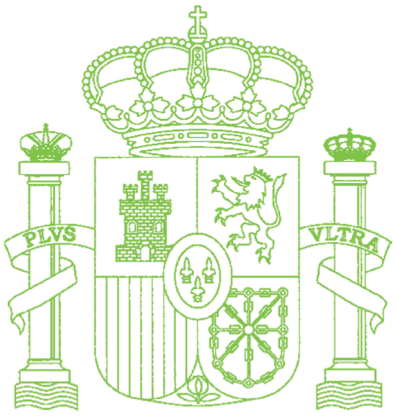
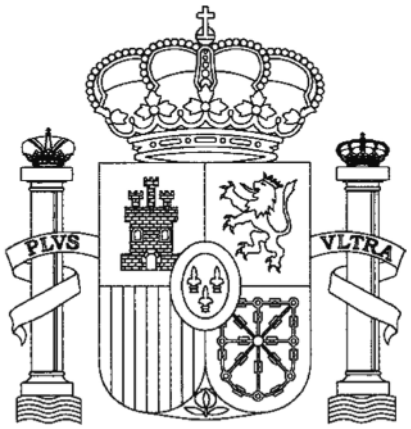


SPAIN

Convention on Nuclear Safety

Eighth National Report



SPAIN

Convention on Nuclear Safety

Eighth National Report

August 2019

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Edita y distribuye:
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Maqueta: Grupo Ediciones Cinca

Depósito Legal: M-24738-2019

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I. Introduction

Presentation of the Report

This document constitutes Spain's Eighth National Report in compliance with the obligations deriving from the Convention on Nuclear Safety, drawn up in Vienna on 20th September 1994, in accordance with the provisions of articles 5, 20, 21 and 22 of said Convention. Its content includes data and circumstances from **January 2016 to December 2018**, including only information of relevant importance from after this date.

Preparation of the Report

The preparation of the report is the responsibility of the Nuclear Safety Council (CSN), the sole competent body in Spain regarding nuclear safety and radiation protection, independent from the Government and reporting exclusively to the Spanish Parliament. In compliance with the commitments adopted during the second review meeting, the licensees of the Spanish nuclear power plants, coordinated by the Nuclear Energy Committee (CEN), and also the Ministry for Ecological Transition (MITECO), have contributed to the preparation of the report.

The report has been drafted following the same structure as the articles in chapter 2 "Obligations" from the text of the Convention, starting from Article 6. Each Article includes relevant information on the content of each obligation, distinguishing between the activities of the licensees of the facilities and those of the regulatory body, where applicable, and a brief assessment of the degree of compliance in Spain with the requirements established therein.

It includes a summary section responding to the commitments made at the seventh review meeting, and a conclusions section identifying future challenges and initiatives planned to be implemented in the near future.

The National Report includes several annexes that expand and detail the information described in the articles.

The content and scope of this eighth report of the Convention is based on the recommendations set out in section C of the Information Circular on Guidelines for National Reports under the Convention on Nuclear Safety (INFCIRC/572/Rev. 6, of the 19th January 2018).

This report also includes information on the commitments adopted by the Contracting Parties, identified in the Summary Report of the Seventh Review Meeting, as well as the commitments adopted by the Contracting Parties at the Diplomatic Conference held in 2015, the outcome of which culminated in the so-called Vienna Declaration.

Basic description of the Spanish nuclear programme and nuclear energy with regard to national energy policy.

There are seven light-water nuclear reactors in operation in Spain, located at five sites, representing an installed power of 7,398.7 MWe, representing 6.8% of the total installed electrical generation power, and a contribution of around 20% of the total national electrical energy production. Six of the units are pressurised water reactors (PWR) and the remaining unit is a boiling water reactor (BWR). The average lifetime of the units currently operating in Spain is around 33 years.

The Santa María de Garoña nuclear power plant (BWR) had formally been in administrative shutdown situation since 6th July 2013. In May 2014 a renewal of its operating permit was requested, which was denied under the Ministerial Order of the 1st August 2017, published in the Official Spanish State Bulletin of the 3rd August 2017. Since then, the Santa María de Garoña nuclear power plant has been in a permanent shutdown situation and will be in this administrative situation until the decommissioning starts.

In addition, two nuclear power plants are being dismantled. The José Cabrera plant ceased operation in 2006; in 2010 its ownership was transferred to ENRESA (*Empresa Nacional de Residuos Radiactivos, S.A., S.M.E., M.P.* - the Spanish National Radioactive Waste Company) and it was granted a dismantling permit, a process that is expected to be completed in 2020. On the other hand, the Vandellós I plant is currently in the latency phase, after ceasing operation in 1989 and reaching dismantling level 2 in 2003.

With regard to Spain's energy policy, on the 22nd February 2019 the Spanish Government prepared and submitted to the European Union a proposal for an Integrated National Energy and Climate Plan for 2021-2030, which establishes the evolution of nuclear energy's share in the energy mix and provides for the orderly and staggered closure of Spain's nuclear power stations within the 2025-2035 timeframe. On this basis, in March 2019 the owners of the Spanish nuclear power plants and ENRESA signed a Protocol establishing an orderly closure schedule for the nuclear plants.

Diplomatic Conference of the Convention on Nuclear Safety

In December 2013, in accordance with Article 32(3) of the Convention on Nuclear Safety, the Swiss Confederation submitted to the Director-General of the International Atomic Energy Agency (IAEA), as depositary of that Convention, a proposal to amend Article 18 of the Convention, INFCIRC/449. The Depositary communicated this proposal to the Contracting Parties on 19 December 2013.

During the sixth review meeting of the Convention, held from 24 March to 4 April 2014, the Contracting Parties present and voting decided by a two-thirds majority to hold a Diplomatic Conference to be organised within one year to consider the proposal submitted by Switzerland. In addition, the Contracting Parties to the Convention requested that the Director-General of the IAEA, as Depositary, organise a consultation meeting open to all Contracting Parties to exchange views and prepare for the adoption of the procedural rules. This meeting took place on 15 October 2014 at the IAEA headquarters in Vienna.

The Diplomatic Conference was held on 9 February 2015 at the IAEA headquarters in Vienna. As a result of this Conference, the Contracting Parties adopted the Vienna Declaration on Nuclear Safety. In addition, the Contracting Parties decided that *the principles making up the Declaration should be reflected in the actions of the Contracting Parties, in particular during the preparation of their reports on the implementation of the Convention, especially with regard to Article 18, as well as other relevant articles, including Articles 6, 14, 17 and 19, starting with the national reports that the Contracting Parties would submit for consideration during the Seventh Review Meeting of the Convention on Nuclear Safety.*

Spain, as a Contracting Party to the Convention on Nuclear Safety, adopted the Vienna Declaration and, in response to the commitments made during the aforementioned Diplomatic Conference, has included information in its eighth national report relating to compliance with the safety principles contained in the aforementioned Vienna Declaration. This information has been included following the instructions given by the Chair of the Eighth Review Meeting of the Convention in a letter to the Contracting Parties dated 13 December 2018.

II. Summary

The Eighth National Report of Spain complies with the obligations deriving from the Convention on Nuclear Safety. The information it contains corresponds to the period 2016-2018, including information after 2018 only in relevant cases, because of its specific interest.

The overall conclusion is that Spain satisfactorily fulfils the obligations of the Convention on Nuclear Safety, as may be seen from the information provided in this report in relation to each of the articles. Likewise, Spain satisfactorily complies with the principles of the Vienna Declaration on Nuclear Safety, as explained in the sections of this report dedicated to this subject.

This summary, prepared in accordance with the guidelines in INFCIRC-572. Rev.6, includes the main aspects and results of the analyses performed: major issues and challenges identified in the previous process of reviewing compliance with the Convention; changes in national nuclear energy programmes; major changes in national regulations; received or planned international peer review missions; treatment of operational experience; lessons learned from emergency response exercises; improvements in transparency and public communication, and the challenges and main activities planned for the new period.

First of all, it should be noted that the challenges posed at the previous Convention Review Meeting have been addressed and developed:

Effective preparation of the combined IRRS-ARTEMIS mission to Spain, which took place in October 2018.

1. Updating of radiation protection and emergency preparedness regulations: the transposition of Directive 2013/59/Euratom, establishing basic safety standards for protection against the dangers arising from exposure to ionising radiation, is being carried out as described in Chapter 7; likewise, the incorporation into Spanish regulations of the latest European standards and lessons from the Fukushima accident in relation to emergency preparedness, as detailed in Chapters 7 and 16, has been completed or is at an advanced stage.

2. Implementation and improvement of the knowledge management plan at the Nuclear Safety Council (CSN): this process has continued, as planned. The system being implemented is based on the IAEA's recommendations, adapted to the CSN's needs, as detailed in Chapter 8. During the period 2016-2018, activities focused mainly on the programme for the preservation of critical knowledge, and an action plan was developed focusing on the preservation and recovery of the knowledge and experience of CSN technical staff born before 1952.

3. Development of a CSN safety culture programme: the programme is being developed in accordance with what has been foreseen, as described in section 8.2.1. As main milestones, in 2017 the Board of Commissioners Meeting of the CSN approved the document CSN *Policy on*

Safety Culture and a working group was set up for its development; at the end of the same year the terms of reference were approved for performance of self-assessment of the safety culture associated with the process; and in 2018 activities prior to the self-assessment were carried out, fundamentally consisting of training and awareness-raising throughout the organisation.

Likewise, three key actions identified during the 7th meeting have been completed: resolving certain aspects associated with long-term operation licensing, with the publication of revision 1 of CSN Instruction IS-22; completing the implementation of the WENRA reference levels (which are practically completed, as detailed below); and the transposition into Spanish legislation of the European Nuclear Safety Directive, essentially effected through the publication of the *Reglamento de Seguridad Nuclear,* Nuclear Safety Regulation (RSN).

With regard to formal aspects, the examination of the national report of the 7th meeting identified the absence of a summary of the report. In response to this shortcoming, this section has been developed for the 8th meeting.

It has also been verified that the report responds to the recommendations of the plenary sessions of the previous review meeting of the Convention. In particular, it has been verified that it reflects the progress of the most important matters identified at the 7th meeting, applicable to Spain:

- Safety culture
- International peer reviews
- Legal framework and independence of the regulatory body[1]
- Financial and human resources1
- Knowledge management
- Ageing management and long-term operation[2]
- Emergency preparedness
- Consultation and communication with interested parties

In the context of the nuclear programme in Spain, two significant events have occurred since 2016:

- The definitive shutdown of the Santa María de Garoña Nuclear Power Plant (CNSMG), following the refusal by the competent Ministry to renew its Operating Permit (OA) for reasons other than safety, in August 2017. The plant is currently awaiting dismantling.

- The publication and submission to the European Commission, on 22 February 2019, of the draft National Integrated Energy and Climate Plan for 2021-2030, which is the national strategic planning tool that integrates energy and climate policy and reflects Spain's contribution to the achievement of the objectives established within the European Union. This document establishes the forecasts for the evolution of nuclear energy's contribution to the energy mix, and foresees an orderly and staggered closure of Spain's nuclear power stations within the 2025-2035 timeframe. On the basis of this plan, in March 2019 the owners of the Spanish nuclear power plants and ENRESA (*Empresa Nacional de Residuos Radiactivos*, the Spanish Radioactive Waste Company) signed a Protocol establishing an orderly closure schedule for the nuclear plants.

Within this framework, the Spanish nuclear power plants currently in operation have submitted (or plan to submit) the corresponding requests for Operating Licence renewal, on the dates established in the current authorisations.

[1] These issues were given specific treatment in the combined IRRS-ARTEMIS mission to Spain, as they constituted the two policy issues selected by Spain for discussion with the IRRS team

[2] This was the subject of the first EU *Topical Peer Review*, carried out during the reporting period

In the period 2016-2018, significant progress has been made or major regulatory projects completed, as described in Chapter 7 and elsewhere in the report. Mention has already been made of the transposition into Spanish regulatory framework of the Nuclear Safety Directive and the progress made in the transposition of Directive 2013/59/Euratom. This directive affects different matters and involves different ministries apart from the CSN.

Also significant is the publication of revision 2 of CSN Safety Guide GS 1.10, which regulates the preparation of Periodic Safety Reviews (PSRs). This guide contemplates a new methodology that puts an emphasis on self-assessment and proposals for safety improvements by the licensees, aligned with the IAEA guide SSG-25, and satisfies WENRA reference levels. The aim of the review is to improve the efficiency of the PSRs, taking into account the experience of the latest PSRs at the Spanish nuclear power plants and in other countries, as well as the lessons learned from Fukushima.

The process of harmonisation with the revised WENRA reference levels after Fukushima is being carried out in accordance with the programme and timetable established by WENRA. The incorporation of the revised reference levels has had a minor impact on the Spanish regulatory framework and on Spanish nuclear power plants, due to the fact that many of the new requirements had already been incorporated by the CSN previously in Complementary Technical Instructions (CTIs) issued to all nuclear power plants as a result of the Fukushima accident. The results of the self-assessment and action plan of all member countries underwent a peer review process throughout 2016, the results of which were published in a WENRA report in 2018, with particularly positive results for Spain, which had the highest compliance with reference levels of the 16 WENRA countries. As of 31 December 2018, 6 of the 101 reference levels that were revised in 2014 have yet to be implemented. The process is expected to be completed by 2019.

With regard to peer-to-peer missions, it is worth mentioning that Spain underwent the first combined IRRS-ARTEMIS (Integrated Regulatory Review Service - Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation) mission carried out on a worldwide scale in October 2018. The mission was requested in order to comply with the obligations of European Directives 2014/87/Euratom and 2011/70/Euratom.

The results of the mission can be summarised in the following figures:

- IRRS report: 13 recommendations / 20 suggestions / 1 good practice / 10 good performance areas
- ARTEMIS report: 5 recommendations / 2 suggestions / 1 good practice / 1 good performance area

Among the recommendations aimed at strengthening nuclear safety and radiation protection in the country are those relating to: the delay in the start-up of the Centralised Temporary Store for High Level Waste and Spent Fuel (ATC); the updating of the General Radioactive Waste Plan; the regulatory framework applicable to Deep Geological Disposal; public and inter-entity communication in the event of an emergency; the improvement of the process for establishing and revising regulations and guidelines in accordance with international standards; and cooperation agreements in relation to the management of contaminated land.

The good practices resulting from the mission, which may be exported internationally, are related to the nuclear and radioactive transport data management tool developed by the CSN and to the excellence of the ATC design.

The implementation of the actions identified in the Action Plan resulting from the mission is currently in full swing, with the aim of completing the great majority of the actions and achieving a satisfactory degree of progress in the remaining ones with a view to the follow-up mission initially scheduled for the autumn of 2021.

In May 2019, the report of the combined IRRS-ARTEMIS mission was made public (https://www.csn.es/en/misiones-internacionales).

As regards external assessments concerning Spanish nuclear power plants, the established policy of receiving and participating in exercises and peer evaluation missions remains in force. A total of 11 missions have been received from the World Association of Nuclear Operators (WANO) and the IAEA in the 2016-2018 period. The main new development during 2019 came in the form of a pre-SALTO (Safety Aspects of Long Term Operation) mission from the IAEA received by the Ascó-Vandellós II Nuclear Association (ANAV), aimed at evaluating the preparation of the Ascó and Vandellós II nuclear power plants for long-term operation.

In the field of operating experience, as has been reflected in previous reports, the CSN and Spanish nuclear power plants have established systematic methods for the assessment of both internal and external operating experiences, with the objective of identifying the root causes for the implementation of the corrective measures required to prevent their recurrence. In the 2016-2018 period, this systematic approach was maintained. Detailed information is provided in this report, particularly in section 19.7. The most important aspects are summarised here:

The CSN has developed a methodology in the field of operating experience based on two elements: the verification of the systematics developed by the licensees in their operating experience programmes and the analysis and tracking of incidents occurring at both Spanish and foreign plants. In relation to the tracking and analysis of events, the CSN has several instruments at its disposal: periodic meetings of the Incident Review Panel (national) and the International Incident Review Panel, and participation in international forums for the exchange of operating experience. As a result, a framework has been established that makes it possible, both nationally and internationally, to identify generic events that might affect Spanish nuclear power plants and to carry out or require the implementation of measures to prevent their repetition.

On the other hand, CSN Instruction IS-26 on basic nuclear safety requirements applicable at nuclear facilities establishes, among other things, basic requirements for the licensees of nuclear power plants in relation to their programme of operating experience, both their own and that of others. Likewise, the operating permits for nuclear power plants include a generic condition relating to the treatment of operating experience, which is developed in an ITC issued by the CSN for each facility; with regard to external operating experience, analysis is required of both reportable events occurring at other Spanish nuclear power plants and of operating experiences reported by the Institute of Nuclear Power Operations (INPO) (through WANO), by WANO, by the German Society for Nuclear Safety (GRS), by the main suppliers, and reports of deficiencies in safety equipment originating from the USA regulator (USNRC) and operating experience reports issued for German-designed nuclear power plants.

The Spanish nuclear power plants report their most significant events to WANO, with a view to sharing this operating experience with the worldwide nuclear sector.

Likewise, Spanish nuclear power plants have processes for screening, applicability analysis and definition of actions derived from events at other nuclear power plants, with the objective of preventing them from occurring at their facilities and of integrating the lessons learned into their own practices. These processes have been evaluated repeatedly by WANO, INPO and IAEA, and in all cases it has been concluded that they meet the requirements and standards of the sector.

In relation to their own operating experience, Spanish nuclear power plants have different recognised analysis methodologies. There are methods of analysis of root cause, apparent cause and common cause, most of them being standard methods in the sector or agreed between Spanish nuclear power plants. In relation to off-site events, each nuclear power plant has a systematic system for evaluating their applicability. The conclusions of the analyses of the most significant events, as well as the actions deriving therefrom, are reviewed by forums with a high level of responsibility on the part of the licensees. A fundamental tool for processing operational experience is the Corrective Action Programme (CAP).

CSN Instructions IS-11 and IS-12 require that training programmes include operational experience. Training in operational experience should be aimed at highlighting the root causes of incidents and the corrective actions necessary to prevent their recurrence.

Spanish nuclear power plants have established mechanisms for the exchange of both national and international operating experience. The CSN participates in the Working Group on Operating Experience (WGOE) of the Nuclear Energy Agency (NEA). As part of the activities of this group, in 2017 the International Operating experience workshop on Best Practices with Regulatory Operating Experience Databases was held in Madrid, organised by the CSN. Within the framework of the Nuclear Energy Committee (CEN), an organisation bringing together the licensees of nuclear power plants, there is a permanent operating experience working group, which carries out its own analyses. For its part, the CSN actively participates in the international Incident Reporting System (IRS) databases, dependent on the IAEA and the NEA; and the Nuclear Event Web-Based System (NEWS), dependent on the IAEA. Likewise, the CSN forms part of the Clearinghouse on Operating Experience feedback, a regional network comprises dedicated staff from European Commission Joint Research Centre in Petten and regulatory bodies from the member states.

Every two years, the CSN carries out inspections of operating experience with the objective of checking the systems established at nuclear power plants for analysing events. The licensees of the nuclear power plants submit an operating experience report on an annual basis.

Section 6.1 details the important issues relating to safety at Spanish nuclear power plants during the reporting period.

As regards the lessons learned from the Fukushima accident, in Spain the design modifications and all associated actions have been implemented, as described in the previous reports and as detailed in this report (mainly in sections 6.2 and 18.1), in which the latest modifications implemented are taken into account, pending completion of only one long-term action: the updating of the seismic characterisation of the sites, which is being carried out in accordance with the established programme, under the supervision of the CSN. During the three-year period of 2016-2018, three far-reaching, impactful modifications to safety improvement have been implemented (or completed) in all Spanish nuclear power plants: CAGE (*Centro Alternativo de Gestión de Emergencias,* Alternative Emergency Management Centre), SFVC (*Sistema de Venteo Filtrado de la Contención,* Containment Filtering Venting System) and PAR (Passive Autocatalytic Contained Hydrogen Recombiners).

As regards emergency drills and exercises, the programme described in previous reports has continued to be carried out, incorporating the lessons learned in each exercise for the continuous improvement of the response infrastructures and organisations, both those of the nuclear power plants and those of the institutions involved in the emergency plans and those of the CSN itself. Detailed information is provided in Chapter 16.

The off-site PENs (*planes de emergencia nuclear*, nuclear emergency plans) include the performance of at least two exercises per year, in which the personnel of the CSN Radiological Group participate. The scope of these exercises includes the activation and start-up of radiological access controls, ECDs (*Estaciones de Clasificación y Descontaminación,* Classification and Decontamination Stations) and Municipal Coordination Centres, with a view to maintaining the training of the plan's habitual personnel and facilitating the exchange of intervention personnel between the different emergency plans.

The PEIs (*Planes de Emergencia Interior,* Interior Emergency Plans) establish the obligation to carry out a general drill every year. The CSN draws up the annual schedule of simulations of the nuclear power plant PEIs, in which it specifies the minimum scope of each scenario. Detailed scenarios are not disclosed to the facility personnel or the CSN Emergency Response Organisation (ORE). In some cases, the development of drills has required the use of SAMG (*guías de gestión de accidentes severos,* severe accident management guidelines).

In addition, the CSN PAE (*Plan de Actuación en Emergencias,* Emergency Action Plan) has a programme of national and international exercises and drills that allows the operability of its technical capacities to be checked and the appropriate improvements to be made.

Likewise, a single CAE (Emergency Support Centre) has been established near Madrid, with portable power generation and water pumping equipment that can be taken to the affected facility within less than 24 hours of its activation.

The UME (*Unidad Militar de Emergencias,* Military Emergency Unit) is responsible for responding to emergencies arising from technological hazards, including nuclear hazards. The CSN signed a collaboration agreement with the UME, including aspects relating to telecommunications, training, emergency backup centre and the provision and maintenance of shared equipment. In addition, the CEN, through the Nuclear Forum, signed a Collaboration Protocol with the UME for intervention in extremely serious emergency situations at Spanish nuclear power plants.

Among the lessons learned from exercises and drills during the three-year period of 2016-2018, it is worth highlighting the need to set up reception areas for extraordinary means and resources, both national and international, in suitable predetermined places close to potentially affected areas, in order to facilitate the coordination of their actions and improve their effectiveness and efficiency, as well as to promote the use by the licensees of the nuclear power plants of the new means and resources available as a result of the post-Fukushima improvements.

Aspects related to transparency and public communication are covered in Chapter 8 (and in paragraphs 16.2 and 19.6 for incident and emergency reporting). In general, during the 2016-2018 period measures to improve transparency and communication as detailed in previous reports continued to be implemented, incorporating some additional actions. The following paragraphs summarise the essentials in this area.

The CSN 2017-2022 Strategic Plan includes transparency as one of the four instrumental objectives for achieving the fundamental objective of safety. The legal act creating the CSN expands the requirements in relation to public information, with the objective of increasing the transparency of the organisation and achieving greater public confidence in the actions of the CSN, establishing three ways of channelling this requirement: the transmission of information to State institutions; participation in information forums in the vicinity of nuclear power plants; and the establishment of an information policy for the general public. In addition, the Advisory Committee for Public information and participation on nuclear safety and radiation protection was established under this Act.

In this area, the most important milestone during the reporting period was the publication of the CSN Communication Plan (2017), relating to external, internal and emergency communication.

In addition, the CSN website continues to provide information on the minutes of Board of Commissioners meetings and the technical reports supporting decision making; the inspection reports; the operating states of the nuclear power plants; and the environmental radiological quality measured by the Automatic Stations Network and the Environmental Radiological Surveillance Network. The results of the SISC (*Sistema Integrado de Supervisión de Centrales Nucleares*, Integrated Nuclear Power Plant Supervision System) are also presented.

As regards information for the media and stakeholder groups, the CSN responds to direct requests from the media, applying criteria of transparency and agility to the extent allowed by technical rigour.

The CSN has maintained other existing traditional means of communication, such as participation in information committees for the population surrounding nuclear power plants, the organisation of conferences, seminars and training activities, the operation of the information centre (an interactive space

which covers all activities relating to the CSN's mission and is open to the public and free of charge), the issue of publications of a technical and informative nature and a journal on nuclear safety and radiation protection, the aim of which is to communicate with the public in order to facilitate understanding of issues relating to the organisation's activity.

At the international level, the CSN has continued to collaborate in the NEA Working Group on Public Communication, sharing experiences and good practices regarding regulatory body communication.

The aforementioned Advisory Committee for public information and participation on nuclear safety and radiation protection continues to be a basic instrument in the identification and implementation of improvements in the area of transparency and communication. It incorporates an Analysis Commission, the mission of which is to analyse proposals for recommendations which serve as a basis for decision-making by the Committee. Since its creation, and as of the time that this report was written, the Committee has made 10 recommendations, most of which have already been implemented while the rest are in the process of being implemented.

In the process of drawing up standards, the CSN continues to apply the established procedure for public information and participation, submitting the draft standards for comment, giving audiences to the interested parties and informing society.

As regards the reporting of operating incidents, CSN Instruction IS-10 Rev.1 establishes the criteria for the reporting of events at nuclear power plants. Likewise, in the case of incidents considered of interest by the CSN, news, reviews and press releases are published on the regulator's website. In the case of incidents classified above level 0 on the IAEA's International Nuclear and Radiological Event Scale (INES), the CSN has a public communication mechanism established in its procedures.

As regards emergency communication, a Spanish Royal Decree is pending approval in relation to providing information to members of the public, intervention personnel and the EU, international organisations and neighbouring countries that may potentially be affected in the event of a nuclear or radiological emergency.

Finally, it should be pointed out that although this has occurred outside the period covered by this report, the modification of the composition of the members of the Board of Commissioners of the Nuclear Safety Council constitutes a significant milestone for the regulatory body. On 29 March 2019, the Chairman and three directors of the Board of Commissioners of the Body were changed.

To this end, since that date the composition of the Board of Commissioners has been as follows:

- President: Mr. Josep María Serena i Sender
- Board member: Mr. Javier Dies Llovera
- Board member: Mr. Francisco Miguel Castejón Magaña
- Board member: Ms. María Pilar Lucio Carrasco
- Board member: Ms Elvira Romera Gutiérrez
- General Secretary: Mr. Manuel Rodríguez Martí

III. Compliance with the Obligations of the Convention

Article 6. Existing nuclear installations

This Article describes the most relevant safety issues and improvement programmes that have been developed since the last national report in connection with Spanish nuclear power plants. Appendix 6.A includes updated data on the nuclear facilities existing in Spain and included within the scope of the Convention.

6.1 Overview of significant security-related issues

Almaraz I and II nuclear power plants

On 7 June 2010, the Ministry of Industry, Tourism and Trade granted the plant a 10-year renewal of its Operating Licence. The Operating Licence included requirements for the implementation of a series of safety improvements, some of which are described in section 6.2 and others referenced therein.

During the period covered by this report, the licensee reported 27 events, 25 of which have been classified as level 0 on the International Nuclear Events Scale (INES), and two classified as level 1 (the same event in each unit), relating to non-compliance with the Technical Specifications (ETF) due to the inoperability of the component cooling system caused by problems in the heat exchanger cleaning system, affecting train B in unit I and train A in unit II.

During this period there was an automatic shutdown at Almaraz II NPP, due to a high steam generator level, and there were no unscheduled shutdowns.

In addition, in application of the CSN procedures for responding to significant events, the following specific inspections were carried out, both in 2016:

- A reactive inspection of the two units of the centre with regard to pump motor faults in the essential services system.
- A supplementary grade 1 inspection of the SISC (*Sistema Integrado de Supervisión de Centrales,* Integrated Plant Supervision System) as a consequence of a "white" performance indicator in the reliability index of the emergency diesel generators of unit II.

The purpose of these inspections has been to ensure that the licensee clearly determines the scope and extent of the problem identified and understands the causes and factors contributing to this problem and that the corrective actions necessary to correct the problem and prevent its recurrence are identified and applied.

Applying the CSN procedures regulating inspections (SISC) and the enforcement process, the CSN issued a warning to the licensee in 2018 for the following reasons:

- Non-compliance with ETF 3.9.7.2. as a result of having performed a series of movements of the spent fuel cask without prior fulfilment of the Surveillance Requirements required by said ETF. (unit I).
- Non-compliance with Article 8.6 of CSN Instruction IS-32 during performance of the surveillance test of the containment enclosure sprinkler system, as it was not declared inoperable (common to both units).
- Non-compliance with section 9 of CSN Instruction IS-21, for not opening an 'anomalous condition' investigation. In this case, the 'anomalous condition' investigation should have analysed the decrease in the volume of water in the essential services reservoir detected by the licensee after carrying out bathymetry of the reservoir (shared by both units).
- Non-compliance with section 9 of CSN Instruction IS-21, for not opening an 'anomalous condition' investigation. In this case, the 'anomalous condition' investigation should have analysed the acceptance criterion of the surveillance test carried out on the containment enclosure spray system, when this is tested in recirculation mode (U1 and 2) (shared by both units).

Ascó I and II nuclear power plants

On 27 September 2011, the Ministry of Industry, Tourism and Trade granted the plant a 10-year renewal of its Operating Licence. The Operating Licence included the requirement to introduce a series of safety improvements which are set out in section 6.2 and other sections referenced therein.

During the period covered by this report, the licensee reported 35 events, all of which have been classified as level 0 on the INES Scale.

There were no automatic shutdowns of the reactor during this period.

At Ascó I NPP, an unscheduled shutdown of the reactor was carried out in April 2017 to identify a potential leak from the pressure barrier, which was ultimately discarded when it was verified that the leak was occurring through a valve gland.

At Ascó II NPP there were two unscheduled shutdowns, both in 2018. The first was due to application of the ETF action associated with the inoperability of an extended-range neutron flux detector for a longer time than that allowed by the ETF. The second was in order to repair the main feed water turbo-pump A to the steam generators.

The following specific inspections were carried out in application of the CSN procedures for responding to exceptional events:

- May 2016. Ascó II NPP. Inspection in support of resident inspection in response to a boron dilution event during the refuelling outage.
- June 2016. Ascó I and II NPP. Inspection regarding the use of chemical bolts, which incorporate adhesive mortars as a chemical fixing system in support anchors.
- May 2017. Ascó I NPP. Reactive inspection for loss of external power in bar 9A due to water filtration in the electrical room of the turbine building coming from a non-secure area that had been partially flooded. This event gave rise to an alert on the site (a category II event under the plant's on-site emergency plan), as the licensee believed that the fire detection system had been triggered by a fire lasting more than 10 minutes, when it had actually been activated by smoke generated by degradation of the insulating materials of electrical components caused by the water.
- November 2018. A supplementary grade 1 inspection at Ascó II NPP related to a "white" inspection finding, due to the failure to open an 'anomalous condition' investigation and to perform the corresponding operability analyses of an emergency diesel generator with flexible couplings that had exceeded the maximum useful life permitted by the manufacturer.

Applying the CSN procedures regulating inspection (SISC) and the enforcement process, the CSN issued a warning to the licensee for the following reasons:

Year 2016:

- Non-compliance with CSN Instruction IS-01, defining the format and content of the individual radiological tracking document, and with Spanish Royal Decree 413/1997 on the operational protection of external workers; the Radiation Protection Manual (MPR) and the PR-D-002 plant procedure on requirements for a worker to be considered exposed to ionising radiation. Control of registrations and de-registrations.
- Non-compliance with ETF 3/4.9 "Fuel refuelling operations".

Year 2017:

- Non-compliance with the Operating Licence in relation to the management and control of radioactive waste.

Year 2018:

- Non-compliance with Technical Instruction CSN/IT/DSN/AS0/13/03 on ventilation systems.

Likewise, in 2018 the CSN proposed the opening of an enforcement file for minor infringements due to non-compliance with Instruction IS-21 on requirements applicable to nuclear power plant design modifications, deriving from the inspection target found in unit II mentioned above.

Cofrentes nuclear power plant

On 10 March 2011, the Ministry of Industry, Tourism and Trade granted the plant a 10-year renewal of its Operating Licence. The Operating Licence included requirements for the implementation of a series of safety improvements, some of which are described in section 6.2 and others referenced therein.

During this period the licensee reported 18 events classified as level 0 on the INES Scale, except for one, classified as level 1, which occurred in October 2017, when an unscheduled shutdown was performed to identify the cause of a flow discrepancy between the feed water loops, caused by parts detached from a control valve that had been housed in the reactor spray sprinklers.

During this period, there were no automatic reactor shutdowns, one unscheduled shutdown and three scheduled shutdowns, one of which was for refuelling No. 21, which took place between 23 September and 28 October 2017.

On 31st October 2017, during the startup following the 21st refuelling outage, the plant was subjected to an unscheduled shutdown, as an imbalance of flow rates between the two feed water lines was detected. During this shutdown, the A line was inspected, including the feed water sprinklers and the A loop (spargers), recovering the loose parts from a valve on this line from which they had been detached and dragged and fitted into the sparger. The shutdown ended on December 6, 2017, after the repair.

In January and February 2018, programmed stops were made to correct dripping that was detected between the joints of the control rod drive mechanisms (CRD), resolving the deviation satisfactorily.

Applying the CSN procedures for responding to significant events, the following specific inspections were carried out, corresponding to the aforementioned incidents:

- November 2017. Reactive inspection of a discrepancy between the flow rates of the feed water loops as a result of the detachment of loose parts of a check valve and its housing in the core sprinklers.
- July 2018. Additional inspection of CRD gaskets for leaks.

Applying the CSN procedures regulating inspection (SISC) and the enforcement process, the CSN issued a warning to the licensee during this period for the following reasons:

Year 2016:

- Non-compliance with the deadlines established in Complementary Instruction CSN/ITC/SG/COF/13/05 of the Council to validate the procedures associated with the instrumentation implemented in the spent fuel pool, as part of the post-Fukushima actions.

Year 2018:

- Non-compliance with CSN instructions IS-21 and IS-32, relating respectively to the design modifications and the ETF, as the anomalous condition of the feedwater system was not identified when detecting the discrepancy between the loop flows.

Trillo Nuclear Centre

On 17 November 2014, the Ministry of Industry, Energy and Tourism awarded the plant a 10-year renewal of its Operating Licence. The Operating Licence includes the requirement to introduce a series of safety improvements that are set out in section 6.2 and other sections referenced therein.

During this period the licensee reported 3 events, none of which has been classified above level 0 in the INES Scale.

No automatic or unscheduled shutdowns of the reactor occurred during the period.

There were no specific CSN inspections regarding significant events.

Applying the CSN procedures regulating inspection (SISC) and the enforcement process, in 2017 the CSN issued a warning to the licensee of the Trillo NPP for the following reason:

- Non-compliance with CSN Instruction IS-21 on design modifications at nuclear power plants and with CSN Instruction IS-23 on in-service inspection due to ventilation gate leaks in excess of that established in the plant licensing bases.

Vandellós II nuclear power plant

On 21 July 2010, the Ministry of Industry, Tourism and Trade granted the plant a 10-year renewal of its Operating Licence. The Operating Licence included requirements for the implementation of a series of safety improvements, some of which are described in section 6.2 and others referenced therein.

During the period covered by this report, the licensee reported 22 events, all of which have been classified as level 0 on the INES Scale.

During this period there were three unscheduled reactor outages, two in 2018, due to commencement of the facility's ETF actions to identify potential pressure barrier leaks, which were confirmed in both cases. In 2016, an automatic shutdown occurred due to a high neutron flux in the intermediate range detectors as a result of a defect in the implementation of a design modification during the refuelling outage.

Throughout the period and in application of the CSN procedures for responding to significant events, the following specific inspections were carried out:

- December 2016: Reactive inspection regarding the inoperability of both trains of the residual heat evacuation system due to the loss of the power supply of the A-14 protection cabinet.
- August 2017: A reactive inspection due to repetitive failures observed in relays of the essential chilled water system.

- March 2018: A reactive inspection after identification of pressure barrier leaks.
- July 2018: A reactive inspection after a failure to close an opened safety valve on train A of the waste heat extraction system which was in operating mode 5 during the post-stop start-up process in order to repair leaks in the pressure barrier.
- December 2018: A reactive inspection after identification of pressure barrier leaks.

Applying the CSN procedures regulating inspection and the enforcement process, the CSN proposed the following actions for the following reasons:

Year 2017:

- A warning for non-compliance with CSN Instruction IS-30 on protection against fires at nuclear power plants, and with the post-Fukushima adapted ITC CSN/ITC/SG/VA2/13/04, as regards protection requirements against large fires.
- Opening of penalty proceedings for non-compliance with CSN Instruction IS-30, on fire protection at nuclear power plants, in relation to the periods for implementation of design modifications.
- A warning for non-compliance with ETF due to improper time alignment of the fuel building emergency ventilation system.

6.2 Overview of programmes and measures foreseen for continuous improvement of facility safety

In December 2017 the CSN submitted revision 2 of the National Action Plan for post-Fukushima measures (NAcP) to ENSREG, as agreed at the plenary meeting of this organisation in June 2017, which states that the implementation of the actions and commitments undertaken by Spain after European endurance tests has been completed or is at a very advanced stage. The exhaustive application of the lessons learned in response to the Fukushima accident, including the improvements implemented in the nuclear power plants, was deemed an area of excellent performance as a result of the IRRS-ARTEMIS mission to Spain in 2018. The specific improvements at each nuclear power plant are detailed below.

Almaraz I and II nuclear power plants

The Operating Licence includes conditions for the continuous improvement of plant safety, resulting from the assessment of the Periodic Safety Review (PSR) and the NAC (*Normativa de Aplicación Condicionada*, Conditional Application Standard), as support processes for the Operating Licence renewal application. As required by the Operating Licence, the licensee is completing the transition to the NFPA 805 fire protection standard by implementing the modifications and improvements derived from the analyses performed.

In addition, the Operating Licence requires the systematic analysis of both internal and external operating experience in order to assess its applicability to the plant and the implementation of corrective and improvement measures, as well as the analysis of the applicability of new regulations issued in the origin country of the project. In both cases the results of the analyses performed are incorporated in an annual report that the licensee submits to the CSN during the first quarter of the year, for supervision and monitoring by that organisation.

As regards actions following the Fukushima accident, during this period (2016-2018) the plant completed the implementation and commissioning of the following design modifications, after obtaining the corresponding favourable assessment from the CSN or ministerial authorisation, as the case may be:

- installation in the containment of passive autocatalytic hydrogen recombiners (PAR) in unit II (unit I was completed in 2015)
- an alternative emergency management centre (CAGE) in Almaraz NPP

- a filtered vent system in units I and II
- design modification of the containment isolation system for sampling of the containment atmosphere in units I and II

With these actions, the licensee has fulfilled compliance with the requirements established by the CSN in the ITC issued following the Fukushima accident, with the exception of the requirements established in the ITC for updating the seismic characterisation of the site, which the licensee is carrying out in accordance with the established deadlines.

Sections 18.1.4, 18.1.5 and 18.1.6 detail improvements in safety and designs, in addition to those deriving from the PSR and NAC. Among the most relevant is the licensing process for the transition to the Improved Technical Specifications (ETFM), in accordance with the United States Nuclear Regulatory Commission (USNRC) standard NUREG-1431, Rev.4

Ascó I and II nuclear power plants

The Operating Licence contains conditions for continuous safety improvements resulting from the evaluation of the PSR and the NAC as support processes for the Operating Licence renewal application. During this period, the licensee continued to implement the improvements deriving from the analysis of compliance with CSN Instruction IS-27 of the Nuclear Safety Council on general design criteria for nuclear power plants, relating to the capacity for remote shutdown in the event of abandonment of the control room and the associated action plan required under the Operating Licence. The licensing process is in the final phase.

Likewise, the Operating Licence requires the systematic analysis of both internal and external operating experience in order to assess its applicability to the plant and the implementation of corrective and improvement measures, as well as the analysis of the applicability of new regulations issued in the origin country of the project. The results of the analyses performed are incorporated into an annual report that the licensee submits to the CSN during the first quarter of the year.

As regards actions following the Fukushima accident, during this period (2016-2018) the plant completed the implementation and commissioning of the following design modifications, after obtaining the corresponding favourable assessment from the CSN or ministerial authorisation, as the case may be:

- CAGE of NPP Ascó
- a filtered vent system in units I and II
- a design modification whereby passive seals have been implanted in the reactor coolant pumps

With these actions, the licensee has fulfilled compliance with the requirements established by the CSN in the ITC issued following the Fukushima accident, with the exception of the requirements established in the ITC for updating the seismic characterisation of the site, which the licensee is carrying out in accordance with the established deadlines. All of this is recorded in the NAcP sent to ENSREG by the CSN in December 2017.

Sections 18.1.4, 18.1.5 and 18.1.6 detail improvements in safety and designs, in addition to those deriving from the PSR and NAC. Among the most relevant is the licensing process for the transition to ETFM, in accordance with USNRC standard NUREG-1431, Rev.4

Cofrentes nuclear power plant

The Operating Licence includes conditions for continuous plant safety improvements, resulting from the evaluation of the PSR and the NAC as support processes for the Operating Licence renewal application.

During the period covered by this report, the improvements derived from the PSR were completed, affecting relevant documents of the facility, such as the Quality Assurance Manual, the Radioactive Waste and Spent Fuel Management Plan and the scope of the annual reports on operating experience and new standards. Among others, aspects relating to radiation protection and dosimetry control, training activities, application of the Maintenance Rule, environmental qualification, management of severe accidents, probabilistic safety analyses, deterministic studies of internal flooding, seismic margins and remote shutdown systems have been addressed; among the most significant design improvements is the availability of the water level signal in the vessel in the post-accident recorders.

Likewise, the Operating Licence requires the systematic analysis of both internal and external operating experience in order to assess its applicability to the plant and the implementation of corrective and improvement measures, as well as the analysis of the applicability of new regulations issued in the origin country of the project. The results of the analyses performed are incorporated into an annual report that the licensee submits to the CSN during the first quarter of the year.

As regards actions following the Fukushima accident, during this period (2016-2018) the plant completed the implementation and commissioning of the following design modifications, after obtaining the corresponding favourable assessment from the CSN or ministerial authorisation, as the case may be:

- an alternative emergency management centre (CAGE)
- a filtered containment vent system (SVFC)
- passive autocatalytic recombiners (PAR)

With these actions, the licensee has fulfilled compliance with the requirements established by the CSN in the ITC issued following the Fukushima accident, with the exception of the requirements established in the ITC for updating the seismic characterisation of the site, which the licensee is carrying out in accordance with the established deadlines. All of this is included in the NAcP sent to ENSREG by the CSN in December 2017

As a result of the NAC analysis improvements have also been completed, such as:

- analysis of the contained combustible gases control system.
- reanalysis of the safe shutdown capacity of the plant in the event of abandonment of the control room.
- improved accuracy in the measurement of temperature difference channels.
- implantation of triggering of Class 1E battery chargers by overvoltage in the output.
- completeness of the testing programme in accordance with the ASME code.
- implementation of improvements resulting from analyses of containment purge isolation valve actuators to guarantee the capacity and integrity of the seat seal and operational improvements to minimise the operating time of the containment purge system.
- analysis of compliance with the single failure criterion of various plant logics.
- Analysis and implementation of improvements in cable separation.
- protection against atmospheric discharges.
- review of the PDRD (*Plan Director de Reducción de Dosis,* Dose Reduction Master Plan), including an independent audit of the plant's ALARA programme

Sections 18.1.4, 18.1.5 and 18.1.6 detail safety and design improvements, some of which are additional to those deriving from the PSR and NAC.

Trillo Nuclear Centre

The Operating Licence includes conditions for continuous plant safety improvements, resulting from the evaluation of the PSR and the NAC, as support processes for the Operating Licence renewal application. In this context, the main improvements implemented at the plant during the period covered by this report are as follows:

- Updating of the Safety Study to explicitly include the characteristics of the site.
- Improvements in leak testing of valves and isolation dampers of containment ventilation systems,
- Improved testing of filtration and ventilation systems
- Improvements in ageing management programmes
- Improved instrumentation testing and control of safety-related systems

Likewise, the Operating Licence requires the systematic analysis of both internal and external operating experience in order to assess its applicability to the plant and the implementation of corrective and improvement measures, as well as the analysis of the applicability of the new standards issued in the origin country of the project (also including US standards, even though it is not the origin country of the Trillo NPP project). In both cases the results of the analyses performed are incorporated in an annual report that the licensee submits to the CSN during the first quarter of the year, for supervision and monitoring by that organisation.

