SPAIN

Convention on Nuclear Safety

TENTH NATIONAL REPORT

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Contents

I. INTRODUCTION


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Presentation of the Report

This document constitutes the Tenth National Report of Spain in compliance with the obligations arising from the Convention on Nuclear Safety, signed in Vienna on 20 September 1994, in accordance with the provisions established in Articles 5, 20, 21 and 22. The report contains data and facts for the years 2022, 2023 and 2024, including relevant information after this date.

Drafting of the Report

The coordination for the drafting of the National Report is the responsibility of the Nuclear Safety Council (CSN), the sole competent regulatory body for nuclear safety and radiation protection, independent of the Government and which reports exclusively to the Spanish Parliament. The Ministry for Ecological Transition and the Demographic Challenge (MITECO) and the licensees of the Spanish nuclear power plants, coordinated by the Nuclear Energy Committee (CEN in Spanish), have contributed to the preparation of this report in compliance with the commitments adopted during the Second Review Meeting. In this regard, the report includes specific views of the different stakeholders involved in the safety of nuclear installations from their different fields and respective responsibilities.

The report was drafted following the same structure as the articles in Chapter 2 "Obligations" of the Convention text, starting with Article 6. Each article includes the relevant information on the content of each obligation, distinguishing insofar as possible between the activities of the licensees of the installations and those of the regulatory body, where applicable, and a brief assessment of the degree of compliance in Spain with the requirements established therein. Several of the articles also include annexes that expand and detail the information described.

The initial part includes a Summary section that responds to the commitments acquired at the Joint Eighth and Ninth Review Meeting; it highlights the most relevant aspects concerning nuclear facilities, emergencies, the regulatory framework and the regulatory body for the 2022-2024 period; and it includes the results of the IRRS Follow up Mission carried out in January 2025. In addition, proposals for "notable achievements" are listed.

The report also contains a Conclusions section which identifies the challenges the regulator is facing and the initiatives planned to be implemented in the near future, as well as some conclusions from the operators' point of view.

The content and scope of this Tenth National Report are based on the recommendations set out in the Guidelines regarding National Reports under the Convention on Nuclear Safety (INFCIRC/572/Rev. 8 of 6 March 2025).

This Tenth National Report also includes information on the commitments made by the Contracting Parties, as identified in the Summary Report of the Joint Eighth and Ninth Review Meeting, as well as the commitments made by the Contracting Parties at the Diplomatic Conference and which resulted in the so-called Vienna Declaration.

Basic description of the Spanish nuclear programme and nuclear energy in the national energy policy

There are seven light water nuclear reactors in operation in Spain, located at five sites, with an installed power of 7,398.7 MWe, which represents 5.45% of the installed national electricity, and a contribution of around 20% of the total national electricity production. Six of the units are pressurised water reactors (PWR) and the remaining unit, at Cofrentes Nuclear Power Plant (NPP), is a boiling water reactor (BWR). The average lifetime of the units currently operating in Spain is about 39 years.

General view of Ascó Nuclear Power Plant (Tarragona).

It should be noted that in November 2024, the operating authorisation for the Trillo nuclear power plant was renewed until November 2034.

In Spain there are two nuclear power plants being decommissioned, namely:

- The Vandellós I nuclear power plant is currently in the dormancy phase, having ceased operation in 1989 and reached decommissioning level 2 in 2003.

- The Santa María de Garoña nuclear power plant (BWR) has been in a state of permanent shutdown since 6 July 2013. In May 2014, it applied for renewal of the operating authorisation, which was denied by Ministerial Order of 1 August 2017, published in the Official State Gazette of 3 August 2017, and since then it has been in a situation of permanent shutdown. The decommissioning of this nuclear power plant is being carried out in two successive phases. Ministerial Order of 13 July 2023 authorised the

transfer of ownership of the Santa María de Garoña nuclear power plant from the company Nuclenor, S.A. to the public radioactive waste management company (Enresa), and phase 1 of decommissioning was authorised. During this first phase, which is expected to last 3 years, activities will include the modification of auxiliary systems and installations, the dismantling of the interior of the turbine building, the adaptation of the turbine building as an auxiliary dismantling building, the start-up of an Individualised Storage Facility (ISF) to house all the spent fuel, and the evacuation of this fuel from the pool to the ISF.

During phase 2, which is expected to last 7 years, major radiological decommissioning, decontamination, demolition and clearance of buildings, and site restoration will be carried out. Like phase 1, phase 2 will require a decommissioning authorisation from the Ministry for Ecological Transition and Demographic Challenge, following a report from the CSN, and will be subject to an environmental impact assessment.

In addition, in Spain, the decommissioning of the José Cabrera nuclear power plant has been completed. This plant shut down permanently in 2006; in 2010 its ownership was transferred to the Spanish nuclear waste management company Enresa (and the decommissioning authorisation was granted; in 2023 the plant's decommissioning work was completed and site restoration activities began. In 2024 the final radiological characterisation of the site was already ongoing, and will continue until at least 2027. Also, the last remaining waste at the site is being managed.

General view of the decommissioning José Cabrera Nuclear Power Plant (Guadalajara).

With regard to energy policy, in March 2020 the Spanish government submitted to the European Commission the Integrated National Energy and Climate Plan 2021-2030 (PNIEC) (BOE 31-03-2021), which establishes, among other aspects, the planning of the participation of nuclear energy in the energy mix, and envisages the orderly phase out of the Spanish nuclear fleet in the 2027-2035 timeframe. This Plan was updated under Royal Decree 986/2024 of 24 September, approving the update of the National Integrated Energy and Climate Plan 2023-2030.

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

Table 1. Nuclear Power Plants in operation in Spain (2024)

Reactor	Location	Licence Holder	Electrical power (MW)	Type	Year of Comissioning
Almaraz I	Almaraz (Cáceres)	Almaraz-Trillo Nuclear Power Plants, AIE. (CNAT)	1,049.40	PWR	1983
Almaraz II	Almaraz (Cáceres)	Almaraz-Trillo Nuclear Power Plants, AIE. (CNAT)	1,044.50	PWR	1984
Ascó I	Ascó (Tarragona)	Ascó-Vandellós II Nuclear Association, AIE. (ANAV)	1,032.50	PWR	1984
Ascó II	Ascó (Tarragona)	Ascó-Vandellós II Nuclear Association, AIE. (ANAV)	1,027.21	PWR	1986
Cofrentes	Cofrentes (Valencia)	Iberdrola Generación Nuclear, S.A.	1,092.02	BWR	1985
Vandellós II	Vandellòs i L'Hospitalet de l'Infant (Tarragona)	Ascó-Vandellós II Nuclear Association, AIE. (ANAV)	1,087.14	PWR	1988
Trillo	Trillo (Guadalajara)	Almaraz-Trillo Nuclear Power Plants, AIE. (CNAT)	1,066.00	PWR	1988

Convention on Nuclear Safety Diplomatic Conference

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 the 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 a period of one year to consider the proposal

submitted by Switzerland. The Contracting Parties of the Convention also requested the IAEA Director General, as Depositary, to organise a consultation meeting open to all Contracting Parties to exchange views and prepare for the adoption of the rules of procedure. This meeting took place on 15 October 2014 at the IAEA headquarters in Vienna.

The Diplomatic Conference took place on 9 February 2015 at the IAEA headquarters in Vienna. Arising from this Conference, the Contracting Parties adopted the Vienna Declaration on Nuclear Safety. Furthermore, the Contracting Parties decided that *the principles that make up this 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 to be submitted by the Contracting Parties for consideration during the Seventh Review Meeting of the Convention on Nuclear Safety.*

Spain, as a Contracting Party of the Convention on Nuclear Safety, adopted the Vienna Declaration and, in response to the commitments reached during the aforementioned Diplomatic Conference, includes in this Tenth Report information relating to compliance with the safety principles contained in the aforementioned Vienna Declaration.


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II. SUMMARY

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Spain's Tenth National Report complies with its obligations under the Convention on Nuclear Safety. The information it contains covers the period 2022-2024, in addition to the significant progress made in the first half of 2025.

The overall conclusion is that Spain is in satisfactory compliance with the obligations of the Convention on Nuclear Safety, as may be deduced from the information provided in this report in relation to each of the articles. Spain has also formally endorsed the principles of the Vienna Declaration on Nuclear Safety, as outlined in the relevant sections of this report.

This summary includes the challenges identified for Spain in the previous review process of the Convention; the actions carried out in the framework of the main common issues identified at the Joint Eighth and Ninth Review Meeting; changes in national nuclear energy programmes and in national regulations; the results of international peer review missions received or planned; lessons learned from emergency response exercises; and proposals for notable achievements.

2.1. Challenges of the Joint Eighth and Ninth Review Meeting

Firstly, the challenges raised at the previous Review Meeting of the Convention have been addressed and further developed:

1. Plan and execute efficient licensing and monitoring processes, adequately managing human resources (Art.7, Art.17, and Art.18).
2. Progress in actions aimed at digital transformation in a secure environment (Art. 18).
3. Retain, maintain and improve technical expertise and professional resources, both in the CSN and in the licensee organisations (Art. 8, Art. 11).
4. Ensure compliance with the requirements of the long-term operating and ageing management programme at nuclear power plants (Art. 14).

2.2. Major common issues

This section summarises the progress made by Spain on the major common issues identified at the Joint Eighth and Ninth Review Meeting:

Managing extraordinary circumstances impacting the safe operation of nuclear installations

Mention should be made of the development and maintenance of working methods and IT capacities following the COVID-19 pandemic, which now allow a large number of tasks to be performed telematically (virtual meetings, coordination of assessments, , etc.), both at the nuclear installations and at MITECO and the CSN.

Strengthening national regulatory capabilities taking into account new and innovative technologies

The CSN attends and participates in international working groups in order to gain insight into the progress being made in these areas and the way in which the regulatory bodies are dealing with them.

As a result of this attendance and participation, good practices, knowledge and lessons of experience are identified that can be incorporated into the regulatory body, where appropriate.

Fostering international collaboration

The regulator's international technical and institutional activities are carried out in four areas:

- *The European Union*, of which Spain is a member, participates in international meetings on nuclear safety and radiation protection, under the Euratom Treaty.
- *The international Conventions* that have been ratified by Spain and in which the CSN participates, within its scope of competence, through the application of the commitments acquired.
- *Multilateral relations* within international organisations such as the International Atomic Energy Agency (IAEA), the OECD's Nuclear Energy Agency (NEA) and the associations of regulators of which the CSN is a member by its own decision (INRA, WENRA, FORO, HERCA, ENSRA).
- *Bilateral relations*, which are normally carried out under technical cooperation agreements or memoranda of understanding with counterpart organisations.

Foster international peer review missions and timely addressing of findings

In March 2023, the Government of Spain requested to host an IRRS Follow up Mission, which took place at the headquarters of the Nuclear Safety Council from 26 January to 3 February 2025. The results of this mission are developed in section 2.5.

The ARTEMIS Follow-up Mission will take place from 28 September to 3 October 2025 in Madrid.

In addition, the CSN, as a member of the European Nuclear Safety Regulators Group (ENSREG), participated in the Second *Topical Peer Review (*TPR-II) on fire protection for the period 2022-2024. This review is a very relevant tool for mutual learning and exchange

of experiences, in which measures developed by other countries are evaluated after the results have been analysed, discussed and published.

Possible impact of global climate change on the safe operation of nuclear installations

The consideration of climate change as a factor of potential impact on the safety of nuclear installations has long been one of the CSN's initiatives, as part of its regulatory action strategy aimed at the integral and continuous improvement of the safety of the installations. Among these regulatory actions, special mention should be made, for the purposes of this section, of those associated with periodic safety reviews, renewals of operating authorisations and supervision and control activities.

The most significant parameters that are indicators of climate evolution are all related to records of severe weather conditions (temperatures, precipitation, floods, strong winds, tornadoes, etc.). The potential impact of climate evolution on the safety of installations derives from changes in severe weather conditions that may be induced; this makes it necessary to analyse trends in the evolution of recorded meteorological data (particularly extreme values), and to verify that these extreme values are covered by the design basis of the installation.

Thus, the current regulatory framework requires the implementation of surveillance and monitoring programmes for site characteristics and external events, including an analysis of the potential impact of extreme weather conditions on the safety of the installation throughout the life cycle, based on observed changes.

Information systematically updated in the Safety Analysis Reports of the Spanish nuclear power plants

Following completion of the assessment processes by the CSN of the second Periodic Safety Review (PSR) of each nuclear power plant and the renewal of the corresponding operating authorisation (years 2010-2014), the CSN issued each facility with a Complementary Technical Instruction linked to this authorisation, requiring, among other actions, a systematic plan to keep up-to-date the information relating to the site parameters included in the Safety Analysis Report (SAR).

Consequently, operators update the SAR of their sites with recent meteorological data in order to verify that the design is still adequate. In addition, it is important to note that, following the Fukushima accident, and in the context of the EU stress tests, the Spanish nuclear power plants implemented various improvements and carried out new safety analyses to assess the capacity to respond to extreme external conditions (including meteorological events). These situations, considered as design extensions, are also described in the safety analysis report of the Spanish nuclear power plants.

Periodic safety reviews

The process carried out during the Periodic Safety Reviews requires the operators to assess their capabilities to deal with such scenarios.

Review 2 of CSN Safety Guide 1.10, dedicated to the periodic safety review of nuclear power plants (and which is also used in Spain for other nuclear installations, with its ap-

plication being graded), based on IAEA SSG-25, directs the assessment of a series of safety factors with a view to identifying feasible and reasonable proposals for improvement, making it possible to maintain or increase the safety of the plant.

The objective of the review of 'safety factor 7: risk analysis' is to determine the adequacy of the plant to cope with internal and external risks, taking into account the design, site characteristics, the current and planned condition of structures, systems and safety-relevant components, as well as the analytical methods, standards and knowledge used. External risks to be considered include floods, winds, storms, weather conditions (extreme temperatures, high humidity, drought, snow, ice accumulation).

Renewal of the operating authorisation after the 3rd PSR

Following completion of the CSN's assessment of the third PSR for the Almaraz I and II, Ascó I and II, Cofrentes, Vandellós II and Trillo nuclear power plants, and the granting of the renewal of the corresponding operating authorisation, the CSN has issued Complementary Technical Instructions for each facility, requiring an estimation of the impact on the final heat sink capacity and safety margins of possible unfavourable future changes in the control meteorological parameters, applying the applicable methodology in accordance with their licensing terms.

CSN supervision and control

Within the so-called Integrated Plant Supervision System (SISC), the CSN has a Basic Inspection Plan (BIP) that specifically contemplates various periodic inspections at each nuclear power plant in relation to site parameters. Two types of inspections are contemplated: those of general scope (every two years, including all those risks relating to meteorological and flooding events identified for the site of each nuclear power plant), and those of limited scope (every six months, performed by the CSN resident inspectorate, in which checks are carried out on a sample of structures, systems or components that might be significantly affected by severe meteorological conditions or off-site flooding).

The objective, scope and frequency of inspections relating to site parameters are included in the technical procedures of the CSN Management System.

In view of the above considerations, the Spanish nuclear power plants have a design that takes into account severe climate scenarios, operate with safety margins and are constantly under review; in addition, their procedures, guidelines and Site Emergency Plans contemplate the material and human resources required to address these conditions, as well as the preventive actions to be taken when such scenarios are foreseen.

In any case, for the identification of possible improvements, the conclusions derived from the climate assessment programmes carried out by both official expert bodies and other international organisations (IAEA, WENRA, etc.) will be taken into account.

Securing reliable supply chains

The nuclear power plants have specialised supply chain areas that periodically exchange good practices and success cases in the procurement of equipment and components, as well as less satisfactory experiences that have occurred and actions implemented to mit-

igate them, through sectoral meetings and gatherings. In the same vein, the industry has sectoral guides for the detection of counterfeit and fraudulent components, based on international references, which are regularly updated.

Strategies for ageing management in support of the operation of nuclear installations

Ageing management at the nuclear power plants, throughout their in-service lifetime, is based, in accordance with the requirements of IS-22 and the reference standards used, on the activities developed in the Lifetime Management Plan (LMP), through ageing management review assessments and the implementation of the corresponding ageing management programmes (AMPs) necessary for the adequate management of the ageing effects and mechanisms identified. Among them, the industry's operating experiences are considered and assessed, which are evaluated by the plants and incorporated as appropriate within the activities of the LMP . This may entail the modification of certain on-site assessments and activities to take into account the latest operational experiences identified. The Spanish nuclear power plants, through their Life Management sector group, share and analyse their experiences in the performance of LMP activities, as well as through the inspections periodically performed by the CSN at the plants.

Strengthening emergency preparedness and response arrangements and fostering cross-border collaboration

The Nuclear Safety Council holds an agreement with the French Nuclear and Radiological Safety Authority (ASNR) with the objectives of establishing mechanisms for prompt notification of nuclear or radiological accidents occurring anywhere in either country, establishing mechanisms to facilitate mutual assistance and collaborating on the implementation of nuclear emergency plans through the planning and organisation of drills.

Likewise, there is a Technical Collaboration Protocol with the Portuguese authorities for the promotion of technical cooperation and the exchange of experiences related to nuclear and radiological emergencies, as well as for cooperation in the exchange of information, including data on radiological parameters, in the event of a nuclear or radiological emergency

2.3. Nuclear installations: peer reviews and operational experience

With regard to evaluations in the field of Spanish nuclear power plants, the established policy of receiving and participating in peer review exercises and missions remains in force. A total of 10 missions were received from the World Association of Nuclear Operators (WANO) and the IAEA in the period 2022-2024. It should be pointed out that in July 2021 the SALTO follow-up mission was received at the Ascó NPP in 2023 to verify the correct implementation of the actions adopted and to adequately address the long-term operation.

In the field of operating experience, as reflected in previous reports, the CSN and the Spanish nuclear power plants have established systematic methods for the assessment of both internal and external operating experiences, the objective being to identify the root causes in order to implement the corrective measures required to prevent their recurrence. This systematic approach was maintained for the period 2022-2024. 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 area of operating experience based on two elements: verification of the systematic approach 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: the periodic meetings of the (national) Incident Review Panel and of the International Incident Review Panel, and participation in international forums for the exchange of operating experience. All this has established a framework that makes it possible, both at national and international level, to identify events of a generic nature that might affect Spanish nuclear power plants and to implement or require the implementation of measures to prevent their repetition.

Furthermore, the Nuclear Safety Council Instruction IS-26 on basic nuclear safety requirements applicable to nuclear installations establishes, among other things, basic requirements for nuclear power plant licensees in relation to their internal and external operating experience programme. Likewise, the nuclear power plant operating authorisations include a generic condition relating to the treatment of operating experience, which is developed in a CTI (Complementary Technical Instrucction) issued by the CSN for each installation, in relation to the operating experience of others. As has become habitual and at the sector's own initiative, the CEN Operating Experience Group has drawn up the so-called ICEO reports (Joint Operating Experience Report), similar to the IER/SOER documents of INPO/WANO, published annually: in 2022 "Common cause analysis of incidents relating to human factors occurring at Spanish nuclear power plants"; and in 2023 "Good practices and recommendations of trend, repeatability and recurrence analyses".

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, the Spanish nuclear power plants have processes for screening, analysis of applicability and definition of actions arising from events at other nuclear power plants, with the aim of preventing their occurrence at their facilities and integrating the lessons learned into their own practices. These processes have been repeatedly assessed by WANO, INPO and IAEA and have been found to meet industry requirements and standards. All the plants have relevant bodies that can be assimilated to committees for reviewing the results of the analysis of the most significant events.

In relation to internal operating experience, the Spanish nuclear power plants have different recognised analysis methodologies. Root cause, apparent cause and common cause analysis methods exist, most of them being standard methods in the sector or agreed-upon between the licensees of the Spanish nuclear power plants. With regard to external events, each nuclear power plant has a system for assessing their applicability. The conclusions of the analyses of the most significant events, as well as the actions arising from them, are reviewed by high-level fora of licensees' responsibility. A fundamental tool for dealing with operational experience is the Corrective Action Programme (CAP).

CSN Instructions IS-11 and IS-12 require training programmes to include operational experience. Operational experience training should be geared towards identifying the root causes of incidents and the corrective actions necessary to prevent their recurrence.

The Spanish nuclear power plants have established mechanisms for the exchange of operating experience both nationally and internationally. The CSN participates in the *Working Group on Operating Experience* (WGOE) of the Nuclear Energy Agency (NEA). Within the framework of the Nuclear Energy Committee (CEN), the organisation that groups together the licensees of the Spanish nuclear power plants, there is a permanent working group on operating experience, which carries out its own analyses, with the activation on demand of the Sectoral Incident Analysis Group (GSAI) and the drawing up of the aforementioned annual ICEO (Operational Experience Joint Report) report for the period 2022-2024 being of particular note. For its part, the CSN actively participates in the international databases *Incident Reporting System* (IRS), which depends on the IAEA and the NEA, and the *Nuclear Event Web-Based System* (NEWS), which depends on the IAEA. The CSN is also a member of the Clearinghouse, a support group for the regulatory bodies of the European Union (EU) in the analysis of operating experience.

Every two years, the CSN carries out operating experience inspections with a view to checking the systematic approach established at the nuclear power plants for analysing events, while every year the licensees of the nuclear power plants submit an operating experience report.

The CSN has also drawn up a new Operating Experience Safety Instruction (IS-48, dated 9th April 2025) that establishes the general criteria to be met by the operating experience programmes of the Spanish nuclear power plants under operating and decommissioning authorisation, provided that fuel is kept in the pool and, in relation to operating experience, design, construction, testing, operation, shutdown and decommissioning of the nuclear power plants.

2.4. Regulatory framework

The 2022-2024 period saw either significant progress or completion of rules and regulation projects, which are detailed in chapter 7 and elsewhere in the report.

Instructions were issued by the regulatory body:

- IS-10, Review 2, of 7 September 2023, of the Nuclear Safety Council, on criteria for reporting events at nuclear power plants.
- IS-46 of 14 May 2024 of the Nuclear Safety Council on physical safety during transport of nuclear materials and radioactive sources.

Recently, in April 2025, the following Safety Instructions were issued:

- IS-47, which approves the list of municipalities with priority action against radon and establishes guidelines for radon measurements in the indoor air of workplaces located in them.
- IS-48, which establishes the criteria to be met by nuclear power plant operating experience programmes.

Nuclear Safety Council's Safety Guides relating to matters covered by the Convention that have been issued or revised in the 2022-2024 period are:

- Safety Guide GS-01.03 (Rev.2) Nuclear facility emergency management planning and response.
- Safety Guide GS-01.09 (Rev.2) Emergency preparedness at nuclear facilities and documentation of their management system.
- Safety Guide GS 05.17 Calibration and verification of radiation protection instrumentation for the measurement of radiation and contamination at radioactive facilities.

In 2020, the European Nuclear Regulators Association (WENRA) issued revised reference levels for operating reactors. All the standards issued by the CSN take into account the incorporation of these reference levels, in compliance with the commitment assumed by the regulatory body.

According to the last report issued by Spain in January 2024 on the degree of compliance with the WENRA reference levels, eight reference levels remain to be implemented in the Spanish regulatory framework, which are detailed in section 7.1.3.

In the context of the nuclear programme in Spain, the most relevant regulatory developments during the period covered by this report include the following:

- Royal Decree 1029/2022, of 20 December, approving the Regulation on health protection against the risks arising from exposure to ionising radiation, transposing into national legislation Directive 2013/59 EURATOM. for protection against the dangers arising from ionising radiation
- Order TED/796/2023, of 13 July, authorising the transfer of ownership of Santa María de Garoña nuclear power plant from the company Nuclenor, SA to Enresa., and authorising phase one of the decommissioning of this plant.
- Order TED/1269/2024 of 11 November granting the renewal of the operating authorisation for the Trillo nuclear power plant.
- Law 11/2023 of 8 May on the transposition of European Union Directives on the accessibility of certain products and services, migration of highly qualified persons, taxation and digitalisation of notarial and registry procedures; and amending Law 12/2011 of 27 May on civil liability for nuclear damage or damage caused by radioactive materials (Article 42).

Royal Decree 1217/2024, of 3 December, approving the Regulation on nuclear and radioactive facilities and other activities related to exposure to ionising radiations (hereinafter RINR).

2.5. IRRS Follow-up mission

Spain underwent the first combined IRRS-ARTEMIS mission *(Integrated Regulatory Review Service Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation*) of the International Atomic Energy Agency (IAEA) in October 2018. The mission was requested to fulfil 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 Part: 13 recommendations / 20 suggestions / 1 good practice / 10 areas of good performance.

- ARTEMIS Part: 5 recommendations / 2 suggestions / 1 good practice / 1 area of good performance.

In accordance with the regulations on these missions, the recipient country should request the IAEA to carry out a *follow-up* mission, with the aim of continuing the work carried out and evaluating the actions implemented on the basis of the recommendations and suggestions resulting from the mission.

Meeting of the expert team of the IRRS follow-up mission (2025)

Following the IAEA's request, the Government of Spain requested in March 2023 to host an IRRS Follow up Mission, which took place at the headquarters of the Nuclear Safety Council from 26 January to 3 February 2025.

First of all, it should be noted that with this Follow-up Mission Spain has completed a second complete cycle of IRRS mission reviews.

In relation to the 2025 Follow-up Mission, the results could be considered a **"**notable achievement**,"** as the expert team concluded that the 12 recommendations and 20 suggestions reviewed were either fully closed or closed depending on the progress made and the confidence in their effective completion on time. In addition, on an exceptional basis for such missions, two good practices were identified:

- The *digital radiation passbook*, a digital platform that provides users with real-time dose data, reduces the need for manual data entry and allows the regulator to perform real-time statistical analysis; and
- A *centralised digital dosimetry system*, provided by the CSN, to be used during emergencies for the real-time monitoring of the radiation doses of the workers participating in the emergency of all external response organisations (DOSI-APP).

It was also recognised that the CSN personnel demonstrate solid commitment and professionalism in fulfilling their mandate to guarantee nuclear and radiological safety in Spain. For their part, it was confirmed that the Government and the CSN have systematically taken into account the recommendations and suggestions of the 2018 mission and significant improvements have been implemented in several areas.

The IRRS team highlighted, among others, important results in the following areas:

- Human Resources Plan, including a systematic approach to training (SAT) for all staff;
- CSN Safety Culture;
- National Radon Action Plan; and
- CSN collaboration with Autonomous Communities.

In addition, the IRRS team made a new suggestion:

- To establish guidance documents on the content of information about possible radiation risks delivered to the public by authorized partiesas required by legal provisions, in accordance with a graded approach.

2.6. Emergency preparedness

In terms of 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 of the CSN itself. Detailed information can be found in Chapter 16.

The off-site nuclear emergency plans (NEP) include the performance of at least two exercises per year, with the participation of the personnel of the CSN Radiological Group. The scope of these exercises includes the activation and start-up of the radiological access controls, the Classification and Decontamination Stations (CDSs) and the Municipal Coordination Centres, in order to maintain the training of the plan's regular personnel and to facilitate the exchange of intervention personnel between the different emergency plans.

The Interior Emergency Plans (IEPs) establish the obligation to carry out a general drill every year. The CSN draws up the annual schedule of nuclear power plant IEP drills, in which it specifies the minimum scope of each scenario. The detailed scenarios are unknown to both the facility personnel and the CSN Emergency Response Organisation (ERO). In some cases, the development of drills required the use of Severe Accident Management Guidelines (SAMGs).

The Emergency Action Plan of the CSN also has a programme of drills and exercises, of internal, national and international scope that allow for the verification of the operability of technical capacities and the implementation of the necessary improvements.

During the three-year period 2022-2024, the drafting of the initiating events of the Spanish nuclear power plant IEPs has been improved within the framework of the Joint CSN-Radiological and Health Protection Sector Group; the objective of the work has been to resolve the discrepancies in interpretation detected in the plans in the course of drills and exercises. In 2020, the regulation on emergency preparedness and response for the facilities was reinforced through the issuance of the CSN Safety Instruction IS-44 on emergency planning, preparedness and response requirements for nuclear facilities, which meant that in 2022 CSN Safety Guides 1.3 and 1.9, which develop criteria and recommendations for compliance with this Instruction, were revised.

2.7. Regulatory body: transparency and public communication

Aspects related to transparency and public communication are covered in chapter 8 (and in sections 16.2 and 19.6, as far as incident and emergency communication is concerned).

