}$ | $8.13\ 10^{9}$ | $7.55\ 10^{9}$ | $2.46\ 10^{8}$ |
| Tritium | $2.35\ 10^{10}$ | $5.83\ 10^{13}$ | $3.97\ 10^{13}$ | $2.72\ 10^{13}$ | $3.91\ 10^{13}$ | $1.53\ 10^{13}$ |
| Dissolved gases | — | $7.43\ 10^{9}$ | $5.58\ 10^{9}$ | $4.68\ 10^{7}$ | $1.82\ 10^{8}$ | [3] |
| Gaseous effluents | | | | | | |
| Noble gases | — | $1.23\ 10^{13}$ | $5.83\ 10^{13}$ | $2.60\ 10^{12}$ | $6.30\ 10^{12}$ | $3.19\ 10^{11}$ |
| Halogens | — | $4.18\ 10^{6}$ | $4.92\ 10^{6}$ | LDL [1] | $1.92\ 10^{8}$ | LDL [1] |
| Particles | $5.02\ 10^{5}$ | $1.04\ 10^{6}$ | $3.91\ 10^{6}$ | $6.25\ 10^{6}$ | $5.09\ 10^{7}$ | $1.02\ 10^{6}$ |
| Tritium | $4.27\ 10^{9}$ | $3.05\ 10^{12}$ | $6.80\ 10^{11}$ | $4.75\ 10^{11}$ | $2.80\ 10^{11}$ | $4.86\ 10^{11}$ |
| Carbon-14 | — | $1.05\ 10^{11}$ | $2.28\ 10^{11}$ | $4.61\ 10^{11}$ | $4.63\ 10^{11}$ | $2.81\ 10^{10}$ |

| | BWR NPPs | |
|---|---|---|
| | Santa María de Garoña | Cofrentes |
| Liquid effluents | | |
| Total effluents except tritium and dissolved gases | $1.22\ 10^{8}$ | $6.47\ 10^{7}$ |
| Tritium | $4.22\ 10^{11}$ | $3.29\ 10^{11}$ |
| Dissolved gases | $9.90\ 10^{5}$ | $1.22\ 10^{6}$ |
| Gaseous effluents | | |
| Noble Gases | $1.64\ 10^{12}$ | $7.58\ 10^{12}$ |
| Halogens | $5.24\ 10^{8}$ | $2.49\ 10^{8}$ |
| Particles | $1.15\ 10^{7}$ | $1.06\ 10^{7}$ |
| Tritium | $1.84\ 10^{12}$ | $4.89\ 10^{11}$ |
| Carbon-14 | $2.05\ 10^{11}$ | $2.29\ 10^{11}$ |

(1) LDL: Lower Decision Limit.

(2) Effluents generated as a result of the dismantling of the plant.

(3) Liquid discharges do not contain any dissolved gases since these are removed during the treatment process.

# APPENDIX 15.C

## Environmental radiological monitoring programmes in the areas of influence of Spanish nuclear power plants

The radiological monitoring of the areas surrounding Spanish nuclear power plants is carried out by means of two independent programmes.

The first one is implemented by plant licensees according to Nuclear Safety Council guidelines and is subjected to the CSN's regulatory control.

The second programme is carried out by the Nuclear Safety Council itself, in certain cases through the entrustment of functions to the regional governments of the Autonomous Communities, in collaboration with national or university laboratories in the region where the installation is located. This program is fully independent from that conducted by licensees as far as the sampling and the laboratories that perform the analytical determinations are concerned. The sampling points, the types of samples and the analyses performed coincide with those used by licensees. Its scope is around 5% of the programme implemented at each installation.

At present, there are eight environmental radiological monitoring programmes in place around the different nuclear power plants – five in operation, one undergoing the cessation of its operation, one being dismantled, and one in the dormancy phase, in which some 8,000 samples are taken and some 13,000 analytical determinations are made per year.

Table 15.C.1 shows a summary of the programmes which are being implemented around Spanish NPPs in operation.

Table 15.C.2 includes, for illustrative purposes, the average values of the results obtained from the analyses of air samples from the environmental radiological monitoring programmes around the stations in 2011 (values below the detection limits where discarded).

Table 15.C.1. ERMPs of the licensees of Spanish NPPs in operation

| Type of sample | Sampling frequency | Analyses performed |
|---|---|---|
| Air | Continuous sampling with weekly filter change | Total beta activity, Sr-90 Gamma spectrometry, I-131 |
| Direct radiation | Change of dosimeters following a maximum exposure period of three months | Integrated dose rate |
| Drinking water | Sampling on a fortnightly or shorter basis | Total beta activity, remaining beta activity, Sr-90, tritium, gamma spectrometry |
| Rainwater | Continuous sampling with monthly sample collection | Sr-90, gamma spectrometry |
| Surface water and groundwater | Surface water sampling on a monthly or shorter basis and groundwater sampling on a quarterly or shorter basis | Total beta activity, remaining beta activity, tritium, gamma spectrometry |
| Soil, sediments and indicator organisms | Annual soil sampling and six-monthly sediment and indicator organism sampling | Sr-90, gamma spectrometry |
| Milk and crops | Fortnightly milk sampling during the grazing season and monthly milk sampling during the rest of the year. Crop sampling during the harvest season | Sr-90, gamma spectrometry, I-131 |
| Meat, eggs, fish, seafood and honey | Monthly sampling | Gamma spectrometry |

Table 15.C.2. ERMPs of nuclear power plants. Year 2011

| NPP | Air. Average value [Bq/m$^3$] | | | |
|---|---|---|---|---|
| | ß-Total | I-131 | Sr-90 | Cs-137 |
| Almaraz | 8.42E-04 | 1.20E-03 | <LDL | <LDL |
| Ascó | 7.97E-04 | 1.21E-03 | <LDL | <LDL |
| Cofrentes | 8.14E-04 | 1.08E-03 | <LDL | <LDL |
| Vandellós II | 7.03E-04 | 6.95E-04 | <LDL | <LDL |
| Trillo | 6.38E-04 | 7.85E-04 | <LDL | <LDL |
| Santa María de Garoña | 4.99E-04 | 9.83E-04 | <LDL | <LDL |
| José Cabrera* | 7.21E-04 | — | 1.09E-05 | <LDL |

LDL: Lower Detection Limit.
*In the dismantling phase.

# Article 16. Emergency preparedness

## 16.1. Emergency plans and programmes

In Spain the planning and preparedness for nuclear emergency situations are governed by the Basic Nuclear Emergency Plan [Plan Básico de Emergencia Nuclear (PLABEN)] and by the Regulation on Nuclear and Radioactive Facilities. Likewise, general provisions on nuclear emergencies are included in the Law Creating the CSN (reformed by the Law 33/2007, of 7 November), the Regulation on Health Protection against Ionising Radiations, the Council of Ministers' Agreement on public information about applicable health protection measures and the proper behaviour in the event of a radiological emergency, and basic civil defence regulations.

The most noteworthy aspects of the modifications made during this period to the legal and regulatory framework regarding nuclear emergencies are summarised below.

### 16.1.1. Basic Nuclear Emergency Plan (PLABEN)

As a result of the second extraordinary meeting of the Convention on Nuclear Safety, where the lessons learnt from the accident at Fukushima NPP were analysed, a commission comprising personnel from the Interior Ministry's Directorate-General for Civil Defence and Emergencies and the CSN was set up to analyse the following aspects of PLABEN for revision and improvement:

1. The appropriateness of the resources allocated to the emergency response organisation. Studying the degree of appropriateness of the resources assigned to Off-site Nuclear Emergency Plans, so as to take measures aimed at making up for any inadequacies or shortages.
2. Reference levels and old intervention levels, in order to establish urgent and middle-term population protection measures. Analysing said levels, taking into account the lessons learnt from the Fukushima accident and the need to adapt the current levels in Spanish regulations to that laid down in the new IAEA Basic Safety Standards.
3. Reference levels and old dose levels, in order to establish intervention personnel protection measures. Defining these levels from a more integrated, joint perspective for both people who take part in the nuclear power plants' On-site Emergency Plans and people who participate in Off-site Nuclear Emergency Plans.
4. Accident scenarios and their time scale

   Studying extreme accident hypotheses, as those analysed in NPP stress tests, and their concurrence with the more unfavourable circumstances, in order to come up with scenarios by means of which to analyse the appropriateness of current forecasts on which Off-site Nuclear Emergency Plans are based.

   Likewise, studying those aspects relating to the coordination between the Competent Authorities' and the affected NPP's emergency management centres, particularly when it comes to adopting mitigating measures entailing off-site releases. Additionally, considering whether it is convenient to boost the planning and response during the urgent phase of the emergency, in order to take into account the possibility that said phase may last longer than initially expected.
5. The delimitation of planning areas.

   Reconsidering the dimensions of said areas and their potential adjustment according to the evolution of the accident and social and environmental circumstances.

6. Criteria relating to the decision making on the adoption of the following measures:
   a) Confinement
   b) Radiological prophylaxis
   c) Evacuation
   d) Relocation
   e) Food control

   Reconsidering the criteria and methods for establishing protection measures, taking into consideration the necessary harmonisation of similar measures in EU member states and, in particular, neighbouring countries.
7. Emergency public information and warning systems.

   Conducting studies to enhance public early warning systems and making improvements in the effectiveness of public information in order to keep the population abreast of adopted protection measures and increase its knowledge of the evolution of the emergency and of the measures which are applied at any given time.
8. Building installations for the decontamination of the population affected by an emergency and other associated aspects. Analysing currently existing means to perform these activities, should it be necessary to increase their capacity and effectiveness.
9. The role of municipal organisations in the planning of and response to nuclear emergencies.

   Analysing and strengthening the capacity of municipal organisations, so as to improve their effectiveness in the performance of their functions.
10. The participation and collaboration of NPP licensees in the preparation and response phases of off-site plans.

    Developing more detailed criteria, so as to achieve a greater involvement of licensees, by means of human and material resources, in the implementation of Off-site Emergency Plans in the event of large nuclear emergencies.
11. The transition between the urgent, intermediate and recovery phases.

    Improving the definition of the criteria for transitioning from the urgent to the intermediate phase of the emergency and of the actions to be taken therewhile.

The result of the commission's analysis will lead to the revision of the current Basic Nuclear Emergency Plan.

### 16.1.2. The CSN's Statute

In order to include the changes made by the Law 33/2007, of 7 November, in the Law Creating the Nuclear Safety Council, the CSN proceeded to correspondingly recast its current Statute into a new text that would entirely replace the previous version and systematise and harmonise the functions currently performed by the Council, transferring to a single text the basic regulations for the assignment of the administrative powers that are bestowed upon the CSN in laws or regulations stemming from the implementation of the Nuclear Energy Act since 1964 and that up, until now, lacked a joint or coherent regulation. In particular, the CSN's new Statute (Royal Decree 1140/2010) implements the functions assigned to it regarding nuclear emergency preparedness and response in a manner that is coherent with the changes made to the above-mentioned Law Creating the CSN.

### 16.1.3. New procedures in the CSN's Emergency Action Plan (PAE)

The CSN has an Emergency Action Plan (PAE) that includes the Emergency Response Organisation (ORE) and brings together all the functions, specific resources and basic action procedures of the organisation's management and technical organs, their interactions and the general training guidelines therefor.

The ORE, which is complementary to the normal working organisation, has an operating structure with a single command that performs the managerial and decision-making functions; its technical and logistics units participate in it according to an action plan which has been specifically established for these cases and is activated in proportion to the level of severity of the accident that triggers the emergency.

In the event of an emergency, the ORE will act in accordance with the PAE and independently from the regulatory and control functions which have been assigned to the CSN. It has the following functions:

- Collaborating to take the emergency to a safe condition.
- Helping to mitigate the radiological consequences of the accident that caused the emergency situation on people, property and the environment.
- Informing and advising the authorities in charge of directing the applicable emergency plan on the adoption of measures to protect the population.
- Informing the population of the risks associated with the emergency situation.
- Complying with international commitments as regards early notification and mutual assistance in any aspect connected to the CSN.

The plan includes the processes for adding members from the CSN's basic organic structure to the emergency response organisation and the critical emergency tasks to be performed in each situation in order to adequately comply with the responsibilities assigned to the body under the Spanish emergency response system.

In addition, the Plan considers the activation and performance of a series of services for "in situ" intervention in the affected areas as regards the level of off-site response.

The ORE essentially operates from an emergency centre (SALEM) which is in a state of permanent alert and is manned on a rotating shift basis by a technician and a communications officer, plus a 12-people standby emergency team capable of responding to an emergency situation in less than one hour.

The CSN's Emergency Action Plan includes a staff training plan with three levels of involvement (informative, organisational, and technical). Likewise, the PAE includes an exercise and drill programme having an in-house, national and international scope to periodically check the operability of its technical capabilities and make the appropriate improvements.

In 2010, the CSN published a procedure for the coordination between its Sub-Directorate for Emergencies and ORE and the radiological groups of Off-site Emergency Plans to define the channels through which to coordinate the activities of its resident inspectors at Spanish NPPs in their capacity as Radiological Group Leaders (JGR) of Off-site Nuclear Emergency Plans (PENs), its Sub-Directorate-General for Emergencies (SEM) and its Emergency Response Organisation (ORE) with regard to the set of activities which are carried out during said plans' emergency preparedness, introduction, implementation and operability maintenance phases.

In 2012, the CSN issued a procedure on the performance of the ORE's Radiological Group in the event of emergency situations, whose purpose is to lay down the activities that the Radiological Group (GRA) must carry out as part of the CSN's Emergency Action Plan (PAE) for nuclear and radiological emergency situations.

From the experience gained from the follow-up to the Fukushima accident, it can be concluded that at least the following aspects of the PAE need to be revised – something which will presumably take place during the 2013-2014 period:

- The issuance of official press releases of a technical nature about the situation and evolution of nuclear accidents.
- Actions during extended emergencies.
- Improving consequence assessment tools and decision-making support tools.
- The reliability of the means for the CSN, the other bodies involved in the management of nuclear emergencies and the NPPs to communicate during emergencies, in particular in case of extreme natural events.

### 16.1.4. Implementation of emergency preparedness measures by license holders and off-site nuclear emergency plans

**Level of on-site response**

The emergency preparedness and response actions at this level are established in the On-site Emergency Plans (PEIs - Self-protection) of nuclear installations.

The purpose of these plans is to set out the actions envisaged by the licensee of the nuclear installation to reduce the risk of a radiological emergency and, if any, to limit the release of radioactive material into the environment.

A joint CSN-UNESA group revised the UNESA Guide "Emergency Classification and List of Initiating Events of NPP On-site Emergency Plans." On the basis of the revision of this guide, licensees remodelled the text of several initiating events in the PEIs of their nuclear power plants and sent these revised texts to the CSN for approval; if approved, they would subsequently be added to the new editions of the PEIs.

Likewise, since February 2013, NPP licensees have been including in their PEI-associated procedures the use of calculation codes for estimating the source term and the population dose in the event of nuclear accidents resulting in an off-site release of radioactive material which are substantially better than previously existing codes and have been tailored to match the characteristics of the operation and the surrounding area of Spanish NPPs. Consequently, the forms for reporting accidents to the competent authorities have also been modified and improved.

At the time of the drafting of this report, and as a consequence of the results of the stress tests, a new revision of the PEIs is anticipated in order to incorporate, among other things, the following:

- The revision of the licensees' Emergency Response Organisation, mainly to deal with accidents which affect several units simultaneously, and improvements thereto in order to comply with that required in this regard in the CSN's Safety Guide 1.3, which up until now had a recommendatory nature.
- Improvements to adapt the reference levels for workers belonging to the licensee's emergency organisation to those for workers belonging to the Off-site Emergency Plan of Group I or II, depending on the duties envisaged in case of an emergency.
- New emergency management support centres: an Emergency Support Centre, which will be common to all plants, and an Alternative Emergency Management Centre to be built at each site.
- The analysis of the available access roads in each of the contemplated scenarios and the inclusion of possible alternative routes in procedures.

- Portable equipment to deal with events that involve a loss of off-site power and of the ultimate heat sink: motor-driven pumps, diesel generators, lighting equipment, generating sets, instrumentation, and so forth.
- Autonomous communication equipment whose availability in the postulated scenarios is guaranteed.

On the other hand, licensees shall:

- Draw up emergency management procedures in the event of extensive damage entailing a loss of the normal direction and control of the emergency. In that situation, the use of Extensive Damage Mitigation Guides is envisaged: extensive damage mitigation procedures to maintain the integrity of the fuel in the core and the spent fuel pond and of the primary containment, preventing or minimising off-site radioactive releases insofar as possible.
- Prepare a protocol for plants to help each other during emergencies, and develop a procedure to speed up the formalities which off-site teams must go through before they can enter a site in the event of an emergency.

**Level of off-site response**

The emergency preparedness and response actions at this level are established in the Off-site Nuclear Emergency Plans (PEN) of nuclear power plants, which in turn include Nuclear Emergency Municipal Action Plans (PAMEN), and in the Central Nuclear Emergency Response and Support Plan (PENCRA).

PENCRA lays down the systematic approach to provide the Management of each PEN with all the support and additional means it might require (the current plan was approved in 2005). PENCRA is a national-level response model which provides for the mobilisation of all the resources and capabilities of the Spanish State which might be needed to perform said response, including international aid.

All Spanish resources required to support Off-site PENs are managed by the Directorate-General for Civil Defence and Emergencies (DGPCE), which is part of the Ministry of the Interior, as the organ that coordinates all necessary support given by the different Bodies of the Central Administration, other Public Administrations and private entities.

These national resources were increased with the creation of the Military Emergency Unit (UME), which reports to the Ministry of Defence, by a Council of Minister's Resolution dated 7 October 2005, since one of this unit's competences is to face up to emergencies derived from technological risks, including the nuclear. As part of collaboration agreement with the UME, the CSN participates in telecommunications, training, operational emergency coordination and common-equipment procurement tasks.

The Royal Decree 1097/2011 approved the UME's Intervention Protocol. One of the relevant subjects of said Protocol is that State Civil Defence Plans shall take the UME into account in their emergency intervention and organisational estimates.

In 2011, the CSN issued a Nuclear Emergency Dosimetry Procedure to define and develop the on-the-field activities to be carried out as regards the monitoring and control of radiation doses received by responders of nuclear emergency interventions. This procedure has to be used as a reference and guide by the Radiological Groups of Off-site Nuclear Emergency Plans, which must control the dose of all responders of every plan, once the emergency situation has been declared, the CSN being responsible for all dose control functions.

The Action Plans of the Radiological Groups of the PENs are currently being adapted to strengthen the support given thereto by the CSN's Emergency Response Organisation by taking

advantage of new technological developments in communication, radiological consequence estimation and data transmission tools.