As regards actions following the Fukushima accident, during this period (2016-2018) the plant completed the implementation and commissioning of the following modifications, after obtaining the corresponding favourable assessment from the CSN or ministerial authorisation, as the case may be:

- CAGE
- Implementation of the filtered containment venting system (SVFC).

With these actions, the licensee has fulfilled compliance with the requirements established by the CSN in the ITC issued following the Fukushima accident, with the exception of the requirements established in the ITC for updating the seismic characterisation of the site, which the licensee is carrying out in accordance with the established deadlines. All of this is recorded in the NAcP sent to ENSREG by the CSN in December 2017.

Sections 18.1.4, 18.1.5 and 18.1.6 detail improvements in safety and designs, in addition to those deriving from the PSR and NAC.**Vandellós II nuclear power plant.**

The Operating Licence includes conditions for continuous plant safety improvements, requiring the implementation of actions derived from the PSR and the NAC, as support processes for the Operating Licence renewal application.

In this context, during the period under examination, the licensee continued to implement improvements deriving from analyses of compliance with the CSNIS-27 Instructions on general design criteria in relation to the electrical independence of the control circuits of safe shutdown equipment and IS-30 on fire protection requirements in the event of a control room fire. The associated licensing process is in the final evaluation phase.

Likewise, the Operating Licence requires the systematic analysis of both internal and external operating experience in order to assess its applicability to the plant and the implementation of corrective and improvement measures, as well as the analysis of the applicability of new regulations issued in the origin country of the project. In both cases the results of the analyses performed are incorporated in an annual report that the licensee submits to the CSN during the first quarter of the year, for supervision and monitoring by that organisation.

As regards actions following the Fukushima accident, during this period (2016-2018) the plant completed the implementation and commissioning of the following modifications, after obtaining the corresponding favourable assessment from the CSN or ministerial authorisation, as the case may be:

- installation of PARs
- an alternative emergency management centre (CAGE)
- Implementation of a filtered containment venting system

With these actions, the licensee has fulfilled compliance with the requirements established by the CSN in the ITC issued following the Fukushima accident, with the exception of the requirements established in the ITC for updating the seismic characterisation of the site, which the licensee is carrying out in accordance with the established deadlines. All of this is recorded in the NAcP sent to ENSREG by the CSN in December 2017.

Sections 18.1.4, 18.1.5 and 18.1.6 detail safety and design improvements, in addition to those derived from the PSR-NAC. Among the most relevant is the licensing process for the transition to ETFM, in accordance with USNRC standard NUREG-1431, Rev.4

6.3. Identification of those facilities for which there are closure decisions

The Operating Licence granted by the Ministry of Industry, Tourism and Trade on 3 July 2009 authorised the operation of the CNSMG (Santa María de Garoña Nuclear Power Plant) until 6 July 2013. However, at the end of 2012 the licensee voluntarily decided to halt the operation of the plant and proceeded to unload the fuel from the reactor vessel to the irradiated fuel pool. Finally, on July 6, 2013, the Ministry declared that the CNSMG had ceased to operate.

Subsequently, on May 27, 2014, the licensee requested the renewal of the Operating Licence, within the period of one year from the declaration of cessation, established in Article 28 of the Regulation on Nuclear and Radioactive Installations, approved by Spanish Royal Decree 1836/1999, of 3rd December (RINR), which allows this renewal to be requested, provided that it did not take place for reasons of nuclear safety and radiation protection. The CSN issued Technical Instruction CSN/ITC/SG/SMG/14/01, containing requirements and establishing a period for the submission of documents in support of the licensee's request.

During the period covered by the report, the CSN evaluated the licensee's request, issuing the corresponding mandatory favourable report in February 2017 with conditions and requirements to be implemented prior to start-up. Despite the favourable assessment of the CSN, in August 2017 the Ministry refused to renew the CNSMG's Operating Licence. From that moment onwards, the licensee began a process of adapting the plant to the condition of cessation, abandoning the maintenance and conservation of those systems that up to that moment had been carried out in anticipation of a possible resumption of operation and that are not necessary in the event of cessation of operation. Likewise, it initiated the pre-dismantling activities authorised by the ministerial cessation order of July 6th 2013 and within the framework of the ITC issued by the CSN associated with said cessation order.

During the period of this report no events were reported that have been classified above Level 0 on the INES Scale.

6.4 Position regarding the continued operation of nuclear power plants

All Spanish nuclear power plants comply with the articles of the Convention on Nuclear Safety. Spanish nuclear power plants are subject to an Operating Licence renewal regime for a fixed period of time. Furthermore, the plants are required to issue PSRs at least once every 10 years updating the systematic continuous safety assessment programmes, the results of which lead to the implementation of improvements. Those facilities for which the Operating Licence renewal application includes the beginning of the LTO (*Operación a Largo Plazo,* Long-Term Operation) within the authorised period must provide an integrated plan for ageing assessment and management as part of the documentation to be sent to the Administration, among other additional requirements.

The current position of the licensees of the Spanish nuclear power plants is to request the renewal of their respective PSAs when they expire.

In May 2017 revision 2 of CSN Safety Guide 1.10 was published, which regulates the preparation of the PSR, reinforcing the self-assessment performed by the licensees, in line with IAEA guide SSG-25. In

June 2017 the Ministerial Orders referring to the Operating Licences of the nuclear power plants were modified, establishing a period of 3 years prior to the expiry of the current Operating Licence for the submission of a series of support documents for long-term operation, among which the PSR is not included. In this manner, the deadlines for submitting the PSR and the request for renewal of the Operating Licence become independent, linking the PSR to compliance with the requirements established in the new Nuclear Safety Regulation (RSN), which transposes the Nuclear Safety Directive 2014/87 Euratom, issued on 8th July 2014 by the European Council, after modifying the current directive 2009/71 as a consequence of the 2011 accident at Fukushima in order to reinforce the European regulatory framework as regards safety objectives in the operation and management of facilities throughout their entire life cycle, to the Spanish regulatory framework. This RSN came into force via Spanish Royal Decree 1400/2018 of 23 November 2018.

In line with the foregoing, in June and July 2017 respectively, the Almaraz and Vandellós 2 nuclear power plants, the Operating Licences of which expire the soonest, sent the supporting documentation for long-term operation to the competent Ministry, and in December 2017 sent the CSN the PSR Base Document, which was favourably assessed by the CSN in June 2018. Since then, both plants have been carrying out the work associated with the PSR. The Ascó and Cofrentes nuclear power plants presented the Base Documents of their respective PSRs to the CSN in December 2018.

The continuity of operation of the plants during the period under examination must be analysed in terms of economic viability, the conditions imposed by the nuclear safety requirements, the economic framework and the fight against climate change undertaken by Spain within the framework of the European Union.

6.5 Vienna Declaration

The information contained in this chapter includes important elements that illustrate Spain's compliance with the commitments derived from the Vienna Declaration.

Section 6.1 thus details the significant safety incidents that occurred at the Spanish nuclear power plants during the reporting period and the response measures taken both by the licensees and, when necessary, by the CSN. It has been concluded that, in all incidents that have occurred, the licensee has identified the causes and established the appropriate corrective actions. The processes for responding to significant safety incidents established by both the licensees and the CSN constitute in themselves systematic safety assessment and review mechanisms, resulting in improvements in the design and operation of the plants. It should also be pointed out that all reportable events are classified in accordance with the INES scale, which is a widely used and internationally accepted methodology for assessing events.

Section 6.2 describes the main safety improvements specific to each plant implemented during the period covered by this report. Many of these actions contribute to the objective of improving the design to prevent accidents and mitigate radioactivity emissions should an accident occur. Most of these improvements arise as results of PSRs and NACs, which are periodic, comprehensive and systematic processes which are perfectly consolidated and carried out in accordance with IAEA standards and other good practices acquired through accumulated experience and peer-to-peer exchange.

The improvements identified in the PSR and the NAC for implementation in the following period are prioritised in accordance with their safety benefits and, together with other improvements considered by the CSN, may be incorporated as conditions in the renewal of the corresponding Operating Licence or through specific ITC. The regulatory requirements for the performance of PSRs (Safety Guide GS 1.10, included by reference in the Operating Licence) include the revision of the standards issued by the IAEA.

Finally, section 6.4 explains that the justification for the continuity of plant operation is based on the established on-going safety review programmes, among which the PSR and NAC should be highlighted.

APPENDIX 6

Basic characteristics of Spanish nuclear plants

Basic characteristics of nuclear plants

	Almaraz	Ascó	Vandellós II	Trillo	Santa María de Garoña[1]	Cofrentes
Type	PWR	PWR	PWR	PWR	BWR	BWR
Number of units	2	2	1	1	1	1
Heating capacity (MW)	Unit I: 2,947 Unit II: 2,947	UI: 2,940.6 UII: 2,940.6	2,940.6	3,010	1,381	3,237
Electrical power (MW)	UI: 1,049.43 UII: 1,044.45	UI: 1,032.5 UII: 1,027.2	1,087.1	1,066	466	1,092.02
Cooling	Open: reservoir of Arrocampo	Mixed: River Ebro - Towers	Open: sea Mediterranean	Closed: towers, Tagus River contribution	Open: Ebro River	Closed: towers, Júcar River contribution
Prior Authorisation	UI: 29/10/1971 UII: 23/05/1972	UI: 21/04/1972 UII: 21/04/1972	27/02/1976	04/09/1975	08/08/1963	13/11/1972
Construction permit	UI: 02/07/1973 UII: 02/07/1973	UI: 16/05/1974 UII: 07/03/1975	29/12/1980	17/08/1979	02/05/1966	09/09/1975
Authorisation for commissioning	UI: 10/03/1980 UII: 15/06/1983	UI: 22/07/1982 UII: 22/04/1985	17/08/1987	04/12/1987	30/10/1970	23/07/1984
Operating permit	UI and UII: 08/06/2010	UI: 02/10/2011 UII: 02/10/2011	26/07/2010	17/11/2014		20/03/2011

[1] Authorisation expired. In a state of definitive shutdown, pending commencement of dismantling.

Article 7. Legislative and regulatory framework

7.1. Establishment and maintaining a legislative and regulatory framework

7.1.1. Overview of the primary legislative framework for nuclear safety

With regard to nuclear safety, during the period from January 2016 to December 2018, the following laws affecting nuclear safety matters were officially approved and published:

Organic Law 3/2018 of 5 December on the protection of personal data, guaranteeing digital rights.

Regulation (EU) 2016/679 of 27 April 2016 on the protection of individuals with regard to the processing of their personal data and on the free movement of such data strengthened the legal certainty and transparency of personal data. Although the Regulation was directly applicable in Spain as of 25 May 2018, a new organic law was needed to replace the previous one (Organic Law 5/1992, of 29 October, regulating the automated processing of personal data).

This new law contemplates the principles of data protection, the rights of individuals and the provisions applicable to specific processing. This requires a prior assessment by the data controller or data processor of the risk that the processing of personal data may entail, so that the appropriate measures can be adopted on the basis of this assessment. The role of the Data Protection Officer is introduced, who, among other functions, has the task of facilitating amicable resolution of complaints. This law regulates matters relating to the Spanish Data Protection Agency and the autonomous authorities in this area, and establishes an enforcement system.

Law 9/2018 of 5 December amending Law 21/2013 of 9 December on environmental assessment, Law 21/2015 of 20 July amending Law 43/2003 of 21 November on forestry and Law 1/2005 of 9 March regulating the greenhouse gas emission allowance trading scheme.

This new law completes the transposition of Directive 2014/52/EU of the European Parliament and of the Council, of 16 April 2014, on environmental impact assessment, modifying some aspects of previous laws: the principles inspiring environmental assessment are now rearranged, the preferential use of electronic means is introduced to guarantee the effective participation of stakeholders in environmental assessment processes, and an obligation is established on the part of the developer to include an analysis on the vulnerability of projects to serious accidents or catastrophes in any environmental impact study. It acts as a preventive instrument. Specifically, all the actions to be performed by the CSN are included in the procedure for the environmental impact assessment of projects to be authorised in accordance with the RINR (*Reglamento sobre Instalaciones Nucleares y Radiactivas,* Regulation on Nuclear and Radioactive Installations) approved by Spanish Royal Decree 1836/1999, of 3rd December. In accordance with Law 15/1980 of 22nd April, which created this Organisation, the CSN is responsible for assessing the environmental radiological impact of nuclear and radioactive facilities and of activities involving the use of ionising radiation in accordance with the provisions of the applicable legislation.

Spanish Royal Decree-Law 12/2018 of 7 September on the security of networks and information systems.

This transposes Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 on measures to ensure a high common level of security of networks and information systems within the Union. This Spanish Royal Decree-Law applies to entities that provide essential services for the community and depend on networks and information systems for the performance of their activities, including the CSN.

Operators should take appropriate measures to manage the risks posed to the security of the networks and information systems they use, even if their management is outsourced. Notification of events or incidents that may affect these services was envisaged. In order to increase its effectiveness and to reduce the administrative and economic burdens that the obligations of this standard impose on the entities concerned, the aim is to ensure that it is consistent with the obligations arising from the application of other rules on information security.

7.1.2. Ratification of international conventions and legal instruments related to nuclear safety

The CSN Strategic Plan for 2017-2021 includes as an objective:

Updating and revision of the standards and regulations as a consequence of the amendments to Directives 2013/59/EURATOM and 2014/87/EURATOM and the application of the principles of effective regulation.

The RSN transposing Directive 2014/87 Euratom was published on 23 November 2018, as indicated in paragraph 6.4 above.

7.1.3. Implementation of WENRA's Terms of Reference

Spain actively participates in WENRA through the working groups on harmonisation of reactors (RHWG) and waste and decommissioning (WGWD), in addition to permanent representation during WENRA plenaries. The study of the harmonisation of reactor safety, published by WENRA in January 2006, established the requirements to be met under the regulations established by the different regulatory bodies, in order to facilitate the preparation of the corresponding action plans, identifying the regulations to be developed or modified. The action plan established by the CSN in 2006 contemplated the issue of fifteen Council instructions and some modification to the RINR.

Subsequently, and after the 2011 accident in Fukushima, WENRA published, in September 2014, a new list of reference levels (Reference Levels, RL), modifying 101 of the previous ones and incorporating new editions, adding a total of 342 RL distributed in 19 thematic areas (issues). In addition, WENRA agreed to conduct a self-assessment and peer review process of each country's status with respect to the 2014 LRs, as well as to report on progress in the degree of compliance through individual quantitative and qualitative reports since January 2016. In accordance with the programme and schedule established by the RHWG, in June 2016 Spain issued the self-assessment report, the results of which were subjected to a peer review process that led to the preparation of the action plan that was updated, in the period covered by this report, in 2017 and 2018. In general, it may be said that the incorporation of the revised RL following Fukushima has a minor impact on the Spanish regulatory framework, due to the fact that many of the new requirements have already been incorporated by the CSN into the ITCs (mandatory instructions associated with the Operating Licence of the facilities) issued to all nuclear power plants (and other nuclear facilities) as a result of the Fukushima accident. In addition, the Council's new instructions have also incorporated many of the revised RLs.

The results of the process were published in a WENRA report in September 2018, with particularly positive results for Spain, with the best compliance out of reference levels from the 16 member countries.

The latest report issued by Spain on the degree of implementation of the RL, of 31st December 2018, states that 6 of the 101 RL that were revised in 2014 have not yet been implemented, and this has been included in the Action Plan of the associated CSN for the year 2019, the execution of which is expected to be completed this year.

7.1.4. Challenge 2. Updating of legislation on nuclear safety, radiation protection and emergencies (new section)

During this period, the transposition into Spanish law of Council **Directive 2014/87/Euratom** of 8 July 2014 (amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear facilities) was completed. The transposition of this Directive was completed with the approval and publication of Spanish Royal Decree 1400/2018, of 23rd November, approving the Regulations on nuclear safety at nuclear facilities, although the directive as a whole has been transposed to a total of 28 national provisions of varying rank (Laws, Royal Decrees-RD, Royal Legislative Decrees-RDL and CSN Instructions), most of which were already in force on the date of adoption of the directive.

Furthermore, in the period from January 2016 to December 2018, progress continued towards the transposition of **Directive 2013/59/Euratom** of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

7.2. National safety requirements and regulations

7.2.1. General framework for secondary legislation in the field of nuclear safety

In addition to the laws listed in section 7.1.1., during the period from January 2016 to December 2018 a Ministerial Order and a Royal Decree were approved that have an impact on nuclear safety:

ETU Order /1185/2017, of 21 November, regulating the declassification of waste materials generated at nuclear facilities.

This standard enacts the partial transposition of Council Directive 2013/59/Euratom of 5 December 2013 on the declassification of solid waste materials generated at nuclear facilities. It also establishes the criteria required for the adequate management of materials emanating from nuclear facilities, whether operational or undergoing dismantlement.

The Order contains a model that allows the licensees of the facilities themselves to carry out the clearance of waste materials, in accordance with the levels established in Appendix I thereof. However, before initiating the clearance process, the licensee of the nuclear facility is required to submit a test plan to the CSN for the radiological characterisation of the materials and a schedule for its performance. The results of the performance of this plan must also be approved by the CSN.

Royal Decree 1400/2018, of 23 November, approving the Regulation on Nuclear Safety in Nuclear Facilities.

This Regulation incorporates Council Directive 2014/87/Euratom of 8 July 2014, establishing a Community framework for the nuclear safety of nuclear facilities, into the Spanish regulatory framework. This regulation is in the general interest and has a positive impact on the protection of people and the environment against the risks arising from ionising radiation.

Although our normative framework already incorporates the various requirements demanded by this Directive to a large extent, it did not have a specific regulatory standard on the nuclear safety of nuclear facilities. Likewise, some aspects of the Directive have been identified which are not covered in our

judicial structure and which, it is believed, need to be transposed and incorporated into these Regulations, along with others arising from specific CSN directives (such as IS-26, of 16 June 2010), thereby creating a unified text within the remit of Spanish Royal Decrees.

7.2.2. Provisions and guides drawn up and published by the regulatory body

During the period covered by this report, the CSN has approved various Instructions by virtue of the legal qualification granted to this Organisation by Article 2.a) of Law 15/1980, of 22nd April, creating this CSN. These Instructions are technical standards of a binding nature, obligatory for their addressees, which become part of the legal system.

Thus, since the seventh national report the following CSN Instructions have been approved, which are obligatory for licensees of the activities they address:

IS-15, Revision 1, of 5th May 2016, on requirements for maintenance efficiency surveillance at nuclear power plants (Official Spanish State Bulletin of 16th June 2016).

This Instruction has been revised due to the experience deriving from its appearance in 2007 and the evolution of international standards since then, which has revealed certain aspects of improvement that need to be included in the regulations, although they were already being applied as complementary Technical Instructions by nuclear power plants.

IS-41, of 16 July 2016, approving the requirements for the physical protection of radioactive sources (Official Spanish State Bulletin of 16 September 2016).

This Instruction is a direct mandate of the single transitory provision of Royal Decree 1308/2011, of 26th September, on the physical protection of nuclear facilities, materials and radioactive sources.

Its objective is to ensure that the security of radioactive sources includes physical protection in order to avoid, prevent, detect, delay and respond to any potential deliberate malicious acts involving these sources. These requirements apply to Category 1, 2 and 3 radioactive sources. For those sources that do not fall under category 3 but are beyond the exemption limits, prudent management practices are described to ensure their physical protection.

IS-42, of 26th July 2016, on the criteria for notification to the CSN of events during the transport of radioactive material (Official Spanish State Bulletin of 22nd September 2016).

The purpose of this Instruction is to identify the types of events during the transport of radioactive material that should be reported to the CSN and their notification timeframes, specifying the minimum information to be provided in a notification and identifying those responsible for the announcement and subsequent reporting of the event. This applies to transport occurring or detected in Spanish territory or outside it, when the transport originates from Spain. Events during sea or air transport, occurring or detected outside the port or airport, respectively, are excluded.

IS-30 (Rev. 2), of 16 November 2016, on requirements for the nuclear power plant fire protection programme (Official Spanish State Bulletin of 30 November 2016).

In preparing the first version of this Council Instruction of 19 January 2011, account was taken of the work carried out by the Western European Nuclear Regulators' Association (WENRA) with a view to harmonising the regulations of the different countries. As a result of this effort, a set of common requirements known as “reference levels” were established, which were to be reflected in the national standards and which include the requirements applicable to what has been designated "Fire Protection in Nuclear Power Plants".

Subsequently, as a result of the experience derived from its application, the need to regulate the different particularities presented by both the design and the original licence bases of the fire protection system at each of the different Spanish plants, and the evolution of regulations regarding fire protection, revision 1 of Instruction IS-30 of 21 February 2013 was approved.

It has now been deemed necessary to update it in order to clarify and facilitate the practical application of the term "exemption" by dividing the term coined in Revision 1 into two new terms, "exemption" and "equivalent measures", which are adequately aligned with the regulatory framework for nuclear safety and radiation protection.

IS-27, Revision 1, of 14th June 2017, on general design criteria for nuclear power plants (Official Spanish State Bulletin of 3rd July 2017).

In addition to the standards from the origin country of the nuclear power plant technology (Appendix A of 10CFR50 for Spanish plants of American design), the first edition of this Instruction took account of the work carried out by WENRA (Western European Nuclear Regulators Association) in order to establish the design criteria, with a view to harmonising the regulations of the different countries and thus determining a set of common requirements or reference levels to be reflected in the national standards.

Based on the experience derived from its application since 2010, it has been deemed necessary to revise certain specific aspects of this Instruction in order to establish its appropriate scope, which will now encompass only the Structures, Systems and Components (SSC) “related to safety”, and not “those relevant to safety”. All possible interpretation and compliance issues arising from the fact that the nuclear power plants have been designed following the criteria of Appendix A of 10CFR50 are thus eliminated.

Restricting the scope of this IS to safety-related SSCs does not imply that safety-relevant SSC no longer have regulatory requirements; rather, it means that IS-26 (on Basic Nuclear Safety Requirements Applicable to Nuclear Installations) and IS-30, revision 1 (on Requirements of the Fire Protection Programme at Nuclear Power Plants) are applicable to it.

IS-22, Revision 1, of 15th November 2017, on safety requirements for the management of ageing and the long-term operation of nuclear power plants (Official Spanish State Bulletin of 30th November 2017).

This Instruction has been revised in order to update and clarify the CSN requirements for the development of a process for managing the ageing of the SSC (*Estructuras, Sistemas y Componentes*, Structures, Systems and Components) of the nuclear power plants, including the case of the long-term operating period, on the basis of the experience deriving from their application since 2009 by the different plants, which have highlighted certain aspects of improvement that need to be included in the regulations.

The regulatory requirements “reference levels” agreed by the Western European Nuclear Regulators Association, WENRA, have been taken into account in order to harmonise the regulations of the different countries.

The complete list of all the Nuclear Safety Council Instructions may be consulted on the organisation's website: www.csn.es

The Safety Guides of the Nuclear Safety Council are merely advisory documents, unless a future normative provision should make them obligatory. Their purpose is to achieve better compliance with regulatory provisions and precepts, guiding rather than binding administrating parties in making the most appropriate decisions.

Among the new issues or revisions addressed by the Nuclear Safety Council Guidelines published during the period corresponding to this report, the following should be pointed out with regard to matters covered by the Convention:

GS-07.06 (Rev.1) "Contents of Radiation Protection Manuals for Nuclear and Radioactive Installations involved in the Nuclear Fuel Cycle". Adopted by the Board of Commissioners on 15 April 2016.

This revision extends the content of the previous Guide, updating those aspects that had become obsolete and succinctly developing the content of each of the Chapters of the Manual, as well as establishing the guidelines for its preparation.

The text of this Guide is based on the generic Radiation Protection Manual for Spanish nuclear power plants, which has been used as the basis for the preparation of the radiation protection manuals for all operating plants, as well as for nuclear and radioactive fuel cycle facilities.

In addition, specific criteria have been included regarding the following aspects: minimum review frequency, inclusion of annexes with plans of the facility and some of its systems, reference levels for environmental contamination, reference levels for internal and external dosimetry, etc.

GS-01.18 (Rev.1) "Measurement of the effectiveness of maintenance in nuclear power plants". Adopted by the Board of Commissioners on 22 June 2016.

This Guide was first published in 2007. This revision contemplates the changes introduced in the American standards, i.e. the origin country of the technology most frequently used to license Spanish nuclear power plants, which do not lead to substantial changes in the content of the standard, but do introduce new nuances or requirements that should be included in this CSN GS. The only point that clearly constitutes a new requirement is the inclusion of guidelines for the consideration of hazards due to fire events in the risk assessments required by paragraph (a)(4) of the American Maintenance Rules.

On another note, certain modifications are introduced in the flood protection Safety Structures, Systems and Components (SSC) in the SSC during the period of cessation of facility operations up until the start of dismantling, and in specific aspects of the monitoring programme, among others.

GS-01.15 (Rev.1) "Updating and maintenance of the Probabilistic Safety Analysis". Adopted by the Council Board of Commissioners on 25 January 2017.

The objective of the revision of this Guide is to develop the minimum criteria to be followed by nuclear power plants in order to have high-quality updated PSAs, as established in Council Instruction IS-25, of 9th June 2010, on criteria and requirements on the performance of probabilistic safety assessments and their applications to nuclear power plants.

The existing process has been adjusted to the new needs of both the licensees and the CSN, and the new methodologies developed at national and international level are included in the PSAs. The time intervals at which PSA maintenance and updates are to be performed are now specified, and the documentation to be submitted by the plants is defined.

GS-01.10 (Rev.2) "Periodic safety reviews of nuclear power plants". Adopted by the Council Board of Commissioners on 30 May 2017.

This review is based on international experience with Periodic Safety Reviews (PSRs) in our surrounding countries and documents generated at the IAEA. Safety factors are analysed in order to identify feasible and reasonable modifications or improvements to maintain or increase plant safety.

It is now changing from a more prescriptive regulatory strategy based on the CSN's ITC to a self-assessment by the licensee, who is responsible for analysing and proposing changes and improvements

to the standards applicable to the facility. The process of Periodic Safety Reviews (PSRs) is separated from the renewal of Operating Permits, with the Guide referring only to Council Instruction IS-26, of 16th June 2010, on basic nuclear safety requirements applicable to nuclear facilities, which requires an PSR to be drawn up every ten years.

GS-06.06 "Preparation of Safety Studies for transport packages not subject to approval". Adopted by the Council Board of Commissioners on 14 June 2017.

This Guide determines the requirements applicable to the content of the regulatory compliance documentation and facilitates the preparation of Safety Studies for packages not subject to design approval, developing the requirements of Council Instruction IS-39, of 10th June 2015, in relation to the control and tracking of the manufacturing of packaging for the transport of radioactive material.

It directs the user directly to the sections of the European Agreement for the Carriage of Dangerous Goods by Road (ADR) and the IAEA Regulations for the Safe Transport of Radioactive Material, in relation to the requirements established for packages not subject to approval.

In the process of drawing up the CSN Instructions and the Safety Guides, the participation of interested parties is facilitated and comments may be made. Citizens are also informed of both standards through digital and telematic means.

7.3. System of licensing

7.3.1. Licensing systems and processes, including the types of activity being licensed and, as appropriate, the procedure for granting new licenses

In accordance with Article 12 of Spanish Royal Decree 1836/1999, of 3rd December, approving the RINR (*Reglamento sobre Instalaciones Nucleares y Radiactivas*, Regulation on Nuclear and Radioactive Installations), nuclear facilities shall require, as the case may be, the following authorisations, the contents of which have already been included in the Seventh National Report.

a. Preliminary or site authorisation
b. Construction permit.
c. Operating permit.
d. Modification authorisation.
e. Authorisation of execution and assembly of the modification.
f. Authorisation for dismantling.
g. Dismantling and decommissioning permit.

In addition, the following should be authorised:

h. The temporary storage of nuclear substances at a facility in the construction phase not holding an operating permit.
i. Change of nuclear facility ownership.

These authorisations are granted by the current Ministry for Ecological Transition, following a report by the Nuclear Safety Council, as foreseen in the RINR.

7.3.2. Public and stakeholder involvement

The recently approved Regulation on nuclear safety at nuclear facilities, published in the Official Spanish State Bulletin of 24th November 2018, dedicates its fifth Additional Provision to the "transparency" of nuclear safety at nuclear facilities. To this end, a duty of information is imposed on these issues, on

workers and the general public, on groups of interest living in the vicinity of these types of facilities, and even on the competent regulatory authorities of other Member States, in this case, of nuclear facilities located in the vicinity of the border with those States, and information must be available on all aspects, both under normal operating conditions and in the event of incidents or accidents.

This information is required to be made available to the public, unless it compromises other overriding interests in terms of national security as required by applicable law.

The aforementioned involvement of the different agents is articulated through the regulations that currently exist on this subject and which are listed in this Provision:

- **Law 15/1980, of 22nd December, creating the CSN** (information to the public on matters falling within the competence of the CSN and information to the Government and the Congress of Deputies, as well as to the regional governments and parliaments concerned with the safety of nuclear facilities or the quality of the environment within the national territory).
- **Law 27/2006, of 18 July, which regulates the rights of access to information, public participation and access to justice in environmental matters:** dissemination and public release of information on environmental matters and the participation of stakeholders and the public in the processes of regulatory development thereof.
- **Regulation on Nuclear and Radioactive Installations (Spanish Royal Decree 1836/1999, of 3rd December):** processing of public information relating to requests for prior authorisation of a nuclear facility, as well as the relationship with the local information committees established during the construction, operation and dismantling of nuclear power plants to report on the performance of the activities regulated in the authorisations and to deal jointly with others of interest.
- **Basic Nuclear Emergency Plan (Spanish Royal Decree 1546/20004, of 25th June):** procedure to guarantee information coverage in the event of an emergency for the affected population, the public Administrations involved and the rest of the population, and notification to different international organisations competent in this area and to the authorities of bordering countries and other States.
- **IS-10, revision 1, of 30th July 2014, of the Nuclear Safety Council:** criteria for notification of events to the Council by nuclear power plants.
- **IS-19, of 22nd October 2008, of the Nuclear Safety Council:** obligation of the licensees of nuclear facilities to inform the people of the organisation and other interest groups of the information relevant to safety objectives.

Other provisions are also listed, such as Decision 87/600/Euratom for the notification and provision of information to the European Commission and other Member States in cases of radiological emergency. There is also an Agreement by the Council of Ministers of 1 October 1999 regarding the public behaviour to be followed in the event of a radiological emergency.

7.3.3. Legal provisions to prevent the operation of a nuclear facility without a valid licence

Finally, it should be pointed out that the performance of activities without a licence will incur the sanctions provided for in the sanctions regime established by Chapter XIV of the Nuclear Energy Act. As an example, the operation of nuclear installations or the handling of radioactive materials by personnel not licensed to direct or execute such operations, where there is a serious danger to personal health or safety or serious damage to property or the environment, would constitute a very serious infringement (Article 86).

7.4. System of regulatory inspection and enforcement process

Basic Features of Inspection Programmes

The inspections make it possible to obtain the information required to verify compliance with the current applicable legislation, CSN instructions and the specific conditions imposed in the authorisations, licences or regulatory permits, and these are detailed in the CSN's systematic inspection and control programme.

The Integrated Plant Supervision System (SISC) is the basic tool of the CSN, and has been used for over ten years to supervise the operation of the Spanish nuclear power plants and establish the corrective or other actions applicable, depending on its results. It is based on the US NRC Reactor Oversight Programme (ROP). The development of the SISC transversal elements programme (relating to Organizational and Human Factors) and the systematic safety culture inspections of the organisations operating the nuclear power plants were considered an area of good performance as a result of the combined IRRS-ARTEMIS mission to Spain in 2018. In addition, the development of a procedure to identify non-compliance with safety requirements used to strengthen supervision was also considered an area of good performance as a result of that mission.

The inspections performed by the CSN technical personnel may be of the following types:

— Licensing: these inspections ensure that the authorisation processes of the facilities are carried out in accordance with the requirements of the regulations on nuclear safety and radiation protection.

— Monitoring: these inspections guarantee that the facilities operate in accordance with the requirements supported by the corresponding authorisation. They may be systematic (periodic) control inspections aimed at checking the operating conditions of the facility, or occasional control inspections without a set periodicity.

— Special: these cover the inspection functions attributed to the CSN, other than the previous ones, that arise as a result of incidents, exceptional intervention situations in the event of a radiological emergency, complaints, etc.

The set of systematic control inspections is structured in the Basic Inspection Plan (PBI) for nuclear power plants, which is completed every two years and the execution of which is planned in the Annual Work Plan. The PBI inspections deal with aspects such as design modifications, component design bases, compliance with surveillance requirements, operating experience, etc.

The SISC is based on a risk-informed and stratified approach in strategic areas and safety pillars that incorporates transversal aspects that provide more detailed tracking of the operation of operating nuclear power plants. The programme oversees three cross-cutting areas that affect all the pillars of the SISC and which are: AHO (*actuación humana y organizativa*, human and organisational action); IRP (*identificación y resolución de problemas,* problem identification and resolution), and ATOS (*ambiente de trabajo orientado a la seguridad*, safety-oriented work environment). The system of inspection findings and indicators allows the CSN to incipiently identify possible degradations in safety, organisational and cultural aspects that might have an impact on nuclear safety. The information provided by the SISC is analysed quarterly, the information of which is submitted to the Board of Commissioners Meeting of the CSN for subsequent publication on the CSN web page. The Corrective Action Programme (CAP) is a support tool for the SISC to maintain the required level of security, due to its importance in identifying and correcting deficiencies and other problem-solving activities of the licensees.

Since the CNSMG plant has ceased operation, it is no longer within the scope of the SISC, and since 2014, as with the SISC, a supervision and tracking system (SSG) adapted to its operating situation has been applied, with the only difference being that the tracking reports are issued every six months.

The number of findings identified between 2016 and 2018, as well as the number of indicators that have entered the white band, according to their importance for safety, are shown below, distributed according to their importance, as follows

	Findings/Indicators green (*)	Findings/Indicators white (*)	Findings/Indicators yellow (*)	Findings/Indicators red (*)
2016	Findings 107	2 indicators	0	0
2017	Findings 138	1 indicator	0	0
2018	Findings 115	1 finding	0	0

(*) Green finding and indicator: importance for safety is very low; white finding and indicator: importance for safety is between low and moderate; yellow finding and indicator: importance for safety is substantial, red finding and indicator: high importance for safety.

These results have led to the action matrix as shown below:

(**)	Almaraz I NPP	Almaraz II NPP	Ascó I NPP	Ascó II NPP	Vandellós II NPP	Cofrentes NPP	NPP Trillo
2016	LR	RR	LR	LR	RR	LR	LR
2017	LR	LR	LR	LR	RR	LR	LR
2018	LR	LR	LR	RR	LR	LR	LR

Meaning of codes used in the table:
(**) LR, Licensee Response. A plant is in this column when all evaluation results for a quarter are green.
(**) RR, Regulatory Response. A plant is in this column when it has one or two white results, either performance indicators or inspection findings, in a strategic area.

During 2016 all the nuclear power plants were in the situation known as "licensee response" or LR, in green, except Almaraz NPP, which was in RR for two quarters, due to a "white" indicator related to failures in the emergency diesel generators, and Vandellós II NPP, which was also in RR for the first three quarters, due to a "white" indicator associated with emergency response during simulations.

In 2017 all plants were in LR, except NPP Vandellós II, which was in RR in the first quarter due to the fact that the reliability index indicator of mitigation systems (IFSM) for emergency diesel generators was in the white band during this period. With the exception of this indicator, all performance indicators were green throughout the year.

During 2018 all the plants were in LR, except Ascó II NPP, which from the second quarter remained in LR, due to a related white finding for not having evaluated the safety impact of a component which had aged beyond its useful life.

Enforcement and warning proceedings

The SISC allows the enforcement process to be optimised by automatically setting in motion a process that allows the CSN to warn the licensee directly instead of initiating the opening of an enforcement file by the Ministry for the Ecological Transition at the request of the CSN.

Enforcement and warning proceedings in 2016

- The licence holder of NPP Ascó received two warnings in 2016. The first was due to non-compliance with CSN Instruction IS-01, regulating the radiological licence, for non-compliance with requirements in radiological control processes. The second was as a consequence of an ETF non-compliance during a boron dilution incident at the reloading stage.
- The licence holder of Cofrentes NPP was warned for failing to meet the deadline established in the CSN's ITC for validating the procedures associated with the instrumentation implemented in the spent fuel pool.

Enforcement and warning proceedings in 2017

- The licence holder of the Ascó NPP received a warning for non-compliance with an Operating Licence condition relating to the management and control of radioactive wastes.
- The licence holder of Trillo NPP received a warning for non-compliance with CSN instructions IS-21 and IS-23 in relation to leaks in several ventilation system gates in excess of that established in the licensing bases.
- The CSN proposed the opening of an enforcement file against NPP Vandellós II for non-compliance with CSN Instruction IS-30 and the ETFs. Likewise, the CSN cautioned the plant for non-compliance with CSN Instruction IS-30 and the post-Fukushima adapted ITC, as regards protection requirements against large fires.

Enforcement and warning proceedings in 2018

The CSN issued the following warnings and enforcement proceedings against nuclear power plants in 2018:

- NPP Almaraz received four warnings:
  - o Non-compliance during performance of the ETF 3.9.7.2 containment enclosure sprinkler system surveillance test.
  - o Non-compliance with CSN Instruction IS-32 of the Nuclear Safety Council during the performance of a surveillance test.
  - o Two breaches of CSN Instruction IS-21 of the Nuclear Safety Council, establishing the need to open an ‘anomalous condition’ assessment and resolution procedure.

- Ascó NPP received a warning for non-compliance with the CSN's Technical Instruction on ventilation systems. Likewise, the CSN proposed the opening of an enforcement file for non-compliance with CSN Instruction IS-21 for failing to analyse the operability of unit II emergency diesel generator B with flexible couplings that had exceeded the maximum useful life permitted by the manufacturer.

- Cofrentes NPP received a warning for non-compliance with CSN instructions IS-21 and IS-32, relating respectively to the design modifications and the ETF, as the anomalous condition of the feedwater system had not been identified during detection of the discrepancy between the loop flows.

- Vandellós II NPP received a warning for non-compliance with CSN Instruction IS-09 of the Nuclear Safety Council, which establishes the physical safety requirements.

7.5. Compliance with licensing regulations

In the event of possible non-compliance, the CSN, in accordance with Law 15/1980, of 22nd April, which created the Nuclear Safety Council and Law 25/1964, of 29th April, on Nuclear Energy, may propose the opening of the enforcement proceedings it deems pertinent and impose warnings.

During the 2016-2018 period, with reference exclusively to nuclear power plants, the CSN issued a total of 14 warnings and 3 proposals for the opening of enforcement proceedings.

Article 8. Regulatory body

8.1. Establishment of the Regulatory Body

Competences in the areas of nuclear safety and radiation protection in Spain are distributed among various authorities.

The Government is responsible for the design of energy policy and for issuing mandatory regulations.

MITECO (*Ministerio para la Transición Ecológica,* the Ministry for Ecological Transition) is the Department of the General Administration of the State competent in matters relating to nuclear energy, being responsible for granting authorisations relating to nuclear facilities, following a mandatory and binding report by the CSN and, where appropriate, by other ministerial Departments, as well as for submitting regulatory proposals, adopting Provisions for the development of the current standards and applying the system of sanctions in relation to nuclear energy.

The CSN is the State's sole competent body in relation to nuclear safety and radiation protection. It is a Public Law Entity independent from the General State Administration, which reports on the development of its activities to the Parliament and relates to the Government through the MITECO.

8.1.1. Roles and Responsibilities of the Ministry for Ecological Transition

In accordance with Spanish Royal Decree 864/2018, of 13th July, the MITECO exercises the following functions within the scope of the Convention on Nuclear Safety:

- Granting of authorisations for nuclear and radioactive[4] facilities, following a mandatory report by the CSN. That report shall be binding, if negative, and when imposing necessary safety conditions.
- Preparation of normative proposals and application of the enforcement regime.
- Follow-up of the international commitments undertaken by Spain in the field of nuclear energy, in particular in the areas of nuclear non-proliferation, physical protection of nuclear materials and facilities and civil liability for nuclear damage.
- Relations with international organisations specialised in the field.

8.1.1.a) Organisational structure

Spanish Royal Decree 864/2018 develops the basic organic structure of the MITECO. Within this Ministry, the Secretary of State for Energy is the highest energy body, and within this, the Directorate-

[4] Second and third category radioactive facilities located in the territory of Autonomous Communities to which administrative powers in this area have been transferred are excepted.

General of Energy Policy and Mining, to which the Sub-Directorate General for Nuclear Energy reports, is the governing body that performs the functions referred to in the previous section specifically applicable to the field of nuclear energy.

8.1.1.b) Coordination of nuclear R&D&I activities

The MITECO, through the Sub-Directorate General for Nuclear Energy, participates in the coordination of some of the research, development and innovation activities in the field of nuclear energy in Spain through its participation in the Nuclear Fission Energy Technology Platform (CEIDEN).

CEIDEN, established in 2007, has the objective of coordinating the different national R&D plans and programmes in relation to nuclear fission energy, as well as participation in international programmes, coherently orienting the efforts of the entities involved.

The CEIDEN Platform currently has 110 members and 17 collaborating entities. The following are represented on its Management Board: MITECO, through the Sub-Directorate General for Nuclear Energy, the CSN, the Ministry of Science, Innovation and Universities, the Centre for Energy, Environmental and Technological Research (Ciemat), Universities and representatives of companies linked to the nuclear energy sector.

Additional information on the CEIDEN platform can be found at www.ceiden.com

8.1.1.c) *Participation in international organisations and activities*

The MITECO, through the Sub-Directorate General for Nuclear Energy, maintains active participation in the activities relating to nuclear energy promoted by the International Organisations to which Spain belongs.

The MITECO collaborates in the conclusion of bilateral agreements with other countries in the field of peaceful uses of nuclear energy and represents the Spanish Government in the Assemblies of Contributors of various international Funds to which Spain is a contributor.

Within the European Union, MITECO advises Spain's Permanent Representative with a view to that person’s participation in the Council working groups dealing with matters regulated by the Euratom Treaty.

Within the framework of the International Atomic Energy Agency (IAEA), the MITECO forms part of the Spanish Delegation to the Agency's General Conference.

Likewise, the MITECO forms part of the Spanish Delegation to the Steering Committee of the Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD), and participates in various NEA technical committees.

8.1.2. Functions and responsibilities of the CSN

Its main functions in relation to nuclear power plants are as follows:

— To propose the necessary regulations to the Government within the scope of its competence, and to issue Instructions, Guides and Circulars of a technical nature relevant to those matters.
— To issue mandatory reports to the MITECO for it to decide on the granting of legally established authorisations; such reports shall be binding, if negative, and when they impose necessary safety conditions.
— To carry out monitoring and inspection of all facilities during all their phases, in particular during their design, construction, start-up and operation, as well as during the transport, manufacturing

and approval of equipment incorporating radioactive sources or generating ionising radiation. In this respect, the CSN has the authority to suspend the operation of activities and facilities for safety reasons.

— To collaborate with the competent authorities in drawing up the criteria to be met by the external emergency plans and the plans for the physical protection of nuclear and radioactive facilities and, once the plans have been drawn up, to participate in their approval, as well as in coordinating support and response measures to emergency situations.

— To propose the opening of enforcement proceedings in the event of infringements in relation to nuclear safety and radiation protection, in accordance with the legislation in force, and to issue technical reports for the adequate qualification of the facts.

— To control radiation protection measures for exposed workers, the public and the environment. As regards radiation protection of the environment, the CSN controls and monitors radiological quality throughout Spain and assesses the environmental radiological impact of nuclear and radioactive facilities and of activities involving the use of ionising radiation.

— To issue statements of favourable assessment of new designs, methodologies, simulation models or verification protocols related to nuclear safety and radiation protection.

