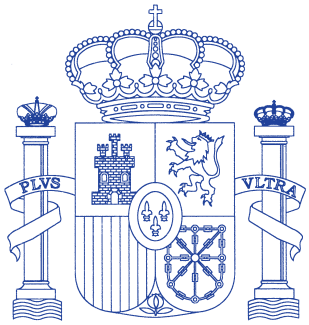
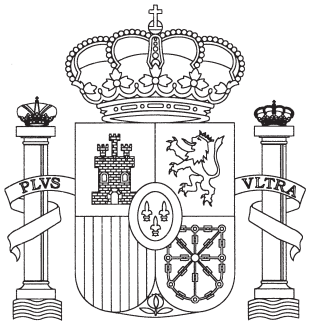


ESPAÑA

Convention on Nuclear Safety

Eighth and Ninth National Report



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Convention on Nuclear Safety

Eighth and Ninth National Report

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Index

I. Introduction

Presentation of the Report

This document constitutes the Eighth and Ninth National Report of Spain 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 the three-year periods of 2016-2018 and 2019-2021, including only information of exceptional importance from after this date.

Preparation of the Report

The preparation of the report is the responsibility of the Nuclear Safety Council (CSN), the only Spanish State body competent in relation to nuclear safety and radiation protection, independent of 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 the Ministry for Ecological Transition and the Demographic Challenge (MITERD) have contributed to the preparation of the report. Therefore, the National Report includes specific views of the different stakeholders involved in the nuclear safety from their areas and responsibilities.

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, where possible, 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.

A Summary section is included , which responds to the commitments acquired at the Seventh Review Meeting and highlights the most relevant aspects and circumstances during the 2016-2021 period, in addition to the actions taken by the regulatory body and the nuclear power plants during the COVID-19 pandemic, as well as a Conclusions section, which identifies the challenges facing the regulatory body and the initiatives that are planned to be implemented in the near future.

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

The content and scope of this Eighth and Ninth Convention Report is based on the recommendations set out in Section C of the Information Circular on Guidelines for National Reports prescribed by the Convention on Nuclear Safety (INFCIRC/572/ Rev. 6, dated 19 January 2018) and the Report of the President of the Organisational Meeting of the Eighth and Ninth Joint Review Meetings of the Contracting Parties in October 2021.

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 of the Contracting Parties at the Diplomatic Conference, 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 6.44% 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 36 years.

It should be noted that during the three-year period 2019-2021, which includes the COVID-19 pandemic, the operating authorisation renewals of the Spanish nuclear power plants of Almaraz (unit I until 2027 and unit II until 2028), Ascó (unit I until 2030 and unit II until 2031), Cofrentes until 2030 and Vandellós II until 2030 were successfully carried out.

The Santa María de Garoña nuclear power plant (BWR) had been formally closed for decommissioning since 6th July 2013. In May 2014 it applied for renewal of its operating licence, which was denied by a Ministerial Order dated 1 August 2017, published in the Official Spanish State Bulletin dated 3 August 2017, and since then it has been at definitive shutdown status, pending the start of its decommissioning.

In addition, two nuclear power plants are being decommissioned. 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.) and the decommissioning authorisation was granted; dismantling work is scheduled to be completed in 2022 and site restoration activities are scheduled to begin then, which will continue through 2023. On the other hand, the Vandellós I plant is currently in the latency period, after ceasing operation in 1989 and reaching dismantling level 2 in 2003.

With regard to Spain's Energy Policy, in March 2020 the Spanish Government submitted to the European Commission a proposal for an Integrated National Energy and Climate Plan for 2021-2030 (PNIEC) (Official Spanish State Bulletin 31/03/2021), which establishes — among other aspects — the planning of nuclear energy's share in the energy mix and envisages the orderly shutdown of the Spanish nuclear fleet within the 2027-2035 timeframe.

Taking into account the draft of this Plan, in March 2019 the owners of the Spanish nuclear power plants and ENRESA signed a Protocol of Intentions establishing a schedule for the cessation of operation of the plants currently in operation. This schedule is necessary to develop a strategy for the phased decommissioning of these nuclear power 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 is being presented 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.

Spain's actions due to the COVID-19 pandemic

In addition, as a result of the COVID-19 pandemic, the Eighth Review Meeting scheduled for March 2020 had to be postponed. In the first instance, the decision was made to carry it out in March 2021. However, given the ongoing nature of the pandemic and in order to ensure a face-to-face meeting, a decision was finally made to hold the Eighth and Ninth Review Meetings jointly in March 2023.

An organisational meeting of the Eighth and Ninth Joint Review Meetings of the Convention on Nuclear Safety was held in October 2021 to corroborate the agreements adopted at the Eighth Review Meeting. In addition, it was agreed that national reports should describe the experience of the COVID-19 pandemic response. This information has been included in the Summary section.

II. Summary

The Eighth and Ninth National Report of Spain complies with the obligations deriving from the Convention on Nuclear Safety. The information it contains corresponds to the three-year periods of 2016-2018 and 2019-2021.

With regard to formal aspects, the examination of the National Report of the Seventh Review Meeting identified the absence of a summary of the report. In response to this shortcoming, this new section has been developed.

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, as well as information on actions implemented in the aftermath of the COVID-19 pandemic.

2.1. Challenges of the 7th Review Meeting

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

1. Effective preparation of the combined IRRS-ARTEMIS mission to Spain, which took place in October 2018.
2. 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, is at an advanced stage. The transposition of Article 4.2 of *Issue T* on natural hazards, transferred to Article TU 4.2 of Issue TU "external hazards" in the most current version of the WENRA reference levels, will be carried out by means of the CSN Instruction on sites, currently under preparation and scheduled for 2022.
3. 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 IAEA's needs, as detailed in Chapter 8. During the three-year periods of 2016-2018 and 2019-2021, 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 technicians who have left the institution due to retirement.
4. 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 mile-

stones, in 2017 the Plenary 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. The self-assessment was carried out in 2021 and, once this assessment was concluded, with the final report issued by the contracted entity in December 2021, the agency's management considered the need to establish and implement an action plan to address the results and recommendations from this process. In the preparation and implementation of an action plan, the CSN management has considered the suitability of having the support of an external company specialising in organisational change management and safety culture, for which purpose the necessary procedures have been initiated that will conclude with the contracting of an external entity with these characteristics in 2022. The management of the organisation has foreseen that this entity will assist the CSN in this process for a period of four years.

In addition, three key actions identified during the 7th meeting have been finalised:

- resolve certain aspects associated with long-term operation licensing, with the publication of revision 1 of CSN Instruction IS-22
- complete the implementation of the WENRA reference levels (almost completed, as detailed below)
- and the transposition into Spanish law of the European Nuclear Safety Directive, essentially through the publication of the Nuclear Safety Regulation (NSR).

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 resources
- Knowledge management
- Ageing management and long-term operation[2]
- Emergency preparedness
- Consultation and communication with interested parties

2.2. Nuclear programme in Spain

In the context of the nuclear programme in Spain, the most relevant aspects are as follows:

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

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

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

- The publication and submission to the European Commission, in March 2020 of the draft National Integrated Energy and Climate Plan for 2021-2030 (PNIEC) (Official Spanish State Bulletin 31-03-2021), 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 envisages the orderly shutdown of the Spanish nuclear fleet within the 2027-2035 timeframe. Taking into account the draft 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 those plants currently in operation.
- The operating authorisation renewals for the Spanish nuclear power plants of Almaraz (unit I until 2027 and unit II until 2028), Ascó (unit I until 2030 and unit II until 2031), Cofrentes until 2030 and Vandellós II until 2030.
- The issuance of Law 7/2021 of May 20 on climate change and energy transition, Article 10 of which prevents the granting and extension of authorisations for exploration, research, direct concession of exploitation of radioactive minerals and radioactive facilities of the nuclear fuel cycle for processing.
- Entry into force on January 1, 2022 of Law 12/2011 of May 27 on civil liability for nuclear damage caused by radioactive material due to the ratification of the Paris Convention and the Brussels Supplementary Convention, entering into force on January 1, 2022.

2.3. Nuclear facilities

As regards external assessments concerning Spanish nuclear power plants, the established policy of receiving and participating in exercises and peer assessment missions remains in force. A total of 10 missions were received from the World Association of Nuclear Operators (WANO) and the IAEA in the 2019-2022 period. It should be noted that in July 2021 Ascó NPP received the SALTO (Safety Aspects of Long Term Operation) mission from the IAEA, to adequately address the long-term operation, and a follow-up of the mission is scheduled for 2023 to verify the correct implementation of the actions taken.

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 2019-2022 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 nuclear power plant operating permits include a generic condition relating

to the treatment of operating experience, which is developed in an CTI (Complementary Technical Instruction) issued by the CSN for each facility, in relation to the operating experience of others. As a new addition included in the CTIs issued by the CSN for the Spanish nuclear power plants that renewed their Operating Licences in the 2019-2022 period, these require that the annual operating experience report of each plant include the analysis of the reports required by the Site Emergency Plan related to the activation of the same issued by other Spanish nuclear power plants, with the inclusion of the analysis of the SER and SOER of WANO no longer required.

In any case, the Spanish nuclear power plants continue to report their most significant events to WANO, so that this operating experience can be shared with the world 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 assessed 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 external hazards, 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, Comité de Energía Nuclear), the organisation that groups together nuclear power plant licensees, there is a permanent working group on operating experience which carries out its own analyses, with on-demand activation of the Sectoral Group for Incident Analysis (GSAI), the preparation of the ICEO report "Adherence to procedures and effectiveness of pre-job meetings" and the systematic exchange of international operating experience being its most notable actions in the 2019-2022 period. 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 Clearing house, a group supporting the European Union (EU) regulatory bodies in the analysis of operating experience.

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.

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. Phase I data collection has been completed and phase II analysis is in progress. During the three-year period 2016-2018, all the post-Fukushima modifications were implemented at all the Spanish nuclear power plants, with the following being particularly noteworthy for their far-reaching impact on improving safety: the Alternative Emergency Management Centre (CAGE), the Containment Filtered Venting System (SFVC) and the Containment Autocatalytic Passive Hydrogen Recombiners (PAR).

2.4. Regulatory framework

In the 2016-2018 period, 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 law of the Nuclear Safety Directive and the progress made in the transposition of Directive 2013/59/EURATOM. Among these, it is worth mentioning the issuance and publication of Royal Decree 451/2020 regarding control and recovery of orphan radioactive sources, Royal Decree 586/2020 regarding mandatory information in case of nuclear or radiological emergency, and Royal Decree 601/2019 regarding justification and optimisation of the use of ionising radiation in connection with personal radiation protection on occasions of medical exposures.

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. In the latest report issued by Spain on the degree of compliance with the WENRA reference levels in January 2022, it is noted that eight reference levels are still pending implementation in the Spanish regulatory framework. Six reference levels refer to operating experience, 1 reference level to probabilistic safety analysis and 1 reference level to natural hazards; in this case there is an initial revision of a CSN Instruction on sites where the objective values of design basis event exceedance frequency and minimum acceleration value are included.

2.5. Combined IRRS-ARTEMIS Mission

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.

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

Once the combined review mission was completed, the CSN Board of Commisioners approved an action plan with the aim of carrying out actions in response to the recommendations and suggestions resulting from this mission, establishing a short, medium and long term action strategy.

This action plan is ongoing. At the end of the year 2021, the percentage of completion of the milestones that make up the action plan was 60% of activities completed compared to the total.

2.6. Emergency Preparedness

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 IEPs (*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 IEPs, 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 (ERO). In some cases, the development of drills has required the use of GGAS (*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 ESC (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. During 2020 and 2021, due to pandemic constraints, the goal of conducting at least two exercises for each offsite nuclear emergency plan could not be met in all cases.

2.7. Regulatory body

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 period covered in this report measures to improve transparency and communication as detailed in previous reports continued to be implemented, incorporating some additional actions.

The CSN's 2020-2025 Strategic Plan establishes a Strategic Objective, referenced as number 5, dedicated to improving the perception of the regulator's activity by the public and stakeholders through rigour, truthfulness and reliability.

The Law 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 Spanish 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 Law.

In this area, another important milestone during the reporting period was the publication in 2017 of the CSN Communication Plan, which includes aspects relating to external, internal and emergency communication.

In addition, the CSN website continues to provide information on the minutes of Plenary 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, as well as actively participating in the ENSREG Working Group on Communication and Transparency.

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 communication in emergencies, Royal Decree 586/2020, of June 23, regarding mandatory information in the event of a nuclear or radiological emergency, establishes the content of the information to be provided to the population actually affected by the emergency, the general public, the intervention personnel, the European Union, international organisations and third countries potentially affected by a nuclear or radiological emergency occurring in Spanish territory.

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 Plenary of the Nuclear Safety Council constitutes a significant milestone for the regulatory body. On 29 March 2019, the President and three Commissioners of the Plenary of the Body were changed.

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

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

2.8. Spain's actions during the COVID-19 pandemic

2.8.1 CSN experience

In relation to the actions carried out due to the COVID-19 pandemic within the scope of the regulatory body, from the beginning of the health alert the CSN adapted its activity to provide continuity in the performance of its functions, reconciling the framework established by *Royal*

Decree 463/2020 of March 14th *declaring a state of alarm for the management of the health crisis caused by COVID-19* with the need to preserve nuclear safety and radiation protection during the operation of the facilities within its realm of competence.

During the months of April to June 2020, the need was established to draw up a Plan for the continuity of the CSN's activity on a weekly basis, with a view to maintaining internal communication between the organisation's staff, preventing isolation or disconnection. This document provided compiled information on the activities undertaken by the organisation during this period, in addition to the information available on the CSN's internal website.

The following is a summary of the most important aspects addressed in this plan:

GENERAL MEASURES

1. **General Operation of the Organisation.**

   Personnel who have maintained on-site activities at the headquarters of the regulatory body to ensure the performance of the CSN's functions:

   - Three security service personnel, 24 hours in shifts.
   - An officer and a technician from the emergency centre, , working 24 hours in shifts, maintaining the operability of the emergency roadblocks by telephone or email.
   - One maintenance technician, working 24 hours alongside CSN and contract personnel, on a shift basis.
   - An IT service technician plus a backup technician working from home.

   In addition, a system of authorisations was established for access to the CSN headquarters where needed, guaranteeing a maximum capacity to ensure protection measures against the pandemic.

2. **Management of the registry for the official reception and issuance of documentation.**

   - The use of electronic signature applications was encouraged.
   - Attendance of one person once a week to physically attend to the registry.
   - Dispatch of paper documents was minimised, with digital media prevailing instead.
   - The ORVE application for access to the Common Electronic Registry of the AGE was enabled.

3. **Cleaning and sanitation.**

   From the beginning of the alert, cleaning measures were maximised at the CSN's headquarters, including the use of masks, access limitation signs, disinfectant mats, distribution of hydro-alcoholic gels throughout the building and periodic disinfections against COVID-19.

4. **Information and communication with personnel**

   - Weekly update of the CSN business continuity plan and dissemination by the available means of communication (Intranet, web, e-mail, etc.)
   - Webinars with the entire organisation on strategic topics
   - Use of videoconferencing applications for meetings and internal communication among the organisation's personnel
   - Antibody testing for COVID-19 through the Medical Service.

- Definition of a *Protocol of preventive actions for the on-site reincorporation of employees at the CSN*, according to the guidelines of the health and Civil Service authorities and negotiated with trade union agents represented at the CSN
- Definition of a *Protocol of actions for the transition to a new normality at the Nuclear Safety Council* , approved by the Board of Commissioners on June 10th , which has been revised on several occasions depending on the progress of the pandemic and negotiated with the trade union agents represented at the CSN.

5. Interruption of access to the CSN facilities for the public and other initial measures

- Since the beginning of the COVID-19 pandemic, the following immediate actions were undertaken:

  — Interruption of visits to the information centre.

  — Suspension of non-essential travel outside the Community of Madrid.

6. Management of the CSN's economic activity

Continuity of the CSN's economic activity, meeting its economic commitments to personnel, suppliers and public administrations in a timely manner, through the electronic processing of contracts and expense files.

MEASURES FOR THE ORGANISATION OF WORK

1. Measures to optimise the activity of organisational units

- The necessary virtual meetings have been held to monitor ongoing activities and to plan and establish objectives to comply with the CSN's Annual Work Plan
- The use of internal communication channels has been promoted to ensure that staff are informed about the functioning of the organisation and the development of its activities

2. Initial measures adopted:

a. MEASURES ADOPTED BY THE CSN IN RELATION TO THE SUPERVISION OF REGULATED FACILITIES AND ACTIVITIES

- On March 30th a communiqué was published online with criteria for the interpretation of Royal Decree 463/2020 in relation to the dossiers in progress and activities of the organisation, in view of the numerous queries received through the web portal, email, etc. This information was extended by means of the informative note published by the CSN on its institutional website *extending the validity of radioactive facility operator and supervisor licences, approved courses and radiological passports during the health alert*.
- Suspension of inspections except for essential reactive inspections. Subsequently, the inspection plans for 2020 were reviewed. In July 2020, the document on minimum general criteria for the performance of non-face-to-face inspections as part of the CSN's inspection function was published.
- Postponed and rescheduled the activity of the radiological protection courts and licensing exams for supervisors, operators and service chiefs
- During the state-of-alarm period, an exceptional system was put in place to issue notifications of the start-up of radioactive facilities in the healthcare field, in the absence of an inspection prior to the start-up of the facility.
- The supervision and control of the operating nuclear power plants was maintained through resident inspectors, establishing a system of face-to-face shifts combined with remote work

- Analysis of the information submitted by each nuclear facility on strategies, plans and procedures to ensure their safe operation in a pandemic situation.
- The CSN's network of automatic environmental radiological surveillance stations (REA) and the regional networks to which the CSN has access have remained operational at all times, with no abnormal values being reported at any time.

2.8.2. Experience of Spanish nuclear power plants

The coordination of the actions of Spanish nuclear power plants in the face of the pandemic was established in the Spanish Nuclear Industry Forum, through the Nuclear Energy Committee (CEN). The Operations Committee monitored the evolution of the pandemic, shared the practices established in each of the plants, and adopted the joint actions that were of interest at any given time.

Coordination with the Nuclear Safety Council to report on all the actions derived from pandemic tracking was carried out mainly through the Project Manager of each of the plants and the Resident Inspectorate.

The main actions carried out at the nuclear power plants were grouped into the following main lines of action:

- Communication: Internal, for the transmission of new standards and expectations to the workers of the facilities, and external, to inform the regulator, health organisations and different administrations.
- Operational Approach: Development of work coordination and management processes guaranteeing the availability of resources for the performance of essential activities at the plants in situations in which the presence of personnel at the sites might be limited.
- Medical surveillance of facility personnel, closely monitoring workers, advising, assessing and treating their symptoms.
- Monitoring and protection of the emergency response organisation capacity: Development of contingency plans to guarantee compliance with the functions to be performed in the event of an emergency, in the event of a hypothetical significant reduction of personnel in any group.
- Protection of sites and workplaces: The main actions were the special protection of control rooms and licensed personnel, the limitation of face-to-face meetings, travel and external visits, the adoption of teleworking in certain positions, and increased cleaning and disinfection in common areas.
- Adaptation of staff training to a virtual environment, in order to maintain the objectives of the established annual training programmes.
- Identification of supplies and services critical to the operation of the facilities, which should be considered as essential, in order to guarantee the power supply of the nuclear power plants during a pandemic state.
- Consultation and follow-up of the measures being adopted in nuclear power plants at the international level for their possible applicability.

With these measures, and thanks to the coordination carried out in the sector, the operation of the plants has not been significantly affected by the pandemic situation, and not only has it been possible to cope with the power operation of the plants, but the planned refuelling outages at the different facilities have been carried out normally.

III. Compliance with the Obligations of the Convention

Article 6. Existing nuclear facilities

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. General 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 three-period of 2016-2018 covered by this report, the licensee reported 27 events, 25 of which were 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 Operating Technical Specifications (OTSs) 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 the Almaraz II NPP, due to a high steam generator level, and there were no unscheduled shutdowns.

Applying the CSN procedures for responding to significant events, the following specific inspections were also 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 sanctioning process, the CSN issued a warning to the licensee in 2018 for the following reasons:

- Non-compliance with OTF 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 OTF (unit 1).

- 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).

Update

On July 23, 2020, the Ministry for Ecological Transition and the Demographic Challenge granted the Almaraz plant a renewal of its Operating Licence (AE), valid until November 1, 2027 for Unit I and until October 31, 2028 for Unit II. 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 2019-2021 the licensee reported 11 events (6 for Unit I and 5 for Unit II), all of which were classified as level 0 on the International Nuclear Event Scale (INES).

During this period, the following automatic shutdowns took place at Almaraz NPP:

- In June 2020, during the load ramp-up process after refuelling 27, there was an automatic shutdown signal of the Unit I reactor due to turbine trip, which originated from the alternator trip due to the differential electrical protection trip of the main transformer.
- In June 2020, there was an automatic shutdown signal from the Unit II reactor due to tripping of the protection system (SSPS) and tripping of the system circuit breaker.
- In July 2021, an automatic shutdown of the Unit II reactor occurred during a logic test of the firing channels.

During this period the following coercive actions have been issued to the licensee of the Almaraz nuclear power plant:

- Warning to the licensee for non-compliance with Operating Technical Specification 3.9.12 regarding the fuel building ventilation system in 2019.
- Warning to the licensee for non-compliance with board instruction IS-23 regarding in-service inspection of nuclear power plants in 2019.
- Proposal to open sanctioning proceedings for non-compliance with CSN Instruction IS-30, regarding the use of the PCI system to containment sprinklers, in 2019.
- Proposal to open disciplinary proceedings for non-compliance with requirement b.5 of CTI No. 11, relating to fixed instrumentation for flow measurement of filtration units, in the year 2020.
- Warning for failure to comply with Article 3.2.2 of CSN Instruction IS-30, relating to fire protection, in the year 2021.
- Warning for non-compliance with section A1 of point 5 of CSN Instruction IS-10, relating to criteria for reporting events to the CSN by the nuclear power plants, in the year 2021.

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 2016-2018 period, the licensee reported 35 events, all of which were 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 OTF action associated with the inoperability of an extended-range neutron flux detector for a longer time than that allowed by the OTF. 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 internal 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 sanctioning 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 (RPM) 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 OTF 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 a sanctioning file for minor infringements due to non-compliance with Instruction IS-21 regarding requirements applicable to nuclear power plant design modifications, deriving from the white finding in unit II mentioned above.

Update

On September 27, 2021, the Ministry for Ecological Transition and the Demographic Challenge granted the Ascó power plant a renewal of its Operating Licence (AE), valid until October 1, 2030 for Unit I and valid for a period of 10 years for Unit II. 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 2019-2021 period, the licensee reported 26 events, all having been classified as level 0 on the INES Scale, with the exception of the unscheduled plant shutdown event due to loss of main feedwater at Unit I in April 2021, classified as level 1.

The following automatic reactor shutdowns took place at Ascó NPP during this period:

- In June 2020, there was an unscheduled shutdown of the Unit II reactor due to inoperability of pump 14P01A of the waste heat removal system.
- In September 2020, there was an unscheduled shutdown of the Unit I reactor due to the failure of a valve in the residual heat removal (RHR) system.
- In April 2021, there was an unscheduled shutdown of the Unit I reactor due to loss of main feedwater.
- In April 2021, there was an unscheduled shutdown of the Unit I reactor due to the shutdown of a reactor coolant pump during the plant start-up process.
- In June 2021, there was an unscheduled shutdown of the Unit I reactor due to the reactor protection system.
- In June 2021, there was an unscheduled shutdown of the Unit II reactor due to a malfunction in the alternator voltage regulator.