The CSN, in its strategic plan for the 2020-2025 period, recognises the principle of transparency as one of its fundamental values, based on the capacity to provide citizens with relevant, valid and fully verifiable information in all matters relating to nuclear safety and radiation protection. Specifically, it includes Strategic Objective 5.6, which establishes the "reinforcement of the independence, transparency, credibility and confidence of the public in the CSN through the quality of the information transmitted, the response to requests for information from stakeholders, the public, etc., in order to obtain their respect and acceptance of regulatory decisions, backed by the best technical knowledge available and the results of R&D".

The amendment to the Law creating the CSN in 2007 broadened the requirements in relation to public information, with the aim of increasing the transparency of the organisation and increasing confidence among the citizens in CSN activities. The Law establishes three ways to channel this demand:

- Transmission of information to the institutions of the State:
- Information committees on the environments of nuclear facilities:
- Public information policy:

In case of the occurrence of any significant event or incident in nuclear and radioactive facilities, news, reviews and press statements on the issue are published on the website. IS-10 typifies the reportable events at the Spanish nuclear power plants, the deadlines and the means and formats for their notification, as well as the criteria for submitting additional information and reviewing the reports issued. Review 2 of IS-10 was approved in February 2024.

During the period 2022-2024, the CSN has paid special attention to information and communication, focusing its communication efforts on reportable events likely to generate interest among the public and other stakeholders.

The CSN has updated the whistleblowers' channel on its website for communications on non-compliance in nuclear safety, radiation protection and security matters within the scope of its competences. The update is an adaptation to the *Law 2/2023, of 20 February, regulating the protection of persons who report regulatory infringements and the fight against corruption*, transposing into Spanish law the *European Directive 2019/1937 on the protection of persons who report breaches of Union law.*

a) *Communication in the international arena*
One of the CSN's strategic lines of action for the period 2020-2025 is the maintenance and reinforcement of Spain's representation in the international arena, in addition to ensuring compliance with international obligations and commitments, in line with other national organisations and institutions, in the defence of common positions.

b) *Dissemination activities and the Interactive Information Centre*
The CSN carries out a broad range of activities, both technical and communication-related, on themes related to its activity.

c) *Response to requests for access to information*
During this period, the CSN has continued to respond to requests for access to public information and environmental information by the citizens through the transparency portal.

In the field of emergencies, Royal Decree 586/2020 on mandatory information in the event of a nuclear or radiological emergency, fully transposes Articles 70 and 71, Annex XII and partially Articles 17 and 99 of Directive 2013/59/Euratom.

Furthermore, Local Public Information Committees have been held annually in the areas surrounding the nuclear power plants, organised and coordinated by MITECO with the participation of the CSN, the licensees and other stakeholders

2.8. Notable achievements

The 3rd Extraordinary Meeting of the Contracting Parties of the Convention on Nuclear Safety approved, among other proposals, to improve the effectiveness and efficiency of good practices and good areas of performance identification processes, which should be named by the Contracting Parties as "notable achievements" in their National Reports, prior to their presentation and subsequent classification during the peer discussion at the Review Meeting.

In this regard, the following "notable achievements**"** are considered and developed throughout the text of this National Report:

1. Results of the IRRS Follow-up Mission (2025) (Section 2.4.)
2. Digital radiation passbook (Section 15.1.1)
3. Centralised digital dosimetry system for emergencies (Paragraph 16.1.4)
4. Human resources plan including the implementation of the SAT methodology (Section 8.1.2 b)
5. Safety culture in partner companies (Section 10.2)

In addition, an Annex is included at the end of the chapter Conclusions with the required checklist for each of these notable achievements.

III. COMPLIANCE WITH THE OBLIGATIONS OF THE CONVENTION

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Article 6. Existing Nuclear Installations

This article describes the most relevant safety issues and improvement programmes that have been developed since the last National Report within the Spanish nuclear power plant fleet. Annex 6.A includes updated data on the nuclear facilities existing in Spain and included within the scope of the Convention.

General view of the Almaraz nuclear power plant (Cáceres)

6.1. Overview of important safety-related issues

Almaraz I and II nuclear power plant

On 23 July 2020, the Ministry for Ecological Transition and the Demographic Challenge granted the Almaraz plant a renewal of its Operating Authorization (OA), valid until 1 November 2027 for Unit I and until 31 October 2028 for Unit II. The OA included requirements to implement a number of safety improvements, some of which are set out in section 6.2 and other sections referenced therein.

During the period 2023-2024 the licensee reported 12 events (5 for Unit I and 7 for Unit II), all of which have been classified as level 0 on the International Nuclear Event Scale (INES).

During this period there was an automatic shutdown at the Almaraz nuclear power plant in May 2023 due to a high level signal in steam generator 3.

In June 2024, an unscheduled shutdown occurred due to leakage of electrohydraulic fluid in an isolation valve supplying the actuator of another valve in the system.

During this period, the coercive actions have been issued to the licensee of the Almaraz nuclear power plant, which are included in section 7.4.

Ascó I and II nuclear power plant

On 27 September 2011, the Ministry of Industry, Tourism and Trade granted the plant a renewal of its OA for a period of 10 years. The OA included a requirement to introduce a number of safety improvements as set out in section 6.2 and other sections referenced therein.

During the period 2023-2024 the licensee reported 34 events (19 for Unit I and 15 for Unit II), all of which were classified as level 0 on the International Nuclear Event Scale (INES), except for the event reported on 16/06/2023 (initiation of the shutdown sequence required by the OTS the due to the inoperability of automatic shutdown signals for over-power and overtemperature), which was classified as level 1.

The following automatic reactor shutdowns took place during this period:

- October 2023 at Ascó II NPP, by turbine trip signal, due to the opening of the output switch to the 380 kV farm.
- February 2024 at Ascó II NPP, due to low level signal in steam generator B.
- April 2024 at Ascó II NPP, due to low level signal in steam generator C.
- November 2024 at Ascó II NPP, due to alternator protection signal.
- October 2023 at Ascó I and II NPP, due to turbine tripping as a result of the opening of the output switch to the 380 Kv park.
- March 2024 at Ascó I NPP, due to low level signal in steam generator C.

In addition, the following unscheduled shutdowns occurred, without reactor trip:

- June 2023, at Ascó I NPP, due to steam leakage in the high pressure turbine drainage system.
- September 2023, at Ascó I NPP, to repair the instrumentation of a primary system pump.
- October 2023, at Ascó I NPP, for intervention on the hydrogen cooling system of the main alternator, due to hydrogen leakage.
- February 2024, at Ascó II NPP, in application of the OTS as the containment isolation valves were de-energised.
- May 2024, at Ascó I NPP, to overhaul a valve in the main feedwater system.

During this period, the coercive actions have been issued to the licensee of the Ascó nuclear power plant, which are included in section 7.4.

Cofrentes nuclear power plant

On 17 March 2021, the Ministry for Ecological Transition and the Demographic Challenge granted the Cofrentes plant a renewal of its Operating Authorisation (OA), valid until 30 November 2030. The OA included requirements to implement a number of safety improvements, some of which are set out in section 6.2 and other sections referenced therein.

During the period 2023-2024 the licensee has reported 14 events, all of which have been classified as level 0 on the International Nuclear Event Scale (INES).

The following automatic reactor shutdowns took place during this period:

- September 2023, by turbine trip signal.
- November 2023, by turbine trip signal.
- January 2024, due to low level signal in vessel.
- July 2024, due to low level signal in vessel.
- November 2024, due to low turbine valve control fluid pressure signal.

During this period, the coercive actions have been issued to the licensee of Cofrentes nuclear power plant, as included in section 7.4.

Trillo nuclear power plant

On 11 November 2024, the Ministry for Ecological Transition and the Demographic Challenge granted the Trillo plant a renewal of its Operating Authorisation (OA) valid until 17 November 2034. The OA included requirements to implement a number of safety improvements, some of which are set out in section 6.2 and other sections referenced therein.

During the period 2023-2024 the licensee has reported 5 events, all of which have been classified as level 0 on the International Nuclear Event Scale (INES).

No automatic or unscheduled reactor shutdowns occurred during the period.

During this period, the coercive actions have been issued to the licensee of the Trillo nuclear power plant, which are included in section 7.4.

Vandellós II nuclear power plant

On 23 July 2020, the Ministry for Ecological Transition and the Demographic Challenge granted the Vandellós II plant a renewal of its Operating Permit (AE), valid until 27 July 2030. The OA included requirements to implement a number of safety improvements, some of which are set out in section 6.2 and other sections referenced therein.

During the period 2023-2024 the licensee has reported 13 events, all of which have been classified as level 0 on the International Nuclear Event Scale (INES).

The following automatic reactor shutdowns took place during this period:

- August 2023, due to low level signal in steam generator.
- September 2023, by turbine trip signal.
- January 2024, due to shutdown of the motor-generator of the control rod drive.

During this period, the coercive actions have been issued to the licensee of the Vandellós II nuclear power plant, which are included in section 7.4.

6.2. Overview of planned programmes and measures for the continuous improvement of the safety of installations

In December 2017, the CSN submitted to ENSREG review 2 of the National Action Plan for post-Fukushima measures (NAcP), as agreed at the plenary meeting of this organisation in June 2017, in which it is stated that the implementation of the actions and commitments acquired by Spain following the European stress tests has been completed or is at a very advanced stage. The comprehensive implementation of lessons learned in response to the Fukushima accident, including improvements implemented at nuclear power plants, was considered an area of good performance as a result of the combined IRRS-ARTEMIS mission to Spain in 2018. At present all measures associated with the national action plan for post-Fukushima measures have been implemented.

In the years 2023 and 2024, the Spanish nuclear power plants have been implementing the improvements established in the corresponding renewals of their operating authorisations, in accordance with the deadlines indicated in their implementation plans.

6.3. Identification of those installations for which decommissioning and closure decisions exist

There are no nuclear installations for the disposal of spent nuclear fuel or radioactive waste for which a regulated decommissioning and closure process is underway.

6.4. Position on 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 a fixed-term OA renewal regime. In addition, at a minimum frequency of typically 10 years, the plants carry out PSRs updating the systematic continuous safety assessment programmes, the results of which lead to the implementation of improvements. Those facilities whose application for renewal of the OA includes the start of the Long Term Operation (LTO) in the authorised period must provide, among the documentation to be submitted to the Administration, an integrated ageing assessment and management plan, among other additional requirements.

This system is included in the Nuclear Safety Regulation (NSR), transposing into the Spanish regulatory framework the Nuclear Safety Directive 2014/87/Euratom, issued on 8 July 2014 by the European Council, after amending the current Directive 2009/71 as a result of the 2011 Fukushima accident, in order to strengthen the European regulatory

framework in terms of safety objectives in the operation and management of facilities throughout their life cycle.

According to the terms of the current operating authorisations, the Almaraz I nuclear power plant is scheduled for permanent shutdown in November 2027, Almaraz II in October 2028, Ascó I in October 2030 and Cofrentes in November 2030. The Ascó II and Vandellós II nuclear power plants have an operating permit in force for ten years, after which time they may apply for renewal under the terms established.

Applying the process of Periodic Safety Reviews and requests for renewal described above, during the period covered by this report, Centrales Nucleares Almaraz-Trillo A.I.E., as licensee of Trillo NPP, in March 2023 requested the renewal of its Operating Authorisation for a period of 10 years, up to November 2034, which was granted by MITECO in November 2024.

6.5. Vienna Declaration

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

Section 6.1 therefore describes in detail the significant safety events and reportable events occurring at the Spanish nuclear power plants during the period covered by the report and the response measures taken, both by the licensees and, where necessary, by the CSN. It is concluded that in all the incidents that have occurred, the licensee has identified the causes and has established the appropriate corrective enforcement actions. The safety significant event response processes established by both the licensees and the CSN constitute, in themselves, systematic safety assessment and review mechanisms, resulting in improvements in plant design and operation. It should also be noted that all reportable events are classified according to the INES scale, which is a widely used and internationally accepted event assessment methodology.

In section 6.2, it is pointed out that at present all the measures associated with the national action plan for post-Fukushima measures have been implemented at the Spanish nuclear power plants and, in the years 2023 and 2024, they have continued to work on the improvements established in the corresponding renewals of their operating authorisations, in accordance with the deadlines indicated in their implementation plans. Many of these actions contribute to the goal of improving design to prevent accidents and mitigate releases of radioactivity in the event of an accident.

Finally, section 6.4 explains that the justification for the continued operation of the plants is based on the programmes established for continuous safety review, with the PSR process standing out among these.

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ANNEX 6. Basic characteristics of Spanish nuclear power plants

Basic characteristics of the nuclear power plants

	Almaraz	Ascó	Vandellós II	Trillo	Cofrentes
Type	PWR	PWR	PWR	PWR	BWR
Number of units	2	2	1	1	1
Thermal power (MW)	Unit I: 2,947 Unit II: 2,947	UI: 2,940.6 UII: 2,940.6	2,940.6	3,010	3,237
Electrical power (MW)	UI: 1,049.43 UII: 1,044.45	UI: 1,032.5 UII: 1,027.2	1,087.1	1,066	1,092.02
Cooling	Open: Arrocampo reservoir	Mixed: River Ebro Torres	Open: Mediterranean Sea	Closed: towers, Tagus river inflow	Closed: towers, Júcar river inflow
Preliminary authorisation	UI: 291071 UII: 230572	UI: 210472 UII: 210472	270276	040975	131172
Construction authorisation	UI: 020773 UII: 020773	UI: 160574 UII: 070375	291280	170879	090975
Start-up authorisation	UI: 100380 DAYS 150683	UI: 220782 DAYS 220485	170887	041287	230784
Authorisation for operation	UI and UII: 230720	UI: 270921 UII: 270921	230720	11114	170321

Article 7. Legislative and Regulatory Framework

7.1. Establishing and maintaining the legislative and regulatory framework

7.1.1. Overview of the main nuclear safety legislative framework

In the field of nuclear safety and radiation protection, in the period from January 2022 to December 2024, the following laws affecting the field of nuclear safety have been officially adopted and published:

Royal Decree-Law 6/2022, of 29th March adopting urgent measures within the framework of the National Response Plan to the economic and social consequences of the war in Ukraine

Its first final provision includes the amendment of the Nuclear Energy Act 25/1964 of 29 April 1964 to add the definitions of "radiologically contaminated soil or land" and "soil or land with use restrictions". It also regulates the obligations for the licensees and landowners of these soils to submit a soil status report to the Ministry for Ecological Transition and the Demographic Challenge, which may declare the soils or land as radiologically contaminated or with restrictions on their use. The Nuclear Safety Council must issue a mandatory report for the Ministry's declaration of contaminated land or land with restrictions on its use, a declaration which will include the actions to be carried out for its restoration. Rules are established to ensure that the Land Registry records this classification of land. Finally, this amendment includes non-compliance with these obligations as a very serious infringement in Article 86a) 10a of the Nuclear Energy Act.

Law 2/2023, of 20th February, on the protection of persons who report regulatory infringements and the fight against corruption

This law transposes Directive 2019/1937 of the European Parliament and of the Council of 23 October 2019 into national law and its purpose is to protect persons who, in an employment or professional context, detect serious or very serious criminal or administrative infringements of our legal system, as well as the infringement of certain precepts of the European regulation and report them through the mechanisms regulated therein. Anonymous communication is allowed and the law covers both persons with employment or professional ties and those who have already terminated their professional relationship, volunteers, interns, trainees and persons involved in recruitment processes. It also extends to persons providing assistance to whistleblowers, persons in their entourage who may suffer reprisals, as well as legal entities owned by the whistleblower, among others.

Its provisions include the obligation imposed on the public sector to have in place an Internal Information System. To regulate its implementation, the Plenary of the CSN approved an Agreement on 6 June 2023.

Law 11/2023, of 8th May, on the transposition of European Union Directives on the accessibility of certain products and services, migration of highly qualified persons, taxation and digitalisation of notarial and registry procedures; and amending Law 12/2011, of 27th May, on civil liability for nuclear damage or damage caused by radioactive materials

The aim of Law 12/2011 is to adapt the civil liability matters contained in the Paris and Brussels Protocols to the Spanish legal system. The former provides for strict civil liability, which is incumbent on the operator, who is liable for the damage caused, and the latter provides for additional compensation.

Among the changes brought about by this new law are, among others, the extension of the geographical scope of the liability of the operator in the event of accidents occurring during the transport of nuclear substances; the reformulation of the treatment of the transit of nuclear substances through the national territory, demanding civil liability from the operator, and the regulation of priority issues in the payment of compensation to include the distribution of national and international public funds.

The function of the CSN to issue a report in the procedure for claims for liability for nuclear damage and for damage caused to persons, property and economic loss as a consequence of an accident involving radioactive material that is not a nuclear substance is established. On the other hand, in relation to environmental damage caused by radioactive materials from a radioactive facility, the liability of the licensees of the facility is unlimited. It also includes the right of recovery of compensation paid for damage caused by radioactive installations.

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

In the period 2022-2024, Spain participated in activities relating to the fulfilment of its commitments as a contracting party to the following international treaties and conventions:

- Convention on Nuclear Safety, the CSN acts as a national point of contact and coordinates the preparation of national reports.
- Joint Convention, the CSN collaborates with MITECO and Enresa in the drafting of National Reports.
- Convention on the Physical Protection of Nuclear Materials.
- Convention on Early Notification of Nuclear Accident, the CSN acts as the national contact point.
- Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency
- Euratom Treaty, compliance and transposition into Spanish law of the Directives concerned.

7.1.3. Implementation of WENRA terms of reference

Spain participates actively in WENRA through the Reactor Harmonisation Working Group (RHWG) and the Working Group on Waste & Decommissioning (WGWD), in addition to

permanent representation in the WENRA plenary. The Reactor Safety Harmonisation Study, published by WENRA in January 2006, established the criteria applicable to the regulations formulated by the different regulatory bodies, in order to facilitate the development of the corresponding action plans, identifying the regulations to be developed or modified in accordance with these criteria. The action plan established by the CSN in 2006 contemplated the issuing of fifteen Council instructions and some modifications to the then current Regulation on nuclear and radioactive facilities, approved by Royal Decree 1836/1999, of 3rd December.

Subsequently, following the 2011 Fukushima accident, in September 2014 WENRA published a new list of *Reference Levels (RLs*), modifying 101 of the previous ones and incorporating new ones, for a total of 342 RLs distributed in 19 thematic areas *(issues*). In addition, WENRA agreed to conduct a process of self-assessment and peer review of the state of compliance of each country's regulations with respect to the 2014 RLs, as well as to report progress on the degree of compliance through individual quantitative and qualitative reports, starting in January 2016.

In accordance with the programme and the timetable established by the RHWG, in June 2016 Spain issued the self-assessment report, the results of which were subject to a peer review process that led to the drafting of the action plan for the period 2016-2018, which has been updated. In general, it may be said that the incorporation of the revised RLs following Fukushima has little impact on the Spanish regulatory framework, due to the fact that many of the new requirements were already incorporated by the CSN in the CTIs (mandatory instructions associated with the OA of the facilities) issued to all the nuclear power plants (and other nuclear facilities) as a result of the Fukushima accident. In addition, the new CSN 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.

Subsequently, in 2020, WENRA issued a new review of the reference levels for operating reactors, which modified the issues C (Leadership and Management for Safety), I (Ageing Management), SV (Internal Hazards) and TU (External Hazards), which countries had to incorporate into their regulations, and whose peer review was scheduled to take place between 2024 and 2025.

In the report issued by Spain on the degree of compliance with the WENRA reference levels in January 2024, eight reference levels remained to be implemented in the Spanish regulatory framework. The status of implementation of these levels is shown below:

a) Six reference levels that refer to Issue J on operational experience are pending incorporation into the Spanish regulatory framework through the drafting of a Council Instruction (CI), which is currently in the final stages of publication, expected in 2025. Their incorporation into the regulatory framework will formalise compliance with these reference levels, although in practice the CSN has in place a system for supervision of the operating experience of nuclear power plants that includes requirements equivalent to those of these reference levels.
b) The reference level O 1.4 for 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 already reflected in the report on the results of the latest peer review published in 2018, it is not necessary to immediately review the board's instruction on criteria and requirements for conducting probabilistic safety analyses and their appli-

cations to respond to this level, as it implicitly requires considering different mission times in PSAs, leaving its explicit incorporation pending for a subsequent review of the same.

c) The reference level TU.4.2 for the old issue TU on external risks has not yet been incorporated into the Spanish regulatory framework. Specifically, the inclusion of the target values for: design basis event exceedance frequency, which should not exceed 10^{-4} /year, and the minimum acceleration value of 0.1 g PGA (*peak ground acceleration*). These aspects will be covered by the council instruction on siting, which is currently under preparation. It includes requirements relating to external risks, and in particular the target values mentioned above.

The Spanish nuclear power plants are members of ENISS (European Nuclear Installations Safety Standards), an organisation that brings together operators from 14 European countries and which, among other activities, actively participates in the common positioning in the WENRA public consultation processes.

7.2. National safety requirements and regulation

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, two ministerial orders and three royal decrees affecting nuclear safety were approved between January 2022 and December 2024:

Royal Decree 1029/2022, of 20th December, approving the Regulation on health protection against the risks arising from exposure to ionising radiation

Transposing 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.

This new regulation repeals the previous regulation approved by Royal Decree 783/2001, of 6 July, as well as Royal Decree 413/1997, of 21 March, on the operational protection of external workers at risk of exposure to ionising radiation due to intervention in a controlled area. Among the new features of the new regulation is that external workers now receive the same protection as exposed workers employed by a company practising with radiation sources. New reference levels associated with emergency exposure situations are introduced for both emergency responders and members of the public.

Royal Decree 665/2023, of 18th July, amending the Regulation of the Public Hydraulic Domain, approved by Royal Decree 849/1986, of 11 April; the Regulation of the Public Administration of Water, approved by Royal Decree 927/1988, of 29 July; and Royal Decree 9/2005, of 14 January, establishing the list of potentially soil-polluting activities and the criteria and standards for the declaration of contaminated soils

The reform introduced by Royal Decree 9/2005, of 14 January, allows for the establishment of working groups made up of representatives of the administrations with competences for water and contaminated soils. For reasons of coherence, references to the disposal of waste

regulated by Law 7/2022, of 8 April, on waste and contaminated soils for a circular economy, were removed; as were indications on groundwater recharge linked to wastewater discharges as they are not relevant here; lists I and II of substances were also removed as they should all be considered as pollutants, as provided for in European regulation.

Royal Decree 1217/2024, of 3rd December, approving the Regulation on nuclear and radioactive installations and other activities related to exposure to ionizing radiation

This new regulation repeals and replaces the previous Regulation on Nuclear and Radioactive Installations approved by Royal Decree 1836/1999, of 3 December, and responds to the need to complete the regulatory framework relating to the transposition of the European directives of the Council.

In relation to the request for the different authorisations for nuclear facilities, a series of new elements are incorporated in the documentation to be submitted by the licensee, as well as in the authorisation for spent nuclear fuel or radioactive waste disposal facilities. With regard to radioactive facilities in the nuclear fuel cycle, the non-acceptance of new requests for prior authorisation or construction of these facilities has been included. Another new feature incorporated into this regulation is the requirement for persons involved in the transport of radioactive material to complete a Radiation Protection Programme applicable to their transport.

It is also established that licensees of nuclear installations must report on releases of radioactive gases or liquids to the environment under normal operating conditions and on dose assessments that the representative of the members of the public may receive. This regulation also regulates the use of high activity encapsulated radioactive sources.

Order ETD/374/2022, of 25th April, establishing the system of reinsurance to be provided by the Insurance Compensation Consortium for civil liability for nuclear damage

This ministerial order fully covers the new framework for civil liability for nuclear risks established in Law 12/2011.

The coverage of this system extends to personal injuries claimed from the tenth year and up to the thirtieth year after the nuclear accident covered in the policy, both in the case of nuclear damage caused by accidents at nuclear facilities in Spanish territory, and those occurring during the transport of nuclear substances, whatever the territory in which the accident takes place, provided that the operator responsible for the nuclear damage during transport is Spanish.

Cover is also provided for damage due to accumulation of risk to complete the capacity of the insurance sector as a whole, up to 1.2 billion euros per policy, with a maximum of 300 million euros per policy, necessary for the insurance of the Ascó I and Ascó II nuclear power for nuclear accident within the terms of Law 12/2011, of 27 May.

Agreement of the Council of Ministers of 7th March 2023 laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation in the field of civil protection

This Agreement partially transposes certain articles of Council Directive 2013/59/Euratom of 5 December 2013. Approves the Strategy for the protection of the public and responders in the event of a nuclear or radiological emergency. The Agreement provides that the CSN will be the advisor in all declared emergency situations that activate an external nuclear emergency plan or special radiological risk plan. With regard to the radiological criteria for nuclear power plant off-site emergency plans, the Agreement develops more precisely the maximum dose to be received in emergencies, as already contained in the PLABEN. Radiological criteria for civil protection planning instruments for radiological risk are also developed.

Order PJC/1430/2024, of 16th December, publishing the Agreement of the National Security Council of 15 October 2024, approving the National Civil Protection Strategy.

The Strategy defines and analyses, for the purposes of Law 17/2015 on the National Civil Protection System and the Basic Civil Protection Standard approved by Royal Decree 524/2023, accidents in facilities or processes in which hazardous substances are used or stored, chemical risk arising from accidents in facilities or processes in which chemical substances are used or stored, nuclear risk arising from accidents in installations or processes in which combustible substances used in nuclear power stations are used or stored, radiological risk arising from accidents in installations or processes in which radioactive substances are used or stored and the transport of dangerous goods by road and rail.

7.2.2. Provisions and guides developed and published by the regulator

During the period 2022-2024, the CSN approved various Instructions by virtue of the legal empowerment granted to this Organisation by Article 2.a) of Law 15/1980, of 22nd April, on the creation of this CSN. These Instructions are binding technical rules, obligatory for recipients, and form part of the legal system.

Thus, since the Eighth and Ninth Joint National Report , the following CSN Instructions have been approved, which are obligatory for the licensees of the activities to which they are addressed:

Instruction IS-10, Review 2, of 7th September 2023, of the Nuclear Safety Council, on criteria for reporting events at nuclear power plants.

Following the publication of Review 1 of this Instruction on 30th July 2014, and taking into account the experience accumulated since its publication and the changes in the plant documents, such as the creation of the Operating Requirements Manual and the change to the Enhanced Operating Technical Specifications, it was considered necessary to draw up a new version of this Instruction in order to update it and facilitate and clarify the criteria for the reporting of events occurring at nuclear power plants, amending both the general reporting conditions and the criteria for events to be reported.

The review was also influenced by regulatory changes such as Royal Decree 1400/2018, of 23 November, approving the Regulation on nuclear safety at nuclear facilities, the

preamble of which refers to the *"emphasis on early notification of events*", and Article 32 indicates that the licensee must "*notify the competent authority of events with a potential impact on the safety of the facility*" and, finally, the Fifth Additional Provision 1.g) indicates that IS-10 applies.

Instruction IS-46, of 14th May 2024, of the Nuclear Safety Council on physical safety during transport of nuclear materials and radioactive sources.

The purpose of this instruction is to establish safety requirements for nuclear material and radioactive sources during transport in order to protect them against theft, robbery or other unlawful appropriation, and to prevent acts of sabotage or other malicious acts which, if successful, could have unacceptable radiological consequences for individuals, society or the environment.

A number of thresholds are defined which determine the level of protection to be provided for transport of radioactive materials, through the application of specific safety measures beyond prudent management practices, in order to provide protection commensurate with the level of threat and the degree of interest of the transported materials for the materialisation of a malicious act capable of causing potential unacceptable radiological consequences, according to the principle of a graded approach proportionate to the risk

Two new CSN Instructions were also approved in the first half of 2025, the drafts of which were basically drawn up during 2024:

Instruction IS-47, of 9 April 2025, of the Nuclear Safety Council, approving the list of municipalities with priority action against radon and establishing guidelines for radon measurements in the indoor air of workplaces located in them.