Finally, a Framework Agreement for collaboration between the DGPCE, the CSN and UNESA, on the participation of Spanish NPP licensees to implement, and maintain the effectiveness of, off-site emergency plants, has been drafted and is in the process of being signed. Specific agreements will have to be reached and signed by the corresponding parties to implement said Framework Agreement.

### 16.1.5. Regulatory review and control activities

The CSN verifies and inspects the introduction of PEIs by licensees and checks that these plans are updated and revised in accordance with its guidelines. It also controls and supervises both the licensees' emergency preparedness training programme and the performance of the mandatory annual emergency drills by licensees.

In relation to the capacity of nuclear power plant licensees to deal with emergencies, a annual emergency drill programme is drawn up on a yearly basis, which includes the necessary division of the performance of drills at the different NPPs into months, according to the CSN's criteria regarding the responders' lack of previous knowledge of the scenario of postulated events and the date of performance of the corresponding drill and to the scope of the emergencies to be simulated. At NPPs in operation, this scope entails the declaration of a Category-III or -IV emergency and, additionally, the following postulated events: fire, damage control and repair, and the rescue of and first aid to injured and contaminated personnel. The idea behind this is for the personnel of the emergency response organisation at nuclear power plants to carry out most of the response actions laid down in their respective On-site Emergency Plan (PEI).

## 16.2. Informing the public and neighbouring States

### 16.2.1. Public information on health protection measures and the proper behaviour in the event of a radiological emergency

That which was laid down in the Council of Ministers' Resolution, of 1 October 1999, on the programmes for the early warning of the population in the vicinity of nuclear power plants and the training of responders in nuclear emergency situations, has been implemented and strengthened through the approval of the Directive on Early Warning of the Population in Off-site Nuclear Emergency Plans and the Directive on the Training and Qualification of Off-site Nuclear Emergency Plan Responders.

The public early warning programmes included in the different nuclear emergency plans are managed by the Directorate-General for Civil Defence and Emergencies; in addition to participating in their delivery, the CSN makes recommendations to standardise the different information programmes of the respective nuclear emergency plans.

### 16.2.2. Exchanging information with neighbouring States

Spain is a signatory to the IAEA's conventions on early notification and mutual assistance and, as an EU member state, complies with the requirements of the Council Decision 87/600 EURATOM on Community arrangements for the early exchange of information in the event of a radiological emergency.

Through its Emergency Room (SALEM), the CSN is the Spanish National Warning Point of the system which implements the content of the IAEA's Convention on Early Notification of a Nuclear Accident (EMERCON/ENAC). Different-scope drills are carried out on a periodic basis to verify that the system work properly.

With regard to the IAEA's Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency, the Spanish National Warning Points are the DGPCE, through its Operations Coordination Room (SACOP), and the CSN, through SALEM.

The system that implements the content of the Council Decision 87/600 EURATOM, on the early exchange of information, is known as ECURIE (European Community Urgent Radiological Information Exchange). The Spanish National Warning Point of contact with the ECURIE Management Centre is the CSN, through SALEM. The messages sent to ECURIE may be either warning messages, for the notification of emergencies, or information messages, i.e. voluntary notifications of less important events and incidents that may be of use to the competent Authorities of other member States.

Article 5(2) of the Council Decision 87/600/EURATOM calls for the ECURIE System to be checked on a regular basis by means of different-scope drills ranked from 0 to 3.

The European Union has other support systems in the event of a nuclear or radiological emergency, such as EURDEP (European Union Radiological Data Exchange Platform) and ENSEMBLE (atmospheric dispersion forecast model results).

With regard to the EURDEP programme, the CSN sends the data from its network of automatic environmental radiological monitoring stations [Red de estaciones automáticas de vigilancia radiológica ambiental (REA)] and from the stations of the Autonomous Communities on a daily basis and in accordance with the commitment made by the countries participating in EURDEP. In the event of an emergency and during the performance of drills, the data are sent with a frequency of less than one hour.

In 2011, the CSN published a procedure for the international notification of emergencies, the purpose of which is to establish the action guidelines for the CSN's ORE with regard to the preparation of reliable technical information in the event of a nuclear accident or radiological emergency and its transmission to International Bodies in order to comply with international commitments on early notification and mutual assistance.

This procedure applies to the processes for the preparation and transmission of technical information to the IAEA and the European Commission in the event of a nuclear accident or a radiological emergency within Spanish territory. It does not apply to emergency public information processes in general. The performance of ECURIE or EMERCON drills and the management of emergencies beyond Spanish borders are outside the scope of this procedure.

Likewise, in 2010 the CSN signed a bilateral agreement with the French Nuclear Safety Authority (Autorité de Sûrete Nucléaire) whereby bilateral mechanisms were set up for the early notification of nuclear or radiological accidents which occur anywhere in either of the two countries and might affect the national territory, the population or the environment of the other country or give rise to concerns among its population.

## d) Safety of facilities

# Article 17. Siting

## 17.1. Assessment of site-related factors

### 17.1.1. Site-related measures and regulatory criteria and assessment of nuclear facility locations, including all applicable Spanish laws

The specific requirements and criteria for performing site studies in relation to the safety of nuclear installations, as well as for assessing their acceptability, were expressly collected in the new Council Safety Instructions (ISs) issued in 2010 by the Nuclear Safety Council, specifically IS-26, on basic nuclear safety requirements applicable to nuclear installations, and IS-27, on general nuclear power plant design criteria. They were drafted by taking into account the Spanish practices that were applied up until that point, the current regulations of those international bodies to which the Spanish State belongs (IAEA regulations) and the regulations available in the country of origin of each installation's technology (basically Germany and the USA), as well as the WENRA reference levels published in 2008.

Section 4 of IS-26, on basic nuclear safety requirements applicable to nuclear installations, is entirely devoted to siting and deals with the applicable general criteria and the monitoring of site conditions over time. Any potential site for a nuclear installation must be properly assessed so as to determine the effects the latter might have on the surrounding population and environment, as well as all potential constraints the site might place on the design. This assessment includes factors such as population density and distribution, meteorology, surface water and groundwater hydrology, geology, seismology, land and water uses, and other ecological and environmental factors, as well as those attributable to human activities. The availability of off-site services which might help to maintain the safety of the facility and protect the population, such as, among others, power supply, fire protection, access road, communication and emergency-preparedness services, is also analysed.

With regard to site condition monitoring over time, changes in site-related aspects during the life of the facility must be assessed to ensure that safety conditions remain unchanged. On the other hand, site characteristics that might affect the safety of the facility, the risks associated with off-site (natural or anthropogenic) events, and the conditions of the surrounding area that might be affected by its operation must be monitored throughout the life cycle of the facility.

The Safety Instruction IS-27, on general nuclear power plant design criteria, includes two site-specific criteria: Criterion 2, on design bases for protection against natural phenomena, which establishes that the most severe events that have happened in the past must be taken into consideration and that a sufficient margin must be left in order to account for the limitations of historical data, and Criterion 4, on environmental- and dynamic-effect design bases, which calls for the protection of structures, systems and components (SSCs) directly or indirectly related to safety against off-site events and conditions.

Additionally, there is one specific instruction, IS-29, on safety criteria at temporary spent fuel and high level waste storage facilities. The different aspects of the assessment of the safety of this type of facility, including the characterisation of the site and its relation to safety, are discussed in it.

It requires giving consideration to plausible or credible events which are unlikely to happen and might be caused by environmental or extreme weather phenomena or off-site human activities so as to establish a conservative boundary in the design bases.

The design parameters associated with the site (seismological, hydrological, meteorological, etc.) must be obtained by means of an adequate combination of deterministic studies (maximum foreseeable values) and probabilistic studies (allowing uncertainties to be delimited) and validated by appropriately qualifying the opinion of experts. The site's safety assessment must include the identification and evaluation of design parameters.

According to the preceding principles, and following the recommendations contained in the CSN's Safety Guide 1.10, Rev. 1 (2008), "Periodic NPP Safety Reviews," Spanish nuclear power plants perform periodic safety reviews (PSRs) every ten years, whose scope and objectives include site aspects, in particular, regarding programmes for the continuous evaluation of safety and the applicability of the changes in the regulations that might have taken place in the appropriate ten-year period.

From a siting standpoint, the evaluation process of the Periodic Safety Reviews of NPPs has required each one of them to revise and update the content of Chapter 2 "Siting" of their Safety Analysis Report so as to explicitly include the applied design bases relating to the site. Furthermore, Spanish NPPs have been required to devise a systematic plan to keep the information of this chapter up to date such that it provides an accurate snapshot of the real situation of the site and the validity of the design basis associated therewith throughout time.

## 17.2. Impact of the facility on individuals, society and the environment

Given the interaction of impacts from the site and the nuclear facility built on it, it is necessary to assess them and monitor their evolution in order to ensure that potential impacts stay within acceptable limits or, otherwise, to take appropriate action to properly limit said impacts.

The continuous monitoring of the various impact factors associated with the site (seismology, meteorology, hydrology and so forth) finds expression in the corresponding monitoring plans by means of suitable systems which are specially tailored to each site and facility and periodically reviewed to guarantee their effectiveness according to the obtained results. Every facility prepares periodic reports on its monitoring programmes, which include the analysis of the results obtained. The CSN reviews these reports and performs periodic inspections of the installations for a proper supervision and control thereof.

With regard to the interaction with groundwater, the stations have developed and implemented Hydrogeological Programmes for controlling and monitoring their sites as regards both the groundwater table and chemical and radiological quality of groundwater, which are closely related to their Environmental Radiological Monitoring Plans.

Surface water and groundwater monitoring and control programmes have the following basic goals:

- To monitor the radiochemical (chemical and radiological) quality of the surface water and groundwater against potential accidental emissions of radioactive effluents, among them, tritium.
- To detect anomalous concentrations and possible radioactive contamination in site waters, early indicators of the degradation of structures, systems or components and of the possible need to take mitigation actions (repairs, cleaning operations, etc.).
- To have a detailed understanding of the hydrogeological behaviour of each site and of the potential effect of groundwater on the building structures of the nuclear power plant.

Spanish nuclear installations have operating seismic monitoring programmes which make use of instrumentation installed in outdoor areas and inside the buildings whose main purpose is to register any significant seismic movement that is felt at the site and to compare it to design earthquakes (OBE and SSE). In addition, once the seismic monitoring systems have verified the occurrence of an earthquake larger than the OBE at the site, in accordance with the corre-

sponding procedures one of the categories of the On-site Emergency Plan of the affected nuclear facility would be activated according to the severity of the earthquake and the safety-related damages it has caused.

All Spanish NPPs have programmes in place to monitor the weather parameters of the site, which use suitable meteorological instrumentation and transmit the recorded data to the plant's control room to the CSN's Emergency Room (SALEM). Some installations have also introduced ground movement monitoring programmes to detect overall and differential movements in the ground; the ground of all sites is stabilising since these movements are clearly decreasing over time.

The CSN periodically inspects the monitoring programmes of nuclear installations (every four years at the most) in order to verify that they work properly throughout the operating life of each facility.

Furthermore, the CSN has introduced a specific plan for the performance of periodic site parameter inspections at every nuclear power plant, which is part of its Integrated Plant Supervision System (SISC). The plan essentially consists of two types of inspections: one general in scope (every two years) and the other of limited scope (every six months). The general scope includes all those risks related to those weather and flooding events which have been identified for each nuclear power plant's site; the CSN reviews the licensee's studies and supporting documents, the results of the monitoring programmes which are implemented, operating experience incidents, and the licensee's corrective actions programme. On the other hand, the CSN conducts the six-monthly specific-scope inspections on structures, systems, equipment or components which have been previously selected because of their relationship with plant safety and might be significantly affected by severe weather conditions or off-site flooding. The purpose, scope and periodicity of site parameter inspections are set out in the CSN's technical procedures PT.IV.201 "Protection against Severe Weather Conditions and Flooding" and PT.IV.206 "Operation of Heat Exchangers and the Ultimate Heat Sink".

## 17.3. Reassessment of site-related factors

The response of nuclear power plants to extreme weather events (earthquakes, flooding, extreme weather conditions…) beyond their design bases that compromise safety functions and might lead to severe accidents has been evaluated within the European stress test framework. The effectiveness of the preventive measures which were adopted in their design or which they have additionally taken according to the defence-in-depth principle has also been checked.

### Earthquakes

All Spanish NPPs have reviewed the design bases of their structures, systems and components as regards their integrity in the event of earthquakes. The results indicate that the design bases are properly met. Additionally, the stations have reviewed all data on the earthquakes which have occurred in their site's surrounding area since the cut-off date considered in the studies for the definition of the Design Base Earthquake (DBE) until the first half of 2011 and have reached the conclusion that, according to the methodology applied in the initial studies, the DBE values which were initially taken – which ranged from 0.10g to 0.20g – are still valid.

The potential indirect effects caused by an earthquake inside the facility have been analysed: to this end, explosions and fires, in addition on-site floods as a result of ruptured pipes, have been taken into consideration. The CSN considers that the protection barriers and actions identified in each plant's reports are appropriate.

In addition, the scope of the analyses of the seismic margins of SSCs needed to guarantee the integrity and cooling of the spent fuel pond has been broadened. Among the measures taken to strengthen the plant against seismic events, the stations have reviewed or proposed to review

the margins of the equipment used to deal with a station blackout (SBO) and a severe accident. They have verified that a seismic margin equal or greater than 0.3g can be assigned to these SSCs; otherwise, additional measures have been planned to meet this margin.

Another aspect that has been analysed is the potential loss of water in the spent fuel pond, or, when applicable, in the heat sink ponds, as a result of the sloshing caused by an earthquake. It has been determined that, given the earthquake intensity considered (both the DBE and the 0.3g seismic margin), this effect would not be relevant in any case.

In the case of plants sited in a river basin with dams upstream of the site, the structural strength of the latter has been analysed in order to verify that they can withstand an earthquake of the same intensity that the station's DBE. In addition, the strength of said dams against beyond design basis earthquakes has been analysed and the seismic margins at each dam have been quantified.

Conversely, the plants have also analysed the consequences that the bursting of said dams would have on the site. To this end, they have studied the propagation of the inflow of water that would be created by a dam's failure until it reached the site in order to calculate the maximum plausible flood level at the plant and the time it would take for the peak flow to reach the plant.

As regards seaquakes, the only Spanish plant built on the coast has a very high protection margin since its safety systems are 20 metres above sea level.

**Actions for improvement taken**

The global activities which Spanish nuclear power plants have planned in order to boost their response in the event of extreme earthquakes are the following (the time for their introduction is also indicated):

- Analysing the seismic margins of SSCs and defining feasible actions to upgrade their seismic performance to 0.3g (in 2012).
- Making design modifications to SSCs with a seismic margin lower than 0.3g so as to reach that value or, otherwise, replacing them altogether (until 2014).

## Flooding

All plants reviewed their facility's design basis in the event of floods caused by off-site natural events, including the hydrological and meteorological data recorded at each site throughout the operation of the plant. They reached the conclusion that the flood levels adopted as their design basis are still valid today.

In addition to the aforementioned analyses of floods caused by the failure of dams, review studies consider floods caused by other reasons, such as intense local precipitations, inflows of water in rivers and ravines, tidal waves, swells and an excessive increase in the sea or groundwater levels. The maximum anticipated occurrence and the existing safety margins are studied in these analyses and various suggestions for improvements are put forward which are applicable to each case.

**Actions for improvement taken**

The global activities which Spanish nuclear power plants have planned to boost their response in the event of extreme flooding are the following (the time for their introduction is also indicated):

- Analysing the site and its surroundings according to current models of their geographical features (ravines, slopes, terraces, etc.) in order to define potential actions for improvement (in 2012).
- Analysing the site's drainage network (surface water and groundwater) so as to identify potential actions for improvement (in 2012).

- Solving already detected weaknesses and implementing the improvements identified in the site flooding study directed towards increasing the water-tightness of doors and buildings and the capacity of drains (until 2014).

### Other natural events

The analyses conducted by the plants start with a preliminary probabilistic screening, which uses the available results from the IPEEEs to try to determine which off-site events, other than earthquakes and floods, might have a safety-related impact on the site. Among others the following off-site events have been considered: strong winds, electric storms, hail, snowfalls, extreme temperatures (high and low), frost, drought, and forest fires.

For each of these events, the plants have reviewed the plant's original design basis and made sure that its outdoor structures and components have been properly designed. Additionally, they have tried to verify the existence of beyond design basis safety margins for events which seem plausible at each site and have pinpointed different strengthening measures that must be taken.

**Actions for improvement taken**

The global activities which Spanish nuclear power plants have planned to boost their response in the event of other natural extreme events are the following (the time for their introduction is also indicated):

Reassessing specific off-site natural events (hail, extreme temperatures, and lightning) and subsequently implementing the actions for improvement that have been established (until 2014).

## 17.4. Consultation with other Contracting Parties probably affected by the facility

Spain participates with its experts in different international initiatives for the development of nuclear safety as regards site factors, collaborating in the R&D projects and working groups of different international bodies. The most significant activities currently under way are the following:

- Participating in different working groups of the IAEA's International Seismic Safety Centre (ISSC), the purpose of which is to contribute to increase seismic safety and the safety of all off-site events at nuclear installations across the world.
- Taking part in the Project "Seismic Input Definition and its Control Point" of the CSNI/IAGE Group (NEA-OECD), the purpose of which is to clarify the practices followed in member states to characterise and define the design seismic action from near or faraway foci, as well as its control points.
- Collaborating with the French regulatory body (ASN) to perform cross inspections (environmental aggressions and severe weather conditions) at nuclear power plants in order to share the practices followed and exchange experiences.

# Article 18. Design and construction

## 18.1. Implementation of the defence-in-depth concept

### 18.1.1. Overview of the measures of the Contracting Parties and the regulatory criteria related to the design and construction of nuclear installations

During the period of time covered by this report, the CSN issued the following Council Instructions, which contain regulatory criteria:

Nuclear Safety Council Instruction IS-26, of 16 June 2010, on basic nuclear safety requirements applicable to nuclear installations. The aim of this Instruction is to set the basic nuclear safety requirements applicable to the nuclear installations defined in the Directive 2009/71/EURATOM, of 25 June 2009, of the Council of the European Union, establishing a Community framework for the nuclear safety of nuclear installations for the different phases of their life cycle, from their siting and design to their decommissioning, on the basis of the documentation generated by the IAEA, and to include WENRA reference levels of a more general nature.

Nuclear Safety Council Instruction IS-27, of 16 June 2010, on general nuclear power plant design criteria. The general design criteria are the set of minimum requirements with which a nuclear power plant must be designed so as to be considered safe. The purpose of this Instruction is to establish said set of criteria. During its preparation, the regulations from the countries of origin of the technology of Spanish NPPs were taken into account, in particular the contents of Annex A of Part 50 of Title 10 of the US Code of Federal Regulations and the equivalent regulations from the BMU in Germany, as well as those from the IAEA. Likewise, the experience gained in relation to the design of structures, systems and components (hereinafter, SSCs) was taken into consideration. Additionally, the work that was carried out in the Western European Nuclear Regulators Association (WENRA) to harmonise the regulations of the different member countries was taken into account in this Instruction.