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

- September 2019. Ascó I and II NPP. Supplementary inspection related to a soft physical safety finding.
- 2021. Ascó I NPP. Reactive inspection due to unexpected CO2 discharge in the non-safety 220 V battery rooms.

During the 2019-2021 period the following coercive actions were issued to the licensee of the Ascó nuclear power plant:

- Warning to the licensee for non-compliance due to failure to comply with CSN safety instructions IS-32, IS-21 and IS-10, due to not accounting for the uncertainty of the flow measurement of the system 43 pumps in the acceptance criterion of the surveillance procedures, in 2019.
- Warning for non-compliance with CSN IS-21 and the Ascó NPP Quality Assurance Manual, due to the implementation of design modifications by means of work orders, in 2019.
- Warning for non-compliance with Performance Technical Specification 3/4.6.1.7 «Structural integrity of containment», in 2020.

- Warning for non-compliance with the Radioactive Waste and Spent Fuel Management Plan, in 2020.
- Proposal to open disciplinary proceedings for non-compliance with the Quality Assurance Manual in relation to ventilation systems, in 2020.
- Warning for non-compliance with condition 3 of the operating permits for units I and II, in the year 2021.

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 the 2016-2018 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 sanctioning 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/CTI/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 OTF, as the anomalous condition of the feedwater system was not identified when detecting the discrepancy between the loop flows.

Update

On March 17, 2021, the Ministry for Ecological Transition and Demographic Ecological Transition and the Demographic Challenge granted the plant a renewal of its Operating Licence (AE), valid until November 30, 2030. 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 2019-2021 period, the licensee reported 12 events, all having been classified as level 0 on the INES Scale, with the exception of the event of activation of the PCI detection system in the feed cubicle to valve E51F078, in May 2021, which was classified as level 1.

The following automatic or unscheduled reactor outages did not occur at Cofrentes NPP during this period:

- In September 2021, the reactor was triggered by a feedwater transient.
- In September 2021, the reactor trip was triggered by automatic actuation of the reactor protection system by a very high scale signal from the intermediate power range neutron instrumentation.
- In December 2021, the reactor trip was triggered by manual actuation of the system that protects the reactor in the event of a pressure increase in the dry well.

Applying the CSN procedures for responding to significant events, a supplementary inspection was carried out in 2021 due to a physical safety white finding.

During the period 2019-2021 the following coercive actions were issued to the licensee of the Cofrentes nuclear power plant:

- Warning to the licensee for non-compliance with section nine of CSN Instruction IS-21, on requirements applicable to modifications at nuclear power plants, for failure to open an anomalous condition following detection of the deviation consisting of the absence of pressure and flow rate measurements during performance of the ASME OM code functional tests of the P6OCCOO6A/B/C diesel oil transfer system pumps, in 2019.
- Warning for non-compliance with section nine of CSN Instruction IS-21, on requirements applicable to modifications at nuclear power plants, due to the failure to open an anomalous condition upon detection of reduced reliability of essential cooled water system valves, in 2019.

Trillo Nuclear Power Plant

On 17 November 2014, the Ministry of Industry, Energy and Tourism granted 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 the 2016-2018 period, the licensee reported 3 events, none of which were classified above level 0 on 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 sanctioning 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.

Update

During the 2019-2021 period, the licensee reported 8 events, all classified as level 0 on the INES Scale, with the exception of an event of non-compliance with the OTFs by not declaring the inoperability of the pool cooling pump TH17D001, in May 2021, which was classified as level 1.

During this period there was an unscheduled shutdown due to a fire in phase 2 of the main transformer.

In relation to specific CSN inspections in the light of outstanding events, in 2019 a supplementary grade 1 inspection was performed on the target finding related to the 2018 IEP drill. Likewise, in 2021, 2 reactive inspections were carried out on the reported event ISN 2021/006 related to the declaration of a pre-alert due to a fire lasting more than 10 minutes in the area of the main transformer and on an event related to the failure of a steam generator regulation valve.

During the 2019-2021 period the following coercive actions were issued to the licensee of the Trillo nuclear power plant:

- Warning to the licensee for non-compliance with administrative regulation 6.2.2.h of the OTFs, regarding criteria to prevent shift personnel from working excessive hours, in the year 2021.
- Warning for non-compliance with Article 6.2. of CSN Instruction IS-20, which establishes the safety requirements for spent fuel storage containers, in the year 2021.
- Warning for non-compliance with Article 9 of CSN Instruction IS-21, on requirements applicable to modifications at nuclear power plants, in the year 2021.

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 2016-2018 period, the licensee reported 22 events, all of which were 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 OTF 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 sanctioning 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 CTI 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, regarding fire protection at nuclear power plants, in relation to the periods for implementation of design modifications.
- A warning for non-compliance with OTF due to improper time alignment of the fuel building emergency ventilation system.

Update

On 23 July 2020, the Ministry for Ecological Transition and the Demographic Challenge 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 2019-2021 period, the licensee reported 13 events, all of which were classified as level 0 on the INES Scale, with the exception of the following, which were classified as level 1:

- Massive non-compliance with the August 2020 PCI barrier fire resistance times.
- Inoperability of steam generator "B" pressure channel through train "A", dated August 2021.
- OTF non-compliance for minimum recharge water storage tank solution temperature below acceptance criteria, dated December 2021.

During this period, the following automatic or unscheduled reactor shutdowns took place at Vandellós II NPP:

- In September 2020, an unscheduled shutdown occurred due to a non-insulatable leak in the cooling system of the main generator.
- In April 2021, there was an unscheduled shutdown due to activation of the electrical protection of the main generator.

In relation to specific CSN inspections in the event of significant events, in 2019 a reactive inspection was carried out due to a reactor coolant pressure boundary leak.

During the period 2019-2021 the following coercive actions were issued to the licensee of the Vandellós II nuclear power plant:

- Warning for non-compliance with Board Instruction IS-32, on Technical Specifications for Operation, in 2019.
- Warning for non-compliance with CSN Instructions IS-21, on requirements applicable to modifications at nuclear power plants, and IS-10, establishing criteria for reporting events to the CSN by nuclear power plants.
- Warning for non-compliance with the Radioactive Waste and Spent Fuel Management Plan and Complementary Technical Instruction No. 4 associated with the operating permit, in 2020.
- Warning for non-compliance with Article 7.2 of CSN Instruction IS-21, on requirements applicable to modifications at nuclear power plants, due to shortcomings detected in the

plant acceptance programme of the temporary crane used for the implementation of the design modification relating to the replacement of spent fuel pool storage racks in 2021.

- Warning for non-compliance with article five of CSN Instruction IS-21 on requirements applicable to modifications at nuclear power plants and with article 4.4 of CSN Instruction IS-10 on event notification criteria at nuclear power plants, due to the performance of a manoeuvre using a procedure not applicable in the operating mode in which the plant was located.

6.2. General overview of programmes and measures envisaged 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 subjective 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 appraisal 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) at the 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 CTI issued following the Fukushima accident, except the requirements established in the CTI 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 Enhanced Operating Technical Specifications (EOTSs), in accordance with the United States Nuclear Regulatory Commission (NRC) standard NUREG-1431, Rev.4

Update

In 2020, the renewal of the Operating Licence of both units of the Almaraz nuclear power plant was granted.

As a result of the analysis performed for the renewal of the Operating Licence, the licensee has identified 72 improvement opportunities, of which none has been classified as being of high importance for safety, 14 are considered to be of medium importance, 26 of low importance and 32 of very low importance, and the licensee has developed programmes and action plans for the implementation of these proposals.

In the area of actions following the Fukushima accident, the plant has made progress in complying with the requirements established in the CTI for updating the seismic characterisation of the site, which the licensee is carrying out according to the established deadlines, and which has been completed in the current year 2022. In the context of this action, the licensee has completed compliance with the requirements established by the CSN in the CTIs issued after the Fukushima accident

Ascó I and II nuclear power plants

The Operating Licence contains conditions for continuous safety improvements resulting from the assessment 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 subjective 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 appraisal from the CSN or ministerial authorisation, as the case may be:

- CAGE of the Ascó NPP
- 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 CTI issued following the Fukushima accident, except the requirements established in the CTI 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 NU-REG-1431, Rev.4

Update

In 2021, the renewal of the Operating Licence of both units of the Ascó nuclear power plant was granted.

As a result of the analysis performed for the renewal of the Operating Licence, the licensee has identified 93 improvement opportunities, of which none has been classified as being of high importance for safety, 8 are considered to be of medium importance, 51 of low importance and 34 of very low importance, and the licensee has developed programmes and action plans for the implementation of these proposals.

In the area of actions following the Fukushima accident, the plant has made progress in complying with the requirements established in the CTI for updating the seismic characterisation of the site, which the licensee is carrying out according to the established deadlines, and which has been completed in the current year 2022. In the context of this action, the licensee has completed compliance with the requirements established by the CSN in the CTIs issued after the Fukushima accident

Cofrentes nuclear power plant

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

During the 2016-2021 period, 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 subjective 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 appraisal from the CSN or ministerial authorisation, as the case may be:

- An alternative emergency management centre (CAGE)
- Filtered containment venting system (SVFC):
- passive autocatalytic recombiners (PAR)

With these actions, the licensee has fulfilled compliance with the requirements established by the CSN in the CTI issued following the Fukushima accident, except the requirements estab-

lished in the CTI 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.

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.

Update

In 2021, the renewal of the Operating Licence of the Cofrentes nuclear power plant was granted.

As a result of the analysis performed for the renewal of the Operating Licence, the licensee has identified 58 improvement opportunities, of which none has been classified as being of high importance for safety, 7 are considered to be of medium importance, 37 of low importance and 14 of very low importance, and the licensee has developed programmes and action plans for the implementation of these proposals.

In the area of actions following the Fukushima accident, the plant has made progress in complying with the requirements established in the CTI for updating the seismic characterisation of the site, which the licensee is carrying out according to the established deadlines, and which has been completed in the current year 2022. With this action, the licensee completed compliance with the requirements established by the CSN in the CTIs issued following the Fukushima accident.

Trillo Nuclear Centre

The Operating Licence includes conditions for continuous plant safety improvements, resulting from the assessment 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 in the 2016-2018 period are as follows:

- Updating of the Safety Report 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 subjective 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 appraisal 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 CTI issued following the Fukushima accident, except the requirements established in the CTI 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.

Update

The current Operating Licence of the Trillo nuclear power plant expires in November 2024. In 2021, the licensee initiated the first actions with a view to its renewal by the aforementioned date, which will involve the performance of a periodic safety review of the facility, as a result of which the strengths and improvement proposals considered appropriate will be identified and submitted to the CSN.

In the area of actions following the Fukushima accident, the plant has made progress in complying with the requirements established in the CTI for updating the seismic characterisation of the site, which the licensee is carrying out according to the established deadlines, and which has been completed in the current year 2022. With this action, the licensee completed compliance with the requirements established by the CSN in the CTIs issued following the Fukushima accident.

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 2016-2018 period, 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 assessment phase.

Likewise, the Operating Licence requires the systematic analysis of both subjective 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 appraisal 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 CTI issued following the Fukushima accident, except the requirements established in the CTI 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

Update

In 2020, the renewal of the Operating Licence of the Vandellós II nuclear power plant was granted.

As a result of the analysis performed for the renewal of the Operating Licence, the licensee has identified 112 improvement opportunities, of which none has been classified as being of high importance for safety, 9 are considered to be of medium importance, 64 of low importance and 39 of very low importance, and the licensee has developed programmes and action plans for the implementation of these proposals.

In the area of actions following the Fukushima accident, the plant has made progress in complying with the requirements established in the CTI for updating the seismic characterisation of the site, which the licensee is carrying out according to the established deadlines, and which has been completed in the current year 2022. With this action, the licensee completed compliance with the requirements established by the CSN in the CTIs issued following the Fukushima accident.

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 (*Centro Nuclear Santa María de Garoña*, 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 established in Article 28 of the Regulation on Nuclear and Radioactive Facilities, approved by Spanish Royal Decree 1836/1999, of 3rd December (RINR), which allows this renewal to be requested as soon as the declaration of cessation is made, provided that it did not take place for reasons of nuclear safety and radiation protection. The CSN issued

Technical Instruction CSN/CTI/SG/SMG/14/01, containing requirements and establishing a period for the submission of documents in support of the licensee's request.

During the 2016-2018 period, the CSN assessed 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 appraisal 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 CTI issued by the CSN associated with said cessation order.

During the period 2019-2021, the licensee reported 3 events classified as level 0 on the INES Scale, with the exception of an event of execution of a manoeuvre on the reloading crane in conditions not allowed by the technical specifications for shutdown in April 2021, classified as level 1.

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 (*Long-Term Operation*) within the authorised period shall 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 Operating Licences 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 (NSR), 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 NSR 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 appraised 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.

Update

Consistent with the National Integrated Energy and Climate Plan 2021-2030 (PNIEC), in March 2019 a protocol of intentions was signed between the National Radioactive Waste Company (ENRESA) and the companies which own the nuclear power plants, which established the following dates for the definitive cessation of operation:

Almaraz I	Nov-2027
Almaraz II	Oct-2028
Ascó I	Oct-2030
Cofrentes	Nov-2030
Ascó II	Sep-2032
Vandellós II	Feb-2035
Trillo	May-2035

In accordance with this schedule, and applying the process of Periodic Safety Reviews and renewal requests described above, the licensees of the Almaraz and Cofrentes plants requested and obtained in July 2020 and March 2021, respectively, the renewal of their Operating Permits, up to the dates indicated in the table.

The licensee of the Vandellós II plant requested the renewal of its authorisation for a new 10-year period, until July 2030. This was granted in July 2020. Therefore, an additional renewal for a period of slightly less than 5 years will be necessary to reach the expected date of cessation of operations.

The licensee of the Ascó plant requested the renewal of its Permit for a period of 9 years for Unit 1 (until October 2030, the date of definitive shutdown) and for 10 years for Unit 2 (until October 2031). These renewals were granted in September 2021. This will require an additional renovation for Unit 2 for a little less than 1 year to reach its planned closure date of September 2032.

Finally, for the Trillo plant, in November 2021, the competent Ministry modified the order containing the current operating authorisation so that the renewal application may be submitted before March 31, 2023, coinciding with the submission of the Periodic Safety Review. In November 2021, the plant owner submitted the supporting documentation for the LTO and in December 2021 submitted the PSR Base Document, the activities of which are currently underway.

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 2016-2018 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 CTIs. 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 ongoing safety review programmes, among which the PSR and NAC should be highlighted.

APPENDIX 6

Basic characteristics of the Spanish nuclear power plants

Basic characteristics of the nuclear power plants

	Almaraz	**Ascó**	**Vandellós II**	**Trillo**	**Santa María de Garoña**[3]	**Cofrentes**
Type	PWR	PWR	PWR	PWR	BWR	BWR
Number of units	2	2	1	1	1	1
Heating capacity	Unit I: 2,947	UI: 2,940.6	2,940.6	3,010	1,381	3,237
(MW)	Unit II: 2,947	UII: 2,940.6				
Electrical power (MW)	UI: 1,049.43	UI: 1,032.5	1,087.1	1,066	466	1,092.02
	UII: 1,044.45	UII: 1,027.2				
Cooling	Open: Arrocampo reservoir	Mixed: Ebro River — Torres	Open: Mediterranean Sea	Closed: towers, Tagus River contribution	Open: Ebro River	Closed: towers, Júcar River contribution
Prior Authorisation	UI: 29/10/1971	UI: 21/04/1972	27/02/1976	04/09/1975	08/08/1963	13/11/1972
	UII: 23/05/1972	UII: 21/04/1972				
Construction permit	UI: 02/07/1973	UI: 16/05/1974	29/12/1980	17/08/1979	02/05/1966	09/09/1975
	UII: 02/07/1973	UII: 07/03/1975				
Commissioning authorisation	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: 23/07/2020	UI: 27/09/2021	23/07/2020	17/11/2014		20/03/2021
		UII: 27/09/2021				

3 In a situation of definitive cessation of operations since August 2017.

Article 7. Legislative and regulatory framework

7.1. Establishment and maintenance of the legislative and regulatory framework

7.1.1. Overview of the main 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 a sanctioning 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 regarding 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 Facilities) 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 shall 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.

Update

With regard to nuclear safety, during the period from January 2019 to December 2021, the following laws affecting nuclear safety matters were officially approved and published:

Law 7/2021, of May 20, on climate change and energy transition.

This law has the following objectives: to ensure Spain's compliance with the objectives of the 2015 Paris Agreement on climate change, to facilitate the decarbonisation of the Spanish economy and its transition to a circular model in a way that guarantees the rational and supportive use of resources, to promote adaptation to the impacts of climate change and the implementation of a sustainable development model that generates decent employment and contributes to the reduction of inequalities.

As regards the repercussions for the CSN, it should be pointed out as a new change that article 10 of the Law prevents the granting and extension of permits for exploration, research or direct concessions for the exploitation of radioactive minerals and radioactive facilities of the nuclear fuel cycle for their processing; this means that a report from the CSN will not be required in this respect. The ninth final provision adds a new paragraph to Section 1 of Article 38 of Law 25/1964, April 29th regarding Nuclear Energy, with a view to considering public works of general interest to be those which are carried out in execution of the General Radioactive Waste Plan approved by the Government and which, with a charge to the Fund for their financing, must be carried out by ENRESA itself or through third parties.

Law 12/2011, of May 27, regarding civil liability for nuclear damage or damage caused by radioactive materials.

Entry into force on 1 January 2022, as a result of the provisions of its seventh final provision, which made the enactment of this Act conditional upon the entry into force in Spain of the Protocol of 12 February 2004 amending the Convention on Civil Liability for Nuclear Damage (Paris Convention) and the Protocol of 12 February 2004 amending the Convention supplementing the former (Brussels Convention). These Protocols were formally ratified, entering into force on January 1, 2022.

The main purpose of this Law is to regulate nuclear civil liability in accordance with the aforementioned international conventions, which is complemented with the establishment of a specific civil liability regime for damages that may be caused by accidents involving radioactive materials other than nuclear substances.

Royal Decree-Law 36/2020, of December 30, which approves urgent measures for the modernisation of the Public Administration and for the execution of the Recovery, Transformation and Resilience Plan.

It affects Law 21/2013, of December 9, 2013, on Environmental Assessment, insofar as it extends and cuts, depending on the procedures, various deadlines in the ordinary strategic envi-

ronmental assessment and in the environmental assessment of projects, referring, among others, to consultations with the affected public administrations and interested persons.

7.1.2. Ratification of 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 NSR 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 CSN instructions and some modification to the RINR.

Subsequently, and after the 2011 accident in Fukushima, WENRA published a new list of reference levels in September 2014 modifying 101 of the previous ones and incorporating new editions, adding a total of 342 RLs distributed across 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 RLs, 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 2016-2018 period. In general, it may be said that the incorporation of the revised RLs 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 CTIs (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 RLs, dated 31st December 2018, states that 6 of the 101 RLs 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.

Update

In the latest report issued by Spain on the degree of compliance with the WENRA reference levels in January 2022, it is noted that eight reference levels are still pending implementation in the Spanish regulatory framework. The status of implementation of these levels is shown below:

a) Six reference levels referring to *issue J* on operating experience are pending incorporation into the Spanish regulatory framework through the preparation of a CSN Instruction (CI) or a

Complementary Technical Instruction (CTI) from the CSN Plenary. The current draft IS or CTI is expected to be approved in 2022. With their incorporation into the regulatory framework, compliance with these reference levels will be formalised, although in practice the CSN has implemented a system for supervision of the operating experience of the nuclear power plants that includes the requirements of the reference levels.

b) Reference level O 1.4 of *issue O* on probabilistic safety analysis (PSA) refers to the need to include "mission times" in PSAs. This circumstance is common to several countries and, as reflected in the results report of the last WENRA peer review, published in 2018, it is not necessary to immediately revise the board's instruction on criteria and requirements for the performance of probabilistic safety analyses and their applications to respond to this level, since implicitly it does require considering different mission times in PSAs, leaving its explicit incorporation pending for a subsequent revision of the same.

c) The reference level T.4 of the former *issue T* on natural hazards (currently reference level 4.2 of *issue TU* "external hazards") is pending incorporation into the Spanish regulatory framework. Specifically, the objective values of: design basis event exceedance frequency, which should exceed 10^{-4} /year, and the minimum acceleration value of 0.1 g of PGA ("peak ground acceleration") are pending inclusion.

The CSN has drawn up an initial revision of the Site CSN Instruction, which includes requirements relating to off-site risks and, specifically, the aforementioned target values. This draft instruction has gone through several steps of the administrative procedure (hearing and public information and internal comments) and is expected to be approved in 2022.

7.1.4. Challenge 2. Updating of legislation on nuclear safety, radiation protection and emergencies

In the 2016-2018 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 2021, 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.

Update:

With regard to the period from January 2019 to December 2021, it is worth mentioning the approval of the following two provisions in the field of radiation protection and emergencies:

Royal Decree 451/2020, of March 10, on the control and recovery of orphan radioactive sources

Generically, "orphan source" is any radioactive source that is not under regulatory control, either because it has never been under regulatory control, or because it has been abandoned, lost, misplaced, stolen or transferred without proper authorisation.

The purpose of this Royal Decree is to avoid, or at least reduce as far as possible, the exposure of workers and members of the public to ionising radiation, as well as the contamination of the environment, as a consequence of the existence of orphan sources. Following the detection of an orphan source, the actions to be carried out are aimed at the removal of the material by ENRESA. This removal will require a specific authorisation from MITERD, following a report from the CSN, in accordance with the provisions of Article 74 of the Regulation on nuclear and radioactive facilities, approved by Royal Decree 1836/1999, and Article 13 of the aforementioned Royal Decree 451/2020.

Royal Decree 586/2020, of June 23, regarding mandatory information in the event of a nuclear or radiological emergency.

The purpose of this Royal Decree is to establish the standards and procedures for information on prevention and protection measures applicable, together with other relevant information, to the population that could be affected, and to those that are actually affected, in the event of a nuclear or radiological emergency; to the intervention personnel of the external response level nuclear emergency plans and of the special civil protection plans for radiological risk; and to the European Union, its Member States, third countries and other international organisations.

Furthermore, the two aforementioned regulations partially transpose into Spanish law Council Directive 2013/59/EURATOM of 5 December 2013 establishing basic safety standards for protection against the dangers arising from exposure to ionising radiation.

7.2. National requirements and nuclear safety 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 decommissioning.

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 shall 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 shall 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, on basic nuclear safety requirements applicable to nuclear facilities), thereby creating a unified text within the remit of Spanish Royal Decrees.

Update

Between January 2019 and December 2021, one Ministerial Order and three Royal Decrees have been approved that have an impact on the field of nuclear safety

Order PC/488/2019, of April 26, publishing the National Civil Protection Strategy, approved by the National Security Council

This includes, among all potential risks, nuclear and radiological risks from nuclear and radioactive facilities, as well as those that may occur in other types of infrastructures such as airports, seaports or metal recycling facilities. In order to mitigate and manage these risks, the existing regulatory instruments are listed, such as the PLABEN (Basic Nuclear Emergency Plan) and the Nuclear Emergency Plans outside Nuclear Power Plants, among others.