In Spain, the provisions of Council Directive 2013/59/Euratom of 5 December 2013 have been at least partially transposed by Royal Decree 1029/2022 of 20 December 2022 approving the Regulation on health protection against risks arising from exposure to ionising radiation. Article 75(1)(c) of the Regulation stipulates that operators of workplaces located on the ground floor and below ground level in priority municipalities must estimate the annual average radon concentration in the air in all areas of the workplace where workers are required to work or to which they have access because of their work, excluding outdoor areas.

Article 79 of the aforementioned regulation stipulates that the Nuclear Safety Council shall publish, on the basis of the best available information, a nationwide list of municipalities in which a significant number of buildings have airborne radon concentrations (annual average) above the reference level, set at 300 Bq/m3. It is also specified that the list will be updated periodically depending on the progress of the National Radon Plan and new data available.

In this regard, the classification of municipalities according to radon potential is established in Appendix B of section HS-6 "Protection against radon exposure" of the "Basic Health and Safety Document" of the Technical Building Code (CTE as per the Spanish), approved in 2019 (Royal Decree 732/2019, of 20 December, amending the Technical Building Code).

This instruction identifies as priority municipalities, for the purposes of Article 79 of the RPSI, those in "Zone II" of Appendix B of section DB HS-6 of the CTE. In addition, this instruction contains a number of provisions to facilitate the implementation of Articles 75 and 76 of the RPSI with regard to radon concentration measurement surveys and the preparation of reports on the results of these surveys.

Instruction IS-48, of 9th April 2025, of the Nuclear Safety Council, laying down the criteria to be met by nuclear power plant operating experience programmes

Operating Experience (OE) is a valuable source of information for understanding and improving the safety and reliability of nuclear installations. It is essential that there is a systematic approach to OE information gathering efforts to ensure the completeness and accuracy of records. This allows for effective analysis and use of information.

OE programmes aimed at analysing OE that may lead to events with actual or potential consequences that are not negligible from the point of view of nuclear safety or radiation protection. This analysis should be carried out systematically, and with a gradual approach to security relevance.

This instruction is approved in order to integrate and harmonise the requirements applicable to these facilities in relation to OE, completing the process of implementation of the WENRA reference levels within the national regulatory framework and establishing in a single instrument the criteria to be met by the OE programmes of the Spanish nuclear facilities. The development of a CSN Instruction contemplating these criteria is considered necessary in order to provide consistency to the process of regulatory development undertaken by the CSN as a result of this European harmonisation effort.

Among the new topics or revisions addressed by the Nuclear Safety Council Safety Guides published in the period 2022-2024 and relating to matters covered by the Convention, the following should be noted:

Safety Guide GS-01.03 (Rev.2) Nuclear facility emergency management planning and response

Approved by the Plenary of the CSN at its meeting of 2 September 2022. This guide has been thoroughly revised, extending the scope of application of the previous guide published in 2007, as a consequence of the internal regulatory changes produced by the transposition of the European Directives affecting this area. This new review includes recommendations for compliance with the requirements included in the CSN Instruction of 26 March 2020, IS-44 on emergency planning, preparedness and response requirements for nuclear facilities. This instruction was published as a result of the CSN's requirement issued to all the licensees of nuclear facilities regarding improvements in the preparation, planning, performance and assessment of the annual emergency drills and exercises. The management of these emergencies contemplates an on-site response level, which is the responsibility of the licensee, as established in the facility's On-Site Emergency Plan and the procedures that develop it. This guidance applies to each of the life phases of nuclear installations, including those in the fuel cycle.

Safety Guide GS-01.09 (Rev.2) Emergency preparedness at nuclear facilities and documentation of their management system

Approved by the Plenary of the CSN at its meeting of 2 September 2022. This guide, like GS-01.03, has been thoroughly revised in accordance with regulatory changes and the publication of IS-44, whose requirements are further developed by the guide, which also establishes criteria for quality assurance and the handling of documentation and records on emergency management. It is applicable to all nuclear installations at the domestic response level, and at each phase of a nuclear installation, to ensure that the operating organisation has and maintains over time an adequate capability to respond effectively to a nuclear or radiological emergency.

Safety Guide GS-05.17 Calibration and verification of radiation protection instrumentation for the measurement of radiation and contamination at radioactive installations

Approved by the Plenary of the CSN at its meeting of 07 December 2022. This guide provides recommendations on certain aspects related to the choice of an adequate calibration and a correct methodology for the verification of radio protection equipment in radioactive facilities. Different practical, operational and regulatory aspects must be considered and the relevant information arising from each test must be documented in order to maintain a traceable record of the status of each monitor. It is also intended to facilitate the CSN's surveillance and control of this requirement. The obligation to carry out this type of test stems from Specification I.6 of Annex I of Instruction IS-28, of the Nuclear Safety Council, on the technical specifications for operation to be met by second and third category radioactive facilities.

In the process of drawing up the CSN Instructions and the Safety Guides, the participation of the interested parties is facilitated and they may provide comments. Citizens are informed of both rules by computer and online means.

7.3. Licensing systems

7.3.1. Systems and processes for licensing, including the types of licensed activity and, where applicable, the procedure for re-licensing

In accordance with Article 18 of the Regulation on nuclear and radioactive facilities and other activities related to exposure to ionising radiation (RINR), approved by Royal Decree 1217/2024, of 3rd December, nuclear facilities will require, depending on the case, the following authorisations.

a) Prior or Siting Authorisation.
b) Construction Authorisation.
c) Operating Authorisation.
d) Modification Authorisation.
e) Execution Authorisation and Assembly of the Modification.
f) Decommissioning Authorisation
g) Decommissioning and Closure Authorisation.

In addition, it must be authorised:

a) The individualised storage facility of nuclear substances in a facility under construction that does not have an operating authorisation.
b) Change of license of nuclear installations.

These authorisations are granted by the current Ministry for Ecological Transition and the Demographic Challenge, following a report by the Nuclear Safety Council, in accordance with the provisions of the RINR.

7.3.2. Public and stakeholder participation and information

The Regulation on nuclear safety at nuclear facilities (Royal Decree 1400/2018, of 23 November), dedicates its fifth additional provision to *"transparency"* in nuclear safety at nuclear facilities. In this respect, an obligation is imposed to make information on these issues available to workers and the general public, as well as stakeholders living in the vicinity of such installations, and even to the competent regulatory authorities of other Member States - nuclear installations located in the vicinity of borders with those States. The information shall cover all aspects, both under normal operating conditions and in the event of incidents or accidents.

The provision of information to the public is limited in cases where other national security interests are compromised according to the applicable legislation (Law 19/2013 of 9 December 2013 on transparency, access to public information and good governance).

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

- **Law 15/1980, of 22nd April, on the Creation of the CSN: public** information on matters 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 on the safety of nuclear facilities or the quality of the environment in the national territory.
- **Law 27/2006, of 18th July, regulating the rights of access to information, public participation and access to justice in environmental matters**: dissemination and public availability of information on environmental matters and the participation of stakeholder and the public in the processes of regulatory development of same.
- **Regulation on Nuclear and Radioactive Installations and other activities relating to exposure to ionising radiation (approved by Royal Decree 1217/2024, of 3rd December):** public information procedure relating to the request for prior authorisation of a nuclear installation, 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 jointly deal with other activities of interest.
- **Basic Nuclear Emergency Plan (Royal Decree 1546/2004, of 25th June):** procedure to guarantee information coverage in the event of an emergency to the affected population, to the Public Administrations involved and to 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.

- Instruction **IS-10, revision 2, of 7th September 2023, of the Nuclear Safety Council:** criteria for reporting nuclear safety or radiation protection events to the CSN by nuclear power plants.
- Instruction **IS-19, of 22nd October 2008, of the Nuclear Safety Council:** obligation of the licensees of nuclear installations to inform the people of the organisation and other stakeholders of information relevant to safety objectives.

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

Subsequent to the aforementioned Regulation, **Royal Decree 586/2020, of 23rd June, on obligatory information in the event of a nuclear or radiological emergency,** was published. It establishes the prior information to be provided to the public that may 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 in the special civil protection plans for radiological risk, to the European Union, to other international organisations and to Member States and third countries.

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

The Nuclear Safety Council, according to Article 2 c) and d) of its Law of creation, has the power to stop works or activities at nuclear facilities in the event of the appearance of anomalies affecting safety and may propose the cancellation of the authorisation if the anomalies cannot be corrected. It also has the power to suspend the operation of facilities or activities for safety reasons.

Finally, the performance of activities without a licence will give rise to the penalties foreseen in the enforcement regime established in the Nuclear Energy Act, Chapter XIV. For example, the operation of nuclear installations or the handling of radioactive materials without licensed personnel for the management or execution of the operations, when this results in a serious danger to the safety or health of persons or serious damage to property or the environment, will constitute a very serious infringement (Article 86).

7.4. Regulatory system for inspection and enforcement basic features of inspection programmes

The inspection programmes are part of the CSN's supervision and control process. The inspections make it possible to verify that the operation and functioning of the facilities are in accordance with the applicable legislation in force, the CSN instructions and the specific conditions imposed in the regulatory authorisations, licences or permits.

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

- Licensing: Ensuring the licensing processes of facilities are carried out and in accordance with the requirements of nuclear safety and radiation protection regulations and providing support in that regard.

- Control: Verifying and ensuring that the installations are operated in accordance with the requirements supporting the corresponding authorisation. These may be either systematic (periodic) inspections, aimed at checking the operating conditions of the installation, or spot-check inspections without an established periodicity. The set of systematic and procedural 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).
- Special: reactive or supplementary. They cover the inspection functions attributed to the CSN, other than those mentioned above, which require the performance of an inspection to gain in-depth knowledge of an incident. They arise as a consequence of incidents, exceptional situations of intervention in case of radiological emergency, complaints, etc.

The Integrated Plant Supervision System (SISC) is the CSN's basic tool for supervising the operation of the Spanish nuclear power plants in operation and establishing whatever corrective or other actions might be applicable, depending on the results. The SISC is based on the *Reactor Oversight Process* (ROP) of the US NRC and was implemented in Spain in 2006.

The SISC is based on a risk-informed approach stratified into strategic areas and safety pillars incorporating cross-cutting aspects that provide more detailed monitoring of the performance of operating nuclear power plants. The SISC considers three strategic areas to characterise the safety of a nuclear power plant: nuclear safety, radiation protection and security. These areas are developed in seven safety pillars 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.

The Nuclear Safety Council approved procedure PA.IV.207, "Self-Assessment Programme of the Integrated Nuclear Power Plant Supervision System, SISC", which is to be used periodically to determine the effectiveness and efficiency of the system and to identify the modifications that should be introduced in the supervision and control system of these facilities in order to improve their operation. In 2023, The CSN addressed the IV programme of the SISC self-assessment, in accordance with the current procedure PA.IV.207 (revision 3, 2017).

In addition, the SISC monitors three cross-cutting areas that affect all pillars of the SISC: human and organisational performance; problem identification and resolution; and safety-oriented work environment.

The corrective action programme (CAP) is a tool to support the SISC in maintaining the required level of safety because of its importance in identifying and correcting deficiencies and other problem-solving activities of the operators.

At the following link, SISC, there is a more detailed description of this programme for the systematic assessment of plant performance. The information provided by the SISC is analysed on a quarterly basis and is submitted to the Plenary of the CSN for subsequent publication on the CSN website.

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

Programme Findings or non-compliances detected in the inspections. The system of inspection findings and indicators allows the CSN to identify incipiently possible degradations in safety, organisational and cultural aspects that could have an impact on nuclear safety. The information is analysed and classified according to a colour code that grades the safety significance of the values and findings obtained. Depending on the results, each plant is placed in an action matrix establishing the actions to be taken by the licensee and the CSN depending on the relevance of the results found during the application of the SISC at each nuclear power plant.

The number of inspection findings identified between 2022 and 2024 for all operating nuclear power plants is shown below, distributed by importance. Section 6.1 details the most significant findings for each plant.

Table 2. Findings at nuclear power plants (2022-2024)

	Green inspection findings (*)	White inspection findings (*)	Yellow inspection findings (*)	Red inspection findings (*)
2022	153			
2023	156	2		
2024	103	2		

(*) Green finding: very low safety importance. White Findings: low to moderate safety importance. Yellow finding: substantial safety importance. Red finding: high safety importance.

All the plant operating indicators for the period 2022 -2024 remained in the green band, i.e., very low safety importance, except for the Cofrentes plant, which in the second quarter of 2022 was in the low to moderate safety importance band (white) due to the result of the unscheduled outages indicator.

These results of the findings and performance indicators have placed the nuclear power plants in an action matrix as indicated below:

Table 3. Action Matrix (2022-2024)

		Almaraz I NPP	Almaraz II NPP	Ascó I NPP	Ascó II NPP	Cofrentes NPP	Vandellós II NPP	Trillo NPP
2022	1 T	LR	RR	LR	LR	LR	LR	LR
	2 T	LR	LR	LR	LR	RR	LR	RT
	3 T	LR	LR	LR	LR	LR	LR	LR
	4 T	LR	LR	LR	LR	LR	LR	LR
2023	1 T	LR	LR	LR	LR	LR	LR	LR
	2 T	RR	RR	LR	LR	LR	LR	LR
	3 T	RR	RR	LR	LR	LR	LR	LR
	4 T	RR	RR	LR	LR	LR	LR	LR

		Almaraz I NPP	Almaraz II NPP	Ascó I NPP	Ascó II NPP	Cofrentes NPP	Vandellós II NPP	Trillo NPP
2024	1 T	LR	LR	LR	LR	LR	LR	LR
	2 T	RR	RR	LR	LR	LR	LR	LR
	3 T	RR	RR	LR	LR	LR	LR	LR
	4 T	RR	RR	LR	LR	LR	LR	LR

LR Licensee Response. A plant is in this column when in a quarter all assessment results are in the green

RR Regulatory Response. A plant is in this column when it has one or two target results, either performance indicator or inspection findings, in different safety pillars or no more than two targets in a strategic area

In 2022 all plants had "Licensee Response" status except for Almaraz II NPP which had "Regulatory Response" status for the first quarter of 2022 due to the final categorisation in Q2 2021 of a white finding related to the risk analysis in the field of fire protection. Cofrentes NPP was also placed in the second quarter of 2022 in the "regulatory response" situation of the action matrix due to the result in the performance indicator on unscheduled reactor outages per 7000 hours with the critical reactor.

In 2023 all plants retained "Licensee" status except Almaraz I NPP and Almaraz II NPP. In both cases this was due to an inspection white finding that the as-built fire protection configuration of a flow transmitter differed from that reflected in the base fire protection licence analyses.

Until the third quarter of 2024 all plants retained "Licensee Response" status except for Almaraz I NPP and Almaraz II NPP, with "Regulatory Response" status since the second quarter due to the inspection white finding relating to the failure to implement a human action equivalent to the 3-hour RF passive fire resistance protection, in a fire scenario in zone EL-12-01.

All this information, as well as the individualised detail of each inspection finding and/or operating indicator, is accessible to the public at the CSN website and the information is updated on a quarterly basis.

Penalty proceedings and warnings

Non-compliance with the regulatory provisions is sanctioned in accordance with the provisions of Chapter XIV of the Nuclear Energy Act 25/1964, of 29 April, Article 86, which establishes a catalogue of infringements that categorise instances of non-compliance which, depending on the seriousness of the acts, are classified as very serious, serious or minor.

In the case of the presumed commission of infringements that might be classified as minor, the Nuclear Safety Council, as an alternative to proposing to the Ministry of Ecological Transition and Demographic Challenge the initiation of enforcement proceedings, is empowered, in accordance with Article 91 of the aforementioned Law 25/1964, to warn the licensee of the activity and require the corresponding corrective measures, when the

circumstances of the case so advise and provided that no direct damage or harm to persons or the environment is caused.

Proposed initiation of enforcement proceedings and warnings in 2022

In 2022, the CSN proposed the initiation of two enforcement proceedings against Spanish nuclear power plants:

- Santa María de Garoña NPP for non-compliance with Technical Shutdown Specification (TSS) 3.7.15.
- Vandellós II NPP for non-compliance with Annex A, section A.7 of Council Instruction IS-30.

In 2022, the CSN issued 10 warnings to nuclear power plant licensees:

- Almaraz NPP received two warnings:
- for non-compliance with certain requirements of the Supplementary Technical Instructions post-Fukushima
- for non-compliance with the minimum cable separation criteria of IEEE standard 384-1992.
- Ascó NPP received three warnings:
  - for non-compliance with Article 9 of Council Instruction IS-21
  - for non-compliance with point 2 of the CTIs associated with condition 9 the authorisation.
  - for non-compliance with Council Instructions IS-21 and IS-31.

- Trillo NPP received three warnings:
  - for non-compliance with paragraph 8.4 of Council Instruction IS-32
  - for non-compliance with paragraph 8 of Council Instruction IS-21
  - for non-compliance with Article 3.14 of Council Instruction IS-26 and Article 733.9 of Council Instruction IS-19.

- Vandellós II NPP received a warning for non-compliance with section 9 of Council Instruction IS-21.
- Cofrentes NPP received a warning for non-compliance with Council Instruction IS-21.

Proposed initiation of enforcement proceedings and warnings in 2023

In 2023, the CSN has not proposed the opening of any enforcement procedure against the Spanish nuclear power plants and has issued 8 warnings to the licensees of the nuclear power plants:

- Almaraz NPP for non-compliance with the requirement to monitor the measurement of Delta-P in fuel building ventilation filters, as this was carried out without the pre-filters fitted (RV OTS 4.9.13.d.1).
- Ascó NPP for non-compliance with Article 7.4 of Council Instruction IS-26 in relation to the implementation of the manual of operating requirements for extensor damage management equipment.
- Cofrentes NPP received two warnings:
  - for non-compliance with Article 5.15 of Council Instruction IS-20, Article 4.3 of CSN Instruction IS-29, and Section 15.4.3 of the Quality Assurance Manual (QAM)

  - for non-compliance with Improved Operating Technical Specifications for Performance 4.4.2.1.b regarding the minimum thickness of the HI-STAR 150 spent fuel storage cask.

- Trillo NPP received two warnings:
  - for non-compliance with Operating Technical Specifications 7.1.1 and 7.2.1.3 relating to the ENSA-DPT spent fuel storage cask.
  - for non-compliance with section 4.2.1.9 of the internal emergency plan.

- Vandellós II NPP for non-compliance with section 3.4.1 of Council Instruction IS-30, due to the non-availability of a fire detection system in the fire area of tank BN-T01, without having requested a favourable assessment.
- Santa María de Garoña NPP for non-compliance with Section 5.7 of Council Instruction IS-20 and Section 3.4.16 of Council Instruction IS-29, during the loading of the first cask of spent fuel ENUN52B.

Proposed initiation of enforcement proceedings and warnings in 2024

In 2024 the CSN has proposed the opening of the following two penalty proceedings:

- Ascó I NPP for non-compliance with surveillance requirement 4.3.1.1 of the Operating Technical Specifications.
- Almaraz NPP for non-compliance with condition D of CSN/CTI/SG/AL0/20/13, associated with the transition to NFPA-805, and with the commitments acquired by the licensee associated with said condition D.

In 2024, the CSN issued 6 warnings to nuclear power plant licensees:

- Ascó NPP received four warnings:
  for three breaches of Article 4.12 and of notification criteria D4 and D5 of Article 5 of Council Instruction IS-10 (Review 1), arising from delays in notifications
  for non-compliance with Article 3.4.13 of Council Instruction IS-30.
  for non-compliance with Article 8.7 of Council Instruction IS-19.
  for non-compliance with reporting criterion D4 of Council Instruction IS-10, Review 1 following the amendment of IS-10 (Review 2).
- Ascó II NPP for non-compliance with surveillance requirement 4.0.4 of the Operating Technical Specifications (OTSs).
- Vandellós II NPP for non-compliance with Article 5 of Council Instruction IS-21, on requirements applicable to modifications at nuclear power plants.

7.5. Compliance with licensing regulations

In the event of instances of non-compliance, the CSN, according to Article 2 c) and d) of its Law of creation, has the power to stop works or activities at nuclear facilities in the event of the appearance of anomalies affecting safety and may propose the cancellation of the authorisation if the anomalies cannot be corrected. It also has the power to suspend the operation of facilities or activities for safety reasons.

In accordance with the provisions of Law 15/1980, of 22 April 1980, creating the Nuclear Safety Council, and Law 25/1964, of 29th April 1964, on Nuclear Energy, the CSN may propose the initiation of whatever enforcement proceedings it deems appropriate and impose warnings.

During the period 2022-2024 and referring exclusively to nuclear power plants, the CSN has issued a total of 24 warnings and 4 proposals for the initiation of enforcement proceedings.

Article 8. Regulatory Body

8.1. Creation of the regulatory body

The Nuclear Safety Council is the sole competent body for nuclear safety and radiation protection. As a regulatory body, the CSN is a Public Law Entity independent from the General Government, which reports on the development of its activities to Parliament and engages with the Government through the Ministry for Ecological Transition and the Demographic Challenge (MITECO).

The government is responsible for designing energy policy and issuing mandatory regulations in this area. MITECO is the Ministry of the General Government responsible for nuclear energy, and is responsible for granting authorisations relating to nuclear facilities, following a mandatory report by the CSN and, where appropriate, other ministerial departments, as well as for submitting regulatory proposals, adopting provisions for the development of the standards in force and applying the enforcement system in relation to nuclear energy.

8.1.1. Roles and responsibilities of the Ministry of Ecological Transition and Demographic Challenge

In accordance with Royal Decree 503/2024, of 21 May, MITECO exercises the following functions within the scope of the Convention on Nuclear Safety:

- Granting of authorisations for nuclear and radioactive facilities, following a mandatory report by the CSN. This report shall be binding, if negative, and when it imposes necessary safety conditions.
- Drafting of regulatory proposals and implementation of the enforcement regime.
- Monitoring of international commitments subscribed by Spain in the field of nuclear energy and, in particular with regard to non-proliferation and civil responsibility for nuclear damage.
- Relations with international organisations specialised in the field.

8.1.1.a) Organisational structure

Royal Decree 503/2024 develops the basic organic structure of MITECO. Within this Ministry, the Secretariat of State for Energy is the highest energy-related body, and within this, the Directorate General for Energy Planning and Coordination, to which the Sub-Di-

rectorate General for Nuclear Energy reports, is the management body that performs the functions referred to in the previous section that are specifically applicable to the field of nuclear energy.

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

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

The CEIDEN Platform, set up in 2007, aims to coordinate the different national R&D plans and programmes in the field of nuclear fission energy, as well as participation in international programmes, coherently orienting the efforts of the entities involved. It currently has 115 members and 18 collaborating entities. The following are represented on its Management Board: MITECO, through the Subdirectorate General for Nuclear Energy, the CSN, the Ministry of Science, Innovation and Universities, the Centre for Energy, Environmental and Technological Research (CIEMAT), Universities and representatives of companies linked to the nuclear energy sector.

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

8.1.1.c) Participation in international organisations and activities

MITECO, through the Subdirectorate General for Nuclear Energy, actively participates in the activities promoted in the field of nuclear energy by the international organisations to which Spain belongs.

MITECO collaborates on 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.

At European Union level, MITECO advises the Permanent Representation of Spain with a view to its participation in the Council working groups dealing with matters regulated by the Euratom Treaty.

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

MITECO is also a member of the Spanish Delegation to the Steering Committee of the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development (OECD), and participates in various NEA technical committees.

8.1.2. Roles and responsibilities of the CSN

The Nuclear Safety Commission (CSN) is set up as a Public Law entity, independent of the General Government, with legal status and its own budget and independent of those of the State the only body with competency in the area of nuclear safety and radiation

protection. In accordance with the provisions of the aforementioned Law, the CSN Statute was approved by the Government by Royal Decree 1440/2010, of 5 November.

The legal regime to which it must submit its actions is based on the prevalence of its constitutive law and its Statute, with the supplementary nature of the organisational and legal rules common to the General Government. It acts with organic and functional autonomy, with full independence from the General Government and interest groups, without prejudice to it being subject to parliamentary and judicial control.

The mission of the CSN is to protect the workers, the population and the environment from the harmful effects of ionising radiation, ensuring that nuclear and radioactive facilities are operated safely by their licensees and establishing measures for the prevention and correction of radiological emergencies, whatever their origin.

The CSN is responsible for the exercise of all the functions established in Article 2 of Law 15/1980 and in Title I of the Statute, as well as for the exercise of such other functions as may be attributed to it by law, regulation or by virtue of International Treaties in the areas of nuclear safety, radiation protection and physical protection.

Its main functions in relation to nuclear power plants are the following:

- Propose to the Government the necessary regulations in the field of its competence, and to issue Instructions, Guides and Circulars of a technical nature in this area.
- Issue mandatory reports to MITECO for it to decide on the granting of the legally established authorisations; these reports shall be binding, if negative, and when they impose necessary safety conditions.
- Carry out the control and inspection of all installations, during all their phases, especially during their design, construction, commissioning and operation, as well as in the transport, manufacture 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.
- Collaborate with the competent authorities in drawing up the criteria to be met by the external emergency plans and the physical protection plans for nuclear and radioactive facilities and, once the plans have been drawn up, participate in their approval, as well as coordinate the support and response measures for emergency situations.
- Propose the initiation of enforcement proceedings in the event of infringements in the area of nuclear safety and radiation protection, in accordance with the legislation in force, and issue technical reports for the appropriate classification of the facts.
- Control measures for the radiation protection of exposed workers, the public and the environment. With regard to environmental radiation protection, the CSN controls and monitors radiological quality throughout Spain and assesses the environmental radiological impact of nuclear and radioactive facilities and activities involving the use of ionising radiation.
- Issue favourable declaration on new designs, methodologies simulation models and verification protocols relating to nuclear safety and radiation protection.
- Granting and renewing 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 occurred in recent years.

8.1.2.a) Structure of the CSN

The Plenary of the CSN is the highest management body responsible for adopting agreements for the exercise of all the functions provided for in Article 2 of Law 15/1980, as well as the exercise of any other functions attributed to the Nuclear Safety Council.

The current Statute, and in addition to the provisions of Section 3.ª Collegiate bodies of the different public administrations (Art. 15 to 22), of Law 40/2015, of 1 October, on the Legal Regime of the Public Sector, determining the legal regime governing the adoption of agreements that take place in the sessions of the Plenary of the CSN as a collegiate body.

In accordance with the legal framework of the CSN, the highest governing bodies are the Plenary and the Presidency.

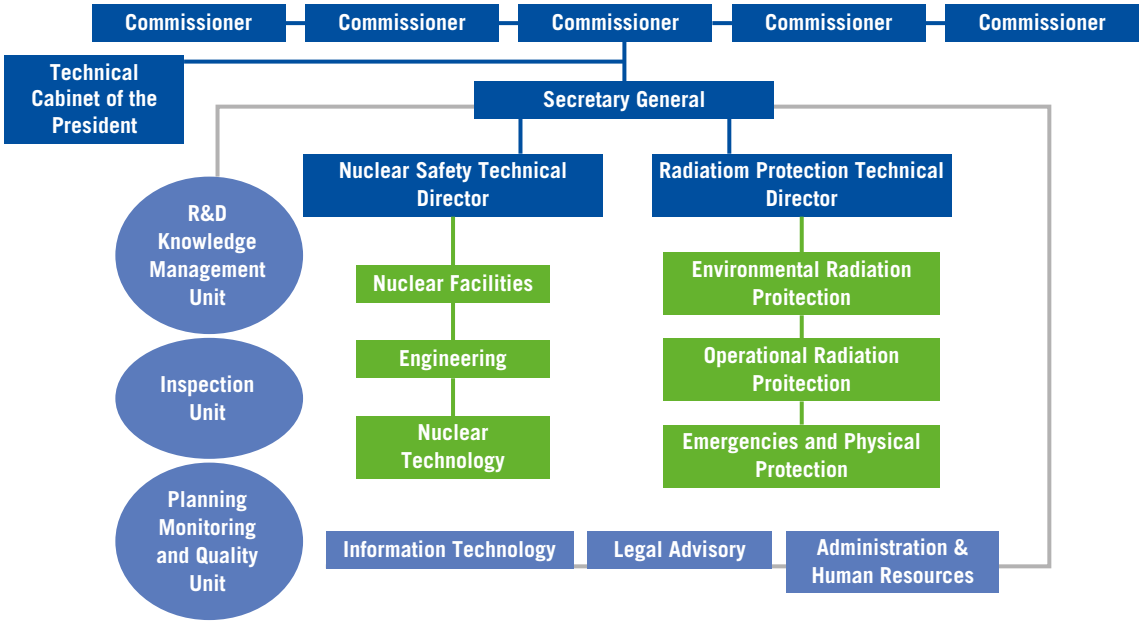
The governing bodies are: the Secretariat General, the Technical Directorate for Nuclear Safety, the Technical Directorate for Radiation Protection, the Technical Cabinet of the Presidency and the Sub-Directorates.