### 18.1.2. Status in connection with the application for all nuclear installations of the defence-in-depth concept, providing multiple protection levels for the fuel, the pressure boundary and the containment, taking into account on-site and off-site incidents and the impact of sequential incidents of external agents (a tsunami caused by an earthquake, mud slide caused by heavy rains).

The Section "Defence in depth" of IS-26 establishes that the licensee of a nuclear installation must add during design, construction, operation, dismantling, and waste transport and management multiple barriers to prevent and mitigate off-site releases of radioactive material above the authorised limits.

The principle of defence in depth, or safety at all costs, is already incorporated into the design and maintenance of nuclear power plants, and is applied to both physical barriers and engineered safeguards whose function it is to protect them.

Defence in depth is guaranteed through the application of the following levels of protection:

- Minimisation of deviations from normal operation and of system failures.
- Detection and control of said deviations.

- Availability of SSCs and procedures capable of taking the plant to a safe condition following a design-basis accident, at least one barrier being maintained for the confinement of radioactive material.
- Minimisation of the probability of accidents happening beyond the design basis and of the uncontrolled release of radioactive material, there being procedures or guides in place with which to manage them.
- Attenuation of the radiological consequences of releases of radioactive material resulting from any accident that might occur.

All NPPs incorporate these levels of protection into both their physical design and their guides and procedures for action.

The already introduced Severe Accident Programme provides adequate protection for NPPs against beyond design basis accidents.

### 18.1.3. Extension of the use of design principles such as passive safety or failure of the safety function, automation, physical and functional separation, redundancy and diversity for the different types and generations of nuclear installations

As Spanish nuclear power plants were built, from Generation-I to Generation-III reactors, improvements to the design thereof were made by applying stricter physical-separation, redundancy and diversity criteria, analysing new types of accidents not contemplated in the initial design, and so on, for those operational and accident situations within the NPPs' design basis.

On the other hand, all plants –and on the occasion of the renewal of their operating licence– were required to upgrade or make certain design modifications to the installation to increase the safety thereto in order to cope with the passing of new, more demanding regulatory criteria (it should be remembered that, back then, this was done every operation cycle). Thanks to this practice, together with the introduction of the periodic review of safety, on the one hand, and conditional application regulations, on the other, it can be concluded that both Generation-I and Generation-II and -III plants have the same safety levels.

Conversely, all stations have to comply with the new regulations that have been issued during the time period which this report covers (Instructions IS-26 and IS-27). Should a plant not meet a criterion, it would have to perform the corresponding design modification so as to fulfil it.

### 18.1.4. Implementation of design modifications and changes (plant modifications, backfitting) to prevent beyond design basis accidents or to mitigate the radiological consequences in the event thereof

In addition to the measures which Spanish nuclear power plants have been taking in the past few years and which have been described in previous reports, the Fukushima accident and the performance of the stress tests as a result thereof, which have lead to the validation of the safety levels of current designs and proven their robustness against this type of event, have obligated them to adopt additional measures. Different analyses and design modifications have already been undertaken according to a very demanding schedule.

Although each plant has taken its own measures, the following apply to all stations:

- The performance of studies for the introduction of measures to face up to accidents causing extensive damage, including interfaces with the installations existing at the plants, portable means and equipment, a warehouse therefor, a heliport, and so forth, as well as the definition of a new emergency organisation. All of it according to the requirements of the CSN.

- The purchase of portable 380 VAC diesel generators to supply the minimum critical loads defined in the station blackout (SBO) scenario.
- The initiation of the designs for the installation of filtered containment vents, passive hydrogen recombiners, an Alternative Emergency Management Centre (CAGE) and an Emergency Support Centre (CAE).
- The verification of the capacity for voltage recovery from hydroelectric power plants.

In the case of Almaraz NPP, the emergency wiring to portable equipment, as required by the CSN, and upgrades to the auxiliary feedwater (AFW) turbine-driven pump are worth mentioning.

In the case of Trillo NPP, the emergency wiring to portable equipment and the procurement of diesel motor-driven pumps can be highlighted.

And in the case of Santa María de Garoña NPP, the following measures stand out:

- The replacement of scram pilot electrovalves.
- The modification of the measuring range of the $H_2$ concentration control unit in the Primary Containment.
- The installation of restricting orifices in instrumentation lines inside the Primary Containment.
- The replacement of the motors of the four Low Pressure Core Injection pumps.
- The improvement of the independence and physical separation of circuits in panels of the Control Room.
- The reinforcement of the condensate tank to increase its seismic margin.
- The upgrade of line supports to prevent interactions between Class-II and Class-I lines in the event of an earthquake.
- The replacement of low-voltage relays in emergency buses to guarantee their seismic margin.
- The launch of the project to build an Individualised Temporary Storage Facility (TSF) for the dry storage of spent fuel.
- The procurement of a diesel motor-driven pump to supply water in the event of a station blackout (SBO) coinciding with a loss of the connection with the ultimate heat sink (UHS).

This process of making improvements is not new, as nuclear power plants have been implementing design modifications to enhance safety since they first started operating.

NPPs have also continued to perform emergency drills, which in certain cases have required the use of severe accident guides. Furthermore, training has been delivered on the application of said guides at all the nuclear power plants.

### 18.1.5. Improvements made to NPP designs as a result of deterministic and probabilistic assessments since the last national report on the Convention and overview of the main improvements made since the initial licensing of Spanish nuclear installations

As regards Probabilistic Safety Assessments (PSAs), Spanish nuclear power plants have continued to perform different applications thereof in support of licensing and safety improvement processes. These applications have consisted in the implementation and presentation of risk-informed modifications, prioritisation applications for Structures Systems and Components, and operational risk assessments. An example of these are the evaluations of compliance with Section 3.4 of Council Instruction IS-15, on requirements for monitoring the efficiency of maintenance at nuclear power plants (a transposition of Section a.4 of 10CFR50.65), by using the safety monitor, the verification of the refuelling programmes according to Shutdown Safety Guide (CEN-30), or the introduction at some plants of programmes which allow to focus test

and maintenance tasks on the most risk-significant equipment [Pipe In-Service Inspection (ISI), Check Valve In-Service Tests (ISTs), Motor or Pneumatic Valve Programmes, and Maintenance Rule] Likewise, the process for the analysis and continuous improvement of both the design and the operating procedures has continued to be applied. In particular, the following PSA-related activities are worth mentioning.

- In the case of Almaraz I and II and Ascó I and II NPPs, the process to adopt the Standard NFPA-805 (USA) as a licensing base for fire protection systems, which will allow to use the results of the PSAs in this area, has started.
- In the case of Vandellós II and Ascó I and II NPPs, the results of flooding PSAs have been used to suggest design modifications to significantly reduce the risk against pipe failure.
- In the case of Cofrentes NPP, the results of the on-site flooding PSA have served to propose design modifications to prevent the possibility of the Control Room's flooding due to fire protection system pipes rupture. Alternatively, the results obtained from the seismic margin analysis, as part of the Interim Plant Evaluation Event Extension (IPEEE), have lead to the identification of a few components having a High Confidence, Low Probability of Failure (HCLPF) capacity below the 0.30-g seismic margin earthquake (SME), whose modification has been required by the CSN and pledged in the improvement suggestions of the Final Stress Test Report.
- Apart from making improvements to both the Shutdown Operation Manual and fire protection, Trillo NPP is currently conducting the full-scope fire PSA at power in accordance with the USNRC's NUREG/CR-6850.
- Santa María de Garoña NPP completed the fire PSA at power in accordance with the USNRC's NUREG/CR-6850 and installed a fire safety monitor. The results of the fire PSA were taken into consideration in the operational aids included in the Fire Risk hazards analysis. In addition, a Level-I Spent Fuel Pool PSA for both at refuelling outage and at the cessation of activity was performed. Suggestions for design modifications –which would be implemented in the future– were derived from these analyses.

Furthermore, the results of the PSAs were used to support the regulatory supervision process (SISC) during both the definition and calculation of performance indicators and the categorisation of findings.

During the period which is the subject of this report, Spanish NPPs planned, designed or implemented the following design modifications (DMs) not mentioned in previous sections:

**In the case of Vandellós II NPP:**

- The replacement of the main transformers.
- The modification of the fire protection system ring.
- The reduction of the flooding risk of the remote shutdown panel and the charging pumps due to the rupture of the fire protection system.
- The mitigation of the flooding risk in the Control Building for the same reason; the installation of isolation valves.
- The relocation of the meteorological Tower.
- The change of the Cold Overpressure Mitigation System (COMS) from a control to a protection system.
- The performance of safety assessments with a greater tolerance (+3% vs +1%) for the setpoint of the safety valves.
- The removal of the hydraulic seal and the replacement of internals in safety valves of the pressuriser.

- The qualification of new hydrogen analysers.
- The modification of the HVAC system of the Fuel Building.

**In the case of Ascó NPP:**

- The use of the relief valves of the RHRS as protection against overpressures under cold conditions.
- The use of the toxic gas detection system for Control Room habitability.
- The modification of the interlocks and logic of the bridge crane in the Fuel Building.
- The relocation of post-accident radiation monitors in the Auxiliary Building.
- The backfitting of the meteorological Tower.
- The mitigation of the flooding risk in the Control Building due to the fire protection system rupturing; the installation of isolation valves.
- The modification of the sub-frequency trip logic of the switches of the reactor cooling pumps (RCPs).
- The construction of an Individualised Temporary Storage Facility (TSF) for storing spent fuel assemblies on site, with a dry container system.

**In the case of Cofrentes NPP:**

- The replacement of containment building electrical penetrations.
- The installation of permanent shielding to reduce dose and eliminate hot spots.
- The upgrade and improvement of fire protection systems.
- Improvements in diesel generators.
- The backfitting of reactor coolant recirculation motors.
- The backfitting of condensate booster pumps.
- The replacement of containment electrical penetrations.
- The partial backfitting of the process computer.
- The replacement of incore instrumentation (TIP).
- The construction of a new building to house the decontamination shop.
- Actions aimed at dose minimisation and radiological monitoring on site.
- The use of noble metals to protect vessel internals from intergranular corrosion.
- Preparations to replace the turbine-generator set.

**In the case of Almaraz NPP:**

- The replacement of radiation monitors in the control roon air intake.
- The upgrade of the lightning protection system.
- The backfitting of the upgraded safety parameter display system process computer.
- The installation of alarms in the Control Room related to meteorological parameters included in the On-site Emergency Plan.
- The removal of the hydraulic seal and the replacement of internals in safety valves of the pressuriser.
- The enhancement of the spent fuel pool cooling system by adapting it to US NRC 1.13 Rev. 2.

- The upgrade of the instrumentation for measuring the level in the primary circuit under half-loop conditions.
- Actions derived from the revision of the flooding manual. The isolation of the water supply to room SD-026.
- The improvement of ambient conditions in S-26 (mechanical penetration room).
- The non-essential component cooling isolation logic.
- The installation of a new cavity level measurement transmitter.
- The increase of the capacity of RHR relief valves.

**In the case of Trillo NPP:**

- The update of motor-operated valves.
- The backfitting of electric batteries.
- Improvements in the filling of the safety injection and residual heat removal system.
- The installation of new process computer.
- Improvements to the limitation system to eliminate unnecessary actuations due to neutron noise.
- Improvements to the water pre-treatment system.
- Improvements to the refuelling machine.

**In the case of Santa María de Garoña NPP:**

- The replacement of buried piping.
- The modification of the room's cooling system for the emergency core cooling system pumps (ECCS).
- The replacement of battery chargers.
- The installation of a new fire protection (FP) diesel pump with seismic requirements and seismic qualification of the FP system associated with safe shutdown systems.
- The installation of a new containment isolation Group 7.
- Modifications to protection systems derived from the analysis of Standard IEEE-279.
- The replacement of actuators in valves of the atmospheric control system to guarantee the isolation of the containment.
- The change in the containment vacuum breaker failure mode.
- The installation of a new battery room ventilation system in accordance with Standard ASME-AG.

The procurement of a motor-generator set for emergency supply in the event of a station black-out (SBO).

The following table shows the most significant past improvements:

| Cofrentes | Trillo | Almaraz | Santa María de Garoña | Ascó | Vandellós II |
|---|---|---|---|---|---|
| Replacement of internals of both recirculation pumps and upgrade thereof. | Third off-site electricity distribution network. | Installation of the 4th emergency diesel generator. | Replacement of piping susceptible of experiencing Intergranular Stress Corrosion Cracking (IGSCC); repair of the core shroud, and replacement of core spray piping inside the reactor vessel. | Replacement of steam generators. | New spent fuel pool racks. |
| Improvements derived from power uprate to 110% (neutron instrumentation, turbine, generator...). | Passive autocatalytic recombiners for control of H2 in the containment in the event of severe accidents. | Reracking of the spent fuel pools. | Reracking of the spent fuel pool (1987 and 1998). | Power uprate. | Power uprate. |
| Installation of a generator circuit breaker enabling the supply from the external 400kV grid with the generator decoupled. | Development of Severe Accident Manual with new assumptions (tube rupturing in steam generators...). | Direct level indication in the vessel (RVLIS, Reactor Vessel Level Indication System). | Installation of new class-1E motor control centres. | Modification of the radiation monitoring system. | Small power uprate. |
| Replacement of the power transformer (the three phases). | Linked to the Operating Experience and Systems Analysis (AEOS) and design modifications (1994-2000 approx.): changes to the essential cooling water system, design modifications of the on-site electrical system, sequencing of loads under accident conditions (reactor protection and safeguards system). | Upflow conversion in the vessel. | Replacement of the protection system trigger instrumentation. Installation of the analogue trip system. | Small power uprate and conversion to cold head. | New recirculation of the residual heat removal system. |

| Cofrentes | Trillo | Almaraz | Santa María de Garoña | Ascó | Vandellós II |
|---|---|---|---|---|---|
| Piping replacement of the hydraulic control rod drive system. | Replacement of the low pressure turbine. Power uprate. | Replacement of steam generators and reactor vessel heads. | Remodelling of the logics of the primary containment isolation groups. | Replacement of the vessel heads. | New safeguard cooling system; changing the ultimate heat sink in case of emergency; switching from the sea to a closed freshwater system; and going from cooling the emergency diesel generators and essential units with seawater to cooling them with air-cooled water. |
| Installation of the new distributed control system. | Reracking of the spent fuel storage pool. | Installation of the 4th start-up transformer. | Replacement of APRM neutron flux instrumentation with PRNM-NUMAC digital instrumentation. | Increase of the filtering surface of the sumps in the Containment. | Increase of the filtering surface of the sumps in the Containment. |
| Replacement of the condenser. | Temporary storage facility for spent fuel assemblies. | Increase of SW/CC cooling capacity, replacement of pump impellers; installation of a SW pond cooling system. | Installation of a remote shutdown panel independent from the control room; new routing of a safe-shutdown electrical division. | Weld overlay in pressuriser nozzles. | Weld overlay in pressuriser nozzles. |

### 18.1.6. Regulatory review and control activities

In order to verify that nuclear power plants are operating in accordance with applicable regulations and the requirements set by the regulator and that the actions required in the different licences and approvals are adequately implemented, the CSN carries out a Basic Inspection Programme such that each of the plants is subjected to at least a biennial Inspection in each of the areas object of inspection. Article 19 provides more details on this Inspection Programme

Once a refuelling outage is complete, in accordance with that laid down the Council Instruction IS-02, on documentation relating to Refuelling Activities at Light Water Nuclear Power plants, each plant must send a final report with the results and the degree of fulfilment of the initially planned inspection programme and which clearly identifies any deviations that took place, those areas of the in-service inspection programme with interferences above 10 percent of the volume under examination, and every individual inspection or test program, as well as a list of all the people who took part and the equipment that was used. This report must explicitly reflect the areas in which reportable indications or anomalies were detected.

All this information is subjected to a supervision process by the CSN by means of the inspections it conducts as part of the Basic Inspection Programme for each plant. When licensees propose a modification to the In-Service Inspection Programme using risk-informed criteria, this methodological change is assessed by the CSN.

On the other hand, as indicated in Article 14, a safety assessment must be carried out for each and every design modification, in accordance with Council Instruction IS-21, on requirements applicable to modifications at nuclear power plants. Depending on the result of the safety assessments, those modifications which fulfil the criteria set in said IS-21 must be approved by the CSN prior to their implementation. The CSN controls implemented modifications by means of the basic inspection plan, which includes a specific inspection of design modifications.

## 18.2. Incorporation of proven technologies

When a new design is to be incorporated, there is a preliminary homologation process available to prove that the design is suitable by means of analyses, test programmes, prior experience or a combination thereof. Furthermore, since Spanish nuclear power plants are of US or German design, in most cases there is previous experience in the application of the technologies built in the designs.

During the period under consideration, fuel rod thermomechanical analysis methodologies and BWR transient analysis methods were updated, taking into account the effect of the degradation of conductivity with burnup; moreover, the restriction to the burnup limit associated with a BWR fuel design was lifted with the use of the previous methods.

The acceptability of using these methodologies was subjected to a detailed process of assessment in which consideration was given to the experience in their application in other countries; in addition, they were validated with respect to data obtained at experimental facilities where fuel behaviour has been analysed in detail.

### 18.2.1. Measures of the Contracting Parties and regulatory criteria for the use of technology proven by experience or qualified analyses or checks

During the time period covered by this report, some licensees submitted applications for the incorporation of digital instrumentation into their safety systems, such as radiation monitors, or in control systems. The applications were accepted after taking the applicable regulatory guides into consideration.

A calculation code for the thermomechanical analysis of fuel rods was evaluated during this period of time in order to extend the licence for a new fuel design for BWRs up to a maximum

final burnup of 70 MWd/kgU. The use in Vandellós II NPP of a calculation methodology using a more realistic code for the analysis of containment pressure and temperature taking into account the new heat sink (in 2011) and the use in BWRs of a better estimated calculation methodology during LOCAs were also submitted for approval.

### 18.2.2. Measures taken by licence holders to implement these technologies. Analyses, tests and experimental methods for the qualification of new technologies such as digital instrumentation and equipment control

Safety system components are subjected to a process of ambient and seismic qualification which takes into account the conditions under which they must perform their function. The results of the ambient qualification process are included in the appropriate equipment ambient qualification manual, which specifies the ambient conditions which the piece of equipment in question must withstand. The conditions laid down in said manual are verified during the inspections envisaged in the Basic Inspection Programme.