Royal Decree 601/2019, of October 18, on justification and optimisation of the use of ionising radiation for the radiological protection of persons on the occasion of medical exposures

This Royal Decree repeals the previous 2001 Royal Decree on the matter, and is enacted as a consequence of Council Directive 2013/59/EURATOM of December 5. Special emphasis is placed on the conditions and requirements of the information that professionals shall provide to patients about the benefits and risks of the radiation dose, as well as the obligation of the patient, prior to exposure, to provide the professional with any relevant information about his or her physical condition or health. The conditions for the application of the general principle of optimising radiation protection of persons undergoing medical-radiological procedures are defined and characterised. It includes a section on specific training in radiation protection for the professionals involved, as well as accidental and unintentional exposures.

Royal Decree 451/2020, of March 10, on the control and recovery of orphan radioactive sources

Its purpose is to partially incorporate into our legal system Council Directive 2013/59/EURATOM, of December 5, 2013, as regards the actions to be carried out for the detection, control and management of orphan sources, actions that were included in several previous Protocols signed by the CSN as Megaport.

The purpose of these regulations is to avoid, or at least reduce as much as possible, the exposure of workers and members of the public to ionising radiation and the contamination of the environment as a result of the existence of orphan sources, especially in facilities for the recovery, storage or handling of metallic materials for recycling. Also covered are seaports of general interest or other important places of transit of persons or goods, as well as companies or persons in possession of sources that are not subject to regulatory control. Other circumstances in which orphan sources may be found as a result of possible abandonment, loss, misplacement or theft are also taken into account.

The measures, monitoring and control requirements, and procedures for action in the event of detection or processing of sources, to be adopted in facilities for the recovery, storage or handling of metallic materials for recycling, are established, and it is compulsory to register them in a registry at the Ministry for Ecological Transition and the Demographic Challenge.

Royal Decree 586/2020, of June 23, regarding mandatory information in the event of a nuclear or radiological emergency

Its objective is to transpose into Spanish law that which Council Directive 2013/59/EURATOM, of December 5, 2013 stipulates in this regard. In addition to the content of the prior information to be provided to the population that could be affected in the event of a nuclear or radiological emergency, it includes the content of the information to be provided to the population actually affected by the emergency, to the population in general, to the intervention personnel assigned to the external response level nuclear emergency plans and to the special civil protection plans for radiological risk, to the European Union, to other international organisations and to Member States and third countries that could be affected by a nuclear or radiological emergency occurring in Spanish territory.

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

During the 2016-2018 period, the CSN 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 shall 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 Council 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 CSN 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 (SSCs) "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 ESCs does not imply that safety-relevant ESCs no longer have regulatory requirements; rather, it means that IS-26 (on Basic Nuclear Safety Requirements Applicable to Nuclear Facilities) 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 Structures, Systems and Components (SSC) 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.

Update

IS-11, Revision 1, of January 30, 2019, of the Nuclear Safety Council, on licensing of nuclear power plant operating personnel (Official Spanish State Bulletin of February 15, 2019)

Since its publication in 2007, it was deemed advisable to revise it in order to introduce the express requirement of Systematic Training Design, in line with recognised international standards to guarantee the qualification of plant personnel. Improvements have also been made to the conditions of active tenure for holders of nuclear power plant operator or supervisor licences, and recovery in the event of their loss.

IS-43, of 20th March 2019, of the Nuclear Safety Council, establishing the criteria for the notification of events relating to the physical safety of nuclear power plants (Official Spanish State Bulletin 04 April 2019)

It establishes the criteria for requiring the licensees of nuclear power plants, whether they be in operation or shutdown while storing nuclear fuel, to report events that may have a bearing on the safety of a nuclear facility. Safety-related event reporting was excluded from IS-10 of July 30, 2014, which regulates the (general) criteria for event reporting to the Council by nuclear power plants.

IS-44, of February 26, 2020, of the Nuclear Safety Council, on requirements for planning, preparedness and response to emergencies at nuclear facilities (Official Spanish State Bulletin of March 12, 2020)

This Instruction establishes the requirements that shall be met by the licensees of nuclear facilities in order to manage nuclear emergencies at the site response level (included in the Site Emergency Plan). The principal means of preventing and mitigating the consequences of accidents at nuclear power plants is the principle of "defence in depth", which consists of establishing a series of consecutive and independent levels of protection referring both to the design and construction and to the operation of the plants, to ensure that no single technical, human or organisational failure can give rise to harmful effects on the health of the population and the environment, and that combinations of failures that could cause significant harmful effects are extremely improbable.

IS-45, dated November 17th 2021, from the Spanish Nuclear Safety Council, regarding safety requirements during the design, construction and operation phases of nuclear and radioactive facilities of the nuclear fuel cycle, to provide for their decommissioning and, where appropriate, their dismantling and closure (Official Spanish State Bulletin dated 19 January 2022)

It develops the common requirements or reference levels established by WENRA (Western European Nuclear Regulators Associations) to harmonise regulation in this area. It determines the design criteria and requirements to provide for the safe decommissioning of the facilities and which are applicable during the period of the prior authorisation, construction and operation of the facilities, including the period of cessation of operation. In order to comply, the licensee shall liaise with the organisation responsible for the future dismantling to establish a strategy compatible with the General Radioactive Waste Plan, and draw up a Preliminary Decommissioning Plan

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 2016-2018 period, 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 Facilities involved in the Nuclear Fuel Cycle". Adopted by the Plenary 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 Plenary 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 licence 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 Plenary 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 CSN 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 Plenary 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 CTI 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 CSN 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 Reports for transport packages not subject to approval". Adopted by the Council Plenary on 14 June 2017.

This Guide determines the requirements applicable to the content of the regulatory compliance documentation and facilitates the preparation of Safety Reports for packages not subject to design approval, developing the requirements of CSN 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.

Update

GS-10.10 (Rev.1) "Qualification and certification of personnel performing non-destructive tests". Adopted by the Council Plenary on 19 February 2020.

This Revision of the Guide has been approved to facilitate compliance with the legislation in force as regards the increase in the level of demand of the criteria on which the qualification and certification of the technical personnel performing non-destructive testing (NDT) on certain components important for the safety of Spanish nuclear facilities, which are detailed in the Guide, shall be based. The requirements for the training and qualification of this personnel are developed in several international and Spanish standards, including the UNE-EN-ISO 9712 Standard dated November 2012 and entitled "Qualification and certification of personnel performing non-destructive testing", which, together with the ASME code, constitutes a reference for this Guide.

GS-05.09 (Rev. 1) "Authorisation and registration documentation for companies selling X-ray equipment and associated technical support services." Adopted by the Council Plenary on 27 October 2021.

This revision gathers regulatory experience since this guide was published in 1998 and aims to identify activities that require authorisation as an X-ray equipment sales and technical assistance company for medical diagnostic purposes, describe its authorisation process, define the documentation that shall be submitted to support the application and provide guidelines to facilitate preparation of the same, to note the obligations that authorisation entails and to provide support in preparing the annual report on the activities of this type of company.

GS-06.05 (Rev.1) "Guide to assist in the application of regulatory requirements on the transport of radioactive material, updated according to ADR 2021 (Agreement on the International Carriage of Dangerous Goods by Road)". Adopted by the Council Plenary on 16 June 2021

This Safety Guide focuses on the transport of radioactive materials by road in ADR contracting countries and applies to designers and manufacturers of radioactive materials and the packaging used for their transport and to shippers, carriers and receivers of radioactive packages. However, it can also be useful for determining those requirements in terms of air, sea and rail transport that are not directly related to the mode of transport, such as those relating to the design of

packages and their preparation for transport, since in all cases they come from the Regulations of the International Atomic Energy Agency (IAEA) regarding the safe transport of radioactive material.

GS 01.04 (Rev. 1) "Control and monitoring of liquid and gaseous radioactive effluents emitted by nuclear centres". Adopted by the Council Plenary on 24 November 2021.

This revision is the result of changes in the applicable legislation in this area, both at national and European level (Directive 2013/59/EURATOM). The purpose of this guide is to establish a series of recommendations for the design and implementation of monitoring and control programmes for the discharge of liquid and gaseous radioactive effluents from nuclear power plants to the environment through discharge pathways. To this end, the project objectives and operating criteria for the monitoring and control systems are established in accordance with the Technical Specifications (TS) and the Outdoor Dose Calculation Manual (MCDE, Manual de Cálculo de Dosis en el Exterior).

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. Licensing system

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

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 Facilities), 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. Prior or site authorisation

c. Construction permit.

d. Operating permit.

e. Modification authorisation.

f. Authorisation of execution and assembly of the modification.

g. Authorisation for dismantling.

h. Dismantling and decommissioning permit.

In addition, the following should be authorised:

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

j. Change of nuclear facility ownership.

These authorisations are granted by the current Ministry for Ecological Transition and the Demographic Challenge, 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 shall 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 Facilities (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.

Update

— **Spanish Royal Decree 586/2020, of June 23rd, regarding mandatory information in the event of a nuclear or radiological emergency:** prior information to be provided to the population that could be affected in the event of a nuclear or radiological emergency, to the general public, to the intervention personnel assigned to the external response level nuclear emergency plans and to the special civil protection plans for radiological risk, to the European Union, to other international organisations and to Member States and third countries

— **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 facilities 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. Regulatory system associated with the inspection and sanctioning process Basic features of inspection programmes

The inspection programmes are part of the CSN's supervision and control process, which materialise in the inspections that allow verification that the operation and functioning of the facilities and activities are in accordance with the applicable legislation in force, the CSN's instructions and the specific conditions imposed in the regulatory authorisations, licences or permits.

The Integrated Plant Supervision System (SISC) is the basic tool of the CSN, and has been used for over fifteen years to supervise the operation of operating Spanish nuclear power plants and establish the corrective or other actions applicable, depending on its results. The SISC is based on the US NRC Reactor Oversight Programme (ROP).

The development in 2013 of the SISC cross-cutting organisational and human factors elements programme of inspection findings and systematic inspections on safety culture in nuclear power plant operating organisations were considered an area of good performance as a result of the 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: this ensures and supports implementation of facility authorisation processes in accordance with the requirements of the regulations on nuclear safety and radiation protection.

— Monitoring: These confirm and guarantee that the facilities operate in accordance with the requirements supported by the corresponding authorisation. These may be systematic (periodic) control inspections aimed at checking the operating conditions of the facility, or possible control inspections without an established periodicity.— Special inspections: these cover the inspection functions attributed to the CSN, different from the previous ones, which require the performance of an inspection in order to gain in-depth knowledge of something that has occurred: these arise as a result of incidents, exceptional situations of intervention in the event of radiological emergencies, complaints, etc.

Update

In the SISC, the information comes from both the Performance Indicators, which characterise the operation of the plant by means of numerical data, and from the Inspection Programme Findings.

The Inspection Programme consists of observations, measurements, examinations or direct tests, the purpose of which is to assess the condition of the structures, systems, components and materials of the facility as well as the operating activities, processes and procedures and the competence of the personnel, making it possible to verify compliance with standards, good practices or documented commitments and, ultimately, that the facility is operating safely. Non-compliance issues are referred to as inspection findings and are categorised according to

their safety significance, based on procedures for determining the safety significance of findings.

The collection of systematic, procedural and periodic control inspections is structured in the Nuclear Power Plant Basic Inspection Programme (BIP), which is completed every two years and whose execution is planned in the Annual Work Plan (AWP).

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 three strategic areas that characterise the safety of a nuclear power plant contemplated by the SISC are nuclear safety, radiation protection, and security, which are developed on the seven pillars of safety corresponding to initiating events, reactor core damage mitigation systems, integrity of protective barriers, emergency preparedness, occupational radiation protection of workers, radiation protection of the public, and physical safety.

Furthermore, the SISC 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 Plenary 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 was declared closed down, 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 indicator	0	0
2019	Findings 117	1 indicator	0	0
2020	Findings 86	0 indicator	0	0
2021	Findings 147	1 indicator	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
2019	LR	LR	LR	LR	RR	LR	RR
2020	LR	LR	LR	LR	LR	LR	LR
2021	LR	RR	LR	LR	RR	LR	LR
2021	RT	RR	RT	RT	RR	RT	RT

Meaning of codes used in the table:
(**) LR, Licensee Response. A plant is in this column when all assessment 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[3] for the first three quarters, due to a "white" indicator associated with an 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 assessed the safety impact of a component which had aged beyond its useful life.

Update

During 2019, the nuclear power plants were in the normal situation, with Ascó II NPP continuing during the first quarter in the regulatory response column (RR) of the SISC, which was joined by Trillo NPP due to a finding categorised as white related to deficiencies during a drill in the application of protection measures in accordance with the category of the IEP and Vandellós II NPP in the third quarter of 2019, due to the fact that the indicator E1, Response to emergency situations and drills, of the Emergency Preparedness Pillar moved to the white colour band.

During 2020, except for CN Trillo, which in the first quarter was in regulatory response (RR) status. All plants were placed and ended the year in the licensee response column of the action matrix, because all performance indicators were in the "GREEN" colour band and the deviations found in the inspections were categorised as "minor" or "GREEN" findings.

During 2021 all the plants ended the year in the "Licensee Response" (LR) column of the SISC action matrix, except in the case of Almaraz II, which spent the last three quarters in "Regulatory Response (RR)" due to a white finding relating to a risk analysis concerning fire protection, since the calculation of the risk arising from a fire in area EL-11 of unit II did not contemplate all the risks, as it omitted the risk arising from a cable route that affects the safe shutdown capability and therefore affects the quantification of fire risk by the PSA in that fire area.

3 In a regulator response (RR) situation, the operator shall conduct an analysis to determine the root cause and contributing factors and include all steps necessary to address the deficiencies in its corrective action programme. The analysis will be subject to a supplementary inspection by the CSN, following which the CSN will meet with the licensee to confirm the effectiveness of the actions.

Penalty proceedings and warnings

The SISC allows the sanctioning 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 a sanctioning file processed by the Ministry for the Ecological Transition and the Demographic Challenge at the request of the CSN.

Penalty proceedings and warnings in 2016

- The head 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 OTF non-compliance during a boron dilution incident at the reloading stage.
- The licensee of Cofrentes NPP was warned for failing to meet the deadline established in the CSN's CTI for validating the procedures associated with the instrumentation implemented in the spent fuel pool.

Penalty proceedings and warnings in 2017

- The licensee of the Ascó NPP received a warning for non-compliance with an Operating Licence condition relating to the management and control of radioactive wastes.
- 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 a sanctioning file against NPP Vandellós II for non-compliance with CSN Instruction IS-30 and the OTFs. Likewise, the CSN cautioned the plant for non-compliance with CSN Instruction IS-30 and the post-Fukushima adapted CTI, as regards protection requirements against large fires.

Penalty proceedings and warnings in 2018

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

- NPP Almaraz received four warnings:

Non-compliance during performance of the OTF 3.9.7.2 containment enclosure sprinkler system surveillance test.

Non-compliance with CSN Instruction IS-32 of the Nuclear Safety Council during the performance of a surveillance test.

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 a sanctioning 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 OTF, 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

Update

Penalty proceedings and warnings in 2019

The CSN proposed the opening of disciplinary proceedings against the licensee of the Almaraz NPP for non-compliance with CSN Instruction IS-30, relating to the use of the PCI system for the containment sprinklers, and issued a total of 9 CSN warnings to:

- Ascó, which received two warnings, one for non-compliance with IS-21 and the Plant Quality Assurance Manual, due to the implementation of design modifications through work orders, and the second for non-compliance with CSN instructions IS-32, IS-21 and IS-10, due to not accounting for the uncertainty of the flow measurement of the technological safeguard service water system pumps in the acceptance criteria of Surveillance Procedures PV-105A/B/C/D.
- Cofrentes, which received two warnings, one for non-compliance with IS-21, due to the failure to open an anomalous condition in the absence of pressure and flow measurements during the execution of the ASME OM tests of the diesel oil transfer pumps, and the second for non-compliance with CSN instruction IS-21, due to the failure to open an anomalous condition in a situation of reduced reliability of the valves of the essential cooled water system.
- Vandellós II, which received two warnings, one for non-compliance with CSN Instructions IS-21 and IS-10, due to actions subsequent to the opening of a relief valve during plant start-up, and the second for non-compliance with CSN Instruction IS-32 on technical operating specifications.
- Almaraz. It received two warnings, one for non-compliance with CSN Instruction IS-23 on in-service inspection of nuclear power plants, and the second for non-compliance with Operating Technical Specification 3.9.12, for the fuel building ventilation system.
- Santa María de Garoña received a warning for non-compliance with the radioactive waste and spent fuel management plan regarding the radiological characterisation of waste materials

Penalty proceedings and warnings in 2020

In 2020 the CSN issued 3 warnings and 3 proposals for sanctions proceedings at the nuclear power plants:

- The CSN proposed the opening of a sanctioning proceeding to Almaraz NPP. Non-compliance with requirement b.5 of the Complementary Technical Instruction CTI No. 11 established in the letter of reference CSN-C-DSN-10-135, relating to fixed instrumentation for flow measurement in filtration systems.
- The CSN proposed the opening of a disciplinary proceeding involving the Ascó NPP. Non-compliance with the Quality Assurance Manual in relation to ventilation systems.
- The CSN proposed the opening of a disciplinary proceeding regarding Santa María Garoña NPP.Non-compliance with the Radiation Protection at Standstill Manual, regarding the responsibilities of the licensee within the ALARA programme.
- Ascó NPP: Warning for non-compliance with Operating Technical Specification 3/4.6.1.7 “Structural integrity of the containment”, and a second warning for non-compliance with the Radioactive Waste and Spent Fuel Management Plan (RW&SFMP).

- Vandellós II: Warning for non-compliance with the Radioactive Waste and Spent Fuel Management Plan (PGRR and CG) and Complementary Technical Instruction No. 4 associated with the operating permit.

Penalty proceedings and warnings in 2021

In 2021, the CSN did not propose opening any disciplinary proceedings against a Spanish nuclear power plant, but did issue the following warnings to licensees of nuclear power plants:

- Almaraz NPP. Warning for non-compliance with article 3.2.2 of CSN Instruction IS-30 on fire protection
- Almaraz NPP. Warning for non-compliance with section A1 of point 5 of CSN Instruction IS-10, relating to criteria for reporting events to the CSN by the nuclear power plants. Fraudulent documentation of Yokogawa recorders
- Ascó NPP. Warning for non-compliance with condition 3 of the operating permits for units I and II
- Trillo NPP: Warning for non-compliance with administrative rule 6.2.2.h of the FTS, on criteria to prevent shift personnel from working excessive working hours
- Trillo NPP: Warning for non-compliance with Article 6.2. of the Nuclear Safety Council Instruction IS-20 of January 28, 2009, which establishes the safety requirements for spent fuel storage casks
- Trillo NPP: Warning for non-compliance with Article 9 of CSN Instruction IS-21 on requirements applicable to modifications at nuclear power plants
- Vandellós II NPP Warning for non-compliance with article five of CSN Instruction IS-21 on requirements applicable to modifications at nuclear power plants and with article 4.4 of CSN Instruction IS-10 on nuclear power plant event notification criteria. Actions associated with the RCS pressure drop transient below the OTFs limit
- Vandellós II NPP Warning for non-compliance with article 7.2 of CSN Instruction IS-21 on requirements applicable to modifications at nuclear power plants
- Santa María de Garoña NPP. Warning for non-compliance with the Technical Specification at Shutdown (TSS) 3.7.15

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 sanctioning proceedings it deems pertinent and impose warnings.

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

Update

During the 2019-2021 period, with reference exclusively to nuclear power plants, the CSN issued a total of 29 warnings and 6 proposals for the opening of sanctioning 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.

The MITERD (Ministerio para la Transición Ecológica y el Reto Demográfico, the Ministry for Ecological Transition and the Demographic Challenge) is the Department of the General Administration of the Spanish 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 Spanish State's sole competent body in relation to nuclear safety and radiation protection. It is a Public Law Entity independent of the General Spanish State Administration, which reports on the development of its activities to the Parliament and relates to the Government through the MITERD.

8.1.1. Roles and Responsibilities of the Ministry for Ecological Transition and the Demographic Challenge

In accordance with Spanish Royal Decree 500/2020, of 28th April, the MITERD exercises the following functions within the scope of the Convention on Nuclear Safety:

- Granting of authorisations for nuclear and radioactive facilities,[4] 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 sanctioning 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 500/2020 develops the basic organic structure of the MITERD. Within this Ministry, the Secretary of State for Energy is the highest energy body, and within this, the Directorate-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 which are specifically applicable to the field of nuclear energy.

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

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

The MITERD, through the Sub-Directorate General for Nuclear Energy, participates in the coordination of some 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 115 members and 18 collaborating entities. The following are represented on its Management Board: the MITERD, through the General Sub-Directorate for Nuclear Energy, the CSN, the Ministry of Science and Innovation, the Center for Energy, Environmental and Technological Research (Ciemat), Universities and representatives of companies linked to the nuclear power industry.

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

8.1.1.c) Participation in international organisations and activities

The MITERD, 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 MITERD 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, MITERD 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 MITERD forms part of the Spanish Delegation to the Agency's General Conference.

Likewise, the MITERD 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 MITERD 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 sanctioning 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 appraisal of new designs, methodologies, simulation models or verification protocols related to nuclear safety and radiation protection.

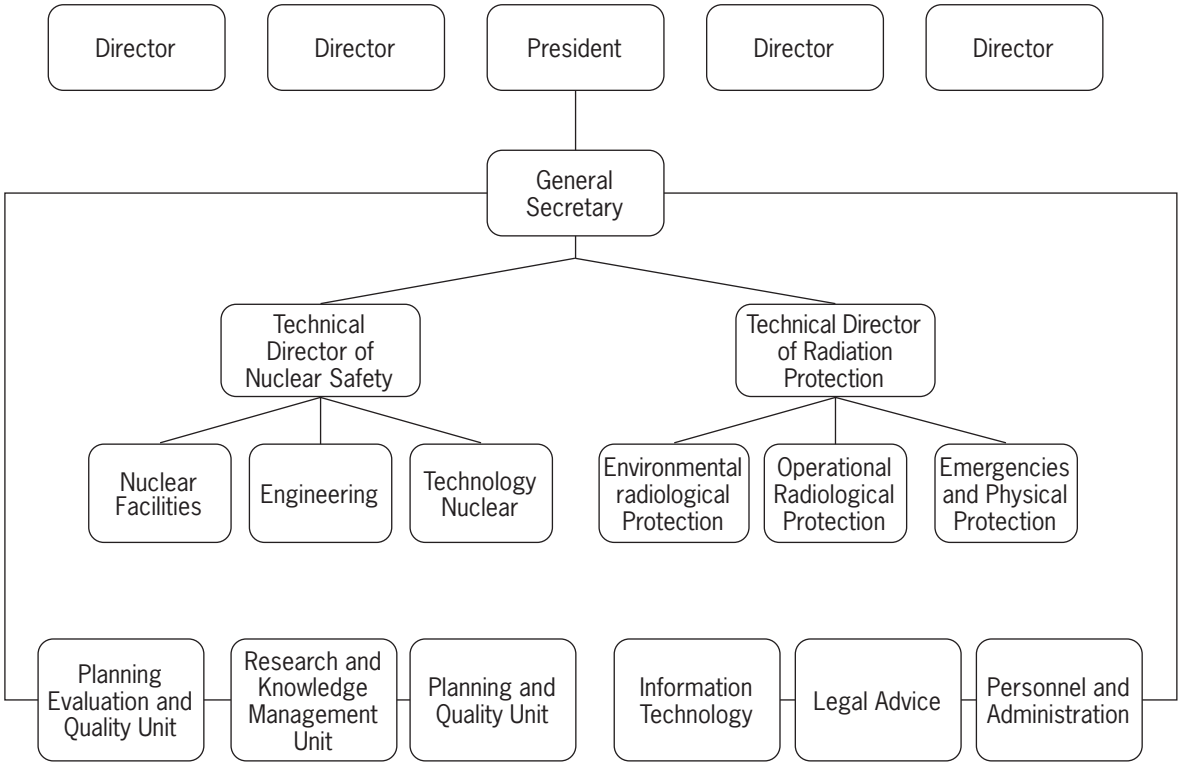
— To grant and renew operator and supervisor licences and Head of Radiation Protection Service diplomas.