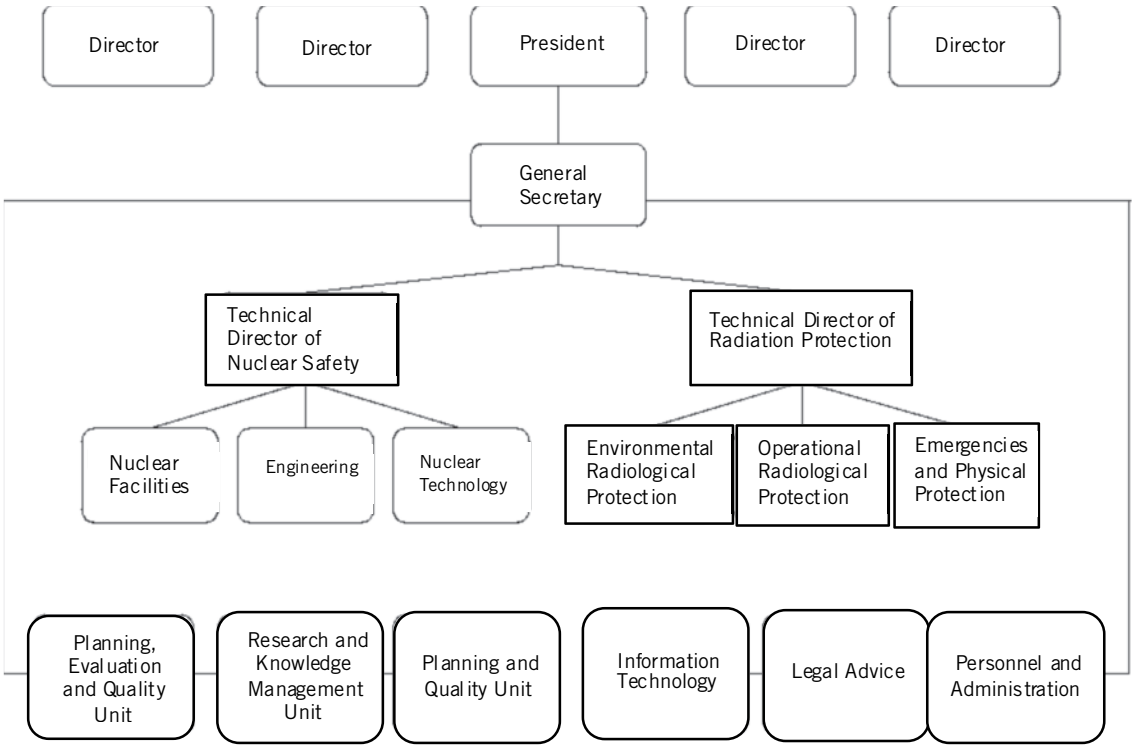
— To grant and renew operator and supervisor licenses and Head of Radiation Protection Service diplomas.

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

8.1.2.a) Structure of the CSN

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

Figure 8.1: Organisation chart of the CSN



Board of Commissioners of the Nuclear Safety Council In accordance with the Law that created the Nuclear Safety Council and its statute, the Board of Commissioners of the Nuclear Safety Council was made up of the following persons during the period from January 2016 to December 2018:

— President: Mr. Fernando Marti Scharfhausen, appointed on 28 December 2012 by Spanish Royal Decree 1732/2012
— Vice-President: Ms Rosario Velasco García, appointed on 22 February 2013 by Spanish Royal Decree 138/2013
— Board member: Fernando Castelló Boronat, appointed on 22 February 2013 by Spanish Royal Decree 139/2013
— Board member: Jorge Fabra Utray, appointed on 7 December 2017 by Spanish Royal Decree 1028-2017
— Board member: Javier Dies Llovera, appointed on 16 October 2015 by Spanish Royal Decree 934/2015

The Board of Commissioners is assisted by a General Secretary, Manuel Rodríguez Martí, appointed by Spanish Royal Decree 280/2017, of 17 March Units reporting directly to the General Secretary

In addition to the two technical directorates, three Sub-Directorates and three Units report to the Secretary General:

- Information Technology Sub-Directorate.
- Sub-Directorate of Personnel and Administration.
- Sub-Directorate of Legal Advice.
- Inspection Unit.
- Research and Knowledge Management Unit.
- Planning, Evaluation and Quality Unit.

Technical Directorate for Nuclear Safety

This Technical Directorate groups together all the functions relating to the technological safety of nuclear facilities, except those relating to the disposal of low and intermediate level radioactive wastes, which are the responsibility of the Technical Directorate for Radiation Protection. It is also responsible for the safety of the transportation 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 facilities, the radiation protection of the workers and the management of low and intermediate level radioactive wastes, this Technical Directorate assumes responsibility for the radiation protection of the public and the environment and for 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 Physical Security.

8.1.2.b) Development and maintenance of human resources over the past three years.

As of 31st December 2018, the staff of the CSN consisted of 439 people

Table 8.1. Distribution of Nuclear Safety Council personnel as of 31st December 2018.

	Council	Secretary General	Directorates (Technical)	Total
Senior Roles	5	1	1	7
N.S. And R.P. Body Functionaries	7	14	196	217
Officers of other Bodies or Ranks	5	88	35	128
Occasional Staff	25	0	0	25
Labour Personnel	2	42	18	62
Total	**45**	**144**	**250**	**439**

The status of personnel in the 2016-2018 period is detailed in table 8.2.

Table 8.2. Structure of the CSN staff 2015-2018

	2016	2017	2018
Senior Roles	7	8	7
N.S. And R.P. Body Functionaries	220	213	217
Officers of other Bodies or Ranks	141	141	128
Occasional Staff	27	24	25
Labour Personnel	64	62	62
Total	**459**	**448**	**439**

The number of women represents 52% of the total staff and the number of men represents the remaining 48%.

The average age of the body's staff is 53.

As regards qualifications, as of December 31, 2018 68.96% of the staff were university graduates, 6.21% were undergraduates and 24.83% held other qualifications.

Spanish Royal Decrees RD 105/2016 of 18 March, RD 702/2017 of 7 July and RD 955/2018 of 27 July approved public employment offers for the years 2016, 2017 and 2018 respectively, with six vacancies being offered in 2016, 8 vacancies in 2017 and 25 in 2018.

The Council plans to carry out a strategic analysis of human resources to ensure adequate generational replacement and distribution of technical personnel according to the needs of the regulatory body. This process has been identified as a challenge for the CSN.

8.1.2. (c) Measures to develop and maintain competence

In view of its specific characteristics, the CSN devotes special importance to the training of its staff. During the three-year period 2016 to 2018, the training plans continued to be drawn up in such a way

that their objectives were aligned with those of the current CSN Strategic Plan, grouping them into seven programmes, one of which is divided into four subdivisions:

- Perfection and Recycling.

  — Nuclear Safety Sub-Programme.
  — Radiological Protection Sub-Programme.
  — Transversal Training Areas Sub-Programme.
  — Initial Technical Training Sub-Programme.

- Management Development.
- Administrative Management.
- Accident Prevention.
- IT.
- Languages.
- Abilities.

During the period covered by this report, 340 courses were taught, equivalent to an average of 113 courses per year. An annual average of more than 23,915 hours were devoted to training, which represents 3.12% of the working day. The investment in training amounted to €1,086,092, which is equivalent to around €362,031 per year.

The presence of the CSN in national and international forums (congresses, meetings, seminars) relating to its functional and competence scope continued to be promoted.

Maintaining and improving its high technical, professional and knowledge level, based on a systematic analysis of the competencies and skills required, in accordance with the IAEA recommendations, has been identified as a challenge for the CSN.

The CSN is currently continuing to develop a knowledge management model specifically adapted to its needs, based on the IAEA recommendations, which will be fully incorporated into its Management System and which will employ the characteristic elements of knowledge management already available to it.

The knowledge management process for the CSN should address the four basic pillars of the model recommended by the IAEA. It is structured as a transverse process of a cyclical nature, the stages of which are:

- Identification of the capabilities required by the CSN to fulfil its mission (Necessary capabilities).
- Periodic assessment of the resources available at the CSN (Available resources).
- Permanent assessment of gaps, deficiencies and losses of information, documentation and knowledge of the CSN (gaps and deficiencies).
- Programme for the preservation of critical knowledge and continuous improvement of capabilities (Acquisition and preservation).
- Internal communication plan to ensure dissemination and accessibility of knowledge and information (Accessibility and availability).
- Programme of independent evaluation and periodic review of the process (Evaluation and review).

During the 2016-2018 period, activities focused on the programme for the preservation of critical knowledge and the continuous improvement of capabilities, and an action plan was developed on this subject, focusing on the preservation/recovery of the knowledge and experience of the CSN technical staff born prior to 1952. It was applied to 16 technical staff, starting with a pilot phase for four technical staff who retired in the course of the first half of 2016, expanding to 16 between the end of 2016 and the middle of 2017.

The methodology used in this 2016 action plan comprises the following phases:

- Preparation Phase: Identification of critical knowledge holders
- Knowledge Extraction and Systematisation Phase
- Exploitation Phase: Deployment of an agenda for the use of systematised knowledge

As a result of this action plan, 16 knowledge books were developed; each includes the workplace profile, the knowledge domains, the relational framework, documents linked to the workplace (procedures and processes), experiences, knowledge raised (narratives, fact sheets, audio-visual pills), and knowledge products (series, transfer workshops, etc.).

In addition, a knowledge management model, a CSN key knowledge preservation procedure and several facilitator training sessions were developed.

In 2017 the document "CSN Knowledge Management Model. Proposal for 2017-2020 Actions", approved by the Board of Commissioners of the CSN in 2018, was prepared. This document states that "The retirements planned for the coming years require a set of actions aimed at the preservation of knowledge that, together with new hires, will enable an integrated approach to a broader model of knowledge management through the following components: A knowledge map, preservation of knowledge, socialisation of knowledge, organisational structure, computer tools, metrics and indicators and organisational processes implemented at the CSN"

The Board of Commissioners Meeting of the CSN also agreed "To ensure that the responsibility for the development and implementation of the CSN Knowledge Management Model falls to the Research and Knowledge Management Unit"

In 2018, the knowledge management methodology was consolidated, using a specific computer application, with the help of an external organisation specialising in this area.

8.1.2.d) *Development in relation to financial sources over the past three years*

Each year, the Board of Commissioners of the CSN draws up a budget proposal for expenses and revenues, which are integrated into the General State Budgets and whose approval corresponds to Parliament. From 2016 to 2018, the amounts approved by the General Courts were (in thousands of euros):

	Tax year 2016	**Tax year 2017**	**Tax year 2018**
Income budget	46,507.00	46,507.00	46,937.00
Expenditure budget	46,507.00	46,507.00	46,937.00

Practically all economic resources are obtained through the collection of public fees and prices for the services rendered by the CSN in compliance with its functions.

The conditions of this income are regulated by Law 14/1999, of May 4th, on Public Fees and Prices for Services rendered by the Nuclear Safety Council.

At present, the funding channels are as follows:

Financing by Public Fees and Prices for:

- Studies, reports and inspections prior to operating and decommissioning authorisations for nuclear and radioactive facilities granted by MITECO.

- Inspection and control of operating nuclear and radioactive facilities and related activities.
- Licensing of personnel assigned to operate or supervise the operation of nuclear and radioactive facilities.
- Reports, tests or studies concerning new designs, methodologies, simulation models or verification protocols relating to nuclear safety or radiation protection.

On average for the three-year period, this funding component accounted for approximately 99% of revenue.

State Transfers

The CSN carries out checks on radiation protection measures aimed at the general public and the environment. The performance of these functions is not financed through public taxes and prices regulated in Law 14/1999, as it does not constitute a taxable event.

Its financing is obtained via General State Budgets, through MITECO credits.

On average for the three-year period, this funding component accounted for approximately 0.8% of revenue.

Other resources

The rest of the financing, approximately 0.2%, corresponds mainly to equity income derived from interest on bank accounts.

Of the total funding and for the period 2016-2018, approximately 57% was used to cover staff costs, and 30% to cover expenditure on current goods and services.

8.1.2.e) Statement on the adequacy of resources. Developments in financial resources over the past three years

During the 2016-2018 period, the CSN did not encounter any financial difficulties in an environment of general economic recovery. However, the guidelines for budgetary stability and expenditure efficiency established for the Public Sector by the Government have continued to be respected.

Following the path initiated in 2015, during this three-year period it proved possible to proceed with the creation of new posts for civil servants in the safety and radiation protection body as a measure to guarantee generational change and the transmission of knowledge among the organisation's staff.

8.1.2.f) CSN quality management system

In 2017 the Board of Commissioners Meeting of the CSN agreed to approve the Strategic Plan for the period 2017-2022, with which the Management System of the Nuclear Safety Council is aligned.

This Management System is process-oriented, based on the requirements of the IAEA (GS-R-3) and the ISO 9001 standard: 2008. The CSN is in the process of revising the management system to adapt it to the IAEA General Safety Requirements GSR Part 2 and ISO 9001: 2015. The processes, which cover all the activities of the body, are classified as follows:

- Strategic, which include the functioning of the Board, information and communication, and the development of regulations.
- Operations, including the authorisation, assessment, supervision and control of facilities and activities (including transport); personnel licensing; radiation protection of workers, the public and the environment; emergency management and physical safety.

- Support, including institutional and international relations; research and development; economic and human resources management (including training); information systems; documentation; and administration of the Management System.

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

The Management System is subject to continuous improvement. In addition to assessments of compliance with the plans and objectives, the CSN has an internal audit plan in place and is systematically subjected to external assessments by national and international organisations:

- The internal audit plan ensures that all operational processes are audited at least once every four years, and the rest at least once every five years.
- In addition to being subject to the economic-financial audits and checks required of all public bodies, the CSN is required to systematically report to the Spanish Parliament and those of the Autonomous Communities that have nuclear facilities. To this end, the CSN produces an annual report on its activities, which it addresses to Parliament. It is the responsibility of Parliament to carry out continuous monitoring of the CSN's activities.
- Council Directive 2014/87/Euratom of 8 July 2014 requires the Member States of the European Union to carry out periodic self-assessments of their national framework and competent regulatory authorities at least once every ten years and to invite an international peer review of the relevant parts of their framework and competent regulatory authorities in order to continuously improve nuclear safety. In addition, Member States will conduct an initial thematic peer review in 2017, and subsequent thematic peer reviews will take place at least every six years. With this objective in mind, the first thematic review focusing on ageing management was launched in 2017.
- The Management System implemented at the CSN, combined with experience in the performance of international self-assessments and peer reviews, will facilitate compliance with this requirement. At this point it is important to mention that the CSN underwent a combined peer review mission - *Integrated Regulatory Review Service - Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation* (IRRS-ARTEMIS) - conducted by the IAEA in October 2018.

8.1.2.g) Transparency of regulatory activities, including actions taken to improve transparency and communication with the public.

The CSN Strategic Plan for the 2017-2022 period includes transparency as one of the four instrumental objectives for achieving the fundamental objective of safety.

This transparency policy has its roots in Law 15/1980, of 22nd April, which created the CSN, reformed by Law 33/2007, of 7th November. It also incorporates the aspects included in the Aarhus Convention, ratified by Spain in 2004 and embodied in national legislation in Law 27/2006, of 18 July, which regulates the rights of access to information, public participation and access to justice in environmental matters, in addition to complying with Law 19/2013, of 9 December, on transparency, access to public information and good governance.

The modification of the Law establishing the CSN in 2007 extended the requirements in relation to public information, with the objective of increasing the transparency of the organisation and achieving greater public confidence in the actions of the CSN. The law establishes three ways to channel this requirement:

- Transmission of information to State institutions: Each year the CSN sends a detailed report on the activities performed by the organisation to the General Courts, as well as the autonomous parliaments of the autonomous communities that have nuclear facilities in their territory. This annual report is presented to the Congress of Deputies through the appearance of the President of the CSN. Likewise,

and as part of its relations with the Courts, the CSN responds to parliamentary initiatives (oral and written questions, Non-legislative Propositions, etc.) and complies with the resolutions issued in the annual reports.

- Information committees in areas surrounding nuclear power plants: The CSN participates in information forums in the vicinity of nuclear power plants in order to give information regarding aspects relating to their operation and emergency preparedness. The RINR (Spanish Royal Decree 1836/1999, of 3 December) regulates the functioning of the Local Information Committees, chaired by the MITECO, which are held annually. The CSN actively participates in these forums, in which it annually presents relevant aspects relating to the control and operation of the facilities.

- Policy of information to the general public:

The right of access to information and public participation in relation to nuclear safety and radiation protection competences is included in Article 12 of Law 15/1980. This obligation for the CSN as a Public Law Entity is of special importance, as a result of which the strengthening, systematisation and characterisation of an integral CSN information and communication system is made official in one of the strategic lines of the current Strategic Plan, identified with transparency. On 5th April 2017 the CSN approved its Communication Plan, which defines the objectives and strategy at three levels of communication: external communication, internal communication and communication in the event of an emergency.

Along these lines, the CSN publishes on its web page the inspection reports of the facilities, information on the operating status of the nuclear power plants and information on environmental quality measured by the Automatic Stations Network and the Environmental Radiological Surveillance Network. The minutes of Board meetings and the technical reports that support the Council's decision-making are also published. Likewise, the CSN keeps the results of the systematic plant operation assessment programme, known as SISC, updated on its web page.

In the event of any significant event or incident occurring at nuclear and radioactive facilities, news, reviews and press releases on the CSN website are published. In parallel, the CSN deals with direct requests for information from the media, to the extent allowed by technical rigour.

As regards information for the media and stakeholder groups, apart from everything included in the institutional portal, the CSN responds to direct requests from the media, applying criteria of transparency and agility to the extent allowed by technical rigour.

Public information and participation in policy-making

As included in Spanish Royal Decree 1440/2010, of 5th November, approving its Statute, the CSN has the power to draw up its own standards that are necessary for compliance with its standards of competence. The technical standards drawn up by the CSN in relation to nuclear safety, radiation protection and physical protection are known as CSN Instructions and are binding on the subjects affected by their scope of application once published in the "Official Spanish State Bulletin" (BOE) as a regulation.

In addition, a section is included stating that when regulations are being prepared, the interested parties will be given a hearing through the appropriate digital and telematic means, citizens will be informed and the draft Instruction will be subject to their comments. To this end, the CSN offers a space on its corporate website to receive comments on instructions and safety guides which are being drawn up.

Law 27/2006, of 18 July, regulating the rights of access to information, public participation and access to justice in environmental matters, recognises the right of any natural or legal person to have access to

the environmental information held by Public Administrations and to express observations and opinions before decisions are adopted, as well as the obligation of the latter to disseminate such information, with "environmental information" being understood to mean all information relating, among others, to waste, including radioactive waste. This implies informing the public about the general provisions relating to radioactive waste and subjecting the draft legislation on radioactive waste management to a period of public information.

For its part, Law 40/2015, of 1 October, on the Legal Regime of the Public Sector, entailed several modifications to Government Law 50/1997, of 27 November, which became effective in October 2016. Specifically, it involved the incorporation of a new Article on the drafting of any standards which are to have legal and regulatory force, in which it is stated that a public consultation must be carried out through the web portal of the competent department prior to the drafting of the text, wherein the opinion of the subjects potentially affected by the future standard and of the most representative organisations will be sought if the standard affects the legitimate rights and interests of individuals. Once the text of the standard has been drafted, it is again submitted to public information (a procedure that was already provided for in Law 50/1997 before the amendment introduced in 2015, as well as in Spanish Royal Decree 1440/2010).

At the international level, the CSN has continued to collaborate in the Working Group on Public Communication of the NEA/OECD Regulatory Activities Committee, sharing experiences and good practices regarding regulatory body communication.

Other means of communication

Organisation of conferences, seminars and training activities:

The CSN is involved or collaborates with other institutions in the organisation of various events aimed at promoting knowledge of issues directly or indirectly related to its functions.

Information centre:

The Council has an interactive space which covers all activities relating to the CSN's mission and is open to the public and free of charge, which for the most part hosts visits from educational centres and institutional delegations, both national and international.

Edition of publications

The CSN carries out a wide range of technical and informative publishing activities within the framework of the annual publications plan.

Furthermore, the CSN publishes a journal on nuclear safety and radiation protection, the aim of which is to be a means of communication with the public in order to facilitate understanding of issues relating to the activity of the organisation. *Alfa, Revista de Seguridad nuclear y Protección Radiológica* (Alfa: the Journal of Nuclear Safety and Radiation Protection) maintains its objective of disseminating knowledge in relation to radiation protection and nuclear safety, and includes an information section on the activities of the CSN and the decisions of the Board of Commissioners.

8.1.2.h). Advisory committees

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 created in accordance with Article 15 of Law 15/1980 creating the Nuclear Safety Council, with the mission of issuing recommendations to the CSN

in order to favour and improve transparency, access to information and public participation in matters within the competence of the CSN.

It was constituted on February 24, 2011, at its first meeting, thus complying with the request under Resolution No. 24 of the Commission on Industry, Tourism and Trade of the Congress of Deputies.

It has an Analysis Commission, the task of which is analysis of proposals for recommendations and preparation of assessment reports that serve as the basis for decision-making by the Advisory Committee.

A total of 15 meetings have been held since its creation, and as of the time that this report was written, six of them have taken place within the period covered by the report. The Advisory Committee has made 10 recommendations, four of which had already been fulfilled and were reported in the seventh national report for the Convention on Nuclear Safety. The current status of compliance as of 31 December 2018 is as follows:

Recommendation 5 proposes that the CSN hold an informative day in which the organisation presents its code of ethics. The CSN planned the response to this recommendation in two phases. In the first phase, an internal workshop was held for CSN personnel to present the Code of Ethics and the Safety Culture Policy, which took place on 14th November 2017. The second phase is pending organisation of this Informative Conference by the CSN.

Recommendation 6 requires the publication by the CSN of an informative document on nuclear safety and radiation protection aspects relating to the long-term operation of nuclear power plants. The CSN plans to carry out this publication in 2019.

Recommendation 9 proposes that the CSN organise a conference on the implementation of the improvements at Spanish nuclear power plants deriving from stress tests. In response to this recommendation, the CSN has considered the organisation of an open day for stakeholders for the year 2019.

8.1.2.i) Challenge 1. Combined IRRS-ARTEMIS Mission

In 2016, Spain requested that the International Atomic Energy Agency (IAEA) carry out a combined IRRS-ARTEMIS mission in order to comply with the obligations arising from the Directives published at European Community level and referred to as Directive 2014/87/Euratom and Directive 2011/70/Euratom. Spain had already received a full-scale IRRS mission in 2008 and its corresponding follow-up mission in 2011.

The combined IRRS-ARTEMIS mission was carried out from 14 to 26 October 2018, being the first mission of its kind carried out by the IAEA. The mission was conducted by a review team composed of 24 experts from 16 IAEA Member States, supported by a team of 8 IAEA staff. The mission was also attended by 4 observers from the European Commission, Germany (2) and Bangladesh.

The mission was carried out in accordance with the procedures established in the guidelines published by the IAEA for the execution of these types of missions, through the review of host country documentation, interviews with host country counterparts in the various modules covered by these missions and the observation of inspections at facilities such as: nuclear power plants in operation, nuclear power plants undergoing dismantling, medical facilities, industrial radioactive facilities and nuclear fuel factories.

The outcome of the mission can be summarised in the following figures:

- IRRS report. The findings identified by the review team were as follows:
  - 13 recommendations
  - 20 suggestions
  - 1 good practice
  - 10 areas of good performance

- ARTEMIS report. The findings identified by the review team were as follows:
  - 5 recommendations
  - 2 suggestions
  - 1 good practice
  - 1 area of good performance

Among the recommendations of the IRRS-ARTEMIS combined mission review team, aimed at strengthening nuclear safety and radiation protection in the country, the following stand out:

- The Government should ensure that any delay in the start-up of the Centralised Temporary High Level Waste and Spent Fuel Store (ATC) does not have a negative impact on the safety of radioactive waste and spent fuel management.
- The Government shall carry out immediate actions aimed at updating the General Radioactive Waste Plan.
- The Government, CSN and ENRESA should complement the regulatory framework with standards and an implementation plan for Deep Geological Disposal.
- The Government should improve arrangements and coordination in communication with the public and between entities in the event of a nuclear or radiological emergency.
- Competent authorities should improve the process for systematically establishing and amending regulations and guidelines in accordance with international standards.
- The CSN should foster cooperation agreements with other competent authorities in relation to the management of contaminated land.

The review team also identified two good practices that can be exported internationally:

- An innovative transport data management tool to efficiently support regulatory compliance assessments.
- ATC design. In particular, the process that incorporates the best elements in the design of this facility, together with its multiple capacities for spent fuel management.

8.2 Situation of the Regulatory Body

Since its creation in 1980, the CSN has successively carried out all its competences and functions, such that today it has the regulatory capacities and legal instruments required to carry out its functions with the full guarantee that the entities and activities being regulated are so treated in accordance with the most demanding international standards, criteria and guides.

Both the Law creating the CSN and its Statute establish the mechanisms to guarantee that its actions have the necessary credibility and trust on the part of the society it aims to protect, as well as to guarantee its independence in the exercise of the functions entrusted to it.

8.2.1. Challenge 4. Culture of Safety Programme

On 12th January 2017, the Board of Commissioners Meeting of the CSN approved the document entitled "CSN Policy on Safety Culture". This document defines the safety culture at the CSN as the set of

characteristics and attitudes shared by all the staff, which ensures that compliance with the mission of this organisation is the highest priority and is always present in all its activities.

In order to draw up the CSN policy document on safety culture, a working group was set up that consulted existing initiatives in this area at the international level in order to obtain information on the various approaches used by regulatory bodies in the practical implementation of this concept, as well as to collect all the publications prepared by international organisations in this area as reference material in the execution of this project.

Likewise, the aforementioned CSN working group drew up a proposal for an action plan for the promotion and reinforcement of safety culture within the organisation. One of the points contained in the plan is to carry out a self- assessment of the safety culture of the organisation.

At its meeting held on 29th November 2017, the Board of Commissioners Meeting of the CSN studied two proposals on alternatives for carrying out the self-assessment of CSN's safety culture, agreeing to carry out this assessment following an internal assessment process.

As of 2018, the CSN has already initiated the activities required for the development of an internal self-assessment on safety culture in the organisation. To this end, training activities were planned for the staff of the organisation at all levels, with the aim of providing training and knowledge regarding the meaning and attributes of the concept of safety culture, particularly in the case of a regulatory body, with the aim of making staff aware of the importance of the concept. This training action constitutes the starting point in the construction of a common safety culture language, as well as the initial mechanism for providing the preparation necessary to understand and contribute to the self-assessment process planned within its activities by the CSN, which will require the collaboration and participation of all CSN personnel.

The start of the safety culture self-assessment process is planned for 2019 after the completion of the ongoing training process for the CSN's staff.

8.3 Coordination between the MITECO and the Nuclear Safety Council

In accordance with Spanish Royal Decree 864/2018, of 13th July, the CSN connects to the Government through the MITECO.

While the CSN is the State's sole competent body in relation to nuclear safety and radiation protection, the MITECO is the department in charge of proposing and implementing the Government's energy policy including that therein which relates to nuclear energy.

8.3.1. Authorisation of nuclear and radioactive facilities

The MITECO is responsible for granting authorisations for nuclear and radioactive facilities, following a mandatory report by the CSN. This report is binding, if negative, along with the imposed conditions if it should be positive.

8.3.2. Enforcement procedures in the event of infringements relating to nuclear safety, radiation protection and/or physical protection

The MITECO is the authority empowered to impose sanctions deriving from the enforcement regime. In general, the system of penalties applicable in Spain is established in Law 25/1964, of 29th April, on Nuclear Energy; in Law 30/1992, of 26th November, on the Legal System for the Public Administrations and Common Administrative Procedure; and in Spanish Royal Decree 1398/1993, of 4th August, approving the Regulation of the procedure for the exercise of enforcement power.

Law 25/1964 classifies offences and classifies them as very serious, serious and minor, detailing the criteria for their correct classification. It also establishes the applicable sanctions, which are graded according to the type of facility in question and the seriousness of the infringement committed.

The aforementioned Law 25/1964 also establishes the procedure and powers for the imposition of sanctions:

- In the event of non-compliance with legal or regulatory precepts in relation to nuclear safety, radiation protection or physical protection, the CSN shall propose the initiation of the corresponding enforcement proceedings, informing the competent authority (MITECO) of both the events constituting the infringement and the relevant circumstances necessary for its adequate qualification.
- Likewise, the MITECO may commence enforcement proceedings on its own initiative in the case of infringements in areas other than nuclear safety or radiation protection.
- The MITECO Directorate-General of Energy Policy and Mining is the instructing body that receives allegations and then examines the evidence, carries out the hearing process and prepares a proposal for a Resolution that is submitted to the body that will issue the Resolution. This proposal includes details of proven facts, infringements, responsibilities and sanctions. Depending on the gravity of the infraction, the Resolution is issued by the Director-General of Energy Policy and Mining, by the Minister, or by the Council of Ministers.
- In the case of infringements that may be classified as minor, as an alternative to the proposal to initiate an enforcement procedure, the CSN may warn the licensee of the facility and require the corresponding corrective measures. If this requirement is not met, the CSN may impose coercive fines. The MITECO does not intervene in this procedure.

Likewise, the CSN is empowered by law to suspend the operation of any nuclear or radioactive facility for safety reasons, as well as to adopt precautionary measures, intervention, prohibition and warnings.

Article 9. Responsibility of the Licence Holder

9.1. Legislation assigning primary responsibility for safety to licence holders

Article 36 of Law 25/1964 on nuclear energy explicitly establishes that "the licensee of nuclear or radioactive facilities, or of activities relating to ionising radiation, shall be responsible for their safety".

Article 8 of Spanish Royal Decree 1836/1999, approving the RINR, establishes that “the holder of each permit shall be responsible for the operation of the facility or activity under safe conditions, respecting the stipulations of the official documents under which the corresponding permit is granted at all times”.

In addition, section 3 of this Article establishes that the licensee shall continuously ensure the improvement of the nuclear safety and radiation protection conditions at the facility in question. To this end, the licensee shall analyse the best existing techniques and practices, in accordance with the requirements established by the CSN, and implement those that are suitable in the opinion of said organisation.

Furthermore, Article 5 of the Nuclear Safety Regulation (RSN), approved by RD 1400/2018, of 23rd November, establishes that “primary and non-delegable responsibility in relation to nuclear safety rests with the holder of the licence. This responsibility includes control of the activities of contractors and subcontractors that may affect the nuclear safety of the nuclear facility or facilities”.

Likewise, the CSN may require the licensee, at any time, to perform analyses for the implementation of improvements in nuclear safety and radiation protection, by virtue of the provisions of Article 2a of Law 15/1980, which established the CSN.

9.2. Description of the main means by which the licence holder discharges the prime responsibility for safety

The licensee shall discharge these obligations by operating the facility in accordance with the limits and conditions established in the Operating Licence granted by the MITECO, following a mandatory and binding report by the CSN.

The limits and conditions established in the Operating Licence identify the official operating documents that are obligatory and define the licensing and updating process: Safety Study, Technical Specifications (ETF), Operating Regulations, Site Emergency Plan, Quality Assurance Manual, Radiation Protection Manual (MPR), Radioactive Waste and Spent Fuel Management Plan.

The physical protection authorisation granted under Spanish Royal Decree 1308/2011, on the physical protection of nuclear facilities and materials and radioactive sources, identifies the physical protection plan by virtue of which this authorisation is granted, as well as the applicable updating regime.

In addition, the operation of the plant must comply with the CSN Instructions issued by the organisation in accordance with Article 2.a of Law 15/1980, creating the CSN, according to which the Council "may draw up and approve instructions relating to nuclear facilities and activities relating to nuclear safety and radiation protection"..., "The instructions are technical standards in relation to nuclear safety and radiation protection that shall be binding on the subjects affected by their scope of application, once they have been notified or, where appropriate, published in the Official Spanish State Bulletin".

Among the licensee's obligations is the submission of reports to the CSN of different types and frequencies on the most relevant activities of the facility (surveillance programmes, refuelling outage, reportable events, design modifications, etc.). Among the most significant reports are those analysing the operating experience of the company and others, those analysing the applicability of the new standards of the origin country of the project, the results of the environmental radiological surveillance programme, of the dosimetry controls on the workers, of the activities performed within the framework of the radioactive waste and spent fuel management plan, of the training and education activities of the personnel with and without operating licenses and the removal of radioactive packages from the facility. These reports are subject to supervision by the CSN.

In addition, the licensees have safety-related management policies and systems, in accordance with CSN Instruction IS-19 on management system requirements at nuclear facilities. As explained in Article 14.3.4, the licensees have procedures, guides (sometimes of a sectoral nature) and organisational entities that enable compliance with the applicable requirements and establish internal control mechanisms. The suitability of these means is subject to systematic supervision and monitoring by the CSN.

9.3. Description of the mechanisms by which the regulatory body ensures that the licence holder discharge its prime responsibility for safety

The CSN has several instruments for verifying that the licensee fulfils its obligations.

The first and most effective is the inspection plan, which consists of:

- Systematic and periodic inspections of the Basic Inspection Plan (PBI) with regard to the planned activities of the licensee considered to be the most important for safety.
- Inspections of generic issues, on specific issues arising, generally through in-house and external operational experience, both national and international.
- Reactive inspections, which are organised when a safety-relevant event occurs, in accordance with criteria established in CSN internal procedures.
- Supplementary inspections, which are carried out when there are relevant results, in accordance with the SISC methodological criteria, oriented towards the diagnosis and resolution of problems, which are generally identified in inspection findings or through performance indicators.
- Licensing inspections, which are organised within the framework of the processes of authorisation of design modifications, ETF change, change of licence bases, renewal of the Operating Licence, etc.

The CSN has access to the documentation submitted periodically by the licensees, in compliance with the licensing conditions applied to them and mentioned in section 9.2 above, from the analysis of which aspects to be included in the scope of the inspection agendas may be derived.

There are two resident inspectors in each centre (except for double units, where there are three). These inspectors carry out an essential part of the inspection programme, in addition to contributing to the supervision of plant operation and to the assessment of daily operating events, with the coordinated support of the CSN organisational structure.

In addition, the CSN systematically tracks the operating indicators of each plant, in accordance with the criteria established in the SISC procedures, which make it possible to identify the actions applicable on the part of the licensee and the CSN. The starting information comes from the deviations identified in the inspections, known as "findings", categorised according to their importance, in order to allow identification of the needs for implementation of actions by the licensee and for tracking by the CSN.

If the deviation constitutes non-compliance with a legal or regulatory requirement, the CSN may propose the initiation of an enforcement procedure to the MITECO. If the non-compliance constitutes a minor infraction and there are a series of circumstances that underline its minor importance, the Nuclear Energy Act allows the CSN to directly warn the licensee of the facility in order to indicate the non-compliance and the corrective measures to be adopted.

9.4. Description of the mechanisms by which the licence holder maintains open and transparent communication with the public

All Spanish nuclear facilities maintain an open and transparent communication policy, such that the public has sufficient and truthful information on their activities.

Information from nuclear power plants

1. **Communication and media relations.** Spanish nuclear power plants have organisations, teams and people in charge of disseminating information on their situation to the media and society in general. This is channelled through the dispatch of notes, communiqués and information; press conferences and meetings with the media; dispatch of specific information, etc. Some facilities also periodically collaborate with the media through articles or advertorials. These activities are more frequent and relevant in the environments of each facility. The boost that has been given to each plant's web pages as a communication tool is particularly noteworthy. Initiatives for the use of other tools for direct and interactive communication with the public through social networks are also becoming more frequent. Audiovisual channels are beginning to be used to make certain activities or processes developed in the plants known to a wider and more diverse public.
2. **Publications.** Most nuclear power plants have their own periodical publications (company magazines) containing the main news affecting each facility and its surroundings, as well as the nuclear sector as a whole. Specific publications are also produced, such as general information on the facility for visitors, monographic brochures, technical reports and reports, etc. In recent years there has been a greater increase in digital versions of these formats, which are more accessible and have greater potential for dissemination.
3. All Spanish nuclear power plants have an **information centre**. These are facilities where the operation of the plant is explained in an informative and practical manner, as well as the measures to guarantee its safety, environmental quality and the management of radioactive wastes. These centres are mainly visited by schoolchildren, university students and citizens of the communities where the plants are located.

Information from other collective organisations

Within the nuclear sector, the role of the **Spanish Nuclear Industry Forum,** which carries out important informative and informative work, should be highlighted. Its organisation includes the **Communication Committee**, which also includes nuclear power plants, and which meets periodically to exchange experiences and promote and coordinate joint initiatives. There is also a Training committee that

coordinates and channels activities involving the world of education and a documentation committee that supports the other activities of the Forum.

The Spanish Nuclear Society, which brings together professionals in the sector, also carries out significant dissemination work through its Communication and Publications commissions and also through the initiatives of the Young Nuclear Workers and WIN (Women in Nuclear) collectives, which form part of the Society.

Information from public institutions and bodies

The **Local Information Committees** for each facility constitute a unique initiative in terms of public information and participation. It is an open forum in which the national, regional, provincial and local institutions, the plants themselves and the most representative entities and associations of each area, as well as the regulatory body, are represented. They are called periodically to report on the main aspects related to each plant, as well as other relevant topics related to the facilities and activities that are presented and debated by all the entities represented there. The central offices, through their communication departments, also maintain frequent contact with the municipalities and their representatives, as part of their policy of relations with the environment. One of the CSN's annual planning activities is monitoring and participating in these local information committees.

Information to institutions and public representatives

All facilities and sectoral representatives make contact (either on their own initiative or when required) with provincial, autonomous and national institutions - specifically, commissions of the Congress of Deputies and the Senate - to advise and report on the activities, plans and projects of each facility.

In summary, it can be stated that the nuclear facilities, as well as the Spanish nuclear sector as a whole, carry out a series of activities that guarantee public information, communication and access to information by society, in such a way as to ensure that the transparency of their activity is adequately guaranteed. The ultimate goal of this effort is to achieve public confidence in nuclear power generation.

9.5 Mechanism to ensure that the licence holder of the nuclear installation has appropriate resources (technical, human and financial) and powers for the effective on site management of an accident and mitigation of its consequences

Actions and measures related to the proper management of accidents at the site and the mitigation of their consequences are set out in various chapters of this report. Issues relating to the licensee's resources allocated to emergency preparedness and on-site emergency plans are dealt with in section 16. The aspects relating to the design and implementation of systems for the prevention and mitigation of the consequences of accidents are included in section 18. Finally, section 19.4 describes procedures and guidelines for emergency operation (EOP) and severe accident conditions (SAMG).

The Action Plans (CAP) mentioned in section 10.2 are tools that the licensees include in their management systems to establish the programming and allocation of appropriate resources for carrying out the actions and measures identified, which translate into continuous improvement of the means for managing and responding to the accidents that may occur at the facility.

As regards coverage of the risks associated with liability for accidents, this is within the scope of the financial resources, the availability of which is explicitly required in the new RSN, as is also explained in section 11.1 of this report.

The new RSN that transposes Directive 2014/87 EU establishes provisions in Article 7, **Organisation and management** system aimed at ensuring that the licensees have technical, economic and human resources, as well as safety policies, all integrated into a management system that takes into account organisational aspects, human factors and safety culture, including the contracting of external organisations.

Specifically, it stipulates the following requirements:

1. The obligation to provide, throughout the entire life cycle of the facility, the necessary technical, economic and human resources with adequate qualifications and competencies, as well as an appropriate organisational structure to maintain nuclear safety and ensure adequate response capacity in emergency situations.
2. The obligation to provide a nuclear safety policy that promotes continuous improvement through:
    a. The identification of any new information and analysis of anything relevant within a timeframe appropriate to its significance for nuclear safety.
    b. The systematic review of nuclear safety taking into account in-house and external operational experience, advances in nuclear safety and in science and technology.
    c. The implementation of identified nuclear safety improvements that are reasonably feasible, within the appropriate timeframes.
3. The obligation to establish, implement, evaluate and continuously improve an integrated management system, including nuclear safety, occupational risk prevention, environmental protection, physical protection, quality and economic aspects, to ensure that nuclear safety is duly taken into account with regard to all activities of the organisation. This management system must give due priority to nuclear safety above any other consideration, guaranteeing its maintenance and promoting its continuous improvement.
4. The obligation to make sure that the integrated management system incorporates all the necessary measures to promote and improve an organisational nuclear safety culture that, among other things, enhances the ability to scrutinise safety principles and practices and to report on safety issues at all levels of the organisation.
5. The obligation to take into account the influence of human and organisational factors on nuclear safety throughout the entire life cycle of the facility.
6. The obligation to guarantee that the quality requirements are defined and applied in an appropriate manner to achieve the safety objective established in Article 6 of this Regulation, and that these requirements are integrated into its management system throughout the life cycle of the facility.
7. The obligation to ensure that contractors (and subcontractors under their responsibility) whose activity may affect the safety objective established in Article 6 of these Regulations have the adequate human, technical and economic resources for the efficient and safe performance of assigned tasks.

Given that these provisions apply to the entire life cycle of the facility, which, according to the definition included in the said Regulation, includes "the stages of planning, siting, design, construction, operation and dismantling", their scope includes all the means of managing the various operational situations that may occur during the cycle, including accidents. The licensees have the non-delegable responsibility of complying with the RSN, including the control of the activities of contractors and subcontractors that might affect the safety of the facilities, in accordance with Article 5 *Liability of the licensee* of the aforementioned Regulation.

Article 10. Priority to Safety

10.1. Arrangements and regulatory requirements regarding the policies and programmes to be implemented by the licence holder in order to prioritise safety in the design, construction and operation of nuclear installations

According to Article 8.3 of the RINR, the licensee shall strive at all times to improve the nuclear safety and radiological protection conditions of the facility. To this end, the licensee shall analyse the best existing techniques and practices, in accordance with the requirements established by the CSN, and implement those that are suitable in the opinion of said organisation.

Article 6. *Safety objective for the nuclear installations* of the new RSN incorporates as an objective the siting, design, construction, commissioning, operation and dismantling of nuclear facilities:

a) The obligation to prevent accidents and, in the event that they occur, the mitigation of their consequences.

b) The obligation to avoid, either due to physical impossibility or extreme improbability with a high level of confidence:

i) Early radioactive releases that require emergency measures outside the site without sufficient time for their application;

ii) Major radioactive emissions that require protection measures for the population that must not be limited in duration or area.

The nuclear power plants establish management systems in accordance with the requirements of IAEA guide GS-R-3 "The management system for facilities and activities" and the CSNIS-19 Instruction on the requirements of the nuclear facilities management system. These requirements define how to establish, implement, evaluate and continuously improve a management system that integrates nuclear safety, occupational risk prevention, environmental protection, physical protection, quality and economic aspects, in order to guarantee that nuclear safety is adequately taken into account in all the activities of the organisation.

In addition to establishing the prevention of accidents and the mitigation of their consequences as a safety objective, the new NRS reinforces very relevant aspects, such as human and financial resources, transparency and the safety culture, which were not sufficiently explicit in other regulations.

The management systems establish measures for the safe management of the plants, starting with the establishment of effective activity planning and the availability of duly qualified economic and human resources. Article 7 *Organisation and management system* of the new NRS reinforces these aspects. The establishment of performance indicators makes it possible to identify negative trends and to review the CAP on an annual basis, on the basis of the results obtained from the evaluation of the previous year and any new needs that have been identified. CAPs identify the most important activities to be undertaken over a 5-year period.

Likewise, Article 12 *Safety assessment* of the new NRS requires the licensees to carry out an assessment of the facility during the phases of siting, design and operation, in order to determine that an adequate level of safety has been achieved and that the facility meets the safety objective established in the Regulation. It is important to bear in mind that the reflection in the Final Safety Study of the results of the assessment, required by Article 12.2 of the aforementioned RSN, has an implementation period of 3 years, in accordance with the Sole Transitional Provision of the Spanish Royal Decree approving the RSN.

The licensees establish systems for the systematic assessment of operating experience, both internal and external, with the objective of identifying the root causes of events in order to prevent their repetition or occurrence.

Self-evaluation programmes have been established that allow those responsible for the activities to critically assess the results obtained against the defined expectations, in order to identify non-conformities or proposals for improvement that allow progress in the quality of the processes.