At present, a project is being jointly developed by the regulatory body and the electricity sector for the analysis and optimisation of the methodologies applied during the process of dedication of simple software-based instrumentation and control equipment. In those cases where this type of technology has been introduced, the standards of the industry of the technology's country of origin have been applied.

During the 2010-2012 period –in particular at Cofrentes NPP– different safety-related equipment was upgraded by replacing it with class-1E digital equipment. This equipment was the following:

- Protection relays of Emax circuit breakers. This project began before the period under consideration, but the replacement of the old electrical switches took place over several refuelling outages. The new Emax circuit breakers are fitted with a digital technology-based protection relay. This relay was dedicated as class equipment for its use in safety-related applications.
- Yokogawa recorders. Old paper-tape recorders are being retired and replaced with video recorders. Class-1E recorders will be replaced with Yokogawa recorders. These commercial-grade recorders were dedicated for use in safety-related applications.
- Ametek indicators. Class-1E-qualified indicators were installed.
- SIEC. The plant process computer (SIEC) was replaced during the 18$^{th}$ refuelling outage. Even though not all of the system is a safety system, part of the signal acquisition system was qualified as Class 1E because it receives signals from safety-related systems.

Finally, Cofrentes NPP performed the analysis of cybersafety requirements and implemented the technical solutions to be applied to digital systems. These requirements affect both safety-related and non-safety-related equipment.

Alternatively, although they are not class systems and do nor require qualification, another important modification at Cofrentes NPP during this time period was the replacement of traversing in-core probes TIPs and containment TV close circuit cameras.

### 18.2.3. Regulatory review and control activities

The application of IS-21 allows to differentiate between modifications which can be implemented without requesting an authorisation and modifications which require authorisation. IS-21 lists all the documentation that must be enclosed with the corresponding application. Additionally, the Regulation on Nuclear and Radioactive Facilities states that, when, in the regulator's opinion, a modification has a large scope or magnitude, the licensee must apply for an implementation and assembly permit.

Conversely, in June 2010 the CSN issued the Instruction IS-26, on basic nuclear safety requirements applicable to nuclear installations, which stipulates that the design of structures, systems and components important to safety must be based on proven technology validated under operating conditions similar to those at the installation in question.

## 18.3. Design for a reliable, stable and manageable operation with specifications relating to human factors and human-machine interfaces

### 18.3.1. Measures of the Contracting Parties and regulatory criteria for a reliable, stable and manageable operation with specific considerations regarding human factors and human-machine interfaces

SSCs must be designed, manufactured, installed and operated according to their safety classification and taking into account the maintenance, inspection and testing capabilities to guarantee their functional capacity throughout the life of the installation. Whenever a system is required to intervene in the event of anticipated operational occurrences or rapidly evolving accidents, its actuation must be automatic in order to keep the installation in a safe condition, without the manual intervention of operating personnel being required, for enough time to make it possible for the subsequent necessary actions to be contemplated and taken. Likewise, the SSCs of the installation must be designed such that the performance of their safety functions under the ambient and seismic conditions contemplated in the anticipated operational occurrences and design-basis accidents is guaranteed and they incorporate adequate protections against on-site and off-site events and fires.

The CSN urged NPP licensees to formally include the requirements relating to human factors in their design modification management procedures, for which they should seek the participation of specialists in this discipline. In 2010, the CSN issued the Instruction IS-27, on general nuclear power plant design criteria. As part of its criteria it states that "the design of structures, systems and components important to safety must take human factors engineering principles and techniques into account."

Among its requirements, the Instruction IS-21 states that "human factors methods and criteria shall be properly included in all phases of the modification process and all modification-related activities".

The CSN has continued to make sure that modification projects at Spanish NPPs properly take these human factors criteria into consideration. These projects have considered in more or less detail, depending on their magnitude and importance for safety, the elements that make up the USNRC's NUREG-0711, which has been adopted as a reference document by Spanish NPPs.

### 18.3.2. Implementation of the measures taken by the licence holder

The regulations issued by the USNRC fall within the scope of the periodic tracking of changes in the regulations of the countries of origin of the technology of Spanish NPPs. Particularly significant are the generic letters relating to the management of the accumulation of gases in the lines of the ECCS, RHRS and CSS (GL 2008-01) and the performance, and possible clogging, of the filters in the recirculation sumps from which the emergency cooling systems would suck (GL 2004-02); this last topic continued to be the focus of attention during the period covered by this report. This matter was a continuation of what was began during the period of time covered by the Fifth Report. In each of these cases, licensees carried out the actions contemplated in those generic letters; the corresponding evaluations are currently under way.

The work done to utilise error prevention tools; the behavioural expectation and human factors programmes; the reinforcement of the analysis and use of in-house and industry operating ex-

perience; the communications activities with all stakeholders; the promotion of training, including physical changes in the simulator; and the progress made in the operating procedure revision programme, are the most significant organisation and human factors-related projects which were undertaken during the period under consideration.

Moreover, the Fukushima event resulted in the issuance of four Complementary Technical Instructions by the CSN, which has lead to the performance of assessments and analyses, as well as to the implementation of measures and the execution of projects, which will be completed in the coming years up to 2016.

## 18.4. Regulatory review and control activities

According to that laid down in every operating licence, licence holders must submit a set of periodic and non-periodic reports. The practice described in Article 14 of this report has been maintained, according to which licensees determine which of these reports must be evaluated and which ones, owing to their being subjected to a supervision process, are to be taken into account in every plant inspection programme.

### Maintenance effectiveness

The CSN receives a report from each plant on the application of the Maintenance Rule during each operation cycle and performs inspections on this subject every two years as part of its Basic Inspection Program The CSN ensures that licensees suitably comply with that required in the Council Instruction IS-15, on requirements for monitoring the effectiveness of maintenance at nuclear power plants, and Safety Guide 1.18, on measuring the effectiveness of maintenance at nuclear power plants, which implements said instruction.

### In-service inspection

Prior to the start of each inspection interval – which covers a 10-year period during which all inspection areas must to be inspected, licensees must submit to the CSN a general revision of the In-service Inspection Manual, which includes the areas to be inspected and the non-destructive testing method that must be applied to each inspection area, in accordance with the requirements of the applicable edition of the ASME Code, Section XI. At the end of 2009, the CSN issued the Council Instruction IS-23, on in-service inspection at nuclear power plants, which defines the requirements for in-service inspection programmes to ensure that SSCs maintain their structural and operational capacities.

Furthermore, prior to every refuelling outage – as mentioned in the Council Instruction IS-02, regulating the documentation about refuelling activities, each plant must send the inspection programme, including the inspection percentages; the areas to be inspected; the non-destructive testing techniques to be used; the support and shock-absorber inspection programme; the estimates of personnel, equipment and means to be used; the scope of steam generator tube inspections (for PWRs), including the methods and techniques which are planned to be used; any special inspections and tests; and the valve and pump functional tests or pressure tests which are planned to be conducted in compliance with specific surveillance requirements.

Once a refuelling outage is over, each plant must send a final report with the results and the degree of completion of the initially planned inspection programme which clearly identifies any deviations which have taken place, those areas with interferences in excess of 10 percent of the inspection volume, and every individual inspection or test programme, as well as a list of all personnel who have taken part and all the equipment that has been used. This report must explicitly indicate those areas in which reportable indications or anomalies were detected.

**Refuelling Safety Report (RSR)**

The purpose of the RSR is to include the refuelling safety assessments needed to prove that the core resulting from the replacement of the fuel fulfils the safety criteria established in the plant's Safety Analyses Report (SAR) and, therefore, that the operation of the core is safe according to the provisions of said document and within the operating limits and conditions required in the official operating documents and the operating licence in force. These analyses are reviewed by the CSN, even though its explicit approval is not required; however, when changes to Plant Technical Specifications or modifications requiring authorisation (such as changes to analytical methodologies, types of fuel assembly, plant operating conditions, etc.) are derived from said analyses, the latter are subjected to the CSN's approval.

# Article 19. Operation

## 19.1. Initial authorisation

The regulatory requirements for the initial authorisation of new nuclear power plants are those called for in the Regulation on Nuclear and Radioactive Facilities (RINR) (RD 1836/1999, modified by the RD 35/2008); for each plant, they are embodied in the official operating documents required for the granting of the preliminary and construction permits and the operating licence.

In Spain, however, no initial authorisations for NPPs have been granted since the 1980s.

## 19.2. Operating limits and conditions

### 19.2.1. Measures of the Contracting Parties and regulatory criteria for the definition of the safe operation boundary and the setting of operating limits and conditions

The Regulation on Nuclear and Radioactive Facilities (Royal Decree 1836/1999, modified in 2008) establishes the content of the documentation that must be included in each plant's Operating Licence (OL). Annex 19.A includes a standard OL form.

Below is the list of "Official Operating Documents" (OODs) established by the Regulation on Nuclear and Radioactive Facilities:

a) Safety Analysis Report

b) Operation Handbook

c) Plant Technical Specifications

d) On-site Emergency Plan

e) Quality Assurance Manual

f) Radiation Protection Manual

g) Radioactive Waste and Spent Fuel Management Plan

h) Physical Protection Plan

The Plant Technical Specifications (PTSs) contain the limiting values of the variables affecting safety, the actuation limits of automatic protection systems, the minimum operating conditions, the programme of periodic checks, calibrations and inspections of systems and components, and the operating control.

The OP, on the one hand, and the OODs, on the other, comprise a series of requirements defining the envelope and whose fulfilment guarantees the safe operation of the plant.

### 19.2.2. Implementation of operating limits and conditions, their documentation, training in them and availability to plant personnel with responsibilities for safety-related tasks

PTSs are documents adapted to each nuclear power plant from standard documents generated in the country of origin of the technology of said NPP, such as e.g. the USNRC's NUREG-0452 and NUREG-1431, and constitute the set of technical requirements and limits governing the operation of Spanish nuclear power plants.

PTSs have a clearly defined structure and typically consist of the following chapters:

- Definitions.
- Safety limits and limiting safety-system setpoints, and their bases.
- Limiting Conditions for Operation (LCOs), including the actions required in the event the LCOs and the Surveillance Requirements (SRs) are not met.
- Design characteristics.
- Administrative rules.
- Bases of LCOs and SRs.

PTSs are developed to be used and documented in a surveillance plan and a set of surveillance procedures, which establish the performance frequencies applicable to each requirement, the way in which to perform the tests which are the subject of the requirement, and the acceptance criteria thereof.

PTSs are an essential part of the training of personnel with responsibilities for safety-related tasks and, especially, control room operating personnel; knowledge thereof and on how to use them constitutes one of the milestones of the examinations set by the CSN for the licensing of operating personnel.

### 19.2.3. Revision of operating limits and conditions when necessary

Given the importance of PTSs for the operation of Spanish nuclear power plants, their revision process is therefore very complex and detailed so as to guarantee that they are properly revised; in all cases they must be sent to the CSN for technical analysis and evaluation.

The normal PTS revision process may be initiated at the suggestion of the licensee of the installation or of the CSN, which directly requests Spanish nuclear power plants to revise or adapt their PTSs when there are new operating experiences, regulations, etc.

The modification proposal drawn up by the licensee is subjected to review by the Plant's Nuclear Safety Committee (PNSC), the top station advisory body in relation to nuclear safety and radiation protection; following its favourable appraisal by the CSN, it is subjected to review by the Operator's Nuclear Safety Committee (ONSC), the top advisory body of the Management as regards nuclear safety of the NPP.

Subsequently, and following the CSN's binding report, the Ministry of Industry, Energy and Tourism formally approves, if applicable, the revisions of the PTSs.

### 19.2.4. Regulatory review and control activities

The CSN carries out the regulatory control of the licensee's compliance with the limiting conditions for operation set in the PTSs and the other official operating documents. On receiving any application for the modification of the PTSs, the CSN must inform the Ministry of Industry, Energy and Tourism thereof. Additionally, the CSN performs inspections on the licensee's compliance with the requirements set in the PTSs.

## 19.3. Operation, maintenance, inspection and testing procedures

### 19.3.1. Measures of the Contracting parties and regulatory criteria in the operation, maintenance, inspection and testing procedures of nuclear installations

Operation, maintenance, inspection and testing activities must be carried out in Spanish nuclear installations following approved procedures. Their use is considered another aspect of defence

in depth by means of the adoption of approved written instructions; their purpose is to prevent human errors during the performance of the activities.

In accordance with the Council Instruction IS-26, of July 2010, on basic safety requirements applicable to nuclear installations, licensees must have a set of operating procedures for normal, abnormal and emergency conditions specifying the actions to be taken to keep the installation in a safe condition. Likewise, licensees must have operating procedures or guides for mitigating the consequences of beyond design basis accidents. Licensees must verify and validate their operating procedures before they come into effect and keep them up-to-date to reflect the situation of the installation and the organisation. All involved personnel must be properly trained in the use and application thereof.

These procedures essentially reflect the dynamics and development of the processes, cover the activities that need to be carried out on the equipment of the installation in any plant operating mode, and ensure that the requirements contained in the official operating documents are met. They may also include the information flows and the responsibilities of each of the involved individuals, thus constituting the basic coordination system.

### 19.3.2. Establishment of operating procedures and their implementation, periodic review, modification, approval and documentation

Spanish nuclear power plants have and permanently update written procedures that cover all nuclear safety- and radiation protection-related activities.

Within the scope of the NPPs proper, their operating procedures are especially relevant, which are divided into the following types:

- General operating procedures: they establish the conditions and the manoeuvres to be performed to operate the plant in the different operating modes and to switch from one to another.
- Auxiliary operating procedures: they lay down in detail the manoeuvres for bringing into service the specific systems or equipment required by the general procedures.
- Alarm operating procedures: they set forth the actions to be carried out after an alarm is triggered in the control room. In some stations these procedures are part of the system procedures.
- Abnormal condition operating procedures: they address system or equipment transients or problems which do not qualify as accidents.
- Emergency operating procedures (EOPs): their purpose is to manage incidents/accidents, including design basis accidents.
- Severe Accident Management Guides (SAMGs): they contain operating strategies to mitigate the consequences of a severe accident.
- Extensive Damage Mitigation Guides (EDMGs): they contain strategies to face up to the loss of large plant areas.

SAMGs were introduced in Spanish NPPs in 2000, whereas EDMGs are still in the process of being instituted.

The other operating procedures included in the above list were introduced at the very beginning of the operation of the Spanish NPPs and are mostly adaptations of procedures drawn up by the main vendor of the technology of each plant.

They are periodically reviewed according to certain administrative procedures; depending on their type and importance, different obligatory review periods are established.

Operating procedures have been revised and updated throughout the life of the Spanish stations according to the in-house and industry operating experience collected through the years.

Operating procedures affected by major changes or modifications are tested, validated and trained in full-scope simulators prior to their use at the nuclear power plants.

Operating procedures affecting nuclear safety are obligatorily subjected to the review of the Plant's Nuclear Safety Committee (PNSC).

### 19.3.3. Availability of procedures for the personnel of the nuclear installation

Spanish nuclear power plants have a system for the filing and distribution of official documents, including all procedures, that guarantees they are available to the personnel who must use them.

Knowledge of operating procedures is another key milestone of the operating personnel licence exams which the CSN sets for candidates for jobs at Spanish NPPs.

### 19.3.4. Involvement of relevant installation staff in the development of procedures

At Spanish nuclear power plants procedures are drawn up by installation personnel, specifically by the specialists in each area, structure, system or component.

They are subsequently reviewed by the authors' superiors and approved by the top management of the plant.

As has been pointed out before, procedures affecting nuclear safety or radiation protection must be reviewed by the PNSC prior to their approval.

### 19.3.5. Addition of operating procedures to the management system of nuclear installations

Spanish nuclear power plants have management systems in place whose aim is the safe, reliable and efficient management of all activities by providing a systematic overview of the different, specific management systems: safety, quality, environmental, human resources, financial resources, and so on.

As a result of the Council Instruction IS-19, on the requirements of the management system of nuclear installations, Spanish NPPs proceeded to revise their management systems to adapt them to the requirements of said instruction.

Particularly with regard to documents such as operating procedures, IS-19 lays down a series of guidelines for controlling, writing, reviewing and approving them, which the stations must follow.

### 19.3.6. Regulatory review and control activities

In accordance with the Regulation on Nuclear and Radioactive Facilities, the application for the operating licence of a nuclear power plant must be accompanied, among other documents, by the Quality Assurance Manual and the Operation Handbook. The first of these documents establishes the scope and content of the quality programme applicable to the testing and operation of safety-related systems, structures and components. The second document lays down the organisation and the duties of the personnel attached to the installation and the basic training programmes for these personnel, as well as the rules for operation under normal and accident conditions. These rules, and the procedures which implement them, refer to the whole of the installation and to the different systems of which it consists.

In order to implement the Regulation on Nuclear and Radioactive Facilities, the CSN issued the Council Instruction IS-19, on the requirements of the management system of nuclear installations, which stipulates that quality requirements shall be managed together with the other elements of the management system, comply with the provisions of the Standard UNE 73 401 "Quality Assurance at Nuclear Installations," and meet the highest, internationally renowned

quality standards in the nuclear field, and that the activities associated with each process must be carried out under controlled conditions by using procedures, instructions, drawings or other suitable means, which shall be periodically reviewed so as to ensure their suitability and effectiveness.

Additionally, it issued the Council Instruction IS-26, on basic safety requirements applicable to nuclear installations, which establishes that the licensee of a installation must have a set of operating procedures specifying the actions to be taken to keep the installation in a safe condition. Likewise, it must have operating procedures or guides for mitigating the consequences of beyond design basis accidents. Furthermore, the licensee must verify and validate the operating procedures before they go into effect and keep them updated to reflect the situation of the installation and the organisation, and ensure that all involved personnel are properly trained in the handling and application thereof.

## 19.4. Procedures to respond to anticipated operational occurrences and accidents

### 19.4.1. Measures of the Contracting Parties and regulatory criteria in the procedures to respond in advance to the occurrence of accidents and incidents

As in the case of severe accident management guides, consideration was given during the writing of the abnormal and emergency operating procedures for each installation to the generic guides developed by the BWROG and the PWROG, which were tailored to each specific case. This process of tailoring and writing the abnormal and emergency operating procedures included both generic style guides and specific studies for their implementation. They were also subjected to an in-house verification and validation process to guarantee both their technical accuracy and their ease of use.

In the case of extensive damage mitigation guides, Spanish NPPs are currently introducing them. To develop them, licensees are adapting the strategies defined in the reference documentation issued in the US. Licensees will subject said guides to a verification and validation process.

### 19.4.2. Introduction of event- or symptom-based emergency operating procedures

The first emergency operating procedures used by Spanish nuclear power plants were based on events.