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: Organizational chart of the CSN



CSN Plenary Session

In accordance with the Law that created the Nuclear Safety Council and its statute, the Plenary of the 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

— Commissioner: Fernando Castelló Boronat, appointed on 22 February 2013 by Spanish Royal Decree 139/2013

— Commissioner: Jorge Fabra Utray , appointed on 7 December 2017 by Spanish Royal Decree 1028-2017

— Commissioner: Javier Dies Llovera, appointed on 16 October 2015 by Spanish Royal Decree 934/2015

The Plenary Session of the Board is assisted by a Secretary General, Manuel Rodríguez Martí, appointed by Spanish Royal Decree 280/2017, of 17 March.

Update

In the period from August 2019 to December 2021, the Plenary of the Board consisted of the following persons:

— President: Mr. Josep María Serena i Sender, appointed on 29 March 2019 by Spanish Royal Decree 227/2019

— Commissioner: Mr. Javier Dies Llovera, appointed on 16 October 2015 by Spanish Royal Decree 934/2015

— Commissioner: Ms Pilar Lucio, appointed on 29 March 2019 by Spanish Royal Decree 229/2019

— Commissioner: Ms Elvira Romera Gutiérrez, appointed on 29 March 2019 by Spanish Royal Decree 230/2019

— Commissioner: Mr. Francisco Miguel Castejón Magaña, appointed on 29 March 2019 by Spanish Royal Decree 228/2019

The Plenary Session of the Board is assisted by a Secretary General, Manuel Rodríguez Martí, appointed by Spanish Royal Decree 280/2017, of 17 March.

Units reporting directly to the Secretary General

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, Assessment and Quality Unit.

Technical Directorate of 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 Facilities.
- 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 during the last three years.

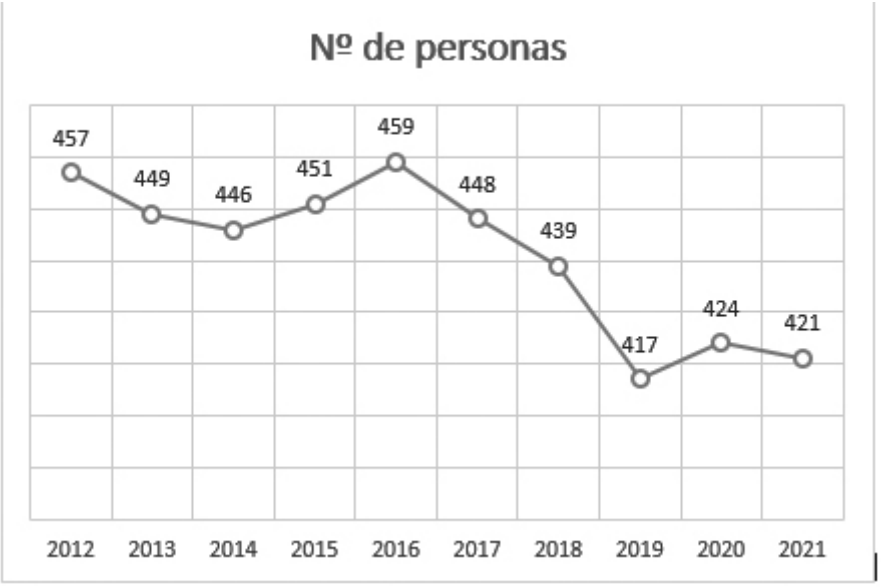
As of December 31, 2021,the CSN personnel staff was made up of 421 persons

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

	Council	General Secretary	Technical Directorates	Total
Senior Roles	5	1	1	7
N.S. And R.P. Body Functionaries	10	18	192	220
Officers of other Bodies or Ranks	4	84	29	117
Occasional Staff	25	0	0	25
Labour Personnel	2	35	15	52
Total	**49**	**135**	**237**	**421**

The evolution of the CSN personnel over the last ten years is shown in the following chart

Evolution of the number of workers at the CSN in the 2012-2021 period



The number of women represents 51.07% of the total staff and the number of men represents the remaining 48.93%.

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

As of 31 December 2018, the staff comprised 306 advanced graduates, 26 undergraduates and 89 people with other qualifications.

Spanish Royal Decree 936/2020of October 27th approved the public employment offer for that year for that year, offering 25 positions.

Update

In recent years, the Board has implemented a strategy aimed at recruiting new human resources, mainly for its technical staff, in order to prevent the loss of knowledge associated with the retirement process of senior personnel. Given that the personnel that make up the technical staff of the CSN are civil servants, the recruitment process has been carried out by increasing the number of positions offered through the public employment offers in the period of 2017 to 2021.

8.1.2.c) Measures to develop and maintain competition

Due to its specific characteristics, the CSN attaches special importance to the training of its human resources, and the training plans have continued to be drawn up in such a way that their objectives have been aligned with those of the CSN Strategic Plan in force at all times strategic Plan in force at any given time the training plans have been grouped into seven programmes, one of which is subdivided into four:

- 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.

Update

In 2020, 46 training activities were carried out and in 2021 the number of training activities was 92 courses, which represents a decrease with respect to the number of training activities carried out in the annual period, which was 340 courses. This decline in training activities was due to the impact of the pandemic caused by COVID-19. It has been observed that in the 2020-2021 period the number of activities conducted online has been 78% compared to 22% of activities carried out in person, all of which was a consequence of adaptation to the needs imposed by the health crisis caused by the COVID-19 pandemic

In relation to the planned budget for training in the 2019-2021 period, the same amount of 0609,780 has been maintained, with a different degree of execution being observed in the different years in accordance with the justification indicated above. Thus, in 2019 the execution percentage was 53.8%, in 2020 it was 48.43% and in 2021 it was 51.09%. It may be observed that the values existing in the years prior to the impact of the pandemic are recovering.

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 assessment and periodic review of the process (Assessment 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 technicians born prior to 1952. It was applied to 16 technicians, starting with a pilot phase for four technicians 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
- Approval 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, audiovisual pills), and knowledge products (series, transfer workshops, etc.).

In the 2020-2021 period, this same work strategy was maintained, with the development of 10 knowledge books and 7 audiovisual pills.

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 Plenary 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: knowledge maps, knowledge preservation, knowledge socialisation, organisational structure, IT tools, metrics and indicators, and organisational processes implemented at the CSN".

The Plenary 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.

Update

The software application used in the RECOR project for the preservation and maintenance of knowledge is based on a software application called KITE

KITE is a software package developed to maintain social networks based on the exchange and generation of knowledge. It allows CSN personnel to communicate in the context of communication channels related to thematic areas where an exchange of information is promoted and facilitated in coherence with the strategic lines of the organisation.

KITE has three main functions: management, socialisation and exploitation of available resources, allowing searches by thematic or knowledge areas.

The resources available through this computer application are available to all CSN personnel, but are not in the public domain.

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

Each year, the Plenary of the CSN draws up a budget proposal for expenses and revenues, which are integrated into the General Spanish State Budgets and the approval of which falls to the Parliament. From 2016 to 2021, the amounts approved by the General Courts were (in thousands of euros):

	Tax year 2016	Financial year 2017	Financial year 2018
Revenue budget	46,507.00	46,507.00	46,937.00
Expenditure budget	46,507.00	46,507.00	46,937.00

Update

	Tax year 2019	Financial year 2020	Financial year 2021
Revenue budget	46,937.00	46,937.00	46,998.00
Expenditure budget	46,937.00	46,937.00	46,998.00

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 MITERD.

— Inspection and control of operating nuclear and radioactive facilities and related activities.

— Granting of licences for 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.

Spanish 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 Spanish State Budgets, through MITERD 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, for the period of this report (2016-2021), approximately61% was allocated to cover staff costs, and 39% to 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 period of this report (2016-2021)the CSN has had no financial difficulties. 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 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 personnel.

8.1.2.f) CSN quality management system

In 2017 the Plenary 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 was aligned.

Update

On June 17, 2020, the CSN Plenary approved a new Strategic Plan for the 2020-2025 period. This new strategic plan provides an overall view of the CSN's responsibilities, establishes objectives and activities to achieve its strategic goals, and defines the key performance indicators (KPIs) that will allow the achievement of these objectives and activities by the organisation to be monitored and analysed.

The new Strategic Plan establishes two strategic goals; one focused on nuclear and radiological safety and the other focused on the achievement of sustainable development objectives. The strategic goal of sustainability is transversal and will be developed in all the processes that make up the CSN's management system.

The Strategic Plan is developed in plans and programmes, including the Annual Work Plan (AWP), which is approved by the Board Plenary and includes the main activities and the overall activities to be carried out during the year. In addition, for each strategic objective of the Strategic Plan, a series of performance indicators have been defined to monitor its progress and degree of fulfilment

The CSN has a process-oriented Management System based on the requirements of the IAEA (GS-R-3) and the ISO 9001 standard: 2008. The CSN is at a very advanced stage of revising the Management System Manual to adapt it to the GSR IAEA standard. 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.

Update

Additionally, an analysis of the integration of different management systems has been carried out: environmental and energy efficiency according to the ISO standards that develop them, concluding in the need to incorporate the aforementioned management systems in the CSN management system in a systematic approach and holistic vision. This implementation began in 2020, and an external consultant was hired to advise the CSN in this process, and the implementation plan is at a very advanced stage.

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 Spanish 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.

— Committees for information regarding 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 MITERD, 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 Council 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 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 shall 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. Likewise, the CSN actively participates in the ENSREG Working Group on Communication and Transparency.

Update

In 2020, the Nuclear Safety Council approved its current Strategic Plan for the period 2020-2025, which includes five strategic objectives. Strategic Objective 5 refers to improving the perception of the regulator's activity by citizens and stakeholders through rigour, truthfulness and reliability. Two main activities have been considered to achieve this goal: collaboration with national bodies, i.e., improving and promoting relations with the public institutions of the Spanish State and with stakeholders; and the improvement of credibility, openness and transparency, through the strengthening of the independence, transparency, credibility and confidence of the public in the CSN, the updating of the external Communication Plan to allow active communication with the public and stakeholders, the reinforcement of the activity of the Advisory Committee for information and public participation of the CSN, and the promotion through it of increased stakeholder participation in regulatory decisions and the performance of communication and dissemination activities on the CSN and its functions with the public in general.

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 Plenary.

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.

Since its creation and as of the closure of this document, a total of 22 meetings have been held, 12 of which have taken place between 2016 and 2021. 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.

Update

The current situation with respect to compliance, as of January 1, 2022, is that all the recommendations made by the Advisory Committee have been fulfilled and closed by the CSN with the exception of recommendation number 7 made in 2017 by said Committee where the CSN was requested to review the agency's publications containing the effective dose tables for medical radiodiagnostic imaging scans in the United Kingdom in the year 2000. This activity should be carried out within the scope of the Health Forum that the CSN maintains with the Professional Societies of Radiological Protection and Medical Physics so that it can again be the subject of a joint publication by all the institutions and professional societies that participated in the edition of the previous version. The delay in complying with this recommendation was due to the Ministry of Health's prioritisation of activities aimed at addressing the health crisis situation due to COVID-19 in the period between 2020 and 2022.

The following are in a state of completion:

8.1.2.(i) Challenge 1. Joint 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.

Update

Upon completion of the combined review mission carried out in 2018, the CSN Plenary approved an action plan with the aim of carrying out actions to respond to the recommendations and suggestions resulting from this mission by establishing an action strategy in the short, medium and long term

The monitoring and compliance with this action plan is carried out through the CSN's Information Security and Management System Committee, with monthly monitoring meetings being held with a view to identifying possible deviations from the planned actions and carrying out remedial or mitigating actions.

This action plan is not in the public domain, but it has been analysed jointly with the national entities and organisations involved in its execution, and there is a periodic exchange of information on the degree of progress in the achievement of its objectives

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 Plenary 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 personnel, 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 an assessment of the safety culture of the organisation.

In 2018, the CSN initiated the activities required for the development of an internal assessment regarding safety culture in the organisation. To this end, training activities were planned and implemented 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.

Update

This training action constituted 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 assessment process planned within its activities by the CSN, which will require the collaboration and participation of all CSN personnel.

At its meeting held on January 29, 2020, the CSN Plenary approved the contracting of an external support service entity for the development of the CSN safety culture assessment to be carried out in the years 2020-2021. The contracting of the external entity that has performed this service was carried out in September 2020

The methodology used in this project was the NOMAC methodology, which allows us to assess the most important operating processes of an organisation and to analyse the perceptions of its personnel in relation to the principles of safety culture.

This project was structured in four stages, as follows:

- Dissemination, training and methodological adaptation
- Functional and exploratory analysis
- Data acquisition
- Analysis and return of results

This assessment has included a documentary review and a process of interviews, focus groups and exploratory meetings with the different CSN organisational units, with a view to gaining knowledge of the organisation and collecting data that would allow the safety culture assessment to be carried out. The implementation process of this assessment has been impacted by the health crisis situation, so the activities that distinguish this type of process, such as interviews, focus groups or observations of the systematic activities of the agency were mostly conducted online, being met with a very positive response and a high willingness to participate on the part of the agency's staff

The contracted entity completed its analysis in October 2021, and the management of the organisation organised an informative seminar to communicate the results to the personnel of the organisation in a hybrid format, in person within the capacity of capacity and telematically, where the contracted entity presented the results obtained, exchanged information and solved all the doubts and clarifications expressed by the CSN personnel.

Upon completion of this assessment, the final report of which was issued by the contracted entity in December 2021, the agency's management has considered the need to establish and implement an action plan to address the results and recommendations of this process. In the preparation and implementation of an action plan, the CSN management has considered the suitability of having the support of an external company specialising in organisational change management and safety culture, for which purpose the necessary procedures have been initiated that will conclude with the contracting of an external entity with these characteristics in 2022. The management of the organisation has foreseen that this entity will assist the CSN in this process for a period of four years,

as the 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 agency's staff.

8.3. Coordination between the MITERD and the Nuclear Safety Council

In accordance with Spanish Royal Decree 864/2018 dated 13th July, the CSN interacts with the Government through the MITERD.

While the CSN is the Spanish State's sole competent body in relation to nuclear safety and radiation protection, the MITERD 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 MITERD 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. Sanctioning procedures in the event of infringements relating to nuclear safety, radiation protection and/or physical protection

The MITERD is the authority empowered to impose sanctions deriving from the sanctioning regime.

In general, the penalty regime applicable in Spain is established in Law 25/1964, of April 29, 1964, on Nuclear Energy; and in Law 39/2015, of October 1, 2015, on the Common Administrative Procedure of the Public Administrations.

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 sanctioning proceedings, informing the competent authority (MITERD) of both the events constituting the infringement and the relevant circumstances necessary for its adequate qualification.
- Likewise, the MITERD may commence sanctioning proceedings on its own initiative in the case of infringements in areas other than nuclear safety or radiation protection.
- The MITERD 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 a sanctioning 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 MITERD 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 (NSR), approved by Spanish Royal Decree 1400/2018 dated 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 principal means by which the licensee fulfils the primary responsibility for safety

The licensee shall fulfil these obligations by operating the facility in accordance with the limits and conditions established in the Operating Licence granted by the MITERD, 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 Report, Operating Technical Specifications, Operating Regulations, Site Emergency Plan, Quality Assurance Manual, Radiation Protection Manual (RPM), 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 shall 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 licences 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 licensee fulfils its primary 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 (BIP) 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, OTF 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 a sanctioning procedure to the MITERD. 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 licensee 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, publications, collaborations or advertorials. These activities are more frequent and relevant in the environments of each facility. Additionally, the information published on the websites of each plant is particularly noteworthy as a communication tool. Furthermore, we have begun to promote the use of social networks to provide citizens and the general public with brief and direct information on the reality and activities of certain facilities. As part of this modernisation process, the use of audiovisual channels is being driven 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 (such as bulletins and company magazines) containing the main news (in printed or digital format) affecting each facility and its surroundings, as well as the nuclear sector as a whole. Specific publications are also produced, as well as general information on each information on each facility, monographic brochures, activity reports, etc on activities, technical reports, etc. There is a tendency to promote digital versions of these formats, since they are more accessible and have a greater potential for dissemination.
3. In addition, 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. During the pandemic, these centres remained closed to the public as part of the measures dictated by the health authorities in the fight against COVID-19. The favourable evolution of the health data is allowing a gradual return to normal operation (May 2022).

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 related to the world of teaching

in collaboration with teaching collectives and a Documentation Committee that supports the rest of the Forum's activities.

The Spanish Nuclear Society, which brings together professionals from the nuclear industry, 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. These meetings have been held throughout the pandemic, albeit remotely. 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. The consequences of the health crisis have postponed these appearances or replaced them with online meetings.

In summary, it can be stated that the nuclear facilities, as well as the Spanish nuclear sector as a whole, carry out a set 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 licensee of the facility has appropriate resources (technical, human and financial) and authority for effective management at the site 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 internal 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 (GGAS).

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 NSR, as is also explained in section 11.1 of this report.

The new NSR that transposes Directive 2014/87 UE 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. 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. Have 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, assess 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 shall 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. 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 appropriately 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 NSR, 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. Provisions and regulatory requirements regarding the policies and programmes to be implemented by the licensee in order to give priority to safety in the design, construction and operation of nuclear facilities

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 nuclear facilities* of the new NSR 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:

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

   2) 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 GSR Part 2, "Leadership and Management for Safety" and CSN Instruction IS-19 on the requirements of the management system for nuclear facilities. These requirements define how to establish, implement, assess 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, in addition to establishing the prevention of accidents and the mitigation of their consequences as a safety objective, the new NSR 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 NSR reinforces these aspects. The establishment of performance indicators makes it possible to identify negative trends and to review the action plans on an annual basis, on the basis of the results obtained from the assessment of the previous year and any new needs that have been identified. The action plans identify the most important activities to be undertaken over a 5-year period.

Likewise, Article 12 *Safety assessment* of the new NSR 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 Report of the results of the assessment, required by Article 12.2 of the aforementioned NSR, has an implementation period of 3 years, in accordance with the Sole Transitional Provision of the Spanish Royal Decree approving the NSR.

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-assessment 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 assessments are: quality audits, independent supervisions, assessments carried out by different committees (nuclear safety committee, the ALARA committee, environment committee, occupational health and safety committee, etc.).

External assessments 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. Assessments 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	Assessment	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
	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

The analysis of the results of the external assessments (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.

Update

The assessments carried out by the World Association of Nuclear Operators (WANO) through peer reviews and those carried out by the IAEA through operational safety review missions (OSART) or safety aspects of long-term operation (SALTO) at Spanish nuclear power plants during 2019, 2020 and 2021 were as follows:

Plant	Assessment	Date
ANAV / Ascó-Vandellós II	Pre-SALTO (IAEA) mission	2019
Ascó	Peer Review (WANO)	2019
Trillo	Peer Review Follow up (WANO)	2019
Almaraz	Peer Review (WANO)	2020
ANAV / Ascó-Vandellós II	Corporate Peer Review Follow up (WANO)	2020
Cofrentes	Peer Review Follow up (WANO)	2020
Vandellós II	Peer Review Follow up (WANO)	2020
Ascó	Peer Review Follow up (WANO)	2021
Ascó	SALTO Mission (IAEA)	2021
CNAT / Almaraz-Trillo	Corporate Peer Review (WANO)	2021

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 assessments (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 provisions on 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 programmes are periodically assessed by the CSN.

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 assessments, with respective frequencies of 3 and 6 years, as part of which it is recommended that the various assessment 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.

Update

Within the framework of the plant operating permit renewals, the licensees of the facilities have undertaken to include a specific chapter on the improvement of human and organisational factors in the Safety Report for each plant. This incorporation is being carried out according to each plant's authorisation renewal schedule and will be completed in 2022, and a common approach has been adopted for all facilities. This approach has been specified and developed in the CEN-56 sectorial guide "Guide for the development of the organisation and human factors chapter in the Safety Report of Spanish NPPs", published in April 2021.

In relation to participation in technical missions at both Spanish and foreign plants, 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 2019, 2020 and 2021 in 20 WANO peer-to-peer missions, 19 WANO technical missions and 3 IAEA missions, which in all cases were undertaken at nuclear power plants.

10.3. Regulatory processes for the tracking and supervision of the provisions applied by licensees to give priority to 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 and medium-term Strategic Planning processes, the analysis and prioritisation of projects that define the long-term and medium-term Investment Plan (5 years), and the Annual Operating Plan or budget. The CSN is informed annually of nuclear power plant investment planning.

Update

Based on the renewals of the Operating Permits granted in 2020 and 2021, the CSN has required each of these nuclear power plants to submit its Action Plan (a five-year plan, revised annually, which includes the licensee's strategic and operating objectives, action plans and investment projects, investment budgets and available and foreseen human resources, together with an assessment of the Plan) to the CSN on an annual basis.

- The CSN supervises the improvement plans to maintain and reinforce safety aspects. In addition, 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.

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 Plenary and are subject to monitoring and assessment 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 organisation 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 NSR 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 assessment procedures for requests that systematise the scope and content of the assessments

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 sanctioning proceedings. This process involves various organisational units, not only technical but also legal.

The Committee for the Review of Sanctioning Files (CRES) is responsible for analysing proposals for sanctioning 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 NSR explicitly reinforces the aspects related to human and financial resources, transparency and safety culture.

11.2. Human resources

Regulatory provisions and requirements in relation to personnel, qualifications, training and retraining of personnel at nuclear facilities

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-licenced 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 to analyse required competencies and training needs for all safety-related activities performed at nuclear facilities

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 assessment of the degree of personal compliance with the planned learning objectives; and, finally, the assessment 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 personnel, including training on simulators

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 shall have a duration of at least 240 hours and on-the-job training shall 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 licence (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 licenced 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.

Nuclear power plant simulator capabilities used for training on plant fidelity and scope of simulation

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

During the 2016-2018 period, 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 NSR establishes the following rule under Article 8, *Training,* whereby the holder shall:

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 in training programmes as a result of new knowledge derived from safety analysis, operational experience, development of training methods and practices

As has been the case in recent years, the initial and ongoing 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 basis and those that give rise to severe accidents outside the design basis of the facility.

Methods used to assess the adequacy of personnel at nuclear facilities

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.