Law 15/1980, of 22nd April 1980, creating the Nuclear Safety Council, and the Statute of the Nuclear Safety Council, approved by Royal Decree 1440/2010, of 5 November, establish, respectively, in Article 4 and in Title II, chapters IV and V, the structure of the CSN as follows:

- The Plenary, one of the two highest governing bodies of the Nuclear Safety Council, is made up of the person holding the Presidency and four councillors.
- The Presidency, which, in addition to its powers as a member of the Plenary, has its own powers as the highest management body.
- The Secretariat General, to which two Technical Directorates (Nuclear Safety and Radiation Protection) and the following Sub-Directorates and Units report directly:
  - Sub-directorate for Personnel and Administration
  - Sub-directorate for Information Technologies
  - Sub-directorate for Legal Counsel.
  - Planning, Assessment and Quality Unit.
  - Inspection Unit
  - Research, Management and Knowledge Unit
- The Technical Directorate for Nuclear Safety, to which the following Sub-Directorates report:
  - Nuclear Power Plants Sub-Directorate
  - Nuclear Engineering Sub-Directorate
  - Nuclear Technology Sub-Directorate

- The Technical Directorate for Radiation Protection, to which the following sub-directorates report:
  - Operational Radiation Protection Sub-Directorate
  - Emergencies and Physical Protection Sub-Directorate
  - Environmental Radiation Protection Sub-Directorate

The organisation chart of the Nuclear Safety Council is presented below.



In accordance with the provisions of Law 15/1980, of 22 April 1980, the highest governing bodies of the Nuclear Safety Council are the Plenary and the Presidency, which shall act in the exercise of their respective competences in compliance with the principles established in Article 4.3 of the aforementioned Law 15/1980, of 22nd April 1980. Relations between the two governing bodies are governed by the principles of cooperation, balance and respect for the legitimate exercise of the other body's powers.

The person holding the Presidency and the Board members are appointed by the Government, at the proposal of MITECO, after the person proposed for the post appears before the corresponding Commission of the Congress of Deputies, under the terms established in the Regulations of the Congress of Deputies.

The General Secretariat, which is defined as the management body of the CSN, on which the administrative and legal working bodies depend for the fulfilment of their objectives, as well as such internal or external technical bodies as provided for in the Statutes. The Secretary General acts as Secretary of the Plenary of the CSN attending its sessions with speaking rights but no voting rights.

Other CSN management bodies are the Technical Directorates, the Directorate of the Technical Cabinet of the Presidency and the sub-directorates listed above. In relation to the first three, the following is highlighted:

- The Technical Directorate for Nuclear Safety, with responsibility for all the functions relating to the safety of nuclear facilities, except those pertaining to the storage of Low and Intermediate Level Waste, which are the responsibility of the Technical Directorate for Radiation Protection. It also assumes that relating to the security of transport of nuclear substances and radioactive waste. It also has three Sub-directorates: Nuclear facilities, Engineering and Nuclear Technology.
- The Technical Directorate for Radiation Protection, in addition to inspection and control of radioactive facilities, radiation protection for workers and management of low and intermediate level waste, assumes responsibility for the radiation protection of the

public and the environment and radiation emergencies. This Directorate has three Sub-directorates: Environmental Radiation Protection, Operational Radiation Protection and Emergencies and Physical Protection.

- The Technical Cabinet of the Presidency assists the Presidency of the CSN, and is responsible for fulfilling whatever specific tasks may be assigned to it by the person holding the Presidency, as well as those relating to the activities of the Plenary as a collegiate body.

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

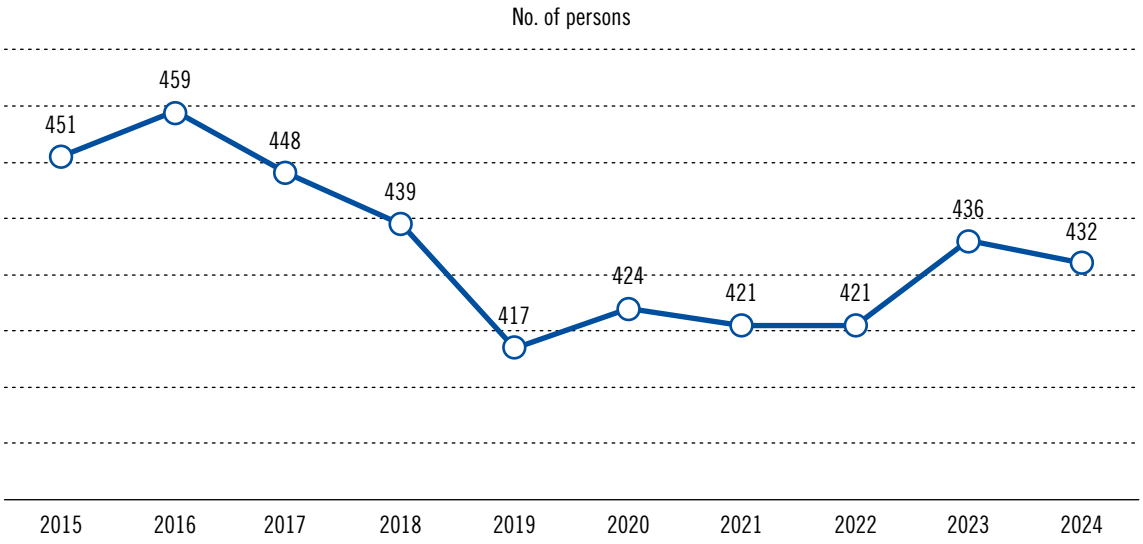
As of 31 December 2024, the personnel of the CSN consisted of 432 employees, of which 210 were civil servants of the Nuclear Safety and Radiation Protection Corps, dedicated to inspection, control and monitoring of the performance of nuclear and radioactive facilities; another 127 were civil servants belonging to the Corps and Scales of the Public Administrations; 34 were temporary staff; 8 senior management and 53 were contract staff.

Table 4. Distribution of Nuclear Safety Council staff as at 31st December 2024.

	Council	Secretariat General	Technical Addresses	Total
Senior Officials	5	1	2	8
Civil Servants of the Nuclear Safety and Radiation Protection Corps	9	17	195	221
Civil Servants of other Corps or Scales	5	94	27	126
Temporary Staff	25	0	0	25
Staff	1	37	14	52
Totals	**45**	**149**	**238**	**432**

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

Graph. Evolution of the number of workers at the CSN in the period 2021-2024



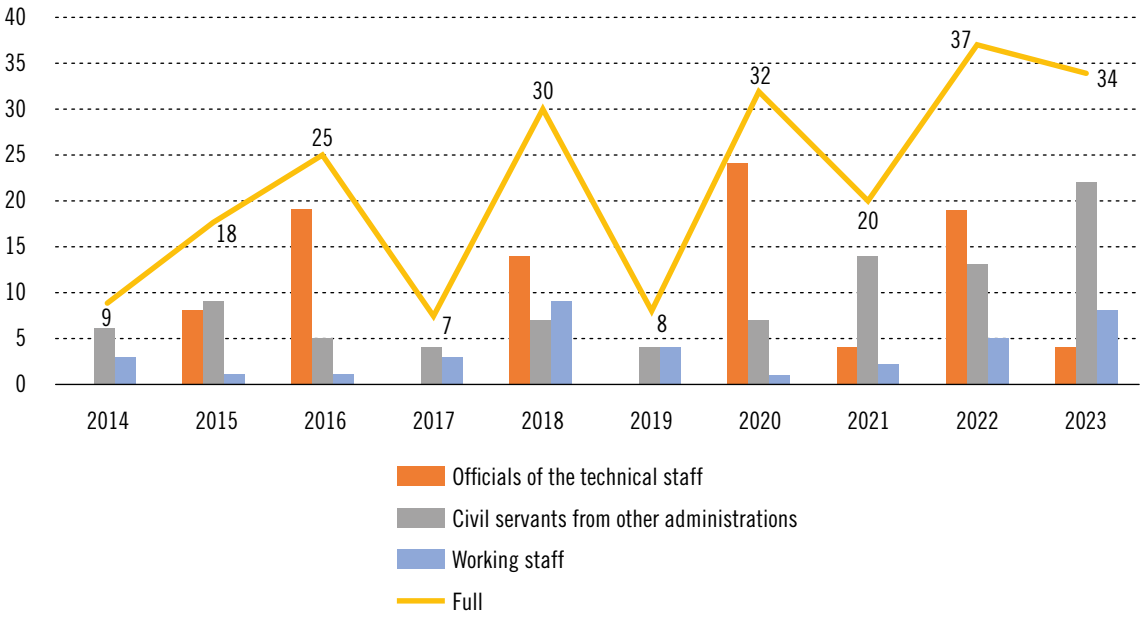
Women represent 51.39% of total personnel and men the remaining 48.61%. The average age of personnel was 53. In terms of the qualification of the personnel, 71.93% had higher qualifications, 6.37% had undergraduate degrees and 21.70% had other qualifications.

A priority objective of the CSN in this area is to have the appropriate human resources in terms of a sufficiently large workforce (technical and from other administrative bodies) and made up of people with a high degree of qualification, experience, competence and knowledge, allowing it to effectively and efficiently perform and execute the functions and competences attributed to it.

In recent years, the Council has pursued a strategy aimed at recruiting new human resources, mainly for technical staff, in order to prevent the loss of knowledge associated with the retirement process of senior staff. 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 2017 to 2024.

Continuing along the path initiated in 2015, during this period it has been possible to proceed with the creation of new civil servant positions in the radiological safety and protection corps as a measure to ensure generational replacement and the transmission of knowledge among the staff of the organisation.

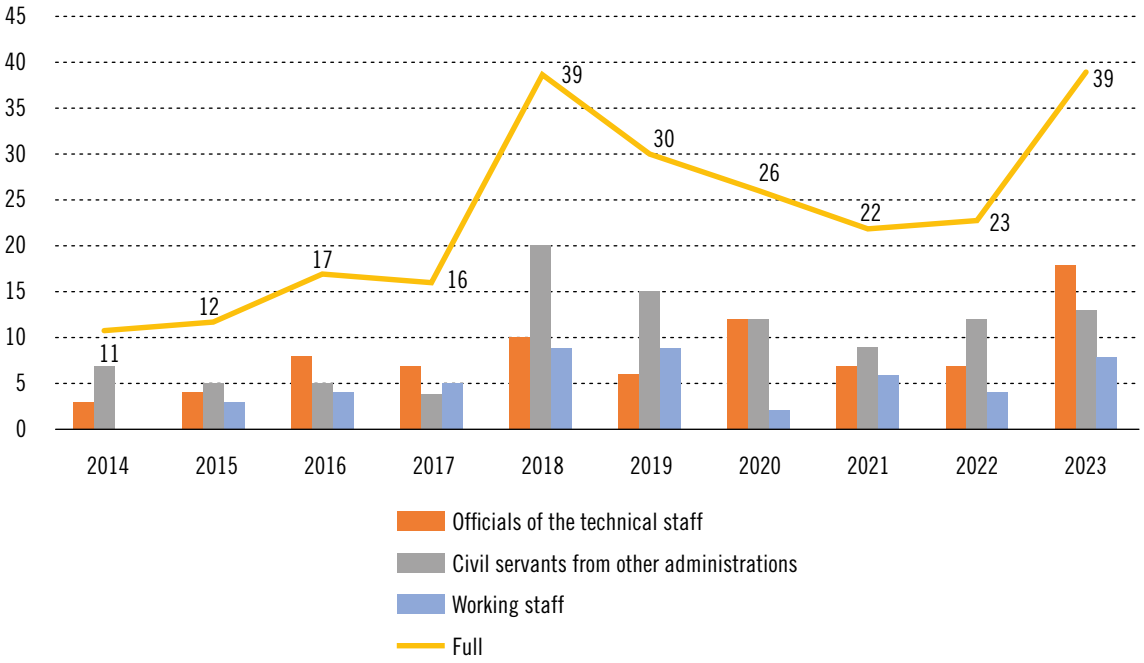
Graph. Admissions to the CSN in the period 2014-2023



The incorporations of staff belonging to the technical corps correspond mainly to new recruits who have passed the selection processes called within the framework of the different public employment offers, while those related to civil servants belonging to other corps have taken place through the different recruitment mechanisms envisaged in the applicable regulations (mainly merit-based competitions and free appointment).

On the other hand, the following table shows the personnel departures from the CSN between 2014 and 2023, the main cause being retirement:

Graph. Exits from the CSN in the period 2014-2023



It is noteworthy, in this respect, that the Nuclear Safety and Radiation Protection Corps has been considered a priority sector when formulating public employment offers, in order to guarantee generational replacement and the transmission of knowledge among the personnel of the organisation. This means, for practical purposes, that the number of vacancies offered may exceed the number of vacancies to be filled.

Thus, in December 2024 the CSN approved its Human Resources Plan for the period 2024-2030, a forward-looking plan for the organisation's human resources and their management, with the aim of ensuring, within the framework of the available budgets, the human resources required, in quantitative and qualitative terms, to meet the CSN's challenges in the short and medium term.

In drawing up this CSN human resources plan 2024-2030, consideration has been given to the situations pointed to by the IAEA in the IRRS mission held in Spain in 2018, such as the introduction of new types of facilities, new activities or technologies, the ageing of the facilities or the transition from one stage to another in their life cycle; as well as the technological changes that are transforming the way public policies are designed and managed and, in particular, artificial intelligence, which is consolidating as a management tool with multiple applications, especially in human resources management.

The plan describes the nature of the CSN, its regulatory framework, functions, organisational structure and strategic framework consisting mainly of its mission, vision and values. It also makes a link between the CSN's human resources policy and the IRRS human resources mission, in particular the importance of studying current and future potential challenges in order to determine short- and medium-term staffing needs.

It also elaborates on these potential challenges in the period of the document, bearing in mind that these challenges are of two distinct natures: technical and organisational. The technical challenges will be mainly marked by the external context, while the organisational challenges, linked to the situation of the workforce in the short and medium term, are marked by factors such as numbers, age, replacement of personnel, attraction of talent, etc. In this respect, it is important to point out that generational replacement is one of the CSN's major challenges, to which the organisation's own strategic plan for the period 2020-2025 already points.

The five lines of action defined in the Plan, line 1, *Attraction of talent*, include the CSN's promotion of a series of actions to improve awareness of the organisation as an attractive place for the development of a professional career, as well as to improve the selection process. Measures have also been taken to speed up selection and promotion processes through better planning of these processes.

Line 2 is also noteworthy. *Talent management* describes how each year the CSN approves its training plan and is developing the "*Systematic Approach to Training*" (SAT) project, which serves as a methodology for defining the professional profiles (knowledge and skills) of the CSN personnel for the efficient and effective performance of each job post and, on the basis of these professional profiles, defining in a more systematic manner the training plan for the personnel performing basic functions of the organisation.

In order to check the development of the programmes and actions envisaged, this human resources plan will be specified and monitored annually through the annual human resources plans, incorporating, in all cases, the requests for public employment offers (OEP in Spanish). This annual plan shall be drawn up in the first quarter of the relevant year.

Based on the above, the development of this Human Resources Plan including the implementation of the SAT methodology is considered a **"notable achievement".**

8.1.2.c) Measures for the development and maintenance of competition

In view of 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 any given time, grouped into seven programmes, one of them subdivided into five:

- Nuclear Safety and Radiation Protection Technical Programme Further training.
  - Nuclear Safety Sub-programme
  - Radiological Protection Sub-programme
  - Transversal Training Areas Sub-programme
  - Initial Technical Training Sub-programme
  - ORE Training Sub-programme
- Management Development Programme.
- Administrative and Legal Management Programme.
- Occupational Risks Prevention and Health Programme.
- Computer Science Programme.
- Languages Programme.
- Skills Programme.

In relation to the planned budget for training in the period 2022 to 2024, the same sum of €609,780 was maintained, with a different degree of execution in the different years. The implementation rate was 51.09% in 2021, 66.49% in 2022, 60.58% in 2023 and 68.69%in 2024.

The CSN has continued to promote its presence at national and international forums (congresses, meetings, seminars) relating to its functional and competence areas.

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

One of the results of the combined IRSS-ARTEMIS review mission conducted by the IAEA and hosted by Spain in 2018 was the recommendation to promote specific training adapted to the needs of the CSN.

In response to this recommendation, the CSN Plenary approved the Action Plan associated with the mission, which in response to this recommendation established the implementation of the SAT methodology in accordance with IAEA *Safety Report Series* No. 79, TEC-DOC 1860, 1794, 1254 and 1757 guides, among others.

At its meeting of 22 January 2020, the CSN plenary agreed to contract an external service for the analysis and design phases of the SAT methodology at the CSN. As a result of the tender, the contract was awarded to an external company, which started the project in 2020.

The development of this project follows a series of milestones, which are listed below:

- Documentary analysis, preparation of the project plan and identification of jobs.
- Job analysis, validation of job listings. DIF assessment and selection of training tasks.
- Performance of a pilot test with two technical areas of the CSN. Task analysis.
- Competence analysis. Training programmes.

At the same time, an IT tool has been developed in order to subsequently manage the practical implementation of the EWS.

Throughout 2021 and 2022, all the activities listed above were carried out, finalising the phases of analysis and design of the methodology and the proposal of a global model for the development of training plans. The development of the IT tool has also been completed. In order to fine-tune the IT application and the methodology itself, a pilot project was carried out in 2024 with six organisational units.

Today, the CSN continues to develop a knowledge management model adapted specifically to the needs, based on the recommendations of the IAEA, which is fully incorporated into its Management System and which uses characteristic elements of knowledge management which are already available.

The knowledge management process for the CSN must address the four basic pillars of the model recommended by the IAEA. It is structured as a cyclical cross-cutting process, with the following stages:

- Identification of the capabilities required by the CSN to perform its mission (Required capabilities).
- Periodic evaluation of the resources available at the CSN (Available resources).
- Ongoing assessment of gaps, shortcomings and losses of information, documentation and knowledge of the CSN (Gaps and shortcomings).
- Programme for the preservation of critical knowledge and continuous improvement of skills (Acquisition and Preservation).
- Internal communication plan to ensure dissemination and accessibility of knowledge and information (Accessibility and availability).
- Independent evaluation programme periodic review of the process (Evaluation and Review).

The CSN Plenary also agreed to "Approve that the responsibility for the development and implementation of the CSN Knowledge Management Model should lie with the Research and Knowledge Management Unit".

For this purpose, in 2022 the IDGC unit continued with the action plan focused on the preservation/recovery of the knowledge and experience of CSN technicians born before 1956, in accordance with the methodology known as RECOR Project, using the computer application KITE.

KITE is a software developed to maintain social networks based on knowledge sharing and knowledge generation. It allows CSN personnel to communicate in the context of communication channels relating 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, which are the management, socialisation and exploitation of available resources, allowing searches by subject or knowledge area.

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

In 2022, the plenary session of the CSN at its meeting on 16 November 2022 called for the planning of a series of specific actions to be carried out as a pilot project as from 2023, among them a) Documenting the decision-making processes in regulatory events/issues of relevance from the point of view of knowledge management, in this first year it is suggested that this be done for the licensing of nuclear power plant decommissioning and transfer of ownership authorisations; b) Drawing up monographs on regulatory experiences that the technical directorates consider to be of interest; c) Continuing with the RECOR process in a more visible and flexible manner, giving priority to persons over 60 years of age.

Throughout the period, 32 experts have participated, sharing and recording their knowledge in the RECOR process, 24 facilitators have actively participated in the transfer process, 105 expert knowledge preservation sessions have been held and 20 *knowledge books* have been produced, including important documented experiences and systematically organised experiences of the expert.

Furthermore, also as a strategy for transferring knowledge at the CSN, the webinar format has been used in these conditions of teleworking by the personnel, which has allowed in-house experts to share their knowledge through talks and lectures.

During the year 2024 the CSN has focused on analysing the process of "Creation and development of competences", the objective of which is to ensure that the personnel assigned to the Nuclear Safety Council all have the necessary attributes (competencies) to carry out their functions.

These competences are achieved through programmes of complementary activities, all of which are necessary, and which in this process are identified in two main blocks, training and knowledge management. As activities that help in the objective of obtaining personnel with the competences required for the performance of the CSN's functions are those relating to calls for grants for specialised training in nuclear safety and radiation protection at the CSN itself and the calls for University Chairs, through which the CSN finances study programmes in which nuclear safety and radiation protection aspects play a prominent role. With the aim of encouraging the training of highly qualified technical personnel in nuclear safety and radiation protection and attracting talent, as well as broadening the knowledge and specialisation of the university's students, research staff and teaching staff, through its own curricula, specialisation courses and active participation in related research projects.

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

Every year, the Plenary of the CSN draws up a budget proposal for expenses and revenues that are included in the General State Budget and whose approval corresponds to Parliament. From 2022 to 2024 the sums approved by the Spanish Parliament are (in thousands of euros):

Table 5. CSN budget (2022-2024)

	Financial Year 2022	Financial Year 2023	Financial Year 2024
Revenue budget	47,399.67	48,900.00	48,900.00
Expenditure budget	47,399.67	48,900.00	48,900.00

It should be noted that as no new General State Budget Act for 2024 was passed, the 2023 budget was automatically extended, in accordance with Article 134 of the Spanish Constitution and the General Budget Act.

The financial resources are obtained practically in their entirety from the collection of fees and public prices for the services rendered by the CSN in compliance with its functions.

The conditions of these sources of income regulated by Law 14/1999 of 4 May on Fees and Prices Charged to the Public for Services Rendered by the Nuclear Safety Council.

At present, the financing channels are the following:

Financing through fees and public prices by:

- Preparation of studies, reports and inspections prior to authorisations for operation and closure of nuclear and radioactive facilities granted by MITECO.

- Inspection and control of nuclear and radioactive facilities in operation and related activities.
- Granting of licenses to personnel designated to operate or supervise the operation of nuclear and radioactive facilities.
- Reports, tests and studies on new designs, methodologies simulation models and verification protocols relating to nuclear safety and radiation protection.

On average for the three-year period, this financing chapter has accounted for approximately 99% of revenues.

State transfers

The CSN carries out controls of radiation protection measures for the general population and the environment. The performance of these functions is not financed through the fees and public prices regulated in Law 14/1999, as they do not constitute a taxable event and are not subject to public prices.

Financing is obtained via the General State Budget, through credits from MITECO.

On average for the three-year period, this financing chapter accounted for approximately 0,8% of revenues.

Other resources

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

Of the total funding and for the period of this report (2022-2024), approximately 58% is for staff costs, 25% for current goods and services, and 9% for real investments.

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

During the reporting period (2022-2024), the CSN has not experienced financial difficulties. However, the guidelines of budgetary stability and efficiency in spending established for the Public Sector by the Government have continued to be respected.

8.1.2.f) CSN quality management system

In 2017 the CSN Plenary agreed to approve the Strategic Plan for the period 2017-2022, with which the Nuclear Safety Council's Management System was aligned. This document was revised in 2020. In June of that year the CSN Plenary approved the 2020-2025 Strategic Plan, which provides an overall vision of the CSN's responsibilities, establishes objectives and activities for the achievement of its strategic goals and defines the Key Performance Indicators (KPIs) that will allow for the tracking and analysis of the achievement of these objectives and activities by the organisation.

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

As of 2020, the CSN has a new Code of Ethics 2020- 2025 in place, replacing the previous one from 2016.

The CSN also has a process-oriented Management System, based on the requirements of the IAEA GSR part 2 standard: "Leadership and Management for Safety" and the IAEA General Safety Guide GSG-12 "Organisation, Management and Resources of Regulatory Body for Safety", as well as the UNE-EN ISO 9001:2015 standards: "Quality management systems", UNE-EN ISO 14001:2015 "Environmental Management Systems. Specifications and Requirements for their Use", ISO 45001:2018 "Occupational Health and Safety Management Systems. Requirements and guidance for use", UNE-EN ISO 50001:2018 "Energy Management Systems. Requirements with Guidance for Use".

The documents that describe the system are organised hierarchically: Strategic Plan, Policies, System Manual, Organisation and Operation Manual, process descriptions, and procedures. Furthermore, on 18th March 2024 the Plenary of the CSN approved review 4 of the Management System Manual.

This new review achieves the following objectives:

- Bringing the CSN management system into line with the IAEA's general requirements set out in GSR Part 2 "Leadership and Management for Safety" and the IAEA General Safety Guide GSG-12 "Regulatory Body Organisation, Management and Resources for Safety".
- The CS Integrated Quality, Environment, Occupational Health and Safety and Energy Efficiency Policy is introduced, in line with ISO standards.
- This includes the CSN Policy on information and whistleblower defence in compliance with Law 2/2023.
- The organisation of the management system processes is improved.
- On the one hand, a new support process is included: Competence building and development
  - On the other hand, the classification of the processes "Regulatory development" has been changed to a support process and "Management system" to a strategic process.
  - Lessons learned from the 2024 IRRS-ARTEMIS Mission report are incorporated into the scope of the Management System.
- CSN policies are updated, taking into account the fact that the CSN is a critical operator

The Management System is subject to continuous improvement-based review system. In addition to the compliance assessments of the plans and objectives the CSN has established an audit plan which is submitted for external assessment on the part of national and international bodies. In this regard, it is worth highlighting the following:

- The internal audit plan ensures that all operational processes are audited every four years, and the rest at least every five years.

The CSN, in addition to undertaking audits and the necessary economic and financial controls required of all public bodies, must systematically inform the Spanish Parliament and the Autonomous Communities that have nuclear facilities. To this end, the CSN draws up an annual report on its activities, which it submits to Parliament. The Parliament is responsible for continued supervision of the activities of the CSN.

- Council Directive 2014/87/Euratom of 8 July 2014 requires EU Member States to carry out, at least once every ten years, periodic self-assessments of their national framework and competent regulatory authorities and to invite international peer review with the aim of constantly improving nuclear safety and radiation protection. Member States will also conduct a first thematic peer reviews in 2017, with subsequent thematic peer reviews taking place at least every six years. With this objective in mind, the first thematic review focused on ageing management was undertaken in 2017 and continued in 2022 with a review of fire protection systems. All of this is also set out in the *Third Additional Provision. Peer Reviews* of the Regulation on nuclear safety at nuclear facilities, approved by Royal Decree 1400/2018, of 23 November.
- The Management System implemented at the CSN, and the experience in the performance of international self-assessments and peer reviews, will facilitate compliance with this requirement. At this point it is relevant to mention that the CSN underwent a combined IAEA review mission in October 2018: Integrated Regulatory Review Service and Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (IRRS-ARTEMIS).

Other high-level documents of the CSN Management System approved since 2022 are the following:

- The CSN Equality Plan 2023-2026.
- The CSN Communication Plan 2022-2025.
- The CSN Strategy for International Relations 2020-2025

These documents continue the implementation of the policies and strategies defined in the 2020-2025 Strategic Plan and, in some cases, update the CSN's position and, in others, establish it for new policies that have been recently introduced.

Finally, the CSN is completing the implementation of an action plan related to the safety culture within the organisation, in line with the conclusions of the 2018 IRRS-ARTEMIS Mission report. This activity is carried out with the help of an external company that facilitates the application of international standards in the field of safety culture.

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

The CSN, in its strategic plan for the 2020-2025 period, recognises the principle of transparency as one of its fundamental values, based on the capacity to provide citizens with relevant, valid and fully verifiable information in all matters relating to nuclear safety and radiation protection. Specifically, it includes Strategic Objective 5.6, which establishes the "reinforcement of the independence, transparency, credibility and confidence of the public in the CSN through the quality of the information transmitted, the response to requests for information from stakeholders, the public, etc., in order to obtain their respect

and acceptance of regulatory decisions, backed by the best technical knowledge available and the results of R&D".