The main characteristics of this type of procedures were as follows: they covered a single scenario, they assumed the most unfavourable conditions, they assumed the operability of the instrumentation, and they did not consider the failure of equipment or systems after the event had started. The technical bases for these procedures were the systems' design and licensing criteria and did not always adequately cover the scope of the conditions subsequent to the event.

After the Three Mile Island accident in March 1979, it was considered necessary to review a series of aspects of emergency operating procedures, which lead to the development of a "symptomatic emergency response approach."

The emergency operating procedures developed using this new approach are symptomatic input procedures because they only take into account the evolution of certain plant parameters and indicate the actions to be taken on the basis of said evolution.

In the case of Spanish PWR NPPs – as with other stations of the same technology, emergency operating procedures comprise two subsets of procedures: optimal recovery procedures, which focus on events, even though they are based on symptoms, and functional restoration procedures (to be used in case of the deterioration of the accident situation, although always within the scope of the emergency operating procedures), which are purely symptomatic procedures.

Specific emergency operating procedures were developed for the establishment of this new approach. These procedures are implemented following curves, tables and setpoint values calculated by using best-estimate methods, according to the specific design of each plant.

In addition, in most cases technical bases were drawn up which allowed to identify the fundamentals of the steps of the procedures.

A basic programme was followed for the development and implementation of the procedures that included the definition of the style criteria according to the owners' groups' guidelines, the writing in keeping with technical and administrative criteria, and criteria for the integration of emergency procedure management into training programmes, including simulator training, so as to maintain the necessary qualification of control room operators, and the development of a procedure update and validation plan.

After the Fukushima accident, the owners' groups have identified several aspects for improvement in emergency operating procedures which will be corrected once the modifications to their reference guides have been approved.

Some changes (e.g. relating to spent fuel ponds) have already been incorporated into emergency operating procedures during the partial revisions thereof.

### 19.4.3. Establishment of procedures and guides to prevent severe accidents and mitigate their consequences

Severe accidents are accidents which are more serious than design-basis accidents and entail a significant degradation of the core. In general, a severe accident is considered to begin at the onset of core damage due to the loss of cooling.

Preventing the accident from progressing and leading to core damage is part of the scope of the actions contemplated in the emergency operating procedures aimed at preventing severe accidents. Maintaining containment capacity, putting an end to core damage, and reducing the release of radioactive material are goals which fall within the scope of the severe accident management guides aimed at mitigating severe accidents.

Consequently, the severe accident management guides which have been developed are specific action guides to flood the vessel and the containment and control the containment and the release of radioactive products.

A programme similar in all respects to the one described for emergency operating procedures (style criteria, training programmes, validation plan, etc.) was undertaken for the development and implementation of severe accident management guides.

Finally, the conditions for transitioning from the emergency operating procedures to the severe accident management guides, as well as the systematic approach for the revision of the On-site Emergency Plan, were established in order for the latter to have a specific organisation devoted to the management of severe accidents and the training programmes required to ensure the effective implementation of these actions.

After the Fukushima accident, the owners' groups have identified several aspects for improvement in the severe accident management guides, which will be corrected once the modifications to their reference guides have been approved.

### 19.4.4. Improvements in accident management in the event of extreme natural events

After the Fukushima accident in 2011, the CSN issued a series of Complementary Technical Instructions (ITCs) which required licensees to carry out an additional safety assessment that took beyond design basis events into account. A first set of ITCs considered off-site events (earthquakes, flooding…), station blackouts, the loss of the ultimate heat sink and other events

and called for the description of the accident management measures currently in place for the different stages of the following scenarios:

- The loss of the core cooling function and the threat to the integrity of the containment.
- The loss of the spent fuel storage pond cooling function.

Likewise, after the Fukushima accident, the owners' groups have identified several aspects for improvement in the emergency operating procedures (EOPs) and the severe accident management guides (SAMGs), which will be corrected once the modifications to their reference guides have been approved.

One of the main modifications to EOPs/SAMGs will be the consideration of the new portable, self-contained equipment included in the Extensive Damage Mitigation Guides (EDMGs) –which are being drafted by taking the document NEI 06-12, Rev. 2, "B.5.b Phases 2 & 3 Submittal Guideline," of December 2006, as a reference – which has already been introduced at US stations– to manage those accidents which entail the loss of large plant areas due to a large fire and which can also involve the loss of the normal handling and control of the emergency.

EDMGs (and their associated equipment) have the following main objectives: supplying water to the vessel to cool the core, venting the containment to maintain its integrity, and supplying/spraying water into/on the ponds to prevent the stored fuel from becoming exposed. All of this under extreme conditions preventing the plant's fixed installations from being used.

Other modifications to the EOPs/SAMGs will be directed towards a better management of the hydrogen generated during a severe accident. Additionally, in order to enhance plant robustness, passive autocatalytic recombiners (PARs) will be installed in those areas of the containment which can be at risk of hydrogen accumulation (in the case of Santa María de Garoña NPP, in the Secondary Containment).

In connection with the prevention of containment overpressure, apart from those changes which have already been identified and will be made to EOPs and SAMGs, plant licensees will install a filtered containment vent as an additional upgrade to protect the containment. The installation of this filtered vent will provide an adequate protection against the risk of failure of the containment building due to overpressure and will additionally reduce the radiological implications of the unfiltered venting thereof.

On the other hand, the necessary modifications to be able to operate the containment vent under station blackout conditions will be made.

As far the reduction/mitigation of the off-site release of fission products is concerned, in addition to the filtered venting of the containment, the NPPs are analysing the strategy of spraying the outside of the containment building or of any other building.

NPP licensees will incorporate the analysis of those severe accidents that could take place with the plant shut down into their programme for updating the Probabilistic Safety Assessments (PSAs).

As regards accident management planning, a series of improvement suggestions were made, which are laid out in Section 16.2.6 of this report.

The implementation of the different improvement actions which have been identified follows the schedule set in the CSN's post-Fukushima instructions; these actions are being conveniently included in the plants' configuration control, their procedures [Extensive Damage Emergency Guides (EDEGs), Extensive Damage Mitigation Guides (EDMGs) and On-site Emergency Plans (OEPs)] and their training and maintenance programmes.

### 19.4.5. Regulatory review and control activities

Emergency Operating Procedures were instituted in Spanish NPPs at the end of the 1980s, whilst Severe Accident Management Guides were introduced at the end of the 1990s. It should

be pointed out that important modifications have been carried out in the past aimed at preventing core damage rather than at mitigating its consequences. Modifications were made in BWRs and PWRs to address anticipated transients without scram (ATWSs), thanks to which additional systems were installed to guarantee the reliability of the reactor scram function. Likewise, the modifications to face up to a complete loss of off-site power (or station blackout, covered in the USNRC's 10 CFR 50.63 "SBO Rule") –which consist in making available an alternative power supply, along with the possibility of using the hydrostatic test pump to supply water to the main pump seals or the fire protection diesel pump as an alternative means of reactor injection– are prevention measures against this power outage situation.

In general, licensees were not required to perform design modifications to implement severe accident management measures, except when they were relevant from the point of view of safety and were, hence, warranted.

Periodic inspection programmes –not included in the Basic Inspection Plan– have been set up, such that at least one inspection is scheduled per year aimed at the introduction and update of EOPs and SAMGs and the training of the personnel included therein. Thus, this aspect is inspected at all nuclear power plants over a period of six years.

As a result of the performance of the stress tests at Spanish NPPs within the European framework, a need has been identified to improve the Severe Accident Management Guides to take into account in them strategies to deal with accidents in more than one unit simultaneously at the same site, events caused by a shutdown situation and events which start in the spent fuel ponds. This has been reflected in the Complementary Technical Instructions which the CSN has issued in the wake of the stress tests.

Having a set of operating procedures and guides suitable for operating the station in the event of the potential situations that might happen throughout the life of a nuclear power plant –from normal operation to a severe accident– significantly contributes to increasing the safety thereof given that they have a direct impact on the reliability of operator actions and markedly reduce the likelihood of human errors.

In accordance with the Council Instruction IS-26, on basic safety requirements applicable to nuclear installations, licensees must have a set of operating procedures for operating under normal, abnormal and emergency conditions specifying the actions to be taken to keep the installation in a safe condition. Likewise, licensees must have operating procedures or guides for mitigating the consequences of beyond design basis accidents. Licensees must verify and validate their operating procedures before they come into effect and keep them up-to-date to reflect the situation of the installation and the organisation. All involved personnel must be properly trained in the use and application thereof.

The CSN is drafting a Council Instruction relating to emergency operating procedures and severe accident management guides, which it expects to issue in 2013. The draft thereof includes the requirements which are applicable taking the reference levels drawn up by WENRA regarding this matter and the results of the stress tests conducted after the Fukushima accident into account.

As a result of the aforementioned stress tests, a set of improvements for the management of accidents have been defined, which include not only the implementation of physical modifications, such as the filtered venting of the containment or the installation of passive hydrogen recombiners, but also the drafting of guides for the management of severe accidents under shutdown conditions and guides which contemplate the occurrence of events that might affect more than one unit at the same site and at the same time. Additionally, the installation of an alternative emergency situation management centre at each site and the setting-up of a nationwide emergency situation support centre equipped with means and equipment which can be taken to affected sites in less than 24 hours have been considered.

These and other requirements related to the stress tests have been included in the Complementary Technical Instructions (ITCs) which the CSN has issued to every licensee and will be subjected to monitoring, evaluation and/or supervision, as appropriate, by the CSN.

## 19.5. Engineering and technical support

### 19.5.1. General availability of the necessary engineering and technical support in all safety-related fields of nuclear installations under construction, in operation or under decommissioning

The engineering firms and equipment suppliers which participated in the construction and commissioning of the second generation of nuclear power plants in Spain –which are currently in operation– have maintained some of their capabilities since then thanks to their:

- Participation in the permanent maintenance and update of the design to upgrade the installations.
- Participation in new investment projects to improve current installations (replacement of steam generators, turbines, cooling towers, etc.).
- Participation in national and international R&D projects related to new problems derived from operating experience and lifetime management programmes.
- Participation in the design phase of Generation-III projects.
- Participation in European projects to support Eastern European nuclear power plants and organisations.

The international projection of Spanish electric utilities, especially when it has been partially aimed at participating in nuclear projects, has allowed engineering firms and suppliers of goods and services to keep and develop their capabilities, which in turn has benefitted the Spanish market.

In the nuclear fuel field, internationally recognised development and improvement programmes have been undertaken thanks to the capabilities developed by the companies and to ENUSA's leadership in fuel manufacturing.

The Spanish sector's capacity to meet the needs of nuclear installations has been the subject of the study "Capacidades españolas para afrontar un nuevo proyecto nuclear" (Spanish Capabilities to Tackle a New Nuclear Project), conducted by the CEIDEN Technology Platform. This study assessed the capabilities of the main sectors (Engineering and Consulting, Inspection and Services, Construction, Assembly, Suppliers of mechanical and electrical equipment, the Fuel Cycle, Test Labs, and so on); its conclusion was that the Spanish industry is more than capable of providing all necessary technical support in all plant construction- and operation-related areas.

Additionally, by means of a collaboration agreement under the aegis of UNESA, Spanish nuclear power plants have promoted in co-operation with a series of Spanish companies and institutions the development of an R&D&I model comprising a network of Reference Centres specialised in the different innovation areas in order to retain a permanent capacity to provide the required support to operate the Spanish nuclear fleet under maximum safety, reliability and competitiveness conditions.

These Reference Centres, which are renowned for their technical and scientific know-how in the nuclear field, study the documentation which is presented at EPRI meetings and seminars and deemed to be of interest for Spanish NPPs according to their specific subject, as well as that EPRI documentation which UNESA sends to every involved person at each Reference Centre for analysis within the corresponding area.

As for dismantling, the effort made and work carried out for Vandellós I and José Cabrera NPPs, led by ENRESA, have provided Spanish companies with the opportunity to develop technical and managerial capabilities in this area and show their ability to carry out dismantling processes.

### 19.5.2. Availability of the necessary technical support at the site and in the licence holder's organisation or at the utility's headquarters and procedures for making central resources available to the nuclear installations

The technical support capabilities required by a nuclear power plant can be said to be wide-ranging; they may be configured in different ways depending on the organisation of the owner company or companies, so establishing a single philosophy for all is not really practical. The Operation Handbook of each station identifies its managerial approach, duties and responsibilities and its availability of resources. These capabilities are described in more detail in the organisation and operation manuals and lower-level procedures.

Broadly speaking, there should be a series of strategic investment and R&D lines associated with the management of assets, with a decision-making and knowledge base supported, not only by the corporate organisation, but also by the plant's engineering and maintenance sections' essential understanding of the state of the structures, systems and components.

Likewise, it would appear to be logical for the strategy for managing radioactive waste and fuel to have an important corporate component in order to optimise the unified management thereof. The necessary agreements with the technologists responsible for the NSSS, the turbine-generator set, and other relevant plant equipment will be along these lines.

Other key aspects of technological competence are licensing and operating experience, which can be supported by either the corporate organisations or the plants, although in the first case certain minimum decentralised capabilities should be maintained at all times.

A corporate structure would be justified in order to guarantee an independent supervision of the nuclear power plant, as well as the monitoring of its operation and the improvement of its processes.

The procedures to put corporate resources at the nuclear power plant's disposal are associated with the monitoring of the strategic plans by the station's governing body and the directives stemming therefrom.

### 19.5.3. General situation in relation to the reliance on contractors for providing the installation with technical support

The availability of contractors with duly qualified and motivated technical personnel and means is of key importance for the safe and efficient operation of the installations. The report prepared by the CEIDEN Technology Platform and mentioned in Section 19.5.1 arrives at the conclusion that, thanks to the constant technical support that contractors give plants in operation, the Spanish industry has the capabilities to provide all necessary technical support in all fields related to plant construction and operation safety.

Broadly speaking, there are three levels of contractor companies as regards the reliance thereon to support the organisation.

A first level would be made up of the technologists, among which the suppliers of the installation's NSSS, the turbine-generator set, the emergency diesel generators, the main transformers and the design engineering stand out.

There is a high level of dependence on these suppliers, especially in the case of the NSSS vendor, which makes it necessary to establish long-term agreements with them for the entire life of the plant.

Another contractor level comprises specialised service and/or equipment supply companies. They are essential for inspection, diagnosis, maintenance, quality control, relevant repair and equipment supply activities. Although there are different options available on the market, the knowledge of the installation that stems from the continuity of personnel and the unique aspects

involved in working with radiation makes it advisable to maintain medium-term ties with these contractors.

The third contracting level consists of companies requiring less qualified personnel, such as those providing cleaning, scaffolding, surveillance and similar services, which normally employ a lot of locals. There is no technical reliance on them, although there might be important determining factors against replacing individuals – even if the contractor company is – due to socioeconomic reasons to support the surrounding area and historical contractual clauses.

### 19.5.4. Regulatory review and control activities

The supervision and control process imposed by the CSN on nuclear installation licensees envisages various mechanisms that allow the different aspects of the licensees' engineering and technical support-related processes to be addressed.

On the one hand, the CSN imposes control mechanisms on the licensee's organisation. Said organisation is described in the Operation Handbook and must identify the responsibilities of the Technical Support Department. Any changes in the Operation Handbook must be approved by the CSN, which to this end requires these changes (duties, human resources, and training) to be justified and analysed in depth. Likewise, installation licensees send to the CSN every year a report on the modifications or actions related to the optimisation of the human resources in their organisation.

Licensees have recourse to other external support organisations in charge of developing projects and providing the necessary technical support. In general, the processes subcontracted out to external organisations must be controlled by the licensee's own organisation, which should verify the quality of the service as per the regulations. The CSN in turn oversees compliance with said regulations by means of inspections. For the direct supervision of the organisational aspects of licensees, the CSN has established, among other things, inspections relating to the organisation, training and supervision of contractor work during refuelling outages.

On the other hand, the CSN has established mechanisms for the control and supervision of the engineering work done by nuclear installations in relation to design modifications, maintenance, etc. These mechanisms manifest themselves in both a direct supervision of installation modifications affecting nuclear safety or radiation protection – which must be subjected to the CSN's authorisation process – and supervision and control by means of inspections focused on component design bases, component surveillance requirements, design modifications, operating experience, and so forth.

## 19.6. Safety-significant incident report

### 19.6.1. Measures of the Contracting Parties and regulatory criteria to report safety-significant incidents to the regulatory body

The Council Instruction IS-10 lays down the criteria applied by the CSN to require the licensees of NPPs to report those events that have occurred therein and might be related to nuclear safety or radiation protection. Events are reported to the CSN's emergency room by means of a reportable event report. In addition, these reports are distributed among Spanish nuclear power plants; the CSN informs the public of their content by way of press releases and publishes them on its website as per its internal procedures.

As a result of the application of the Council Instruction IS-10, establishing the criteria for the reporting of events to the CSN by nuclear power plants, 66 events at Spanish NPPs were reported in 2010, 69 in 2011, and 49 in 2012.

All in all, the current Council Instruction IS-10 sets up a framework for reporting significant events to the regulatory body, makes it easy for plants to exchange operating experience between them, and allows the public to be informed of relevant events.

From the experience gained in the application of said Instruction, a process to review it has been initiated with a view to clarifying certain reporting criteria and achieving a higher degree of homogeneity as regards the importance for safety of the reported events.

### 19.6.2. Reporting criteria that have been established and procedures for reporting safety-significant and other incidents

The abovementioned Council Instruction IS-10, on criteria for the reporting of events at nuclear power plants, defines the timeframe for reporting each type of event according to its safety significance (1 hour or 24 hours), the reporting means, the criteria for sending additional information and reviewing the issued reports, and the reporting formats.

According to this instruction, the information that must be conveyed in the initial report must include the reportable event number, the date and time of occurrence or detection of the event, the thermal power before and after the event, the applicable reporting criteria, a brief description of the event, the situation at the time of reporting, releases of radioactive material, if any, and the measures which were taken or planned.

After the initial reporting, a more detailed report must be sent to the CSN within 30 days which includes the following additional information:

- Related precedents and operating experience.
- Initial conditions.
- A chronological description of the event.
- A detailed description of the event and the anomalies that took place.
- Direct causes of the event.
- A description and the conclusions of the root cause analysis.
- Immediate corrective actions.
- Deferred corrective actions.
- The licensee's conclusions.

The Instruction describes 36 types of events that must be reported, which are divided into eight reporting categories:

- Records.
- Occupational health and safety.
- Spillage.
- Plant Technical Specifications.
- Operation.
- Safety systems.
- Other risk situations not envisaged in the licensing documents.
- Off-site events.