Policies 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:

- Ultimate responsibility for ensuring nuclear safety lies with the management of the licensee's organisation, and cannot be delegated to support staff.
- 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.
- The support staff knows and makes use of the same processes as the holder's organisation to carry out their activities.
- 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.
- Occupational safety expectations are clearly communicated to the support personnel who carry out their activities in the plant.
- 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 assess the qualifications and training of the contractor personnel, the licensee shall adopt the necessary measures to guarantee that the external company's hiring standards are adequate, as defined in CSN Instruction IS-12:

- 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.
- 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.
- 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 shall 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 national supply and demand for nuclear science and technology experts

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 personnel required for the management of very serious accidents, including contracted personnel or personnel from other nuclear facilities

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 shall be dimensioned to be able to take the actions required to deal with design basis accidents and to execute the mitigation strategies derived from the analysis of situations beyond that foreseen in the design basis, in accordance with the provi-

sions of the EOP and GGAS, as well as in the procedures that develop the facility's internal 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 CTIs 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 assessed 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 (ESC), the Military Emergency Unit (EMU), 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 licences 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 ongoing training). The scope of these inspections also includes aspects related to the maintenance of the physical and functional fidelity of full scope replica simulators.

Update

The period from August 1, 2019 to December 31, 2021 was also marked by the SARS-CoV-2 coronavirus pandemic in the field of training and qualification of workers in the nuclear sector. As such, on March 14, 2020 the Government decreed a state of alarm to deal with the spread of the coronavirus, in order to ensure the protection of citizens' health, contain the disease and strengthen the public health system.

In view of this situation, the Spanish nuclear sector sent to the CSN a «Proposal for action for the training of the Spanish NPPs regarding protection against the SARS-CoV-2 virus». This proposal takes into consideration the country's situation and proposes, in essence, the delivery of training activities to licensed and unlicensed personnel, permanent and sporadic, through e-learning and distance learning methodologies and environments. It also contemplates the assessment of the student using new technologies and distance learning platforms.

The CSN reported favourably on this proposal. Subsequently, on December 25, 2020, the resolution of December 18, 2020 was published in the Official Spanish State Bulletin (BOE-A-2020-17005), the scope of management of which establishes extraordinary measures to address the impact of COVID-19 on vocational training for employment in the workplace, as regards the training initiative scheduled by companies.

In this context, the Spanish nuclear power plants developed a large part of their training programmes in an *e-learning* or distance learning environment. In the design, development and delivery of the programmes, the methodological criteria established in the systematic design used in face-to-face environments have been maintained. In this way, they were able to meet the initial and continuing training needs of their personnel, guaranteeing the maintenance of their skills and qualifications until the end of the state of alarm, which marked the return to normality.

The knowledge and experience acquired during this period have allowed the use of these training environments, which have advantages over traditional classroom training, to be incorporated in a more methodological and formal way.

Article 12. Human factors

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

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 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, assessment 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 facilities

The Spanish nuclear power plants have established programmes for the improvement of organisational safety and human factors (OS&HF). 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 OS&HF programme are:

- As far as possible, prevent aspects of organisation and human factors from negatively influencing the safety of the plant and its availability (or at least minimise these effects), 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 assessments, 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.
- Review the design of equipment, systems and their human-machine interface as well as design modifications to confirm that they are being 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 OS&HF, training and research projects.
- Participate in external forums for debate, exchange and research on organisational improvements and human factors.
- Evaluate and improve the safety culture of the plant's operating group.

In addition, the OS&HF Programme aims to:

- Establish objectives and expectations upon which to self-assess 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 OS&HF 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 OS&HF 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 OS&HF 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.

Periodic external assessments of safety culture are carried out every 6 years, alternating with the internal assessments mentioned above, along with participation in international congresses and groups related to safety culture and OS&HF issues.

Common training has been defined for OS&HF 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.

Update

In addition to the common training provided periodically and jointly, a series of specific courses for OFH specialists have been defined and delivered in 2020 and 2021, in line with the current needs of the sector.

12.4. Self-assessment of administrative 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 obtaining information on experience related to human factors and organisational aspects

Licensees use CAP as an analysis tool to identify negative trends in OS&HF issues.

Through the CEN of the Nuclear Forum, groups of specialists in the CAP and OS&HF 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 rein-

forcement of those responsible for the work, the communication of expectations and training courses. The establishment and management of in-plant command programmes facilitates this monitoring by providing first-hand information on operator and supervisor behaviours, as well as reinforcing desired behaviours and enhancing leadership.

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 assessment 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 the 2016-2018 period the CSN continued its assessment and inspection tasks, contemplating OS&HF 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 OS&HF programmes and associated projects and activities through the assessment of licensee requests, most notably via biennial BIP inspections. Likewise, the CSN-CEN mixed working group, the aim of which is to address different aspects of OS&HF in specific meetings, 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. Likewise, the COVID-19 pandemic has highlighted the need for the preparation of Business Continuity Plans at nuclear power plants, which have been required by the CSN.

Article 13. Quality Assurance

13.1. Regulatory provisions and 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 NSR, 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 facilities

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 NSR, 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, assessed 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 quality assurance programme, quality management system or typical management system covering all aspects of safety throughout the lifetime of the nuclear facility, including the performance by contractors of safety-related activities

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 NSR 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 NSR, 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. Licence holder audit programmes

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 in three- or four-year cycles 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 assessments. 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 IBP, 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 GDP inspections mentioned in Article 7.4, "Regulatory system associated with the inspection and sanctioning process", 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 to ensure compliance with the "Programme for the identification and resolution of problems and improvements (CAP) integrated in the PBI, whose purpose is to verify that the facility issues in due time and form the nonconformities that arise, that it assesses and categorises them, that it resolves them by means of corrective actions prioritised according to the importance in resolving the conformity from the point of view of nuclear safety and radiation protection, that it analyses the effectiveness of the actions and that it performs trend analysis of the nonconformities of very low significance in the risk that, after analysis, show that they imply an adverse trend. In the same way, the improvement proposals are checked, as are their associated improvement actions, and the Regulatory Requirements with their associated actions.
- 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 GNP 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 inspections have been carried out at one or two nuclear facilities to assess the application of the management system and processes. These inspections are not included in the PBI and once performed, it has not been considered necessary to perform them again.

In recent years, quality assurance assessment and inspection has focused on the following activities:

- 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
- Quality plans for changes to scope licence bases or any other project the importance of which requires a specific quality plan.

Quality Assurance Programmes for decommissioning in all its phases.

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. Safety assessment

14.1.1. Regulatory provisions and requirements for comprehensive and systematic safety assessments

The RINR establishes the requirements to be met by the licensees during the different authorisation processes (prior or site, construction, operation, modification, dismantling and Decommission Statement) 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 Report or in the OTF.
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 appraisal by the CSN or ministerial authorisation prior to their assembly or start-up. When a modification requires authorisation, the safety analysis shall 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 owners shall report to the MITERD and the 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 shall 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 NSR 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. The national action plan on nuclear power plant ageing management derived from the first thematic review was approved by the CSN Plenary on September 25, 2019. The second peer review will be carried out between 2022 and 2024, on fire protection in nuclear power plants, based on the technical specifications developed by WENRA mainly during 2021. Spain, through the CSN, has actively participated in the preparation of these specifications.

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 assess safety aspects. Following the Fukushima accident, the CSN issued CTIs requiring that endurance tests be carried out and that the necessary assessments 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 regulatory requirements during the period 2016-2017, except for the updating of the seismic characterisation of sites, which during the period corresponding to this report has continued its course, being in its final phase of completion as of December 31, 2021, within the deadlines 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 as part of the licence granting process and safety analysis reports at different stages of the life cycle of nuclear facilities

During the period covered by the eighth report, no nuclear power plant had its Operating Licence renewed as their periods of validity all remained in force. Processes related to the submission of future Operating Licence renewal applications have been initiated in several cases:

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

— Ascó I and II 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 I and II and Vandellós II Nuclear Power Plants: base document of the PSR performed and favourably appraised by the CSN (2018).

— Ascó I and II and Cofrentes Nuclear Power Plants: base document of the PSR submitted to the CSN (2018).

The specific safety assessments carried out during the period covered in the eighth report, following the established regulatory processes, are indicated below:

Almaraz Nuclear Power Plant

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

— Start-up of the Filtered Containment Venting System (SVFC) in Almaraz NPP, units I and II.

— Commissioning of the CAGE.

— Implementation of PAR in unit II (unit I had been authorised in 2015).

— Execution and start-up of the ITA for dry storage of spent fuel.

— Commissioning of the new feed water turbo pump 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 the eighth report, among the modifications made that required reporting by the CSN the following are notable:

— Methodological changes to Accident Analysis to verify compliance with the radiological acceptance criteria of IS-37.

— Review of the Control Room habitability analysis after LOCA, due to modification of the considered alignment of the Emergency Control Room Ventilation System (SVESC).

— Start-up of the Filtered Containment Venting System (SVFC) in Ascó I NPP.

Changes in OTF deriving from the revision of the HI-STORM, and HI-STAR (dry storage of spent fuel) casks Safety Report.

Cofrentes Nuclear Power Plant

During the period covered by the eighth 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 MARA-THON 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 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 the CNSMG.

Subsequently, on May 27, 2014, the holder requested the renewal of the Operating Licence. Following assessment 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-operations status, abandoning the maintenance and conservation of unnecessary systems. Likewise, it conducted the pre-dismantling activities authorised by the ministerial cessation order of July 6th

2013 and within the framework of the CTI issued by the CSN associated with said cessation order.

During the 2016-2018 period the licensee constructed an ITA 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 Power Plant

During the period covered by the eighth 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 ITA.

— 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 the eighth report, among the modifications made that required reporting by the CSN the following are notable:

— Change in the OTF "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"

— OTF Changes "New Remote Stop Panel Signals"

— Methodological changes to Accident Analysis in order to verify compliance with the radiological acceptance criteria of Instruction IS-37

— 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.

Update

During the period covered by the ninth report, the Operating Licences (AE) of all the nuclear power plants in operation were renewed, with the exception of Trillo, whose Operating Licence remained in force during this period:

— Almaraz I and II Nuclear Power Plants: authorisations granted on July 23rd, 2020.

— Vandellós II Nuclear Power Plant: authorisation granted on July 23, 2020.

— Ascó I and II Nuclear Power Plants: authorisations granted on September 27, 2021.

— Cofrentes Nuclear Power Plant: authorisation granted on March 17, 2021.

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

Almaraz Nuclear Power Plant

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

— Unit II fuel building overhead crane design modification.

— Modification of P-T limits for Long-Term Operation.

— Change of dose calculation methodology for category II and III initiating events to comply with Safety Instruction IS-37.

— Design modification for the change of fire protection licence bases (PCI) to NFPA-0805.

— Favourable appraisal to perform the parallel inspection of the vessel nozzle-welding joints in recharge 28 of unit I.

— Feeding of the containment fire suppression water system to the general plant system.

— Seismic instrumentation free-field sensor upgrade.

Ascó Nuclear Power Plant

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

— Exclusion of the need to perform the scan parallel to the nozzle-vessel welds.

— Modification of P/T curves and COMS set points for Long Term Operation.

— Updated containment response analyses for change in cooling flow rate to safeguards exchangers.

— Methodological changes to Accident Analysis in order to verify compliance with the radiological acceptance criteria of Safety Instruction IS-37.

— Design modification for the change of fire protection licence bases (PCI) to NFPA-0805.

— Modification of the Licensing Basis of the Boric Acid Addition System of Ascó I and II NPP. Seismic classification in accordance with RG-1.29.

Cofrentes Nuclear Power Plant

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

— Construction and start-up of an Individualised Temporary Storage Facility (ITSF) for spent fuel

— Modification of fuel handling accident analysis

— Protection of valve logics affected by Hot Short, applying Safety Instruction IS-27

— Modernisation and increase in capacity of the container handling crane at the fuel building

— New nuclear fuel design demonstration programme

Santa María de Garoña Nuclear Power Plant

During the period covered by the ninth report, of the modifications carried out that required a CSN report the most notable were those relating to Phase 2 of the Santa María de Garoña Nuclear Power Plant pool systems reconfiguration project, which adapt the facility's systems to the conditions existing several years after the definitive shutdown of the reactor.

Trillo Nuclear Power Plant

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

— Change to the Operating Technical Specifications following new UHS analyses.

— Design modification for alternative compliance with CSN Instruction IS-30 regarding the roof of the ZK safeguard diesel building.

Vandellós II Nuclear Power Plant

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

— Favourable appraisal of the exclusion of the need to carry out the exploration parallel to the nozzle-vessel welds.

— Replacement of the Boraflex racks of the Spent Fuel Pool (re-racking).

— Methodological changes to Accident Analysis in order to verify compliance with the radiological acceptance criteria of Instruction IS-37

— Methodological change in containment response analysis (Gothic).

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 Periodic Safety Review (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 Nuclear Safety Regulations reinforces the provisions of Instruction IS-26 in relation to PSR and establishes that "as a result of the PSR, the licensee shall 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 NSR 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 basis 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 shall 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 appraisal by the CSN. This practice replaces the process carried out in the previous PSR period in Spain, known as NAC (Normativa de Aplicación Condicionada, Conditional-Application Regulation).

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 prior authorisations and in the Operating Licence.

The PSAs 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.

Update

During the period of this report (2016-2021)the CSN has favourably appraised the base documents for the performance of the PSRs of the Ascó I and II and Cofrentes nuclear power plants (July 2019) and reported favourably (with conditions) the renewals of the authorisations of Almaraz and Vandellós II NPPs (2020) and Ascó I and II and Cofrentes NPPs (2021), all on the basis of their respective PSRs.

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. As indicated in section 8.1.2.f) of this document, the CSN is at a very advanced stage of the process of revising the Management System Manual in order to adapt it to the IAEA GSR standard. Part 2 and ISO 9001: 2015 Which 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.

Assessments 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 BIP, 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 appraisal 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 section 14.1.3, from which are derived conditions for the improvement of safety applicable to the new Operating Licences, which in some cases are developed in the CTI.

14.1.5. Improvements as a result of endurance tests following the Fukushima nuclear power plant accident

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. . At the time of writing this report, the licensees have completed phase 1 of data collection and are currently in phase II of analysis, which is expected to be completed within the deadlines established by the CSN in the corresponding CTIs.

As indicated above, the post-Fukushima requirements established by the CSN for Spanish nuclear power plants in relation to stress tests were incorporated in two CTIs, issued by the CSN during 2011 and 2012. Simultaneously, the CSN required the licensees, by means of CTI-2/4, issued in 2011 and 2012, to analyse situations of loss of large areas of the plant in order to identify improvements in their management. Finally, in April 2014 the CSN issued a new CTI 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 CTIs 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 and subjected to a specific permitting process (which was carried out in the 2016-2018 period of the previous report), the most notable were the construction of the Alternative Emergency Management Center (CAGE), installation of a filtered containment vent (SVFC) and installation of passive autocatalytic recombinant (PAR) hydrogen autocatalysts in the containment.

Update

During the 2019-2021 period, the CSN has mainly carried out supervision and control actions aimed at verifying the adequate maintenance of the implemented structures, systems and components (SSCs), including the testing and training programmes, as well as the adequacy of the administrative controls established by the licensees of the Spanish nuclear facilities on these SSCs.

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 shall constitute a safe place to manage the emergency in accident scenarios beyond the design basis, 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. Safety verification

14.2.1. Regulatory provisions and requirements for safety verification

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 (OTS), Safety Report (SS), Site Emergency Plan, Operating Regulations, Quality Assurance Manual, Radioactive Waste Management Plan and Radiation Protection Manual (RPM), require authorisation; in some cases the applicable screening process is carried out at the CTI. Any modification to the Site Emergency Plan or to the OTF requires ministerial authorisation, while changes to the SS may or may not require authorisation, depending on whether 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 appraisal 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 In-

struction IS-22. The OTF 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 NSR establish that the licensees shall 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 of continuous safety verification programmes (in-service inspection, surveillance, functional testing of systems, etc.)

During the 2016-2018 period, 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 CSE 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 CSE .

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 OTF. 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 shall be qualified in accordance with a methodology accepted by the CSN. The Non-Destructive Testing (NDT) methods and techniques used shall 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 assessment 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 PSA 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.

Update

During this period the Almaraz I and II, Ascó I and II, Cofrentes and Vandellós II Nuclear Power Plants have renewed their Operating Licences, initiating the corresponding actions and commitments associated with the PSRs drawn up during the application process for the aforementioned Operating Licences.

On this basis, activities associated with life management, long-term operation and related inspections are being carried out at the plants.

Likewise, the in-service inspection programmes, with their corresponding intervals, are being executed in accordance with the required scopes and deadlines. The application of the ASME code in its full scope is being executed normally in the scope contemplated in official documents such as OTFs and MROs.

The emission of anomalous conditions has been normalised during this period as the plants have been acquiring and sharing their experience, consolidating itself as an essential process in the daily operations of the plants.

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 (LMP) 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-assessed,

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 LMP 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 MRAs that implement and prepare the Integrated Ageing Management Plan (IPEGE)shall 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).

Update

During the period between August 2019 and December 2021, most nuclear power plants have renewed their Operating Permits, incorporating in the new authorised operating periods the long-term operation (LTO), i.e., operation beyond the design life of 40 years; specifically:

Almaraz I NPP (1981): 2020-2027 (6 years of LTO)

Almaraz II NPP (1983): 2020-2028 (5 years LTO)

Ascó I NPP (1983): 2021-2030 (7 years LTO)

Ascó II NPP (1985): 2021-2031(6 years LTO)

Cofrentes NPP (1984): 2021-2031 (7 years LTO)

Vandellós II NPP (1987): 2020-2030 (three years of LTO)

14.2.4. Arrangements for internal review by the licence holder of safety justifications 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 appraisal 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 super-

vision 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 OTSs 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 functioning of the currently operating plants 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. Regulatory provisions and 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.

Update

The new revision of the Regulation on health protection against risks arising from exposure to ionising radiation is expected to be published in 2022, it transposes the basic safety standards set out in Directive 2013/59/EURATOM for protection against risks arising from ionising radiation.

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 Royal Decree 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. Expectations in relation to regulation of the licensee's processes aimed at optimising radiation doses and applying 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, within the various nuclear power plant organisations, 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 the plants.
- The management of the plant organisation shall 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 shall 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 shall 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 (RPM).

15.3. Execution of radiation protection programmes by the licensees

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

Update

Prior to the entry into force of Directive 2013/59/EURATOM, the CSN required nuclear power plant licensees to implement the dose limits established in the Directive; licensees were required to estimate the implication of the new dose limits on the crystalline lens, essentially in terms of those workers carrying out activities in non-homogeneous radiation fields.

Since 2020 all RPMs of Spanish nuclear power plants have been adapted to the dose limits of Directive 2013/59/EURATOM.

Exposed workers:

Update

- Effective dose limit: 20 mSv per official year. in special circumstances up to 50 mSv in a single year, provided that the annual average over 5 consecutive years does not exceed 20 mSv.
- Crystalline equivalent dose limit: 20 mSv equivalent dose in a single year or 100 mSv over 5 consecutive years, subject to a maximum dose of 50 mSv in a single year.
- Dose limit equivalent to skin (averaged over 1 cm^2): 500 mSv per official year.
- 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. In special circumstances the Nuclear Safety Council may authorise a higher effective dose value in a single official year, provided that the average over five consecutive official years does not exceed 1 mSv per official year
- Dose limit equivalent to skin (averaged over 1 cm^2): 50 mSv per official year.
- Dose limit equivalent 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.

Update

- 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. Notwithstanding this effective dose limit, the following equivalent dose limits shall also apply:
- Equivalent dose limit for the lens: 15 mSv per official year.
- Dose limit for skin (averaged over 1 cm^2): 150 mSv per official year.
- 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 Radiological Protection Manual for the different operating modes of the plant: normal operation, exceptional works and shutdowns.

Update

Appendix 15.A presents dosimetry information for workers exposed in the year 2021.

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 (Official Spanish State Bulletin 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.

Table 15.B.1 indicates the activity released by the nuclear power plants in 2021. 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 2021.

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 assessed by the CSN. Appendix 15.C describes the contents of the environmental radiological surveillance programmes and their most significant results during the year 2021, which are the latest available at the time of writing.

With respect to the situation that arose as a result of the COVID-19 pandemic, it should be pointed out that surveillance in the nuclear power plant environment was considered to be the performance of essential activities, like the rest of the activities carried out at the plants, as a result of which in general the impact of the pandemic was very small, with a percentage of compliance with the programmes for sampling and analysis of the ERSP's close to 100%, as in any other campaign.

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 may be accessed via the CSN institutional web page by clicking on the link: www.csn.es where the results from the years 2006 to 2021 may currently be viewed. 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 assessment 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.

In the framework of Article 35 of the EURATOM Treaty between 2018-2021 European Commission experts have carried out four verification missions in Spain with the following objectives:

— 2018. Environmental and release monitoring programmes and national network for environmental monitoring of radioactivity in the area surrounding the Almaraz NPP.

— 2019. Palomares. Monitoring of environmental radioactivity and monitoring of radioactivity in foodstuffs.

— 2021. Environmental radiological and release monitoring and national network for monitoring environmental radioactivity in the area surrounding the Santa María de Garoña NPP

— 2021. Environmental radiological monitoring of the Galician and Cantabrian coasts.

The Commission was able to verify the operation and efficiency of a representative part of these facilities, concluding in its final reports that all the necessary facilities are in place to monitor the levels of radioactivity in the effluents and in the environment, and that this monitoring and control is carried out adequately.

15.4. Regulatory review and control activities

Assessments 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 assessed through the supervision of the final refuelling reports submitted by the licensees, in accordance with the provisions of Instruction IS-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 2021

A. External exposure

The statistical results of the doses accumulated in 2021 for the total number of nuclear power plants are as follows:

Collective doses

Update

The following table shows the overall annual collective doses for each of the nuclear power plants in the year 2021. A total of six refuelling stops were made. The nuclear power plants that have carried out a refuelling outage in 2021 were Almaraz I, Almaraz II, Ascó I, Vandellós II, Trillo and Cofrentes.

The Santa María de Garoña NPP has not been in operation since the end of 2012, and has been granted a cessation-of-operations declaration.

Almaraz I and II (PWR)	856.15	mSv. person
Ascó and II NPP (PWR)	412.71	mSv. person
Garoña (BWR)	17.29	mSv. person
Cofrentes (BWR)	1664.66	mSv. person
Vandellós II (PWR)	610.86	mSv. person
Trillo (PWR)	213.79	mSv. person

These data mean that the average collective dose, per reactor, throughout 2021 is 471.93 mSv. person. By reactor type, this parameter reaches a value of 840.97 mSv-person for BWRs and 348.92 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 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).