This policy of transparency is rooted in the Law under which the CSN was created and in the CSN Statute, Article 15 which includes the functions of publicising actions, informing public opinion and public participation. The CSN's transparency policy also incorporates aspects contained in the Aarhus Convention, ratified by Spain in the year 2004 and materialised in the national legislation in Law 27/2006 of 18 July, regulating the right to information, public participation and access to justice in environmental matters.

Moreover, the amendment to the Law creating the CSN in 2007 broadened the requirements in relation to public information, with the aim of increasing the transparency of the organisation and increasing confidence among the citizens in CSN activities. The Law establishes three ways to channel this demand:

- *Transmission of information to the institutions of State:*

The CSN issues annually, to the Spanish Parliament, and to the regional parliaments of the Autonomous Communities who have nuclear facilities in their territories, a report detailing its activities. In addition and as part of the relations with the *Cortes*, the CSN responds to parliamentary initiative (oral and written questions, legislation proposals, etc.) and complies with the resolutions issued for annual reports.

- *Local information committees for the environments of nuclear power plants:*

The legislation establishes that the CSN must foster and participate in information forums in the area of these facilities, presided over by MITECO to cover aspects related to the control and monitoring of nuclear installations and emergency preparation. The functioning of these Local Information Committees is regulated in Article 20 of the RINR.

- *Public information policy:*

Article 14 of the Law creating the CSN, establishes the need to facilitate access to information and the participation of the citizens and of civil society. This implies the obligation to inform the media and stakeholders of relevant facts pertaining to the operation of the installations, placing focus on the communication of events and incidents that might affect safety, the possible radiological impact on people and the environment and corrective measures to be applied.

Along these lines, the CSN publishes on its website the inspection reports for facilities, the information on the operational status of nuclear power plants and information on environmental quality measured by the Network of Automatic Environmental Radiation Alert Stations. The minutes of meetings of the Council and the technical reports that support the decision making of same are also published. In addition, on its website the CSN keeps an up to date record of the results of the systematic assessment programme for the operation of the power plants, called the Integrated Plant Supervision System (SISC, as per the Spanish) which incorporates new supervision methods focused on observation of behaviour of nuclear power plants in operation through the functioning and the assessment of the findings of the inspections carried out by the CSN.

In case of the occurrence of any significant event or incident in nuclear and radioactive facilities, news, reviews and press statements on same are published on the website.

During the period 2022-2024, the CSN has paid special attention to information and communication, focusing its communication efforts on news events likely to generate interest among the public and other interested parties. Bearing in mind that it is increasingly necessary to find a new model of communication from the Public Administrations that allows a response to the growing demand for rigorous information by the public, the CSN is in a continuous search for new channels that are effective. Thus, during this period the CSN's presence on social networks has increased and an external newsletter has been set up through which the organisation disseminates information on its activities to more than 1,200 people.

In parallel the CSN attends to the direct requests for information from the media with all the flexibility that technical rigour allows.

With regard to the participation of citizens:

- The CSN is obliged to submit instructions and safety guides to public comment during their preparation, for which it provides an online space on its corporate website through which comments can be submitted. Similarly, MITECO provides information on current regulation in relation to nuclear energy and submits the proposals for royal decrees and regulations to the due process of public participation through its website.
- The CSN has a "Mailbox" for public enquiries available on its website, through which requests are received for information on the safety of the facilities, aspects relating to the radiation protection of persons and the environment, and criteria on the application of the national standards.

The CSN has updated the whistleblowers' channel on its website for communications received by the regulatory body on non-compliance in nuclear safety, radiation protection and security matters within the scope of its competences. The update is an adaptation to the *Law 2/2023, of 20 February, regulating the protection of persons who report regulatory infringements and the fight against corruption*, transposing into Spanish law the *European Directive 2019/1937 on the protection of persons who report breaches of Union law.*

- Group of Municipalities of Areas with Nuclear Power Plants and Radioactive Waste Storage (AMAC).

On 4 April 2022, an agreement was signed between the CSN and AMAC to improve the communication with the population of areas with nuclear installations in Spain and to assess their perception of the information provided. The purpose of this agreement was to implement initiatives aimed at improving the public's perception of the CSN's mission to guarantee nuclear safety and radiation protection, and to provide better access to the different areas of knowledge, resulting in improved communication and transparency of the body.

From the results of the activities carried out during this period, it may be concluded that the Agreement signed between the CSN and AMAC has largely achieved its objectives, it being emphasised that a very high percentage (more than 50%) of those attending the different workshops state that their opinion of the CSN has changed in a positive manner.

Other channels of communication:

- *Communication in the international sphere*

One of the CSN's strategic lines of action for the period 2020-2025 is the maintenance and reinforcement of Spain's representation in the international arena, in addition to ensuring compliance with international obligations and commitments, in line with other national organisations and institutions, in the defence of common positions.

- *Dissemination activities and the Interactive Information Centre*

The CSN carries out a broad range of activities, whether technical or related to dissemination, on themes related to their activity. Among other activities, the organisation of conferences, seminars and training activities and extensive publishing activity including *Alfa*, the Nuclear Safety and Radiation Protection Magazine.

The CSN has an information centre with museum and interactive elements, which marked its 25th anniversary in 2023 and which receives a very significant number of visits (at the time of writing this Report, the number of visitors had already exceeded 150,000), mostly from schools, training schools, universities and cultural associations from all over Spain, but also from national and international institutional delegations.

Of the 29 modules that make up the Information Centre, some are adapted for persons with sensory disabilities. The description of the contents and themes included in the exhibition tour is provided in detail by CSN technicians and revolves around the world of ionising radiation and the risks associated with them, with an express description of the technical and institutional mechanisms that guarantee the safety of people and the environment in each and every one of the processes in which this safety could be put to the test.

- *Response to requests for access to information*

Without prejudice to all the aforementioned channels, the CSN responds to requests for access to public information and environmental information addressed to it by the citizens themselves through its transparency portal. In this regard, between 2022 and 2024, 69 requests for information have been received and resolved through this channel. The CSN also keeps its website updated on personnel, budgetary and contracting matters, complying with the active publicity requirements set out in *Law 19/2013, of 9 December, on transparency, access to public information and good governance (*LTAIBG*).*

8.1.2.h) Advisory Committee

The Law creating the CSN establishes the constitution of an Advisory Committee and public participation which began functioning on 23 February 2011. The purpose of this committee is to issue recommendations to the CSN to improve transparency, access to information and public participation in its areas of competency.

The Advisory Committee is comprised of representatives of the main national stakeholders which include ministries, universities, professional associations, electricity industry groups, mayors of areas with nuclear power plants and NGOs. The CSN Strategic Plan for the period 2020-2025 includes Strategic Objective 5. 8 which aims to "boost the activity of

the Advisory Committee in the area of information and public engagement of the CSN, and to promote through it an increase in the participation of stakeholders in regulatory decisions."

8.2. Situation of the regulatory body

Since its creation in 1980, the CSN has successively developed all its competences and functions, such that today it has the regulatory capacities and legal instruments required to perform its functions with full assurance that the regulated entities and activities are carried out in accordance with the most demanding international standards, criteria and guidelines.

Both the Law Creating the CSN and its Statute establish mechanisms to guarantee that its actions enjoy the necessary credibility and confidence on the part of the society it is charged with protecting, as well as to guarantee its independence in the performance of the functions entrusted to it.

8.3. Coordination between MITECO and the CSN

In accordance with the provisions of Royal Decree RD 864/2018, of 13th July, the CSN engages with the Government through MITECO.

While the CSN is the sole State body responsible for nuclear safety and radiation protection, MITECO is the department responsible for proposing and executing the Government's policy on energy, and within this, on nuclear energy.

8.3.1. Authorisation for nuclear and radioactive facilities

MITECO is responsible for granting authorisations for nuclear and radioactive facilities, following a mandatory report by the CSN. This report is binding, if negative, as are the conditions imposed, if positive.

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

MITECO is the competent authority for imposing sanctions arising from the enforcement regime.

In general terms, the system of penalties in relation to nuclear safety, radiation protection and security applicable in Spain is established in Law 25/1964, of 29th April, on Nuclear Energy; and in Law 39/2015, of 1st October, on the Common Administrative Procedure of the Public Administrations.

Law 25/1964 typifies infringements and classifies them as very serious, serious and minor, detailing the criteria for their correct classification. It also sets out the applicable penalties, which are graduated according to the type of installation concerned and the circumstances taken into account in the regulations.

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 provisions in relation to nuclear safety, radiation protection or physical protection, the CSN will propose the initiation of the corresponding enforcement proceedings, informing the competent authority (MITECO) of both the events constituting the infringement and the relevant circumstances required for its appropriate classification.
- Similarly, MITECO may initiate enforcement proceedings at its own initiative in the case of infringements in matters other than nuclear safety or radiation protection.
- The Directorate General for Energy Planning and Coordination of MITECO is the investigating body which, after receiving the allegations, the evidence and the hearing, prepares a resolution proposal which it submits to the body that will issue the resolution. This proposal includes the established facts, the infringements, the responsibilities and the sanction. Depending on the seriousness of the infringement, the resolution is issued by the Director General of Energy Planning and Coordination, by the Minister, or by the Council of Ministers.
- In the case of infringements that may be classified as minor, the CSN may, as an alternative to proposing the initiation of enforcement proceedings, issue a warning to the licensee of the facility and require the corresponding corrective measures. If this requirement is not met, the CSN may impose coercive fines. MITECO is not involved in this procedure.

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 holder

Article 36 of the Nuclear Energy Act 25/1964 explicitly states that "the operator of nuclear or radioactive installations or of activities involving ionising radiation shall be responsible for their safety".

Article 12 of the RINR, approved by RD 1217/2024 of 3 December, establishes that "the holder of an authorisation shall be responsible for the safe operation of the installation or activity and always within the terms of the documents under which the corresponding authorisation is granted".

In addition, section 2 of the same Article establishes that the licensee shall continuously ensure the improvement of the nuclear safety and radiation protection conditions of the installation. To this end, it 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 the CSN.

Furthermore, Article 5 of the Regulation on Nuclear Safety (RSN), approved by RD 1400/2018, of 23 November, establishes that "the primary and non-delegable responsibility for nuclear safety lies with the holder of the authorisation. This responsibility includes the control of the activities of contractors and subcontractors that may affect the nuclear safety of nuclear installations"

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

9.2. Description of the principal means by which the licence holder fulfils the primary responsibility for safety

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

The limits and conditions set out in the OAs identify the mandatory compliance official operating documents and define the process for licensing and the updating thereof: Safety Study, Operating Technical Specifications, Operating Regulations, On-Site Emergency

Plan, Quality Assurance Manual, Radiation Protection Manual, Radioactive Waste and Spent Fuel Management Plan.

Furthermore, the physical protection authorisation granted under the provisions of RD 1308/2011, on the physical protection of nuclear facilities and materials and radioactive sources, identifies the physical protection plan by virtue of which the authorisation is granted, as well as the applicable update regime.

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

Among the obligations of the licensee is the submission of different types of reports to the CSN and the Ministry at different frequencies on the most relevant activities at the installation (surveillance programmes, refuelling outages, reportable events, design modifications, etc.). Among the most noteworthy reports are those on analysis of in-house and industry operating experience, analysis of the applicability of new standards in the country of origin of the project, the results of the environmental radiological surveillance programme, dosimetry controls on the workers, the activities performed within the scope of the radioactive waste and spent fuel management plan, the training activities of licensed and non-licensed personnel and the removal of radioactive packages from the facility. These reports are subject to supervision by the CSN.

In addition, the licensees have safety-oriented management policies and systems in place, by virtue of the provisions of CSN Instruction IS-19, on management system requirements at nuclear facilities. As explained in Article 14, operators have procedures, guidelines (sometimes of a sectoral nature) and organisational bodies that enable compliance with the applicable requirements and establish internal control mechanisms. The suitability of these means is subject to systematic supervision and control by the CSN.

9.3. Description of the mechanisms by which the regulatory body ensures that the operator fulfils its primary responsibility for safety

The CSN has several instruments at its disposal to verify that the licensee is complying with his obligations. The first and most effective is the inspection plan, which consists of:

- Systematic and regular Baseline Inspection Plan (BIP) inspections on the operator's planned activities considered most important for safety.
- Inspections of generic issues, on specific topics generally arising from our own and others' operational experience, both nationally and internationally.
- Reactive inspections, which are organised when a safety-relevant event occurs, in accordance with the criteria established in the CSN's internal procedures.
- Supplementary inspections, which are carried out when there are relevant findings, in accordance with the SISC methodological criteria, aimed at diagnosing and resolving problems, generally identified in inspection findings or through performance indicators.

- Licensing inspections, which are organised within the framework of authorisation processes for design modifications, change of OTS, change of licensing basis, renewal of OA, etc.

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

There are two resident inspectors in each plant (except in 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 incidents, with the coordinated support of the CSN organisational structure.

The CSN systematically monitors the operating indicators of each plant, in accordance with the criteria established in the SISC procedures, making it possible to identify the actions applicable by the licensee and the CSN. The initial information comes from the deviations identified during the inspections, known as "findings", categorised according to their significance, in order to allow for the identification of the need for actions to be implemented by the licensee and for monitoring by the CSN.

If the deviation is a breach of a legal or regulatory requirement, the CSN may propose to MITECO the initiation of enforcement proceedings. If the instance of non-compliance constitutes a minor infringement and there are a series of circumstances that make it clear that it is of minor importance, the Nuclear Energy Act allows the CSN to issue a direct warning to the licensee of the facility to point out the instance of non-compliance and the corrective measures to be adopted.

9.4. Description of the mechanisms by which the licence holder communicates openly and transparently with the public

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

Information from the licensees

1. **Communication and media relations.** The Spanish nuclear power plants have organisations, teams and individuals responsible for informing the media and society in general about their situation. This is channelled through the publication of press releases, communiqués and information statements; press conferences and meetings with the media; sending of specific information, etc. Some facilities also regularly collaborate with the media through Articles, publications or advertorials. These activities are more frequent and relevant in the environments of each installation. Particularly noteworthy is the information published on the websites of each plant as a communication tool. On the other hand, the use of social networks has long been promoted to provide citizens and the general public with direct and clear information on the reality and activities of certain facilities. As part of this modernisation process, the use of audiovisual channels is being promoted to inform a wider and more diverse public of certain activities or processes carried out at the plants.

2. **Publications.** Most of the nuclear power plants have their own periodical publications (company bulletins and magazines) where the main news affecting each facility and its environment, as well as the nuclear sector as a whole, are published, either on paper or digitally. Specific publications are also produced, as well as general information on each facility for visitors, monographic brochures, activity reports, technical reports, etc. There is a tendency to promote digital versions of these formats, as they are more accessible and have greater dissemination potential.
3. On the other hand, 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 way, as well as the measures to guarantee its safety, environmental quality and the management of radioactive waste. These centres are mainly visited by schoolchildren, university students, associations and citizens of the communities where the plants are located.

Information from other collective organisations

Within the Spanish nuclear sector, it is worth highlighting the role of the **Spanish Nuclear Industry Forum,** which brings together different types of organisations from the nuclear sector and carries out important informative and informative work through its website, social media and through press conferences, meetings with journalists, press visits to nuclear facilities, as well as participation in conferences, round tables and debates on energy. Within its organisation, the **Nuclear Communication Committee,** of which the nuclear power plants also form part, meets periodically to exchange experiences and to promote and coordinate joint initiatives in communication...

The **Spanish Nuclear Society (SNE)**, which brings together nuclear industry professionals, also carries out significant outreach work through its Communication and Publications Commissions and also through the initiatives of the Young Nuclear Professionals and WIN (Women in Nuclear) groups, which are part of the SNE.

Information from public institutions and bodies

A noteworthy initiative in terms of public information and participation, set out in Article 20 of the RINR, is the **Local Information Committees**. The Local Information Committee of each facility is chaired by the representative of MITECO and vice-chaired by the mayor of the municipality in whose municipality the facility is located. It is a forum open to the public in which national, regional, provincial and local institutions, the plants themselves and the most representative entities and associations in each area, as well as the regulatory body, are represented. They are convened annually to report on the performance of the activities regulated in the corresponding authorisations and to jointly address other issues of interest in relation to the nuclear facility, activities that are presented and debated by all the entities represented there. The plants, through their own communications departments, also maintain frequent contact with the municipalities and their representatives as part of their environmental relations policy. One of the CSN's annual planning activities includes the monitoring and participation of these local information committees.

Information for the institutions and public representatives

Each facility and the sectoral representatives, on their own initiative or when required, engage with provincial, regional and national institutions - specifically committees of the

Congress of Deputies and the Senate - to report and account for the activity and the plans and projects of each facility.

In summary, it may be stated that the nuclear facilities, as well as the Spanish nuclear industry as a whole, carry out a set of activities that guarantee public information, communication and access to information by society, such that the transparency of their activity is adequately guaranteed. The ultimate goal of this effort is to build 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 powers for effective management at the site of an accident and mitigation of its consequences

Actions and measures relating to the correct management of accidents on site and the mitigation of their consequences are set out in various chapters of this report. The issue of the operator's resources for emergency preparedness and internal emergency plans is dealt with in section 16. Aspects relating to the design and implementation of accident prevention and consequence mitigation systems are covered in section 18. Finally, section 19.4 sets out emergency operating procedures (EOPs) and Severe Accident Management Guidelines (SAMGs).

The Action Plans mentioned in section 10.2 are tools that the licensees include in their management systems to establish the programming and assignment of appropriate resources for the performance of the actions and measures identified, which translate into a continuous improvement of the resources for management and response to the accidents that might occur at the facility.

As for the coverage of risks associated with liability arising from accidents, this is within the scope of the financial resources, as required by the regulations in force, the availability of which is explicitly required in the new RSN, as also set out in section 11.1 of this report.

Royal Decree 1400/2018, of 23 November, approving the Regulation on nuclear safety at nuclear installations (RSN), transposing EU Directive 2014/87 EU, establishes in Article 7 "Organisation and management system" provisions aimed at ensuring that licensees have the necessary technical, economic and human resources, as well as safety policies, all integrated into a management system that takes into account organisational, human factors and safety culture aspects, including the contracting of external organisations.

Specifically it stipulates:

1. The availability, throughout the life cycle of the installation, of the necessary technical, economic and human resources with adequate qualifications and competences, as well as an appropriate organisational structure to maintain nuclear safety and ensure adequate response capacity in emergency situations.
2. To have a nuclear safety policy that promotes its continuous improvement by means of:
   a. The identification of any new information and analysis of relevant information within a timeframe appropriate to its significance for nuclear safety.
   b. Systematic review of nuclear safety taking into account own and others' operational experience, developments in nuclear safety and in science and technology.

   c. The timely implementation of identified nuclear safety improvements that are reasonably achievable.
3. To establish, implement, evaluate and continuously improve an integrated management system covering nuclear safety, occupational risk prevention, environmental protection, physical protection, quality and economic aspects, to ensure that nuclear safety is adequately addressed in all activities of the organisation. This management system must give due priority to nuclear safety above all other considerations, guaranteeing its maintenance and promoting its continuous improvement.
4. Incorporate into the integrated management system the necessary measures to promote and enhance a nuclear safety culture that, inter alia, enhances, at all organisational levels, the ability to question safety principles and practices and to report on safety issues.
5. Take into account the influence of human and organisational factors on nuclear safety throughout the life cycle of the installation.
6. Ensure throughout the life cycle of the installation that the quality requirements are adequately defined and implemented to achieve the safety objective laid down in Article 6 of the Regulation and that these requirements are integrated into its management system.
7. Ensure that contractors and subcontractors under their responsibility and whose activity may affect the safety objective set out in Article 6 of the regulation have adequate human, technical and financial resources for the efficient and safe performance of the assigned tasks.

Given that these provisions apply to the entire life cycle of the installation, which comprises, according to the definition included in this regulation, *"the stages of planning, siting, design, construction, operation and decommissioning",* their scope includes all the resources for managing the different operational situations that may occur during the cycle, including accidents. The licensees have the non-delegable responsibility for compliance with the RSN, including control of the activities of contractors and subcontractors that might affect the safety of the installations, in accordance with Article 5, *Licensee Responsibility,* of the aforementioned regulation.

Finally, it should also be noted that Article 15 of the RINR regulates the coverage of nuclear damage or damage caused by radioactive materials. In particular, it stipulates that:

a) Under no circumstances whatsoever shall the admission of nuclear substances or other radioactive materials into an installation, their transport, or the operation of nuclear and radioactive installations be permitted unless civil liability cover for nuclear damage or damage caused by radioactive materials is guaranteed in accordance with the provisions in force.
b) Any variation, suspension or cancellation of such coverage shall be immediately communicated by the licensee to the Directorate General for Energy Planning and Coordination and to the Nuclear Safety Council, and the Directorate General for Energy Planning and Coordination shall determine how to proceed in each case.

Article 10. Priority to Safety

10.1. Regulatory provisions and requirements for policies and programmes to be implemented by the licensee to prioritise safety in the design, construction and operation of nuclear installations

As established in Article 12.2 of the RINR, the licensee shall continuously ensure the improvement of the nuclear safety and radiation protection conditions of his facility. To this end, it 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 the CSN.

Furthermore, Article 6. *Safety objective for nuclear installations* of the RSN incorporated as an objective in the siting, design, construction, commissioning, operation and decommissioning of nuclear installations:

a) The prevention of accidents and, should they occur, the mitigation of their consequences.
b) Avoid, either because of physical impossibility or because it is extremely unlikely, with a high level of confidence:
   1. Early radioactive releases requiring off-site emergency measures without sufficient time for their implementation;
   2. Large radioactive emissions requiring measures to protect the population which cannot be limited in time or space.

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 installations. These requirements define how to establish, implement, evaluate and continuously improve a management system that integrates nuclear safety, occupational risk prevention, environmental protection, physical protection, quality and economic aspects to ensure that nuclear safety is adequately taken into account in all activities of the organisation.

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

Management systems establish measures for the safe management of plants, starting with good planning of activities and the availability of appropriately qualified human and finan-

cial resources. Article 7 "Organisation and Management System" of the RSN reinforces these aspects. The establishment of performance indicators makes it possible to identify negative trends and to revise action plans annually, depending on the results obtained in the previous year's evaluation and new needs identified. The action plans identify the most important activities to be undertaken over a 5-year period.

Similarly, Article 12 "Safety assessment" of the RSN requires licensees to carry out an assessment of the facility in the siting, design and operation phases, in order to determine that an adequate level of safety has been achieved and that the facility meets the safety objective established in the regulation. It is important to bear in mind that the reflection in the Final Safety Study of the results of the assessment, required in Article 12.2 of the aforementioned RSN, had a 3-year implementation period, according to the Sole Transitional Provision of the Royal Decree approving the RSN, and the licensees have implemented it adequately.

Operators establish systems for systematic evaluation of operational experience, both internal and external, with the objective of identifying the root causes of events in order to prevent their recurrence or occurrence.

Self-assessment programmes have been established that allow those responsible for the activities to make a critical assessment of the results obtained in relation to the defined expectations, with the aim of identifying non-conformities or proposals for improvement that allow progress to be made in the quality of the processes.

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

On the other hand, external evaluations provide comparative information on best practices in the sector with the way activities are carried out at the head office, allowing areas for improvement to be identified.

The assessments performed by the World Association of Nuclear Operators (WANO) through peer review and those performed by the IAEA through operational safety review missions (OSART) or safety aspects of long term operation (SALTO) at the Spanish nuclear power plants during the years 2022, 2023 and 2024 have been:

Table 6. Review missions to Spanish nuclear power plants (202-2024)

Central	Evaluation	Date
Iberdrola G.N.	Corporate Peer Review (WANO)	2022
Trillo	Peer Review (WANO)	2022
Almaraz	Peer Review Follow-up (WANO)	2022
Cofrentes	Peer Review (WANO)	2023
Vandellós II	Peer Review (WANO)	2023
Ascó	SALTO Mission Follow-up (IAEA)	2023

Central	Evaluation	Date
Ascó	Peer Review (WANO)	2024
ANAV / Ascó-Vandellós II	Corporate Peer Review (WANO)	2024
Trillo	Mid Cycle Visit (WANO ePM)	2024
ANAV	Independent Safety Culture Assessment (IAEA)	2024

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

10.2. Actions taken by licence holder to implement provisions on safety measures, examples of good practice and achievements with regard to the safety culture

In the area of safety culture, the plants have established an improvement programme based on a common guide, organised from a broader programme called "Human and Organisational Factors Improvement Programme", which is explained in Article 12. The safety culture programmes are periodically evaluated by the CSN.

The safety culture improvement programme establishes training requirements for specialists in this area, which is provided jointly for all the plants, in order to standardise criteria. Areas of joint work and projects between plants are also identified, such as the improvement of leadership, safety culture in collaborating companies, etc.

On this last point, the **programmes to improve the safety culture of the collaborating companies** with which the plants work on a regular basis should be highlighted as a **"notable achievement".** WANO has seen these programmes as a strength at ANAV and Cofrentes NPP, and CNAT is also developing them.

The results of the safety culture improvement programmes, like the results of other processes, contribute, by means of the annual review of the licensee action plans, in which the most important short and medium-term activities are identified, to the improvement of plant safety.

The management of the corrective action programme makes it possible to identify the priority of the actions to be carried out in the plants according to their importance for safety. The actions are categorised 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 adherence to action deadlines allows for early elimination of the causes of the incident and thus the recurrence of the incident.

The standards in this respect (CSN Instruction IS-19, on management system requirements at nuclear facilities) require self-assessment and independent external assessment of the licensee's safety culture, although no periodicity is established. However, prior to the initial publication of IS-19, the licensees had already made a commitment to conduct internal and external safety culture assessments, with respective periodicity of 3 and 6 years, in which a combination of different assessment techniques, such as surveys, interviews, behavioural observations, working group discussions, etc., is recommended.

In addition, it is worth mentioning the information and lessons learned from other bodies, apart from WANO, thanks to the contact that the licensees maintain with the BWROG and PWROG owners' groups, *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 Foro Nuclear. These forums enable the implementation of measures to reinforce behavioural expectations and leadership at all levels, using the various documents issued by these bodies.

Participation in technical missions to the plants, both in Spain and abroad, is considered a very 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 have participated during the years 2022, 2023 and 2024 in WANO peer-to-peer missions, in WANO technical missions and in IAEA missions, in all cases carried out at nuclear power plants.

Within the framework of plant operating authorisation renewals, the licensees of the facilities have undertaken to include a specific chapter on the improvement of human and organisational factors in the Safety Analysis of each one of them. This incorporation has been carried out according to the schedule of the aforementioned renewals and is due to end in 2022. A common approach has been adopted for all installations. This approach has been specified and developed in the sectoral guide CEN-56 "Guide for the development of the chapter on organisation and human factors in the Safety Analysis of Spanish NPPs", published in April 2021.

10.3. Regulatory processes for monitoring and oversight of the provisions implemented by licence holders to prioritise safety

The supervision performed by the CSN is framed within the following activities:

- The Nuclear Power Plant Management Systems establish the long and medium-term Strategic Planning processes, the analysis and prioritisation of projects that define the long and medium-term Investment Plan (5 years) and the annual Operating Plan. The CSN is informed annually of the investment planning of the nuclear power plants.

From the renewals of the operating authorisations granted in 2020, 2021 and 2024 to the Spanish nuclear power plants, the CSN has required each of them to submit their Action Plan to the CSN on an annual basis. It is a five-year plan, reviewed annually, which sets out the strategic and operational objectives of the licensee, the action plans and investment projects, the investment budgets and the available and planned human resources, together with an assessment of the Plan itself).

- The CSN supervises the improvement plans to maintain and reinforce safety aspects. The CSN's annual work plan is determined on the basis of the planning reported by the licensees and foresees the performance of Management System inspections, among others, which make up the different inspection plans.

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

The overall objectives and strategies established by the CSN are included in its 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 Plenary of the Council and are subject to monitoring and evaluation activities documented in the corresponding reports. Accordingly, the set of policies or strategic axes defined, the decisions taken and the activities carried out must be aligned with this plan, which acts as a reference for the hierarchical structuring of the objectives in order to reduce discretion in the CSN's regulatory activities.

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

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

To meet this objective, the CSN considers the PSRs to be a fundamental tool for requiring the continuous implementation of safety improvements; the RSN includes the provisions applicable to the PSRs in Article 13 *Periodic safety reviews*. In addition, following the Fukushima accident, the CSN also required the Spanish nuclear facilities to implement the safety measures arising from the analyses arising from this accident, extending the improvement of the standards and establishing the necessary controls.