### 19.6.3. Statistics on safety-significant incidents in the past three years

During the 2010-2012 period, all the events reported to the Spanish regulatory body, the Nuclear Safety Council, by Spanish nuclear power plants were classed as belonging to Level 0 on the IAEA's International Nuclear Event Scale (INES), with the exception of the three cases detailed below:

**Ascó I & II (Tarragona) – Ines 1**

**11 November 2012**

During some tests, the malfunction of an interlock was detected. In the event a low-pressure situation in the pressuriser, this malfunctioning interlock would cause the safety injection and the isolation of the steam lines to become automatically locked, instead of allowing them to be locked by hand, as established by its design. The licensee declared the affected interlock to be inoperable and corrected its operation. Unit II was undergoing a planned load decrease for maintenance reasons.

This event also applied to Unit I, which was in the midst of its refuelling outage.

**Ascó I (Tarragona) – Ines 1**

**27 April 2011**

Ascó NPP's licensee reported that, while the plant was undergoing its refuelling outage, a motor-operated sump isolation valve was inadvertently opened during the calibration of one of the four channels for the semiautomatic recirculation from the containment building sumps. Consequently, 25 cubic metres of water were discharged from the primary coolant system into the associated sump. A result of the discharge, the footwear of 14 workers in the vicinity got wet.

The licensee proceeded to evacuate all personnel who were working in the affected area, the workers were made to change their drenched footwear, and the appropriate radiological measures were taken; no worker suffered internal contamination.

**Ascó I & II (Tarragona) – Ines 1**

**21 January 2011**

During the manoeuvres to install the locks separating the fuel pond from the auxiliary fuel operation area, inappropriate movements were made due to each of the locks weighing around 1,400kg, which exceeded the allowed weight to bridge the interlocks of the limit switches on the bridge crane. The purpose of these interlocks is to prevent heavy weights from being moved above the pond's spent fuel storage area. These kinds of manoeuvres are customary during refuelling and maintenance operations.

**Ascó II (Tarragona) – Ines 1**

**16 August 2010**

The licensee detected an error in the test procedure for the charging pump and pump D of the essential service water system. As a result of this error, not all circuits associated with charging pumps A and B and pump D were fully tested during the last tests conducted on this equipment. The licensee declared this equipment to be inoperable as per the corresponding Plant Technical Specifications.

The licensee modified the affected procedures by including new sections to ensure that the tested circuits were fully verified. After the tests were repeated and successfully passed, the equipment was declared to be operable.

**Ascó II (Tarragona) – Ines 1**

**25 January 2011**

The licensee of the installation reported that operational deficiencies had been detected preventing some of the motor-operated valves of the engineered safeguard service water system

from fully opening as a result of low temperatures. Specifically, the valves for supplying water to the wells of the system's towers from the safeguard basins.

This event, which did not affect workers, the population or the environment, represented a non-compliance with the Plant Technical Specifications since this water system must remain operable to be able to deal with emergency situations.

As a result of the event and in compliance with the Technical Specifications, the licensee ordered to the plant to be powered down. Once the problem was solved, the station was powered back up and is currently stable and operating at full power.

**Cofrentes (Valencia) – Ines 1**

**12 May 2010**

The level transmitters in the borated water storage tank of the standby liquid control system were indicating a level greater than the actual one because their calibration did not take into account the correction for the density of the liquid held in the tank (a solution of sodium pentaborate in water); once said correction was applied, the resulting volume was slightly below the limit required in the Plant Technical Specifications. Nevertheless, it was verified that the mass of sodium pentaborate dissolved in the water was greater than that required to ensure the system's function.

**Vandellós II (Tarragona) – Ines 1**

**21 February 2011**

It was detected that the setting tests of some safety valves did not meet all ASME Code requirements, which resulted in a non-compliance with surveillance requirement 4.0.5 of the PTSs.

**Vandellós II (Tarragona) – Ines 1**

**4 December 2012**

The plant detected that instrumentation root valves were open during normal operation, which could have prevented the performance of the safety functions of two or more safety systems.

### 19.6.4. Documentation and publications on recorded events and incidents from both the licence holders and the regulatory body

The Reportable Event Reports (RERs) issued by Spanish nuclear power plants on the basis of the Council Instruction IS-10 are sent to the CSN's Emergency Room. From there they are widely distributed inside and outside the CSN according to the procedures which were described in great detail in the Spanish report for the fifth review meeting of the Convention on Nuclear Safety.

### 19.6.5. Policy for using the INES Scale

The Nuclear Safety Council has developed a procedure for the classification of events using the INES Scale, which is applicable to events that occur at Spanish nuclear power plants and fuel cycle installations and activities which have any of the characteristics indicated in the INES Scale's User Manual.

If the CSN determines that the classification of an event at a nuclear installation is higher than 0, it will get in touch with the affected installation's licensee to discuss the reasons for the classification and compare data.

If the event is classed as Level 1 by CSN's Technical Directorate for Nuclear Safety, the report is handed over to the Technical Office of the Presidency for it to inform the authorities and the public and sent at the same time to the General Secretariat and the members of the CSN.

If the class assigned to the event by the Technical Directorate is Level 2 or higher, the report will be handed over to the General Secretariat, which in turn will summon the members of the Council to discuss the class. Once the event has been discussed, the public will be informed through the Technical Office of the Presidency.

In addition, if the CSN ranks an event in Level 2 or above, the area in charge of classification will fill in a reporting form to inform the IAEA's INES Scale Secretariat.

### 19.6.6. Regulatory review and control activities

In addition to the RERs that licensees are required to issue within 1 hour and 24 hours, as appropriate, in accordance with IS-10, the CSN's Resident Inspectors carry out a review thereof to verify that the information they contain is accurate and understandable, using for this purpose both the information provided by the licensee and their own independent observations. To this end, after they are notified of an event, resident inspectors gather information on the situation of the plant and the performance of the equipment, components and personnel involved in the event and send a preliminary assessment report to a long list of recipients at the CSN.

Subsequently, all RERs received at the CSN are studied by the Incident Review Panel, which is made up of representatives from different areas specialising in nuclear safety and radiation protection. During its monthly meetings, the information sent is reviewed, the proposed corrective actions analysed, and the need to perform or request additional actions to prevent the event from reoccurring discussed. Finally, the event is classified as a significant, of interest or irrelevant event according to its significance.

Events classed as significant are included in the annual report sent to Congress and are subjected to special monitoring by the specialist areas and during the biannual operating experience inspections, where special attention is paid to the effectiveness of the corrective actions.

In addition, an event will be classed as "generic" if it might potentially affect other plants, which may entail the sending of the appropriate letters to their licensees in order for them to analyse the applicability of the event to their installations. The quality and scope of these analyses, as well as the suitability of the proposed actions, are evaluated by CSN personnel who are specialised in the corresponding area.

## 19.7. Operational experience feedback

### 19.7.1. Measures of the Contracting Parties and regulatory criteria for the licence holder to collect, analyse and share operating experience

The CSN has developed a methodology in the operating experience area that is based on two aspects: the verification of the systematic approach for event analysis developed by licensees, and the analysis and monitoring of incidents that occur at both Spanish and foreign plants.

In order to check the systematic approach of licensees, the CSN carries out operating experience inspections at the sites on a biannual basis. In connection with the tracking and analysis of events, the CSN has two essential tools: the periodic meetings of the Incident Review Panel, and the analysis of international events based on the use of international databases and its participation in communication forums. All these elements are discussed in this section. The above has served to establish a framework to identify generic events at both the national and the international level that could potentially affect Spanish nuclear power plants and to take or request the adoption of measures to prevent the reoccurrence thereof.

### 19.7.2. Programmes of licence holders for feeding back information on operating experience from their plant, other Spanish plants and foreign plants

The CSN issued in its day Complementary Technical Instructions which complemented the operating licences of Spanish nuclear power plants and specified the industry operating experience to be analysed.

The analysis of industry operating experience is required in the following cases:

- Reportable events that have occurred at the other Spanish nuclear power plants.
- Experiences reported by organisations with authority on the matter, i.e.:
  a) For NPPs of American design, the significant event reports issued by INPO [(INPO Event Reports (IERs)] or the equivalent reports issued by WANO (SOERs).
  b) For NPPs of German design, the operating experience notices (Weiterleitungsnachricht) issued by the German Nuclear Safety Society (GRS).
- Written recommendations from vendors, these being understood to be their technical bulletins (SAL, SIL, RICSIL, Technical Bulletin, etc.), as well as the notifications of deficiencies in safety equipment: all notifications relating to the USNRC's 10CFR21 for NPPs of American design, and all service and experience reports from KWU for NPPs of German design.
- Operating experience analyses expressly required by the CSN.

The industry operating experience programmes of Spanish nuclear power plants cover these requirements but are not limited to them. All other documents considered to be of special interest to improve the management of the different processes of each plant are analysed.

The analyses of industry operating experience start with the performance of an applicability study, followed, after the results of the analyses are received, by proposals for corrective or improvement actions.

In addition to the above, mechanisms have been set up for sharing industry operating experience within the organisations for information purposes.

Every year licensees must send a fixed-content report to the CSN covering the evolution of the analyses of in-house and industry operating experience performed by Spanish nuclear power plants. This report is used by the CSN to monitor operating experience programmes.

### 19.7.3. Procedures to analyse national and international events

The Incident Review Panel, which is made up of representatives from the necessary specialist areas, meets approximately once a month.

During these meetings, the reportable events that have taken place since the last meeting are presented one by one. This is followed by an analysis of the quality of the information supplied; specialist areas analyse the suitability of the scope of the corrective actions proposed by the licensee to prevent the reoccurrence of the event. If these actions are considered to be insufficient, additional actions are proposed, which may include the request for additional information, the request that a root cause analysis be performed to find out the ultimate causes of the event, the performance of a subject-specific inspection at the site, or the performance of a more detailed evaluation of the incident by the specialist areas involved.

Once the analysis has been completed, the Panel agrees on a classification of the incident based on its significance for safety. In addition, an event can be classed as generic if it can affect other Spanish stations. In these cases, the additional action may consist in sending a letter to potentially affected plants telling them to analyse the applicability of the event and to propose actions to prevent it from occurring.

At the international level, the CSN analyses the events reported via the following databases: the Incident Reporting System (IRS) and the Nuclear Events Web Based System (NEWS). Its specialists analyse those events that might have generic implications and, where appropriate, propose the corrective actions they consider appropriate, including the possibility of requesting licensees to carry out an applicability analysis or perform subject-specific inspections.

Furthermore, the information transmitted via these databases is used during the biannual operating experience inspections as a tool to check the scope of industry operating experience analyses performed by Spanish nuclear power plants.

### 19.7.4. Procedures for drawing conclusions and implementing any necessary modification at the installation and for personnel training and simulators

The management of operating experience is contained in various procedures of each Spanish nuclear power plant. A fundamental tool for the processing of operating experience is the Corrective Action Programme (CAP). Once a corrective action derived from the analysis of an incident is entered in the CAP, it is categorised and the required level of analysis is established.

All plants have procedures or guides that implement the methodology that must be followed to analyse operating experience. These procedures establish whether an incident requires the performance of a root cause analysis or whether it is only necessary to investigate its direct or apparent cause. The methodology that is most widely used at Spanish plants for the performance of root cause analyses is the Human Performance Enhancement System (HPES). In addition to each incident being studied individually, trend analyses are carried out to detect latent weaknesses and areas for improvement in the organisations.

The result of all these analyses is a series of actions that are incorporated into the Corrective Action Programme. Each action is assigned a priority, a timeframe, and a person responsible for its performance. There are many different types of actions: design modifications, procedural changes, training actions, and so forth.

The Council Instruction IS-12, defining the qualification and training requirements of plant and external non-licensed personnel within the scope of nuclear power plants, requires that training programmes include operating experience about incidents that have occurred at the plant, as well as about other events which have taken place at other plants and are applicable and relevant thereto. Likewise, operating experience training must be geared towards making the root causes of incidents and the corrective actions required to prevent their reoccurrence quite clear.

The training department of every nuclear power plant takes into account the training actions incorporated into the Corrective Action Programme when preparing the annual training programme. The Corrective Action Programme is an important source of information for the design of classroom and simulator training sessions. Occasionally, the internal communications sessions of each department are used to pass on the lessons learnt from the study of operating experience.

### 19.7.5. Mechanisms for sharing important operating experience information with other organizations

Both the CSN and Spanish nuclear power plants have mechanisms in place for exchanging operating experiences at the national and international levels.

The CSN and UNESA, as the representative of the Spanish NPPs, participate in the Working Group on Operating Experience (WGOE) of the OECD's Nuclear Energy Agency (OECD/NEA), the objective of which is to improve nuclear safety. This is achieved by sharing operating experience and know-how and analysing and sharing the perspective of a group of experts so as to reach conclusions regarding trends and lessons learnt and, thus, be able to implement corrective actions in

the short and medium terms. In the long term, the WGOE makes proposals for safety assessments, identifies areas which require additional research, determines or proposes new inspection practices for regulators, and shares improvements in plant operational management.

Within the framework of UNESA, the plants have set up a permanent working group on operating experience. This group is formed by the operating experience coordinators of Spanish NPPs. The main purpose of this group is to share experiences about both the events that occur at the different sites and the operating experience management process itself. The group's meetings take place at least on a quarterly basis. An important part of these meetings is given over to sharing information on events reportable to the CSN that have happened or have been analysed in the last quarter. A series of initiatives have been launched by the group, the following being particularly significant:

- The systematic approach of the Sector Incident Analysis Group (GSAI) became consolidated during 2010, 2011 and 2012, whereby a Spanish nuclear power plant may set in motion a group of experts from the other Spanish NPPs in order for them to carry out the root cause analysis of an incident that has taken place at the requesting plant. The working of this group is the subject of the UNESA Guide CEN-29 "Guía de funcionamiento del Grupo Sectorial de Análisis de Incidentes (GSAI)" (Incident Analysis Sector Group Working Guide). This Guide was revised in 2011.
- UNESA published the Guide CEN-31, Rev. 0, of November 2009, "Establecimiento de criterios para el intercambio de información procedente de experiencia operativa entre las centrales nucleares españolas" (Establishment of criteria for the exchange of information from operating experience between Spanish nuclear power plants), which recognises that the main goal of the transmission and exchange of operating experience between nuclear power plants is to improve plant operation and to prevent the reoccurrence of operating incidents and problems with a view to achieving operational excellence. The plants make a series of commitments as regards the minimum information that must be exchanged and the mechanisms for this exchange, all of it aimed at enhancing and facilitating the understanding of the events and improving the analyses of their applicability.
- UNESA has published Joint Operating Experience Reports [Informe Conjunto de Experiencia Operativa (ICEO)], prepared by its Operating Experience Group, following the philosophy of INPO's IERs and WANO's SOERs. The sector will publish one of these documents every year. Two ICEOs have been published to date: in 2011, "Gestión de descargos en las centrales Nucleares españolas" (Tagout Management at Spanish Nuclear Power Plants), and in 2012, "Propuesta de Indicadores de experiencia Operativa de aplicación común en las Centrales Nucleares españolas" (Proposal of Common Operating Experience Indicators for Spanish Nuclear Plants), which is being piloted in 2013 before its definitive introduction in 2014.
- The following activities are carried out for the exchange of operating experience at the international level:
- Spanish nuclear power plants regularly report events to WANO for publication as Significant Event Reports (SERs), Event Notification Reports (ENRs), Event Analysis Reports (EARs) or Miscellaneous Event Reports (MERs).
- Participation in international seminars.
- Sending experts to take part in WANO missions (Peer Reviews) and IAEA missions (OSARTs).
- Hosting WANO Peer Reviews and OSART missions at Spanish NPPs.

These activities for sharing operating experience at the national and international levels round out the industry operating experience evaluation programmes established at each plant.

In view of what has been set out above, it might be concluded that the CSN, UNESA and Spanish nuclear power plants as a whole actively promote the exchange of experience as a way of establishing corrective actions leading to operational excellence.

Lastly, it is worth mentioning that WANO revised and updated its event reporting criteria in 2012, which is going to revise again throughout 2013 to incorporate the comments received from the nuclear industry at meetings and workshops.

### 19.7.6. Use of international databases on operating experience

The two international operating experience databases which the CSN uses the most are:

- The Incident Reporting System (IRS), which is dependent on the International Atomic Energy Agency and the OECD's Nuclear Energy Agency, and
- The Nuclear Events Web Based System (NEWS), which is managed by the International Atomic Energy Agency.

In addition, the CSN also consults the Licensee Event Reports (LERs) and Information Notices issued by the USNRC.

As regards the IRS, there is a coordinator from the Operating Experience and Regulations Area who is in charge of preparing the reports about those Spanish events which in his or in other safety experts' opinion are relevant from the point of view of nuclear installation safety. Preliminary Reports are written within 30 days from the occurrence of the event and are subjected to comments by the corresponding CSN specialists before being sent out. Main Reports are prepared once the additional information that is sent as 30-day Reportable Event Reports or in any other way is received. These Main Reports are subjected to comments from both CSN staff and the nuclear sector and to the CSN's official approval before they are sent to the database by the coordinator.

The data stored in these databases can be looked up by those CSN employees who are registered therewith. As far as the IRS is concerned, there is a list of specialists from the different areas who receive e-mails on events that might be of interest to them. Furthermore, the IRS coordinator distributes those events which, in his opinion, are relevant from the point of view of operating experience.

As regards the NEWS database, the INES Scale coordinator is responsible for entering the information associated with events classified in Level 1 or higher.

The NEWS database can be consulted by all CSN staff; it is a tool that is used, among other things, to check the scope of the analyses performed by licensees in relation to industry operating experience events.

### 19.7.7. Regulatory review and control activities on the licence holder's control procedures and programmes

Every two years the CSN carries out operating experience inspections with a view to checking the systematic approach followed at Spanish nuclear power plants to analyse in-house events, events at other Spanish NPPs, and foreign events. During these inspections, the licensee's organisational structure is analysed, resources are evaluated, the quality of the procedures is analysed, and the scope and quality of event analyses are checked. These checks include an analysis of the quality and completeness of the proposed corrective actions, as well as the verification of their performance in a timely manner.

Conversely, every year nuclear installation licensees send an operating experience report, the minimum content of which is described in the Complementary Technical Instructions sent by the CSN to each installation. These instructions require the report to include a summary of the analysis of in-house events, other plants' events and events from industry operating experience which have been considered to be applicable to the installation. These reports are distributed among the personnel from the Operating Experience and Regulations Area, who perform a preliminary evaluation of the scope and quality thereof. This evaluation is subsequently developed in depth during the biannual operating experience inspections.

### 19.7.8. Programmes of the regulatory body for feeding back operational experience and using existing mechanisms to share important operating experience-related information with international organisations and other regulatory bodies

Essentially, the CSN has five tools for the dissemination of operating experience-related information: the actions derived from the Incident Review Panel's monthly meetings, the actions derived from the International Incident Review Panel's quarterly meetings, the use of the generic issues database (TEMGE), the use of international databases, and participation in international working groups.