Updating of graphics

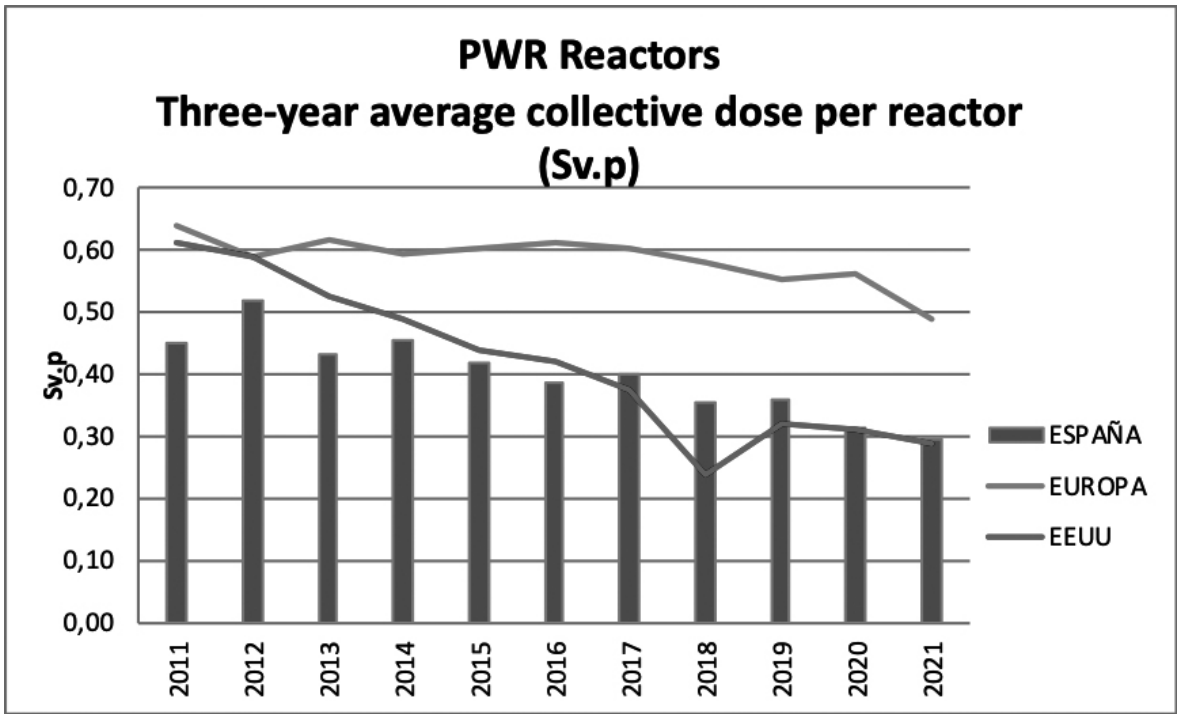


Figure 15.A.1 Average three-yearly collective dose (Sv-person) for PWR type reactors. International comparison.

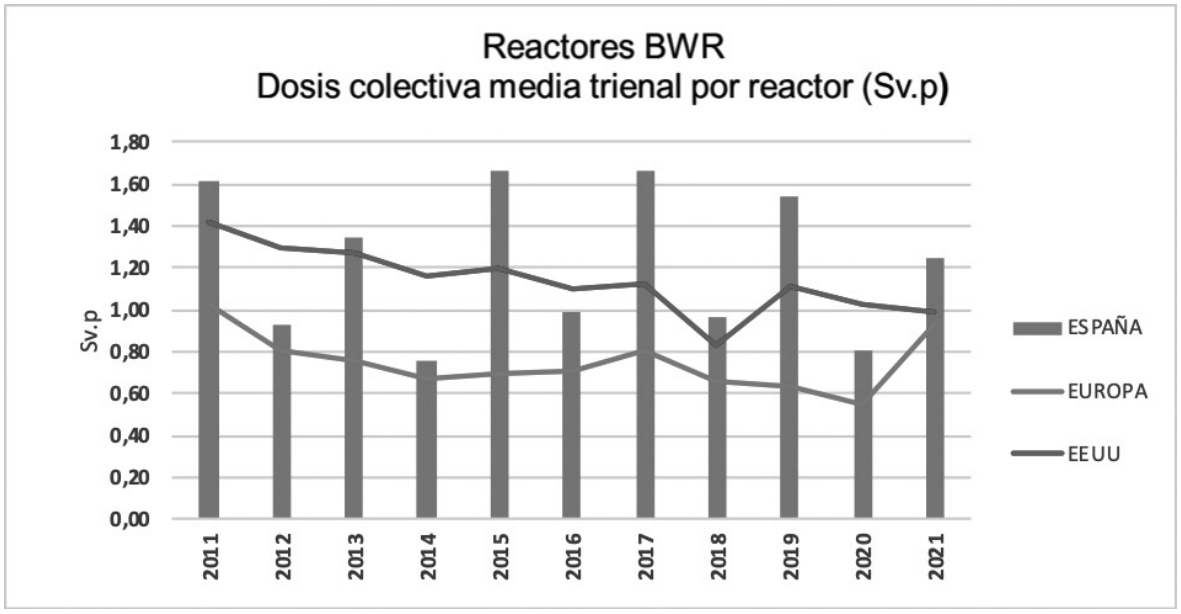


Figure 15.A.2. Average three-yearly collective dose (Sv-person) for BWR type reactors. International comparison.

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 2021; the estimated effective dose to the most exposed member of the public as a result of these discharges represents a maximum of 1% of the authorised dose limit for radioactive effluents.

Table 15.B.1 Radioactive effluents from nuclear power plants. Activity discharged in 2021 (Bq) (1)

BWR PLANTS

	José Cabrera [2] NPP	Almaraz I and II NPP	Ascó I NPP	Ascó II NPP	Vandellós II NPP	Trillo NPP
Liquid Effluents						
Total except Tritium and Dissolved Gases	$5.86\ 10^{7}$	$1.57\ 10^{10}$	$6.38\ 10^{9}$	$1.94\ 10^{9}$	$1.04\ 10^{10}$	$2.63\ 10^{8}$
Tritium	$5.30\ 10^{7}$	$4.08\ 10^{13}$	$2.50\ 10^{13}$	$9.63\ 10^{12}$	$2.23\ 10^{13}$	$1.56\ 10^{13}$
Dissolved Gases		ND	$4.47\ 10^{7}$	ND	$4.01\ 10^{7}$	(3)
Gaseous Effluents						
Noble Gases		$1.00\ 10^{11}$	$2.69\ 10^{10}$	$9.00\ 10^{10}$	$1.45\ 10^{11}$	$9.94\ 10^{10}$
Halogens		ND	ND	ND	$5.21\ 10^{7}$	ND
Particles	ND	$5.10\ 10^{3}$	$2.12\ 10^{6}$	$2.82\ 10^{6}$	$3.23\ 10^{7}$	$3.46\ 10^{5}$
Tritium	ND	$5.73\ 10^{12}$	$8.26\ 10^{11}$	$6.88\ 10^{11}$	$9.26\ 10^{11}$	$7.97\ 10^{11}$
Carbon-14		$3.54\ 10^{11}$	$1.51\ 10^{11}$	$9.60\ 10^{10}$	$3.44\ 10^{11}$	$2.65\ 10^{11}$

BWR PLANTS

	S.M. Garoña[4] NPP	Cofrentes NPP
Liquid Effluents		
Total except Tritium and Dissolved Gases	$2.57\ 10^{7}$	$1.05\ 10^{8}$
Tritium	$5.97\ 10^{10}$	$5.63\ 10^{11}$
Dissolved Gases	—	ND
Gaseous Effluents		
Noble Gases	ND	$1.40\ 10^{12}$
Halogens	—	$8.50\ 10^{7}$
Particles	$1.06\ 10^{4}$	$1.09\ 10^{7}$
Tritium	$6.13\ 10^{10}$	$4.60\ 10^{11}$
Carbon-14	—	$1.13\ 10^{11}$

(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 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 dormancy 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 2021.

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

Type of sample	Frequency of sampling	Analysis performed
Air	Continuous sampling with weekly filter change	Total beta activity, Sr-90, Spectrometry γ, I-131
Direct radiation	Change of dosimeters after one period	Maximum integrated dose rate of exposure for a quarter
Drinking water	Fortnightly or higher sampling	Total beta activity, remaining beta, Sr-90, Tritium, Spectrometry γ
Rainwater	Continuous sampling with sample collection	Sr-90, Spectrometry γ monthly
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	Sr-90, Spectrometry γ
Milk and crops	Bi-weekly milk sampling in the milk production season grazing and monthly during the rest of the year. Crop sampling at harvest time	Sr-90, Spectrometry γ, I-131
Meat, eggs, fish, seafood and honey	Semi-annual sampling	Spectrometry γ

Table 15.C.2 PVRA of nuclear power plants. Year 2021

Nuclear power plant	Air. Mean value Bq/m^3			
	ß-Total	I-131	Sr-90	Cs-137
Almaraz	8/62E-04	<LID	<LID	<LID
Ascó	7/19E-04	<LID	<LID	<LID
Cofrentes	8/57E-04	<LID	<LID	<LID
Vandellós II	6/86E-04	<LID	<LID	<LID
Trillo	6/63E-04	<LID	<LID	<LID
Santa María de Garoña[1]	4/89E-04	—	<LID	<LID
José Cabrera[2]	7/30E-04	--	<LID	2/89E-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 programmes and plans

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 an IEP (Indoor 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. Regulatory provisions and 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 CTIs 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 CTIs, 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 (ESC) 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 ESC 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 IEPs.
- 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 CTI issued by the CSN, the CSN has encouraged the licensees of the nuclear power plants and the Military Emergency Unit (EMU) to sign a collaboration agreement for the possible intervention of the EMU 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-TEMIS mission to Spain in 2018.

All these modifications affecting emergency management at the site have been included in the IEP of all the nuclear power plants, in accordance with the requirements of the CSN in the corresponding CTI.

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-WEN-RA Approach.

16.1.2. Legislation on emergency management

During this period the NSR 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.

Update

Derived from the self-assessment report carried out by the CSN in relation to emergency preparedness and response, prior to the reception of the combined IRRS-ARTEMIS mission carried out by the IAEA to the Spanish regulatory system in October 2018 the CSN instruction IS-44 on emergency planning, preparedness and response requirements for nuclear facilities was drawn up and approved in February 2020. This instruction gathers the requirements applicable to licensees of nuclear facilities in a single document.

In addition to the aforementioned instruction, the CSN is preparing the revision of Safety Guides GS 1.3 and GS 1.9 to facilitate the implementation of the requirements of the instruction. These guidelines are expected to complete the approval process during 2022.

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.

Update

The provisions established in Directive 2013/59/EURATOM corresponding to communication and information in the event of an emergency have been transposed to the national regulations by Spanish Royal Decree 586/2020, of June 23, regarding mandatory information in the event of a nuclear or radiological emergency. The remaining sections of the Directive that refer to requirements for application in the preparation, planning or response to nuclear or radioactive emergencies are pending transposition pending the approval of a new revision of the Basic Nuclear Emergency Plan and the Basic Directive on Civil Protection against radioactive risks, or through the approval of the legal instruments established by the Directorate General for Civil Protection of the Ministry of the Interior.

16.1.3. New Procedures CSN Emergency Action Plan (PAE)

The CSN has an Emergency Action Plan (EAP), including the Emergency Response Organisation (ERO), 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.

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 EAP 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.

Update

The processes to complete the transposition of Directive 2013/59/EURATOM on emergency matters will have their culmination as regards the CSN ERO in a revision of its EAP that takes into account the modifications incorporated into the regulations on planning, preparedness and response to nuclear or radiological emergencies in Spain. Among the aspects that should be considered when revising the SAP are the following:

- Reference levels
- Dose criteria,
- Levels of operational intervention
- Processing of confidential information
- Management of long-duration emergencies
- Salem-2 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 (EMU) and the CSN, based on which SALEM-2 (a backup room of the CSN SALEM located at the EMU 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 the 2019-2021 period the CSN Emergency Procedures Manual was completed.

Similarly, 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 the role and responsibilities of the licensee, the regulatory body and other key parties, 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 plants potentially affected by accidents.
- 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 Spanish 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 EAP and ORE.
- The licensees of the nuclear power plant are responsible for the management of the nuclear emergency within the nuclear sites through their IEPs, and they coordinate with the CSN and the management of the external emergency.

16.1.5. Application of emergency preparedness measures by licensees 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 IEPs 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 2016-2018 period, in order to conclude the results of the endurance tests carried out in advance, the following modifications were incorporated into the IEPs:

- A new IEP 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 safety-related IEPs, in accordance with the guide on emergency action in the event of IEP 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 IEPs:

- One relating to the treatment of IEP 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.

Update

- Emergency response procedure for Civil Guard response units at the site based on the nature of the initiating events

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 EMU, 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 EMU 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, exercises, assessment activities and main results of exercises undertaken, 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.

Update:

During the years 2020 and 2021, due to the constraints of the pandemic, the goal of conducting at least two exercises for each external nuclear emergency plan could not be met in all cases.

In relation to the emergency response capacity of the nuclear power plant licensees, the IEP 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 IEPs, 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 coordina-

tion 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 IEPs by means of inspections covering all aspects of these plans, including exercises and drills. These types of inspections are included in the GDP.

The duties of the CSN also include assessment of the IEPs 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 CTIs, 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 ESC 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

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 to the public and neighbouring States

16.2.1. Provisions for informing the public in the vicinity of nuclear facilities 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 Royal Decree 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 Royal Decree 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.

Update:

2020 saw the approval of Spanish Royal Decree 586/2020 of June 23 regarding mandatory information in the event of a nuclear or radiological emergency. The adoption of this Royal Decree 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. Likewise, this RD has repealed the part relating to information of the Agreement of the Cabinet of Ministers of 1st October 1999 on advance information programmes for populations in areas surrounding nuclear power plants and the training of those involved in nuclear emergency situations.

At all the nuclear power plant sites, the annual meeting of the Local Information Committee continues to be held, led by MITERD and with the participation of those responsible for the CSN, in accordance with the guidelines established in art. 13 of the RINR.

16.2.2. Arrangements for informing the 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 (EU) 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. Assessment of site-related factors

17.1.1. Regulatory provisions and requirements relating to site selection and assessment of nuclear facility sites, including applicable national laws

The specific requirements and criteria for the performance of site studies in relation to the safety of nuclear facilities and for the assessment of their acceptability are expressly included in the NSR regulation and in the CSN Instructions IS-26 *on basic nuclear safety requirements applicable to nuclear facilities and* IS-27 *on general nuclear power plant design criteria* , which compile both the Spanish practice that was already being applied and the standards in force of the international organisations to which the Spanish State belongs (IAEA safety standards) and the standards available in the country of origin of the technology of each facility (USA and Germany), as well as the WENRA reference levels updated in 2014 following the lessons learned from the Fukushima Dai-Ichi accident.

The NSR 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 NSR reinforces the performance of PSRs every ten years, which include aspects of the site in their scope and objectives; in particular, within the ongoing 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.

Instruction IS-26 dedicates its fourth section to the site and addresses the general criteria applied and the monitoring of site conditions over time. Any potential nuclear facility site must be duly assessed to determine the effects it may have on the surrounding population and environment, as well as the possible constraints that the site may impose on the design of the facility. This assessment includes different factors such as population density and distribution, atmospheric conditions, surface and groundwater hydrology, geology, seismology, land and water use, and other ecological and environmental factors, as well as those attributable to human activities. The availability of off-site services that can help to maintain the security of the facility and the protection of the population, such as electricity supply, fire protection, access, communications and emergency preparedness services, among others, is also analysed.

The characteristics of the site that may affect the safety of the facility from commissioning through to decommissioning, the risks associated with external hazards (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.

Instruction IS-27, on general nuclear power plant design criteria, includes two criteria dedicated to siting. Criterion 2, design basis for protection against natural hazards, which establishes the consideration of the most severe events that have been historically recorded, and the addition of a sufficient margin to take into account the limitations of historical data. Criterion 4, environmental and dynamic effects design basis, which requires protection against events and

conditions occurring outside the plant for SSCs (structures, systems and components) directly or indirectly related to safety.

In addition, in 2015, the CSN issued a CTI to all nuclear power plant licensees requiring the performance of a reassessment of the seismic risk of each site, as detailed in section 17.3.1, the execution of which has just been completed and the final report drawn up by the licensees is expected to be received within the deadlines established by the CSN. Currently, the nuclear power plant licensees have completed the first phase of data collection and the second phase of analysis is being finalised.

In all cases, the design parameters associated with a site (seismological, hydrological, meteorological, etc.) shall be obtained through an adequate combination of deterministic studies (maximum predictable) and probabilistic studies (that allow the uncertainties to be delimited), validated with an appropriate treatment of expert judgement. The identification and assessment of the design parameters shall be included in the safety analysis of the facility.

In accordance with the aforementioned principles, and in compliance with article 3.19 of CSN Instruction IS 26, and following the recommendations contained in CSN Safety Guide 1.10 Periodic safety reviews of the NPP's, the Spanish nuclear power plants have been carrying out periodic safety reviews every ten years (PSR's) that include, in their scope and objectives, aspects relating to the site; in particular, within the programmes for the continuous safety assessment and applicability of the changes made to the standards during the corresponding ten-year period.

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 adequate operation throughout the operating lifetime of each facility.

The CSN also has a specific plan for periodic inspections of each nuclear power plant related to site parameters, which form part of the Integrated Plant Supervision System (SISC). The plan consists of two types of inspections, one of general scope (every two years), and another of limited scope (every six months). The general scope includes all those risks related to adverse atmospheric conditions and flooding identified for each nuclear power plant site; the licensee's studies and supporting documents, the results of the surveillance programmes applied, the incidents that have occurred during the operating experience and the licensee's corrective actions programme are reviewed. On the other hand, semi-annual specific scope inspections are performed on structures, systems, equipment or components previously selected for their relation to plant safety, and which may be significantly affected by severe weather 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. Repercussions of the facility for people, society and the environment

17.2.1. Criteria for assessing the likely safety impact of the nuclear facility on the surrounding population and environment

Given the interaction of impacts between the environment and the nuclear facility, it is necessary to monitor and assess them over time to ensure that possible impacts remain within acceptable ranges or, if not, to intervene with appropriate measures to duly limit such impacts.

The continuous monitoring of the various factors associated with the site (seismology, meteorology, hydrology, etc.) is materialised in the corresponding monitoring plans, specially adapted to each site and facility, and periodically reviewed to maintain their effectiveness in accordance

with the results obtained. Each facility prepares periodic reports on its monitoring programmes, including an analysis of the results obtained. These reports are reviewed at the CSN and periodic inspections are carried out at the facilities for adequate supervision and control. With respect to interaction with ground and surface water, the plants have developed Hydrogeological Surveillance and Control Programmes at their sites, both for groundwater levels and for the chemical and radiological quality of the water, closely related to the Environmental Radiological Surveillance Plans.

The basic objectives of the surface and groundwater monitoring and control programmes are:

— monitoring the radiochemical (chemical and radiological) quality of surface and groundwater, in anticipation of possible accidental releases of radioactive effluents, including tritium;

— the detection of anomalous concentrations of radioactive products, and possible associated contamination, in site waters, to serve as an early indicator of the degradation of structures, systems or components and the need to carry out possible mitigation actions (repairs, cleaning, etc.);

— detailed knowledge of the hydrogeological behaviour of each site and of the possible effects of groundwater on the construction structures of the nuclear power plant.

- The Spanish nuclear facilities have operational seismic monitoring programmes, with free-field and in-building instrumentation, the main purpose of which is to record the seismic movement detected at the site and compare it with the design earthquakes (operating base earthquake, OBE, and safe shutdown earthquake, SSE). In addition, once the occurrence of an earthquake greater than the OBE is confirmed at a site, in accordance with the corresponding excess procedures, its operation would be safely shut down and the Site Emergency Plan of the affected nuclear facility would be activated in one of its categories, depending on the category of the severity of the earthquake and the effects caused in relation to safety.

- All the Spanish plants have established programmes for the surveillance of site meteorological parameters, with adequate instrumentation and transmission of the information recorded to the control room of each plant and to the CSN emergency room (Salem). Some facilities also have ground motion monitoring programmes in place to monitor global and differential movements, which are currently in the process of stabilisation given that their evolution over time has been found to be clearly damping.

17.2.2. Application of these criteria in the licence granting process

In the licence granting and renewal processes, all those aspects likely to produce an interaction between the environment and the nuclear facility are analysed, assessed and documented.

Based on the process of the Prior Authorisation of a nuclear facility, as in any other project with potential impact on the environment, Law 21/2013 of December 9, 2013, on environmental assessment, already provides for the presentation by the licensee of the corresponding Environmental Impact Assessment, which is defined as *the set of studies and technical systems that allow estimating the effects that the execution of a certain project, work or activity causes on the environment*, which constitutes a widespread technique in all industrialised countries and recognised as the most appropriate instrument for the preservation of natural resources and the defence of the environment.

This assessment is part of a broad process that introduces the environmental variable into decision-making on whether to carry out a project or activity, making it possible to choose, among

the different possible alternatives, the one that best safeguards general interests, from a global perspective and taking into account all potential effects.

As regards the licensing process of a nuclear power plant, the "Safety Reports", both "Preliminary" and "Final", include an extensive "Site Characterisation" section, which contains an exhaustive study of the most relevant aspects of the site, including: site design basis; geography and demography; industries, transportation and nearby military facilities; meteorology; hydrology (surface and groundwater); geology, geotechnics and seismology. These studies are reviewed and updated throughout the life of the plant to ensure that the initially considered conditions are maintained. The preliminary safety study is a requirement for obtaining the construction permit, while the final safety study is a requirement for obtaining the operating permit.

As has already been indicated, in licence renewal processes nuclear facilities are required to carry out a Periodic Safety Review (PSR), the scope of which includes aspects of the site, specifically as regards continuous safety assessment programmes and the applicability of changes in the standards during the period covered by the PSR. Specifically, in the process of assessing the PSR of the plants, each one has been required to review and update the contents of Chapter 2, Site, of its Safety Report, if necessary, in accordance with the results obtained with the different site parameter surveillance programmes. They have also been required to develop a systematic plan to keep the information in this chapter up to date, so that it accurately reflects the real situation of the site and the validity of the design basis associated with it, over time.

17.3. Reassessment of site-related factors

17.3.1. Activities for the reassessment of site-related factors to ensure that safety at nuclear facilities remains acceptable and is carried out in accordance with appropriate standards and practices

During the stress tests carried out in 2011 by Spanish nuclear power plants, the design basis corresponding to natural events were reviewed and their adequacy was verified. The effectiveness of the preventive measures adopted in the design, or incorporated as additions, according to the principle of defence in depth, was also verified. The response capacity of nuclear power plants to natural events beyond their design basis, which could compromise safety functions and lead to severe accident situations, was also analysed.

In addition, and in relation to seismic risk, some years ago the CSN requested the performance of a plant-specific IPEEE(*Individual Plant Examination for External Events*) for each site, which logically included seismic risk. The post-Fukushima National Action Plan contemplates the review of the IPEEEs and their submission to the CSN by the licensees six months after the implementation of all the component strengthening actions foreseen in the Plan.

Finally, in 2015 the CSN issued a new specific CTI to all nuclear power plant licensees (called CTI-seismic) which requires the performance of a seismic risk reassessment of each site, for which geological and paleoseismic data are analysed to characterise the possible existing capable faults. The process has been carried out jointly for all sites and concludes this year, complying with the most up-to-date international analysis criteria (SSHAC methodology, level 3) and with broad national and international participation. As regards the robustness of the Spanish nuclear power plants in the face of events that could be maliciously caused by human activity, in 2011 and 2012 the CSN issued CTIs requiring the implementation of mitigating measures that would make it possible to deal with this type of event. Some measures required since reinforce those included in the Post-Fukushima action plans, and focus on the human and material resources needed to control and mitigate the consequences of this type of event, especially on the capacity to control large fires beyond those postulated in the plant design basis and the capacity to limit doses to the outside in the event of containment failure, but without considering aspects

such as the capacity of the containment to withstand unforeseen situations, such as the impact of aeroplanes.

In addition, the incumbents have analysed the availability of access roads to the site in case of emergency, after an earthquake and after a flood.

As a result of these analyses and in relation to access to the sites, the licensees have reinforced structures, reinforced mobile equipment and built safe areas to locate it, and reinforced their Emergency Response Organisations, where necessary. It has been verified at all the sites that the measures provided by the licensees compensate for the time during which the access roads would be unusable; for this purpose, three scenarios have been considered: inaccessibility for 0-4 hours, inaccessibility for 4-24 hours and inaccessibility for longer than 24 hours.