The management system provides for independent internal assessments of security-related activities and processes by staff not directly involved in the activity. Examples of independent evaluations are: quality audits, independent supervisions, evaluations carried out by different committees (nuclear safety committee, the ALARA committee, environment committee, occupational health and safety committee, etc.).

External evaluations provide information comparing the best practices in the sector with the way such activities are carried out in the plant, making it possible to identify areas for improvement. Evaluations performed by the World Association of Nuclear Operators (WANO) through peer reviews, and by the IAEA through operational safety review missions (OSART) at Spanish nuclear power plants during this period included:

Plant	*Evaluation*	*Date*
Vandellós II	**Peer Review Follow up (WANO)**	**2016**
Cofrentes	**Peer Review Follow up (WANO)**	**2016**
Almaraz	**Peer Review Follow up (WANO)**	**2017**
Ascó	**Peer Review Follow up (WANO)**	**2017**
ANAV / Ascó -Vandellós II	**Corporate Peer Review (WANO)**	**2017**
Trillo	**Peer Review (WANO)**	**2017**
Almaraz	**Mission OSART (IAEA)**	**2018**
Cofrentes	**Peer Review (WANO)**	**2018**
Vandellós II	**Peer Review (WANO)**	**2018**
CNAT / Almaraz -Trillo	**Corporate Peer Review Follow up (WANO)**	**2018**
Iberdrola G.N. / Cofrentes	**Corporate Peer Review Follow up (WANO)**	**2018**

During 2019 the ANAV (*Asociación Nuclear Ascó-Vandellós,* Ascó-Vandellós Nuclear Association) plans to carry out an IAEA pre-SALTO (Safety Aspects of Long Term Operation) mission aimed at evaluating the preparation of the Ascó and Vandellós II nuclear power plants for long-term operation.

The analysis of the results of the external evaluations (WANO and IAEA) makes it possible to identify projects common to all the plants in order to advance jointly in these areas in the definition of performance expectations, leadership, use of tools to reduce human error, presence of executives in the field, etc.

10.2 Measures taken by licence holders to implement arrangements for the priority of safety measures, examples of good practice and achievements in the field of safety culture

In the area of safety culture, the plants have established an improvement programme based on a common guide (see section 8.2.1), organised from a broader programme known as the "Programme for the improvement of human and organisational factors", which is explained in Article 12.

The safety culture improvement programme establishes training requirements for specialists in this area, which is given in common for all the plants, in order to homogenise criteria. It also identifies areas of work and joint projects between plants, such as improving leadership, safety culture in collaborating companies, and so on.

The results of the safety culture improvement programmes, like the results of other processes, contribute through the annual review of the licensees' Action Plans, which identify the most important activities in the short and medium term to improve plant safety.

The management of the corrective action programme (CAP) makes it possible to identify the priority of the actions to be carried out in the plants according to their importance for safety. Categorisation of the actions is performed by means of a classification (A, B, C and D) of the impact of the problems identified on the nuclear and radiological safety of the plant. Identification of the root cause and fulfilment of the deadlines allows the causes of an incident to be eliminated, ensuring that it does not recur.

A commitment has been made to carry out internal and external safety culture evaluations, with respective frequencies of 2 and 6 years, as part of which it is recommended that the various evaluation techniques, such as surveys, interviews, behavioural observations, discussions in working groups, etc., should be combined.

In addition, mention should be made of the information and learned lessons obtained from other organisations, in addition to WANO, via the contact maintained by the licensees with the owner groups BWROG and PWROG, Electric Power Research Institute (EPRI) and Nuclear Energy Institute (NEI), institutions of which they are members, either directly or through the Nuclear Energy Committee (CEN) of the Nuclear Forum. These forums make it possible to implement measures to reinforce expectations of behaviour and leadership at all levels, using the various documents issued by these bodies.

Participation in technical missions at the plants, both in Spain and abroad, is considered a highly relevant source of experience for safety. In addition to the missions received directly by the licensees of the Spanish facilities, as indicated in the table in section 10.1 above, various experts from these plants participated during 2016, 2017 and 2018 in 43 WANO peer-to-peer missions and 31 WANO technical missions, which in all cases were undertaken at nuclear power plants.

10.3 Regulatory processes for monitoring and oversight of the arrangements applied by licensees to prioritise safety

The supervision performed by the CSN falls within the framework of the following activities:

- The Nuclear Power Plant Management Systems establish the long-term Strategic Planning processes, the analysis and prioritisation of projects that define the Medium Term Investment Plan (5 years) and the Annual Operating Plan or budget. The CSN is informed annually of the planning of nuclear power plant investments and supervises improvement plans to maintain and reinforce safety aspects. The CSN's annual work plan is determined on the basis of planning informed by the licensees and foresees the performance of inspections of the Management System, among others that make up the different inspection plans.

- The scope of systematic SISC inspections includes monitoring of safety culture, which is performed by means of a system of indicators and transversal components associated with the inspection findings, following predetermined CSN actions and in accordance with the methodological descriptors of the status of the nuclear power plant. The safety culture programmes of the nuclear power plants are supervised from a prevention standpoint through inspections of their Organisation and Human Factors Programmes.

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

The global objectives and strategies established by the CSN are included in the Strategic Plan, which represents the commitment of the entire organisation to nuclear and radiological safety. These objectives are set out in annual plans, which are approved by the Board Board of Commissioners and are subject to monitoring and evaluation activities documented in the corresponding reports. In accordance with this, all policies or strategic axes to be defined, decisions to be taken and activities to be carried out will have to be aligned with this plan, which acts as a point of reference for the hierarchical structuring of the objectives in order to reduce the discretionality of the CSN's regulatory action.

The CSN Management System Manual prioritises the aspects essential for safety, optimising the efficiency of the use of CSN and licensee resources.

Considering that the party responsible for the safety of the facilities and activities is the licensee, a responsibility that cannot be delegated, the fundamental objective of the CSN is to establish a regulatory framework and ensure compliance with it for the protection of people and the environment against the risks associated with ionising radiation.

In compliance with this objective, the CSN considers PSRs to be a fundamental tool for requiring the continuous implementation of safety improvements; the new RSN includes the provisions applicable to PSRs in Article 13 *Periodic safety reviews*. In addition, following the Fuskushima accident, the CSN also required Spanish nuclear facilities to implement the safety measures derived from the analyses derived from said accident, promoting the improvement of the standards and the necessary checks.
The following is a general outline of the prioritisation of the CSN's activities in relation to its processes relating to nuclear power plants.

Regulatory development process

The strategic objective of the CSN is the development of the regulatory pyramid and the commitment to the harmonisation of nuclear safety and radioactive waste and spent fuel management standards with the references used internationally and, in particular, within the framework of the association of European regulators, WENRA. To this end, the CSN is in a continuous process of adapting its legislation to current needs, taking into account international and European regulatory developments.

Supervision and monitoring process

The strategic objective of the CSN is to have a regulatory system and practices comparable with those of the most advanced countries, adapted to the changing demands of the environment, guaranteeing a high level of safety of facilities and activities throughout their life cycle, and which:

- Focus on aspects essential for safety, reinforcing the responsibility of the licensees.
- Harmoniously integrate deterministic and probabilistic methodologies, maintaining sufficient margins of security and the principle of in-depth defence.
- Progressively orient themselves towards a behaviour-based process aimed at the surveillance of processes important for safety, making the CSN's actions systematic, integral, predictable and risk-informed.

In order to achieve this strategic objective, it has set up the SISC, which is described elsewhere in this report. This process is subject to independent audits performed by people who do not participate in the process, and the results of the SISC are published on the CSN institutional website.

Process of granting authorisations

With a view to developing the integrated and specific model for the licensing of nuclear facilities at all phases, the CSN has developed evaluation procedures for requests that systematise the scope and content of the evaluations.

This process is subject to independent audits carried out by people who do not participate in the process. The CSN publishes the reports upon which its authorisation process decisions are based on its institutional website.

Sanctioning process

The CSN has established an internal procedure for the treatment of proposals for the initiation of enforcement proceedings. This process involves various organisational units, not only technical but also legal.

The Committee for the Review of Enforcement Files (CRES) is responsible for analysing proposals for enforcement files, warnings, precautionary measures, interventions, prohibitions and reprimands; unifying criteria and advising on the proposal initiated by the corresponding organisational unit, as well as on the manifestations of the interested parties, if any, documenting the agreements adopted.

10.5. Vienna Declaration

The information contained in this chapter includes important elements that illustrate Spain's compliance with the commitments derived from the Vienna Declaration.

Thus, section 10.1 specifies the regulatory provisions requiring licensees to analyse best safety practices for potential implementation. 10.2 explains that each licensee's Action Plans identify and specify safety improvement activities and that the licensees' internal processes, such as corrective action management programmes, have mechanisms for prioritising improvement actions based on their importance for safety.

Paragraphs 10.1, 10.2 and 10.3 describe various important programmes and activities of the licensees in relation to periodic and systematic assessments of safety aspects, such as self-assessment programmes; independent internal assessments, including quality audits, independent supervisions, assessments by the nuclear safety committees, the ALARA committee and other licensee committees; external

assessments, highlighting those carried out by WANO (peer reviews) and by the IAEA (OSART missions and others); internal and external safety culture assessment programmes; and internal and external safety culture assessments.

It also highlights the mechanisms established by the owners to acquire and share best practices and lessons learned with organisations such as WANO, the owner groups BWROG and PWROG, EPRI or NEI.

Finally, in section 10.4, among the measures implemented within the regulatory body itself to guarantee the priority of safety, certain elements contributing to the achievement of the principles of the Vienna Declaration are mentioned, such as the existing processes for establishing requirements for the continuous improvement of the safety of the facilities (e.g. through the results of the PSRs). In this respect, the specific process followed after the Fukushima accident is highlighted, many of the required improvement actions of which are in line with the principles of the Vienna Declaration. Likewise, emphasis is placed on the CSN's strategic objective of having regulatory practices comparable to those of the most advanced countries, for which there are also mechanisms at the regulatory level for sharing and acquiring best practices. The CSN's internal processes that are subject to independent auditing are also highlighted; the CSN audit programme constitutes a mechanism for periodic and systematic review.

Article 11. Financial and human resources

11.1. Financial Resources

In relation to investments in safety by operators, the Integrated Management System includes a number of safety-related investment planning procedures. The purpose of this system is to ensure that all potential investment needs are detected and receive adequate attention, with any unit of the organisation being able to propose actions involving new investments. For purposes of prioritisation, they are classified according to the following criteria, in the order in which they appear:

1) Regulatory authority requirements.
2) Improvement of nuclear safety, radiation protection, risk prevention and environmental protection.
3) Technological updates or plant improvements.
4) Profitability.

For the provision of the financial resources required in the event of a radiological emergency, Spanish nuclear power plants have insurance cover against both the potential radiological impact outside the facilities and the potential expenses of decontamination. This insurance is regulated through Law 12/2011, of May 27, regarding civil liability for nuclear damage or damage caused by radioactive materials.

As previously indicated, in section 9.5, the new RSN explicitly reinforces the aspects related to human and financial resources, transparency and safety culture.

11.2. Human resources

Regulatory arrangements and requirements in relation to staffing, qualifications, training and retraining of staff for nuclear installations

The CSN has several Instructions defining the qualification requirements of the personnel working at the nuclear power plants.

The CSN Instructions IS-11, on nuclear power plant operating personnel licences and IS-12, on qualification and training requirements for non-licensed personnel at nuclear power plants with functions relating to the safe operation of the plant, define the efficient and safe performance of the tasks assigned to each workstation. The term *qualification* includes academic *qualifications*, experience and initial and continuing training.

In addition, CSN Instruction IS-03, on required qualifications to obtain recognition as an ionising radiation protection expert, details the training and experience requirements considered necessary by the CSN for this expert status, and is applicable to both those responsible for the Radiation Protection Service and the technicians under their responsibility.

The CSN also has the IS-06, which defines the scope and content of the training programmes on radiation protection for external workers in the nuclear facility environment, applicable to external companies, facilities and external workers.

The procedures and practices of the nuclear power plants are established in compliance with the requirements defined by the CSN in the aforementioned Instructions, including both in-house personnel and permanent and temporary contractors in the scope of the definition of type profiles and the analyses of suitability for compliance with these training requirements.

Methods used for the analysis of competence requirements and training needs for all safety-related activities in nuclear installations

In order to analyse the required competencies and training needs with respect to nuclear safety-related activities carried out in nuclear facilities, a systematic design inspired by the SAT (Systematic Approach to Training) methodology has been chosen, the objective of which is to determine: the learning objectives in accordance with the results obtained from an analysis of the previous job; the design of the training programme and its implementation, based on these learning objectives; the tools and human resources necessary for its satisfactory achievement; the evaluation of the degree of personal compliance with the planned learning objectives; and, finally, the evaluation and review of the training programme, based on the performance of the personnel in their job.

Both initial and ongoing training programmes result from this systematic process. The degree of complexity of the same has been established according to the different job roles, the most complete being that of personnel with operating licences.

For the effective management of training programmes, Training Committees have been created, in which the participation of hierarchical managers is essential so that training focuses on improving staff performance.

The licensee of a nuclear power plant has to ensure that all the personnel are in possession of the appropriate qualifications for the functions to be assigned to them.

New personnel and those who change jobs are qualified according to the regulation and the application of the SAT methodology indicated above, which requires:

- Initial training carried out by new staff in accordance with the training plan defined for each job.
- Implementation of the necessary training for personnel who change jobs after the corresponding analysis of any training they may need to occupy the new position.
- On-the-job training under the supervision of experienced personnel.
- Overlap when necessary.

The renewal of the qualification is carried out with an average frequency of five years.

Arrangements for initial training and retraining of operations staff, including simulator training

The initial qualification of the Control Room operators lasts 36 months, divided between teaching classes, supervised study, practice on the simulator and on-the-job training. Simulator practices must have a duration of at least 240 hours and on-the-job training must have a duration of 1,200 hours.

The initial qualification required of Control Room supervisors includes a minimum of three years of operator experience and completion of a minimum 12-month training programme, including at least 100 hours of simulator practice and 500 hours of on-the-job training.

Once the Control Room license (whether Operator or Supervisor) is obtained, it is necessary to follow an annual continuous training programme consisting of 100 hours of classes and a minimum of 20 hours of simulator time which, in current practice, ranges between 40 and 50 hours per year.

For personnel licensed to operate the Control Room, regulations require renewal of the licence every six years.

The entire process is documented and inspected regularly.

Over the last few years, a mixed working group has been formed between the Spanish Nuclear Power Plants, the CSN and the main national training contractor, the objective of which was to improve the process of obtaining new licences aimed at optimising the content and dedication time of the initial training programmes, as well as improving the documentation developed by the syllabus.

Capabilities of plant simulator with regard to fidelity to the plant and scope of simulation

Each nuclear power plant has its own full-scope simulator replicating the control room.

During the period covered by the report, the capacities of the simulators have been improved, extending the operating range to normal, abnormal and emergency operating manoeuvres, including operation with reduced inventory in the primary and operations under refuelling conditions. The simulators have incorporated the improvements to the digital control systems of the plants with maximum physical and functional fidelity, using the most up-to-date simulation solutions. The most relevant design modifications have been installed in advance in the simulators, which serve as a validation platform both from the functional point of view and in aspects related to Human Factor Engineering.

Arrangements for the training of maintenance and technical support staff

As has been mentioned above, the procedures and practices of nuclear power plants are adapted to compliance with the requirements defined by the CSN in the aforementioned Instructions. In addition to these rules, the new RSN establishes the following rule under Article 8. *Training*, which the holder must:

1. Establish a global staff training policy structured according to importance and recognising the relevance of nuclear safety.
2. Guarantee that any staff performing functions that may affect the nuclear safety of the facility have adequate qualifications.
3. Implement and update both initial and ongoing training programmes for the facility staff, taking into account a systematic training structure.

Improvements to training programmes as a result of new insights from safety analyses, operational experience, development of training methods and practices

As has been the case in recent years, the initial and on-going training programmes have incorporated the training and qualification requirements deriving from the new personnel tasks that have arisen as a result of the implementation of improvements at the nuclear power plants following the Fukushima accident, which have generally introduced a component of higher practical training. Likewise, it has been necessary to undertake the development of integrated-scope emergency exercises in which all the members of the organisation involved in emergency management participate, both those contemplated in the design bases and those that give rise to severe accidents outside the design bases of the facility.

Methods used to assess the adequacy of staff at nuclear installations

Staff planning is carried out taking into account the implementation of the Strategic Plan, retirement plans and the time devoted to the qualification activities described. Uniquely, vacancies in the control room are planned eight years in advance.

The dimensioning of a qualified, experienced workforce is based on:

- Compliance with applicable regulations.
- The workload experience associated with the different processes for the management of plant operation.
- Benchmarking carried out with power stations of the same technology and with similar regulations.

Policy or principles governing the use of contracted personnel to support or supplement the licensee's own personnel

The principles applicable to staff recruited to support or supplement the licence holder's own staff, in order to achieve a high level of performance, include the following:

O Ultimate responsibility for ensuring nuclear safety lies with the management of the licensee's organisation, and cannot be delegated to support staff.

O The standards and expectations for carrying out the activities of support staff are the same, and at the same level, as those required for internal staff.

O The support staff knows and makes use of the same processes as the holder's organisation to carry out their activities.

O Support staff who carry out their work independently (i.e. under their own supervision) are appropriately qualified with criteria dimensioned to the same level as that required for their own staff.

O Occupational safety expectations are clearly communicated to the support personnel who carry out their activities in the plant.

O The roles and responsibilities of the Supervisor, regardless of whether that person oversees internal staff or support staff, are clearly defined and robustly implemented when supervising support staff activities.

Methods used to assess the qualification and training of contractor's personnel

In order to evaluate the qualifications and training of the contractor personnel, the licensee must adopt the necessary measures to guarantee that the external company’s hiring standards are adequate, as defined in CSN Instruction IS-12:

O Verification that the external company's quality system includes adequate measures to ensure the competence of its personnel, including training programmes and the necessary records to demonstrate their qualification.

O Verification, prior to the start of work, that the personnel assigned by the external company to carry out the contracted work have the required qualifications.

O Satisfactory completion of the segments of the basic (except for escorted work) and specific nuclear power plant training programme (except where under permanent supervision by nuclear power plant personnel) applicable to the performance of the tasks assigned to the personnel designated by the external company, prior to the commencement of work.

In addition, the licensee must require permanent contractors to comply with a continuous training programme, designed in accordance with the criteria defined in the aforementioned IS-12, which allows workers to maintain their qualifications for the correct performance of the contracted work.

Description of the national supply of and demand for experts in nuclear science and technology

New hires are planned sufficiently in advance in order to schedule the necessary staff training, allowing retiring staff to be replaced in a timely manner, with the appropriate overlap for the transfer of as much knowledge as possible during the handover. In the case of an organisational reinforcement, the required training is given before the job is taken up.

In Spain there are several educational programmes that provide their students with an in-depth knowledge of the theoretical and practical foundations of nuclear engineering, and of the technology associated with the production of energy through nuclear fission. These educational programmes enjoy the collaboration of the CSN, the licensees and national and international organisations. A few notable examples are:

— Master's Degree in Nuclear Science and Technology (Polytechnic University of Madrid).
— Master's Degree in Nuclear Engineering and Applications (Ciemat and Autonomous University of Madrid).
— Master's Degree in Radiation Protection in Radioactive and Nuclear Facilities (Polytechnic University of Valencia).
— Master's Degree in Nuclear Engineering (Polytechnic University of Catalonia).
— European Master's Degree in Nuclear Energy-EMINE (Polytechnic University of Catalonia).

Currently, the number of Spanish students studying a master's degree in Spain in disciplines related to nuclear technology is very low, so there is a risk that some programmes will disappear due to a lack of students. In the case of international master's degrees taught in Spain in these disciplines, they can be maintained since they have a significant proportion of students from other countries.

On the other hand, demand for new hires from nuclear power plants is not always met by the supply from the aforementioned master's degrees. For this reason, the plants have specific training programmes for vacancies in different positions that are usually filled with other technical and engineering profiles, as well as with people with specific training in these disciplines, in order to cover all the knowledge, skills and expectations required to perform their functions safely.

The Nuclear Safety Council has established four Chairs in Nuclear Safety and Radiation Protection to promote training and the development of R&D in the field of nuclear safety and radiation protection, with the objective of supporting the entry of young professionals trained in these matters into the sector. This was considered an area of good performance as a result of the IRRS-ARTEMIS mission to Spain in 2018.

Methods used for the analysis of competence, availability and sufficiency of additional staff required for severe accident management, including contracted personnel or personnel from other nuclear installations

An Emergency Response Organisation is made up of operating personnel, collaborating companies and the External Support organisations established in the Internal Emergency Plan. The starting base for forming the Emergency Response Organisation in the event of an accident is the personnel on duty at the plant at the time of the onset of the emergency, as well as the checkpoint personnel who are incorporated into the plant in accordance with the provisions of the Site Emergency Plan. Depending on its severity and characteristics, the organisation progressively expands until it reaches its maximum level in order to be able to undertake all the mitigation measures envisaged.

An Emergency Response Organisation must be dimensioned so as to be able to take the actions required to deal with design-based accidents and to execute the mitigation strategies derived from the analysis of situations beyond that foreseen in the design basis, in accordance with the provisions of the EOP and SAMG, as well as in the procedures that develop the facility's on-site emergency plan.

In order to define the staff and resources that are required at all times in a nuclear power plant Emergency Response Organisation, the licensees have designed a specific methodology in such a way as to guarantee the capacity to face and mitigate events caused by extreme events that imply a condition beyond the design basis established at the plant, as well as potential events that may cause extensive damage throughout the site.

This methodology has been developed from U.S. nuclear industry standards (NEI 06- 12 rev. 2, NEI 12-06 rev. 1, NEI 12-01 rev. 0, NEI 10-5 rev. 0), as well as the various post-Fukushima ITC issued by the CSN and the associated Safety Guides.

A common methodology has been developed with a view to creating a dynamic process that is sustainable over time, such that all Spanish nuclear power plants can check and review at all times how the changes made to the facility or to the organisation, the operating experiences that have arisen or the improvements implemented at the facilities may affect the allocations required to mitigate emergencies. This is a sequential process that allows the impact of the different requirements arising within the plant's Emergency Response Organisation to be evaluated periodically, and the latter to be modified appropriately depending on any changes that may be identified.

In other words, possible external support and resources such as the Emergency Support Centre (CAE), the Military Emergency Unit (UME), external organisations or personnel from other nuclear power plants are constituted as additional aid, but have not been taken into account for the dimensioning of proprietary resources.

Regulatory review and control activities

The CSN carries out supervision and control activities relating to the human resources of the nuclear power plants in the following manner:

- Each plant is required to have analysed and documented the technical capacity and minimum staff requirements of each organisational department for the safe operation of the plant.
- Each plant is required to analyse and document organisational and human resource changes related to nuclear safety or radiation protection functions, to ensure that the functions continue to be properly performed and that the change and its management do not have a negative impact on safety.
- Each year the nuclear power plants send the CSN a report containing modifications or updates relating to optimisation of the human resources of their organisation.

As has already been indicated, as regards the qualification of the personnel performing safety-related functions at nuclear power plants, the CSN has provided instructions IS-11 for personnel holding an operating licence and IS-12 for other personnel.

As regards personnel holding an operating licence, the granting of such a licence by the CSN requires that candidates hold adequate prior qualifications and pass the examination tests (written, control room and plant simulator) established by the CSN Operating Licensing Tribunal. The renewal of operating licenses is granted by the CSN every six years, following a request and verification of compliance with the requirements established in IS-11.

The CSN carries out biennial inspections of the training programmes for the personnel of the nuclear facilities, concerning both the staff and permanent and sporadic contractors. These inspections cover both licensed personnel and other personnel performing safety-related functions. These inspections include aspects of supervision of the licensee's policy, organisation, human and material resources, processes and procedures for systematic design of staff training, the resulting training programmes and their implementation, and checks on compliance with staff qualification requirements (academic qualifications, experience, initial and on-going training). The scope of these inspections also includes aspects related to the maintenance of the physical and functional fidelity of full scope replica simulators.

Article 12. Human factors

12.1. Arrangements and regulatory requirements to take human and organisational factors account for the safety of nuclear installations

The main requirements related to human and organisational factors are detailed below:

- CSN Instruction IS-19, on nuclear facility management system requirements: this instruction defines the requirements applied to the organisation in order to establish, implement, assess and continuously improve a management system that integrates nuclear safety and radiation protection, occupational risk prevention, environmental protection, physical protection and quality.
- CSN Instruction IS-21, on requirements applicable to modifications at nuclear power plants: this requires the adequate incorporation of human factor methods and criteria in all phases of the modification process and activities.
- CSN Instruction IS-26, on basic nuclear safety requirements applicable to nuclear facilities: this requires the licensee of the facility to take into account aspects relating to human factors during the life cycle of the facility, such that operating safety is improved under normal conditions as well as in operational events and accident situations. In addition, the operator of the facility shall pay special attention to human errors and have specific programmes to reduce, detect and correct them.
- CSN Instruction IS-27, on general design criteria for nuclear power plants: the design of safety-relevant structures, equipment and systems (SSCs) should take into account human factor engineering principles and techniques. In addition, the design of the control room will take human factors into account. The control room shall be provided with visual and, where appropriate, acoustic devices to identify processes and conditions that have deviated from the normal condition and may affect safety. The operator shall have the necessary information to be able to check the action and effect of the automatic actions.

12.2. Consideration of human factors in design of nuclear installations and subsequent modifications

The objective of human factor engineering in design is to achieve adequate consideration of the role and contribution of people to the safe and reliable operation of facilities, ensuring that the modifications generated are compatible with human characteristics and limitations.

The activities related to human factors in design modifications are: review of the control room panels, improvement of the human-machine interface, evaluation of changes in the location of elements, variations in working conditions, systematic changes, use of new tools, impact on operation through the use of simulators, etc.

Everything relating to the human-machine interface in the control rooms of Spanish nuclear power plants has been studied in depth in accordance with that which is indicated in the USNRC publications NUREG 0700 revision 2 (Human-System Interface Design Review Guidelines) and NUREG 0711 revision 2 (Human Factors Engineering Programme Review Model).

A general systematic review of design modifications from the point of view of human factors has been established, based also on the aforementioned documents (NUREG 0700 and 0711).

12.3. Licensee's methods and programmes for analysing, preventing, detecting and correcting human errors in the operation and maintenance of nuclear installations

The Spanish nuclear power plants have established programmes for the improvement of organisational safety and human factors. The programme makes it possible to identify, control and reinforce "organisational" and "human" aspects before they can have a negative impact on the plant's security and availability.

The objectives of the Organisational Safety and Human Factors programme are:

— Minimise or prevent, as far as possible, aspects of organisation and human factors from negatively influencing the safety of the plant and its availability, analysing the problems that arise as a result of these, and identifying and executing the corrective actions necessary to avoid their repetition.
— Develop organisational activities related to external and internal evaluations, including those related to the safety culture.
— Respond to organisational requirements for safety culture and human factors proposed by external bodies.
— Evaluate organisational changes according to the established system.
— The design of equipment, systems and their human-machine interface as well as design modifications are carried out taking into account human capabilities and limitations and in accordance with recognised human factor principles and practices.
— Follow-up of the activities developed through supervision.
— Collaborate in Organisational Safety and Human Factors, training and research projects.
— Participate in external forums for debate, exchange and research on organisational improvements and human factors.

In addition, the Organisational Safety and Human Factors Programme aims to:

— Establish objectives and expectations upon which to self-evaluate the programme.
— Coordinate the different projects and activities, homogenising criteria.
— To have technical experts in minimisation of human errors.
— To allow a continuity of the programme in the medium and long term.

With a view to using synergies between the plants, a coordination group of Organisational Safety and Human Factors specialists has been established within the Nuclear Forum CEN for the purpose of exchanging information, coordinating relations with the CSN, developing research projects and carrying out courses for Organisational Safety and Human Factors specialists. Each nuclear power plant has defined an organisation responsible for establishing improvement plans relating to human and organisational factors. These organisations have experts in these fields.

Programmes have also been established to check the correct state of the persons working at the nuclear power plants (*Fitness for Duty*).

The use of simulators in the control room makes it possible to observe behaviour during training sessions. Attitudes such as leadership, questioning, teamwork and the use of error minimisation tools during the execution of different scenarios in the control room simulators are reinforced. Human factor simulators have been established at the nuclear power plants, which allow performance expectations to be reinforced and the use of error minimisation tools by simulating real jobs and practices.

In particular, plans have been put in place to strengthen behavioural expectations. One of the first steps that has been taken has been the review of the aforementioned performance expectations, comparing them with the best standards of the nuclear industry. Subsequently, plans have been established to communicate and raise awareness of these expectations. Once defined and communicated, compliance has been monitored in order to identify weaknesses and establish actions to correct these weaknesses.

The use of human error minimisation tools has been reinforced, such as: adherence to procedures, pre-work meetings, post-work meetings, double verification, independent verification, use of phonetic alphabet, use of operational experience, etc.

Work continues on programmes to strengthen the safety culture and on Organisational Safety and Human Factors programmes. There are common procedures among the nuclear power plants for the performance of internal safety culture assessments and a commitment has been made to carry them out every three years.

There are periodic external evaluations of safety culture and participation in international congresses and groups related to the themes of safety culture and Organisational Safety and Human Factors.

Common training has been defined for Organisational Safety and Human Factors specialists and this training is regularly provided jointly to all persons working in nuclear power plants (both internal and contracted personnel) and is linked to safety culture and human and organisational factors.

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

The Spanish nuclear power plants have self-assessment programmes in place in order to pursue the continuous improvement of the activities and processes carried out in the organisation, identifying and assessing deficiencies and opportunities for improvement through direct involvement of the staff in the critical review and in the improvement of their own work and results.

A method has been established for the preparation, review, approval and subsequent assessment of the company's organisational changes, which reasonably guarantees adequate identification and assessment of the possible impacts that the change will have on the safe operation of the nuclear power plant prior to its implementation.

12.5. Arrangements for on the feedback of on experience in realation to human factors and organisational issues

The headlines use CAP as an analysis tool to identify negative trends in Organisational Safety and Human Factors issues.

Through the CEN of the Nuclear Forum, groups of specialists in the CAP and Organisational Safety and Human Factors have been established who exchange information in order to establish common criteria in the treatment of the information obtained from the analysis of trends, generating common activities to advance in the identified areas for improvement.

The supervision of behaviour, in accordance with the defined expectations of human behaviour, makes it possible to identify areas for improvement, which is put into practice through the reinforcement of those responsible for the work, the communication of expectations and training courses.

The periodic internal and external assessment of the safety culture is another source of information that allows the degree of implementation of activities relating to the safety culture at the plants to be ascertained.

The evaluation and dissemination of internal and external operational experience related to human and organisational factors allows the organisation to become aware of the real problems that occur in these areas and also allows it to establish actions aimed at improving them.

12.6. Regulatory review and control activities

The CSN monitors the requirements and standards relating to human and organisational factors issued in the origin country of the projects and international practices, adapting its standards and regulatory practices. It is the responsibility of the licensees of nuclear facilities to carry out the actions required to respond to the applicable requirements and to establish processes for the continuous improvement of safety in this area, and it is the function of the CSN to supervise the suitability of such actions. In this respect, during this period the CSN continued its assessment and inspection tasks, contemplating Organisational Safety and Human Factors aspects within the scope of the systematic (SISC, PBI) and non-systematic inspection plans (generic, specific, reactive inspections, etc.).

During this period the CSN monitored the state of implementation of the Organisational Safety and Human Factors programmes and associated projects and activities through the evaluation of licensee requests. Likewise, the CSN-CEN mixed working group, the aim of which is to address different aspects of Organisational Safety and Human Factors in specific meetings, especially through the biennial PBI inspections, makes it possible to complete the follow-up on these issues. The projects and activities supervised by the CSN include the development of human factor simulators at Spanish nuclear power plants, safety culture programmes, analysis of human factors in operating experience, engineering of human factors in design modifications, work supervision and behaviour observation activities, projects for analysis of the feasibility of human actions and management of organisational changes.

Article 13. Quality Assurance

13.1 Arrangements and regulatory requirements for quality assurance programmes, quality management systems or licence holder management systems

The CSN requires all nuclear power plants to establish a quality assurance programme, explicitly in the RINR; likewise, CSN Instruction IS-19, on management system requirements at nuclear facilities, indicates that quality assurance systems are to comply with the Spanish standard UNE-73401:1995 "Quality assurance at nuclear facilities", which establishes the criteria on which the quality assurance manuals are to be based.

In addition, the provisions of section 9.5 on the new RSN, in particular Article 7, Organisation and Management System, are applicable; this includes provisions directly applicable to the availability of a management system that integrates the technical, economic and human resources of the plants in order to draw up safety policies that take into account organisational, human factors and safety culture aspects, including the contracting of external organisations.

13.2. Situation with regard to the implementation of integrated management systems in nuclear installations

The integrated plant management systems are within the scope of the CSN's systematic and non-systematic supervision and control processes, which verify the compliance of these systems with the standards mentioned in the previous section, IS-19 and Article 7.3 of the RSN, which in turn have been drawn up using valid references at international level, such as the IAEA guides.

Quality is integrated into the integrated plant management systems, which define the way in which the management system itself integrating nuclear safety, occupational risk prevention, environmental protection, physical protection, quality and economic aspects is to be established, implemented, evaluated and continuously improved in order to guarantee that nuclear safety is adequately taken into account in all the activities of the organisation.

13.3. Main elements of a typical quality assurance, quality management system or management system programme covering all aspects of safety throughout the lifetime of the nuclear installation, including delivery of safety related work by contractors

The aim of the implementation of a quality assurance programme is to make it possible to reasonably ensure that the SSCs (and the use made of them) are adequate to ensure that the operation of nuclear

power plants is carried out in a safe, reliable and documented manner. To this end, these programmes establish the application of a set of systematic, documented and planned activities relating to the safety of the facility, which apply to all phases of the plant lifetime, including activities such as the design, purchasing, manufacturing, handling and transport of materials and the storage of materials, construction, assembly, testing of systems and equipment, commissioning, operation of the facility, inspection, maintenance of systems, repair of equipment, activities during refuelling outages and design modifications that may affect the quality of safety-related items.

The requirements set out in the quality assurance programme apply to all activities that affect SSC safety functions related to safety. It applies to all organisations, both internal and external, involved in security-related activities.

As has been pointed out in previous sections of this report, the quality assurance provisions of the RSN apply to the entire life cycle of the facility, explicitly including *"the stages of planning, siting, design, construction, operation and dismantling",* such that their scope includes all the means of managing the different operating situations that might occur during the cycle, including accidents. The licensees have the non-delegable responsibility of complying with the RSN, including the control of the activities of contractors and subcontractors that might affect the safety of the facilities, in accordance with Article 5 *Liability of the licensee* of the aforementioned Regulation

13.4. Audit programmes of the licence holder audit

The quality assurance programme implemented at nuclear facilities requires the establishment of a planned and documented programme of internal and external audits in order to verify that all aspects of the quality assurance programme are met and that it is effective. The objective of the internal audit programme is to cover, in three- or four-year cycles, all the activities contemplated in the nuclear power plant quality assurance programme. These audits are carried out according to written procedures or checklists. The personnel who carry out these audits must be suitably trained and accredited to carry out this activity.

Measures have been established to follow up corrective actions and verify that deficiencies discovered during audits are corrected within agreed timeframes, along with their causes where possible.

The Spanish nuclear power plants have worked under the coordination of the CEN of the Nuclear Forum to establish common checklists for the performance of audits in different areas based on the best nuclear industry standards defined by the *Institute of Nuclear Power Operations* (INPO) and WANO.

13.5. Audits of vendors and suppliers by licence holders

The quality assurance programme states that purchases of equipment and/or service contracts for safety-related positions must be made from pre-assessed, approved suppliers. To this end, an annual programme of external audits has been established in order to verify the supplier's capacity to provide elements or services that comply with the requirements established in the purchasing or contracting documents.

In order to optimise the supplier assessment process, Spanish nuclear power plants have used written procedures to systematise the common supplier assessment, such that the assessment performed by one nuclear power plant, in accordance with these procedures, may be of use to other plants. A group has been set up within the CEN of the Nuclear Forum to coordinate common assessments for all nuclear power plants. A computer application is available for the control and monitoring of common evaluations. Collaboration agreements are maintained with international groups of nuclear power plant supplier evaluators.

13.6. Regulatory review and control activities

In accordance with the requirements of CSN Instruction IS-19, the nuclear facilities have implemented a coherent management system with valid international references, the supervision of which the CSN carries out through its PBI, as has been indicated in previous sections.

The following should be pointed out with regard to the regulatory control associated with Quality Assurance inspections:

- The quality assurance programme of the facilities is inspected through the biennial PBI inspections mentioned in Article 7.4 above, the scope of which includes specific aspects directly related to the quality criteria included in the Quality Assurance Manual of the facility.
- A triennial inspection is carried out on compliance with the PAC, integrated in the PBI, the purpose of which is to check that the facility reports any nonconformities that may arise promptly and correctly, that it evaluates and categorises them, that it resolves them by means of corrective actions prioritised according to their importance for safety, that it analyses the effectiveness of the actions and that it carries out trend analysis of these nonconformities. Likewise, proposals for improvement and their associated corrective actions are checked.
- The activities of the resident inspectorate include the routine review of the monitoring of the status and conditions of the plant. Although this activity is not included as a PBI inspection, the procedure developed for its execution makes it possible to verify the identification and problem-solving programmes and their management through the CAP.
- Each year an inspection is carried out at one or two nuclear facilities to assess the application of the management system and processes. These inspections are carried out by the resident inspectorate, with the support from CSN experts as deemed necessary.

In recent years, quality assurance evaluation and inspection has focused in particular on the following:

- Management and use of spare parts in safety systems: acquisition of alternative spare parts, management of spare parts in warehouses, activities to prevent work orders being postponed due to lack of spare parts, purchase of nuclear class spare parts and purchases of commercial grade spare parts, and carrying out the corresponding dedication processes.
- Detection of fraudulent elements in the facilities.
- Contracting of services and control and supervision of safety-related work performed by contractors during refuelling.
- Quality plans for the construction of individualised temporary storage (ATI).
- Quality plans for execution, assembly and commissioning of design modifications (with special attention to those derived from post-Fukushima actions)
- Quality plans for changes to scope licence bases or any other project the importance of which requires a specific quality plan.

Article 14. Assessment and Verification of Safety

This section includes the applicable standards and those processes that ensure the performance of systematic safety assessments during the lifetime of nuclear facilities, including long-term operating periods.

14.1. Assessment of safety

14.1.1. Arrangement and regulatory requirements to perform comprehensive and systematic safety assessments

The RINR establishes the requirements to be met by the licensees during the different authorisation processes (preliminary or site, construction, operation, modification, dismantling and declaration of decommissioning) throughout the different phases of the lifetime of the facility.

Among the requirements established in the RINR is performance of accident analysis and assessment of any risks deriving from the operation of the facility. Specifically, CSN Instruction IS-37 establishes the requirements for the performance of accident analyses at nuclear power plants.

As regards design modifications, the RINR requires analysis in order to determine whether ministerial authorisation is required prior to their commissioning and, likewise, establishes the type of modifications requiring construction and assembly permits. These requirements are developed in CSN Instruction IS-21, applicable to:

1) Plant SSC changes
2) Performance of tests not described in the Safety Study or in the ETF.
3) Changes in operating conditions, including assessment methods, practices, procedures, manuals and other documents.
4) Temporary changes.
5) Degraded or non-conforming conditions.

IS-21 distinguishes between different types of assessments (preliminary analysis and/or safety assessments) of modifications, depending on their importance for safety and on whether they require favourable assessment by the CSN or ministerial authorisation prior to their assembly or start-up. When a modification requires authorisation, the safety analysis must demonstrate that once the modification has been implemented, the applicable safety criteria, standards and requirements will continue to be met.

According to IS-21, in the first three months of the year, licence holders must report to MITECO and CSN on any modifications that may be planned, implemented or in the process of being implemented at the plant, including any previous analyses and safety assessments performed.

On the other hand, CSN Instruction IS-26, on basic safety criteria applicable to nuclear facilities, establishes that licensees must perform a PSR at least once every 10 years, the objectives of which are described in section 14.2.3. CSN safety guide GS-01.10 Rev.2. "Periodic safety reviews of nuclear power plants establish the guidelines for the performance of PSRs. In this respect, Articles 12 and 31 of the new RSN reinforce the requirements previously existing in the regulatory framework in relation to facility safety assessments and modifications. Article 13 also strengthens the provisions relating to the PSR laid down in Instruction IS-26, transposing the provisions laid down in Directive 2014/87/Euratom.

In addition to the PSR, compliance with Directive 2014/87/Euratom implies carrying out a detailed assessment every six years of a specific nuclear power plant safety issue (Topical Peer Review), the results of which will be reflected in a national report undergoing a peer review process among all countries of the European Union. The results of this process are published. The first review began in 2017 on the topic of ageing management at nuclear facilities. The results of the national self-assessment, based on the Technical Specifications defined by WENRA, were published in October 2018, as the National Report of the first Topical Peer Review.

Finally, Law 15/1980 creating the CSN enables this regulatory body, in its second Article (Section A) to establish obligatory compliance requirements. This regulatory route is used when it is deemed necessary to review or evaluate safety aspects. Following the Fukushima accident, the CSN issued ITCs requiring that endurance tests be carried out and that the necessary evaluations be carried out to identify and implement the resulting improvement measures. As indicated in Article 6 of this report, the Spanish nuclear power plants completed the implementation of these measures in 2016-2017, except for the updating of the seismic characterisation of sites, which is under way, within the periods established by the CSN. In December 2017 the CSN submitted revision 2 of the National Action Plan for post-Fukushima measures (NAcP) to ENSREG, as agreed at the plenary meeting of this organisation in June 2017, which states as its principal conclusion that the implementation of the actions and commitments undertaken by Spain after European endurance tests has been completed or is at a very advanced stage.

14.1.2. Safety assessments within the licensing process and safety analysis reports for different stages in the lifetime of nuclear installations

During the period covered by this report, no nuclear power plant's Operating Licence was renewed, given that its periods of validity remained in force. Processes related to the submission of future Operating Licence renewal applications have been initiated in several cases:

- Almaraz and Vandellós II Nuclear Power Plants: presentation of the documentation associated with long-term operation (2017).
- Ascó and Cofrentes Nuclear Power Plants: presentation of documentation associated with long-term operation (2018).

Likewise, during this period PSR processes were initiated at the following plants:

- Almaraz and Vandellós II Nuclear Power Plants: base document of the PSR performed and favourably assessed by the CSN (2018).
- Ascó and Cofrentes Nuclear Power Plants: base document of the PSR submitted to the CSN (2018).

The specific safety assessments carried out during the reporting period, following the established regulatory processes, are indicated below:

Almaraz Nuclear Power Plant

During the period covered by this report, among the modifications made that required reporting by the CSN, the following are notable:

— Application for authorisation to start up the Filtered Containment Venting System (SVFC) in Almaraz NPP, units I and II.
— CAGE commissioning request
— Request for implementation of PAR in unit II (unit I had been authorised in 2015).
— Execution and start-up of the ATI for dry storage of spent fuel.
— Commissioning of the new feed water turbopump digital control system.
— Modification of the bridge crane in the fuel building of Almaraz I and II to adapt it to the USNRC NUREG554 (simple failure).

Ascó Nuclear Power Plant

During the period covered by this report, among the modifications made that required reporting by the CSN, the following are notable:

— Application for Authorisation of methodological changes to Accident Analysis to verify compliance with the radiological acceptance criteria of IS-37.
— Application for Authorisation to review the Control Room habitability analysis after LOCA, due to modification of the considered alignment of the Emergency Control Room Ventilation System (SVESC).
— Application for authorisation to start up the Filtered Containment Venting System (SVFC) in Ascó I NPP.
— Changes in ETF deriving from the revision of the HI-STORM, and HI-STAR (dry storage of spent fuel) casks Safety Study.