As already mentioned above, the Incident Review Panel (PRI) is a working group comprising nuclear safety and radiation protection specialists which meets on an approximately monthly basis to analyse the information received on relevant events that have taken place in nuclear and fuel cycle installations. Once the quality of the information received has been ascertained, the completeness of the proposed corrective actions analysed and the need for additional actions discussed, the event is classified into one of three categories according to its significance: significant event, event of interest, or irrelevant event. In addition to this classification, the event can be classed as generic if it can affect or have generic implications for other Spanish plants for any of the following reasons:

- Its direct or root causes might reproduce themselves.
- The affected systems or components are analogous.
- It has been caused by problems of shared suppliers of goods and services.
- The lessons learnt from it indicate that it might lead to a significant improvement of the safety of other nuclear power plants.

When an event is classed as generic, the PRI proposes that a letter be sent to the affected licensee or licensees for them to analyse the applicability of the event and, where appropriate, undertake the actions required to prevent its occurrence. This proposal is analysed and, where appropriate, introduced by the Technical Directorate for Nuclear Safety.

These events classed as generic are entered in the TEMGE database for monitoring purposes by personnel from the Operating Experience and Regulations Area. In addition, all those events that, in the opinion of the specialists, might have generic implications are incorporated into this database. In these cases, the actions to be taken are put forward by the specialist area and disseminated and monitored by the Operating Experience and Training Area.

As far as international events are concerned, the CSN has an International Incident Review Panel, which meets on a quarterly basis and comprises the same areas that make up PRI; it analyses events from the Incident Reporting System, the USNRC's Information Notices and other international sources in order to determine whether they are applicable to any Spanish NPP, and suggests specific actions for reviewing them, from including them in the coming annual operating experience analysis report to issuing specific Technical Instructions to be complied with within a given time period.

Likewise, the CSN enters the information about the events which are most significant for the safety of nuclear installations in a database: the Incident Reporting System (IRS). As regards the IRS, in addition to the communications for the sending of reports, the coordinators of the different countries meet every year to share more detailed information on those relevant events which have taken place in the past year and to propose technical studies of generic issues derived therefrom. In the case of the NEWS database, INES coordinators meet on a biannual basis to discuss the most relevant events and unify classification criteria.

Additionally, the CSN participates in the Working Group on Operating Experience (WGOE) and the Incident Reporting System of the OECD's NEA and the IAEA. Some of the goals of this working group are to identify safety issues which are relevant from a regulatory

standpoint, to identify areas where research programmes are needed, and to share information on improvements to the operation of nuclear power plants. In order to achieve them, the working group meets on a six-monthly and on an annual basis respectively to, among other things, exchange and analyse information relating to relevant incidents at installations from the participating countries.

## 19.8. On-site management of spent fuel and radioactive waste

### 19.8.1. Measures of the Contracting Parties and regulatory criteria for on-site handling of spent fuel and radioactive waste

In accordance with Article 20 of the Regulation on Nuclear and Radioactive Facilities, all Spanish nuclear facilities must have a radioactive waste and spent fuel management plan (WMP).

The CSN issued the Safety Guide 9.3, on the criteria and technical bases for the drawing up of the WMP by nuclear installation licensees; in 2009, by means of Technical Instructions, it required all nuclear power plants to adapt their radioactive waste and spent fuel management plan to match the contents of the said Safety Guide.

The purpose of the WMP is to collect the criteria and instructions that guarantee the safe and optimised management of the radioactive wastes and spent fuel generated at these installations, considering the new advances in the regulations and technology and taking into account:

- The current situation at each installation as regards waste generation, management and, where appropriate, removal.
- The identification of the origin of the wastes and the history of spent fuel.
- The study of alternatives for the management systems and processes and improvements thereto.
- The justification of the suitability of the current management or of the need to make improvements.
- The planning of studies for the implementation of the identified improvements.

The WMP is the reference document for the management of the radioactive wastes generated at nuclear installations during both operation and the dismantling and decommissioning phase, and must contain the necessary information to be able to analyse of the current management. It is applicable to the management of radioactive wastes regardless of their level of radioactivity, as well as to waste materials with radioactive content susceptible of being cleared, to so-called special wastes and to spent fuel. In addition, it is in keeping with the goal of improving the management of the wastes and spent fuel generated at each installation.

In particular, the installation's licensee must keep the inventory of its wastes up-to-date, minimise their generation, recycle and appraise the wastes generated, insofar as this is technically and economically feasible, and condition the final waste materials for removal. The radioactive waste management plan will also serve to guarantee that no radioactive wastes are eliminated by conventional routes.

From the point of view of the usefulness of the radioactive waste management plan for the licenses of the generating installations, the following advantages, among others, have been identified:

- It constitutes a tool for reflecting about and developing waste management.
- It is a tool for in-house and, where appropriate, external communication regarding the management of their radioactive wastes.
- It is a reference document for the competent administration(s), since it commits the licensee to a certain way of managing its radioactive wastes, in accordance with the general rules governing the operation of its installations.

### 19.8.2. On-site storage of spent fuel

Spanish LWR plants have traditionally stored their spent fuel in ponds built at each of the sites.

Some plants have been forced to build an Individualised Temporary Storage Facility (ATI) for the dry storage of fuel in containers. This is the case of Trillo NPP, which has had a facility of this kind since 2003, and Ascó NPP, on the site of which an ATI has been built and licensed which will start running during the first half of 2013. Finally, Santa María de Garoña NPP, where all the fuel in the core was unloaded into the pond in 2012, also has plans to build an ATI, the licensing of which would begin towards the second half of 2013. José Cabrera NPP, which ceased operation in 2006, has another on-site ATI, where all the fuel in the pond was moved to in 2009 so as to proceed to dismantle the plant.

The process to license said individualised temporary storage facilities has consisted, in accordance with current legislation, in the approval of the design of the storage and transport system and the granting of the permit for the construction, completion and commissioning of the storage facility at the plant's site. Moreover, both dual-purpose containers (storage and transport) and the containers in use at Trillo NPP have been granted approval as Type-B(U) packages according to transport regulations. In all cases, the licensing of ATIs is coupled with the corresponding environmental impact assessment (EIA) in accordance with the environmental regulations which transpose the European Directives in this respect.

On the other hand, one of the main strategic lines for spent fuel management laid down by the current, Government-approved 6$^{th}$ General Radioactive Waste Plan is the construction of a centralised temporary storage facility (ATC) for the long-term storage of all spent fuel and vitrified high level waste from the reprocessing in France of the fuel from Vandellós I NPP, as well as other intermediate level wastes which cannot be stored at the El Cabril disposal facility due to their radiological characteristics. The generic conceptual design of this dome-type facility was favourably considered by the CSN in June 2006.

The ATC's site selection and designation process was completed during the time period covered by this report. After the selection process, an Interdepartmental Commission approved in September 2010 the candidate-site proposal report, which was then sent to the Government. The Council of Ministers, in its meeting of 30 December 2011, agreed to designate the municipality of Villar de Cañas (Cuenca) as the site for the ATC and its associated technology centre.

The last Joint Convention report, which is available at the IAEA's and the Ministry of Industry, Energy and Tourism's websites, has more information on spent fuel management and dry storage solutions in particular.

### 19.8.3. Implementation of the on-site treatment, conditioning and storage of radioactive wastes

Low and intermediate level wastes (LILW) generated at nuclear power plants belong to one of the following types:

- Process wastes: chemical reagents and materials intervening in any of the phases of the plant's generation process. This group includes, for example, evaporator concentrates, ion exchange resins and filter sludges.
- Technological wastes: they basically comprise lab material, material used in equipment maintenance, gloves and clothing.

Taking the conditioning of the wastes into account, the generated packages will correspond to solidified wastes (resins, concentrates, sludges), compacted and non-compacted solid wastes, and immobilised wastes (filters).

All packages containing low and medium level radioactive wastes conditioned at Spanish nuclear power plants are subjected to a process of preliminary acceptance by ENRESA in order to ensure compliance with the acceptance criteria of the El Cabril disposal facility.

As of the end of 2012, a total of 24,875 conditioned radioactive waste packages were housed in the temporary storage facilities of Spanish NPPs, which amounts to 34.3% of the available storage capacity.

### 19.8.4. Activities to keep the amounts of waste generated in each process down to a minimum, in terms of both volume and activity

Since the mid 1990s, UNESA (the Spanish Association of Electric Utilities) and ENRESA (the National Radioactive Waste Management Company) has had a Volume Reduction Action Plan in place aimed at reducing the generation of low and intermediate level wastes.

Since then, volume reduction projects have been implemented and new proposals have continued to be developed and made with the aim of optimising the management of radioactive wastes so as to actually reduce their volume.

### 19.8.5. Establishment of procedures for the clearance of radioactive wastes

In Spanish regulations, the clearance authorisation is categorised as an administrative process that makes it possible to manage by conventional methods certain waste materials with radioactive contents generated at nuclear installations without the need for subsequent regulatory controls as regards nuclear safety and radiation protection.

By means of the approval of action procedures common to all Spanish nuclear power plants, the CSN has determined the criteria and technical bases for the clearance of the following waste streams:

- Scrap metal (approved in 2001)
- Activated carbon (approved in 2002)
- Spent ion exchange resins (approved in 2002)
- Used oil (approved in 2003 and updated in 2009)
- Wood (approved in 2006)

Following the application by installation licensees, and with the binding report from the CSN, the Ministry of Industry, Energy and Tourism has granted to date the following permits for the clearance of waste materials:

| NPP | Stream | Resolution |
|---|---|---|
| Almaraz | Oil | DGPEM 10/11/00 (updated on 22/01/10) |
| | Activated carbon | DGPEM 12/06/2003 |
| Ascó | Oil | DGPEM 25/08/2009 |
| | Activated carbon | DGPEM 30/03/2011 |
| | Resins | DGPEM 21/06/2012 |
| Cofrentes | Oil | DGPEM 07/06/2000 (updated on 25/03/2009) |
| | Sludges | DGPEM 12/02/2001 |
| José Cabrera[1] | Oil | DGPEM 16/01/2004 |
| | Scrap | DGPEM 08/05/2003 |
| | Wood | DGPEM 19/09/2007 |
| Santa María de Garoña | Oil | DGPEM 04/06/2001 (updated 12/11/2009) |
| | Scrap | DGPEM 01/04/2009 |
| Trillo | Oil | DGPEM 23/12/1999 (updated on 22/01/10) |
| | Activated carbon | DGPEM 08/05/2003 |
| | Resins | DGPEM 08/05/2003 |
| Vandellós II | Oil | DGPEM 31/07/2009 (updated on 06/08/2009) |

Waste clearance permits set the limits and conditions that installation licensees must fulfil to carry out these processes. Specifically, the following aspects are established in the limits and conditions of clearance permits: the scope of the permit, the applicable clearance levels and the verification of compliance therewith, the destination of the cleared waste materials, the records and traceability of the process, and the periodic information which the licensees must send to the CSN.

### 19.8.6. Regulatory review and control activities

Nuclear power plants in operation have adapted their Radioactive Waste and Spent Fuel Management Plans to the CSN's Safety Guide 9.3 "Contenido y criterios para la elaboración de los planes de gestión de residuos radiactivos de las instalaciones nucleares" (Contents and Criteria for Drawing up Nuclear Power Plant's Radioactive Waste Management Plans).

As far as the activities to control the management of low and intermediate level waste at NPPs are concerned, the CSN has carried out the inspection activities included in its Integrated Plant Supervision System (SISC), according to its Basic Inspection Plan.

The CSN issued the Council Instruction IS-31, on criteria for the radiological control of waste materials generated at nuclear installations, whose purpose is to set the criteria for said control before the waste materials leave the radioactive waste areas to be conventionally managed. In addition, IS-31 includes the technical documentation supporting the applications for waste material clearance permits.

With regard to spent fuel, there are two Council Instructions related to spent fuel and high level waste. The first one is the Council Instruction IS-29, on safety criteria at temporary spent fuel and high level waste storage facilities. This instruction regulates the basic safety requirements

1 José Cabrera NPP is still in the report because the change of ownership to ENRESA took place in 11 February 2010.

that must be met during the design, production, construction, testing and operation of said facilities. The second instruction is the Council Instruction IS-20, establishing the safety requirements in the design of spent fuel containers and defining the contents of the Safety Analysis Report and the interfaces between all involved parties. Both instructions include the international regulations of the IAEA and the countries of origin of the technology and WENRA's reference levels for storage.

This entire set of regulatory review and control activities is directed towards improving the management of radioactive wastes and spent fuel at Spanish nuclear power plants, thus ensuring that this management meets international safety standards.

# APPENDIX 19.A

## Subject: favourable report on the renewal of the operating licence of _____ NPP

On _____, the CSN received from the Ministry of Industry, Energy and Tourism the application for the renewal for ten years of the operating licence of _____ NPP (entry registration no ___), to which Chapter IV of the Regulation on Nuclear and Radioactive Facilities refers, submitted by the licensee in compliance with Provision 2 of the Ministerial Order dated _____ whereby _____ NPP was granted the Operating Licence currently in force. This application is accompanied by the plant's Periodic Safety Review (PSR), the current versions of its Official Operation Documents and the updated versions of its Probabilistic Safety Assessments.

The CSN has continuously monitored and supervised the operation of the aforementioned plant during the period of validity of the current Licence and its compliance with the applicable conditions on nuclear safety and radiation protection and evaluated the Periodic Safety Review.

During its meeting of _____, the CSN agreed to issue to the licensee a Complementary Technical Instruction (ref no. ____) where it requested of it to analyse the new regulations which, up to that moment, had not been included in the plant's licensing bases. The CSN considered that the analysis of said regulations could lead to a significant upgrade and improvement of the installation's safety conditions. The licensee submitted the requested analyses – enclosed in the letters listed below, together with the resulting improvement plans:

The list of documents sent by the licensee, the content of which, by virtue of being mentioned in this document, is added to the plant's Licensing Base.

In keeping with said plans, the licensee has already made improvements at the Plant, which must be rounded out with those established in the attached Conditions.

Likewise, after the accident at Fukushima NPP, the CSN issued Complementary Technical Instructions to the licensees of all Spanish nuclear power plants in order for them to perform the stress tests agreed within the framework of the European Union and to establish measures to face up to beyond design basis events which could entail the loss of large areas of the plant. ____ NPP, as all the other Spanish plants, will have to conduct the required analyses and take all necessary measures to strengthen its safety against extreme situations.

The Nuclear Safety Council shall review the analyses and proposals of nuclear power plant licensees and may issue new requirements should it consider it necessary.

During its meeting of _____, the Nuclear Safety Council studied the application of the licensee of _____ NPP, as well as the reports prepared by the Technical Directorate for Nuclear Safety as a result of the assessments made, and agreed to issue a report in favour of the renewal of its operating licence for a period of ten years, providing the plant's operation is in keeping with the limits and conditions included in the Annex. This agreement was reached in compliance with Section b) of Article 2 of the Law 15/1980, creating the Nuclear Safety Council, and is submitted to the abovementioned Ministry for the completion of the necessary formalities.

In Madrid, on _____

THE PRESIDENT

# APPENDIX 19.B

## Limits and conditions on nuclear safety and radiation protection associated with _____ NPP's operating licence

1. For the purposes provided for in the current legislation, the _____ company is considered to be the holder of the Licence and the operator in charge of _____ NPP.
2. This operating licence authorises the licensee to:
   2.1. Keep and store slightly-enriched uranium fuel assemblies, in accordance with the technical limits and conditions contained in the Safety Analysis Report of the Refuelling of each cycle and with the limits and conditions associated with the specific fresh and irradiated fuel storage permits.
   2.2. Operate the plant up to a core thermal power of ____ MWt.
   2.3. Keep, store, and use all radioactive materials, nuclear substances and radiation sources needed for the operation of the installation.
3. The licence is granted on the basis of the following documents:
   i) Safety Analysis Report, Rev...
   j) Operation Handbook, Rev...
   k) Plant Technical Specifications, Rev...
   l) On-site Emergency Plan, Rev...
   m) Quality Assurance Manual, Rev...
   n) Radiation Protection Manual, Rev...
   o) Radioactive Waste and Spent Fuel Management Plan, Rev...
   p) Physical Protection Plan, Rev...

The plant shall be operated in accordance with the previous documents, in the revision in force according to the update process indicated below.

3.1. Subsequent modifications or changes to the Operation Handbook, the Plant Technical Specifications, the On-site Emergency Plan and the Physical Protection Plan must be approved by the Directorate-General for Energy Policy and Mines, following a report from the Nuclear Safety Council, prior to their entry into force.

The Nuclear Safety Council may temporarily exempt the licensee from complying with any section of the documents mentioned in the preceding paragraph, informing the Directorate-General for Energy Policy and Mines of the start and end dates of the exemption.

3.2. Six months after start-up following every refuelling outage, the licensee shall revise the Safety Analysis Report for it include those modifications made to the plant from the beginning of the previous cycle to the end of said refuelling outage which have not required authorisation according to that established in the Nuclear Safety Council Instruction IS-21 and the new safety assessments performed. This new revision shall be sent to the Directorate-General for Energy Policy and Mines and to the Nuclear Safety Council on the month following its entry into force.

The revisions of the Safety Analysis Report corresponding to modifications that require authorisation from the Directorate-General for Energy Policy and Mines, in accordance with the Nuclear Safety Council Instruction IS-21, must be authorised at the same time as the modifications.

3.3. The Quality Assurance Manual may be modified under the licensee's responsibility provided the change does not reduce the commitments contained in the current quality assurance programme. Changes that reduce said commitments must be favourably appraised by the Nuclear Safety Council prior to their entry into force.

Commitments are understood to be those included in the current Quality Assurance Manual in the form of applicable regulations and guidelines, as well as the description itself of the programme given in the content of the Manual, as specified in the Complementary Technical Instructions which the Nuclear Safety Council issues in this respect.

The revisions of the Quality Assurance Manual must be sent to the Directorate-General for Energy Policy and Mines and to the Nuclear Safety Council within one month from their entry into force.

3.4. The Radiation Protection Manual may be subjected to modifications under the licensee's responsibility except in those cases when they affect basic radiation protection regulations or criteria, as specified in the Complementary Technical Instructions which the Nuclear Safety Council issues in this respect. In these cases, the Nuclear Safety Council's favourable appraisal shall be required prior to their entry into force.

The revisions of the Radiation Protection Manual must be sent to the Directorate General for Energy Policy and Mines and to the Nuclear Safety Council within one month from their entry into force.

3.5. The Radioactive Waste and Spent Fuel Management Plan may be modified under the licensee's responsibility except in those cases indicated in the Nuclear Safety Council's Complementary Technical Instructions. In these cases, the Nuclear Safety Council's favourable appraisal shall be required prior to their entry into force.