The general outlines of the prioritisation of the CSN's activities with respect to its nuclear power plant-related processes are indicated below.

Regulatory development process

The CSN's strategic objective is the development of the standards pyramid and the commitment to harmonise the nuclear safety and radioactive waste and spent fuel management standards with the references used at international level 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 the legislation to current needs, taking into account international and European regulatory developments.

Monitoring and control process

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

- Focus on safety-critical aspects, reinforcing the accountability of operators.
- Harmoniously integrate deterministic and probabilistic methodologies, while maintaining sufficient safety margins and the principle of defence in depth.

- Progressively move towards a behaviour-based process aimed at the surveillance of safety-relevant processes, making the CSN's actions systematic, comprehensive, predictable and risk-informed.

In order to achieve this strategic objective, the CSN established the SISC, already described in other sections of this report. This process is subject to independent audits performed by persons not involved in the process and the results of the SISC are published on the CSN institutional website.

Authorisation process

With the purpose of developing the integrated and specific model for the licensing of nuclear facilities in all their phases, the CSN has developed procedures for the assessment of requests systematically organising their scope and content.

This process is subject to independent audits by persons not involved in the process. The CSN publishes on the institutional website the reports on which its decisions in the licensing processes are based.

Enforcement

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

The Committee for the Review of Sanctioning Proceedings (CRES) is responsible for analysing proposals for enforcement proceedings, warnings, precautionary measures, intervention, prohibition and admonishment; and for unifying criteria and advising on the proposal initiated by the corresponding organisational unit, as well as on the statements of the interested parties, if any, formalising the resolutions adopted in documentary form.

10.5. Vienna Declaration

This section provides important elements that illustrate Spain's compliance with the commitments arising from the Vienna Declaration.

Thus, section 10.1 specifies the regulatory provisions that require operators to analyse best safety practices for potential implementation. In 10.2 it is explained 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 the prioritisation of improvement actions based on their safety significance.

Sections 10.1, 10.2 and 10.3 describe various programmes and activities of the licensees in terms of 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 committees of the licensee; external assessments, including those performed by WANO*(peer reviews*) and by the IAEA (OSART, SALTO or other missions); internal and

external operational experience assessment programmes; and internal and external safety culture assessments.

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

Finally, section 10.4 mentions, among the measures implemented by the regulatory body itself to ensure the priority of safety, some elements that contribute to the achievement of the principles of the Vienna Declaration, such as the processes in place for the continuous improvement of the safety of installations (e.g. through the results of the PSRs). In this respect, the specific process followed after the Fukushima accident is highlighted, many of whose required improvement actions are in line with the principles of the Vienna Declaration. Likewise, the CSN's strategic objective of having regulatory practices comparable to those of other countries with advanced (mature?) regulatory systems is also highlighted, for which purpose the relevant mechanisms are also in place at regulatory level to share and acquire best practices. Also highlighted are the CSN's internal processes that are subject to independent audit; the CSN's audit programme constitutes a mechanism for periodic and systematic review.

Article 11. Financial and Human Resources

11.1. Financial resources

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

1. Requirements of regulatory authorities.
2. Improving nuclear safety, radiation protection, risk prevention and environmental protection.
3. Technological upgrade or improvement of the plant.
4. Profitability.

For the provision of the necessary financial resources in the event of a radiological emergency, the Spanish nuclear power plants have insured coverage both for the potential radiological impact outside the facilities and for the potential costs of their decontamination. Law 12/2011, of 27 May, on civil liability for nuclear damage or damage caused by radioactive materials.

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

11.2. Human resources

Regulatory provisions and requirements relating to personnel, qualifications, training and retraining of nuclear installation personnel

The CSN has several instructions defining the qualification requirements for the personnel working at nuclear power plants.

CSN Instruction IS-11, in review 1, on licensing of nuclear power plant operating personnel and IS-12, on qualification and training requirements for non-licensed personnel at nuclear power plants with functions relating to the safe operation of the plant, define the efficient and safe performance of the tasks assigned to each position. The term qualification includes academic qualifications, experience and initial and further training.

In addition, CSN Instruction IS-03, on qualification for recognition as an expert in protection against ionising radiation, details the training and experience requirements that the CSN considers necessary for this status of expert, and is applicable both to those responsible for the Radiation Protection Service and to the technicians under their charge.

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

Finally, CSN Instruction IS-44, on emergency planning, preparedness and response requirements at nuclear facilities, establishes, among other things, the training requirements associated with the plant site emergency plan.

Nuclear power plant procedures and practices are established in compliance with the requirements defined by the CSN in the aforementioned instructions, including both the on-site personnel and the permanent and sporadic contractors in the scope of the definition of standard profiles and of the suitability analyses for compliance with these training requirements.

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

In order to analyse the competences required and the training needs with respect to the nuclear safety-related activities performed at 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 a previous position analysis; the design of the training programme and its implementation, based on these learning objectives; the tools and human resources required for their satisfactory achievement; the assessment of the degree of personal compliance with the foreseen learning objectives; and, finally, the evaluation and revision of the training programme, based on the performance of the personnel in their job post.

Both initial and continuing training programmes are the result of such a systematic process. The degree of complexity has been established according to the different job positions, the most comprehensive being that of staff with an operating licence.

For the effective management of training programmes, training committees or observatories have been set up, in which the participation of senior management is essential to ensure that training is focused on improving staff performance.

The operator of a nuclear power plant has to ensure that all personnel are suitably qualified for the duties to be assigned to them.

New and changing staff are qualified in accordance with the regulation and the application of the SAT methodology outlined above, which requires:

- Initial training for new staff in accordance with the training plan defined for each position.
- Implementation of the necessary training for staff who change positions after an analysis of the training they would lack for the new position.

- On-the-job training, under the supervision of experienced staff.
- Solape when required.

Renewal of the qualification requires satisfactory performance of the tasks associated with the post, as well as successful completion of the relevant continuing education programme.

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

The initial qualification of the Control Room operators lasts 36 months, divided between classroom lessons, supervised study, simulator practice and on-the-job training. Simulator training should last at least 240 hours and on-the-job training should last 1,200 hours.

Initial qualifications required of Control Room supervisors include a minimum of three years' experience as an operator 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 operator or supervisor licence has been obtained, it is necessary to follow an annual continuous training programme of at least 100 classroom hours and a minimum of 20 simulator hours, although current practice in the Spanish nuclear industry establishes simulator training of between 40 and 50 hours per year

For personnel licensed to operate the Control Room, the regulation requires licence renewal every six years.

The entire process is documented and regularly inspected.

In recent years, a joint working group has been set up 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 time devoted to the initial training programmes, as well as improving the documentation that develops the syllabus. The improvements identified by this working group are already being implemented in the licensing process.

Capabilities of nuclear power plant simulators used for training with respect to plant fidelity and simulation range

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

In the 2022-2024 period, the capabilities of the simulators have been improved, updating them according to the design modifications implemented in the plants and guaranteeing the range of operation in normal, abnormal and emergency operation manoeuvres, including operation with reduced inventory in the primary and operations under refuelling conditions. The simulators have incorporated the improvements of digital plant control systems with the highest 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 a functional point of view and in the aspects related to Human Factors Engineering.

Arrangements for the training of maintenance and technical support staff

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

1. Establish a comprehensive personnel training policy commensurate with its importance and which recognises the relevance of nuclear safety.
2. Guarantee the adequate qualification of personnel performing functions with an impact on the nuclear safety of the installation.
3. Implement and update initial and ongoing training programmes for facility personnel, taking into account a systematic design of the training.

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

Emergency response training has been systematised using the SAT methodology described above. The results of the SAT analysis also made it possible to incorporate into the initial and in-service training programmes the training and qualification requirements arising from the personnel tasks that have arisen with the implementation of upgrades at nuclear power plants after the Fukushima accident, which have generally introduced a high practical training component. It has also become necessary to undertake the development of integrated emergency scope exercises in which all the members of the organisation involved in the management of emergencies participate, both those provided for in the design basis and those giving rise to severe accidents outside the design basis of the facility.

It is also worth highlighting the growing use of new technologies through the development of environments such as *e-learning*, distance learning *(streaming*), virtual and augmented reality, etc.

Methods used to assess the adequacy of personnel in nuclear installations

Workforce planning is carried out taking into account the implementation of the plants' Strategic Plans, retirement plans and the time dedicated to the qualification activities described above. Uniquely, control room vacancies are planned at least eight years in advance, due to the long time required to obtain operating licences.

The sizing of a qualified and experienced workforce is based on:

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

Policy or principles governing the use of contract staff to support or supplement the licence holder's own staff

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:

- The ultimate responsibility for ensuring nuclear safety rests with the management of the operator's organisation; it cannot be delegated to support staff.
- The standards and expectations for the performance of support staff activities are the same and at the same level as those required for in-house staff.
- Support staff are familiar with and use the same processes as the licensee'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 set at the same level as that required for in-house staff.
- Workplace safety expectations are clearly communicated to support staff working in the plant.
- The roles and responsibilities of the supervisor, regardless of whether they are staff or support staff, are clearly defined and robustly implemented in the supervision of support staff activities.

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

In order to assess the qualification and training of the contractor personnel, the licensee must adopt the measures necessary to guarantee that the selection of the external company is adequate, as defined in CSN Instruction IS-12:

- Verification that the external company's quality system provides for adequate measures to ensure the competence of its personnel, including education and training programmes and the necessary records to demonstrate their qualification.
- Verification, prior to the start of the 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 work performed under escort) and nuclear power plant specific (except for permanent supervision by nuclear power plant personnel) training programme applicable to the performance of the tasks assigned to the personnel designated by the external company, prior to the start of the work.

In addition, the licensee must require permanent contractors to comply with a continuous training programme, designed in accordance with the criteria defined in the aforementioned

IS-12, which allows workers to maintain their qualifications for the correct performance of the contracted work.

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

New recruitments are planned sufficiently in advance to allow sufficient time for the necessary training of staff to replace retiring staff and with the appropriate overlap to ensure

the transfer of as much knowledge as possible to the successor. In the case of organisational reinforcement, the required training is given before taking up the job.

In Spain there are several educational programmes that provide students with a thorough understanding of the theoretical and practical fundamentals of nuclear engineering and the technology associated with nuclear fission energy production. These educational programmes benefit from the collaboration of the CSN, licensees, and national and international organisations. Examples include:

- Master's Degree in Nuclear Science and Technology (Universidad Politécnica de Madrid).
- Master in Radiation Protection for Nuclear and Radiological Installations (Universitat Politècnica de València).
- *Master's Degree in Nuclear Engineering* (Universitat Politècnica de Catalunya).
- *European Master's in Nuclear Energy-EMINE* (Universitat Politècnica de Catalunya).

Currently, the number of Spanish students taking a Master's degrees in nuclear-related disciplines in Spain is very low, so there is a risk that some programmes may be discontinued due to a lack of students. In the case of International Master's degrees in these disciplines taught in Spain, these can be maintained as they have a significant proportion of students from other countries.

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

The Nuclear Safety Council has established four University Chairs in Nuclear Safety and Radiation Protection to promote education and training, as well as the development of R&D, in the field of nuclear safety and radiation protection with the aim of supporting the entry of young professionals trained in these areas 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 the competence, availability and sufficiency of additional personnel required for severe accident management, including contracted personnel or personnel from other nuclear installations

An Emergency Response Organisation is composed of the operating personnel, partner companies and the External Support organisations established in the Inland Emergency Plan. The starting point for setting up the Emergency Response Organisation in the event of an accident is the shift personnel present in

the plant at the time of the emergency and the standby personnel who join the plant in accordance with the provisions of the Inland Emergency Plan. Depending on the severity and characteristics of the event, the organisation is progressively scaled up to its maximum degree in order to be able to undertake all the mitigation measures foreseen.

An Emergency Response Organisation should be sized to be able to address the actions required to deal with design basis accidents and to execute mitigation strategies derived from the analysis of situations beyond the design basis, in accordance with the Emergency Operating Procedures and Severe Accident Guidelines, as well as the procedures that develop the internal emergency plan for each facility.

In order to define the staffing and human resources that are necessary at all times in an Emergency Response Organisation at a nuclear power plant, the licensees have designed a specific methodology to guarantee the capacity to deal with and mitigate events caused by extreme events such that they imply a condition beyond the design basis established at the plant, as well as potential events with extensive damage to the entire site.

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

A common methodology was developed with the aim of creating a dynamic and sustainable process over time, such that all the Spanish nuclear power plants can check and review, at all times, how the changes made to the installation or the organisation, the operating experiences that have arisen or the improvements implemented at the facilities may affect the provisions required to mitigate emergencies. A sequential process, which allows for periodic assessment of the impact of the various requirements arising in the plant's Emergency Response Organisation and to modify the latter appropriately according to the changes that may be identified.

All the actions, and therefore the allocations, are established with own resources; in other words, possible external support and resources such as the Emergency Support Centre (CAE), the Military Emergency Unit (UME), external organisations or personnel from other nuclear power plants constitute additional assistance, but have not been taken into account for the sizing of own resources.

Regulatory review and control activities

The CSN carries out supervision and control activities relating to the human resources of the nuclear power plants as follows:

- Each power plant is required to have analysed and documented the technical capacity and minimum human resource requirements of each organisational department for safe plant operation.
- Each power 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 correctly performed and that the change and its management do not have a negative impact on safety.
- Each year the nuclear power plants submit to the CSN a report with the modifications or updates relating to the optimisation of the human resources of their organisation.

As already indicated, with regard to the qualification of the personnel performing safety-related functions at nuclear power plants, the CSN has implemented instructions IS-11 for personnel holding an operating licence and IS-12 for the rest of the personnel.

Article 12. Human Factors

12.1. Regulatory provisions and requirements to take into account human and organisational factors for the safety of nuclear installations

The main requirements related to human and organisational factors are detailed in the following Nuclear Safety Council Instructions:

- IS-19, on management system requirements for nuclear installations: this instruction defines the requirements applied to the organisation to establish, implement, evaluate and continuously improve a management system integrating nuclear safety and radiation protection, occupational risk prevention, environmental protection, physical protection, and quality.
- IS-21, on requirements applicable to modifications at nuclear power plants requires appropriate incorporation of human factor methods and criteria in all phases of the modification process and activities.
- IS-26, on basic nuclear safety requirements for nuclear installations requires the operator of the installation to take into account human factor aspects during the life cycle of the installation, so as to improve the safety of operation under normal conditions as well as in operational events and in accident situations. The operator shall also pay special attention and have specific programmes in place to reduce, detect and correct human errors.
- IS-27, on general design criteria for nuclear power plants: the design of structures, equipment and systems (SSC) important to safety shall take into account human factors engineering principles and techniques. In addition, the design of the control room shall take into account human factors. 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 performance and effect of the automatic actions.

12.2. Consideration of human factors in design and subsequent modifications

The aim of human factors 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 constraints.

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

An in-depth study has been made of everything related to the human-machine interface in the control room of Spanish nuclear power plants in accordance with the USNRC publications NUREG 0700 revision 2 *(Human System Interface Design Review Guidelines)* and NUREG 0711 revision 2 *(Human Factors Engineering Program Review Model).*

A general system for the review of design modifications from a human factors point of view has been established, also based on the above-mentioned documents (NUREG 0700 and 0711).

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

The Spanish nuclear power plants have established human and organisational factors (HOF) safety improvement programmes. The programme makes it possible to: identify, control and reinforce "organisational" and "human" aspects before they can have a negative impact on plant safety and availability.

The objectives of the HOF programme are:

- Minimise or avoid, insofar as possible, organisational aspects and human factors that have a negative influence on the safety of the plant and its availability, analysing the problems that arise as a result thereof, and identifying and implementing the necessary corrective actions to prevent their recurrence.
- Develop organisational activities related to external and internal assessments, including those related to the safety culture.
- To respond to organisational requirements on 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, and design modifications to verify that they are made taking into account human capabilities and limitations and in accordance with recognised human factors principles and practices.
- Follow-up of the activities carried out through supervision.
- Collaborate in HOF projects, training and research.
- Participate in external forums for debate, exchange and research on organisational improvements and human factors.
- Assess and improve the safety culture of the plant's operating community.

In addition, the HOF Programme aims to:

- Establish objectives and expectations on which to self-assess the programme.
- Coordinate the different projects and activities, homogenising criteria.
- Have technical experts in human error minimisation.
- Enable the programme to continue in the medium and long term.

In order to utilise synergies between the plants, a coordination group of HOF specialists has been set up within the Foro Nuclear's CEN for the purpose of exchanging information, coordinating relations with the CSN, developing research projects and organising courses for HOF specialists. Each nuclear power plant has a defined organisation responsible for establishing improvement plans for human and organisational factors. These organisations have experts in these areas.

Programmes have also been set up to check the fitness of people working in nuclear power plants*(Fitness for Duty*).

The use of simulators in the control room makes it possible to observe the behaviour during training. Attitudes such as leadership, questioning attitude, teamwork and the use of error minimisation tools are reinforced during the realisation of different scenarios in the control room simulators. Human factors simulators are available at nuclear power plants to reinforce behavioural expectations and the use of error minimisation tools by simulating real jobs and practices.

One of the first activities carried out is the review of these performance expectations against the best standards of the nuclear industry. Communication and awareness-raising plans for these expectations have then been put in place. Once defined and communicated, compliance has been monitored in order to identify weaknesses and establish corrective actions.

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

Work continues on programmes to strengthen the safety culture and the HOF programmes. Common procedures are in place 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 safety culture assessments are carried out every 6 years, alternating with the internal assessments mentioned above, and participation in international congresses and groups related to safety culture and HOF issues.

In addition to the common training given periodically and jointly, a series of specific courses have been defined and given in the period 2022-2024 for the HOF specialists working at the nuclear power plants (in-house and contracted personnel), related to safety culture and human and organisational factors, in accordance with current needs.

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

The Spanish nuclear power plants have self-assessment programmes in place to pursue the continuous improvement of their activities and processes, identifying and assessing weaknesses and opportunities for improvement, through the direct involvement of personnel in the critical examination and improvement of their own work and results.

A method is in place for the preparation, review, approval and subsequent evaluation of organisational changes in the company that reasonably ensures adequate identification and assessment of the potential impacts of the change 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 issues

Incumbents use the CAP as an analysis tool to identify negative trends in issues related to HOF.

Through the Foro Nuclear's CEN, groups of CAP and HOF specialists have been established to exchange information in order to establish common criteria for the treatment of the information obtained from the trend analysis, generating common activities to make progress in the identified areas for improvement.

Monitoring of behaviour in accordance with defined human behaviour expectations allows for the identification of areas for improvement, which is implemented through reinforcement of task managers, communication of expectations and training courses. The establishment and management of Plant Leadership programmes facilitates this monitoring by providing first-hand information on the behaviours of operators and supervisors, as well as reinforcing desired behaviours and enhancing leadership.

Periodic internal and external assessment of the safety culture is another source of information that allows us to ascertain the degree of implementation of activities related to the safety culture at the plants.

The evaluation and dissemination of its own and others' operational experience related to human and organisational factors enables the organisation to become aware of real problems in these areas and also 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 country of origin of the projects and international practices, adapting its regulatory standards and practices. The licensees of nuclear facilities are responsible for carrying out the actions required to respond to the applicable requirements and to establish processes for the on-going improvement of safety in this area, and the CSN is responsible for supervising the adequacy of such actions. In this respect, during the period 2023-2025, the CSN has continued its assessment and inspection work, considering HOF aspects in the scope of the systematic (SISC, BIP) and non-systematic (generic, specific, reactive inspections, etc.) inspection plans.

During this period, the CSN has monitored the status of implementation of the HOF programmes and of the associated projects and activities through the assessment of licensee requests and, especially, through the biannual BIP inspections. In addition, the CSN-CEN joint working group, whose purpose is to address different aspects of HOF in specific meetings, makes it possible to complete the monitoring of these issues. The projects and activities supervised by the CSN include the development of human factors simulators at

the Spanish nuclear power plants, safety culture programmes, human factors analysis in operating experience, human factors engineering in design modifications, work supervision and behaviour observation activities, human action feasibility analysis projects, management of organisational changes and action plans in response to the accumulation of operating events at certain plants. The nuclear power plants have developed a first version of a chapter dedicated to HOF as part of their Safety Study, an official document of their authorisations.

Article 13. Quality Assurance

13.1. Regulatory provisions and requirements for quality assurance programmes, quality management systems or licensee management systems

The CSN requires all nuclear power plants to establish a quality assurance programme, explicitly in Article 24 of the RINR. Similarly, CSN Instruction IS-19, on management system requirements at nuclear facilities, indicate that the quality assurance systems must 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.

The provisions of Section 9.5 on the RSN are also applicable, in particular Article 7 *Organisation and management system,* which contemplates provisions directly applicable to the availability of a management system integrating 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. Status of the implementation of integrated management systems at nuclear installations

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

Quality is integrated into the integrated management systems of the plants, which define how to establish, implement, evaluate and continuously improve the management system itself, integrating nuclear safety, occupational risk prevention, environmental protection, physical protection, quality and economic aspects, in order to ensure that nuclear safety is adequately taken into account in all the activities of the organisation.

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

The implementation of a quality assurance programme is intended to provide reasonable assurance that the SSCs, as well as their use, are adequate to ensure safe, reliable and documented operation of nuclear power plants. To this end, these programmes establish the application of a set of systematic, documented and planned activities relating to the safety of the installation, which apply to all the phases of the lifetime of the plants, including activities such as design, purchasing, manufacturing, handling and transport of materials, storage of materials, construction, assembly, testing of systems and equipment, commissioning, operation of the installation, inspection, system maintenance, equipment repair, 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 affecting the safety-related ESC safety functions. It applies to all organisations, in-house and external, involved in safety-related activities.

As indicated in previous sections of this report, the quality assurance provisions of the RSN apply to the entire life cycle of the facility, explicitly encompassing *"the stages of planning, siting, design, construction, operation and decommissioning",* such that their scope includes all the means for management of the different operating situations that might arise during the cycle, including accidents. The licensees have the non-delegable responsibility for compliance with the RSN, including control of the activities of contractors and subcontractors that might affect the safety of the installations, in accordance with Article 5, *Licensee Responsibility,* of the aforementioned regulation.

13.4. Audit programmes for licence holders

The quality assurance programme implemented at nuclear installations requires the establishment of a planned and documented programme of internal and external audits to check that all aspects of the quality assurance programme are being met and that it is effective. The internal audit programme aims to cover, in two or three-year cycles, all the activities set out in the nuclear power plant quality assurance programme. These audits are carried out according to written procedures or checklists. The personnel carrying out these audits must be properly trained and accredited to perform this activity.

Measures are put in place to follow up corrective actions and to check that deficiencies discovered in audits and, where possible, their causes, are corrected within agreed deadlines.

The Spanish nuclear power plants have worked, under the coordination of the Foro Nuclear's CEN, 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 licensees

The quality assurance programme indicates that purchases of equipment and/or procurement of services for safety-related positions are to be made from assessed and approved suppliers. To this end, a programme of external audits is established in three-year cycles to verify the supplier's ability to provide items or services that meet the requirements set out in the purchasing or contracting documents.

In order to optimise the supplier assessment process, the Spanish nuclear power plants have systematised, by means of written procedures, the common assessment of suppliers, such that the assessment performed by one nuclear power plant, in accordance with these procedures, may be used for the rest of the nuclear power plants. A group has been established within the Foro Nuclear CEN to co-ordinate 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 management system coherent with valid international references, the supervision of which the CSN carries out through its BIP, as indicated in previous sections.

The regulatory control associated with Quality Assurance inspections is as follows:

- The quality assurance programme of the installations is inspected through the biannual inspections of the BIP mentioned in Article 7.4 "Regulatory system associated with inspection and enforcement", including in its scope aspects directly related to the quality criteria of the installation's Quality Assurance Manual.
- A triennial inspection is performed on compliance with the "Programme for the identification and resolution of problems and improvements (CAP) integrated in the BIP, the purpose of which is to check that the installation issues the non-conformities arising in a timely manner, that it evaluates and categorises them, that it resolves them by means of corrective actions prioritised according to the importance of resolving the non-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 non-conformities of very low significance in terms of risk which, following analysis, show that they imply an adverse trend. Similarly, improvement proposals are checked and their related improvement actions, and Regulatory Requirements with their related actions.
- The activities of the resident inspector include a routine review of the monitoring of the state and condition of the plant. Although this activity is not covered as an inspection of the BIP, the procedure developed for its implementation allows for the verification of problem identification and resolution programmes and their management through the CAP.

In recent years, QA evaluation and inspection has focused on the following activities:

- Management and use of spare parts in safety systems: procurement of alternative spare parts, management of spare parts in warehouses, activities to prevent postponement of

work orders due to lack of spare parts, purchase of nuclear grade spare parts and purchases of commercial grade spare parts, and implementation of the corresponding dedication processes.
- Detection of counterfeit, fraudulent and suspicious items on the premises.
- Contracting of services and control and supervision of safety-related work carried out by contractors during reloading.
- Quality plans for the construction of individualised storage facilities (ISFs).
- Quality plans for the execution, assembly and commissioning of design modifications
- Quality plans for scope licence basis changes or any other project whose importance requires a specific quality plan.
- Quality Assurance Programmes for decommissioning in all phases.

Article 14. Assessment and verification of safety

This section includes the applicable regulations and those processes that ensure systematic safety assessments are carried out during the lifetime of nuclear installations, including long-term operating periods.

14.1. Assessment of safety

14.1.1. Regulatory provisions and requirements to conduct comprehensive and systematic safety assessments

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

The RSN also establishes basic nuclear safety requirements applicable to nuclear installations throughout their life cycle.

Among the requirements set out in the RINR and RSN are the performance of accident analyses and the assessment of the risks arising from the operation of the installation. Specifically, CSN Instruction IS-37 establishes the requirements for the performance of nuclear power plant accident analyses (design basis accidents and design extension conditions-A (DEC-A)). In addition, CSN Instruction IS-36 establishes requirements for the analysis of severe conditions that may give rise to severe accidents (DEC-B), in order to mitigate their consequences.

With respect to design modifications, the RINR requires analysis to determine whether ministerial authorisation is required prior to commissioning, and also establishes which types of modifications require construction and assembly authorisation. These requirements are developed in CSN Instruction IS-21, applicable to:

1. Modifications in the ESC of the plant.
2. The performance of tests not described in the Safety Case or in the OTS.
3. Changes in operating conditions, including assessment methods, practices, procedures, manuals and other documents.
4. Temporary modifications.
5. Degraded or non-compliant conditions.

IS-21 distinguishes between different types of assessments (pre-assessment, safety assessment in case of affirmative pre-assessment, and safety assessment in case of affirmative safety assessment) of modifications, depending on their safety significance and safety impact, and on whether they require a favourable assessment by the CSN or ministerial authorisation prior to assembly or commissioning. When a modification requires authorisation, the safety analysis must demonstrate that, once the modification is implemented, the applicable safety criteria, standards and requirements continue to be met.

As established in IS-21, during the first three months of the year the licensees must submit to MITECO and the CSN a report on the modifications planned, implemented or being implemented at the plant, including the prior analyses and safety assessments performed.

Article 31 of the RSN reinforces the requirements previously existing in the regulatory framework in relation to modifications to the installation, in particular in relation to the assessment of their impact, not only individually, but also cumulatively.

Furthermore, the RSN, in accordance with the provisions of Directive 2014/87/Euratom in relation to the periodic safety review and CSN Instruction IS-26, establishes that the licensees must carry out a PSR at least once every 10 years, the objectives of which are described in section 14.2.3.

The safety guide of the CSN GS-01.10 Rev.2. "Periodic Safety Reviews of Nuclear Power Plants", based on IAEA SSG-25, sets out guidelines for conducting PSRs.

In addition to the PSR, compliance with Directive 2014/87/Euratom involves carrying out a detailed assessment of a specific nuclear power plant safety issue*(Topical Peer Review*) every six years, the results of which will be included in a national report submitted to a peer review process among all EU countries. The results of this process are published. The second peer review on fire protection in nuclear power plants took place during the reporting period. Carried out between 2022 and 2024, based on the technical specifications developed by WENRA mainly during 2021, it should be noted that Spain, through the CSN and with the collaboration of the licensees, has actively participated in the entire process, from the design of the specifications to the drafting of the national report and subsequent *peer review,* which was completed throughout 2024. At the time of writing, the report on the results of the *peer review*s in the final stages of preparation, pending the elaboration of the corresponding national action plans.