Cofrentes nuclear power plant

During the period covered by this report, among the modifications made that required reporting by the CSN, the following are notable:

— Commissioning of the CAGE
— Modification of design for PAR facility
— Equivalent compliance with CSN Instruction IS-30 in auxiliary building fire area AU-01
— Modification of the design corresponding to the use of MARATHON control bars
— Design modification for the use of NSF material in channels of GNF2 fuel elements
— Modification of the design corresponding to the SVFC

Santa María de Garoña Nuclear Power Plant (CNSMG)

As it has been indicated in section 6.3 of this report, at the end of 2012 the licensee voluntarily decided to shut down the operation of the plant, despite the fact that the Operating Licence was valid until July 6th 2013. The plant has since come to a standstill, with the fuel discharged into the pool. On July 6, 2013 the Ministry declared the cessation of operation of CNSMG.

Subsequently, on May 27, 2014, the holder requested the renewal of the Operating Licence. Following evaluation of the request, in February 2017 the CSN issued a favourable report, with conditions and requirements to be implemented prior to start-up. Finally, in August 2017 the Ministry refused to renew the CNSMG's Operating Licence.

Since 2017 the licensee has adapted the activities of the plant to its cessation-of-operation status, abandoning the maintenance and conservation of unnecessary systems. Likewise, the holder is conducting the activities prior to decommissioning authorised by the ministerial cessation order of July 6th 2013 and within the framework of the ITC issued by the CSN associated with said cessation order.

During the 2016-2018 period the licensee constructed an ATI to house dry spent fuel storage casks. The authorisation for the execution and assembly of this facility was issued in October 2015, and the authorisation for commissioning was issued in August 2018.

Trillo Nuclear Centre

During the period covered by this report, among the modifications made that required reporting by the CSN, the following are notable:

— Commissioning of the CAGE
— Modification of the design corresponding to the SVFC
— ENUSA-Westinghouse Demonstration Fuel Element Programme.
— New fuel pickup and update of LOCA analysis codes.
— Authorisation for the use of the ENUN32P spent fuel cask at the Trillo NPP ATI.
— Updating of the subcriticality analyses at the new fuel storage facility and fuel pool, allowing the enrichment limit of the stored fuel to be increased.

Vandellós II nuclear power plant

During the period covered by this report, among the modifications made that required reporting by the CSN, the following are notable:

— Proposal for change to ETF "Updating of the Pressure-Temperature (P-T) Heating and Cooling Curves of the Vandellós II NPP Reactor Refrigerant System (RCS) to include Subatmospheric Pressure Operation"
— ETF Changes "New Remote Stop Panel Signals"
— Application for Authorisation of methodological changes to Accident Analysis in order to verify compliance with the radiological acceptance criteria of Instruction IS-37
— Application for Authorisation for the review of the atmospheric diffusion factors in the Control Room and of the radiological consequences after LOCA, in order to guarantee the habitability conditions in the Control Room, pursuant to the Regulatory Guide (RG) - 1.194.

14.1.3. Periodic safety assessments of nuclear facilities carried out, including references to appropriate standards and practices and illustrative examples of how new data are taken into account and of the main results of such assessments for existing nuclear facilities, including a summary of significant results for individual nuclear facilities (not merely by type and generation)

As has already been indicated, CSN Instruction IS-26 requires a PSR to be performed at least once every 10 years. CSN safety guide GS-01.10 Rev.2. “Periodic safety reviews of nuclear power plants” establishes the guidelines for the performance of PSRs and is the reference tool for the CSN's assessment of these PSRs. Likewise, Article 13 of the RSN reinforces the provisions of Instruction IS-26 in relation to PSR and establishes that “as a result of the PSR, the licensee must introduce nuclear safety improvements within the facility within periods appropriate to their importance for safety, taking as a reference the safety objective established in Article 6 of this Regulation”. The safety objective referred to in Article 6 of the RSN transposes the safety objective of Directive 2014/87 for existing reactors and thus Principle 2 of the Vienna Declaration.

The aforementioned GS-01.10 was revised in 2017 with the dual purpose of:

- improving the efficiency of PSRs, taking into account the experience of the latest PSRs at the Spanish nuclear power plants and in other countries, the lessons learned from the Fukushima accident of March 2011, Community Directives 2009/71/Euratom of 25 June 2009 and

2014/87/Euratom of 8 July 2014, as well as the challenges associated with the ageing and obsolescence of the equipment and the possible long-term operation of the facilities beyond their initially foreseen lifetimes, and

- adapting to WENRA reference levels and to the content of the IAEA guide SSG-25 "Periodic Safety Review for Nuclear Power Plants", which provides recommendations and guidelines for carrying out the PSR.

One of the objectives of the PSR is to analyse the performance of the facility as regards the different aspects of nuclear safety over a sufficiently long period of time to identify trends, analyse the situation of the facility in relation to international standards and the origin country of the project and assess the nuclear safety of the facility, verifying compliance with its design bases and the validity of the measures for the prevention of accidents and the mitigation of their consequences, and the application of the in-depth defence principle. The PSR aims to ensure that nuclear safety remains at a high level during the following period.

For facilities requesting authorisation for long-term operation (beyond the design lifetime), the licensee must include within the documentation supporting the request an *integrated ageing assessment and management plan* containing Ageing Management Reviews (AMR) and Analyses Performed with Defined Design Life Assumptions (Time Limited Ageing Analyses, TLAA), as established in CSN Instruction IS-22, on the management of ageing at nuclear power plants. One of the products of the PSRs is the revision of ongoing safety improvement programmes, or the incorporation of new programmes, if necessary depending on the results of the different analyses.

GS-1.10 contemplates, as a fundamental part of the PSR, analysis and comparison against the most advanced standards and best practices. The new standards to be analysed during the PSR are reflected in the base document for the performance of the PSR, which requires a favourable assessment by the CSN. This practice replaces the process carried out in the previous PSR period in Spain, known as *conditional application regulation* (NAC).

The standards of the origin country of the project have been taken into account since the beginning of the licensing of the Spanish nuclear power plants, by means of requirements relating to their consideration, both in the previous authorisations and in the Operating Licence.

The Operating Permit currently include a condition whereby, within the first quarter of each calendar year, the licensee is required to submit a report on the measures taken to adapt plant operation to the new national requirements on nuclear safety and radiation protection and to the standards of the origin country of the project. In the latter case, an analysis of the applicability to the plant of the new requirements issued by the regulatory body of the origin country of the project must be included.

Likewise, within the scope of the PSR licensees are required to carry out a global analysis of the applicability of the new standards issued in the origin country of the project or in other reference countries and organisations (IAEA). The standard to be analysed is specified in the base documents of the corresponding PSR of each plant.

The safety assessment associated with the PSRs should also include an update of the Probabilistic Safety Assessment, assessing the design modifications informed by the risk and incorporating the operating experience since the last update.

During the period covered by this report (specifically in 2018) the CSN favourably assessed the base documents for the performance of the PSRs of the Almaraz and Vandellós II nuclear power plants.

14.1.4. Regulatory review and control activities

The Management System implemented at the CSN is based on the IAEA-Safety Standard GS-R-3 "The management system for facilities and activities" and on the UNE-EN ISO 9001-2008 standard (currently being updated following the IRRS mission to Spain in October 2018). This establishes the processes and corresponding procedures for the systematic, integral and predictable actions of the CSN, as well as for the periodic review of the status of the main elements of the regulatory process, taking into account the most advanced national and international practices.

Evaluations of the requests submitted by the licensees are carried out in accordance with the CSN's internal safety procedures and guides, which develop the regulatory requirements established in the RINR and in the CSN instructions. In relation to design modifications, as indicated above, the applicable instruction is IS-21.

Within the SISC, the CSN includes biennial inspections of nuclear power plants in the PBI, in order to verify the correct application of IS-21 by the licensees. These inspections attach special importance to the supervision of modifications not requiring authorisation or favourable assessment and to the implementation of temporary modifications at the facility.

An important part of the assessment process associated with requests for renewal of nuclear power plant Operating Licences is the assessment of the PSR results, as has been indicated in the sections, from which are derived conditions for the improvement of safety applicable to the new Operating Licences, which in some cases are developed in the ITC.

14.1.5. Improvements as a result of the stress tests deriving from accident at the Fukushima nuclear power plant

In December 2017 the CSN submitted revision 2 of the National Action Plan for post-Fukushima measures (NAcP) to ENSREG, as agreed at the plenary meeting of this organisation in June 2017, which states as its principal conclusion that the implementation of the actions and commitments undertaken by Spain after European endurance tests has been completed or is at a very advanced stage. Specifically, the seismic characterisation of the sites is under way, within the periods established by the CSN in the corresponding ITC.

As has already been pointed out, the post-Fukushima requirements established by the CSN for Spanish nuclear power plants in relation to resistance tests were incorporated in two ITCs issued by the CSN during 2011 and 2012. Simultaneously, the CSN required the licensees, by means of ITC-2/4, issued in 2011 and 2012, to analyse situations of loss of large areas of the plant in order to identify improvements in its management. Finally, in April 2014 the CSN issued a new ITC to give consistency to the process, in accordance with the degree of compliance existing as of 31st December 2013.

The timeframes for implementing the required improvements in the post-Fukushima ITCs were divided into short term (31 December 2012), medium term (31 December 2013 and 2014) and long term (31 December 2016).

Among the improvements implemented (in the 2016-2018 period, the CSN considered it necessary to subject the following three design modifications to a specific authorisation process prior to their commissioning: construction of the Alternative Emergency Management Centre (CAGE), facility of a filtered containment enclosure vent (SVFC) and the installation of passive autocatalytic recombiners (PAR) of hydrogen in the containment. To this end, the assessment and licensing criteria applicable to these design modifications were included in a document approved by the Board of Commissioners Meeting of the Council.

Alternative Emergency Management Centre (CAGE):

The CAGE is conceived as an alternative centre for the management of very severe situations at each site of a nuclear power plant, and therefore with design criteria that allow its functions to be maintained in extreme situations, coherent with the criteria applied in the European and Spanish post-Fukushima process. The CAGE building must constitute a safe place to manage the emergency in accident scenarios beyond the design bases, with all the necessary equipment to cover the basic needs of light, air, water and food autonomously during the accident and having areas to direct the emergency, coordinate work, medical services, radiological and dosimetric control, decontamination area, communications, etc.

Filtered containment venting system (SVFC):

The function of the SVFC is to protect the overpressure fault containment. It is designed to depressurise containment in a reasonably short period of time in severe accident conditions. It is a filtered system, with high decontamination factors, in order to reduce the release of radioactive material into the environment.

Passive autocatalytic recombiners (PAR):

PARs provide capacity for controlling the concentration of combustible gases in the containment, contributing to the maintenance of containment integrity and to minimising release of fission products into the outside world through the recombination of hydrogen with oxygen, in order to limit the possible deflagrations and detonations that might occur in severe accident scenarios.

14.2. Verification of safety

14.2.1. Arrangement and regulatory requirements for the verification of safety

Operating Licences require licensees to periodically submit a series of reports relating to the tracking of their internal and external operating experience and the results and modifications derived from the analyses of the new standards of the origin country of the project, the results of the environmental radiological surveillance programme, the results of dosimetry checks on the workers, the activities performed within the scope of the radioactive waste and spent fuel management plan, the activities performed within the scope of the training of the licensed and non-licensed personnel of the facility and the removal of radioactive packages from the facility.

Likewise, Operating Licences establish the criteria for determining when the changes implemented in the official operating documents: Operating Technical Specifications (ETF), Safety Study (SS), Site Emergency Plan, Operating Regulations, Quality Assurance Manual, Radioactive Waste Management Plan and Radiation Protection Manual (MPR), require authorisation; in some cases the applicable screening process is carried out at the ITC. Any modification to the Site Emergency Plan or to the ETF requires ministerial authorisation, while changes to the SS may or may not require authorisation, depending on whether or not the design modification giving rise to the change requires authorisation.

As has already been indicated, CSN Instruction IS-21, relating to design modifications at nuclear power plants, establishes the requirements for the implementation of design modifications at the plants, with a screening process based on the impact of the modification on nuclear safety, which determines when a modification at the facility requires or does not require ministerial authorisation or favourable assessment by the CSN.

The requirements applicable to in-service inspection at nuclear power plants are established in CSN Instruction IS-23, and those applicable to ageing management are established in CSN Instruction IS-22.

The ETF establish the test requirements necessary to verify the operability of the safety systems and the requirements applicable in this case are included in CSN Instruction IS-32.

Likewise, CSN Instruction IS-15, relating to the surveillance of the efficiency of maintenance at nuclear power plants, establishes the provisions for assessing the maintenance systems of the facilities in terms of the availability and reliability of the systems important for safety.

As regards PSRs, as has already been indicated, CSN Instruction IS-26 and the RSN establish that the licensees must perform a PSR at least once every ten years. Likewise, Operating Licences, among other documents, require the presentation of the PSR along with the request for renewal of the authorisation.

14.2.2. Main elements for continued verification of safety (in-service inspection, surveillance, functional testing of systems, etc.)

During the period corresponding to this report, the licensees of the nuclear power plants continued to update the design basis and licensing documents of each facility, with the objective of compiling the design and licensing basis of each safety-related system. This activity requires verification of the hypotheses, data and results of the accident analyses included in the SS, identification of the design basis of the supporting components necessary to carry out the safety functions and design modifications incorporated in the safety systems. It also includes verification of the consistency of the installed design of each system with operating practices and procedures. The result of this process has provided an updated SS, sufficiently contrasted and consistent with the design basis documents.

The set of periodic safety-related SSC examinations and tests performed during the operational lifetime is what is known as *In-Service Inspection* and aims to verify the structural integrity and functional capability of the SSC.

Until the issuance in 2009 of the CSN Instruction on in-service inspection at nuclear power plants, IS-23, and in the absence of proprietary standards in Spain, Operating Licences contemplated the application of the standards of the origin country of the technology for the licensees to develop their in-service inspection programmes, applying as a basic standard section XI of the code of the American Society of Mechanical Engineers (ASME) and the Operation and Maintenance code of this association (ASME-OM), required by the ETF. This code is therefore considered an acceptable reference for the preparation of in-service inspection programmes for facilities, which are included in the document entitled In-Service Inspection Manual (MISI). The current IS-23 in force endorses and consolidates this same practice.

In addition to the in-service inspection contemplated in the ASME code, the plants have in-service inspection plans derived from other regulatory requirements or from their own operating experience. These plans include aspects such as the monitoring of erosion-corrosion phenomena.

In-service inspection systems must be qualified in accordance with a methodology accepted by the CSN. The Non-Destructive Testing (NDT) methods and techniques used must be chosen taking into account the different characteristics and natures of the NDT methods, the type of defects, the accessibility conditions and the different radiation levels, as well as the degree of automation of the equipment used to carry out the examinations. These methods and techniques are adequately described in procedures.

The evaluation of the results of these inspections and their comparison with the applicable acceptance criteria make it possible to verify the objectives of these in-service inspection programmes. The comparison of these results with those obtained in the baseline inspection (pre-service) and in the previous in-service inspections carried out makes it possible to analyse the trends observed, justify the changes and take the relevant actions in each case.

In 2016, the guide to Anomalous Conditions (degraded and non-conforming conditions) that may arise during plant operation was revised, in view of experience from its application since 2007.

Until now, the implementation of the PSR has been linked to the granting of Operating Licence renewal. The results of the PSR can be used to improve operation in the following period, as this is a global review of the facility over extended periods of time. In cases in which the renewal of the Operation Permit exceeds the lifetime originally considered in the initial design of the facility, the PSR include special conditions, both administrative and relating to the management of the ageing of the facility, such that the operation of the plant may be extended beyond the initial design lifetime with adequate safety guarantees.

14.2.3. Elements of ageing management programme(s)

The control of the ageing of SSCs is a fundamental part of the life management of nuclear power plants. In compliance with the limits and conditions of the Operating Licences, the licensees prepare an annual report identifying new inspection, surveillance and maintenance activities for the detection and control of ageing processes, in accordance with the methodology described in the System for the assessment of the remaining lifetime of LWR nuclear power plants, jointly developed by the Spanish nuclear power plants.

In July 2009 CSN Instruction IS-22 was published on safety requirements for the management of ageing and the long-term operation of nuclear power plants, determining the scope of the activities to be performed during the design lifetime of the facility, as well as during long-term operation and requiring the incorporation of the conclusions of its analysis into a Lifetime Management Plan (PGV) identifying ageing mechanisms and evaluating current maintenance practices in order to determine their possible extension or modification. In addition, if the period covered by the analyses partially or totally exceeds that of the design initially considered, the analyses (studies, calculations) carried out with life hypotheses of defined design (Analysis of Ageing as a function of time, AEFT) are re-evaluated,

In November 2017, revision 1 of Instruction IS-22 was published to update and clarify the aforementioned requirements, including the case of the long-term operating period, based on the experience derived from its application since 2009.

As has already been indicated, each year during the first six months of each year the nuclear power plants report the activities performed under the PGV to the CSN, specifying proposals for improvement. The ageing management activities and the scope of the PGV in accordance with IS-22 are based, as minimum requirements, on the US Standard 10CFR54 (Requirements for renewal of operating licences), specifically articles 54.3, 54.4 and 54.21, during its design lifetime. Beyond this period, the requirements of this standard associated with the AMR that implement and prepare the Integrated Ageing Management Plan (PIEGE) must also be met as a requirement linked to the first application for renewal of the Operating Licence for a period exceeding the design life (art. 5.1) and subsequent (art. 5.3).

14.2.4. Arrangements for internal review by the licence holder of safety cases to be submitted to the regulatory body

The criteria applicable to design modifications are contained in CSN Instruction IS-21, as has been mentioned in previous sections of this report.

The nuclear power plants have procedures for implementing the different stages of analysis established in this instruction (preliminary analysis, safety assessments and safety analysis), by means of which the impact on safety of all the changes to be introduced is analysed. If the analysis concludes that no authorisation is required from the Administration, the licensee may unilaterally implement or commission the modification. Otherwise, the modification must be submitted to the consideration of the Administration requesting a favourable assessment or authorisation. The procedures define different

levels of the organisation for the technical review and approval of changes, including, in all cases, the Safety and Quality departments of the plants. In addition, in those cases in which it is necessary to request authorisation from the Administration, the modification is reviewed by the corresponding Plant Nuclear Safety Committee and Operator Nuclear Safety Committee, which will provide an additional independent review of the technical and safety analyses to be submitted in support of the request. In some cases, either systematically or depending on the importance and magnitude of the changes requested, an independent review is carried out by organisations other than the one causing the change. This independent review may be carried out by organisations internal to the licensee or by entities external to the licensee's organisation.

The information provided by the probabilistic methodologies included in the Probabilistic Safety Assessment (PSA) available to the nuclear power plants on the impact on safety of the requests submitted constitutes a valuable mechanism that is occasionally used as an additional endorsement of the request made. The nuclear power plants have updated PSA models that are regularly inspected by the CSN.

14.2.5. Regulatory review and control activities

As has already been pointed out in section 7.4, the CSN dedicates a significant part of its resources to the inspection of operating nuclear power plants and has an integrated plant supervision and control system (SISC), which includes the PBI as a continuous supervision instrument.

Both the specialists from the central offices and the CSN resident inspectors at the sites themselves intervene in the inspections of this programme. The resident inspectorate was made up of two inspectors per site; recently this team has been reinforced, with a third inspector resident at the sites with two reactors and two inspectors at the remaining nuclear power plants. The CSN resident inspector performs daily tracking of the operation of the plant and its operating events, compliance with the ETF and other CSN requirements. The scope of the PBI includes inspections involving specialists from various disciplines who study aspects relevant to the safety of the facility, such as design modifications, maintenance effectiveness, SSC design basis, surveillance requirements, site emergency plans, operational radiation protection, etc.

The most important conclusions of the annual assessment of the operation of the plants in operation during the year are set out in section 7.

14.3. Vienna Declaration

The provisions of Articles 14.2.2 and 14.2.3 are clearly included under Principle 2 of the Vienna Conference, in relation to the regular and regular conduct of comprehensive and systematic safety assessments and the implementation of reasonably achievable safety improvements.

It should be pointed out that as a result of the PSRs and the performance of endurance tests and analysis of situations of loss of large areas, safety improvements have been implemented at the Spanish nuclear power plants in different areas, as described in chapter 6. The implementation of all these modifications has contributed to strengthening the Spanish nuclear power plants in the face of situations beyond the design basis.

As regards principle 3, articles 14.2.1 and 14.3.1 explain in detail the regulatory framework requiring the plants to carry out exhaustive and periodic safety assessments and implement the improvements that are reasonably feasible, with emphasis on instruction IS-21 in relation to the treatment of design modifications and IS-26 in relation to the performance of PSRs. It should be pointed out that CSN Safety Guide GS 1.10 Rev.2, which establishes the guidelines for the performance of PSRs by licensees, as indicated above, was revised to adapt it to the IAEA's SSG-25 "Periodic Safety Review for Nuclear Power Plants". The next PSRs of the Spanish plants will be based on this new revision.

Article 15. Radiation protection

15.1. Arrangements and regulatory requirements relating to the radiation protection of nuclear facilities

15.1.1. Regulation on Protection against Ionising Radiation

The basic standards for the radiation protection of exposed workers and members of the public against the risks resulting from exposure to ionising radiation are established in Spanish Royal Decree 783/2001 approving the Regulation on Protection against Ionising Radiation, which transposes Directive 96/29 Euratom into national legislation and has been modified by Spanish Royal Decree 1439/2010. Directive 2013/59/Euratom, which lays down basic safety standards for protection against the dangers arising from exposure to ionising radiation, is in the process of being transposed.

15.1.2. Other provisions

Aspects relating to the radiation protection of workers from contracted companies (external workers) at nuclear power plants are the object of special attention for the CSN, given that experience shows that more than 80% of the occupational doses registered at these facilities correspond to these workers.

The radiation protection of off-site workers at risk of exposure to ionising radiation is specifically regulated by Spanish Royal Decree 413/1997, of 21st March 1997, which transposes the contents of Directive 90/641/Euratom, relating to the operational protection of off-site workers at risk of exposure to ionising radiation through intervention in a controlled zone. The standards relating to the protection of external workers will be included in the RD in preparation for the transposition of Directive 2013/59/Euratom.

As a further development, the CSN has published various Instructions on the procedures to be followed in order to comply with certain requirements established in the national legislation.

15.2. Regulatory expectations for the licence holder's processes to optimise radiation doses and implement the ALARA principle

The three basic principles of justification, optimisation and limitation of the individual dose on which the radiation protection system is based are incorporated in the Spanish legislation through the *Regulation on health protection against ionising radiation*.

In the nuclear-electric sector, the practical application of the principle of optimisation (or ALARA principle) constitutes a basic objective to be achieved and is achieved by means of the implementation in the nuclear power plants of the criteria and systematic approach defined in CSN Safety Guide GS-1.12", *"Practical application of the optimisation of radiation protection in the operation of nuclear power plants"*.

This establishes the general framework to be considered by nuclear power plant organisations in order to comply with the ALARA principle, contemplating, among others, the following criteria:

- Compliance with the ALARA principle should be an objective during plant operation and in the planning of all plant activities, and should form part of the plant modification and modernisation plans, including the dismantling and decommissioning processes. Specifically, it has been applied to projects for the design or modification of the TSAs for irradiated fuel from nuclear power plants.
- The management of the plant organisation must commit to the implementation of the ALARA principle in all its phases, from design to decommissioning, as part of its safety culture.
- The commitment of the Management should be transferred to all the elements of the plant organisation, extending to the external companies involved in the performance of the most significant works from the radiological point of view.
- Adequate means must be established to inform, train and motivate all workers at the plant in compliance with the ALARA principle.

This Safety Guide establishes that the plant organisation's commitment to the ALARA principle must manifest itself with the implementation of an ALARA Programme where:

- Radiological indicators are defined to verify the degree of effectiveness of the implementation of the ALARA principle.
- A systematic approach is established for the review, by ALARA, of the most significant works from the radiological point of view.
- The policy of the power station is defined in everything related to the reduction of the source term.
- A systematic is established for the review, by ALARA, of the design modifications.
- Training programmes are established for the implementation of the ALARA principle.
- Define the content and scope of the internal audit programme to be established to verify the degree of implementation of the ALARA Programme.

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

These premises are transferred to the official operating documents, specifically the Operating Regulations and the Radiation Protection Manual (MPR).

15.3. Implementation of radiation protection programmes by the licence holders

The Regulation on Protection against Ionising Radiation establishes the following dose limits.

Exposed workers:

- Effective dose limit: 100 mSv in five consecutive official years subject to a maximum effective dose of 50 mSv in any official year. This limit will be modified as a consequence of the transposition of Directive 2013/59/Euratom.
- Dose limit equivalent to skin (averaged over 1 cm2): 500 mSv per official year.
- Dose limit equivalent to lenses: 150 mSv per official year. This limit will be modified as a consequence of the transposition of Directive 2013/59/Euratom.
- Dose limit equivalent to hands, forearms, feet and ankles: 500 mSv per official year.

Members of the public

- Effective dose limit: 1 mSv per official year. Dose limit to skin (averaged over 1 cm2): 50 mSv per official year.
- Dose limit to lenses: 15 mSv per official year. Special protection during pregnancy and breastfeeding
- As soon as a pregnant woman communicates her status to the licensee, the protection of the foetus should be comparable to that of members of the public.
- The CSN has established by means of Technical Instructions that for the purposes of tracking the foetal dose limit (1 mSv from the moment of declaration of pregnancy), this limit shall be considered equivalent to a dose value of 2 mSv as recorded on the dosimeter placed on the abdomen of the pregnant woman.
- As soon as a woman who is breastfeeding informs the licensee of her status, no work posing a significant risk of radioactive contamination shall be assigned to her.

Dose limit for trainees and students:

- The dose limits for trainees and students over the age of eighteen who have to use sources during their studies shall be the same as those for exposed workers.
- The effective dose limit for trainees and students aged between sixteen and eighteen years who are required to use sources during their studies shall be 6 mSv per official year. Without prejudice to this dose limit:

  - Equivalent dose limit for the lens: 50 mSv per official year.
  - Equivalent dose limit for skin (averaged over 1 cm2): 150 mSv per official year. This limit will be modified as a consequence of the transposition of Directive 2013/59/Euratom
  - Equivalent dose limit for hands, forearms, feet, and ankles: 150 mSv per official year.
  Administrative dose controls

At the nuclear power plants, effective dose administrative controls are established for all exposed workers, which do not have regulatory implications equivalent to dose limits. They are performed as an internal check to ensure that the dose limits established by legislation are not exceeded and to achieve the objective of dose optimisation, keeping it as low as reasonably possible.

The administrative dose controls are defined in the MPR for the different operating modes of the plant: normal operation, exceptional works and shutdowns.

Appendix 15.A presents dosimetry information for workers exposed in the year 2018.

ALARA Exposures

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

1. A managerial level that promotes and approves the ALARA culture and dosage objectives, providing the necessary resources.
2. An executive level that proposes the ALARA policy and dosage objectives, analyses the results and takes corrective action.
3. A technical level that carries out the analysis, planning and monitoring of the work, reviews the results and proposes actions for improvement.

An operational tool that favours the implementation of the radiation protection programme by the licensee is the Radiation Work Permit (RWP), which constitutes a work order establishing the work to be

performed, the estimated duration of the work, the radiological conditions of the work area and the dosimetry and radiation protection requirements.

The regulatory control of the radiation protection of the population is implemented by means of plant effluent limitation, surveillance and control programmes and environmental radiological surveillance programmes in the area of influence of the plants.

Compliance with conditions for emission of radioactive substances

Spanish standards establish that the release of radioactive effluents into the environment must comply with the established limits, and must also guarantee that it is as low as possible, taking into account economic and social factors. In addition, the CSN has stated in Instruction IS-26, of 16th June 2010, on basic nuclear safety requirements applicable to nuclear facilities (BOE no. 165 of 8th July 2010) that in addition to the aforementioned economic and social factors, consideration should be given to the best techniques available for minimising the release of radioactive effluents.

The system of limitation, surveillance and control of effluents from the nuclear power plants has led to actual release values much lower than the authorised limits, comparable to international levels.

Appendix 15.B indicates the limitation applicable to releases of radioactive substances into the environment from Spanish nuclear power plants.

B.1 indicates the activity released by the nuclear power plants during the year 2018. The radiological impact associated with the releases is not significant, with the activities released representing a small fraction of the authorised dose limits.

The effective doses calculated for the most exposed member of the public never at any time exceeded the limit of 0.1 mSv/year per reactor authorised for radioactive effluents, -0.001 mSv/year being the maximum value estimated for 2018.

Environmental radiological surveillance

Each nuclear power plant has an Environmental Radiological Surveillance Programme for its surroundings, in accordance with the CSN guidelines, the annual calendar and results of which are evaluated by the CSN. Appendix 15.C describes the contents of the environmental radiological surveillance programmes and their most significant results during the year 2017, which are the latest available at the time of writing. It should be pointed out that, in compliance with the functions assigned to the CSN in relation to public information and the provisions of Law 27/2006 regulating rights of access to environmental information, this organisation has developed a computer application to provide public access to environmental radiological surveillance data in Spain, which as of 2017, may be accessed via the CSN institutional web page by clicking on the link: www.csn.es. The contents of the CSN website in relation to environmental radiological surveillance were considered to be an area of good performance as a result of the IRRS-ARTEMIS mission to Spain in 2018.

The assessment of these results shows that the radiological impact of Spanish nuclear power plants on the environment continues to be well below the established limits and that the environmental quality around the facilities is maintained in radiologically acceptable conditions, without any risk to people as a result of their operation.

Environmental monitoring and main results

The CSN has defined the scope and content of the effluent surveillance and control programmes, as well as the environmental surveillance programme for each nuclear power plant. The regulatory activity

includes the inspection of its application and the evaluation of its results. In addition, the CSN carries out an environmental radiological surveillance programme independent of that of the licensee in the area surrounding each plant, which allows results to be contrasted.

The description of these programmes is expanded in Appendix 15.C.

15.4. Regulatory review and control activities

Evaluations of requests submitted by licensees are carried out in accordance with the systematic approach defined in CSN safety guides and procedures, which develop the regulatory requirements established in the RINR and in the CSN instructions issued by the CSN.

Within the SISC, the CSN includes biennial inspections of the nuclear power plants as part of the PBI, including:

- Occupational Radiation Protection Inspection,
- Inspection of control of liquid and gaseous effluents
- Inspection of the Environmental **Radiological Surveillance** Programme
- Application of the established methodology to categorise the findings.
- Monitoring of the performance indicators defined by the programme.

Furthermore, the aspects of occupational radiation protection and application of the ALARA principle during refuelling outages are evaluated through the supervision of the final refuelling reports submitted by the licensees, in accordance with the provisions of Instruction CSNIS-02 of the Nuclear Safety Council on documentation of refuelling activities at light-water nuclear power plants.

APPENDIX 15.A

Information relating to personal dosimetry included in the CSN report to the Congress of Deputies and the Senate, corresponding to the year 2018

A. External exposure

The statistical results of the doses accumulated in 2018 for the total number of nuclear power plants are as follows:

Collective doses

The following table shows the overall annual collective doses for each of the nuclear power plants in the year 2018. Four refuelling outages have occurred at the PWR-type Almaraz II, Ascó I, Vandellós II and Trillo nuclear power plants.

The Santa María de Garoña plant has not been in operation since 2012, and in July 2013 it was granted a cessation-of-operations declaration.

Almaraz I and II	818,10	mSv-person
Ascó I and II	470.83	mSv-person
Garoña	143.76	mSv-person
Cofrentes	355,92	mSv-person
Vandellós II	830,54	mSv-person
Trillo	284.48	mSv-person

These data mean that the average collective dose, per reactor, throughout 2018 is 362.95 mSv-person. By reactor type, this parameter reaches a value of 249.84 mSv-person for BWRs and 400.66 mSv-person for PWRs.

As reference data, figures 15.A.1.and 15.A.2. show comparative graphs of the evolution of the average three-yearly collective dose parameter in Spain, Europe, Asia and the USA, depending on the type of reactor. The international data has been extracted from the database published by the International Information System on Occupational Exposure (ISOE).

PWR Reactors
Triennial average collective dose (Sv-p)

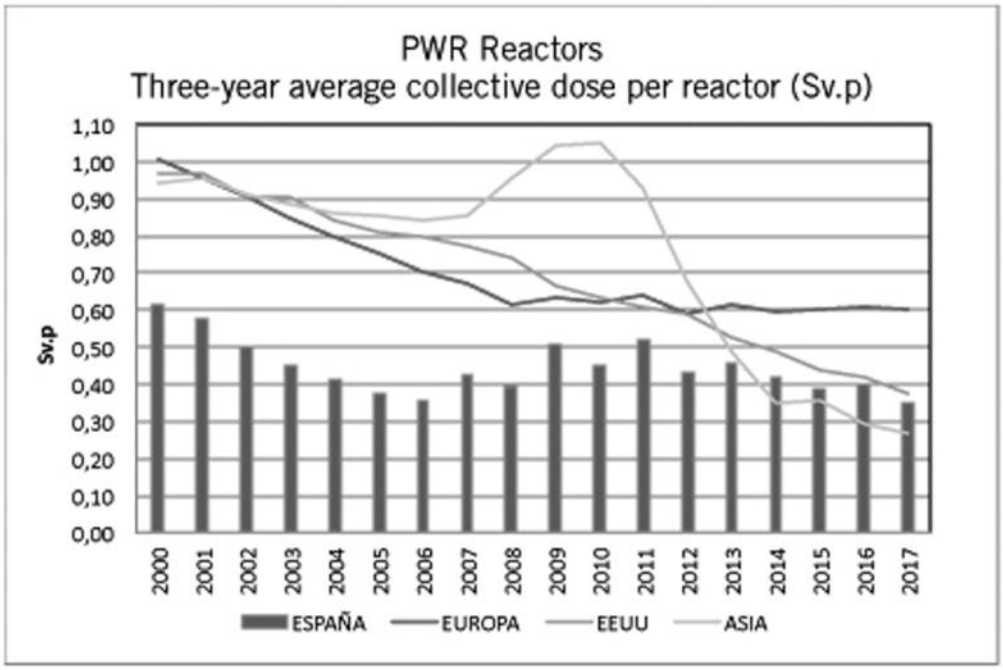
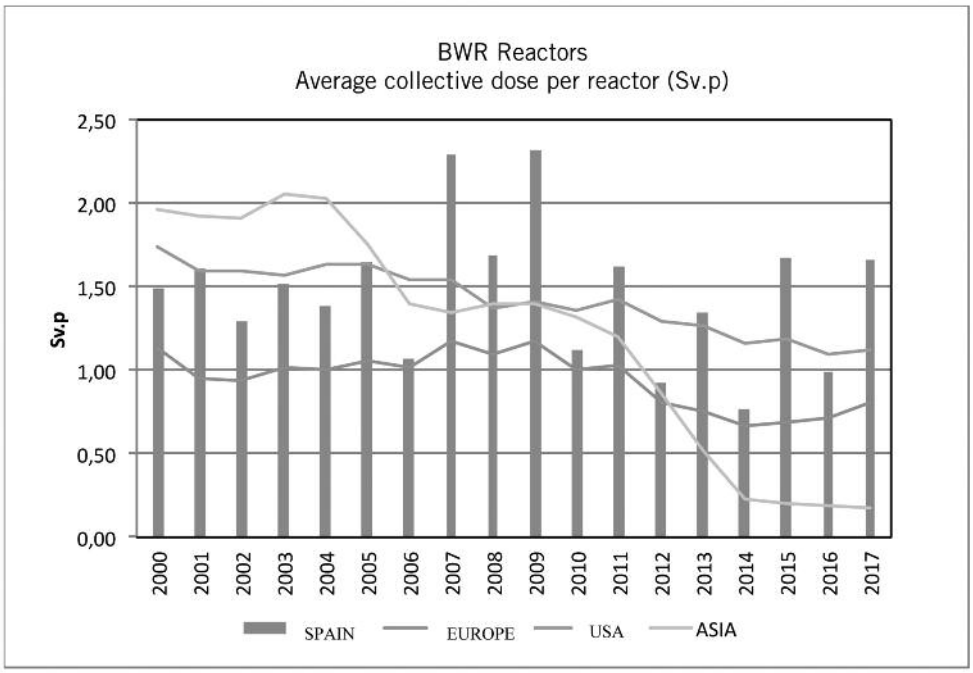


Figure 15.A.1 Average three-yearly collective dose (Sv-person) for PWR type reactors. International Comparison



B. Internal exposure

In relation to internal dosimetry, checks by means of direct measurements of body radioactivity were carried out on all workers with a significant risk of incorporating radionuclides, and in no case were values higher than the established recording level (1 mSv/year) detected.

APPENDIX 15.B

Limitation, surveillance and control of the release of radioactive substances at the Spanish nuclear power plants

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

Since 1997 the release limit for nuclear power plants has been established as an effective dose of 0.1 mSv/year for all the liquid and gaseous effluents from each reactor. This limit guarantees, with a very wide safety margin, that any doses that may be received by the most exposed member of the public are lower than the public dose limits established in the Regulation on Protection against Ionising Radiation: 1mSv/year of effective dose and 50 mSv/year of skin equivalent dose. This release limit applies both to the operating phase of nuclear power plants and to their dismantling.

As a consequence of the application of this spill limitation system, the actual values of the discharges are still much lower than the authorised limits and perfectly comparable on an international scale. Table 15.B.1 shows the effluents from Spanish nuclear power plants released during the year 2018; the estimated effective dose to the most exposed member of the public as a result of these discharges represents a maximum of 1.1% of the authorised dose limit for radioactive effluents.

Table 15.B.1 Radioactive effluents from nuclear power plants. Activity discharged in 2018 (Bq) (1)
PWR POWER PLANTS

	NPP José Cabrera (2)	NPP Almaraz I & II	NPP Ascó I	NPP Ascó II	NPP Vandellós II	NPP Trillo
Liquid Effluents						
Total except Tritium and Dissolved Gases	$5.43\ 10^{8}$	$8.26\ 10^{9}$	$1.69\ 10^{9}$	$1.11\ 10^{9}$	$8.64\ 10^{9}$	$1.94\ 10^{8}$
Tritium	$1.03\ 10^{8}$	$3.51\ 10^{13}$	$2.65\ 10^{13}$	$4.63\ 10^{13}$	$1.52\ 10^{13}$	$2.24\ 10^{13}$
Dissolved Gases	- -	$3.22\ 10^{8}$	$5.40\ 10^{7}$	$5.88\ 10^{6}$	$1.03\ 10^{8}$	(3)
Gaseous Effluents						
Noble Gases	- -	$5.80\ 10^{11}$	$3.03\ 10^{11}$	$8.18\ 10^{10}$	$6.14\ 10^{10}$	$3.88\ 10^{11}$
Halogens	- -	ND	ND	ND	$4.82\ 10^{5}$	ND
Particles	ND	$8.37\ 10^{4}$	$1.56\ 10^{6}$	$1.18\ 10^{6}$	$4.58\ 10^{7}$	ND
Tritium	$1.26\ 10^{8}$	$3.12\ 10^{12}$	$5.17\ 10^{11}$	$6.81\ 10^{11}$	$2.27\ 10^{12}$	$5.79\ 10^{11}$
Carbon-14	- -	$1.71\ 10^{11}$	$8.76\ 10^{10}$	$1.17\ 10^{11}$	$2.61\ 10^{11}$	$2.68\ 10^{11}$

	BWR PLANTS	
	NPP S.M. Garoña[4]	Cofrentes NPP
Liquid Effluents		
Total except Tritium and Dissolved Gases	$6.53\ 10^{7}$	$9.44\ 10^{7}$
Tritium	$1.90\ 10^{11}$	$8.87\ 10^{11}$
Dissolved Gases	- -	ND
Gaseous Effluents		
Noble Gases	ND	$8.28\ 10^{12}$
Halogens	- -	$2.57\ 10^{8}$
Particles	$9.29\ 10^{5}$	$1.71\ 10^{6}$
Tritium	$1.19\ 10^{11}$	$7.79\ 10^{11}$
Carbon-14	- -	$3.10\ 10^{11}$

(1) ND: Not Detected.

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

(3) Liquid discharges do not carry dissolved gases because they are eliminated in the treatment process.

(4) Permanent cessation of operation declared as of 6 July 2013

APPENDIX 15.C

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

Radiological surveillance of the surroundings of Spanish nuclear power plants is carried out by means of two independent programmes developed by different directors.

The first is executed by the licensee in accordance with the directives of the Nuclear Safety Council and is subject to the regulatory control of the CSN.

The second is carried out by the Nuclear Safety Council itself, in collaboration with national or university laboratories in the region in which the facility is located, and in some cases through the assignment of functions to the governments of the Autonomous Communities. This programme is completely independent of the one carried out by the holder as far as the collection of the samples and the laboratories that carry out the analytical determinations are concerned. The sampling points, the type of samples and the analyses carried out coincide with those carried out by the licensees. Its scope is around 5% of the programme developed in each facility and can reach up to 50% depending on the type of sample.

Eight environmental radiological surveillance programmes continue to be implemented around the respective nuclear power plants, five in operation, one under cessation of operation, one undergoing dismantling and one in the latency phase, based on which around 8,000 samples per year are collected and some 13,000 analytical determinations are performed.

Table 15 C. 1 includes a summary of the programmes carried out in relation to the operating nuclear power plants.

Table 15 C. 2 includes, by way of illustration, the average values of the results obtained in the analyses (without considering values below the detection limits) of the air samples of the environmental radiological surveillance programmes conducted around the plants during 2017.

Table 15.C.1 PVRA of licensees at operating nuclear power plants

Air	Continuous sampling with change of weekly filter	Total beta activity, Sr-90, Spectrometry γ, I-131
Direct radiation	Change of dosimeters after from an exposure period maximum of one quarter	Integrated dose rate
Drinking water	Fortnightly or higher sampling	Total beta activity, rest beta, frequency Sr-90, Tritium, Spectrometry γ
Rainwater	Continuous sampling with monthly sample collection	Sr-90, Spectrometry γ
Surface and groundwater	Monthly or more frequent surface water sampling and quarterly or more frequent groundwater sampling	Total Beta Activity, Rest Beta, Tritium, Spectrometry γ
Soil, sediments and indicator organisms	Annual soil and sediment sampling and indicator organisms six-monthly	Mr-90, Spectrometry γ
Milk and crops	Fortnightly milk sampling in the grazing season and monthly in the rest of the year. Crop sampling at harvest time	Mr-90, Spectrometry γ, I-131

Table 15.C.2 PVRA of nuclear power plants. Year 2017

Nuclear power plant	Air. Mean value Bq/m3			
	ß-Total	I-131	Sr-90	Cs-137
Almaraz	9.24E-04	<LID	<LID	<LID
Ascó	7/12E-04	<LID	<LID	<LID
Cofrentes	8/37E-04	<LID	<LID	<LID
Vandellós II	6/46E-04	<LID	<LID	<LID
Trillo	6/68E-04	<LID	<LID	<LID
Santa María de Garoña[1]	5.01E-04	—	<LID	<LID
José Cabrera2	7.00E-04	----	<LID	2.31E-05

LID: Límite Inferior de Detección, Lower Limit of Detection

[1] **Undergoing cessation of operations**

[2] **Undergoing dismantling**

Article 16. Emergency Preparedness

16.1. Emergency plans and programmes

For nuclear emergency situations deriving from accidents at nuclear power plants, planning and preparation are governed by the PLABEN (*Plan Básico de Emergencia Nuclear,* Basic Nuclear Emergency Plan) and by the Directives deriving therefrom.

Likewise, general provisions on nuclear emergencies are included in the Law Creating the CSN, in the RINR, in the Regulation on Protection against Ionising Radiation, in the Agreement of the Cabinet of Ministers on public information on applicable health protection measures and on the behaviour to be followed in the event of a radiological emergency and in the basic civil defence standards.

Each of the nuclear power plants, whether in operation or undergoing shutdown or dismantling, has a PEI (*Plan de Emergencia Interior,* On-Site Emergency Plan) adapted to the risks of its operating situation, which establishes and documents the licensee's response to possible emergency situations.