In addition to what was requested in the CTIs, a collaboration agreement has been signed between the Military Emergency Unit (UME) and Unesa, in situations of extreme gravity referred to in Article 16. Among the functions entrusted to the EMU in relation to access to the facility are: the transfer of people and components to the nuclear power plant, especially in conditions of serious deterioration of the access infrastructures; the release or conditioning of access routes to the nuclear power plant, as well as the release or conditioning of access routes within the site.

17.3.2. Results of recent reassessment activities

The results obtained within the framework of European stress tests on the response of nuclear power plants to extreme natural events (earthquakes, floods, extreme weather conditions) beyond their design basis, have shown that there is a high degree of resistance to these phenomena, as detailed below. In the 2016-2018 period , studies and analyses derived from the results of the stress tests have continued to be carried out, including the review, if appropriate, of the possible combinations of natural events, their foreseeable impact on the facilities and the improvement measures to be adopted, if any.

Earthquakes

All plants have reviewed the design basis for earthquake resistant structures, systems and components. The conclusions indicate that the design basis is adequately met. In addition, the plants have reviewed the data on earthquakes occurring in the vicinity of their sites from the cut-off date considered in the studies for the definition of the *Design Basis Earthquake (* DBE) up to the first half of 2011, and have concluded that, using the methodology applied in the initial studies, the initially adopted values of DBE, which are between 0.10g and 0.20g, are still valid.

The possible indirect effects induced by an earthquake inside the facility have been analysed; for this purpose, explosions and fires have been considered, as well as internal flooding caused by pipe ruptures. The CSN has considered the barriers and protective actions identified in the reports of each plant to be adequate.

The scope of the seismic margin analysis has been extended to the SSCs required to ensure the integrity and cooling of the spent fuel pool. Among the measures to ensure greater plant robustness to seismic events, the plants have revised or proposed the revision of the equipment margins used to achieve safe shutdown if necessary, to deal with a complete loss of power supply*(station blackout*, SBO) and a severe accident situation. It has been verified that these SSCs can be assigned a seismic margin equal to or greater than 0.3g or, if not, the additional measures necessary for compliance have been implemented.

Another aspect analysed was the possible loss of water in the spent fuel pool, or in the heat sink ponds when applicable, due to the movement produced in the water by the earthquake*(sloshing)*, determining that, for the earthquake intensity considered, both the DBE and the seismic margin of 0.3g, this effect would not be relevant in any case.

In those cases where the plant is located in a river basin with dams located upstream of the site, the structural resistance of the dams has been analysed to verify that they can withstand an earthquake of the same intensity as the plant's design basis earthquake. It has also been analysed whether these dams resist higher earthquakes and the seismic margins available in each dam have been quantified.

In addition, and when deemed appropriate, the licensees have addressed the analysis of the consequences for the site of a breach of these dams. For this purpose, they have carried out an assessment of the flood propagation that could cause a credible breach until reaching the nuclear power plant site, in order to determine the maximum flooding level at the plant due to this cause and the time it would take to reach the maximum peak flow.

In the event of a tsunami, the only Spanish power plant built on the coast, Vandellós II, has a very high protection margin, as its safety systems are located more than 20 metres above sea level.

- Planned improvement actions

The improvements already made by Spanish nuclear power plants to strengthen their response capacity in the event of extreme earthquakes are as follows:

— Design modifications to improve the seismic resistance up to 0.3g of ESCs used to achieve safe shutdown if necessary to cope with a complete loss of power supply(*station blackout*, SBO) and a severe accident situation, by implementing the necessary modifications on ESCs with lower values or by carrying out their replacement.

Flooding

All plants have reviewed the design basis of the facility for flooding caused by natural external hazards, including hydrological and meteorological data recorded at each site throughout the entire time of operation. The conclusions obtained indicate that the flood levels adopted as a design basis are still valid today.

In addition to the analyses of floods caused by dam failures mentioned above, the additional studies carried out include floods caused by other causes such as intense local rainfall, floods in rivers and ravines, tsunamis, waves and sea level or groundwater over-rising. In these analyses, the maximum expected event and existing safety margins have been studied, establishing various proposals for improvements applicable to each case.

- Planned improvement actions

The improvements already made by Spanish nuclear power plants to strengthen their response capacity in the event of extreme flooding are as follows:

— Analysis of the site and its surroundings with current models of natural terrain features (ravines, slopes, terraces, etc.), in order to define potential improvement actions.

— Analysis of the site's drainage network (surface and groundwater) in order to identify possible improvement actions.

— Resolution of the vulnerabilities already identified and implementation of the improvements identified in the site flood study, aimed at reinforcing the water tightness of doors, buildings and drainage and sewage capacity.

- Other natural events

The analyses performed by the plants have been based on a prior probabilistic screening, in which use has been made of the results available from the IPEEE to try to establish the external hazards, other than earthquakes and floods, that could have a safety impact at each site. The

following external hazards, among others, have been considered: strong winds, thunderstorms, hail, snowfall, extreme temperatures (high and low), frost, drought and forest fires.

For each of these events, the plants have reviewed the original design basis and have verified that the plant structures and components in off-site areas are adequately designed. In addition, an attempt has been made to verify the existence of safety margins beyond the design basis in the events that are credible at each site, and various reinforcement measures have been implemented.

- Planned improvement actions

The improvements already made by Spanish nuclear power plants to strengthen their response capacity in the event of other extreme natural events are as follows:

— Specific re-assessment of natural external hazards (hail, extreme temperatures and atmospheric discharges) and subsequent implementation of improvement actions.

17.3.3. Regulatory review and control activities

Within the framework of the Integrated Plant Supervision System (SISC), the CSN carries out biennial plant inspections on extreme weather conditions and flooding, and final heat sink. Furthermore, although they are not integrated into the SISC, the CSN periodically carries out planned inspections of the plants' seismic surveillance systems.

The process of design and implementation of the measures required by the CSN at the post-Fukushima JTI's is being subjected to a continuous programme of supervision, including numerous inspections at all the plants to verify aspects relating to the site and the associated protection measures that have been implemented.

17.4. Consultation with other Contracting Parties potentially affected by the facility

One of the CSN's strategic lines of action is the promotion of institutional relations and communication policies with other organisations present in the international sphere. To this end, the CSN actively participates in various international forums with a view to exchanging experiences and technical and regulatory knowledge in the field of nuclear safety and radiation protection, learning about good practices that allow the safety of Spain's facilities to be reinforced and strengthening international coordination. Likewise, the CSN maintains cooperation agreements and protocols with foreign counterpart organisations, in particular with the competent authorities of neighbouring countries, on the basis of which information is exchanged in the event of incidents and to resolve other specific queries regarding Spanish nuclear facilities.

Article 8.3 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 requires the competent regulatory authority to engage, as appropriate, in cooperative activities concerning nuclear safety of nuclear facilities with the competent regulatory authorities of other Member States in the vicinity of a nuclear facility, inter alia, through the exchange and/or sharing of information.

17.5. 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 17.1 explains that in compliance with CSN Instruction IS 26, and following the recommendations contained in CSN Safety Guide 1.10 *Periodic safety* reviews *of NPPs*, the Spanish nuclear power plants have been carrying out periodic safety reviews every ten years (PSR's) that

include, in their scope and objectives, aspects relating to the site; in particular, within the programmes for the continuous safety assessment and applicability of the changes made to the standards during the corresponding ten-year period.

Section 17.2 describes the regulatory basis for analysing, assessing and documenting all those aspects that could lead to an interaction between the environment and the nuclear facility in the licence granting process. In these processes, nuclear facilities are required to carry out a Periodic Safety Review (PSR), the scope of which includes those aspects of the site that specifically affect the continuous safety assessment programmes and the applicability of changes in the standards during the period covered by the PSR. Likewise, information is included on the 'Preliminary' and 'Final' Safety Reports and their contents related to site characterisation, which is updated throughout the lifetime of the nuclear power plants.

Section 17.3.1 highlights the issuance in 2015, by the CSN, of an CTI to all nuclear power plant licensees for the reassessment of the seismic characterisation of the sites, as foreseen in the National Post-Fukushima Action Plan.

Section 17.3.2 details the results obtained within the framework of the European stress tests on the response of the nuclear power plants to natural external hazards beyond their design basis, proving that there is a high degree of resistance to these phenomena. It also details the improvement actions taken to strengthen the capacity of Spanish nuclear power plants in the event of earthquakes, floods and other natural events.

Finally, section 17.4 describes Spain's relations with other contracting parties with the fundamental objective of exchanging experiences and technical and regulatory knowledge in the field of nuclear safety and radiation protection and promoting cooperation between regulatory authorities.

Article 18. Design and construction

18.1. Application of in-depth defence

18.1.1. Regulatory provisions and requirements relating to the design and construction of nuclear facilities

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 "prior authorisation" and III "construction permit", detailing the documentation to be submitted. This regulatory framework has been completed with the NSR, 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 2016-2018 period.

18.1.2. Status of implementation for all nuclear facilities of the in-depth defence concept, which provides for multiple levels of protection of the fuel, primary pressure barrier and containment, and taking into account internal and external hazards and the impact of associated natural sequential external hazards (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 NSR 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 hazards and serious conditions, the doses received by the workers and releases to the outside shall be minimised as much as possible", and then develops the levels of defence that shall 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 PSAs, 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 Periodic Safety reviews (PSRs). 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 NSR, in its Article 13 which is explicitly dedicated to the *Periodic Safety Review,* and Guideline GS-1.10 Rev.2, revised in the 2016-2018 period, 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 appraisal by the Plenary, 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. Application of design measures or changes thereto (plant modifications, remodelling) in order to prevent accidents beyond the design basis and to mitigate radiological consequences should they occur (this applies to the nuclear facility as a whole, 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 IEP.
- Establishment of a centralised emergency support centre (ESC) to share 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 licences, 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 EOPs and GGAS 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 APS update programme.

18.1.6. Improvements implemented in the CCNN designs as a result of deterministic and probabilistic safety analyses performed since the previous national report of the convention and vision of the main improvements implemented since the commissioning of nuclear facilities

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 as support for the Integrated Plant Supervision System (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:

NPP Almaraz 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. NPP Almaraz has developed the APS of Floods, levels 1 and 2 and the APS 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 PSAs 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.

NPP Trillo has completed the Level 2 Flood APS and the Other Modes Fire APS.

NPP Vandellós II has developed the irradiated fuel pool APS, as well as the new models of APS level 1 and 2 of floods in other modes and the APS level 2 of floods at power, with satisfactory results and without identifying vulnerabilities in the design**.**

During the 2016-2018period, the plants planned, designed or implemented the following design modifications in addition to those included in previous sections:

Almaraz I and II NPPs:

- Digital control system of the auxiliary feed water turbo pump.
- Improvements in PCI (fire resistant separation).
- Modifications associated with changing the basis of fire protection licence through transition to NFPA-0805 (detection, extinction and OR 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 ITA 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

Update

During the 2019-2021 period, the most notable licensing processes and other activities related to the use of PSAs are:

Almaraz I and II NPPs:

- Transition to NFPA805 completed, including fire APS N1 and N2.
- APS of fires in other modes N1 and N2.

Ascó I and II NPP:

- Transition to NFPA-805 Fire Protection Standard, including the updated N1 and N2 fire APS.
- Flood APS in other modes N1 and N2.

Cofrentes NPP:

- N1 APS upgrade from internal flooding at Power.
- Update on the analysis of Other External Hazards at Power.
- Updating the APS of N1 from internal hazards to Power.
- Level 1 APS of internal flooding in Other Modes of Operation.

CNSMG:

None

Trillo NPP:

- APS of fires in other N2 modes.
- Flood APS in other N2 modes.

Vandellós II NPP

- APS of fires in other N1 modes.

Likewise, the plants planned, designed or implemented the following significant design modifications in the 2019-2021 period:

Almaraz I and II NPPs:

- PCI improvements (passive protections, automatic detection and extinguishing systems, connection of the interior containment system to the PCI ring, rerouting of cables for thermal barrier protection of the RCPs, control room aids)
- Passive seals in the main reactor pumps and automatic firing.
- Increased margins in the essential reservoir and component cooling system.
- Replacement and continuous monitoring system for 6.3 kV motors.
- I&C installation for tracking essential service exchangers.
- Renewal of switches.

Ascó I and II NPP:

- Modification of P/T curves and COMS set points for Long-Term Operation
- Update of containment response analysis for change in cooling flow rate to 44E01A/B safeguards exchangers

- Application for Authorisation of methodological changes to Accident Analysis to verify compliance with the radiological acceptance criteria of IS-37
- Modification of the Licensing Basis of the Boric Acid Addition System. Seismic classification in accordance with RG-1.29

Cofrentes NPP:

- Construction and start-up of an Individualised Temporary Storage Facility (ITS) for spent fuel.
- Modification of fuel handling accident analysis.
- Protection of valve logics affected by hot shorts in application of Safety Instruction IS-27.
- Modernisation and capacity increase of the container handling crane in the fuel building.
- New nuclear fuel design demonstration programme.

CNSMG:

- Installation of a new Diesel Generator and new DC batteries, suitable for the current needs of the facility, to replace the previous equipment, corresponding to the power operation phase.
- Adaptation of buildings as storage facilities for potentially declassifiable materials.
- Installation of isolation valves for non-seismic parts of pool cooling systems.
- Installation of new instrumentation loops for level measurement in a wide range pool.

Trillo NPP:

- Improvements in systems against gas intrusion.
- PCI improvements (sectorisation and separation).
- Renewal of switches.
- Replacement of ring building isolation dampers.

Vandellós II NPP

- Methodological change in containment response analysis. GOTHIC.
- Replacement of the Boraflex racks of the Spent Fuel Pool (PCD V/36448) — Reracking.
- Application for Renewal of the Operating Permit.
- Methodological changes to Accident Analysis to verify compliance with the radiological acceptance criteria of IS-37.

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 basis, 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 shall carry out a specific analysis and, depending on the result thereof, these shall be previously authorised by the MITERD, following a favourable report by the CSN, or favourably appraised by the CSN.

18.2. Incorporation of proven technologies and methodologies

Article 31 of the new NSR indicates that the licensee of the facility shall guarantee that no modification thereof may degrade the capacity to operate the facility safely, guaranteeing compliance with the fundamental 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. Regulatory provisions and 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 shall 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 RINR, *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 RINR defines the conditions for requesting a favourable appraisal 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 shall 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 licensees 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 shall 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 Turbo Pump.
- 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 OVA-TION 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

Trillo NPP:

- 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 turbo pump 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.

Update

Period (2019-2021)

Almaraz I and II NPP

- Upgraded crossflow (ultrasonic flow measurement) — Improved configuration and noise filtering
- Renovation of meteorological tower.
- Control room interface improvements: Incorporation of large monitors and fire monitoring system.
- Renovation of seismic instrumentation computer.
- Improvements to fire detection system.
- Continuation of cybersecurity improvement work on equipment.
- Renewal of qualified life safety instrumentation (I&C systems subject to ICA).
- Renewal of power supplies and control and protection system cards.

Ascó I and II NPP

- Replacement of fire detection panels and switchboards
- New radiation measurement chains in fuel building venting
- Quantification of activity in the filtered containment vent system
- Refurbishment of the fuel handling system.
- Refurbishment of process and area radiation monitors
- Improvement of equipment and systems cybersecurity
- Implementation and improvements in digital communications systems
- Completion of work on the open-phase detection system
- Improvements in the discharge tower control system
- Main alternator monitoring instrumentation upgrades
- Improvements to the electrohydraulic turbine control system

Cofrentes NPP:

- Renewal of radiation monitors
- Improvements in equipment monitoring with new vibration, temperature and flow instrumentation.
- Renewal of distributed control system equipment and integration of new functions
- Migration of controllers to the distributed control system
- Renewal of controllers in several systems
- Modernisation of control room recorders
- Upgrading of seismic monitoring instrumentation
- Continuation of equipment cybersecurity upgrades
- Installation of particulate and iodine sampling system in the filtered containment vent

Vandellós II NPP

- Renewal of inverter/rectifier/non-1E class static bypass assemblies
- Refurbishment of process and area radiation monitors
- Improvements to the process computer
- Reactor digital control system upgrades
- Upgrades to the main feedwater bypass valve control system
- Quantification of activity in the filtered containment vent system
- Improvement of equipment and systems cybersecurity
- Implementation and improvements in digital communications systems
- Completion of work on the open-phase detection system
- Refurbishment of the fuel handling system.
- Auxiliary crane for changing spent fuel pool racks
- Migration of the control of the circulating water cleaning system
- Update to various PLCs

Trillo NPP

- Continuation of cybersecurity improvement work on equipment.
- Renewal of actuators for regulation of motorised valves (H&B).
- Renovation of chemical analysers and other instruments.
- Card packaging and purchase of additional stock.
- Modernisation of main pump decontamination system control (TU-50)
- Modernisation of the seismic instrumentation system computer.
- Renewal of the alternator monitoring system (GÜR)
- Modernisation of the reactor limitation and protection system (ERBUS) test computer.
- Renewal of the control of the pressuriser shower valves

18.2.3. Regulatory review and control activities

Design modifications incorporating new technologies and methodologies and requiring favourable authorisation or appraisal, 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 BIP 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 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 controllable operation with specifications relating to human factors and human-machine interfaces

18.3.1. Regulatory provisions and requirements for reliable, stable and easily controllable operation, with special consideration of human factors and person-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 ESCs shall be designed to guarantee safety functions under the environmental and seismic conditions considered in the foreseen operational events and in the design basis accidents, incorporating adequate protections against external and internal hazards.

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 concerning modification in nuclear power plants includes among its requirements that "human factor methods and criteria shall be adequately incorporated into all phases of the process and modification activities". Finally, the Regulation on Nuclear Safety at Nuclear Facilities, published in 2018, includes the requirement to «take into account the influence of human and organisational factors on nuclear safety, throughout the life cycle of the facility».

18.3.2. Implementation of measures taken by the licensee

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 2016-2018 period, the licensees have developed procedures to systematise the application of this methodology to design modifications

Update

Almaraz I and II NPP

- Implementation and start-up of the new Control Room Simulator building at the same site as the Almaraz nuclear power plant (previously located in Madrid).

Ascó I and II NPP

- Systematic application of human factors engineering criteria in design modifications and verification of human factors engineering aspects in control and monitoring systems *displays*, according to NUREG-0711, depending on their classification as special or ordinary.

Cofrentes NPP

- Application of the methodology to fuel building crane modifications for container loading, individualised temporary dry storage and spent fuel container loading processes.

Vandellós II NPP

- Systematic application of human factors engineering criteria in design modifications and verification of human factors engineering aspects in control and monitoring systems *displays*, according to NUREG-0711, depending on their classification as special or ordinary.

18.3.3. Regulatory review and control activities

Design modifications requiring authorisation or favourable appraisal, 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 person-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 BIP includes inspections concerning design modifications, in any of their phases,

for the systematic and periodic supervision of aspects relating to human factors and person-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 plans for the construction of new nuclear power plants, but it is understood that the principle is fully applicable, as regards design and operation, to the 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 2016-2018 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 2016-2018 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. Authorisations

The RINR contains the requirements for the initial authorisation of nuclear power plants, which are specified for each nuclear power plant in the various documents that shall accompany the application for the prior, construction and Operating Licence authorisations.

Prior 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 authorisation is provisional until the satisfactory completion of the nuclear tests, and is subsequently granted for a specific period of time, normally 10 years, and the licensee may request the renewal of the Operating Licence in accordance with the provisions of the RINR.

The granting of the aforementioned authorisations is the responsibility of the MITERD, 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. Operational limits and conditions

19.2.1. Regulatory provisions and requirements to define the safe boundaries of the operation and to establish 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.

This documentation includes, among others, the following documents, which are the plant's Official Operating Documents (DOE):

a) Safety Report (SS).

b) Operating Regulations (OR).

c) Operating Technical Specifications (OTS).

d) Internal Emergency Plan (IEP)

e) Quality Assurance Manual (QAM).

f) Radiation Protection Manual (RPM)

g) Radioactive Waste and Spent Fuel Management Plan (RWSFMP)

CSN Instruction IS-32 on OTS 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 staff with responsibility for safety-related work

The OTSs 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 OTFs 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.

OTFs 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.

OTFs allow for the planning of VRs, with associated monitoring procedures (MPs) setting out the frequency of execution of each requirement, the manner of testing and the applicable acceptance criteria.

The OTFs 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 OTFs establish in the CLOs the operability requirements of the ESCs 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 AC (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 shall undertake a «Determination of Operability» according to the applicable procedures. In addition, until the CA is resolved, the licensee shall implement compensatory measures that maintain the required level of safety. All this shall 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.

Update

The Central Offices maintain the operation of the OTF application in the required terms. In addition, the nuclear power plants have been migrating to the Enhanced Technical Specifications (ETSs), which have a structure that facilitates their application to the operating shifts, making them more understandable and minimising potential errors in their application.

As regards anomalous conditions, the plants have consolidated the application of the process during these years, increasing the scope of its application based on the experience acquired and the response to the analyses and actions derived from them.

19.2.3. Review and revision of operational limits and conditions where necessary

Given the importance of the OTFs 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 OTF review process can be initiated:

- at the proposal of the CSN, which may request reviews directly from Spanish nuclear power plants
- at the request of the licensee, to adapt the OTFs 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 appraisal 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 MITERD formally approves the OTF revisions.

Update

The CSNC and CSNE bodies are maintained at the nuclear power plants with their advisory functions in nuclear safety and radiation protection, with a highly relevant role in the review and processing of possible modifications to the OTS's that might be required in the cases associated with a normal review process.

The role of the CSNC in the daily operations of the plants has been strengthened, with a view to increasing its advisory role for the licensee in nuclear safety and radiation protection matters.

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 OTFs 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 OTFs 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 OTSs, the CSN is required to inform the MITERD of any such request.

19.3. Procedures for operation, maintenance, inspection and testing

19.3.1. Provisions and regulatory requirements on procedures for the operation, maintenance, inspection and testing of nuclear facilities

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 NSR, 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, GGAS 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 OTFs requires that they comply with the SSC surveillance tests within the scope of the OTFs and that they be performed by means of written procedures that include acceptance criteria allowing the operability of the ESC 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, the aforementioned CSN Instruction IS-36 requires that procedures be subjected to a process of verification and validation and that users receive regular training and coaching.

Update

In this 2019-2021 period, the plants have been consolidating the processes associated with compliance with the aforementioned SIs. In the area of emergency procedures, it is important to highlight the use of full scope simulators for the training and improvement of procedures, as well as the field validation of instructions, with the corresponding identification of resources and means necessary to guarantee their success.

The management processes have been reviewed during this period, as well as their monitoring indicators, in order to ensure greater efficiency and better application in the operation of the plants.

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 NSR 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 shall 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.
- GGAS: 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.

Update

In this 2019-2021 period, plant procedures have been under review based on:

- results derived from our own internal operating experience
- external operational experiences from other plants
- results of independent audits and supervisions
- improvements identified in the area of the human factor and their implementation in procedures
- needs identified by the executing and supervising personnel themselves, who use the procedure
- application of simulators in the validation and training of procedures and action guides
- implementation of improvements identified by external agencies, such as WANO, INPO, etc.
- analysis of bulletins and recommendations received from technologists and specialists

19.3.3. Availability of procedures for relevant nuclear facility personnel

Spanish plants have a system for archiving and distributing official documents, including procedures. The systems that guarantee 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.