Finally, Law 15/1980, which created the CSN, empowers this regulatory body, in its second Article, section a, to establish mandatory requirements. This regulatory pathway is used when it is deemed necessary to review or assess safety aspects.

14.1.2. Safety assessments in the framework of the licensing process and safety analysis reports at different stages of the life cycle of nuclear installations

During the period covered by the tenth report, the Operating Authorisation (OA) of the Trillo nuclear power plant was renewed (authorisation granted on 11 November 2024).

In relation to this OA renewal process, the Base document for the 3rd Periodic Safety Review (PSR) of the Trillo plant was approved by the CSN in June 2022.

The specific safety assessments that have been carried out during the tenth reporting period, following established regulatory processes, are listed below:

Almaraz nuclear power plant

During the period covered by the tenth report, among the modifications that have required a report by the CSN, the following are particularly significant:

- Commissioning of a new functional CC-SW changer cleaning system after an earthquake.

Ascó nuclear power plant

During the period covered by the tenth report, the following are particularly significant among the modifications that have required reporting by the CSN:

- Implementation of the Improved Operating Technical Specifications in the two units of the Ascó nuclear power plant.
- Modification of the Licensing Basis of the boric acid addition system (seismic classification according to RG-1.29) in both plant units
- Design modification for the densification of the existing Individualised Storage Facility (ISF) at the site.

Cofrentes nuclear power plant

During the period covered by the tenth report, the following are particularly significant among the modifications that have required reporting by the CSN:

- Temporary modification for operation without generation circuit breaker
- Modification for the loading of spent fuel with CILC*(Crud Induced Localised Corrosion*) in the HI-STAR 150 cask (includes other changes associated with the review of the safety study of the HI-STAR 150 cask).
- Modification of pressure-temperature (P/T) limit curves for long-term operation.

Santa María de Garoña Nuclear Power Plant

During the period covered by the tenth report, no modification requiring a report by the CSN was carried out at the Santa María de Garoña nuclear power plant.

Trillo nuclear power plant

During the period covered by the tenth report, the following are particularly significant among the modifications that have required reporting by the CSN:

- Reallocation of fire areas in the auxiliary building (related to a proposed modification of OTS)

- Storage of lubrication oil in the secure storage slab (related to a proposed modification of OTS)

Vandellós II nuclear power plant

During the period covered by the tenth report, the following are particularly significant among the modifications that have required reporting by the CSN:

- Execution and assembly of the Individualised Storage Facility (ATI-100)
- Implementation of the Enhanced Technical Performance Specification

14.1.3. Periodic safety assessments of nuclear installations carried out with the inclusion of 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 installations, including the summary of important results for individual nuclear installations and not only according to their type and generation

As already indicated, Articles 3.19, 3.20 and 3.21 of CSN Instruction IS-26 require the licensees of the Spanish nuclear power plants to carry out a Periodic Safety Review (PSR) at least once every 10 years. The PSR shall confirm that the facility continues to comply with its design basis, and shall result in reasonably practicable improvements resulting from analysis of new regulations and national and international best practice. The CSN safety guide of the CSN 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 PSR assessments by the CSN. Similarly, Article 13 of the Nuclear Safety Regulation reinforces the provisions of Instruction IS-26 in relation to the PSR and establishes that "as a result of the PSR, the licensee shall introduce at the facility such improvements in nuclear safety as are reasonably feasible within timeframes appropriate to their safety significance, taking as a reference the safety objective established in Article 6 of these regulations". The safety objective referred to in Article 6 of the RSN transposes the safety objective of Directive 2014/87 for existing reactors and Principle 2 of the Vienna Declaration into national legislation.

The aforementioned GS-01.10 was revised in 2017 to align with IAEA SSG-25, "*Periodic Safety Review for Nuclear Power Plants*".

The objectives of the PSR include analysing the performance of the facility in the different aspects of nuclear safety over a sufficiently long period of time to identify trends, analysing the situation of the facility with respect to the international standards and those of the country of origin of the project and assessing the nuclear safety of the facility, verifying compliance with its design basis and the validity of the measures for accident prevention and mitigation of their consequences, and the application of the principle of defence in depth. The PSR also aims to ensure that nuclear safety remains at a high level during the following period.

At facilities requesting an authorisation for long-term operation (beyond the design lifetime), the licensee must include, within the documentation supporting the request, an integrated ageing assessment and management plan containing the *Ageing Management Reviews (*AMR) and the *Time Limited Ageing Analyses* (TLAA), as established in CSN Instruction IS-22 on ageing management at nuclear power plants. One of the outputs of

the PSRs is the review of ongoing safety enhancement programmes, or the addition of new programmes, if needed based on the outcome of the different analyses.

GS-1.10 includes, as a fundamental part of the PSR, analysis and comparison with state-of-the-art standards and best practices. The new regulations to be analysed during the PSR are reflected in the basic document for the performance of the PSR, which requires a favourable appraisal by the CSN.

The standards of the country of origin of the project have been taken into account from the beginning of the licensing of the Spanish nuclear power plants, through requirements relating to their consideration, both in the preliminary authorisations and in the OAs.

The OAs currently include a condition whereby, within the first quarter of each calendar year, the licensee must submit a report on the measures taken to bring the operation of the plant into line with the new national requirements on nuclear safety and radiation protection and with the regulations of the country of origin of the project. In the latter case, including an analysis of the applicability to the plant of the new requirements issued by the regulatory body of the project's country of origin.

Likewise, within the scope of the PSR, licensees are required to carry out a global analysis of the applicability of the new regulations issued in the project's country of origin or in other countries and reference organisations (IAEA). These regulations to be analysed are specified in the "base documents" for the execution of the corresponding PSRs for each plant.

The safety assessment associated with the PSR should also include an update of the Probabilistic Safety Assessment, assess risk-informed design modifications and incorporate operational experience since the last update.

During the period covered by this report, the CSN has favourably assessed the basic documents for the performance of the PSRs for Trillo NPP (June 2022) and the Juzbado fuel assembly manufacturing facility (June 2024), and has reported favourably, subject to conditions, on the request for renewal of the operating authorisation for Trillo NPP for ten years, on the basis of the PSR and analysis for long-term operation performed by the licensee (July 2024).

As the most relevant results of the PSR carried out by Trillo NPP, Trillo NPP has identified 46 proposals for improvement, as a result of the review of the new regulations and best practices, which have given rise to 67 proposals for action for their resolution, according to a prioritisation based on their importance for safety. As a result of the CSN's assessment, a set of conditions has been established for the licensee, to be implemented basically within a period ranging from 6 months to the first two years following renewal of the authorisation (awarded by the Ministry in November 2024).

Among the actions to be carried out, the following stand out:

- The implementation of a design modification for the change of location and model of the temperature instruments of the safeguards diesel generators
- Periodic retesting: One relating to backup and emergency diesel generators and three relating to some ventilation systems (UV86 alternative emergency management centre

ventilation system, UV27 control room filtration system and UF essential chilled water system)
- New maintenance actions to minimise the problems of tuberculation, slime and other fouling of some heat exchangers.
- Nine other actions of various kinds in the areas of:
  – Review of procedures, operating manuals and guidelines
  – Conducting or reviewing analyses
  – Incorporation of new regulations into the licensing bases.

14.1.4. Regulatory review and control activities

The Management System implemented at the CSN is based on the IAEA GSR part 2 "Leadership and Management for Safety" and on the UNE-EN ISO 9001-2015 "Quality Management Systems" and UNE-EN ISO 14001-2015 "Environmental Management Systems" standards. Specifications and requirements for use". ISO 45001-2018 "Occupational health and safety management systems. Requirements and guidance for use", UNE-EN ISO 50001-2018 "Energy management systems. Requirements with guidance for use" and in the IAEA General Safety Guide GSG-12 "Organisation, Management and Resources of Regulatory Body for Safety". It establishes the processes and corresponding procedures to ensure that the CSN's actions are systematic, integral and predictable, 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.

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

Within the SISC, the CSN includes in the BIP biannual inspections of the nuclear power plants in order to verify the correct application of IS-21 by the licensees. These inspections attach particular importance to the supervision of modifications that do not require authorisation or favourable assessment, and to the implementation of temporary modifications to the installation.

An important part of the assessment process associated with requests for the renewal of nuclear power plant operating authorisations (OA) is the assessment of the results of the PSR, as indicated in section 14.1.3. The conditions for the improvement of safety applicable to the new OA are derived from this, and in certain cases are developed in Complementary Technical Instructions (CTI) by virtue of the aforementioned Article 2a) of the Law creating the CSN.

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

By way of summary of what has been indicated in previous review reports, 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 under Article 2a) of the Law by which it was created 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 with a view to identifying 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 31 December 2013.

The timelines for the implementation of 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 subject to a specific authorisation process (which was carried out in the 2016-2018 period of the previous report), the construction of the Alternative Emergency Management Centre (CAGE), the installation of a filtered containment vent (SVFC) and the installation of passive autocatalytic recombinant (PAR) hydrogen autocatalysts in the containment stand out.

During the period covered by this report, the nuclear power plant licensees have completed the seismic characterisation of sites. The remaining modifications resulting from the stress tests and CSN assessments that led to the issuance of the post-Fukushima CTIs by the CSN were implemented and commissioned in the period prior to that covered by this report (see ninth review report for further details).

With regard to the results of the seismic characterisation of the sites, during this period the licensees submitted the corresponding reports and resulting action plans to the CSN, which were favourably appreciated by the plenary session of the CSN at its meeting of 31st October 2023, highlighting the need to carry out a seismic PSA at Vandellós II NPP and, in the meantime, the implementation of certain compensatory measures in the short term (two years) on the equipment identified as the most significant, in accordance with the methodology applied (ESEL methodology of the EPRI guide 300200704), in particular the replacement of the refuelling water tank with a more seismically resistant one. The need to perform a seismic PSA has not been identified at the other plants and, where appropriate, the conditions imposed by the CSN plenary session within the framework of the favourable assessment of the action plans refer to aspects of a documentary nature. In all the plants, the spent fuel storage pool and its instrumentation has been included in the scope of the individualised action plans.

14.2. Verification of safety

14.2.1. Regulatory provisions and requirements for safety verification

The OAs require the licensees to periodically submit a series of reports on the tracking of in-house and industry operating experience and the results and modifications arising from the analyses of new standards in the country of origin of the project, the results of the environmental radiological surveillance programme, the results of dosimetry controls on the workers, the activities performed in relation to the radioactive waste and spent fuel management plan, the activities performed in relation to the education and training of licensed and unlicensed personnel of the facility and the dispatch of radioactive packages from the facility.

The operating authorisations also set out the criteria for determining when changes to the official operating documents are implemented: Operating Technical Specifications (OTS), Safety Analysis Report (SAR), On-Site Emergency Plan, Operating Regulations, Quality

Assurance Manual, Radioactive Waste Management Plan and Radiation Protection Manual (RPM), whether or not they require authorisation; in some cases the applicable screening process is carried out in the CTI. Any modification to the Inland Emergency Plan or OTSs requires ministerial authorisation, while changes to the SAR require or do not require authorisation depending on whether or not the design modification leading to the change requires authorisation or not.

As already indicated, CSN Instruction IS-21, on 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 that determines whether or not a modification at the facility requires ministerial authorisation or a favourable assessment by the CSN.

The requirements applicable to in-service inspection at nuclear power plants are established in CSN Instruction IS-23, and those applicable to ageing management are established in CSN Instruction IS-22. The OTSs establish the test requirements necessary to verify the operability of the safety systems and the requirements applicable in this case are set out in CSN Instruction IS-32.

Likewise, CSN Instruction IS-15, on 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 safety-relevant systems.

As regards the PSR, as has already been indicated, CSN Instruction IS-26 and the RSN establish that at least once every ten years the licensees must carry out a PSR. In addition, OAs require, among other documents, the submission of the PSR together with the application 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 period 2022-2024 the licensees of the nuclear power plants have continued to update the design basis and licensing documents for each installation, with the aim of compiling the design and licensing basis for each safety-related system. This activity requires verification of the assumptions, data and results of accident analyses included in the SAR, the identification of the design basis of the supporting components necessary to perform the safety functions and the 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 SAR, sufficiently contrasted and coherent with the design basis documents.

The set of periodic safety-related examinations and tests of SSCs during their operational life is known as In-Service Inspection and aims at verifying the structural integrity and functional capability of SSCs.

Until the issuance in 2009 of the CSN Instruction on in-service inspection at nuclear power plants, IS-23, and in the absence of a specific standard in Spain, the OAs contemplated the application of the standards of the country of origin 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 OTSs. This code is therefore considered an acceptable reference for the preparation of in-service inspection programmes for installations, which are set out in the document known as the In-Service Inspection Manual (ISIM). The current IS-23 in force endorses and consolidates this same practice.

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

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

The evaluation of the results of these inspections and their comparison with the applicable acceptance criteria makes it possible to verify the objectives of these in-service inspection programmes. Comparison of these results with those obtained in the baseline (pre-service) inspection and in the previous in-service inspections carried out allows the trends observed to be analysed, changes to be justified and actions to be taken as appropriate in each case.

In 2016, the guidance on Anomalous Conditions, AC (degraded and non-compliant conditions) that may arise during plant operation was revised in view of the experience of its application since 2007.

Until now, the completion of PSRs has been linked to the granting of the renewal of OAs. The results of the PSR can be used to improve performance in the following period, as it is an overall review of the installation over extended periods of time. In cases where the renewal of the OA exceeds the lifetime originally considered in the initial design of the installation, the PSRs include special conditions, both administrative and related to the ageing management of the installation, so that the operation of the plant may be extended beyond the initial design lifetime with adequate safety guarantees.

During this period, the Trillo Nuclear Power Plant renewed its operating authorisation, initiating the corresponding actions and commitments associated with the PSR drawn up in the process of requesting the aforementioned OA.

Based on the latest OAs, activities associated with life management, long-term operation and related inspections are being carried out at the plants.

Similarly, the in-service inspection programmes, with their corresponding intervals, are being executed according to the required scopes and deadlines.

The emission of anomalous conditions was normalised in this period as the plants have gone on to acquire and share their experiences, consolidating this as an essential process in the daily operations of the plants.

14.2.3. Elements of the ageing management programme(s)

The ageing control of SSCs is a fundamental part of the life management of nuclear power plants. In compliance with the limits and conditions of the OAs, the licensees prepare an annual report identifying new inspection, surveillance and maintenance activities to detect and control ageing processes, in accordance with the methodology described in the LWR Nuclear Power Plant Remaining Life Assessment System, developed jointly by the Spanish nuclear power plants.

In July 2009, CSN Instruction IS-22 was published on safety requirements for ageing management and 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 analyses in a Lifetime Management Plan (LMP) identifying ageing mechanisms and assessing current maintenance practices in order to determine their possible extension or modification. Additionally, if the period covered by the analyses partially or totally exceeds the design life initially considered, the analyses (studies, calculations) carried out with defined design life assumptions (Ageing as a Function of Time Analysis, AFTA) are re-evaluated,

In November 2017, review 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 already indicated, during the first six months of each year the nuclear power plants submit to the CSN the activities performed under the LMP, specifying the proposals for improvement. The ageing management activities, as well as the scope of LMPs in accordance with Instruction IS-22, are based, as minimum requirements, on the US regulation 10CFR54 (Requirements for renewal of operating licenses for nuclear power plants), specifically in Articles 54.3, 54.4 and 54.21, during its design life. Beyond this period, the requirements of that standard associated with the Integrated Ageing Management Plan (IAMP) must also be fulfilled as a requirement linked to the first application for renewal of the OA for a period beyond the design life (Art. 5.1) and subsequently (Art. 5.3).

During the period between January 2022 and December 2024, some of the nuclear power plants have entered the period corresponding to Long Term Operation (LTO) in compliance with the requirements established for this purpose in the Operating Authorisations in force.

The dates of entry into LTO for each plant, with respect to the validity of their operating authorisation, are as follows:

- Almaraz I NPP (1981): 2021 -2027 (6 years of LTO)
- Almaraz II NPP (1983): 2023-2028 (5 years of LTO)
- Ascó I NPP (1983): 2023- 2030 (7 years of LTO)
- Ascó II NPP (1985): 2026-2031(6 years of LTO)
- Cofrentes NPP (1984): 2024-2030 (6 years of LTO)
- Vandellós II NPP (1987): 2027-2030 (three years of LTO)
- Trillo NPP (1988): 2024-2034 (6 years of LTO)

14.2.4. Provisions for internal review by the licensee 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 from the Administration is required, the licensee may unilaterally implement or put into service the modification. Otherwise, the modification must be submitted to the administration for consideration by requesting a favourable assessment or authorisation. The procedures define different levels of the organisation for the technical review and approval of changes, including, in all cases, the Safety and Quality departments of the plants. Additionally, in those cases in which it is necessary to request the Authorisation of the Administration, the modification is also reviewed by the corresponding Plant Nuclear Safety Committee (PNSC) and the Operator Nuclear Safety Committee (ONSC), which provide an additional independent review of the technical and safety analyses to be submitted in support of the request. On some occasions, 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 originating the change. This independent review may be carried out by organisations internal to the operator or by entities outside the operator's organisation.

The information provided by the probabilistic methodologies collected in the Probabilistic Safety Assessments (PSA) available to the nuclear power plants on the safety impact of the requests submitted is a valuable mechanism that is sometimes 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 already indicated in section 7.4, the CSN dedicates a significant part of its resources to the inspection of operating nuclear power plants and has an integrated plant supervision and control system (SISC), which includes the BIP as a continuous supervision tool.

Inspections under this programme involve both specialists from the central offices and the CSN's resident inspectors at the sites themselves. The resident inspectorate consists of two inspectors at single reactor sites and three inspectors at sites with two reactors. The CSN resident inspector carries out daily monitoring of plant operation and operating incidents, compliance with the OTSs and other CSN requirements. Within the scope of the BIP are inspections involving specialists from various disciplines on aspects relevant to the safety of the facility, such as design modifications, maintenance effectiveness, SSC design basis, surveillance requirements, indoor emergency plan, occupational radiation protection, etc.

14.3. Vienna Declaration

Articles 14.2.2 and 14.2.3 clearly fall under Principle 2 of the Vienna Conference, in relation to the regular and routine conduct of comprehensive and systematic safety assessments and the implementation of reasonably practical safety improvements.

It should be pointed out that, as a result of the PSRs and the stress testing and analysis of large area loss scenarios, safety improvements have been implemented at the Spanish nuclear power plants in different areas, as described in chapter 6 and in section 14.1.5 The implementation of all these modifications has contributed to strengthening the Spanish nuclear power plants against situations beyond the design basis.

As regards principle 3, Articles 14.2.1 and 14.2.2 explain in detail the regulatory framework requiring the plants to conduct comprehensive and periodic safety assessments and to implement reasonably feasible improvements, with emphasis on Instruction IS-21 as regards the treatment of design modifications and IS-26 as regards the performance of PSRs. It should be pointed out that the CSN Safety Guide GS 1.10 Rev.2, establishing the guidelines for the performance of PSRs by the licensees, as indicated above, was revised to adapt it to IAEA guide SSG-25 "*Periodic Safety Review for Nuclear Power Plants"*. The latest PSRs of the Spanish nuclear power plants are based on this new review.

Article 15. Radiation Protection

15.1. Regulatory provisions and requirements concerning the radiation protection of nuclear facilities

15.1.1. Regulation on Health 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 Royal Decree 1029/2022 approving the Regulation on health protection against the risks arising from exposure to ionising radiation, transposing into national legislation Directive 96/29 EURATOM. for protection against the risks arising from ionising radiation.

In the last two years the Plenary Session of the Safety Council (CSN) has adopted agreements on the following two resolutions:

- Resolution of 17 January 2023 establishing the effective dose coefficients for external exposure.
- Resolution of 3 April 2024 establishing the effective dose coefficients for internal exposure.

These resolutions comply with the provisions of Royal Decree 1029/2022of 20 December, approving the Regulation on health protection against the risks arising from exposure to ionising radiation.

Aspects relating to the radiation protection of workers belonging to external companies (externally exposed workers) rendering services at nuclear and fuel cycle facilities are the subject of attention by the CSN, in compliance with the national and international regulatory framework, since experience shows that more than 80% of the occupational doses received as a result of the operations or activities carried out in the radiologically classified areas of the aforementioned installations correspond to this group.

The requirements laid down in the national regulations on the radiation protection of externally exposed workers require the external companies to which these workers belong to have, among other things, the obligation to assign and keep updated for each exposed worker in category A, a radiological monitoring document called a radiological card. In this respect, the development and implementation, as well as the maintenance by the **CSN of a Digital Radiation Passbook** should be highlighted as a **"notable achievement"**. This is a digital platform, **launched on 30 September 2024** , which allows external companies to demonstrate compliance with the obligations established in national regulations in relation

to the control of individual dosimetry, medical fitness and training in radiation protection, and for the nuclear or fuel cycle facility in which they provide their services to ensure that these workers comply with the regulatory requirements on radiation protection prior to commencing their activities in radiologically classified areas within the facility.

The **application developed and operated by the CSN** favours the modernisation of public services by providing important benefits such as better access to data and agility in processes; providing companies and workers with the tools and capabilities that give them full control of their data.

The transition from the physical paper ID card to the digital model has been rapid, with almost 50% of the transition completed in the first six months of operation

In the first six months of the application's operation, more than 5,000 digital radiation passbook have been issued, of which more than 3,000 are active and nearly 2,400 have been registered at nuclear or fuel cycle facilities.

The new Digital Radiation Passbook developed by the CSN has been rated as "*Good practice*" by the team of experts of the IRRS monitoring mission held in Spain from 27 January to 3 February 2025 IAEA.

15.1.2. Other provisions

The incorporation into Spanish law of Council Directive 2014/87/Euratom, of 8 July 2014, amending Directive 2009/71/Euratom, of 25 July 2009, establishing a Community framework for the nuclear safety of nuclear installations, led to the approval of the Regulation on nuclear safety at nuclear installations, by Royal Decree 1400/2018, of 23 November.

In order to complete in a coherent way the regulatory framework related to nuclear safety and radiation protection, and following the adoption of the two regulations, The Regulation on health protection against the risks arising from exposure to ionising radiation and the Regulation on nuclear safety at nuclear installations, it has become necessary to review the hitherto existing Regulation on nuclear and radioactive facilities, through the approval of the new Regulation on nuclear and radioactive installations, and other activities relating to exposure to ionising radiation, by Royal Decree 1217/2024, of 3rd December, which repeals Royal Decree 1836/1999, of 3rd December, transposing in this new text those aspects of Council Directive 2013/59/Euratom, of 5th December 2013, that affect its scope of application.

As a further development, the Safety Council has issued a number of Instructions on the procedures to be followed in order to meet certain requirements laid down in national legislation.

15.2. Regulatory expectations for the licensee's processes to optimise radiation doses and implement the Alara Principle

The three basic principles of justification, optimisation and limitation of the individual dose on which the radiation protection system is based are incorporated into Spanish legislation by means of the *Regulation on health protection against the risks arising from*

exposure to ionising radiation. In the nuclear power industry, the practical application of the optimisation principle (or Alara principle) is a basic objective to be achieved through the implementation in the different nuclear power plant organisations of the criteria and systematic approach defined in CSN Safety Guide GS-1.12, "Practical application of radiation protection in nuclear power plant operation "*Practical application of the optimisation of radiation protection in nuclear power plant operation"*.

It 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 be part of plant modification and modernisation plans, including decommissioning and dismantling processes. In particular, it has been applied to projects for the design or modification of irradiated fuel ITSs in power plants.
- The management of the plant organisation must be committed to the implementation of the Alara principle at all stages, from design to decommissioning, as part of the safety culture.
- The Management's commitment should be transferred to all the elements of the plant organisation, extending to the external companies involved in the performance of the most radiologically significant work.
- Appropriate resources must be established to inform, train and motivate all plant workers to comply with the Alara principle.

This Safety Guide establishes that the commitment of the plant organisation to the ALARA principle must be materialised through 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 review, Alara, of the most significant works from a radiological point of view is established.
- The policy of the plant is defined in all matters related to source term reduction.
- A systematic approach to review, Alara, of design modifications is established.
- Training and coaching programmes for the implementation of the Alara principle are established.
- The content and scope of the internal audit programme to be established to verify the degree of implementation of the Alara Programme is defined.

Since the beginning of the 1990's, the implementation of this doctrine has led to important modifications in the operating organisations of the Spanish nuclear power plants, with a view to ensuring that all the elements of the plants are seriously and formally committed to compliance with the Alara principle.

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

15.3. Implementation of radiation protection programmes by licensees

The Regulation on health protection against risks arising from exposure to ionising radiation sets the following dose limits.

Prior to the entry into force of Directive 2013/59/EURATOM, the CSN required the licensees of the nuclear power plants to implement the dose limits established in the Directive, and the licensees were required to estimate the impact of the new dose limits on the crystalline lens, fundamentally in workers carrying out activities in non-homogeneous radiation fields.

Exposed workers:

- 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.
- Dose equivalent limit shall be 100 mSv over 5 consecutive years, subject to a maximum dose of 50 mSv in any single year.
- Limit of skin dose (averaged over $1cm^2$): 500 mSv per official year.
- Limit of dose on hands, forearms, skin and ankles: 500 mSv per official year.

Members of the public

- Effective dose limit: 1 mSv per official year.
- Limit of skin dose (averaged over $1cm^2$): 50 mSv per official year.
- Limit of crystalline dose: 15 mSv per official year.

Special protection during pregnancy and breastfeeding

- As soon as a pregnant woman communicates her condition to the practice owner, 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 monitoring the foetal dose limit (1 mSv from the moment of declaration of pregnancy), this limit will be considered to be equivalent to a dose value of 2 mSv recorded in the dosimeter placed in the abdomen of the pregnant woman.
- As soon as a woman who is breastfeeding informs the operator of her condition, she shall not be assigned to work involving a significant risk of radioactive contamination.

Dose limit for trainees and students:

The dose limits for trainees and students over eighteen years of age who are required to use sources during their studies shall be the same as those for exposed workers.

The dose limit for trainees and students between the ages of sixteen and eighteen who are required to use radioactive sources during their studies is 6 mSv per official year. Notwithstanding this effective dose limit, the following equivalent dose limits shall also apply:

Dose equivalent limit for crystalline lens: 15 mSv per official year.

Limit of skin dose (averaged over $1cm^2$): 150 mSv per official year.

Limit of dose on hands, forearms, skin and ankles: 150 mSv per official year.

Administrative dose controls

In nuclear power plants, administrative effective dose controls are established for all exposed workers, which do not have regulatory implications equivalent to dose limits. These are conducted as an internal control to ensure that dose limits set by legislation are not exceeded and to achieve the objective of dose optimisation by keeping dose as low as reasonably achievable.

Administrative dose controls are defined in the Radiation Protection Manual for the different operating modes of the plant: normal operation, exceptional work and shutdowns.

Annex 15.A presents dosimetry information for workers exposed in the year 2023.

Alara Exhibitions

The implementation of the Alara principle in the various operating organisations always follows the same pattern:

1. A board or management level that drives and approves the Alara culture and dose targets, providing the necessary resources.
2. An executive level that proposes Alara policy and dose targets, analyses 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 is a work order that establishes 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.

Regulatory control of the radiation protection of the population is implemented through plant effluent limitation, monitoring and control programmes and through environmental radiological monitoring programmes in the area of influence of the plants.

Compliance with conditions for the release of radioactive substances

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

The system of limitation, monitoring and control of effluents from nuclear power plants has led to actual discharge values far below the authorised limits, which are internationally recognised.

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

B.1 shows the activity discharged by nuclear power plants in the year 2023. The radiological impact associated with the discharges is not significant, with the discharged activities representing a small fraction of the authorised dose limits.

The effective doses calculated for the most exposed member the public have not in any case exceeded the limit of 0.1 mSv/year per reactor authorised for radioactive effluents, with 0.001 mSv/year being the maximum value estimated for the year 2023.