The most significant aspects of the modifications introduced to the legal and regulatory framework on nuclear emergencies during this period are summarised below:

16.1.1. Arrangements and regulatory requirements relating to on-site and off-site emergency preparedness

Complementary Technical Instructions post-Fukushima

Within the framework of the "endurance tests" promoted by the European Union, the CSN issued a series of ITCs for each of the Spanish nuclear power plants, requiring the licensees to carry out analyses, measures and actions aimed at resizing the licensee's organisation in order to adequately manage emergency situations, taking into account new scenarios, as well as the adoption of mitigation measures to respond to events beyond the design basis relating to the potential loss of large areas of the nuclear power plant.

As a result of these ITCs, all Spanish nuclear power plants have made organisational improvements and design modifications in the areas of emergency preparedness and response and accident management.

The improvements introduced are as follows:

- Adequacy of the human and material resources assigned to the emergency response organisation for severe accidents and prolonged emergencies.
- Establishment of a single Emergency Support Centre (CAE) close to Madrid, with portable medium and low pressure power generation and water pumping equipment that can be taken to the affected facility in less than 24 hours from its activation.
- Construction of Alternative Emergency Management Centres (CAGE) for each site for the purpose, among others, of protecting all the personnel of the emergency response organisation from adverse radiological conditions.
- Signage at each of the nuclear power plants indicating safe areas where extensive damage mitigation, electricity generation and low and medium pressure water impulsion portable equipment are located, complementary to those existing at the CAE and subject to a programme of periodic tests.
- Installation of Passive Hydrogen Recombiners (PAR)
- Installation of filtered containment venting (SVFC) systems. The need to coordinate the action of this system with the Management of the External Emergency Plan has been included in the PEIs.
- Improvement of emergency, internal and external communication systems, extending their redundancy and autonomy.
- Improvement or construction, as the case may be, of helipads at each of the sites.
- Preparation of the corresponding documents, procedures and instructions that contain the new human and material resources available and establish the emergency response operation.

As additional support for all the requirements established in the ITC issued by the CSN, the CSN has encouraged the licensees of the nuclear power plants and the Military Emergency Unit (UME) to sign a collaboration agreement for the possible intervention of the UME resources on site in transport, debris removal, pumping, etc. tasks. The signing of this type of agreement to strengthen emergency response capabilities was considered an area of good performance as a result of the IRRS-ARTEMIS mission to Spain in 2018.

All these modifications affecting emergency management at the site have been included in the PEI of all the nuclear power plants, in accordance with the requirements of the CSN in the corresponding ITC.

Basic Nuclear Emergency Plan (PLABEN)

The approval of a new revision of the PLABEN is still pending. A draft of this document has been drawn up jointly by the CSN and the Directorate General for Civil Protection and Emergencies (DGPCE) of the Ministry of the Interior, which, in addition to incorporating the revision of the 11 points initially considered, also introduces modifications transposing the corresponding articles of Directive 2013/59/Euratom, taking into account the requirements of the IAEA document GSR part 7 and the recommendations of other international entities such as those established in the document known internationally as HERCA-WENRA Approach.

16.1.2 Legislation on emergency management

During this period the NRS was approved at nuclear facilities, in compliance with Directive 2014/27/Euratom, which establishes the need for emergency plans to deal with accidents on site and their coordination with off-site plans.

Derived from the self-assessment report carried out by the CSN in relation to emergency preparedness prior to the IAEA IRRS mission carried out regarding the Spanish regulatory system in October 2018, a CSN instruction on emergency management is being drawn up in order to include the requirements that have been requested of the licensees by means of other regulatory instruments in a single document. It is hoped that this instruction can be published throughout 2019.

The transposition of Directive 2013/59/Euratom into the sections corresponding to emergency preparedness and response, both in the field of protection of the public and the environment, as well as those acting in emergencies, or in the aspects of communication and information to the public and international cooperation, as well as the incorporation of trends, international recommendations and lessons learned following the Fukushima accident as regards emergency management off-site will be completed with the approval at the time of the new draft of the PLABEN mentioned in the previous section.

16.1.3 New Procedures CSN Emergency Action Plan (PAE)

The CSN has an Emergency Action Plan (PAE), including the Emergency Response Organisation (ORE), which includes the functions, specific resources and basic action procedures of its governing and technical bodies, their interactions and the general guidelines on their training.

The ORE, which complements the ordinary working organisation, has an operating structure with a single directorate that exercises the function of management and adopts decisions, and in which its technical and logistical units participate, in accordance with an action plan established specifically for these cases and which is activated according to the level of severity of the accident triggering the emergency.

In the event of an emergency, the ORE acts in accordance with the PAE, independently of the regulatory and control function assigned to the CSN, and its functions include:

- Collaborating in securing the emergency situation.
- Contributing to mitigating the radiological consequences for people, property and the environment generated by the accident that caused the emergency situation.
- Informing and advising the authorities in charge of directing the applicable external emergency plan concerning the adoption of measures to protect the population and the intervention personnel.
- Informing the population about the risks associated with the emergency situation.
- Compliance with international commitments in relation to prompt notification and mutual assistance in relation to the CSN.

The plan includes the processes for the incorporation of personnel from the basic organisational structure of the CSN to the emergency response organisation, and the critical emergency tasks to be performed in each situation in order to adequately cover the responsibilities assigned to the organisation within the national emergency response system.

In addition, the plan considers the activation and action in the field of a series of intervention services in the affected areas, as regards the level of external response in the event of a nuclear emergency.

The ORE essentially operates from an emergency centre (SALEM) which is on permanent alert, for which reason it is staffed on closed shifts by a technician and a communications officer, and has an emergency standby team comprising 14 people which can respond to an emergency situation in less than an hour.

The PAE has a training plan for its staff with three levels of involvement (informative, organisational and technical). In addition, the PAE has a national and international programme of exercises and drills, which allows it to periodically check the operability of its technical capabilities and make the necessary improvements.

As part of the process of revising regulations related to emergency management, the PAE is being revised, as pointed out in the previous report, and a draft is currently available that improves the following aspects:

- Reinforcement of the confidentiality of the issuance of official technical communications on the status and progress of nuclear accidents.
- Actions during long-duration emergencies.
- Improved consequence assessment and decision support tools.
- Improvements to reliability of emergency communication methods used between the CSN and other involved organisations to manage nuclear emergencies and nuclear power plants, in particular in the event of extreme natural events
- Reinforcement of the availability of technicians who would travel to the areas affected or close to the emergency.
- Introduce backup SALEM activation mechanisms.
- Staffing to respond adequately to information requirements in case of emergencies by international organisations and neighbouring countries.

The CSN has a collaboration agreement between the Military Emergency Unit (UME) and the CSN, based on which SALEM-2 (a backup room of the CSN SALEM located at the UME facilities in Torrejón de Ardoz) is kept operational, from which the nuclear power plant simulation is regularly monitored in order to verify correct operation and operability.

Likewise, during this period the CSN Emergency Procedures Manual was completed.

Likewise, the computer application facilitating the reception and interpretation of the data that the mobile radiological characterisation units may send continuously to the SALEM has been consolidated, and the application of the Emergency Control Panel System (SICME) has been developed, which facilitates the decision-making process by the CSN Emergency Management.

Finally, during this period the bases were laid for strengthening the assessment of the radiological consequences deriving from nuclear accidents through the complete renewal of the CSN Automatic Stations Network, which will increase from 25 stations to 185 over a period of three years (2019 to 2021).

16.1.4. Implementation of the main elements of the national emergency preparedness plan, including the chain of command and roles and responsibilities of the licence holder, the regulatory body and other main actors, including state organisations

The role played by each organisation in the management of nuclear emergencies, in accordance with the standards in force in Spain, is summarised below:

- External emergency management is performed by a national authority in the province or Autonomous Community where the nuclear power plant is located (Government Delegation or Sub-delegation), through the corresponding Nuclear Emergency Plan (PEN) external to the nuclear power plant. This Directorate coordinates all response actions, including those carried out by local authorities close to potentially damaged plants.
- The monitoring of the emergency at the national level, in order to provide extraordinary means to the emergency management team and to process international aid, is carried out by different Ministries and State institutions coordinated by the Ministry of the Interior (DGPCE), through the Nuclear Emergency Plan at the Central Response and Support Level (PENCRA).
- The CSN, as the body responsible for nuclear safety and radiation protection, is the institution that assesses the emergency situation and its possible development from a technical perspective; makes pertinent recommendations to the external emergency management team for the adoption of protection measures for the population and intervention personnel in accordance with radiological criteria, and carries out monitoring of the operating status of the plants affected by the accident. All of this is done through its PAE and ORE.

- The licensees of the nuclear power plant are responsible for the management of the nuclear emergency within the nuclear sites through their PEIs, and they coordinate with the CSN and the management of the external emergency.

16.1.5 Implementation of emergency preparedness measures by the licence holders and off-site nuclear emergency plans at nuclear facilities

Internal Response Level

The activities relating to preparation for and responses to emergency situations at this level are established in the PEIs of nuclear facilities.

The objective of these plans is to include the actions foreseen, and the means required to carry them out, by the licensee of the nuclear facility in order to reduce the risk of a radiological emergency and, in the event of such an emergency, to limit the release of radioactive material to the environment.

In the period covered by this report, in order to conclude the results of the endurance tests carried out in advance, the following modifications were incorporated into the PEIs:

- A new PEI initiating event related exclusively to variations in the level or temperature of spent fuel pool water.
- New initiating events relating to the transfer of spent fuel from the storage pools to the individualised temporary storage facilities existing or under construction at all Spanish nuclear power plant sites.
- The treatment to be given to events initiating physical security-related PEIs, in accordance with the guide on emergency action in the event of PEI security events (CEN-49), is agreed between the CSN and the CEN of the Nuclear Forum.

In addition, the licensees have included in the development procedures of their PEIs:

- One relating to the treatment of PEI initiating events related to security initiating events.
- Procedures for action in severe emergencies for which Extensive Damage Emergency Guides (GEDE) and Extensive Damage Mitigation Guides (GMDE) have been published
- Procedures for activation of CAGEs.

Off-Site Response Level

Emergency preparedness and response actions at this level are established in the PENs, which in turn include the Municipal Nuclear Emergency Action Plans (PAMEN) and the Nuclear Emergency Plan at Central Response and Support Level (PENCRA).

The PENCRA establishes the systematic to provide the directorate of each PEN with whatever additional support and means it needs. The PENCRA configures a national response model that foresees the mobilisation of all the resources and capacities of the Spanish State that are necessary to configure this response, including international aid.

The management of national resources to support external PENs is carried out through the DGPCE, within the Ministry of the Interior, as the coordinating body for all the necessary support from the various bodies of the Central Administration, other Public Administrations and private entities.

The UME, dependent on the Ministry of Defence, created by the Agreement of the Council of Ministers of 7 October 2005, is responsible for Emergency Operational Management in the event that this is declared to be of national interest (situation 3), in accordance with the provisions of the Law on the

National Civil Protection System 17/2015, of 9 July, as would be the case with nuclear emergencies. The authority of the UME covers dealing with emergencies arising from technological hazards, including nuclear hazards. The CSN has reached a collaboration agreement with the UME covering aspects of telecommunications, training, emergency backup centres and the supply and maintenance of shared equipment.

Work continues on the adaptation of the Action Plans of the Radiological Groups of the PENs in order to reinforce their support from the ORE, taking advantage of the advance of new technologies related to communication tools, estimation of radiological consequences and data transmission.

Finally, there is a Framework Agreement for collaboration between the DGPCE, the CSN and the CEN, through the Nuclear Forum, on the collaboration of licensees of Spanish nuclear power plants in the implementation and maintenance of the effectiveness of the off-site emergency plans. In addition, the CEN, through the Forum, has signed a collaboration protocol with the UME regarding preparation of the latter for intervention in extremely serious emergency situations in Spanish nuclear power plants.

16.1.6 Training and exercises, evaluation activities and main results of performed exercises, including lessons learned

All the off-site nuclear emergency plans require at least two exercises to be carried out each year, in which the personnel of the CSN Radiological Group participate. The scope of these exercises includes the activation and start-up of radiological access controls, Classification and Decontamination Stations (ECD) or Cecopales (Municipal Coordination Centres), with a view to maintaining the training of the plan's habitual personnel and facilitating the exchange of intervention personnel between the different emergency plans.

In relation to the emergency response capacity of the nuclear power plant licensees, the PEI establish the obligation to carry out a general drill every year. The CSN draws up the annual schedule of simulations of the nuclear power plant PEIs, in which it specifies the minimum scope of each scenario. Detailed scenarios are not disclosed to the facility personnel or the ORE. The scenarios generally contemplate situations that require the declaration of Category III or Category IV, with what this implies concerning external releases of radioactive material, as well as assumptions regarding: fire, control and repair of damage, rescue and first aid of injured and contaminated personnel.

Among the lessons learned from exercises and drills, it is worth highlighting the need to set up reception areas for extraordinary means and resources both national and international in suitable predetermined places close to potentially affected areas, in order to facilitate the coordination of their actions and improve their effectiveness and efficiency, as well as to promote the use by the licensees of the nuclear power plants of the new means and resources available as a result of the post-Fukushima improvements.

16.1.7 Regulatory review and control activities

Within the scope of its competences as the regulatory body, and in accordance with its establishing law, the CSN verifies and checks the PEIs by means of inspections covering all aspects of these plans, including exercises and drills. These types of inspections are included in the PBI.

The duties of the CSN also include assessment of the PEIs and any modifications to them proposed by the licensees, as well as of any other action by the licensee in response to the requirements that the CSN may establish by means of ITCs, instructions or other regulatory instruments.

The supervision and inspection activities of drills and simulations include mandatory annual drills and drills with extensive damage mitigation equipment, either with CAE equipment or with equipment that the licensees have located in the safe storage areas of the sites.

As regards the CSN's supervision and control function, and as regards emergency management, special mention should be made of the activities relating to indicator tracking and the resolution of possible inspection findings of the emergency pillar of the SISC.

16.1.8 International agreements

As indicated in the previous report, a bilateral agreement was signed in 2010 between the CSN and the French ASN (Autorité de Sûrete Nucléaire). The CSN maintains international agreements with neighbouring countries such as France, Portugal or Morocco establishing bilateral mechanisms for the prompt reporting of nuclear or radiological accidents occurring anywhere in either country that might affect the national territory, the population or the environment of the other country or give rise to concern within its population.

Cooperation between the ASN and the CSN has led to the establishment of mechanisms for prompt mutual notification in the event of a nuclear or radiological emergency that might affect either country. These mechanisms have translated into the development of a protocol for the exchange of information in emergencies, which has been tested in exercises and drills since 2015.

In 2015, a Cooperation Agreement was also signed between the Portuguese Environment Agency, the National Civil Protection Authority, the Higher Technical Institute of the University of Lisbon of the Republic of Portugal and the CSN in the area of nuclear and radiological emergencies and environmental radiological protection.

These agreements comply with the recommendations of the HERCA-WENRA Approach on cross-border cooperation for nuclear emergency preparedness and response, and facilitate the transposition of Article 99 of Directive 2013/59/EURATOM.

16.2. Information of the public and neighbouring States

16.2.1 Arrangements for informing the public in the vicinity of nuclear installations about emergency planning and emergency situations

As regards the provisions for information to the public and other potentially affected national or international parties, at the time of writing this report a Royal Decree is in the final stages of preparation prior to approval, relating to information to members of the public, intervention personnel and the European Union, international organisations and neighbouring countries potentially affected in the event of a nuclear or radiological emergency. The adoption of this RD will make it possible to complete the full transposition of the following articles, 70 and 71, as well as Appendix XII, and partly Articles 17 and 99, as regards the information to be provided in Directive 2013/59/Euratom.

The following applies until such time as the aforementioned RD is approved:

- Agreement of the Council of Ministers of 1 October 1999 on prior public information programmes in the vicinity of nuclear power plants and the training of nuclear emergency responders. This Agreement has been developed and strengthened through the adoption of the Directive on prior information to the public and the Directive on the training and education of PEN performers.
- Information programmes for the population prior to the different nuclear emergency plans led by the DGPCE. In addition to participating in its teaching, the CSN makes recommendations allowing the different information programmes of the respective nuclear emergency plans to be homogenised.

The annual meeting of the Local Information Committee, led by the Ministry for the Ecological Transition (MITECO), in which CSN officials participate, continues to be held at all nuclear power plant sites, following the guidelines established in art.13 of the RINR.

16.2.2 Arrangements to inform competent authorities of neighbouring States, as necessary

Spain is a signatory to the Early Notification and Mutual Assistance Conventions of the IAEA, and as a Member Country of the European Union it complies with the requirements of Council Decision 87/600 Euratom on Early Notification and Exchange of Information.

The CSN, through its Emergency Room (SALEM), constitutes the National Warning Point in Spain of the system implementing the contents of the IAEA Early Notification Convention (Emercon/USIE). Periodically, exercises of different scope promoted by the IAEA are carried out to check the proper functioning of the system (ConvEx Exercises).

With respect to the IAEA Mutual Assistance Convention, the Points of Contact in Spain are the DGPCE through its National Emergency Monitoring and Coordination Centre (CENEM), and the CSN through the SALEM.

The system implementing the content of the EU Early Notification Directive 87/600 Euratom is called ECURIE (European Community Urgent Radiological Information Exchange). The point of contact in Spain with the Management Centre of the ECURIE website is the CSN, through SALEM. The messages sent to this ECURIE website may be alerts and emergency notifications or information, which means voluntary reporting of events and incidents of minor importance that may be useful for the competent authorities of other member countries. Spain regularly participates in ECURIE exercises that test information exchange capacities.

Council Directive 87/600/Euratom. Art. 5 (2) requires that the online ECURIE System be regularly checked by means of exercises of different scope, classified from 0 to 3.

In the event of a nuclear or radiological emergency, the EU provides other support systems, such as EURDEP (European Union Radiological Data Exchange Platform) and Ensemble (Atmospheric dispersion forecast model results).

As regards the EURDEP programme, the CSN sends data from the network of automatic environmental radiological surveillance stations and stations in 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 exercises, the data are sent at a frequency of less than one hour.

With regard to the arrangements for informing neighbouring countries, bilateral agreements and methods of collaboration that allow this are indicated in section 16.1.8 of this report.

As has been indicated in section 16.1.3, the CSN, within its Emergency Procedures Manual, has updated and completed the procedures relating to the exchange of information and international notification.

Article 17. Siting

17.1. Evaluation of site-related factors

During the reporting period there have been no substantial changes with respect to the object of this Article, except for the issuance of the RSN by means of Spanish Royal Decree 1400/2018, of 23rd November 2018, which contains the requirements relating to the site already included in other, lower-ranking national standards.

17.1.1 Arrangements and regulatory requirements relating to the siting and evaluation sites of nuclear installations, including applicable national laws

The requirements and criteria applicable to site studies in relation to the safety of nuclear facilities are expressly included in the new RSN, in addition to being developed in CSN Instructions IS-26 *on basic nuclear safety requirements applicable to nuclear facilities and IS-27 on general nuclear power plant design criteria,* which compiles the habitual practices in the national environment, consistent with the standards in force at the IAEA and in the origin country of the technology of each facility (United States and Germany), as well as with the WENRA reference levels.

The RSN dedicates a chapter to site requirements, specifying what is to be performed in its initial assessment and the obligation to establish surveillance programmes throughout the life cycle of the facility in order to carry out adequate monitoring of site conditions. Article 13 of the RSN reinforces the performance of PSRs every ten years, which include aspects of the site in their scope and objectives; in particular, within the on-going safety assessment programmes and the applicability of the changes made to the standards during the corresponding ten-year period.

The safety analysis of the facility should include the identification and assessment of the site design parameters, resulting from an appropriate combination of deterministic (foreseeable maximums) and probabilistic studies (allowing uncertainties to be limited), validated with the judgement of experts.

IS-26 dedicates its fourth section to the site and addresses the general criteria applied and the monitoring of site conditions. The assessment of the site of a nuclear facility should determine the effects of the facility on the population and the environment and identify any factors that may affect the design of the facility, including the different ecological and environmental factors, as well as human activities. It also analyses the availability of external services that can help maintain the safety of the facility and the protection of the population. The characteristics of the site that may affect the safety of the facility, the risks associated with external events (natural or attributable to human activities) and the environmental conditions that may be affected by the operation of the facility are subject to surveillance and monitoring throughout the lifetime of the facility.

IS-27 includes site criteria 2 (protection against natural phenomena, considering the most severe phenomena historically and a sufficient additional margin to take into account the limitations of historical data) and 4 (protection against external events).

In addition, in 2015 the CSN issued an ITC to all licensees of nuclear power plants requiring a reassessment of the seismic risks of each site, as detailed in section 17.3.1, the execution of which has been developing during the period covered by this report and is currently at a degree of progress in accordance with the deadlines established by the CSN.

17.1.2. Regulatory review and control activities

The surveillance programmes of nuclear facilities are periodically inspected by the CSN (maximum every four years) in order to verify their operation during the operating lifetime of the facility.

The CSN also includes specific plans in the SISC for periodic site inspections of two types: one biennial, of general scope and applicable to risks of meteorological events and flooding, and the other every six months, of specific scope and applicable to SSCs previously selected for their relation to plant safety and their potential impact due to severe meteorological conditions or external flooding. The objective, scope and periodicity of the inspections relating to site parameters are included in the corresponding CSN technical procedures.

17.2. Impact of the installation on individuals, society and the environment

17.2.1. Criteria for evaluating the likely safety impact of the nuclear installation on the surrounding population and environment

Given the interaction between the environment and nuclear facilities, it is necessary to monitor and evaluate them over time to ensure that the possible mutual impact is limited and maintained within what is acceptable, for which purpose the corresponding continuous surveillance plans are established (seismology, meteorology, hydrology, etc.), specifically adapted to each site and periodically reviewed to maintain their effectiveness in accordance with the results obtained. Each facility sends the CSN periodic reports on their surveillance programmes, including analysis of the results obtained, which are reviewed at the CSN and used to schedule periodic or non-periodic inspections of the supervision and control processes.

- The Hydrogeological Surveillance and Control Programmes address the interaction with surface and groundwater, in terms of both phreatic levels and radiochemical quality, maintaining close interaction with the Environmental Radiological Surveillance Plans, with the aim of:
  - detecting possible accidental releases of radioactive effluents, including tritium;
  - detecting contamination and abnormal concentrations of radioactive products as an early indicator of SSC degradation and identifying possible corrective actions (repair, cleaning, etc.);
  - detecting possible effects on the plant's construction structures.
- The seismic monitoring programmes have free-field and indoor instrumentation to record seismic movements and compare them with design earthquakes (base operating earthquake, OBE, and safe shutdown earthquake, SSE). If the OBE is exceeded, the facility's PEI is activated, in accordance with the applicable procedures.
- The meteorological parameter surveillance programmes have instrumentation for monitoring, recording and transmission to the plant control room and to the CSN emergency room (SALEM). Some facilities have ground movement monitoring programmes to confirm its stabilisation, based on the evolution of direct buffering over time.

17.2.2. Implementation of these criteria in the licensing process

In the licensing and renewal processes, all aspects likely to produce an interaction between the environment and the nuclear facility are analysed, evaluated and documented.

Law 21/2013, of 9th December, on environmental assessment, requires, during the process of Prior Authorisation of a nuclear facility, the presentation by the licensee of the **Environmental Impact Assessment,** defined as *the compilation of studies and technical systems that allow estimation of the effects that the performance of a given project, work or activity may cause on the environment,* which constitutes a technique recognised as an adequate instrument for the preservation of natural resources and the defence of the environment.

In the overall licensing process of a plant, the Safety Studies (SS) required for the construction and operating permits include **Site Characterisation** as a specific section, containing an exhaustive study of the most relevant aspects of the site, including design bases, geography and demography, industries, transport and nearby military facilities, meteorology, surface and groundwater hydrology, geology and seismology. These studies are reviewed and updated throughout the life of the plant to ensure that the initially considered conditions are maintained.

As has already been indicated, the licence renewal processes require the nuclear facilities to perform a PSR, the scope of which includes the site aspects contemplated in GS-01.10 with the so-called **safety factor 7** risk analysis, which addresses external risks and also considers the applicability of the regulatory changes during the period covered by the PSR. Among the PSR assessment requirements are the review and updating of the content of the SS, in accordance with the results obtained in the site surveillance programmes, as well as the creation of a plan for the systematic updating of the information on the site and its design basis.

17.3. Re-evaluation of site-related factors

17.3.1. Activities for the re-evaluation of the site-related factors to ensure that safety at nuclear installations remains acceptable and is carried out in accordance with appropriate standards and practices

During the licensing of the Spanish nuclear power plants, the CSN required an IPEEE (Individual Plant Examination for External Events) to be performed at each site, including seismic risk.

The design bases of natural events, as well as the capacity to respond to natural events beyond their design bases, were revised for all Spanish nuclear power plants during the post-Fukushima endurance tests in 2011, verifying their suitability. In addition, the revision of the IPEEE was carried out, as stated in the National Action Plan (NAcP), December 2017, mentioned earlier in this report.

At the same time, the CSN required the licensees, by means of ITCs issued in 2011 and 2012, to take measures to strengthen the capacity of the Spanish plants in the event of malicious events, the associated activities of which contributed to reinforcing those identified in the Post-Fukushima action plans. Compliance with these requirements has reinforced the human and material resources to control and mitigate the consequences of these events, especially large fires beyond those postulated in the design basis and the limitation of outdoor doses in the event of containment failure. In particular, the availability of emergency access roads to the site after an earthquake or flood has been analysed, reinforcing structures, mobile teams and building safe areas for their location. In addition, Emergency Response Organisations have been strengthened, considering response times exceeding 24 hours to be cases of inaccessibility.

The NAcP also identifies the issuance by the CSN, in 2015, of a new ITC (commonly referred to as a seismic ITC), applicable to the licensees of nuclear power plants, requiring the re-analysis of the seismic characterisation of the site, on the basis of geological, tectonic and palaeoseismic data and the identification of possible existing active faults . The process consists of two phases and is being carried out jointly for all sites, applying the internationally accepted SSHAC level 3 methodology.

The period covered by the report saw the development of Phase I of the seismic JTI, during which fieldwork, document updating and integration into a database were completed. Phase II, consisting of an integrated seismic hazard analysis, is under way and is included among the CSN's planned activities for 2019. The activities at each site relating to the seismic ITC are being carried out in accordance with the deadlines established by the CSN.

Article 16 details measures to improve emergency response, in addition to those implemented as a result of the ITC, including the collaboration agreement between the licensees of the nuclear power plants and the UME to increase the level of external response in extremely serious situations, contemplating the transfer of people and equipment to the plant in the event of serious deterioration of the infrastructures for access, release or conditioning of access routes to the plant and within the site itself.

17.3.2. Results of recent re-evaluation activities

The results obtained within the framework of the European endurance tests confirm that the Spanish plants are highly resistant to extreme natural events beyond their design bases, such as earthquakes, floods and extreme weather conditions. During the reporting period, the studies and analyses derived from the results of the resistance tests were completed and the improvements identified were implemented, as stated in The National Action Plan (NAcP) of December 2017, and details are below.

Earthquakes

The review of the design bases carried out by the plants concluded by confirming the acceptability of the SSCs in the event of earthquakes, including the barriers and protective actions implemented to deal with the indirect effects of the earthquake within the facility; these were considered explosions, fires and internal flooding due to broken pipes. In addition, the historical data of earthquakes in the vicinity of each site have been reviewed, confirming the validity of the values initially adopted for the DBE, which are between 0.10 g and 0.20 g.

The seismic margin of 0.3 g has been verified or compliance measures have been implemented, including the SSCs related to the integrity and cooling of the spent fuel pool and the safe shutdown equipment in the event of severe accidents and loss of power supply (station blackout, SBO). Likewise, this seismic margin has been verified in the fuel pool and the final heat sink by discarding the loss of inventory due to the movement of the water by sloshing, an effect that is also irrelevant for the DBE

At sites in river basins, it has been verified that upstream dams can withstand an earthquake of the same intensity as the DBE. Likewise, the margins of each dam against more severe earthquakes have been quantified and the consequences of rupture have been analysed, in the cases considered credible, determining the maximum flooding level in the plant and the time to the maximum flow peak.

Vandellós II NPP is the only Spanish plant affected by the tsunami, for which a very high margin of protection has been verified, as its safety systems are more than 20 metres above sea level.

The **improvement actions taken** to strengthen the earthquake response capacity have proved to be the design modifications necessary to achieve the 0.3 g seismic margin for the aforementioned SSC.

Flooding

The review of the design bases has confirmed the validity of the hypotheses considered in the analysis of floods caused by external natural events, including the hydrological and meteorological data of each site during operation in order to contemplate, in addition to dam breakage, other causes of flooding, such as intense rainfall, floods in rivers and ravines, tsunamis, waves and rising sea levels or groundwater.

The analyses of the site and its surroundings have been carried out using current models of natural terrain accidents (ravines, slopes, terraces, etc.). The analysis of the site's drainage network (surface water and groundwater) has also been included.

The **improvements implemented** to strengthen response capacity in the event of extreme floods consisted of resolving the vulnerabilities identified in the site flood analysis, involving reinforcement of the watertightness of doors, buildings and drainage capacity.

Other natural events

The external events, other than earthquakes and floods, with a potential impact on the safety of the site have been selected using probabilistic criteria based on the results available from the IPEEE. Consideration has been given to (among others) events such as strong winds, thunderstorms, hail, snowfall, extreme temperatures (high and low), frost, drought and forest fires, for which the suitability of the original design basis of the plant structures and components in outdoor areas has been confirmed.

Likewise, the existence of safety margins against events beyond the design bases considered credible at each site has been verified, and improvements have been implemented to strengthen the response capacity to extreme natural events, consisting of the specific re-evaluation of different events (hail, extreme temperatures and atmospheric discharges) and subsequent implementation of improvement actions.

17.3.3. Regulatory review and control activities

Within the scope of the SISC, biennial inspections on extreme weather conditions and floods are foreseen, as well as the final heat sink. In addition, periodic inspections are planned on the seismic surveillance systems of the plants, including aspects relating to the site and the protection measures implemented in compliance with the requirements of the CSN in the post-Fukushima JTI, the design and implementation of which was subjected to continuous supervision at the time.

17.4. Consultation with other Contracting Parties potentially affected by the installation

In order to satisfy cooperation between regulatory authorities and other member states as required by Article 8.3 of Directive 2014/87/Euratom, the CSN promotes relations and communications with other international institutions and organisations through the strategic action of active participation in the various international fora in order to exchange experience and knowledge, both technical and regulatory, on nuclear safety and radiation protection, in order to be aware of good practices that reinforce the safety of the facilities and international coordination. Likewise, the CSN maintains cooperation agreements and protocols with foreign counterpart organisations, in particular with the competent authorities of neighbouring countries, with which it exchanges information in the event of incidents.

Article 18. Design and construction

18.1. Application of in defence in depth

18.1.1. Arrangements and regulatory relating to the design and construction of nuclear installations

The CSN has a structured set of technical standards in relation to the design and construction of nuclear facilities that contemplate the principles of in-depth defence, in accordance with the applicable international standards, such as those of the IAEA, the reference levels of WENRA and the technical standards of the countries of origin of the technology of the Spanish nuclear power plants. The following are the most relevant in design and construction, and there is an additional set of Instructions and Safety Guides that are equally applicable, although not specifically related to these phases of the facility.

The RINR establishes the requirements for the design and construction of a new nuclear power plant in chapters II "preliminary authorisation" and III "construction permit", detailing the documentation to be submitted. This regulatory framework has been completed with the RSN, in force since November 2018, which transposes Directive 2014/87/Euratom and with this the objective of Principle 1 of the Vienna Declaration to prevent accidents and, if they occur, to mitigate long-term off-site pollution. These objectives apply to all stages of the life of the facility, with design and construction addressed in Chapter II *Site*.

In addition, the CSN has the Instructions applicable to the design and construction of nuclear facilities IS-26, on basic nuclear safety requirements applicable to nuclear facilities and IS-27, on design criteria applicable to nuclear power plants, of which revision 1 was issued in the period covered by the report.

18.1.2. Status with regard to the application for all nuclear installations of the defence in depth concept, providing multiple levels of protection of the fuel, primary pressure boundary and the containment, and taking into account internal and external events and the impact of associated natural sequential external events (e.g., tsunami caused by an earthquake, mudslide caused by heavy rainfall)

The principle of in-depth defence (DiD) is fully implemented in the Spanish regulatory framework. The new RSN reinforces the application of this principle and explicitly contemplates it in Article 11, applicable to the design and operation of the plants. Specifically, it states that "...including internal and external events and serious conditions, the doses received by the workers and releases to the outside

must be minimised as much as possible", and then develops the levels of defence that must be maintained through the design and construction of appropriate physical barriers and technological safeguards.

Furthermore, the *in-depth defence* section of CSN Instruction IS-26 requires the incorporation of multiple barriers in order to prevent and mitigate releases of radioactive material outside the authorised limits during the design, construction, operation, dismantling, transport and management of the radioactive wastes generated.

All the Spanish nuclear power plants incorporate these levels of protection, both in their physical design and in their procedures and action guides, as was confirmed in the response process to the Fukushima accident, by means of European endurance tests, associated peer reviews and the implementation of the National Action Plan resulting from the analysis of response to extreme natural events and all plausible combinations thereof.

18.1.3 Degree of use of design principles, such as passive safety or safe failure, automation, physical and functional separation, redundancy, and diversity

During the period of construction of the different Spanish nuclear power plants, improvements in the designs were introduced as a result of the evolution of internationally accepted standards, applying more updated and strict criteria of physical separation, redundancy, diversity, analysis of new types of accidents, etc. to the design basis of the plants.

Subsequently, during the renewals of the Operation Permit, the CSN required the introduction of design improvements and modifications in order to increase the safety of the facility, in relation to the most demanding regulatory criteria, a practice that is currently being developed fundamentally within the framework of the PSR. The wide range of standards relating to PSRs makes it possible to homogenise the level of safety of all the Spanish nuclear power plants.

Among the most relevant standards relating to PSR is the RSN, in its Article 13 which is explicitly dedicated to the *Periodic Safety Review*, and Guideline GS-1.10 Rev.2, revised in the period covered by the report, as identified in section 18.1.1 and previous sections of the report. GS-1.10 contemplates different phases of analysis of the plant configuration, with strict supervision by the CSN based on the establishment of milestones of favourable appreciation by the Board of Commissioners, in accordance with the assessment of the “safety factors” determined in order to identify possible plant improvements or modifications under in-depth safety and defence criteria.

18.1.4. Implementation of design measures or changes thereto (plant modifications, remodelling) with the objective of preventing beyond design basis accidents and mitigating their radiological consequences if they were occur (this applies to the entire nuclear installation, including spent fuel pools)

In addition to the measures implemented at the Spanish nuclear power plants, which have been described in previous reports and which have complied with the pre-existing safety improvement processes since the beginning of their operation, during this period the post-Fukushima NAcP was completed, with the sole exception, in view of its broad scope, of the seismic re-analyses currently under way in phase II.

Although the actions are specific to each plant, the following apply generally:

- Measures to deal with extensive damage accident scenarios, addressing interfaces between existing plant facilities, availability of means and portable equipment, their safe location, construction of a heliport, etc., and definition of a new emergency response organisation, with the consequent modification of the PEI.
- Establishment of a centralised emergency support centre (CAE) for sharing common emergency support resources at any of the different nuclear power plants.

- Establishment of alternative emergency management centres (CAGE)
- Acquisition of portable 380 Vac diesel generators to supply the critical loads defined in the extended SBO scenario and installation of emergency connection systems for these equipments.
- Acquisition of portable diesel pumps for extinguishing large fires coinciding with the loss of external electrical energy or damage to the plant's fire-fighting systems. These pumps are also sized to supply water to the reactor vessel or containment, if necessary.
- Establishment of support protocols for nuclear power plants for voltage recovery from nearby hydraulic power plants.
- Preparation of management guides and mitigation of extensive damage GMDE and GEDE.
- Implantation of filtered containment vent (SVFC) systems.
- Implantation of passive autocatalytic recombiners of hydrogen in containment (PAR)

The incorporation of these improvements in the configuration of the plants has been complemented by periodic emergency drills, in which the use of severe accident guides has already been contemplated. Likewise, the contents of the training given in the training of nuclear power plant personnel responsible for its application, as well as in the processes for obtaining operating licenses, have been contemplated.

All these safety improvements, together with those resulting from the PSRs, make it possible to comply with principles 1 and 2 of the Vienna Declaration.

18.1.5. Implementation of special measures to maintain the integrity of the containment in order to prevent long-term off-site contamination, in particular measures taken or envisaged to deal with natural hazards more severe than those considered in the design basis

In order to prevent containment failure, the EOP and SAMG have been modified to improve the management of hydrogen generated in a severe accident, taking into account the installation of the PARs in the containment areas (primary or secondary) most likely to present a risk of hydrogen accumulation and, likewise, incorporating the instructions required to allow operation, contemplating the prolonged loss of electrical energy, of the SVFC as a protection measure against failure due to overpressure of the enclosure, reducing the radiological limitation with the incorporation of the filter.

Likewise, strategies have been designed to reduce/mitigate any external release of fission products, such as external sparging from the containment facility or any other building, as well as sparging from the surface of the spent fuel pool.

The new enhancements have been incorporated into the PSA update programme.

18.1.6 Improvements implemented for designs to NPP as a result of deterministic and probabilistic safety assessments made since the previous National Report of the convention and overview of the main improvements implemented since the commissioning of nuclear installations

The nuclear power plants have continued to perform different PSA applications in support of risk-informed licensing and safety improvement processes, as well as in operational risk assessments. These activities include the use of the Safety Monitor to comply with section 3.4 of CSN Instruction IS-15 on requirements for the surveillance of the efficiency of maintenance at nuclear power plants, the supervision of refuelling programmes in accordance with the Safety Guide at Shutdown or the implementation of programmes to optimise the maintenance of the equipment most significant for the risk (in-service inspection of piping, in-service testing of check valves, motorised or pneumatic valve programmes and Maintenance Rule). Likewise, the results of the PSAs are used to support the SISC, both in the definition and calculation of performance indicators and in the categorisation of findings.

Licensing processes and other activities related to the use of PSAs include the following:

Almaraz NPP continues the process of adopting the NFPA-805 risk-informed standard as the basis for licensing fire protection systems, which will allow the use of the results of the PSAs in this area. Almaraz NPP has developed the PSA of Floods, levels 1 and 2 and the PSA of Other Sources.

The Ascó NPP is also in the process of adopting the NFPA-805 standard as the basis for the licence, independent verifications having been carried out of both the fire PSA and the level 1 and 2 PSA at power. Within the framework of the new models, the PSAs of irradiated fuel pools are available and the PSAs level 2 models of flooding at power have been carried out, the PSAs level 1 and 2 of Fires in Other Modes and the PSAs level 2 of Floods in Other Modes being drawn up.

Cofrentes NPP has developed the PSAs required by IS-25 instruction, the PSAs being level 1 and 2 in Other Modes, PSAs level 2 for fires at power, PSAs level 2 for floods at power and PSAs for fuel pools...

A flood alarm system has been implemented whose objective is to reduce the time involved in the human factor of analysis and detection of a possible flood scenario, and to guarantee the validity of the maximum permitted times of flood isolation considered in the Flood Deterministic Study and in the Flood Manual.

CNSMG, which ceased operation in July 2013, developed the level 1 PSA of the irradiated fuel pool, applicable in the current situation, which has made it possible to validate and complete the shutdown safety guide applied to monitor and minimise the risk of the facility in the event of unavailability of systems and equipment.

Trillo NPP has completed the Level 2 Flood PSA and the Other Modes Fire PSA.

Vandellós II NPP has developed the irradiated fuel pool PSA, as well as the new models of PSA level 1 and 2 of floods in other modes and the PSA level 2 of floods at power, with satisfactory results and without identifying vulnerabilities in the design.

During the reporting period, the plants planned, designed or implemented the following design modifications in addition to those included in previous sections:

Almaraz I and II NPP:

- Digital control system of the auxiliary feed water turbopump.
- Improvements in PCI (fire resistant separation).
- Modifications associated with changing the basis of fire protection licence through transition to NFPA-0805 (detection, extinction and RF separation)
- ATI.
- Modification of the fuel building crane (protection against simple failure).
- Improvements in instrument air system (increased valve manoeuvre autonomy in the event of system failure).
- Installation of an open-phase detection and protection system.
- Improvements in systems against gas intrusion.

Ascó I and II NPP:

- Improvements in the electrical independence of the Control Room (IS-27 criterion CGD-19)
- Improvements for open phase detection and protection
- Installation of the passive seals of the RCS cooling pumps

Cofrentes NPP:

- Implementation of additional improvements to the PCI system and passive protections.
- Improvements related to cybersecurity

- Implementation of a new heated workshop
- Replacement of refrigerant gas in essential chilled water and non-essential chilled water systems.
- Improvements to HVAC systems to facilitate testing.
- Implementation of an open-phase detection system.
- Implementation of a new flood alarm system
- Implementation of improvements in the Recharge Plant.
- Improvements in motorised and pneumatic valves.

CNSMG:
At the beginning of the cessation of operations, and in view of the possibility of a new Operating Licence, the plant carried out improvements to the facility, until such authorisation was denied in August 2017. Since then no significant modifications have been carried out and the activities have focused on the removal of operational wastes from the facility, the isolation and deactivation of systems which are no longer required and preparation for the transfer of the fuel from the spent fuel pool to dry storage casks. In particular, the following should be mentioned as significant modifications:

- Construction of an ATI within the site.
- Improvement of the reactor building crane to enable container handling.

NPP Trillo:
- Improvements in PCI: fire-resistant detection, extinction and separation.
- Improvements in cybersecurity.
- Implementation of an open-phase detection and protection system.
- Renewal of switches.

Vandellós II:
- Improvements for open phase detection and protection
- Improvements in extinguishing systems and passive protections and supplementing PCI's water supply capacity, derived from IS-30
- Improvements in the electrical independence of the Control Room (IS-27 criterion CGD-19)
- Installation of the passive seals of the RCS cooling pumps

18.1.7. Regulatory review and control activities

In order to verify that nuclear power plants operate in accordance with the applicable standards and the requirements established by the regulator, and that the actions required by the various authorisations and approvals are adequately implemented, the CSN systematically carries out the necessary assessments and inspections. Within these, the PBI defines a biennial inspection specific to each plant on the basis of component design, the objective of which is to verify that the plant CSEs adequately comply with their design bases, which incorporate the concept of in-depth defence.

Furthermore, as explained in Article 14 and in accordance with CSN Instruction IS-21 on requirements applicable to modifications at nuclear power plants, for each design modification the licensee must carry out a specific analysis and, depending on the result thereof, these must be previously authorised by the MITECO, following a favourable report by the CSN, or favourably appreciated by the CSN.

18.2. Incorporation of proven technologies and methodologies

Article 31 of the new RSN indicates that the licensee of the facility must guarantee that no modification thereof may degrade the capacity to operate the facility safely, guaranteeing compliance with the main safety functions and the safety objective of the facility.

In addition, Article 5.16 of CSN Instruction IS-26 on basic nuclear safety requirements applicable to nuclear facilities establishes that the design of Safety Important SSCs should be based on proven and validated technologies under operating conditions similar to those of operation.

18.2.1 Arrangements and regulatory requirements for the use of technologies proven by experience or verified by testing or analysis

When it comes to incorporating a new design, a prior approval process must be in place to demonstrate that the design is adequate through analysis, testing programmes, previous experience or a combination of the foregoing. As the Spanish nuclear power plants are based on designs from the United States or Germany, there is in most cases previous applied experience with the technologies and methodologies incorporated in the designs.

Article 25 of the RSN, **Modification of facilities**, establishes that, in the event that a design modification implies a change in the criteria, standards and conditions on which the Operating Licence is based, the licensee shall request authorisation for the modification, which shall be effective prior to the entry into service of the modification or the performance of the tests.

Article 82 of the RSN defines the conditions for requesting a favourable assessment by the CSN of new designs or models, and Article 83 establishes the conditions for the certification and validation of new designs or models for use in Spain.

CSN Instruction IS-21 on design modifications at nuclear power plants requires the identification of the modifications to be submitted for authorisation by the licensees, identifying the documentation that should accompany the request. The RINR also establishes that if, in the opinion of the regulatory authority, a modification is of great scope or importance, the licensee must request authorisation for performance and assembly.