The revisions of the Radioactive Waste and Spent Fuel Management Plan must be sent to the Directorate General for Energy Policy and Mines and to the Nuclear Safety Council within one month from their entry into force.

4. During the first quarter of each calendar year, the licensee must send to the Directorate-General for Energy Policy and Mines and to the Nuclear Safety Council reports on the following aspects, with the scope and content specified in the Complementary Technical Instructions which the Nuclear Safety Council issues in this respect:

4.1. The in-house and industry operating experience applicable to the installation, describing the actions which have been taken to improve the performance thereof or to prevent similar events.

4.2. The measures taken to adapt the operation of the plant to the new Spanish requirements on nuclear safety and radiation protection and to the regulations of the country of origin of the project. In this latter case, an analysis of the applicability to the plant of the new requirements issued by the regulatory body of the country of origin of the project for plants of a similar design shall be included.

4.3. The results of the environmental radiological surveillance programme. The information to be included shall be that specified in Section 6.10 of the current Operation Handbook.

4.4. The results from the dosimetry controls on operating personnel, including an analysis of the trends of the individual and collective doses received by the staff during the previous year.

4.5. Activities of the Radioactive Waste and Spent Fuel Management Plan, including those regarding very low level waste susceptible of being managed as conventional waste, low and intermediate level waste, and high level waste, as well as irradiated fuel.

4.6. Activities of the programme for training all plant personnel whose work might have an impact on nuclear safety or radiation protection.

5. The Directorate-General for Energy Policy and Mines and the Nuclear Safety Council must be informed of the departure of packages of radioactive waste and fissionable materials from the site of the plant at least seven days in advance of the departure date. The departure of other radioactive packages shall be notified within 24 hours from the moment the transport thereof is decided and, in any case, prior to its taking place. The departure of radioactive packages from the site of the plant shall be subjected to the authorisation regime established by current regulations.

When the licensee is responsible for fissionable material transports of which the plant is the point of origin or destination and no shipment authorisation in accordance with current regulations on the transport of dangerous goods is required, the Directorate-General for Energy Policy and Mines and the Nuclear Safety Council must be informed of the schedule for said transports three months in advance of the scheduled date.

6. The licensee may apply to the Ministry of Industry, Tourism and Trade for a new licence for a period no longer than 10 years at least three years in advance of the expiration date of the current operating licence. The application shall be accompanied by: (a) the last revisions of the documents to which Condition 3 refers; (b) a Periodic Safety Review of the plant, the content of which complies with that laid down in the CSN's Safety Guide 1.10, Rev. 1, "Revisiones periódicas de seguridad

de las centrales nucleares" (Periodic Safety Reviews of Nuclear Power Plants); (c) a revision of the probabilistic safety assessment; (d) an analysis of the ageing experienced by the plant's safety components, systems, and structures; and (e) an analysis of the operating experience accumulated during the period of validity of the licence to be renewed.

In the event said application is submitted, the licensee must submit to the Nuclear Safety Council an update of said documents at least one year in advance of the expiration date of the current operating licence.

7. If, during the period of validity of this licence, the licensee were to decide to cease the operation of the plant, it shall communicate this decision to the Directorate-General for Energy Policy and Mines and to the Nuclear Safety Council at least one year in advance of the scheduled date, unless such cessation is due to unforeseen reasons or to a resolution by the Ministry of Industry, Tourism and Trade. The licensee must justify the installation's nuclear safety and radiation protection conditions to be met by the operations to be performed at the installation from the cessation of operation to the granting of the dismantling permit, as specified in the Complementary Technical Instructions which the Nuclear Safety Council issues in this respect.
8. During the period of validity of this Licence, the licensee shall implement the plant's Safety Improvement Programmes identified in the Periodic Safety Review conducted by the licensee in support of the application for this Licence, modified, if appropriate, with the Complementary Technical Instructions which the Nuclear Safety Council issues in this respect.

   Likewise, the licensee shall implement the proposals for action included in the documentation submitted in support of the application for the renewal of the Operating Licence related to the Periodic Safety Review and the Conditional Application Regulations, within the established timeframes, as well as those actions which the licensee is informed of as a result of the evaluation thereof made by the CSN.

## Conclusions

The main regulatory developments and commitments made by Spain from January 2010 to January 2013 and the main future challenges in the nuclear regulatory sphere are set out in this chapter in order to highlight the most significant aspects of this period, give an overview of our efforts to improve safety and achieve the self-assessment goal which lies at the heart of this report. Below there is a section where the licensees of Spanish nuclear power plants list the most important activities they have carried out during this period. According to the obligations agreed with the Contracting Parties at the second extraordinary meeting of the Convention on Nuclear Safety, a specific section has been added which is devoted to the National Action Plan which was drawn up as a consequence of the accident that took place at Fukushima NPP in Japan.

The number of Spanish NPPs has not changed since the fifth national report on the Convention on Nuclear Safety.

## Nuclear Safety Council

As the only body of the Spanish State with authority as regards nuclear safety and radiation protection, the Nuclear Safety Council would like to present in this section its conclusions about the time period which is the subject of the sixth national report on the Convention on Nuclear Safety and outline some future challenges.

*Development of the regulatory framework during the period covered by the sixth national report*

During the time period covered by this report, the following laws affecting nuclear safety were officially approved and published:

- Law 6/2010, of 24 March, modifying the revised text of the Law on Environmental Impact Assessment of Projects, approved by Royal Legislative Decree 1/2008, of 11 January.
- Law 2/2011, of 4 March, on Sustainable Economy.
- Law 12/2011, of 27 May, on third-party liability for nuclear damages and damages caused by radioactive materials.

Likewise, a series of Royal Decrees affecting nuclear safety were approved during the period of time covered by the sixth national report:

- Royal Decree 1440/2010, of 5 November, approving the Statute of the Nuclear Safety Council.
- Royal Decree 1564/2010, of 19 November, approving the Basic Directive for Civil Protection Planning against Radiological Risks.
- Royal Decree 1308/2011, of 26 September, on the physical protection of nuclear installations and materials and of radioactive sources.

Also at the regulatory level, the CSN issued 11 Council Instructions with regard to nuclear safety, which are listed in Section 7.2.2 of this report. It must be pointed out that 6 of these Instructions were a consequence of the Action Plan set up by the CSN to comply with the harmonisations commitments made within WENRA's framework.

Finally, it is worth mentioning that during this time period the CSN published several Guides on the topics listed below:

- 1 guide about power reactors and nuclear power plants.
- 1 guide on fuel cycle installations.
- 1 guide about the transport of radioactive material.
- 3 guides on natural radiation.

*Compliance with the challenges identified in the fifth review meeting of the Convention on Nuclear Safety*

During the fifth review meeting of the Convention on Nuclear Safety, Spain took up the challenge –identified by the other Contracting Parties after the revision of the fifth Spanish report– of informing this sixth time around of the actions which the regulatory body has taken in relation to the progress made in the revision and development of the procedures and instructions included in the CSN's Emergency Action Plan.

In this sense, the Basic Nuclear Emergency Plan was modified by the Royal Decree 1428/2009, of 11 September, whereby the incorporation of international standards and recommendations for managing nuclear emergencies was kept and flexibility criteria in the emergency organisation were introduced essentially to boost the representation of local and regional entities, which gave rise to the adaptation of the master nuclear emergency plans of the area surrounding each nuclear power plant.

On the other hand, the CSN fulfilled the commitment stated in the fifth Spanish review report consisting in the setting up of an Advisory Committee for Public Information and Participation.The Advisory Committee for Public Information and Participation on nuclear safety and radiation protection (hereinafter, the Advisory Committee) was set up in February 2011 with the mission to make recommendations to the CSN to promote and improve transparency, the public's access to information and public participation in matters which fall under the CSN's competences.Likewise, an Analysis Commission was created to analyse the recommendation proposals and prepare an assessment report which will be the basis for the Advisory Committee's decision making.During the period of time covered by this report, the CSN informed the Advisory Committee of its new 2011-2016 Strategic Plan, the actions derived from the accident at Fukushima NPP, the progress and results of the stress tests of Spanish nuclear power plants within the framework of the European Union, the renewal of the operating permits of Ascó I and II NPPs, the administrative situation of Santa María de Garoña NPP, and the problems detected in the vessel material at Doel NPP in Belgium.Similarly, a section specifically devoted to the Spanish Action Plan, drawn up after the Fukushima accident, has been added to this chapter.

*Commitments and future challenges of the Spanish Regulatory Body*

For 30 years, the CSN has been looking after the safe operation of the Spanish nuclear fleet as part of its competences. Likewise, the CSN has prioritised its presence in all relevant international forums on nuclear safety and radiation protection by actively collaborating in matters regarding technical co-operation with and assistance to other regulatory bodies.

With respect to the future, the CSN's aim is to consolidate and strengthen what has been achieved to date while preparing for new challenges and new energy and geopolitical scenarios.Consequently, the CSN plans both to maintain its top level technical and professional know-how and to acquire those new competences which are called for by new technological developments. At a more detailed level, the following issues must be addressed in the very near future:

- As a result of the commitment that WENRA members will make in 2014, the CSN will set up a working plan to incorporate into the Spanish legislation the new reference levels which have been set following the Fukushima Daiichi accident.
- The CSN will review the seismic characterisation of the sites of Spanish nuclear power plants in accordance with the most advanced international standards.
- The CSN will finish revising and developing the procedures and instructions included in its Emergency Action Plan.
- The CSN will launch in 2013 a pilot plan for introducing the cross-sectional element of its Integrated Plant Supervision Plan (SISC), which will integrate aspects related to fields such as human and organisational factors and safety culture.

At the international level, the CSN will continue to actively take part in all relevant activities on nuclear safety, radiation protection and co-operation as regards nuclear regulation. In particular, the IAEA's Action Plan and its international application, the initiatives related to the revision of the process of international conventions as regards safety, and the possible modification of the European community framework on nuclear safety are of special importance.

Safety peer review processes are shaping up to be powerful tools for sharing experiences and lessons learnt in the nuclear regulatory field, as shown by many international initiatives such as the IAEA's international IRRS missions, the NPPs stress tests process within the framework of the European Union and the review meetings of the Nuclear Safety Conventions themselves. Consequently, Spain will remain committed to the performance of this kind of activities and will continue to support them when it is so requested to its regulatory body.

Spain deems that effective independence, transparency and communication are key elements of an effective regulation of nuclear safety and considers it necessary to promote their proper application and reporting by the Contracting Parties to the Convention on Nuclear Safety.

As a final conclusion, it can be said that Spanish nuclear installations have operated correctly from the point of view of safety, as reported in the annual reports submitted by the CSN to the Spanish Parliament during the time period which is the subject of this report.

## License holders

The licensees of Spanish nuclear power plants are responsible for generating electricity in a safe, reliable, economical and environmentally friendly manner. The extent to which the activities performed and the measures adopted by licensees in compliance with this responsibility fulfil the obligations set by the Convention has been described throughout this report by following the layout of the articles of the latter.

The most significant activities during this period are summarised below:

- The 8 Spanish reactors operated normally from the point of view of safety, and no event having an impact on people or the environment was reported.
- The two units of Almaraz NPP requested and obtained authorisation to perform a power uprate of about 7% (gross electrical output).
- From July 2010 (Vandellós II) to September 2012 (Ascó), after having completed their periodic safety reviews (PSRs), Vandellós II, Cofrentes and Ascó I and II NPPs were granted the renewal of their respective Operating Permits for a 10-year period. Each Licence brings with it a series of specific requirements, the implementation of which guarantees the safe and reliable operation of the plant during that period of time according to the strictest international safety standards in force at the time of its granting.
- Santa María de Garoña NPP operated at power and refuelled as usual according to its Operating Permit in force (obtained in July 2009) until December 2012, when the licensee notified the Administration and the CSN that it would cease the plant's activity and proceeded to unload all of the fuel in the spent fuel pond. The reason for said decision was a change in the economic conditions of operation; in particular, the approval a new tax regime for fuel unloaded in spent fuel ponds. In order to prepare the official declaration of cessation of operation, the licensee made the corresponding proposals for the modification of its Official Operating Documents.
- Ascó NPP applied for the corresponding permit and completed the construction of an Individualised Temporary Storage Facility (ATI) in which to house its spent fuel once its spent fuel pond reaches its maximum storage capacity.
- All NPPs completed in due time and form their stress test reports, which were favourably considered by the CSN; the regulator did not detect any safety-relevant weaknesses requiring urgent action.

  The result of ENSREG's revision for the entire fleet was very positive. All plants are in the midst of implementing an intense and consistent safety margin increase programme, a good portion of which was proposed by the licensees themselves as a consequence of the safety assessments carried out as part of the stress tests. The set of measures ranges from increasing the margins for protecting installations against beyond design basis events to augmenting current capabilities to deal with a loss of safety functions and mitigate severe accidents. The following stand out among the measures to be adopted (non-comprehensive list): increasing the seismic margins of certain SSCs; making improvements in the protection against flooding; purchasing portable equipment; boosting the Emergency Response Organisations (OREs); building alternative emergency management centres at each site; installing filtered containment venting systems; installing passive hydrogen autocatalytic recombiners in the containment; building a common emergency support centre capable of providing support to any plant within 24 from its activation.
- Spanish NPPs underwent a total of 9 international Peer Reviews (at least one per plant; 8 from WANO and 1 from the IAEA), all with excellent results. The resulting recommendations are in the process of being completed or implemented.

Within the framework of the European stress tests as a result of the Fukushima accident, two Spanish plants (Almaraz and Trillo) were visited each by a team of ENSREG reviewers, who verified the degree of progress in the implementation of post-Fukushima measures and ascertained the operating team's high degree of commitment to plant safety.

- Spanish plants continue to pay close attention to the exchange of operating experience. The functioning of the Industry Incident Analysis Group (GSAI) became consolidated; the Group published two industry guides about its operating rules and the exchange of operating experience information among plants and issued a new annual report [Joint Operating Experience Report (ICEO)] on specific subjects.
- As a result of the coming into force of IS-25, all Spanish plants are broadening the scope of their Probabilistic Safety Assessments to cover Levels 1 and 2 in all operating modes and include in-house and industry events, which involves and will continue to involve in the immediate future a great amount of analytical work.
- As a consequence of the entry into force of IS-30, all the plants have embarked upon an ambitious process of fire protection-related improvements.
- Two plants (four units) began the process of adopting the US NFPA-805 as an alternative to complying with "traditional" licensing bases.
- In addition to all those already mentioned in a generic manner, all NPPs have made, on their own accord, many design modifications and improvements, in general,according to the conditions of their respective Operating Permits or other regulatory requirements.
- Nuclear power plants carry out on their own initiative a series of activities which guarantee public information, communication and access to information by society so as to properly ensure the transparency of their activity. The purpose of all this effort is to win the public's trust in the nuclear electricity generation.

The licensees of Spanish nuclear power plants fully agree that compliance with the obligations set by the Convention on Nuclear Safety is a basic element to guarantee the highest levels of nuclear safety so as to make it possible for nuclear energy to keep playing its part in the generation of electricity. Consequently, they intend to stay on the path of continuous improvement in order to be able to demonstrate compliance with these obligations at all times.

## Summary of the measures adopted by Spain after the accident at Fukushima Daiichi NPP. Spanish post-Fukushima action plan

After Spanish nuclear power plants completed the European-stress tests and their peer review processes, and in accordance with that agreed by ENSREG in July 2012, the CSN started to devise a National Action Plan (NAcP)[1] detailing the activities to be carried out in Spain in response to the accident that happened at Fukushima NPP. The plan was finished and sent to ENSREG in December of that same year and has been subjected to a Peer Review process, which concluded with a seminar held in Brussels in April 2013.

The Spanish NAcP thoroughly describes the actions which have been or are being carried out with regard to the three topics envisaged in the stress tests and sets the deadlines for the implementation of each of them, which are scheduled to take place in three phases: the short (2012), the medium (2014), and the long term (2016). These topics are essentially the same as the first three topics discussed during the second extraordinary meeting of the Convention on Nuclear Safety (CNS), which took place in Vienna in August 2012. The NAcP also includes information related to the topics 4 and 6 debated during this beforementioned CNS meeting.

The main actions which Spanish nuclear power plants are carrying out as part of this plan are the following:

- Analysing the capacity to withstand natural events beyond those envisaged in the plant's design bases and implementing the improvements identified in said analyses, such as increasing the seismic margin of equipment which is important to deal with the events postulated in the stress tests.
- Implementing improvements to strengthen the capacity of plants to deal with events entailing an extended loss of power supply or the capacity to remove the residual heat from the reactor core, including the appropriate fixed and mobile equipment.
- Improving the capacity to manage emergencies, including increasing the available human means and building an alternative emergency management centre at each site and an Emergency Support Centre at the national level capable of sending specialised human and material means to any site within 24 hours.
- Improving the capacity to prevent and mitigate severe accidents in the reactor or the spent fuel pond, including additional containment protection measures (installation in all plants of filtered vents and passive autocatalytic recombiners).
- Adopting measures aimed at improving the radiation protection of workers that take part in emergencies.

It is worth mentioning that the relevant actions mentioned in connection with the first three topics have been required by the CSN by means of the issuance of the corresponding binding Complementary Technical Instructions (ITCs).

Another issue of the NAcP that is worth mentioning is that, in addition to the scope of the stress tests, the CSN has also launched a parallel process for improving the protection of plants against other extreme anthropogenic events that might lead to the loss of large areas of the installation and severely affect its safety or the environment and public health. This process covers the following essential aspects:

- The capacity to fight large fires beyond those envisaged in the plants design bases.

1 Link to the Spanish Action Plan report:
*http://www.csn.es/index.php?option=com_content&view=article&id=24511%3Ael-csn-remite-a-la-comision-europea-el-plan-de-accion-nacional-de-seguimiento-post-fukushima-tras-las-pruebas-de-resistencia-&catid=13%3Anoticias&Itemid=29&lang=es*

- The capacity to mitigate severe damage to the fuel (in both the reactor core and the spent fuel storage facilities).
- The actions to limit liquid or gaseous radioactive releases.

In this latter case, the CSN has also sent the corresponding ITC to each licensee.

During the Peer Review which took place in Brussels in April 2013, Spain's NAcP was positively received and several good practices were identified, such as the issuance of ITCs by the regulator; the close co-operation between the regulator and the licensees; the improvements regarding the seismic margin of systems; the capacity to remotely access radiation data; and the building of «on-site» emergency centres and a nationwide emergency support centre. The Spanish practice of having the plants perform Periodic Safety Reviews (PSRs) as part of the licence renewal process and incorporate severe accident management-related aspects into their scope were also viewed in a positive light. On the other hand, the desirability of quickly adapting the new reference levels which WENRA plans to issue in relation to extreme natural events to Spanish regulations was seen as a challenge for the CSN.

# Convention on Nuclear Safety

## Sixth National Report

August, 2013

SPAIN