Update

In this 2019-2021 period, the training processes and requirements associated with knowledge of operating procedures and their operating environment have been improved. Internal and external operational experiences have become an essential channel for updating and identifying training needs as the operating results in the plants have improved and the number of incidents has been reduced.

The generational changes in the Control Rooms have led to an improvement in the scope and term of the training activities both in the regulatory area of obtaining new operator and supervisor licences, as well as in the renewal processes of these licenses; an effort made by both the regulatory body and the licensees of the facilities. This has resulted in increased procedural quality and availability as a means of reflecting and applying the necessary knowledge in daily plant operations.

19.3.4. Involvement of relevant nuclear facility personnel 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 shall be reviewed by the CSNC prior to their approval.

Changes to the procedures shall 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.

Update

During this period, staff participation in the preparation and review of procedures has been increased, as a result of the greater scope given to them, the increase in the exchange of experiences and the promotion of the identification of improvements to be implemented.

19.3.5. Incorporation of operating procedures in the nuclear facility management system

The plants' management systems include administrative procedures that describe the processes for reviewing and updating operational procedures. These processes shall 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.

Update

In this period 2019-2021, the procedures have been reviewed and updated in accordance with the required processes and as all the technological modifications and improvements developed in the Spanish nuclear power plants have been developed and implemented. The recent renewals of the operating authorisation obtained during this time have involved the implementation of new requirements, changes and improvements that entail the corresponding updating of procedures, as well as the development and incorporation of new procedures developed.

19.3.6. Regulatory review and control activities

In accordance with the RINR, an Operating Licence request from any nuclear facility shall 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 OS&HF inspections of personnel training, human and organisational factors and the implementation and use of CAP 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 incidents 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 EOPs were implemented at US-designed plants in the late 1980s, while GGAS 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 (GGAS, 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 ESCs, 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. Provisions and regulatory requirements on procedures for responding to predicted operational incidents 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.

Update

In accordance with Royal Decree 1308/2011, of September 26, on the physical protection of nuclear facilities and materials, and radioactive sources (modified by Royal Decree 1086/2015, of December 4), the Civil Guard Response Unit has completed its deployment to all operating Spanish nuclear power plants in 2019. In this respect, these plants have incorporated the considerations and instructions derived from these documents as a result of this deployment into their Site Emergency Plans and their development procedures.

On the other hand, the CSN Instruction IS-44, of February 26, 2020, on emergency planning, preparedness and response requirements for nuclear facilities, published in the Official Spanish State Bulletin No. 63 of March 12, 2020, aims to *"establish the requirements regarding planning, preparedness and response to nuclear and radiological emergencies that are applicable at the site response level of nuclear facilities in Spain. This instruction will apply to all nuclear facilities in each of their life phases."*

Following an internal analysis process, all the Spanish nuclear power plants have incorporated the requirements established by this Instruction into their Site Emergency Plans and their development procedures.

19.4.2. Establishment of operating procedures for emergencies based on events and/or symptoms

The event-based approach to EOPs 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 EOPs of the Spanish nuclear power plants using this technology.

Westinghouse PWR technology EOPs 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 EOPs 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 2016-2018 period.

19.4.3. Establishment of procedures and guidelines to prevent very serious accidents or mitigate their consequences

Severe accidents are those accidental conditions that are more severe than design basis accidents and that lead to a significant degradation of the core, for which reason the actions contemplated in the EOPs are aimed at the prevention of severe accidents. On the other hand, the GGAS 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 GGAS has been similar to that described in the case of EOPs 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 GGAS development programmes includes the establishment of the transition conditions between EOP and GGAS, as well as the review of the IEP and other emer-

gency 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 guidelines for managing accident situations at nuclear facilities 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 CTI requiring the licensees to analyse events beyond the design basis, including external hazards 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 EOPs 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 EOPs/GGAS 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 EOPs, 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, ESC, 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 (AWP) includes periodic GWP inspections allowing checks to be performed on different aspects of the implementation of the SSOs and GWPs 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, PAT includes other types of generic inspections directly focused on the implementation, updating and training of EOPs and GGAS.

19.5. Engineering and technical support

19.5.1. General availability of the necessary technical and engineering support in all fields related to the safety of nuclear facilities, under construction, operation, under accident conditions and or in the process of decommissioning

As has been indicated above, both the NSR 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 the 2016-2018, 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 the necessary technical support at the site and at the licensee's or entity's headquarters, and procedures for making central resources available to nuclear facilities

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 OR, 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 regarding reliance on consultants or contractors to provide technical support to nuclear facilities

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 OR of the facility, including relations with external organisations within the scope of this process. The OR is a document subject to the regime of modifications established in IS-21 and in the Operating Licence itself, according to which changes to the OR shall be approved by MITERD following a favourable report by the CSN.

The organisational and quality aspects are within the scope of the CSN supervision and control processes, as explained above.

The systematic inspections of the PBI include: the inspections of modifications in nuclear power plants, which include changes in the DOE but also any physical or documentary modification that, according to the specific analysis required in IS-21, may require MITERD authorisation or

favourable appraisal by the CSN and in which the plant technical support may have participated technical support of the plant may have been involved; quality assurance inspections on the CAP and the systematic inspections carried out by the resident inspectorate on various aspects of plant operation, which are documented on a quarterly basis. 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. Notification of major security incidents

19.6.1. Regulatory provisions and 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. Notification criteria and procedures established in connection with incidents of safety significance and other occurrences such as near-misses and accidents

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 in revision 1, dated September 2014, and has not been modified in the 2016-2021 period, however, revision 2 of this safety instruction is being revised. 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 (OTF), E. Operation, F. Safety systems, G. Other risk situations and H. External hazards.
- 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 with significance for safety

All events reported to the CSN during the 2019-2021 period were classified at level 0 of the IAEA's International Event Scale (INES), except in the eight cases detailed below:

Update

Ascó I NPP INES 1
April 15, 2021

Unscheduled plant shutdown due to loss of main feed water. Failure of an electronic card of the reactor protection system, causing rapid shutdown of the reactor, and failure of the auxiliary feedwater system water system. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, or additional aggravating factors.

Cofrentes NPP INES 1
14 May 2021

Activation of fire detection system in a power switch to a valve of the insulated core cooling system. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, or additional aggravating factors.

Santa María de Garoña NPP INES 1
14 May 2021

Execution of a manoeuvre on the reloading crane under conditions not permitted by the Technical Specifications for Operation. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, after root cause analysis revealed additional aggravating factors.

Trillo NPP INES 1
May 12, 2021

Inadvertent simultaneous inoperability of two sewage disposal system pumps. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, after root cause analysis revealed additional aggravating factors.

Vandellós II NPP INES 1
17 December 2021

Decalibration of the temperature instrumentation of the refill water storage tank. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, or additional aggravating factors.

Vandellós II NPP INES 1
16 August 2021

Error in the execution of a steam generator pressure instrumentation monitoring procedure. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, or additional aggravating factors.

Vandellós II NPP INES 1
07 August 2020

Non-compliance with fire resistance times of several fire barriers. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, or additional aggravating factors.

Vandellós II NPP INES 1
07 August 2020

Leakage in the pressure barrier through a weld. Classification as Level 1 on the INES scale results from applying in-depth defence criteria, without an initiating event, after root cause analysis revealed additional aggravating factors.

19.6.4. Documentation and publication of reported events and incidents by licensees 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 regarding the 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 Plenary 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 Plenary 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. Exchange of information on operational experience

19.7.1. Regulatory provisions and requirements for licence holders to collect, analyse and exchange operational 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, the Operating Licence establishes a generic condition applicable to the treatment of operational experience, developed through an CTI 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. Licensees' programmes for the exchange of information on operational experience arising from their own nuclear facilities, other domestic facilities and international facilities

As has been indicated, the CSN requires each plant, by means of an CTI associated with the Operating Licence, to submit an annual report on operating experience, in addition to specifying that which shall 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 and General Electric design plants, the significant events *(INPO Event Report,* IER Level 1 and 2) 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.

All the information relating to these analyses is included in the annual report required in the CTI of the Operating Licence, which is used by the CSN to define the planning of inspections and other follow-up actions.

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.

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.

Update

The CTIs issued by the CSN for those Spanish nuclear power plants that renewed their Operating Licences in the 2019-2021 period require that the annual operating experience report of each plant also include the analysis of the reports required by the Site Emergency Plan related to the activation of the same issued by other Spanish nuclear power plants, with the inclusion of the WANO SER and SOER analysis no longer required.

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 assessed 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, causes 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.

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 treatment of operational experience is the CAP, which makes it possible to categorise the events and prioritise the actions identified, usually including modifications to design, 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 licences, 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, participate in the *Working Group on Operating Experience (WGOE) of the NEA*, 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. As regards 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 who operate as described in the CEN-29 guide and carry 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.
- Production by the Operating Experience Group of ICEO Joint Operating Experience Reports, similar to the INPO/WANO IER/SOER documents, published annually by the sector, with publications as follows: "Assessment of the effectiveness of the actions derived from the Operating Experience analyses" in 2016, "Events related to permanent design modifications" in 2017 and "Preventive actions to reduce accident rates" in 2018.
- 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.*

Update

In the 2019-2021 period, the following activities of the permanent working group on operational experience under the framework of the CEN of the Nuclear Forum:

- On-demand activation of the Sectoral Incident Analysis Group (GSAI).
- Development, by the Operational Experience Group, in 2019, of the report ICEO "*Adherence to procedures and effectiveness of pre-job meetings*".
- Exchange of international operational experience

  —Regular submission of events to WANO for publication as WER (WANO Event Report).

  —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.

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 2016-2018 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 IBP, 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 assessment 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 International Operating Experience Workshop on Best Practices with Regulatory Operating Experience Databases, arranged by this organisation.

Finally, it should be noted that the CSN is part of the Clearing House, 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 shall meet the criteria of Safety Guide GS 9.3, compliance with which is required under the CSN's Technical Instruction.

The licensee shall 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 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

Spent fuel from Spanish nuclear power plants is initially stored in the fuel building pools incorporated in the design of each facility. The capacity of the pools has been expanding in recent years through design modifications such as replacing the original racks with more compact ones (re-racking), compacting the stored waste and optimising storage (boraflex).

However, the 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, Cofrentes NPP has started the operation of its ATI and container loading in 2021.

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, MITERD 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 m^3 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.

Update

This section is updated with the volume of conditioned radioactive waste stored in the temporary storage facilities (the volume is that corresponding to 220 l equivalent drums of conditioned packages), and the percentage of occupancy of the temporary storage facilities as of 31/12/2021:

Site	m^3 waste conditioned in warehouses	% occupation
Vandellós II NPP	461,56 (2098 canisters)	22.24%
Ascó II NPP	1299,76 (5908 canisters)	71.56%
NPP Almaraz	3124,66 (14203 canisters)	60.32%
Cofrentes NPP	2293,72 (10426 canisters)	51.87%
NPP Trillo	143,66 (653 canisters)	5.68 %
Garoña NPP	127,16 (578 canisters)	29.89 %

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.

Update

In addition to CNSMG, the Almaraz and Cofrentes plants have used, or are considering using, the metal scrap smelting management route.

Specifically, Cofrentes NPP removed a heater destined for the Swedish company Cyclife's facilities in the fall of 2020 (the initially planned load had to be postponed due to the pandemic). In the case of Almaraz, it is estimated that the project could involve the management of some 2,500 MT of waste, but a final analysis is pending. At CNSMG, all the secondary waste from the smelter was received from the operating waste during September 2021 and work is being carried out with ENRESA to define the management pathways for the secondary material.

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 2016-2018period, 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 EOPs and GGAS (Article 19.4), revised and reinforced in the case of Spanish nuclear power plants as a result of resistance tests and analysis of situa-

tions 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 ESCs to address situations beyond the design basis, including severe accidents.

In this respect, the regulatory framework has been reinforced with Nuclear Safety Council Instruction IS-36, on EOP and GGAS, 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 NPP _____ (entry registration number _____), as referred to in Chapter IV of the Regulation on Nuclear and Radioactive Facilities, submitted by the licensee in compliance with provision 2 of the Ministerial Order dated _____ via which NPP _____ is granted a current Operating Permit. The application 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 assessed.

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 basis. 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 basis that might mean the loss of large areas of the plant. NPP _____, as with 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 dated _____, 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 of Spanish Law 15/1980, establishing the Nuclear Safety Council, and is submitted to that Ministry for the appropriate purposes.

Madrid (Spain), dated: _____

THE CHAIRMAN

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 Report 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) Safety Report, 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 shall 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 for Energy Policy and Mines of the beginning and end of the exemption.

   3.2. Six months after start-up, following each refuelling outage, the licensee shall carry out a review of the Safety 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 Report 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 shall 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 shall be favourably appraised 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 appraisal 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 appraisal 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.

7. 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.

8. 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 shall substantiate the nuclear safety and radiological protection conditions of the facility to which the operations to be carried out in the facility shall 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.

9. 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 assessment 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 and Ninth 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 2021, as well as the main challenges in the nuclear regulatory field, in order to highlight the highlights of the period, to give an overview of our safety efforts and to respond to the self-assessment objective of 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.

Similarly, the Summary section includes the lessons learned and actions taken in response to the COVID-19 pandemic, in compliance with the criteria agreed at the Organisational Meeting of the Contracting Parties of the Eighth and Ninth Joint Review Meetings, held in October 2021.

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 Climate Change and Energy Transition Act.
- The Law on civil liability for nuclear damage or damage caused by radioactive material.
- Spanish Royal Decree approving urgent measures for the modernisation of the Public Administration and for the execution of the Recovery, Transformation and Resilience Plan.
- The Spanish Royal Decree approving the Regulation on nuclear safety in nuclear facilities.
- The Spanish Royal Decree on the control and recovery of orphan radioactive sources.
- The Spanish Royal Decree on mandatory information in case of nuclear or radiological emergency.
- The Order publishing the National Civil Protection Strategy approved by the National Security Council.
- The Spanish Royal Decree on justification and optimisation of the use of ionising radiation for the radiological protection of persons during medical exposures.

- 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 during the transport of radioactive material to the Council
- 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
- IS-11, Revision 1 on licensing of operating personnel in nuclear power plants.
- IS-43, establishing the criteria for the notification of events relating to the physical safety of nuclear power plants.
- IS-44 on nuclear facility emergency planning, preparedness and response requirements.

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 and Ninth National Report on the actions carried out by the Regulatory Body in relation to this issue:

Effectively and efficiently organise the 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.

Once the combined review mission was completed, the CSN Plenary Meeting approved an action plan with the aim of carrying out actions in response to the recommendations and suggestions resulting from this mission, establishing a short, medium and long term action strategy.

This action plan is ongoing. At the end of the year 2021, the percentage of completion of the milestones that make up the action plan was 60% of activities completed compared to the total.

It is expected that in 2022 and early 2023 most of the pending actions related to the publication of regulations within the national legal system will be completed in order to finalise the recommendations and suggestions identified by the review team of this mission.

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 2021 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 was 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. This CSN instruction has been referenced as IS-44 published on February 26, 2020.

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 assessment 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 action plan comprises the following phases:

- Preparation Phase: Identification of critical knowledge holders.
- Knowledge Extraction and Systematisation Phase
- Approval 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 Plenary of the CSN in 2018, was prepared. The Plenary 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.

In the 2020-2021 period, this same work strategy was maintained, with the development of 10 knowledge books and 7 audiovisual pills.

More information can be found in section 8.1.2. c).

Develop a Safety Culture programme within the regulatory body

In 2017 the Plenary 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 personnel 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 an assessment of the safety culture.

In 2018, in accordance with the Plenary 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 personnel, in order to explain and disseminate the meaning and attributes of the concept of safety culture as it applies to a regulatory body. The initiation of the safety culture self-assessment process with the support of an external company contracted by the CSN for this purpose began in 2021, the process being completed with the final report issued by the external company in December 2021.

The CSN management has identified the need to establish and implement an action plan to address the results and recommendations from this process. In the preparation and implementation of an action plan, the CSN management has considered the suitability of having the support of an external company specialising in organisational change management and safety culture, for which purpose the necessary procedures have been initiated that will conclude with the contracting of an external entity with these characteristics in 2022. The management of the organisation has foreseen that this entity will assist the CSN in this process for a period of four years,

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 are considered a priority for the immediate future:

- **Challenge 1. Plan and execute efficient licensing and supervision processes, adequately managing the necessary human resources through the application of operational techniques, as well as adopting a graded approach to risk.**

  Optimising the use of human resources by both the regulator and the regulated in an environment of digital transformation and generational change is essential to maintain and improve compliance with safety requirements in operating nuclear power plants. Non-optimised use of human and material resources can lead to deviations and decreased supervision of other issues, with a potential impact on safety. In order to address this problem, the objective is to make progress in the implementation of operational research techniques that allow for adequate planning, staffing and information processing.

  The use of a graded approach based on the impact on risk in the licensing or supervision processes constitutes an opportunity for improvement to incorporate the use of resources by the affected organisations in the planning processes. Its effective application requires a methodological and precise development, which in any case guarantees compliance with the highest nuclear safety requirements.

- **Challenge 2. Progress in actions aimed at digital transformation in a secure environment.**

  A context of particular relevance is the optimisation of the digital transformation process, including almost all of the organisation's activities. In this context, actions related to cybersecurity, a matter that impacts both the regulated organisations and the regulator, take on special importance.

- **Challenge 3. 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. Improve human resources management at the CSN, adapting both short and long-term personnel needs and ensuring mechanisms for professional progression over different time horizons.**

  The CSN uses technical personnel who are highly qualified, so that they can perform their assigned functions with full protection in place. However, in line with what was identified by the combined IRRS-ARTEMIS mission review team in 2018, 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 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. To this end, a training system called *Systematic Approach to Training* (SAT) will be implemented for its personnel. In addition, this challenge will be complemented by the existence of appropriate career progression mechanisms to encourage the tenure and retention of such personnel in the organisation.

- **Challenge 4. Ensure compliance with the requirements of the long-term operating and ageing management programme at nuclear power plants.**

  Following the renewal of the operating authorisations of the Spanish NPPs, the challenge for the regulatory body would be to ensure their extended operation. To this end, it will be necessary for both facility licensees and the regulatory body to guarantee compliance with the requirements of the long-term operation and ageing management programme of the nuclear power plants. In this sense, licensees shall demonstrate that they are adequately managing ageing-related phenomenologies and optimising their inspection techniques, assessing how their effects affect the functionality of nuclear power plant systems, structures and components.

Conclusions from the point of view of the licensees

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 licensees in the course of their duties, whilst simultaneously fulfilling the obligations established by the Convention.

The most significant aspects are summarised below:

- During the period covered by the report, the entire Spanish nuclear fleet has performed safely, with no incidents having had a significant impact on people or the environment and contributing to the guarantee of supply, operating continuously without interruptions in operation, respecting the health and safety measures derived from the Covid-19 pandemic.
- Thanks to the coordination carried out in the sector and the measures adopted, not only has it been possible to deal with the operation at power, but the planned refuelling outages at the different facilities have also been carried out normally.
- The coordination of the joint actions of the Spanish nuclear power plants in the face of the pandemic continued to be established in the Spanish Nuclear Industry Forum, through the Nuclear Energy Committee (CEN). The Operations Commission of the CEN monitored the evolution of the pandemic, shared the practices established in each of the centres and adopted the joint actions that were of interest at any given time. Coordination with the CSN to report on all actions derived from pandemic monitoring was carried out mainly through the Project Manager of each of the plants and the CSN resident inspection.
- In particular, and with regard to plant worker training and qualification, an action proposal was sent to the CSN essentially proposing the delivery of training activities to licensed and non-licensed personnel, both permanent and sporadic, by means of on-line training methodologies and environments, as well as student assessment using new technologies and distance learning platforms. The CSN responded favourably to this proposal, such that the plants were able to respond to the initial and ongoing training needs of their personnel, guaranteeing the maintenance of their skills and qualifications until the end of the state of alarm, the moment that marked the return to normality.
- The Santa María de Garoña nuclear power plant (BWR) went into shutdown on July 6, 2013. In May 2014, the licensee requested the renewal of the operating permit in accordance with the provisions of Royal Decree 1836/1999 approving the Regulation on Nuclear and Radioactive Facilities. On August 3, 2017, Order ETU/754/2017 of the former

MINETAD was published in the Official Spanish State Bulletin, denying the renewal of the operating authorisation of the Santa María de Garoña nuclear power plant.

Currently, the plant is in a situation of definitive cessation of operation and, since August 2017, it has completed the conditioning of all operating waste and all its fuel assemblies are in the pool, having a licensed ATI for 10 casks. With respect to the request for the authorisation of the transfer of ownership of the plant to ENRESA for its decommissioning, it is being assessed by the CSN/MITERD, together with the Spent Fuel Management Plan and the request for the Phase 1 decommissioning authorisation.

- Consistent with the National Integrated Energy and Climate Plan 2021-2030 (PNIEC), in March 2019 a protocol of intentions was signed between the National Radioactive Waste Company (ENRESA) and the companies which own the nuclear power plants, which established a schedule for the definitive staggered cessation of operation of the facilities, starting with Almaraz 1 (Nov-2027) and ending with Trillo (May-2035).
- In accordance with this schedule, and applying a new process for performing Periodic Safety Reviews and requests for renewal of Operating Licences, the licensees of the Almaraz and Cofrentes plants requested and obtained in July 2020 and March 2021, respectively, the renewal of their Operating Licences, while the licensee of Vandellós II requested the renewal of its permit for a new 10-year period, until July 2030, which was granted in July 2020. Therefore, in this case, an additional renewal for a period of slightly less than 5 years will be necessary to reach the expected date of cessation of operations. In the case of Ascó, the licensee requested the renewal of its Permit for a period of 9 years for Unit 1 (until October 2030, date of definitive cessation) and for 10 years for Unit 2 (until October 2031). These renewals were granted in September 2021, so an additional renewal for Unit 2 will be required for just under 1 year to reach its planned closure date of September 2032. Finally, as regards the Trillo plant, in November 2021 the licensee sent the supporting documentation for the LTO and in December 2021 submitted the PSR Base Document.
- In application of the new methodology imposed by revision 2 of CSN safety guide GS-01.10 for the performance of Periodic Safety Reviews, the plants made improvement proposals which, following receipt of the mandatory authorisations, are being implemented by the licensees in accordance with the schedule required by the CSN.
- In accordance with Royal Decree 1308/2011, of September 26, on the physical protection of nuclear facilities and materials, and radioactive sources (modified by Royal Decree 1086/2015, of December 4), the Civil Guard Response Unit has completed its deployment to all operating Spanish nuclear power plants in 2019.
- In the Spanish nuclear power plants during 2019, 2020 and 2021, the assessments performed by the World Association of Nuclear Operators (WANO) through Peer Reviews have been 8 and those performed by the IAEA through operational safety review missions (OSART) or long-term operation safety aspects (SALTO) have been 2.
- In turn, in relation to participation in technical missions at both Spanish and foreign plants, in addition to the missions received directly by the licensees of the Spanish facilities, various experts from these plants have participated during 2019, 2020 and 2021 in 20 WANO peer-to-peer missions, 19 WANO technical missions and 3 IAEA missions, in all cases carried out at nuclear power plants.

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.

Convention on Nuclear Safety

Eighth and Ninth National Report

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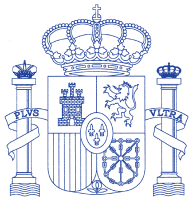

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