Lastly, Article 5.16 of CSN Instruction IS-26 on basic nuclear safety requirements applicable to nuclear facilities establishes that the design of SSCs that are important to safety should be based on technologies which have been proven and validated under similar operating conditions.

18.2.2. Measures taken by licence holders to implement these technologies.

The components of safety systems are subject to an environmental and seismic qualification process, which takes into account the conditions under which they must perform their function, as specified in the equipment's environmental qualification manual. In addition, the modernisation of systems related to security using digital electronic equipment has made it necessary to extend the qualification to this equipment to ensure electromagnetic compatibility with existing plants, meeting the highest quality and safety requirements in software design, in addition to taking cybersecurity aspects into account.

In previous periods methodologies were developed for the dedication of instrumentation and control equipment based on software, with the industry standards from the origin country of the technology being considered applicable in these cases. Currently, the electrical sector is undertaking a pilot project for qualification/dedication of equipment with embedded or "smart" software.

In the 2016-2018 period, the Spanish plants implemented or initiated the following I&C design modifications using digital technology:

Almaraz I and II NPP

- Environmental radiation monitoring network.
- 'Safe' and 'not safe' indicators.
- Control of the Auxiliary Feed Water Turbopump.

- Design and stockpiling of the seismic instrumentation cabin
- Improvement of equipment cybersecurity

Ascó I and II NPP
- Migration of the Digital Electrohydraulic control system from turbines to the OVATION platform.
- Substitution of paper recorders for screen recorders in the Control Room. Elimination of non 1E recorders by implementing their signals in the plant computer.
- Migration of the vibration monitoring system, and blocked-rotor protection of the Reactor Refrigerant Pumps.
- Replacement of the line protection system of the 400 KV and 110 KV devices.
- Implementation of a new open-phase condition detection system
- Modernisation of the fuel handling system.
- Implementation of measures associated with cybersecurity in digital process equipment and systems.
- Implementation of improvements in the hydrogen treatment station of the alternator.
- Obsolescence management migration from programmable controllers to PLCs
- Installation of radar transmitters for measurement of levels in the fixed entry river grids.

Cofrentes NPP:
- Improvement of equipment cybersecurity
- Modernisation of the distributed control system, Phase III
- Replacement of controllers by PLC and remote control screens
- Replacement of area 1 radiation detection system monitors
- Modernisation of sensors and PLC facility of the fuel transfer pipe

NPP Trillo:
- Environmental radiation monitoring network.
- Actuator Dedication Process
- Driver Updates
- PLC Update
- Main steam system valve test monitoring system
- Design and stockpiling of the seismic instrumentation cabin
- Reserve meteorological tower
- Post-accident hydrogen sensor
- Post-accident boron meter
- Inverter with embedded logic
- Sensors and cabins for measurement and control of the ‘pneumo-ball’ system for calibration of radiation detectors.
- ‘Safe’ and ‘not safe’ indicators.
- Improvement of equipment cybersecurity

Vandellós II NPP
- Replacement of the 118V power supply systems for class 1E instrumentation and 1E vital instrumentation.
- Digitisation of the reactor control system and the main turbopump feedwater controls.
- Migration of the water system technological safeguards to the Ovation platform.
- Replacement of the line protection system of the 400 KV and 110KV parks.
- Implementation of a new open-phase condition detection system.
- Implementation of measures associated with cybersecurity in digital process equipment and systems.
- Replacement of the HVAC system with a distributed control system.
- Obsolescence management migration from programmable controllers to PLCs.

18.2.3. Regulatory review and control activities

Design modifications incorporating new technologies and methodologies and requiring favourable authorisation or assessment, or those implying modifications to official operating documents, are subject to a regulatory assessment process, as part of which the CSN may perform specific inspections known as "licensing" inspections.

In order to guarantee compliance with the requirements of Article 25 of the RINR and Article 5.16 of Instruction IS-26, the CSN procedure applicable to assessments establishes the need to confirm the level of safety required and that the technical solutions have been tested or qualified by means of tests or experience.

The PBI also contemplates biennial inspections of design modification to each plant, whether physical, documentary or methodological. These inspections verify, under the criteria of IS-21, the previous analyses and safety assessments carried out in order to determine whether or not they require authorisation, physical implementation and commissioning tests.

The checks carried out during the PBI inspections include the conditions established in the equipment environmental qualification manuals, an aspect that may be considered especially important in modifications introducing new technologies (e.g. digital instrumentation).

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

18.3.1. Arrangements and regulatory requirements for reliable, stable and easily controllable operation, with special consideration of human factors and human-machine interfaces

As established in CSN Instruction IS-26, the SSCs shall be designed, manufactured, installed and operated in accordance with their safety classification and taking into account the maintenance, inspection and testing capacity to guarantee their functional capability during the lifetime of the facility. When the intervention of a system is necessary in anticipated operational events and rapidly evolving accidents, its action should be automatic, without the manual intervention of the operating personnel for a sufficient time to take the necessary corrective actions. Likewise, the SSCs must be designed to guarantee safety functions under the environmental and seismic conditions considered in the foreseen operational events and in the design base accidents, incorporating adequate protections against external and internal events.

The CSN considered it necessary for the licensees of nuclear facilities to formally include requirements relating to human factors in their design modification management procedures, with the participation of specialists in this discipline. Thus, CSN Instruction IS-27 on general design criteria for nuclear power plants establishes that: "the design of safety relevant SSCs shall take into account human factor engineering principles and techniques", and instruction IS-21 includes among its requirements that "human factor methods and criteria shall be adequately incorporated into all phases of the process and modification activities".

18.3.2. Implementation of measures taken by the licence holder

Modifications at Spanish nuclear power plants are designed taking into account the human factor methodology of USNRC NUREG-0711, which analyses the 12 human factor engineering elements in the 4 phases of planning and analysis, design, verification and validation and start-up and operation.

The fundamental objective of this methodology is to design the user-system interface minimising human error, without generating tasks or activities that exceed human capacity, or that lead to situations that could lead to errors. During the reporting period, the licensees have developed procedures to systematise the application of this methodology to design modifications

18.3.3. Regulatory review and control activities

Design modifications requiring authorisation or favourable appreciation, or implying modifications to the official operating documents of the plant, are subjected to an assessment process that analyses their impact on safety, including aspects relating to human factors and the human-machine interface considered significant. Within the process of evaluating a design modification of this nature, licensing inspections may be carried out, at the discretion of the CSN. Likewise, the scope of the PBI includes inspections on design modifications, in any of their phases, for the systematic and periodic supervision of aspects relating to human factors and human-machine interfaces.

18.4. Vienna Declaration

This chapter is probably the most significant as regards the justification for compliance with the commitments deriving from the Vienna Declaration, especially as regards the first principle: *the design, site selection and construction of new nuclear power plants will be consistent with the objective of preventing accidents during commissioning and operation and, should an accident occur, of mitigating radionuclide emissions that might cause long-term off-site contamination, as well as of avoiding early radioactive emissions or radioactive emissions large enough to require long-term protective actions and measures.* In Spain there are no provisions for the construction of new nuclear power plants, but it is understood that the principle applies fully, in terms of design and operation, to existing plants. In fact, much of the action taken in the aftermath of the Fukushima accident is in line with this principle. The other two principles reinforce the application of the first principle to operating plants, from the dual perspective of safety assessments and consideration of IAEA standards and international good practices, processes or aspects leading to the proposal of improvements in plant design and operation, in accordance with the first principle.

Thus, section 18.1, dedicated to the application of in-depth defence principles, includes the regulatory provisions relating to plant design, including the standards issued by the CSN during the reporting period, among which the IS-36 instruction on emergency operating procedures and severe accident management and the IS-37 instruction on analysis of design-based accidents are significant for this purpose. Likewise, the application of the basic nuclear safety defence principle requirements included in Instruction iS-26 to Spanish plants is analysed in depth, explaining and justifying how these principles are guaranteed.

Particularly important from this perspective are subsections 18.1.4, detailing the measures applied in the design to prevent accidents beyond the design basis and to mitigate the radiological consequences in the event of the occurrence of this type of accident; and 18.1.5, setting out measures to preserve the integrity of the containment, in particular in the event of extreme natural events. In the case of Spain, the vast majority of these measures are framed in the response actions following the Fukushima accident and in the action programme to deal with accidents with losses in large areas of the plant (both programmes have been developed in Spain simultaneously and in a coordinated manner). Details are provided of the main design modifications carried out and in progress at each plant with a view to improving plant safety.

Frequently, improvements in the designs necessary for the development of the first principle of the Vienna Declaration involve the implementation of new technologies and methodologies. Section 18.2 describes the measures adopted to guarantee the adequate and safe implementation of these technologies and methodologies at Spanish nuclear power plants. Likewise, the most important modifications implemented in this area at Spanish nuclear power plants during the reporting period are listed.

A key aspect in the implementation of design modifications, especially those with a high impact on safety such as those concerning the development of the first principle of the Vienna Declaration, is the consideration of human factors and aspects associated with human-machine interaction in the development and implementation of modifications and in the subsequent operation of the plant. The consideration of these aspects at Spanish nuclear power plants in order to guarantee reliable and safe operation is summarised in section 18.3.

Article 19. Operation

19.1. Initial Authorisation

The RINR contains the requirements for the initial authorisation of nuclear power plants, which are specified, for each nuclear power plant, in the official operating documents that must accompany the application for the preliminary, construction and Operating Licence authorisations.

Preliminary or site authorisation refers to an official recognition of the proposed objective and of the suitability of the selected site, granting of which entitles the licensee to request a permit for construction of the facility and to initiate the preliminary infrastructure works authorised.

The construction permit entitles the licensee to initiate the construction of the facility and to apply for the Operating Licence at an opportune moment.

The Operating Licence empowers the licensee to load the fuel or to introduce nuclear substances into the facility, to carry out the nuclear testing programme and to operate the facility within the conditions established in the authorisation. This permit will initially be granted provisionally, until such time as the nuclear tests have been successfully completed.

The granting of the aforementioned authorisations is the responsibility of the MITECO, following a mandatory report by the CSN, which is binding if unfavourable, as are the conditions established in the favourable reports.

In Spain no initial authorisations for nuclear power plants have been granted since the 1980s.

19.2. Operation limits and conditions

19.2.1. Arrangements and regulatory requirements for the definition the safe boundaries of the operation and to setting of operational limits and conditions

The RINR establishes the content of the documentation to be included in each plant's Operating Licence application. A standard Operating Licence model is included in Appendix 19.A.

The list of Official Operating Documents (DOE) established by the RINR is as follows:

a) Safety Study (SS)
b) Operating Regulations (OR)
c) Operating Technical Specifications (ETF)
d) Internal Emergency Plan (PEI)
e) Quality Assurance Manual
f) Radiation Protection Manual (MPR)
g) Radioactive Waste and Spent Fuel Management Plan (PGRRCG)

CSN Instruction IS-32 on ETF at nuclear power plants establishes the requirements applicable to the preparation and maintenance of this document.

The requirements and conditions defined in the Operating Licence and DOE constitute the surrounding configuration of the plant, compliance with which guarantees its safe operation.

19.2.2. Implementation of operational limits and conditions, their documentation, related training and their availability to plant personnel engaged in safety-related work

The ETF contain the limits of the variables affecting safety, the action limits of the automatic protection systems, the minimum operating conditions, the schedule for the review, calibration and periodic inspection of the SSCs and the operational control mechanism, thereby constituting the collected technical requirements and limits defining the safe operation of the Spanish nuclear power plants.

For each plant, the ETFs are a specific adaptation of the reference standards of the origin country of the plant technology, based on the hypotheses considered in the analysis of accidents at the facility.

ETFs have a well-defined structure and typically consist of the following chapters:

- Definitions.
- Safety limits and limiting set points of safety systems, and their bases.
- Limiting conditions of operation (CLO) including actions required if CLOs are not satisfied, and monitoring requirements or requirements (RV)
- Design features.
- Administrative rules.
- CLO and RV bases.

ETFs allow for the planning of VRs, with associated monitoring procedures (PVs) setting out the frequency of execution of each requirement, the manner of testing and the applicable acceptance criteria. The ETFs are an essential objective of the training of the personnel responsible for safety-related work and, especially, of the control room operating personnel, and their knowledge and handling form part of the examination performed by the CSN for the granting of operating personnel licences.

The ETFs establish in the CLOs the operability requirements of the SSCs within their scope, and the actions and deadlines applicable in the event of their inoperability.

When the operability of the SSC is questioned, the SSC is in *"anomalous condition"* or CA (a general term that can mean either *"in degraded condition"*, because the suitability or functional capacity of the SSC is reduced, or *"in non-compliant condition",* because it does not comply with any requirement demanded in the Licence Bases); to discriminate as to whether the SSC is inoperable or, on the contrary, operable under CA, the holder must undertake a *"Determination of Operability"* according to the applicable procedures. In addition, until the CA is resolved, the licensee must implement compensatory measures that maintain the required level of safety. All this must be properly documented to allow for monitoring and traceability.

The procedures applied by the nuclear power plants for the treatment of CAs have been carried out in accordance with sectorial guide CEN-22, which has been approved by the CSN. Revision 1 of this guide was published in February 2016, introducing the concept of reduced reliability. Each plant develops its own specific guide as a result of adapting the CEN-22 guide to its particular case.

19.2.3. Review and revision of operational limits and conditions as necessary

Given the importance of the ETFs for the operation of the Spanish nuclear power plants, any change to them requires authorisation, with a technical assessment and a favourable report from the CSN being required prior to their implementation.

The normal ETF review process can be initiated:

- o at the proposal of the CSN, which may request reviews directly from Spanish nuclear power plants
- o at the request of the licensee, to adapt the ETFs to operational experiences, new regulations, etc.

The initial modification proposal is reviewed by the Plant's Nuclear Safety Committee (CSNC, *Comité de Seguridad Nuclear de la Central*), the licensee's highest internal body for nuclear safety and radiation protection assessment. Following the favourable assessment from the CSNC, it is reviewed by the Operator Nuclear Safety Committee (CSNE, *Comité de Seguridad Nuclear del Explotador*), the highest advisory body of the Directorate General concerned with the nuclear safety of the plant. Subsequently, following a mandatory report by the CSN, the MITECO formally approves the ETF revisions.

19.2.4. Regulatory review and control activities

The CSN carries out regulatory checks confirming compliance by the licensee with the CLOs established in the ETF and the remaining DOEs.

At the nuclear power plants, this supervision is carried out on a daily basis and is one of the routine activities of the resident CSN inspectorate. Supervision of compliance with the surveillance requirements established in the ETFs is also carried out by means of periodic biennial inspections integrated in the SISC.

As has already been pointed out, in the event of any request for modification of the ETF, the CSN is required to inform the MITECO of any such request.

19.3. Procedures for operation, maintenance, inspection and testing

19.3.1. Arrangements and regulatory requirements on procedures for the operation, maintenance, inspection and testing of nuclear installations

At Spanish nuclear facilities, all operating, maintenance, inspection and testing activities should be performed in accordance with approved procedures, with the objective of minimising human errors during their performance. This practice responds to the principle of in-depth defence reinforced in Article 16 of the new RSN, which in turn establishes in Article 28 *Procedures and guides* that the licensees should have a set of procedures and guides that are consistent with the facility, valid, up-to-date and used in the training of the personnel involved in their use. These requirements apply to all the operating conditions of the facility and are also included in CSN Instructions IS-26, on basic nuclear safety requirements and IS-36, applicable to EOP, SAMG and GMDE emergency and severe accident management procedures and emergency shutdown action guides (GAP).

CSN instruction IS-19 on the requirements of the management system establishes the quality requirements to allow the activities associated with each process to be performed in a controlled manner, using procedures and other means which will be periodically reviewed to ensure their suitability and efficiency.

The CSN IS-32 instruction on ETFs requires that they comply with the SSC surveillance tests within the scope of the ETFs and that they be performed by means of written procedures that include acceptance criteria allowing the operability of the SSC to be determined. Likewise, CSN instruction IS-23 on in-service inspections also establishes that functional tests on pumps and valves should be carried out by means of written procedures including the test method, the associated reference values and limits, and the applicable acceptance criteria.

Lastly, it is also required that procedures be subjected to a process of verification and validation and that users receive regular training and coaching.

19.3.2. Establishment of operational procedures, their application, periodic review, modification, approval and documentation

The procedures cover the activities required with regard to the facility and its SSCs in order to uphold the safety objective included in Article 6 of the RSN in any operating mode, including different aspects such as the flow of information and the responsibilities of the organisational units involved.

The plants' management systems include administrative procedures that describe the processes for reviewing and updating operational procedures. These processes must comply with the requirements established in CSN instruction IS-21 on design modifications, which is also applicable to procedural modifications.

The operational procedures of nuclear power plants are grouped into the following types:

- General operating procedures: applicable to the SSC manoeuvres to operate the plant in the different normal operating modes, including the transition between modes.
- Auxiliary operating procedures: applicable to the commissioning of complementary systems or equipment for the execution of general procedures.
- Alarm operation procedures: actions applicable after the activation of alarms in the control room.
- Operating procedures under abnormal conditions: instructions against transient conditions or SSC operating problems not covered in the category of accidents.
- EOP: incident/accident management instructions, including design-basis accidents.
- SAMG: guides containing operational strategies to mitigate the consequences of a severe accident.
- GMDE: guides or procedures containing strategies to deal with the loss of large areas of the plant.

These procedures can be developed using generic references, such as main supplier guides, owner groups, internationally accepted standards, etc. The relevance of a procedure for the safety of a procedure determines the periodicity of its review, as well as its own or others' operating experience. Full-scope simulators allow changes in procedures that might affect nuclear safety to be validated and trained, in which case these changes are subject to review by the CSNC.

19.3.3. Availability of procedures for relevant nuclear installation staff

Spanish plants have a system for archiving and distributing official documents, including procedures. The systems guaranteeing the availability of the procedures to the personnel that are to use them are within the scope of the supervision of the CSN, through the inspections contemplated in the inspection plans.

Given the relevance of knowledge of operating procedures and their operating environment, this is an area of knowledge contemplated in the training programmes for obtaining operating personnel licences for Spanish nuclear power plants.

19.3.4. Involvement of relevant nuclear installation staff in the development of procedures

The procedures of the Spanish plants are created by the personnel of the facility, specifically specialists in the SSCs or the field of knowledge in question, who are supervised by their line managers and approved by the highest level of the plant's management. Furthermore, procedures affecting nuclear safety or radiation protection must be reviewed by the CSNC prior to their approval.

Changes to the procedures must follow the process of preliminary analysis, safety assessment and safety analysis established in the aforementioned CSN Instruction IS-21, activities which are also performed by the facility personnel.

19.3.5. Incorporation of operating procedures into the management system of the nuclear installation

The plants' management systems include administrative procedures that describe the processes for reviewing and updating operational procedures. These processes must comply with the requirements established in CSN instruction IS-21 on design modifications, which is also applicable to procedural modifications. Likewise, the management systems comply with the requirements applicable thereto established in CSN Instruction IS-19, with the objective of implementing safe, reliable and efficient management of all activities, including the guidelines for the control, preparation, review and approval of plant procedures.

19.3.6. Regulatory review and control activities

In accordance with the RINR, an Operating Licence request from any nuclear facility must be accompanied by (among other documents) a Quality Assurance Manual and Operating Regulations. These documents respectively establish the scope and content of the quality programmes and the organisation and functions of the facility personnel, the training and qualification programmes and the operating standards under normal and accident conditions.

These documents, like any other concerning the configuration of the facility, will form the object of both periodic and systematic CSN inspection plans carried out within the PBI and any other type of inspection, including the activities of the resident inspectorate. The CSN inspections verify that the licensee adheres to the written procedures, considering non-compliance with the procedures to be an inspection finding to be assessed in accordance with the SISC procedures, which is incurred for non-compliance with the facility's Quality Assurance Manual.

Some of the most relevant PBI inspections related to the licensee's adherence to procedures are the Organisational Safety and Human Factors inspections of personnel training, human and organisational factors and the implementation and use of PAC IS-19, and activities for the supervision of compliance with instruction IS-19. In any case, the different inspection plans cover all the activities considered to be of interest within the regulator's supervisory and control competence.

19.4. Procedures for responding to operational occurrences and accidents

Spanish nuclear power plants have a set of written procedures covering all foreseen modes of operation, including operational incidents and accidents. Specifically, the current SOPs were implemented at US-designed plants in the late 1980s, while SAMG were implemented in the late 1990s, with a schedule similar to that followed in the United States. In the case of NPP Trillo, which is of German design, the process has followed programme and deadlines established there.

The set of procedures covering operational incidents has been expanded in recent years due to the implementation of post-Fukushima actions (SAMG, GMDE, with improvements aimed at optimising accident management at sites with two units and contemplating events originating during shutdown and those originating in the irradiated fuel pool). In addition, it has been necessary to create or modify procedures associated with the implementation of new SSCs, such as passive reactor coolant pump seals, SVFC and PARs.

In addition, new or improved procedures have been drawn up as a result of advances in Safe Shutdown analysis, fire analysis, PSA in other modes, considering the LOCA in states of shutdown, postulated accidents at fuel storage facilities, etc.

19.4.1. Arrangements and regulatory requirements on procedures for responding to anticipated operational occurrences and accidents

As has been indicated, CSN instructions IS-36 and IS-26 establish requirements for the preparation and maintenance of accident management procedures and guides.

Abnormal and emergency operating procedures are developed according to generic references developed by BWR and PWR reactor owner groups, which incorporate lessons learned from applicable operating experience, including Fukushima. The process of adaptation to a specific plant is carried out according to generic writing guidelines and specific implantation studies. This activity undergoes the internal verification and validation process described above.

19.4.2. Establishment of operating procedures for emergencies based on events and/or symptoms

The event-based approach to SOPs initially used in nuclear power plants was replaced by a symptomatic approach following the Three Mile Island accident in 1979, one which takes into account the evolution of significant plant parameters to initiate appropriate mitigation actions. Following this accident, groups of owners of Westinghouse technology plants (PWROG and BWROG) were created, which developed the Emergency Response Guides (ERG), used as a reference for drawing up the SOPs of the Spanish nuclear power plants using this technology.

Westinghouse PWR technology SOPs are grouped into optimal recovery procedures, applicable to scenarios where event diagnosis has been possible and, on the other hand, function recovery procedures, where diagnosis has not been possible and focus on the fulfilment of safety critical functions through a state tree structure. In the case of BWR plants, the EOPs are structured as symptom-based flowcharts.

All the generic changes in the SOPs identified by the group of owners as a result of the Fukushima accident were incorporated into Spanish nuclear power plants, once the modifications to the reference guides had been approved. In addition, all changes resulting from the implementation of the new CAGE, PAR and SVFC systems, among others, were completed in the period covered by the report.

19.4.3. Establishment of procedures and guidance to prevent severe accidents or mitigate their consequences

Severe accidents are those accidental conditions that are more severe than the basic design accidents and that lead to a significant degradation of the core, for which reason the actions contemplated in the SOPs are aimed at the prevention of severe accidents. On the other hand, the SAMG are action guides aimed at mitigating severe accidents by means of strategies for maintaining containment capacity, ending core damage and reducing the release of radioactive material. The development and implementation of SAMG has been similar to that described in the case of EOP and, likewise, GMDE and GEDE, designed to expand the capacity of plants to mitigate the consequences of extensive damage following the Fukushima accident.

The scope of the EOP and SAMG development programmes includes the establishment of the transition conditions between EOP and SAMG, as well as the review of the PEI and other emergency management documents, completing a set of documents that form part of the configuration of the facility and that have been subjected to the modifications derived from the implementation of the post-Fukushima systems, as well as the improvements identified in the PSR and other processes.

19.4.4. Establishment of procedures and guidance to manage accident situations at nuclear installations with multiple units and/or sites with multiple facilities

Following the Fukushima accident in 2011 and as part of the Resistance Testing process, the CSN issued a series of ITC requiring the licensees to analyse events beyond the design basis, including external events such as earthquakes and floods, considering the prolonged loss of electrical energy and/or the final heat sink, in order to reinforce the capacity to deal with this type of extreme event.

Likewise, the nuclear plant owner groups inserted various improvements into the POEs and GGASs, with one of the most relevant being the incorporation of the new portable and autonomous equipment used in the GMDE, prepared in accordance with NEI 06-12 (*B.5.b Phases 2 & 3 Submittal Guideline Revision 2, December 2006*) to deploy the strategies for adding water to the vessel or adding/spraying water into the fuel pool.

Other modifications to the EOP/SAMG are related to the incorporation of new systems, such as PAR and SVFC, to reinforce strategies for controlling the hydrogen generated in a severe accident and preventing overpressure in the containment, considering the prolonged loss of electrical energy and complementing the strategies with external spraying of the containment, or of any other building.

Modifications have also been identified as a result of the implementation of a CAGE and national CAE centre at each site in order to manage the provision of human resources and equipment, contemplating their transfer to the affected site in under 24 hours. The analyses performed have made it possible to identify other types of actions to improve emergency management, such as the signing of agreements with external organisations reinforcing the safety of Spanish nuclear power plants, the most noteworthy being the protocol of collaboration with the UME signed by CEN, through the Nuclear Forum, for intervention in extreme emergencies.

At sites with several units, analyses by the licensees have taken into account the simultaneous effects on several units, and various EOP, GGASs, GMDEs and GEDEs have also been developed, included in the training and coaching programmes and suitably validated using the replica simulator. The emergency response organisation of these facilities should be strengthened by identifying the necessary means of support (portable equipment, CAE, safe area, etc.). Finally, it should be pointed out that the PSR safety assessments allow for the identification of improvements in this area.

These actions follow the indications contained in paragraph 2 of the Vienna Declaration.

19.4.5. Regulatory review and control activities

The inspection plan established in the CSN's Annual Work Plan includes periodic PBI inspections allowing checks to be performed on different aspects of the implementation of the EOP and SAMG in the configuration of the facility, in the context of annual emergency or flood and extreme weather protection simulations, complemented by inspections directly aimed at the equipment implemented after Fukushima. Likewise, Annual Work Plan includes other types of generic inspections directly focused on the implementation, updating and training of EOP and SAMG.

19.5. Engineering and technical support

19.5.1. General availability of the necessary technical and engineering support in all safety related fields for nuclear installations, under construction, in operation, under accident conditions and or under decommissioning

As has been indicated above, both the RSN in Article 5 and the RINR in Article 8.4, as well as the CSN Instruction IS-19 and other standards applicable to the system for the management and control of the configuration of the facility, contemplate requirements obliging licensees to identify and monitor the intervention of external organisations, retaining responsibility for these processes.

The engineering companies and equipment suppliers that participated in the construction and commissioning of the Spanish plants have remained integrated into the organisation, participating in activities relating to the maintenance and constant updating of the design to aid the improvement of the facilities, including those implemented following the Fukushima accident and national and international R&D projects aimed at solving problems arising from operating experience and life management programmes.

The general technical support capacity in engineering and in the supply of goods and services related to nuclear safety involves the national electricity companies, as well as the fuel manufacturing company, ENUSA and the national waste company, ENRESA. These companies, together with other governmental organisations, provide services for numerous activities performed at the sites and their surroundings, such as the supervision and control of effluents and those relating to the development and deployment of emergency plans or the dismantling of the Vandellós I, José Cabrera and, more recently, CNSMG nuclear power plants.

The studies carried out by the CEIDEN Technological Platform, *Spanish capabilities to undertake a new nuclear project and supply chain for the construction of a nuclear facility,* continue to be valid, confirming the existence of sufficient capacity in the Spanish industry to provide the necessary technical support in all fields relating to the construction and operation of the plants.

During this period, in addition to completing the implementation of the modifications derived from Fukushima (CAGE, PAR, SFVC), improvements have been implemented in the areas of cybersecurity and communications, applying the most up-to-date technologies available on the market. In addition, through an R&D&I collaboration agreement between CEN of the Nuclear Forum, the nuclear power plants and a number of national companies and institutions agreed to establish a network of specialised engineering companies of recognised solvency in different areas of the nuclear sector, contributing to maintaining the permanent support capacity required for the operation of the nuclear fleet under conditions of maximum safety, reliability and competitiveness. Among the activities of these engineering companies is the analysis of the information supplied by EPRI, as regards its specific applicability to the Spanish nuclear sector.

19.5.2. Availability of necessary technical support on the site and at licence holder or utility headquarters, and procedures for making central resources available for nuclear installations

The technical support capacity at the nuclear power plants described in the previous section involves an organisation shared between the different plants, such as centralised emergency resources, and a corporate organisation guaranteeing independent supervision of the operation of the plant, in addition to the resources directly implemented on-site. The organisation of these resources is a function of the owner company and, in any case, it is included in the RF, which is the DOE that identifies the management, responsibilities and availability of resources for each facility. The development of this DOE is detailed in the Organisation and Operation Manuals and lower level procedures.

Among the strategic lines associated with shared resources and asset management are investment and R&D, fuel and waste management, and agreements with the relevant SSC technology suppliers of the plant or the equipment and assets of the emergency organisation. However, the support of the competent areas of the plant is essential for a unified management that optimises safety objectives.

The procedures for making central resources available to the power plant are associated with the monitoring of strategic plans and their guidelines, which originate from the governing body of the company managing the operation of the power plant.

19.5.3. General situation with regard to dependence on consultants or contractors for technical support to nuclear installations

The availability of contractors with technical staff and qualified means is key to the safe and efficient operation of the facilities. The report drawn up by the CEIDEN Technological Platform mentioned in point 19.5.1 confirms the existence of a sufficient capacity within the Spanish industry to provide the necessary technical support in all fields related to the construction and operation of the plants.

The dependence on corporate contractors to support the organisation is structured on three levels:

- At the first technological level, it is worth highlighting the suppliers of the nuclear island, turbo-group, diesel generators, main transformers, etc., and the associated design engineering, with which there is a high degree of dependence that makes it necessary to establish long-term agreements throughout the operation of the plant.
- At the second level, contractors from specialised services companies, inspection, diagnosis, maintenance and quality-control activities, relevant repairs and supply of equipment are relevant. Knowledge of the facility and training for working with radiation justify the medium-term link between the plant and these contractors.
- The third level of contracting is made up of companies for services with lower qualification requirements, such as cleaning, scaffolding, surveillance of areas, etc., with which there is no technical dependence, but rather, related to social, historical or geographical conditions.

19.5.4. Regulatory review and control activities

The CSN contemplates different mechanisms for the supervision and control of the licensee's processes relating to the organisational resources of supplies, engineering and technical support. As has been indicated previously, the regulatory framework establishes control mechanisms over the organisation of licensees, who are responsible for their adequate description in the RF of the facilities, including relations with external organisations within the scope of this process. The RF is a document subject to the DOE's regime of modifications established in the RINR and in IS-21; according to these standards, changes to the RF must be approved by the MITECO, following a favourable report from the CSN.

The organisational and quality aspects are within the scope of the CSN supervision and control processes, as explained above. Among the systematic inspections of the PBI are those of modifications at nuclear power plants, which include changes to the DOE and any modification in which the technical support team of the plant has participated, the quality assurance inspections regarding the PAC and those performed quarterly by the resident inspectorate, which cover any cross-cutting aspect. Likewise, an annual inspection of refuelling contractors is planned, in addition to any other inspection considered relevant. Each year the licensees send the CSN a report on any modifications or actions relating to optimisation of human resources within the organisation, and this information is used by the CSN for planning of inspections in this area.

19.6. Reporting of incidents significant to safety

19.6.1. Arrangements and regulatory requirements with respect to the reporting of safety relevant incidents to the regulatory body

CSN Instruction IS-10 establishes the criteria for the notification of events occurring at nuclear power plants, depending on their relation to nuclear safety or radiation protection. Events are reported to the CSN emergency room (SALEM) by means of a reportable event report (ISN). In addition, these reports are distributed to the remaining Spanish plants and are announced by the CSN to the public in press releases and on the CSN website, as established by the CSN's internal procedures.

19.6.2. Reporting criteria and procedures established in relation to safety significance incidents and other events such as near-misses and accidents

The IS-10 typifies reportable events at Spanish nuclear power plants, the deadlines and means and formats for their notification and the criteria for submitting additional information and reviewing the reports issued.

IS-10 is under revision 1, as of September 2014, having not been modified in the period covered by this report. The general guidelines for notification of events within the Spanish regulatory framework are therefore maintained, and are summarised below:

- The 36 events classified as notifiable fall into the eight categories of notification: A. Registers, B. Occupational health and safety, C. Spillages and releases of radioactive materials or substances, D. Operating technical specifications (ETF), E. Operation, F. Safety systems, G. Other risk situations and H. External events.
- The established notification periods are 1 hour or 24 hours, depending on the importance of the event for safety.
- The ISN information follows a content format, which will be expanded by a report submitted within 30 days, including, among many other details, the chronological description, identification of causes, root cause analysis, corrective actions and the licensee's conclusions.

Spanish nuclear power plants have procedures for the notification of events, in accordance with the requirements of IS-10, for the preparation of which valid references are contemplated for the appropriate use and interpretation of the notification criteria. Complimentary procedures are available to carry out root cause analysis, according to valid and internationally accepted methodologies that apply the concepts of extension of condition and cause to check whether the causes of the event reveal vulnerabilities that could be present, latently or actively, in other processes or SSC of the facility.

The consistency between the administrative procedures of Spanish nuclear power plants and the requirements contained in IS-10 is subject to independent supervision by the CSN within the scope, among others, of the PBI inspections and the operating experience programmes of the nuclear power plants.

19.6.3. Statistics of reported incidents significant to safety

All events reported to the CSN during the period 2016-2018 were classified at level 0 of the IAEA's International Event Scale (INES), except in the two cases detailed below:

Almaraz I and II NPP INES 1
25 July 2016

Inoperability of the heat exchanger of train B of the cooling water system of components of unit I for a time longer than that allowed by the ETFs. On 20th July the CSN resident inspectorate determined that

EV 4.7.3.1e had not been performed adequately, the same inoperability being identified, extending the same conditions, on train A of unit II. In both cases, it was concluded that the component had maintained its ability to perform its security function. The classification as INES-1 obeys the criterion of in-depth defence, without an initiating event and without additional aggravating factors.

NPP Cofrentes INES 1
31 October 2017

Inoperability of the feed water system check valve, which in turn isolates the primary containment, for a period longer than that permitted by the ETFs. The assessment of the incident required a reactive inspection and various meetings and discussions with the incumbent. Classification as Level 1 on the INES scale results from applying defense criteria in depth, without an initiating event, after root cause analysis revealed additional aggravating factors.

19.6.4. Documentation and publication of reported events and incidents by both licence holders and the regulatory body

The ISNs issued by Spanish nuclear power plants in accordance with the provisions of IS-10 are sent to the CSN Emergency Room (SALEM), from where they are widely distributed internally and externally, in accordance with the procedures in force, as already described in previous national reports by the Convention.

19.6.5. Policy for use of the INES scale

The CSN has a procedure for the classification of events using the INES scale, which takes the INES scale User Manual as a reference. The head of the CSN's Operational Experience area acts as the National Coordinator of the INES Scale, whose functions include notifying the IAEA's INES Scale Secretariat of any event classified above level 1.

Events at nuclear facilities whose provisional classification may be greater than 0 trigger an interaction with the licensee of the facility to verify the data. If level 1 is confirmed, it is simultaneously reported to the Board of Commissioners of the CSN, to the authorities and to the public. If the classification is level 2 or higher, the General Secretariat summons the members of the Board of Commissioners of the CSN to confirm the classification and, if so, to announce the event to the public.

19.6.6. Regulatory review and control activities

Reportable events are reported to the CSN through the issuing of ISNs, in accordance with IS-10. In addition, the CSN resident inspectors review these ISNs to verify their suitability and provide additional information that they transmit in a preliminary assessment distributed internally within the CSN.

The ISNs are analysed at monthly meetings of the CSN's Incident Review Panel (IRP), made up of representatives from different areas specialising in nuclear safety and radiation protection. In addition to reviewing the information submitted, analysing the proposed corrective actions and determining whether additional actions are necessary, the event is classified by its significance for safety as *significant, of interest* or not *relevant*. Significant events are monitored by the specialist areas, as well as by biennial operational experience inspections within the PBI.

Among the most relevant actions of the CSN are the decisions relating to events considered generic due to their potential impact on other plants, whose applicability analysis may be required of the licensees and subject to the supervision of the CSN in order to establish the corresponding actions.

19.7. Operational experience feedback

19.7.1. Arrangements and regulatory requirements for licence holders to collect, analyse and share operating experience

The CSN analyses the operating experience through the dual approach of supervising the licensees' processes for the analysis of events and, on the other hand, through the analysis and tracking of the ISNs of Spanish and foreign plants, all in accordance with CSN Instruction IS-26, which imposes requirements on in-house and external operating experience. In addition, Operating Licences establishes a generic condition applicable to the treatment of operational experience, developed through an ITC on the contents of the report on in-house and external operating experience, which the licensees of the nuclear power plants are required to submit annually to the CSN.

The tools available to the CSN for event tracking and analysis are the National and International Incident Review Panels (PRI and PRIN, respectively), the use of international databases and participation in forums for the exchange of operating experience, with a view to identifying events that might affect Spanish nuclear power plants and analysing the possible application of measures preventing their repetition.

19.7.2. Programmes of licence holders for the feedback of information on operating experience from their own nuclear installation, from other domestic installations and from installations abroad

As has been indicated, the CSN requires each plant, by means of an ITC associated with the Operating Licence, to submit an annual report on operating experience, in addition to specifying that which must be analysed, as indicated below.

- ISN of Spanish nuclear power plants.
- Experiences communicated by the bodies with competency in the matter, that is:
  a) For Westinghouse design plants, the significant events (*INPO Event Report, IER*) issued by WANO in the *Significant Event Report,* SER, or SOER...
  b) For German-designed plants, the operational experience (*Weiterleitungsnachricht*) reported by the German Technical Support Organisation (GRS).
- Recommendations from suppliers contained in technical bulletins (SAL, SR, RICS-IL, *Technical Bulletin,* etc.), reports of deficiencies in safety equipment; in addition to USNRC notifications under 10 CFR 21 and KWU service and operational experience reports
- Analysis of operating experience expressly required by the CSN.

In addition, the external operating experience programmes of Spanish nuclear power plants contemplate the analysis of any other document of specific interest for each plant. All the information relating to these analyses is included in the annual report required in the ITC of the Operating Licence, which is used by the CSN to define the planning of inspections and other follow-up actions.

Spanish plants share information through the Nuclear Forum's CEN Operating Experience Group, which also allows for the unification of resources for the analysis of events.

Spanish nuclear power plants are also integrated into the network for the exchange of operational experience of the world nuclear sector, WANO, which reports significant events from which lessons may be learned and applied to all nuclear power plants.

19.7.3. Procedures for analysing national and international events

For years, Spanish nuclear power plants have had national and international event analysis processes aimed at integrating the lessons learned into the practices of each plant. These processes have been repeatedly evaluated by industry reference bodies such as WANO, INPO and IAEA, and all cases have been determined to meet industry requirements and standards. All the plants have relevant bodies that can be incorporated into committees that review the results of analysis of the most significant events.

Our own operational experience is analysed using internationally accepted methodologies (HPES, MORT, etc.) that are appropriate for the type of event and contributing factors. Likewise, the methods used are those agreed between the Spanish nuclear power plants, such as the common cause analyses developed in the CEN Operating Experience Group of the Nuclear Forum. As regards external events, those with the greatest relevance for safety, included in documents of the SOER (WANO) or IER Level 1 (INPO) type, are analysed through the Nuclear Forum's CEN Operating Experience Sectoral Group.

19.7.4. Procedures for drawing conclusions and for implementing any necessary modifications to the facility and to personnel training programmes and simulators.

All plants have procedures or methodological guides for analysing operational experience, including criteria for carrying out root cause analysis, with HPES being the preferred methodology used. In addition to studying each incident individually, trend analyses are carried out to detect latent weaknesses and areas for improvement in organisations.

A fundamental tool for the processing of operational experience is the CAP, which allows the actions identified to be categorised and prioritised, and it is common for these to include modifications to designs, procedures, training actions, etc. This information is used by the training units of the plants for the preparation of the annual training programme, making it possible to design teaching and simulator training sessions in order to optimise knowledge of this experience.

CSN Instructions IS-11, on nuclear power plant operating licenses, and IS-12, on the qualification and training of unlicensed personnel, both in-house and off-site, require training programmes to include the relevant in-house and external operating experience applicable to the plant.

19.7.5. Mechanisms for exchanging important experience with other operators

The CSN (as indicated in section 19.7.8) and the CEN of the Nuclear Forum, representing the Spanish nuclear power plants, participates in the NEA *Working Group on Operating Experience (WGOE)*, a group of experts of which is great interest to regulators regarding knowledge applied to the improvement of plant operating management, including the determination of new inspection practices.

The nuclear power plants have a permanent working group on operating experience within the framework of the CEN of the Nuclear Forum, comprising those persons who coordinate operating experience from Spanish plants, at the quarterly meetings of which they share knowledge concerning events and management of operating experience. In the 2016-2018 period, the following activities should be highlighted:

- Activation of the GSAI (*Grupo Sectorial de Análisis de Incidentes,* Incident Analysis Sectoral Group), a group of experts whose operation is described in the CEN-29 guide, which carries out root cause analysis of incidents...
- Revision 1 of CEN-31 Guide *Establishment of criteria for the exchange of information from operating experience between Spanish nuclear power plants,* October 2018, the aim of which is operating excellence through improvements in the analysis and application of the results of operating experience.

- Preparation by the Operating Experience Group of ICEO Joint Operating Experience Report reports, similar to the INPO/WANO IER/SOER documents, edited annually by the sector, with the publication in 2016 of "Evaluation of the effectiveness of the actions derived from Operating Experience analysis"; and in 2017 of "Events related to permanent design modifications" and in 2018: "Preventive actions to reduce accident rates".
- Exchange of international operational experience
  - — Regular referral of events to WANO for publication as SER, *Event Notification Reports (ENR), Event Analysis Reports (EAR) or Miscellaneous Event Reports (MER)*.
  - — Participation in international seminars.
  - — Dispatch of experts on WANO (Peer Review) or IAEA OSART missions.
  - — Reception of WANO (and IAEA; OSART and SALTO) review missions at the Spanish plants.
- Meetings of the Operational Experience Group to address the January 2018 update of the event reporting criteria included in the WANO document MN-01 *Operating experience sub-programme.*

19.7.6. Use of international databases on operational experience

The two databases relating to international operating experience most used by the CSN for analysis in the PRIN are:

- Incident Reporting System (IRS), dependent on the IAEA and the NEA.
- Nuclear Event Web-Based System (NEWS), dependent on the IAEA.

The CSN has appointed a national IRS coordinator in charge of drawing up reports on events in Spain of potential relevance to other countries. These reports are subject to a formal process that includes review, both internally at the CSN and at the IAEA.

In the reporting period, the national coordinator facilitated access to the IRS base for staff in the operational experience areas of the plants, which already have access to NEWS, in order to improve activity related to operational experience and information exchange.

19.7.7. Examination and regulatory control activities regarding the licensee's programmes and procedures

The CSN carries out biennial inspections of operating experience within the PBI, the scope of which includes processing by plants of internal and external operating experience, including international experience, at the Spanish nuclear power plants. These inspections cover the organisational and resource aspects, the procedures and process of analysis and the implementation of their results.

Furthermore, the annual operating experience reports submitted to the CSN by each facility undergo preliminary evaluation in order to select a relevant sample of events that are analysed in greater detail.

19.7.8. Regulatory agency programme relating to exchange of information on operational experience and use of existing mechanisms to exchange important experience with international organisations and other regulatory agencies

The choice of tools for the analysis and dissemination of information on the operating experience available to the CSN is determined by monthly PRI meetings, quarterly PRIN meetings, the Generic Topics database, international databases and participation in working groups.

As has been indicated above, the PRI is a working group made up of specialists in nuclear safety and radiation protection who meet on a monthly basis to analyse relevant events at Spanish nuclear facilities and the fuel cycle, in addition to classifying the event, depending on its importance for safety, as significant, of interest or not relevant and typifying it as generic if it might affect other Spanish plants,

in which case it might require the adoption of actions by the licensees affected and they will be incorporated into the internal database for tracking purposes.

The PRIN functions similarly to the PRI, which is made up of the same areas and meets every four months to analyse international operating experience, determine its applicability to Spanish nuclear power plants and propose specific actions in relation to such events.

The CSN supplements the IRS database with information on those events at Spanish nuclear power plants that are most significant as regards safety. Furthermore, the CSN, through the heads of the organisational unit, attends the annual meetings between the coordinators of the different countries and also participates in the annual operational experience meeting jointly organised by the IAEA and the NEA on events reported to the IRS. Similarly, the INES coordinators meet biennially to present the most relevant events of the NEWS database and to unify classification criteria...

In addition, the CSN participates in the biannual meetings of the NEA WGOE, the objectives of which include incorporating the lessons learned from operating experience into regulations, and sharing information on improvements in plant operation. The WGOE organises workshops every two or three years on topics of special interest to regulators in member countries. In 2017 the CSN headquarters in Madrid hosted the workshop “International Operating experience workshop on Best Practices with regulatory operating experience databases” organised by this organisation.

Finally, it should be noted that the CSN is part of the Clearinghouse, a group that supports the EU regulatory bodies in the analysis of operational experience.

19.8. Management of spent fuel and radioactive waste at the site

19.8.1. Provisions and regulatory requirements for the on-site handling of spent fuel and radioactive waste

In accordance with Article 20 of the RINR, all Spanish nuclear facilities are required to have a PGRRCG (*plan de gestión de residuos radiactivos y de combustible gastado*, radioactive waste and spent fuel management plan), the preparation of which must meet the criteria of Safety Guide GS 9.3, compliance with which is required under the CSN's Technical Instruction.

The licensee must keep the waste inventory up-to-date, minimise production of waste as far as is technically and economically possible, and prepare waste materials for final disposal by an appropriate management process. The PGR is the reference document for safe and optimised management of the radioactive wastes generated at nuclear facilities during the operating, dismantling and decommissioning phases, as it contains information on management of radioactive wastes, including potentially de-classifiable radioactive waste materials, special wastes and spent fuel. CSN Instruction IS-31 establishes the criteria for radiological monitoring of the waste materials generated at nuclear facilities.

Furthermore, CSN instruction IS-29 establishes the safety criteria applicable to the design, manufacturing, construction and operating tests of spent fuel and high level waste storage facilities, and IS-20 establishes the safety requirements for the design of spent fuel casks and defines the content of the Safety Analysis Report. Both instructions are consistent with the international standards of the IAEA, the origin countries of the technology and the WENRA reference levels for storage.

Finally, the Spanish Royal Decree of 2014 concerning the responsible and safe management of spent nuclear fuel and radioactive waste transposes Directive 2011/70 Euratom, which establishes a Community framework for the responsible and safe management of spent nuclear fuel and radioactive waste.

19.8.2. On-site spent fuel storage

The spent fuel of the Spanish nuclear power plants is initially stored in the pools of the fuel buildings incorporated in the design of each facility. The capacity of the pools has been extended in recent years through design modifications such as the replacement of the original racks by more compact racks (re-racking), the compaction of the wastes stored and the optimisation of storage (boraflex).

However, the foreseeable future saturation of the pools has implied the construction of ATIs (*almacenes temporales individualizados,* individualised temporary storage facilities) at the sites themselves for the storage of spent fuel in dry casks. NPP Trillo has been operating an ATI since 2002 and in 2009 NPP José Cabrera completed the transfer of all its fuel to an ATI to begin dismantling. Ascó NPP's ATI began loading containers in 2013 and Almaraz NPP's in 2018. CNSMG has an ATI which was authorised in 2018 and is not currently housing any containers. Finally, in 2018 NPP Cofrentes requested authorisation to construct and assemble an ATI on its site.

The casks of the Trillo, Almaraz and CNSMG nuclear power plants, and those expected for Cofrentes, are dual-purpose casks for the storage and transport of spent fuel, while the José Cabrera and Ascó casks are multi-purpose metal capsule storage systems located in concrete modules, with a module for the transport of capsules containing spent fuel.

In accordance with the current legislation, the licensing of the ATI involved the approval of the design of the storage system and of the bulk (B) transport cask, as well as the authorisation for the construction, performance and commissioning of the storage facility at the plant site, this being a process that requires a corresponding environmental impact assessment, in accordance with the environmental regulations transposed by the European Directives in this respect.

Detailed information on spent fuel management can be found in the sixth national report of the Joint Convention, of October 2017, available on the institutional websites of the IAEA, MITECO and the CSN.

19.8.3. Treatment, conditioning and storage of radioactive waste at the site

The low and intermediate level wastes produced at nuclear power plants are either chemical wastes or other materials from the plant production process (evaporator concentrates, ion exchange resins, filter sludge, etc.) or technological wastes, consisting mainly of laboratory material, equipment maintenance, gloves or clothing. The packages generated after conditioning correspond to solidified wastes (resins, concentrates, sludges), compactable and non-compactable solid wastes and immobilised wastes (filters) submitted to the ENRESA acceptance process, the acceptance criteria being applicable at the El Cabril final disposal facility.

At the end of 2018, 7,177.39 m3 of radioactive wastes had been conditioned in the temporary storage facilities of the nuclear power plants, with the occupancy of the capacity varying considerably from one site to another.

19.8.4. Activities to keep the quantities of waste generated to the minimum practicable for the process in question in terms of volume and activity

In the mid-nineties the Spanish nuclear power plants and ENRESA implemented the Volume Reduction Action Plan to reduce the generation of low and intermediate level wastes, complemented by the development of new proposals to optimise radioactive waste management. The ENRESA framework agreement between nuclear power plants and owner companies was updated in 2007 to adapt it to the El Cabril acceptance criteria, and in 2009 for the inclusion of very low level radioactive wastes. Following the publication of Spanish Royal Decree 102/2014, ENRESA has worked on updating the volume reduction plan.

In 2017, the Joint sector-ENRESA Group on the management of low and intermediate level radioactive wastes identified the smelting of metallic scrap as an alternative way of reducing the volume of wastes to be disposed of at El Cabril, representing a saving for the Fund for the Financing of Activities of the General Radioactive Waste Plan. This has been the management route used for CNSMG operational waste.

19.8.5. Procedures established for the declassification of radioactive materials

Under Spanish regulations, declassification is an administrative authorisation allowing certain waste materials generated at nuclear facilities to be conventionally managed without the need for subsequent safety and radiation protection regulatory controls.

The CSN has approved procedures common to all the nuclear power plants, with criteria for the declassification of waste streams, such as metal scrap, activated carbon, ion exchange resins, used oils and wood. This is a process that requires constant updating in order to adapt it to operational needs, and that requires authorisation in the event that the PGRR itself is affected. During the period covered by the report, a facility has been authorised to include in this plan a new low and intermediate level waste stream corresponding to the liquids generated during the chemical cleaning of steam generators.

In November 2017 the competent Ministry published Order ETU/1185, regulating the declassification of waste materials generated at nuclear facilities, linked to Instruction IS-31 of the Nuclear Safety Council, on the criteria for the radiological control of the waste materials generated at nuclear facilities. The Order takes into account Directive 2013/59 Euratom, which establishes the basic safety standards for protection against the dangers arising from exposure to ionising radiation, including in its scope the declassification of waste materials, as well as the radiological criteria applicable to the authorisation process for the conventional management of these materials in their disposal, recycling or reuse.

19.8.6. Regulatory review and control activities

The nuclear power plant PGRs comply with CSN safety guide GS 9.3. In addition, a set of regulatory review and control activities is defined, aimed at improving the management of radioactive wastes and spent fuel at the Spanish nuclear power plants.

The activities for the supervision and control of the management of low and intermediate level radioactive wastes at nuclear power plants that are operational or undoing dismantling are carried out through SISC inspections, for which purpose two specific inspections are planned in the PBI regarding the clearance of radioactive waste materials and the management of low and intermediate level wastes.

The process, examined and inspected by the CSN, is based on the establishment of 3 radiological control barriers, the exit from the waste generation and treatment areas, the exit from the nuclear facility and, on many occasions, also the entry from the conventional waste management facilities.

19.9. Vienna Declaration

Within the scope of the Vienna Declaration, this Article clearly identifies related aspects, such as the development and maintenance of SOPs and SAMG (Article 19.4), revised and reinforced in the case of Spanish nuclear power plants as a result of resistance tests and analysis of situations of loss of large areas, with the incorporation of the GMDE and the implementation of design modifications to strengthen the instrumentation required in severe accident conditions, or the implementation of redundant or different SSCs to address situations beyond the design basis, including severe accidents.

In this respect, the regulatory framework has been reinforced with Nuclear Safety Council Instruction CSNIS-36, on EOP and SAMG, which incorporated an important part of the WENRA reference levels of issue F (relating to the extension of design in existing nuclear power plants), revised after Fukushima.

Another very relevant aspect in relation to the Vienna Declaration dealt with in this Article is the treatment of operating experience (19.7), processes that are widely implemented in Spanish nuclear power plants and subject to regulatory control by the CSN, with a broad international projection, both on the part of the licensees, who in addition to participating in numerous fora are periodically subjected to peer-review exercises through their participation in organisations such as WANO, and by the regulator. All of this is done with the aim of identifying potential problems and identifying and implementing, as far as is reasonably feasible, the best national and international practices.

All of this is based on a high level of technical training in engineering and technical support services, as discussed in section 19.5. The proper design, assembly, commissioning and subsequent maintenance of the design modifications implemented at the nuclear power plants requires the best possible engineering and technical services to be carried out adequately at all times.

APPENDIX 19.A

Generic technical judgement on the renewal of the operating permit

SUBJECT: FAVOURABLE REPORT ON THE RENEWAL OF THE OPERATING PERMIT FOR THE NUCLEAR POWER PLANT OF

Dated ----------and originating from the Ministry of Industry, Energy and Tourism, a request was received by the CSN for a ten-year renewal of the operating permit of the NPP ---------- (Input registry n° ----------), as referred to in Chapter IV of the Regulation on the Nuclear and Radioactive Facilities, submitted by the licensee in compliance with provision 2 of the Ministerial Order dated ---------- by which the NPP was granted its current Operating Licence. The request is accompanied by the Plant Periodic Safety Review (PSR), current reviews of the Official Operating Documents and an updated review of the Probabilistic Safety Assessment studies.

The CSN has continuously monitored and supervised the operation of the aforementioned plant during the period of validity of the current permit, and compliance with the applicable nuclear safety and radiation protection conditions and the Periodic Safety Review has been evaluated.

At its meeting on the ---------- , the CSN agreed to issue the licensee with a Complementary Technical Instruction (ref. .....) which required analysis of new legislation which had not been included until that point in the plant's licensing bases. The CSN considered that analysis of these standards could lead to significant modernisation and improvement of the safety conditions of the facility. The incumbent submitted the required analyses attached to the letters below, together with the resulting improvement plans:

— List of documents sent by the owner, the content of which, as mentioned in this document, is incorporated into the Licence Base of the plant.

In compliance with these plans, the licensee has already carried out improvements at the plant, which should be completed along with those established in the attached Conditions.

Likewise, following the accident at the Fukushima plant [paragraph incorporated into the last renewal report], the CSN has issued all licensees of Spanish plants with complementary Technical Instructions for them to perform the agreed resistance tests within the framework of the European Union and for them to establish measures to deal with events beyond the design bases involving the loss of large areas of the plant. The ---------- NPP, like all the other plants, will have to carry out the required analyses and implement the necessary measures to reinforce security in extreme situations.

The Nuclear Safety Council shall review the analyses and proposals of the licensees of the nuclear power plants and may issue new requirements if considered necessary.

The Nuclear Safety Council, at its meeting held on this date, has considered the request from the licensee of the ___ nuclear power plant, as well as the reports carried out by the Technical Directorate for Nuclear Safety as a result of the assessments performed, and has agreed to issue a favourable judgement as regards the renewal of the operating permit for a period of ten years, provided that the operation conforms to the limits and conditions included in the Appendix. This agreement has been taken in compliance with Article 2(b)° of Spanish Law 15/1980, establishing the Nuclear Safety Council, and is submitted to that Ministry for appropriate purposes.

Madrid (Spain), dated: THE PRESIDENT

APPENDIX 19.B

Generic limits and conditions associated with the renewal of the operating permit

LIMITS AND CONDITIONS ON NUCLEAR SAFETY AND RADIATION PROTECTION ASSOCIATED WITH THE OPERATING PERMIT FOR THE NUCLEAR POWER PLANT ____

1. For the purposes provided for in current legislation, the companies are considered to be the holders of the Licence and the operators responsible for it, and shall be jointly and severally liable.
2. This operating permit shall empower the holder to:

2.1. Possess and store slightly enriched uranium fuel assemblies, in accordance with the limits and technical conditions contained in the Refuelling Safety Study for each cycle and with the limits and conditions associated with the specific Authorisations for the storage of fresh and irradiated fuel.

2.2. Operate the plant up to the total rated thermal power of the MWt core.

2.3. Possess, store and use the radioactive materials, nuclear substances and radiation sources necessary for the operation of the facility.

3. Authorisation is granted on the basis of the following documents:

a) Security Study, Rev.
b) Operating Regulations, Rev.
c) Operating Technical Specifications, Rev
d) Internal Emergency Plan, Rev.
e) Quality Assurance Manual, Rev.
f) Radiation Protection Manual, Rev
g) Radioactive Waste and Spent Fuel Management Plan, Rev.

The operation of the plant will be carried out in accordance with the previous documents, in the current revision, following the updating process indicated below.

3.1. Subsequent modifications or changes to the Operating Technical Specifications and the Site Emergency Plan must be approved by the Directorate-General of Energy Policy and Mining, following a report by the Nuclear Safety Council, prior to their entry into force.

The Nuclear Safety Council may temporarily exempt compliance with any section of the documents mentioned in the previous paragraph, informing the Directorate-General of
Energy Policy and Mining of the beginning and end of the exemption period.

3.2. Six months after start-up, following each refuelling outage, the licensee shall carry out a review of the Safety Analysis Report incorporating any modifications included in the plant from the beginning of the previous cycle to the end of the refuelling outage that have not required authorisation in accordance with the provisions of Nuclear Safety Council Instruction IS-21 and the new safety analyses performed. This new revision will be sent, in the month following its entry into force, to the Directorate-General of Energy Policy and Mining and to the Nuclear Safety Council.

The revisions of the Safety Analysis corresponding to modifications requiring authorisation from the Directorate-General of Energy Policy and Mining, in accordance with Nuclear Safety Council Instruction IS-21, shall be authorised simultaneously with the modifications.

3.3. Modifications to the Operating Regulation may be carried out under the responsibility of the licensee, provided that they do not imply a reduction of the requirements included in the revision in force in relation to the nuclear safety and radiation protection functions and responsibilities assigned to the plant operating organisation, the personnel training and retraining programmes or the reports, books or records foreseen therein, in which case they must be approved by the Directorate-General of Energy Policy and Mining, following a report from the Nuclear Safety Council, prior to their entry into force.

Revisions to the Operating Regulations shall be submitted to the Directorate-General of Energy Policy and Mining and to the Nuclear Safety Council within one month of their entry into force.

3.4. Changes to the Quality Assurance Manual may be carried out under the responsibility of the owner, provided that the change does not reduce the commitments contained in the current quality assurance programme. Changes that reduce commitments must be favourably assessed by the Nuclear Safety Council prior to their entry into force.

Commitments are understood to be those included in the Quality Assurance Manual in force in the form of applicable standards and guides, as well as the description of the programme reflected in the contents of the Manual, as specified in the complementary technical instructions issued in this respect by the Nuclear Safety Council.

Revisions to the Quality Assurance Manual shall be submitted to the Directorate-General of Energy Policy and Mining and to the Nuclear Safety Council within one month of their entry into force.

3.5. Modifications to the Radiation Protection Manual may be carried out under the responsibility of the licensee, except in those cases affecting basic radiation protection standards or criteria, as specified in the complementary technical instructions issued in this respect by the Nuclear Safety Council. In these cases, a favourable assessment from the Nuclear Safety Council will be required prior to their entry into force.

Revisions to the Radiation Protection Manual shall be submitted to the Directorate-General of Energy Policy and Mining and to the Nuclear Safety Council within one month of their entry into force.

3.6. Modifications to the Radioactive Waste and Spent Fuel Management Plan may be carried out under the responsibility of the licensee, except in those cases indicated in the complementary technical instructions of the Nuclear Safety Council. In these cases, a favourable assessment from the Nuclear Safety Council will be required prior to their entry into force.

Revisions to the Radioactive Waste and Spent Fuel Management Plan shall be submitted to the Directorate-General of Energy Policy and Mining and to the Nuclear Safety Council within one month of their entry into force.

4. During the first quarter of each calendar year, the licensee shall report to the Directorate-General of Energy Policy and Mining and to the Nuclear Safety Council reports concerning the following aspects, within the scope and content specified in the complementary technical instructions issued in this respect by the Nuclear Safety Council.

4.1. Internal and external operating experience applicable to the facility, describing the actions taken to improve the performance of the facility or to prevent similar events.

4.2. Measures taken to adapt plant operation to the new national requirements on nuclear safety and radiation protection and to the standards of the origin country of the project. In the latter case, an analysis of the applicability to the plant of the new requirements issued by the regulatory body of the origin country of the project to plants of a similar design will be included.

4.3. Results of the environmental radiological surveillance programme. The information included will be that described in the corresponding section of chapter 6 "Administrative Rules" of the Operating Technical Specifications.

4.4. Results of the dosimetry checks on the operating personnel, including an analysis of any trends in individual and collective doses received by the personnel during the previous year.

4.5. Activities under the Radioactive Waste and Spent Fuel Management Plan, which includes activities relating to waste materials that may be managed as conventional waste, very low level waste, low and intermediate level waste and high level waste, as well as irradiated fuel.

4.6. Activities of the training programme for all plant personnel whose work may have an impact on nuclear safety or radiation protection.

5. The Directorate-General of Energy Policy and Mining and the Nuclear Safety Council shall be notified of the departure of any packages of radioactive wastes or fissile materials from the plant site at least seven days prior to the date of departure. The departure of other radioactive packages shall be reported within 24 hours of the transport decision, and in any case prior to the transport. Any departure of radioactive packages from the plant site shall be subject to the system of authorisations established by the current standards.

   When the licensee is responsible for the transport of fissionable material to or from the plant, and no authorisation for dispatch is required in accordance with the current regulations on the transport of dangerous goods, the Directorate-General of Energy Policy and Mining and the Nuclear Safety Council shall also be notified of the planned transport three months prior to the scheduled date.

6. At least three years prior to the expiry of this operating permit, the holder may apply to the Ministry of Industry, Energy and Tourism for a new permit for a period not exceeding ten years. The application shall be accompanied by: (a) the latest revisions of the documents referred to in condition 3; (b) a Periodic Safety Review of the plant, the content of which shall be in accordance with CSN Safety Guide 1.10 "Periodic safety reviews of nuclear power plants", revision 1, (c) a revision of the probabilistic safety study; (d) an analysis of the ageing experienced by the plant's safety components, systems and structures and (e) an analysis of the accumulated operating experience during the validity period of the permit to be renewed.

   Should such a request be submitted, the licensee shall submit updated versions of the aforementioned documents to the Nuclear Safety Council at least one year prior to the expiry of the current operating permit.

7. If, during the validity period of this permit, the licensee decides to cease operation of the plant, that party shall notify the Directorate-General of Energy Policy and Mining and the Nuclear Safety Council at least one year prior to the planned date, unless the cessation is due to unforeseen causes or to a resolution of the Ministry of Industry, Energy and Tourism. The licensee must substantiate the nuclear safety and radiological protection conditions of the facility to which the operations to be carried out in the installation must be adjusted, from the cessation of the operation until the granting of the dismantling authorisation, as specified in the Supplementary Technical Instructions that the Nuclear Safety Council issue in this regard.

8. During the period of validity of this Authorisation, the licensee shall implement the Plant Safety Improvement Programmes identified in the Periodic Safety Review performed in support of the request for this Authorisation, modified, where appropriate, with the Complementary Technical Instructions issued in this respect by the CSN.

Likewise, the licensee shall carry out the proposals for action contained in the documentation submitted in support of the request for renewal of the Operating Permit relating to the Periodic Safety Review and the Conditional Application Standards, within the established deadlines, as well as the actions communicated to the licensee at the conclusion of the evaluation thereof carried out by the CSN.

IV. Conclusions

Spain satisfactorily fulfils the obligations of the Convention on Nuclear Safety, as may be seen from the information provided in each of the articles of this eighth national report.

This chapter of conclusions highlights, first of all, the main regulatory developments and commitments completed by Spain in the period from January 2016 to December 2018. It also mentions the main challenges for the future in the nuclear regulatory sphere, with a view to emphasising the most notable aspects of the period, giving a global view of our efforts in favour of safety and responding to the self-assessment objective implied by this report. Finally, a section is included in which the licensees of the Spanish nuclear power plants highlight the most relevant aspects during the period covered by the national report.

In accordance with the obligations deriving from the Diplomatic Conference held in 2015, this report includes information on how Spain applies the safety principles included in the Vienna Declaration on Nuclear Safety. This information may be found in the contents of different articles of the report, following the indications established by the Presidency of the eighth review meeting of the Convention on Nuclear Safety by means of a letter sent to the Contracting Parties.

Development of the regulatory framework

During the period covered by this report, the following legal instruments affecting nuclear safety have been approved and published:

- The Organic Law on the Protection of Personal Data and the Guarantee of Digital Rights.
- The Act amending the Environmental Assessment Act, the Act amending the Forestry Act and the Act regulating the greenhouse gas emission allowance trading scheme.
- The Spanish Royal Decree-Law on the security of networks and information systems
- The Spanish Royal Decree approving the Regulation on nuclear safety in nuclear facilities.
- In addition, the following CSN instructions have been published in the area of nuclear safety, and are listed in Section 7.2.2 of this report:

    - IS-15, Revision 1, on requirements for the surveillance of the effectiveness of maintenance at nuclear power plants
    - IS-41, approving the requirements for the physical protection of radioactive sources

- IS-42, on the criteria for reporting events to the CSN during the transport of radioactive material
- IS-30, Revision 2, on fire-protection programme requirements in nuclear power plants
- IS-27, Revision 1, on general design criteria for nuclear power plants
- IS-22, Revision 1, on safety requirements for the management of ageing and the long-term operation of nuclear power plants

Meeting the challenges identified at the seventh review meeting of the Convention on Nuclear Safety

During the seventh review meeting of the Convention on Nuclear Safety, Spain included, as challenges identified by the other contracting parties, the need to report in this eighth report on the actions carried out by the Regulatory Body in relation to this issue:

Effectively and efficiently organise a combined IRRS-ARTEMIS mission

In 2016, Spain requested that the International Atomic Energy Agency (IAEA) carry out a combined IRRS-ARTEMIS mission in order to comply with the obligations arising from the Directives published at European Community level and referred to as Directive 2014/87/Euratom and Directive 2011/70/Euratom. Spain had already received a full-scale IRRS mission in 2008 and its corresponding follow-up mission in 2011.

The combined IRRS-ARTEMIS mission was carried out from 14 to 26 October 2018, being the first mission of its kind carried out by the IAEA. The mission was conducted by a review team composed of 24 experts from 16 IAEA Member States, supported by a team of 8 IAEA staff. The mission was also attended by 4 observers from the European Commission, Germany (2) and Bangladesh.

The mission was carried out in accordance with the procedures established in the guidelines published by the IAEA for the execution of these types of missions, through the review of host country documentation, interviews with host country counterparts in the various modules covered by these missions and the observation of inspections at facilities such as: nuclear power plants in operation, nuclear power plants undergoing dismantling, medical facilities, industrial radioactive facilities and nuclear fuel factories. The details of the results can be found in section 8.1.2. i) of this report. The report may be found published on the CSN institutional website at the following address https://www.csn.es/en/misiones-internacionales.

Updating legislation in emergencies and radiation protection

During this period, the transposition into Spanish law of Council Directive 2014/87/Euratom of 8 July 2014, amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear facilities, was completed. The transposition of this Directive was completed with the approval and publication of Spanish Royal Decree 1400/2018, of 23 November, approving the Regulation on nuclear safety at nuclear facilities.

Progress also continued in the period from January 2016 to December 2018 towards the transposition of Directive 2013/59/Euratom of 5 December 2013, which lays down basic safety standards for protection against the dangers arising from exposure to ionising radiation and repeals Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

The Regulation on nuclear safety at nuclear facilities also complies with Directive 2014/27/Euratom, which establishes the need for emergency plans to deal with accidents at the site and their coordination with external plans.

As a result of the self-assessment performed by the CSN prior to the IAEA's IRRS mission carried out in October 2018, a CSN instruction on emergency management is being drawn up in order to create a single document including all the requirements relating to emergency preparedness that have been requested from the licensees by means of other regulatory instruments. It is expected that this instruction can be published throughout 2019.

Implement and improve the Knowledge Management Plan within the regulatory body

The CSN is currently continuing to develop a knowledge management model specifically adapted to its needs, based on the IAEA recommendations, which will be fully incorporated into its Management System and which will employ the characteristic elements of knowledge management already available to it.

The knowledge management process for the CSN should address the four basic pillars of the model recommended by the IAEA. It is structured as a transverse process of a cyclical nature, the stages of which are:

- Identification of the capabilities required by the CSN to carry out its mission
- Periodic assessment of the resources available at the CSN
- Constant ongoing assessment of the gaps, deficiencies and losses of information, documentation and knowledge of the CSN
- A programme for the preservation of critical knowledge and continuous improvement of skills
- Internal communication plan to ensure dissemination and accessibility of knowledge and information
- Independent evaluation programme and periodic review of the process

During the 2016-2018 period, activities focused on the programme for the preservation of critical knowledge and the continuous improvement of capabilities, and an action plan was developed on this subject, focusing on the preservation/recovery of the knowledge and experience of the CSN technicians born prior to 1952.

The methodology used in this 2016 action plan comprises the following phases:

- Preparation Phase: Identification of critical knowledge holders
- Knowledge Extraction and Systematisation Phase
- Exploitation Phase: Deployment of an agenda for the use of systematised knowledge

In 2017 the document "CSN Knowledge Management Model. Proposal for 2017-2020 Actions", approved by the Board of Commissioners of the CSN in 2018, was prepared. The Board of Commissioners Meeting of the CSN also agreed "To ensure that the responsibility for the development and implementation of the CSN Knowledge Management Model falls to the Research and Knowledge Management Unit"

In 2018, the knowledge management methodology was consolidated, using a specific computer application, with the support of an external organisation specialising in this area.

More information can be found in section 8.1.2. c).

Develop a Safety Culture programme within the regulatory body

In 2017 the Board of Commissioners Meeting of the CSN approved the document entitled “CSN Policy on Safety Culture”, which defines the safety culture at the CSN as the set of characteristics and attitudes shared by all the staff that ensures that compliance with the mission of this organisation is the highest priority and is always present in all its activities.

For the preparation of this document, a working group was set up that took into account the different approaches used by international regulatory bodies in the practical implementation of this concept, as well as the publications of international organisations on this subject, as reference material.

Likewise, the aforementioned CSN working group drew up a proposal for an action plan for the promotion and reinforcement of safety culture within the organisation. The plan includes a self-assessment of the safety culture in the CSN.

In 2018, and in accordance with the Board of Commissioners agreements on the action plan, the CSN initiated the preliminary activities required for the self-assessment of the safety culture in the organisation. Likewise, training activities were planned and carried out in 2019, aimed at all levels of staff, in order to explain and disseminate the meaning and attributes of the concept of safety culture as it applies to the regulatory body. The start of the safety culture self-assessment process is planned for 2019.

More information can be found in section 8.2.1.

Future Challenges for the Spanish Regulatory Body

Since its creation in 1980, the CSN has performed its functions in accordance with the provisions of its Establishing Act in order to protect workers, the population and the environment from the harmful effects of ionising radiation, ensuring that nuclear and radioactive facilities are operated safely by the licensees and establishing the necessary emergency prevention and mitigation measures, whatever their origin.

Likewise, it has prioritised its international presence in all fora relevant to the field of nuclear safety and radiation protection, actively collaborating in aspects of technical cooperation and providing assistance to other regulatory bodies.

In particular, the following issues have been identified as a priority for the immediate future:

- **Challenge 1. Implement the Action Plan of the IRRS part of the combined IRRS-ARTEMIS mission in a timely manner.**

  As a result of the combined IRRS-ARTEMIS mission carried out regarding the Spanish regulatory system, the review team identified several findings, including recommendations and suggestions not previously identified during the self-assessment process carried out by the CSN, as established in the IAEA guidelines for the performance of these types of missions. Subsequent to the reception of the mission, the Initial Action Plan was completed with the results of the mission and, once approved by the Board of Commissioners of the CSN, implementation and systematic follow-up began, with this being the main post-IRRS activity before receiving the corresponding follow up mission. It is considered a challenge because of the effort that will be necessary to carry it out, which must be combined with the activities of routine licensing, supervision and control.

- **Challenge 2. To plan and execute efficient licensing processes, adequately managing the human and technical resources required to carry out periodic safety reviews and licence renewals.**

  Based on the decision to continue operation of the nuclear power plants described in point 6.4 and the coincidence in time of these requests, the Nuclear Safety Council faces the challenge of carrying out - in a very short period of time - various licensing processes associated with the periodic safety reviews and revisions for renewal of the nuclear power plant operating licenses, in accordance with a novel methodology described in point 6.4, taking into account the long-term

operating periods of the Spanish nuclear power plants. These processes require a significant amount of human and technical resources, meaning that the resources currently available to the regulatory body must be properly managed so that the assessments can be carried out efficiently according to the highest safety standards.

- **Challenge 3. To retain, maintain and improve technical knowledge and professional resources, both at the CSN and within the licensees' organisations, by means of a systematic analysis of requirements for competencies and skills. To improve the management of human resources at the CSN, adapting the personnel to the needs of each unit, both in the short and long term**

  The CSN uses technical personnel who are highly qualified, so that they can perform their assigned functions with full safeguards in place. However, in line with what was identified by the combined IRRS-ARTEMIS mission review team, the regulatory body has a mature staff, with an average age of 53 years, so it is challenging to carry out a plan to keep the skills available in the short and medium term. Similarly, another current challenge is to revise the body's training programme so that it is based on an analysis of the competences and skills needed in the coming years, identifying specific training needs.

  As regards the licensees, the CSN shall continue to guarantee that they meet adequate requirements relating to staff training in order to guarantee the safe operation of the nuclear power plants.

- **Challenge 4. Ensuring compliance with the requirements of the long-term operating and ageing management programme at nuclear power plants**

  In relation to the second challenge, there is another challenge for the regulatory body, which consists of ensuring compliance with the requirements of the long-term operating programme and the management of the ageing of the nuclear power plants. In this respect, the licensees must demonstrate that they adequately manage the phenomenologies associated with ageing, evaluating how their effects affect the functionality of the nuclear power plant systems, structures and components.

Conclusions from the point of view of the holders

The licensees of the Spanish nuclear power plants are responsible for producing electricity safely, reliably, economically and with respect for the environment. Following that which has been articulated by the Convention, this report explains the activities carried out and measures implemented by the holders in the course of their duties, whilst simultaneously fulfilling the obligations established by the Convention.

The most significant aspects are summarised below:

- During the reporting period, all Spanish nuclear power plants behaved in a globally safe manner, with no incidents having been reported that had a significant impact on people or the environment, as evidenced by the evolution of the SISC action matrix.

- The Santa María de Garoña nuclear power plant (BWR) had been in a situation of cessation of operation declared since 6th July 2013. In May 2014 it made an application for regulatory purposes. Although the plant had subsequently requested a renewal of the operating permit, which was denied under a Ministerial Order dated August 1, 2017 and published in the Official Spanish State Bulletin of the Operating Permit on August 3, 2017, the Ministry has since then denied this request. The nuclear power plant is now in a state of definitive shutdown, pending commencement of its dismantling.

- During the period covered by the Report, all licensees currently holding operating permits (with the exception of Trillo[5] Nuclear Power Plant) prepared the documentation required by the regulations for their renewal, which in all cases will extend into a long-term operating period, as required by CSN Instruction IS-22 and CSN Safety Guide GS 1.10 rev.2. In March 2019, with all the documentation submitted, the respective requests for the renewal of the Almaraz I and II and Vandellós II plants were also submitted, and in December 2018 the Basic Documents for the preparation of the respective PSRs of the Ascó I and II and Cofrentes plants were submitted. All of this will form part of the CSN assessment process within the next few years. In all cases, the period covered by the new authorisations implies long-term operation (PLO), for which reason the licensees have submitted the documents associated with said PLO, except in the case of NPP.Trillo, the Operating Licence of which is valid until 2024.

- Likewise, during the period covered by the report, the licensees submitted the base documents for the preparation of the PSRs, with the exception of the Trillo NPP, which in accordance with the applicable standards is required to do so by December 2021.

- The post-Fukushima action plan was completed, in accordance with the NAcP, with the sole exception of the seismic characterisation of the sites, of which, within the periods established in the Instructions issued by the CSN in this respect, phase I has been completed, corresponding to the field work and data collection, the content of which is being evaluated at the CSN. Phase II, corresponding to the seismic hazard analysis, is ongoing.

- As regards emergencies, the additional mechanisms for emergency management established during the previous period have been put into practice, which have led to significant improvements, such as the performance of the annual UME (Military Emergency Unit) exercises at the sites and the development of the annual practices of the Emergency Support Centre (CAE) to ensure the maintenance of its operating capacity.

- The Spanish nuclear power plants, grouped under its Nuclear Energy Committee (CEN), continue to actively promote the exchange of operating experience with a view to establishing actions leading to operational excellence. As of 31/12/2018 the CEN transferred its activities from UNESA to the Spanish Nuclear Industry Forum.

- During the reporting period, the CCNNs were involved in numerous activities involving exchange and analysis of operational experience, both nationally and internationally. Most notably, 10 WANO peer reviews were received during the period, three of which were Corporate Peer Reviews, plus an OSART mission in Almaraz.

- In addition, representatives of the plants participated in 43 peer-to-peer missions and 31 WANO technical missions, conducted in all cases in nuclear power plants.

- All the requirements imposed by the CSN during this period were implemented in accordance with the provisions contained therein. Among the most relevant regulatory changes, mention should be made of the revision of the guidelines for the Periodic Safety Reviews (PSRs), which has substantially modified the systematic approach to the preparation of PSRs in comparison with the previous methodology. The plants that began the licence renewal process during this period (all of those in operation except Trillo1) have followed or are following these guidelines.

All of the above considerations, combined with accumulated operating experience spanning more than thirty years on average, place Spain's nuclear power stations in optimal conditions to face the next operating period.

[5] Its operating licence does not expire until 2024

APPENDIX I

List of acronyms and abbreviations

AE	Operating Licence, Autorización de Explotación
AHO	Human and Organisational Performance (SISC), *Actuación Humana y Organizativa*
ALARA	As Low As Reasonably Achievable
AMR	Ageing Management Review
ANAV	Ascó-Vandellós II Nuclear Association, *Asociación Nuclear Ascó–Vandellós II*
ARTEMIS	Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (IAEA)
ASME	American Society of Mechanical Engineers
ASN	Autorité de Sûreté Nucléaire (France)
ATC	Centralised Temporary Storage (of high level waste and spent fuel), *Almacenamiento Temporal Centralizado*
ATI	Individualised Temporary Storage (of high level waste and spent fuel), *Almacenamiento Temporal Individualizado*
ATOS	Safety Oriented Working Environment (SISC), *Ambiente de Trabajo Orientado a la Seguridad*
BOE	Official Spanish State Bulletin, *Boletín Oficial del Estado*
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owners Group
CA	Anomalous Condition, *Condición Anómala*
CAE	Emergency Support Centre
CAGE	Alternative Emergency Management Centre, *Centro Alternativo de Gestión de Emergencias*
CAP	Corrective Action Programme
Cecopal	Municipal Coordination *Centre, Centro de Coordinación Operativa Municipal*
CEIDEN	Spanish Nuclear Fission Energy Technology Platform
CEN	Nuclear Energy Committee (of the Spanish Nuclear Industry Forum), *Comité de Energía Nuclear*

CENEM	National Centre for Emergency Monitoring and Coordination (DGPCE), *Centro Nacional de Seguimiento y Coordinación de Emergencias*
CIEMAT	Centre for Energy, Environmental and Technological Research, *Centro de Investigaciones Energéticas,* Medioambientales y Tecnológicas
CLO	Operation Limiting Condition (ETF), *Condición Limitativa de Operación*
CRD	Control Rod Driver
CSN	The Nuclear Safety Council, *Consejo de Seguridad Nuclear*
CSNC	Plant Nuclear Safety Committee, *Comité de Seguridad Nuclear de la Central*
CSNE	Operator's Nuclear Safety Committee, *Comité de Seguridad Nuclear del Explotador*
DBE	Design Basis Earthquake
DGPCE	Directorate General for Civil Protection and Emergencies, *Dirección General de Protección Civil y Emergencias*
DOE	Official Operational Document, *Documento Oficial de Explotación*
EAR	Event Analysis Report (WANO)
ECD	Classification and Decontamination Station, *Estación de Clasificación y Descontaminación*
ECURIE	European Community Urgent Radiological Information Exchange
Emercon	Emergency Communication and Assistance Request System (IAEA)
ENR	Event Notification Report (WANO)
ENRESA	The Spanish Radioactive Waste Management Company, *Empresa Nacional de Residuos Radiactivos*
ENSREG	European Nuclear Safety Regulator Group
ENUSA	The National Uranium Enterprise, Empresa Nacional del Uranio
EOP	Emergency Operating Procedures, Procedimiento de Operación en Emergencia.
EPRI	Electric Power Research Institute
ETF	Technical Specifications, Especificaciones Técnicas de Funcionamiento
ETFM	Improved Technical Specifications, Especificaciones Técnicas de Funcionamiento Mejoradas
EU	European Union
EURDEP	European Radiological Data Exchange Platform
GAP	Emergency Stop Guides, *Guías de Emergencia en Parada*
GEDE	Extensive Damage Emergency Management Guides, *Guías de gestión de Emergencias con Daño Extenso*
GMDE	Extensive Damage Emergency Mitigation Guidelines, *Guías de Mitigación de emergencias con Daño Extenso*
GRS	Society for Nuclear Safety (Germany)

GS	Safety Guide (from the CSN), *Guía de Seguridad*
GSAI	Incident Analysis Sectoral Group, *Grupo Sectorial de Análisis de Incidentes*
HERCA	Heads of European Radiation Control Authorities
HPES	Human Performance Evaluation System
HVAC	Heating, Ventilating and Air Conditioning
IAEA	International Atomic Energy Agency
ICEO	Joint Operational Experience Report, *Informe Conjunto de Experiencia Operativa*
IER	INPO Event Report
INES	International Nuclear and Radiological Event scale (IAEA)
INPO	Institute of Nuclear Power Operations
IPEEE	Individual Plant Examination of External Events
IRP	Problem Identification and Resolution (SISC), *Identificación y Resolución de Problemas*
IRRS	Integrated Regulatory Review Service (OIEA)
IRS	Incident Reporting System (OIEA)
IS	CSN Instruction
ITC	Complementary Technical Instruction (from the CSN), *Instrucción Técnica Complementaria*
KWU	Kraftwerk Union
LR	Licensee Response (SISC)
LOCA	Loss Of Coolant Accident
LTO	Long Term Operation, *Operación a Largo Plazo*
LWR	Light-Water Reactor
MER	Miscellaneous Event Report (WANO)
MISI	In-Service Inspection Manual, *Manual de Inspección en Servicio*
MITECO	Ministry for Ecological Transition, *Ministerio para la Transición Ecológica*
MORT	Management Oversight and Risk Tree
MPR	Radiation Protection Manual, *Manual de Protección Radiológica*
NAC	Conditioned Application Standard, *Normativa de Aplicación Condicionada*
NEA	Nuclear Energy Agency (OECD)
NEI	Nuclear Energy Institute
NEWS	Nuclear Event Web-based System
NDT	Non-Destructive Testing

OBE	Operating Basis Earthquake
OECD	Organisation for Economic Co-operation and Development
ORE	Emergency Response Organisation (of the CSN), *Organización de Respuesta en Emergencias*
OSART	Operational Safety Review Team (IAEA)
PSA	Probabilistic Safety Analysis, *Análisis Probabilista de Seguridad*
PAE	CSN Emergency Action Plan, *Plan de Actuación en Emergencias*
PAMEN	Nuclear Emergency Municipal Action Plan, *Plan de Actuación Municipal en Emergencia Nuclear*
PAR	Passive Autocatalytic Recombiners
PBI	Basic Inspection Plan, *Plan Base de Inspección*
PCI	Fire Protection, *Protección Contra Incendios*
PDRD	Dose Reduction Master Plan (Cofrentes NPP), *Plan Director de Reducción de Dosis*
PEI	On-Site Emergency Plan, *Plan de Emergencia Interior*
PEN	Nuclear Emergency Plan, *Plan de Emergencia Nuclear*
PENCRA	Nuclear Emergency Plan at Central Response and Support Level, *Plan de Emergencia del Nivel Central de Respuesta y Apoyo*
PGR	Radioactive Waste and Spent Fuel Management Plan (DOE)
PGV	Life Management Plan
PIEGE	Integrated Plan for the Evaluation and Management of Ageing
PLABEN	Basic Nuclear Emergency Plan, *Plan Básico de Emergencia Nuclear*
PLC	Programmable Logic Controller
PROCURA	Organisational, Cultural and Technical Reinforcement Plan (Ascó NPP)
PTR	Radiation Work Permit
PWR	Pressurised Water Reactor
PWROG	Pressurised Water Reactor Owners Group
RCS	Reactor Coolant System
RD	Spanish Royal Decree
RDL	Spanish Royal Decree-Law
RF	Fire Resistant
RHWG	Reactor Harmonisation Working Group (WENRA)
RINR	Regulation on Nuclear and Radioactive Facilities, *Reglamento de Instalaciones Nucleares y Radiactivas*
ROP	Reactor Oversight Programme (USNRC)

PSR	Periodic Safety Review
RR	Regulatory Response (SISC)
RSN	Nuclear Safety Regulation, *Reglamento de Seguridad Nuclear*
RV	Surveillance Requirement (ETF), *Requisito de Vigilancia*
SAMG	Severe Accident Management Guidelines, *Guías de Gestión de Accidente Severo*
SALEM	CSN Emergency Room
SALTO	Safety Aspects of Long Term Operation (IAEA)
SAT	Systematic Approach to Training
SBO	Station Black Out
SEFM	The Spanish Society of Medical Physics, *Sociedad Española de Física Médica*
SEPR	The Spanish Radiation Protection Society, *Sociedad Española de Protección Radiológica*
SER	Significant Event Report (WANO)
SICME	Emergency Tracking Balanced Scorecard System (CSN), *Sistema de Cuadros de Mando para el Seguimiento de la Emergencia*
SISC	Integrated Plant Supervision System (CSN), *Sistema Integrado de Supervisión de Centrales*
SOER	Significant Operating Experience Report (WANO)
SS	Safety Study (DOE)
SSC	Structures, Systems and Components, *Estructuras, Sistemas y Componentes*
SSE	Safe Shutdown Earthquake
SSG	Garoña Supervision System (CSN), *Sistema de Supervisión de Garoña*
SSHAC	Senior Seismic Hazard Analysis Committee
SVESC	Control Room Building Venting System, *Sistema de Venteo del Edificio de la Sala de Control*
SVFC	Containment Filtering Venting System, *Sistema de Venteo Filtrado de Contención*
TLAA	Time Limited Ageing Analysis
UME	Military Emergency Unit, *Unidad Militar de Emergencias*
USIE	Unified System of Information Exchange in Incidents and Emergencies
USNRC	Nuclear Regulatory Commission (United States)
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators Association
WGOE	Working Group on Operating Experience (NEA)
WGWD	Working Group on Waste and Decommissioning (NEA)
WiN	Women in Nuclear

Convention on Nuclear Safety

Eighth National Report

August 2019

SPAIN