Environmental radiological monitoring

Each nuclear power plant has an Environmental Radiological Surveillance Programme for its surroundings, in accordance with the CSN directives, the annual schedule and results of which are evaluated by the CSN. C describes the contents of the environmental radiological monitoring programmes and their most significant results during the years 2022 and 2023, the latest available at the time of writing this report.

It should be pointed out that, in compliance with the functions entrusted to the CSN in the area of public information, and with the provisions of Law 27/2006 regulating the right of access to environmental information, this organisation has developed a computer application to provide public access to environmental radiological surveillance data in Spain, which can be accessed via the CSN's institutional website at the link: www.csn.es where the results for the years 2006 to 2023 can currently be consulted. The contents of the CSN website on environmental radiological monitoring were considered as an area of good performance as a result of the IRRS-ARTEMIS mission to Spain in 2018.

Assessment of these results shows that the radiological impact of the Spanish nuclear power plants on the environment continues to be well below the established limits and that the environmental quality around the facilities remains acceptable from the radiological point of view, with no risk to people as a result of their operation.

Environmental monitoring and key 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. Regulatory activity includes inspection of their implementation and evaluation of their results. The CSN also carries out an environmental radiological surveillance programme independent from that of the licensee in the area surrounding each plant, which allows the results to be compared.

Annex 15.C provides a more detailed description of these programmes.

In 2022 and 2023 there were no verification missions to Spain by European Commission experts in the framework of Article 35 of the Euratom Treaty.

15.4. Regulatory review and control activities

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

Within the SISC, the CSN includes in the BIP the performance of biannual inspections of the nuclear power plants, which include:

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

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

ANNEX 15.A. Information on personal dosimetry included in the CSN report to the Congress of Deputies and the Senate, corresponding to the year 2023

A. External exposure

The statistical results of the cumulative doses in the year 2023 for the all nuclear power plants are as follows:

Collective doses

The following table shows the overall annual collective doses for each of the nuclear power plants in the year 2021. A total of six refuelling stops were made. The nuclear power plants that have carried out a refuelling outage in 2023 are Almaraz I, Almaraz II, Ascó I, Vandellós II, Trillo and Cofrentes.

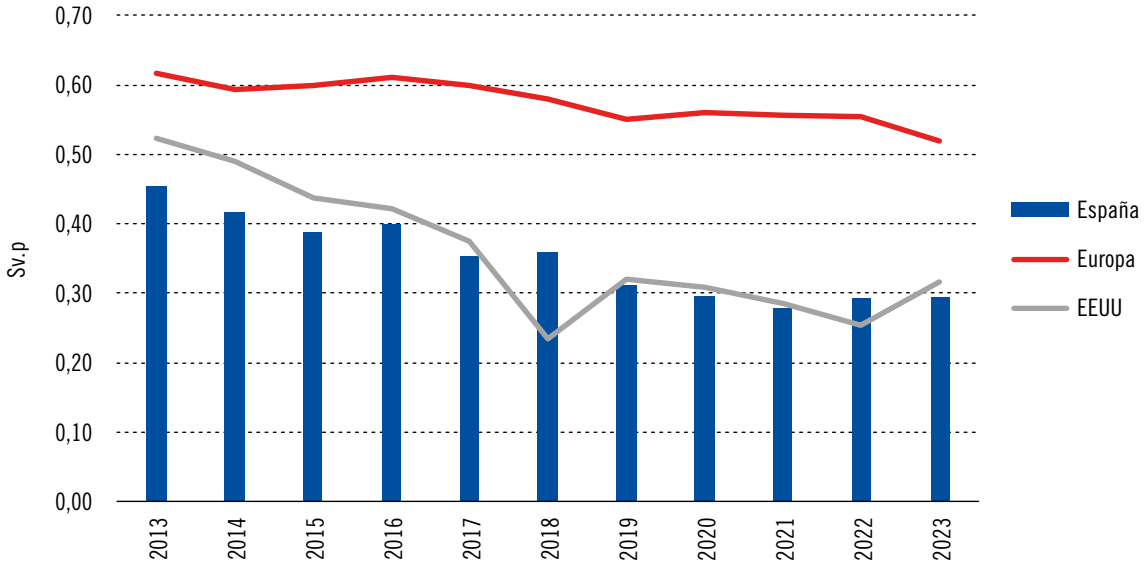
The Santa María de Garoña plant has not been in operation since the end of 2012, and has been granted decommissioning authorisation.

Almaraz I and II (PWR)	321.27	mSv.person
Ascó I and II (PWR)	684.67	mSv.person
Cofrentes (BWR)	1923.91	mSv.person
Vandellós II (PWR)	18.49	mSv.person
Trillo (PWR)	249.28	mSv.person

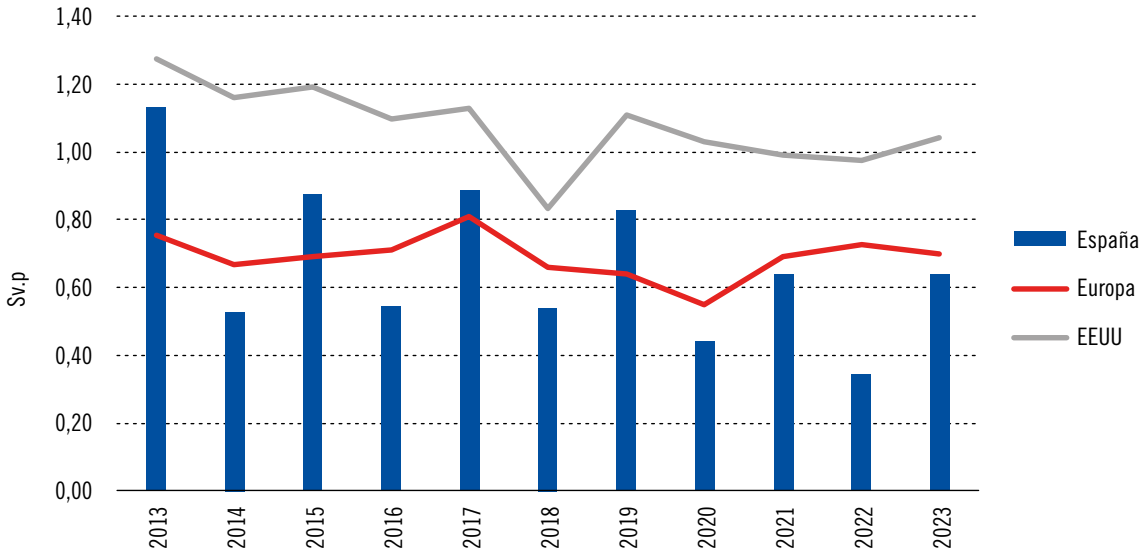
These data mean that the average collective dose, per reactor, over the year 2023 will be 400.30 mSv.person. By reactor type, this parameter reaches a value of 964.33 mSv. person for BWR (including Garoña) and 1923.91 mSv.person (without Garoña) and 212.28 mSv.person for PWR.

For reference data, figures 15. A.2. shows, depending on the type of reactor, comparative graphs of the evolution of the three-year average collective dose parameter in Spain, Europe and the USA. International data have been extracted from the database published by the International Information System on Occupational Exposure (ISOE).

Graph 15.A.1. Three-year average collective dose per reactor for PWR type reactors. International comparison



Graph 15.A.2. Three-year average collective dose per reactor for BWR type reactors. International comparison



B. Internal exposure

With regard to internal dosimetry, all workers with a significant risk of incorporating radionuclides were monitored by means of direct measurements of body radioactivity, and in no cases were values above the established recording level (1 mSv/year) detected.

ANNEX 15.B. Limitation, surveillance and control of releases of radioactive substances at Spanish nuclear power plants

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

Since 1997 the discharge limit for nuclear power plants has been set as an effective dose of 0.1 mSv/a for all liquid and gaseous effluents from each reactor. This limit ensures with a very large safety margin that doses to the most exposed member of the public are lower than the public dose limits set out in the Regulation on health protection against risks arising from exposure to ionising radiation: 1mSv/a effective dose and 50 mSv/a skin equivalent dose. This discharge limit applies both to the operating phase of nuclear power plants and to their decommissioning.

As a result of the application of this discharge limitation system, the actual discharge values are still well below the authorised limits and perfectly comparable at international level. B.1 shows the effluents from the Spanish nuclear power plants discharged during the year 2023; the estimated effective doses to the most exposed individual in the public as a consequence of these discharges represent at most 1% of the authorised dose limit for radioactive effluents.

Table 15.B.1. Radioactive effluents from nuclear power plants. Activity discharged in the year 2023 (Bq)(1)

PWR HEADQUARTERS

	José Cabrera NPP (2)	Almaraz I & II NPP	Ascó I NPP	Ascó II NPP	Vandellós II NPP	Trillo NPP
Liquid Effluents						
Total except Tritium and Dissolved Gases	51.51 10^{7}	14.79 10^{9}	64.01 10^{9}	3.95 10^{9}	12,82 10^{9}	21,16 10^{8}
Tritium	51.06 10^{8}	42,73 10^{13}	2,16 10^{13}	93,25 10^{13}	2,03 10^{13}	1,64 10^{13}
Dissolved Gases		ND	41.13 10^{7}	1,09 10^{4}	ND	(3)
Gaseous Effluents						
Noble Gases		16.91 10^{10}	21,84 10^{11}	91,47 10^{11}	12,70 10^{10}	96.55 10^{10}
Halogens		ND	ND	ND	ND	ND
Particles	ND	57,51 10^{3}	2,34 10^{6}	23,07 10^{6}	3,14 10^{5}	ND
Tritium	ND	54,14 10^{12}	83,91 10^{11}	6,59 10^{11}	95.95 10^{11}	79,40 10^{11}
Carbon-14		32.38 10^{11}	12,61 10^{11}	91,82 10^{11}	31,17 10^{11}	2,22 10^{11}

BWR HEADQUARTERS

	S.M. Garoña NPP(4)	Cofrentes NPP
Liquid Effluents		
Total except Tritium and Dissolved Gases	51,42 10^{10}	13,43 10^{8}
Tritium	21,30 10^{7}	7,87 10^{11}
Dissolved Gases	—	ND
Gaseous Effluents		
Noble Gases	ND	1,25 10^{12}
Halogens	—	82.75 10^{7}
Particles	18.35 10^{5}	12,10 10^{7}
Tritium	65.71 10^{10}	4,56 10^{11}
Carbon-14	—	12,11 10^{11}

ND: Not Detected.

(1) Effluents generated as a consequence of the decommissioning of the plant.

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

(3) In permanent shutdown since 6 July 2013.

ANNEX 15.C. Environmental radiological surveillance programmes in the areas of influence of the Spanish nuclear power plants

Radiological surveillance of the surroundings of the Spanish nuclear power plants is carried out by means of two independent programmes that are carried out by different responsible parties.

The first is performed 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 performed 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 from that carried out by the licensee in terms of sample collection and the laboratories performing the analytical determinations. The sampling points, the type of samples and the analyses performed coincide with those carried out by the operators. Its scope is around 5 % of the programme developed in each installation and can be up to 50 % depending on the type of sample.

There are currently eight environmental radiological surveillance programmes in place around the respective nuclear power plants, five in operation, two in decommissioning and one in the latency phase, in which around 8,000 samples are collected each year and some 13,000 analytical determinations are carried out.

Table 15. C. 1 contains a summary of the programmes carried out around the nuclear power plants in operation.

Table 15. C. 2 includes, for illustrative purposes, the average values of the results obtained in the analyses (without considering the values below the detection limits) of the air samples from the environmental radiological monitoring programmes carried out around the plants during 2022 and 2023.

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, Sr90, Spectrometry γ, I131
Direct radiation	Change of dosimeters after one period	Maximum integrated dose rate one-quarter exposure
Drinking water	Bi-weekly or more frequent sampling	Total beta activity, beta remainder, Sr90, Tritium, Spectrometry γ
Rainwater	Continuous sampling with sample collection	Sr90, Spectrometry γ monthly
Surface and groundwater	Sampling of surface water monthly or more frequently and groundwater quarterly or more frequently	Total beta activity, beta remainder, Tritium, Spectrometry γ
Soil, sediments and indicator organisms	Annual soil sampling and biannual sediment and indicator organism sampling	Sr-90, Spectrometry γ
Milk and crops	Bi-weekly milk sampling in the Grazing season and monthly for the rest of the year. Crop sampling at harvest time	Sr90, Spectrometry γ, I131
Meat, eggs, fish, seafood and honey	Six-monthly sampling	Spectrometry γ

Table 15.C.2. PVRA of nuclear power plants. Year 2022-2023

Nuclear power plant	Air. Mean value Bq/m^3			
	ß-Total	I-131	Sr-90	Cs-137
Almaraz	8.38E-04	<LOD	<LOD	<LOD
Ascó	7.94E-04	<LOD	<LOD	<LOD
Cofrentes	89.16E-04	<LOD	<LOD	<LOD
Vandellós II	67.72E-04	<LOD	<LOD	<LOD
Trillo	67,76E-04	<LOD	<LOD	<LOD
Santa María de Garoña[1]	4,86E-04	—	<LOD	<LOD
José Cabrera[2]	78,14E-04	-	<LOD	2,16E-05

LOD: Lower Limit of Detection

[1] In decommissioning

Article 16. Emergency Preparedness

16.1. Emergency plans and programmes

Preparedness and response to nuclear emergency situations arising from accidents at nuclear power plants are developed in the Basic Nuclear Emergency Plan (PLABEN) and in the regulations derived therefrom.

General provisions on nuclear emergencies are also to be found in the Law Creating the CSN, in the Regulation on Nuclear and Radioactive Installations, in the Regulation on Health Protection against the risks arising from exposure to ionising radiation, in the Royal Decree on obligatory information in the event of a nuclear or radiological emergency, in the Agreement of the Cabinet of Ministers establishing basic standards for protection against the dangers arising from exposure to ionising radiation and in the basic civil protection regulations.

Furthermore, each of the nuclear power plants, whether in operation, shutdown or decommissioning, has an On-Site Emergency Plan (SEP) adapted to the risks of its operating situation, which establishes and documents the licensee's response to possible emergency situations.

The most noteworthy aspects of the modifications introduced in 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

Post-Fukushima Supplementary Technical Instructions

In the framework of the "stress tests" promoted by the European Union, the CSN issued a series of CTIs for each of the Spanish nuclear power plants. The instructions required analyses, measures and actions for the management of new emergency scenarios and beyond design basis events related to the potential loss of large areas of the nuclear power plant.

As a result of the CTIs, all Spanish nuclear power plants undertook organisational improvements and design modifications in the areas of emergency preparedness and response and accident management.

The most important improvements introduced were the following:

- Adequacy of the human and material resources allocated to the emergency response organisation for severe accidents and protracted emergencies.
- Establishment of an Emergency Support Centre (ESC) close to Madrid, with portable equipment for electricity generation and medium and low pressure water supply that can be taken to the affected installation within 24 hours of activation.
- Construction of Alternative Emergency Management Centres (AMCs) for each site to, among other things, protect all personnel of the emergency response organisation from adverse radiological conditions.
- Identification of safe areas at each of the nuclear power plants for portable equipment complementary to those existing in the CAE for extensive damage mitigation, electrical generation and low and medium pressure water supply,
- Passive Hydrogen Recombiners (PAR) Installation
- Installation of filtered containment venting systems (SVFC) and inclusion in the IEPs of the need to coordinate the operation of this system with the External Emergency Plan.
- Improving internal and external emergency communication systems, extending their redundancy and autonomy.
- Upgrading or construction, as applicable, of heliports at each site.
- Drawing up the corresponding documents, procedures and instructions with the new human and material resources available and the emergency response operations.

As additional support for the requirements demanded by the CSN in the ITCs, the Organisation promoted the signing of a collaboration agreement between the licensees of the nuclear power plants and the Military Emergency Unit for on-site intervention in debris removal, pumping or transport tasks, among others. This initiative was highlighted in the IRRS-ARTEMIS mission to Spain in 2018.

All upgrades were included in the corresponding nuclear power plant IEPs.

Basic Nuclear Emergency Plan (PLABEN)

The CSN continues to work closely with the Directorate General for Civil Protection and Emergencies (DGPCE) on updating the PLABEN to include Post-Fukushima improvements, some aspects of Directive 2013/59/Euratom already included in other regulatory tools, certain requirements of the IAEA General Safety Part 7, as well as other international recommendations such as those of the *HERCA-WENRA Approach* document.

16.1.2. Emergency management legislation

In 2018, and in compliance with Directive 2014/87/Euratom, the Regulation on nuclear safety at nuclear facilities was approved, which includes the need to have Site Emergency Plans and their coordination with external plans.

In 2020, and within the framework of the preparation of the IAEA's IRRS mission, the Safety Instruction IS-44 on emergency planning, preparedness and response requirements for nuclear facilities was published, which encompasses in a single document the requirements in this area for nuclear facility operators. In order to develop the criteria acceptable

to the CSN for compliance with IS-44, two Safety Guides were published in 2022: Safety Guide 1.3 on nuclear facility emergency management planning and response and Safety Guide 1.9 on Emergency preparedness at nuclear facilities and documentation of their management system.

Also in 2020, Royal Decree 586/2020 on mandatory information in the event of a nuclear or radiological emergency was published, establishing 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 who are actually affected in the event of a nuclear emergency.

Furthermore, the regulation on emergency preparedness and response for the facilities was reinforced through the issuing by the CSN of Safety Instruction IS 44 on emergency planning, preparedness and response requirements for nuclear facilities; this has also required the review of CSN Safety Guides 1.3 and 1.9, which develop criteria and recommendations that the CSN considers adequate for compliance with IS-44.

Finally, in 2023, the Agreement of the Council of Ministers was published, establishing basic safety standards for protection against the risks arising from exposure to ionising radiation in the field of civil protection, the purpose of which is to incorporate and adapt complementary aspects of Directive 2013/59/Euratom to Spanish regulations.

16.1.3. CSN Emergency Response Plan (ERP)

The CSN has an Emergency Action Plan (ERP), including the Emergency Response Organisation (ERO), which includes the functions, specific resources and basic action procedures of its management and technical bodies, their interactions and the general guidelines on their education and training.

The ERO, complementary to the ordinary work organisation, has an operational structure with a single commander who exercises the management function and makes decisions, and in which its technical and logistical units participate, in accordance with an action plan established specifically for these cases and activated according to the level of severity of the accident that triggers the emergency.

The plan includes the processes for the incorporation of personnel from the basic organisational structure of the CSN into 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 field action of a series of intervention services in the affected areas, with regard to the level of off-site response in the event of a nuclear or radiological emergency

The ERO basically operates from an emergency centre (Salem), which is on permanent alert and has a 14-person emergency response team that can respond in within an hour.

The CSN has a collaboration agreement with the Military Emergency Unit by which it has a back-up room at the UME facilities in Torrejón de Ardoz, the functioning and operability of which are periodically verified.

The ERP has a Training Plan (PFORE) that establishes minimum initial and periodic training requirements for its components and a national and international programme of exercises and drills to test operability.

In addition, it has different technical capabilities to meet its objectives. In recent years, an Emergency Dashboard System (SICME) has been developed to facilitate decision-making and the Salem Operations Book and the Dosi-app emergency dosimetry control system have been updated. The installation of the new CSN Automatic Stations Network has also been completed, with 185 stations with spectrometric capacity and real-time data transmission.

A review of the ERP will be initiated during 2025 to incorporate the latest regulatory developments, in particular the following:

- Reference levels
- Dose criteria
- Operational levels of intervention
- Treatment of confidential information
- Long-term emergency management
- Mechanisms of Salem-2 activation

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 stakeholders, including in state organisations

The role of each organisation in the management of nuclear emergencies, according to the standards in force in Spain, is summarised below:

- The off-site emergency management is carried out 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 off-site Nuclear Emergency Plan (NPP). This directorate coordinates all response actions, including those carried out by the local authorities close to the potentially accident-prone plants.
- The monitoring of the emergency at the national level, in order to provide extraordinary means to the emergency management and to process international assistance, is carried out by different ministries and state institutions coordinated by the Ministry of Interior (DGPCE), through the Nuclear Emergency Plan at the Central Response and Support Level (PENCRA).
- The CSN, as the sole organisation competent in nuclear safety and radiation protection, technically assesses the emergency and its possible evolution, makes recommendations to the off-site emergency management for the adoption of measures to protect the population and the intervention personnel in accordance with radiological criteria and monitors the operating status of the accident plants. All this through its ERP and its ERO.

In this respect, the development and implementation by the CSN of a digital dosimetry management system in emergency scenarios (DOSI-APP) to allow real-time monitoring of the radiation exposures of the intervention personnel and to keep them below the prescribed reference levels should be highlighted as a “notable achievement”.

This system has been considered as a good practice by the IAEA in the February 2025 IRRS follow-up mission. "*The licensees of the nuclear power plants are responsible for on-site nuclear emergency management through their IEPs and coordinate with the CSN and the Off-site Emergency Management*

16.1.5. Implementation of emergency preparedness measures by licensees and nuclear emergency plans outside nuclear facilities

Level of Internal Responsibility

The IEPs of nuclear installations establish the emergency preparedness and response actions at the in-house response level.

These documents also include the actions planned and the means necessary to reduce the likelihood of an emergency occurring and to limit the release of radioactive material to the environment in the event of such an emergency occurrence of an emergency and to limit the release of radioactive material to the environment should it occur.

As a result of the stress tests carried out at the time, the nuclear power plant the nuclear power plant IEPs incorporated the following modifications at the time:

- An IMP initiating event related exclusively to variations in spent fuel pool water level or temperature.
- Initiating events related to the transfer of spent fuel from storage pools to individualised storage facilities.
- Management of security-related IEP initiating events, in accordance with that published in the guide on emergency action in the event of IEP security events (CEN-49) agreed by the CSN and the Foro Nuclear's CEN.

In addition, the licensees included in their IEPs the treatment of initiating events related to physical security, the activation of the CAGE, and edited Extensive Damage Emergency Guides (EDEM) and Extensive Damage Mitigation Guides (EDMGs).

Finally, a procedure was drawn up for the Guardia Civil response units in the event of an emergency.

Level of External Responsibility

The NEPs set out emergency preparedness and response actions at the external response level. The NEPS integrate the Municipal Nuclear Emergency Action Plans (PAMEN) and are coordinated with the Nuclear Emergency Plan for Response and Support Level (PENCRA).

The PENCRA establishes the system for providing the management of each NEP with the additional support and resources it needs. PENCRA shapes a national response model for the mobilisation of all state resources and capacities necessary for the response, including international assistance.

The management of national resources to support the NEPs is carried out through the DGPCE, which is part of the Ministry of the Interior, as the coordinating body for all agencies of the Central Administration, other public administrations and private entities.

The UME, created by the Agreement of the Council of Ministers of 7 October 2005 and attached to the Ministry of Defence, has the function of Operational Emergency Management in accordance with the Law on the National Civil Protection System for emergencies of national interest such as nuclear emergencies. The CSN has signed a collaboration agreement with the UME that includes telecommunications, training, emergency backup centre, and provision and maintenance of joint equipment.

In the last two years the Action Plans of the PEN Radiological Groups have been updated, reinforcing the support of the CSN's ERO and taking advantage of progress in the fields of communications, data transmission and the estimation of radiological consequences.

Finally, there is a Framework Collaboration Agreement between the DGPCE, the CSN and CEN, through Spanish Nuclear Industry Forum, on the collaboration of the licensees of the Spanish nuclear power plants in the implementation and maintenance of the efficiency of the off-site emergency plans. In addition, the CEN, through the Forum, has signed a collaboration protocol with the UME on intervention in emergency situations of extreme gravity in Spanish NPPs.

16.1.6. Training and exercises, evaluation activities and main results of exercises conducted, including lessons learned

Emergency drills are held every year at Spanish nuclear facilities to exercise their response capacity. The CSN draws up the annual schedule of drills and establishes a minimum scope for each one of them. The scenarios are unknown to both the plant and the CSN ERO and generally contemplate the declaration of Category III or Category IV with assumptions of release of radioactive material, fire, damage control and repair, rescue and first aid with contaminated personnel.

In addition, PEN exercises are held with activation of access controls, classification and decontamination stations and municipal coordination centres where the Radiological Group trains the most important radiological actions, such as dosimetry assignment.

As a result of the lessons learned in exercises and drills, the drafting of the initiating events of the Spanish nuclear power plant IEPs has been improved within the framework of the Joint CSN-Radiological and Health Protection Sector Group

16.1.7. Regulatory review and control activities

The CSN carries out its regulatory control functions in the field of emergencies in accordance with its Law of Creation. To this end, it assesses the IEPs of the regulated installations and their modifications, as well as compliance with the requirements established in the instructions it issues or in any other regulatory instrument. It also carries out inspections covering all aspects of the IEPs and forming part of the Basic Inspection Plan.

Inspection and exercise monitoring activities include annual drills and exercises with extensive damage mitigation equipment, either with CAE equipment or with equipment located in secure storage at the sites.

The resolution of possible inspection findings is done through the emergency pillar of the SISC, where the corresponding indicators are also monitored.

16.1.8. International agreements

The CSN has signed bilateral agreements related to nuclear and radiological emergencies with the French regulatory authority (ASNR) and with the Portuguese Environment Agency (APA), the National Civil Protection Authority, the Higher Technical Institute of the University of Lisbon of the Republic of Portugal in the fields of nuclear and radiological emergencies and environmental radiation protection. Both are early notification mechanisms for situations that may affect the respective national territories, the population, the environment or may give rise to public concern. These mechanisms have led to the development of information exchange protocols that are tested in exercises and drills.

These initiatives comply with the recommendations of the HERCA-WENRA Approach on cross-border cooperation in nuclear emergency preparedness and response and facilitate the transposition of Article 99 of Directive 2013/59/EURATOM.

In 2023, the Nuclear Safety Council signed a Memorandum of Understanding with the Nuclear and Radiological Regulatory Commission of the Kingdom of Saudi Arabia. The scope of cooperation includes, among other areas, safety improvement, crisis communications, emergency management, severe accident risk reduction and mitigation of the consequences of such accidents.

In 2024, the CSN signed a Memorandum of Understanding with the Swiss Federal Nuclear Safety Inspectorate (ENSI), establishing the scope of collaboration in relation to nuclear incidents and accident reporting and emergency preparedness and response.

Finally, it should be noted in this section that in the year 2024 the Nuclear Safety Council, in collaboration with other European regulators, as part of the European Union's nuclear safety cooperation initiative for assistance to third countries (INSC), initiated a project to assist the Moroccan regulator in the development of an emergency room.

16.2. Information to the public and neighbouring states

16.2.1. Provisions for informing the public in the vicinity of nuclear installations about emergency planning and emergency situations

The objective of Royal Decree 586/2020 on obligatory information in the event of a nuclear or radiological emergency is to establish the standards and procedures for information on prevention and protection measures applicable, along with other relevant information, to the potentially affected population and to those 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, as well as to the European Union, its Member States, third countries and other interna-

tional organisations. This Royal Decree fully transposes Articles 70 and 71, Annex XII and partially Articles 17 and 99 of Directive 2013/59/Euratom.

On the other hand, a Local Information Committee is held annually in the areas surrounding the nuclear power plants, led by MITECO with the participation of the CSN.

16.2.2. Provisions for informing the competent authorities of neighbouring States

Spain is a signatory to the IAEA Early Notification and Mutual Assistance Conventions, and as a Member State of the European Union (EU) 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 that implements the contents of the IAEA Early Notification Convention (Emercon/USIE). Periodically, exercises of different scopes promoted by the IAEA are conducted to check the correct functioning of the system (ConvEx exercises).

With respect to the IAEA Mutual Assistance Convention, the Contact Points in Spain are the DGPCE through its National Centre for Emergency Monitoring and Coordination (CENEM) and the CSN through the Salem.

The system that implements 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 Web-Ecurie Management Centre is the CSN through the Salem. Messages sent to the Ecurie website can be either alerts, for emergency notifications, or information, which is a voluntary notification of minor events and incidents that may be of use to the competent authorities of other member countries. Spain regularly participates in Ecurie exercises that test information exchange capabilities.

Council Directive 87/600/Euratom. Art. 5 (2) requires the web-Ecurie System to be regularly tested through exercises of different scope and ranked 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).

With respect to the EURDEP programme, the CSN sends data from the network of automatic environmental radiological surveillance stations and from the stations of the Autonomous Communities on a daily basis and in accordance with the commitment acquired by the countries participating in EURDEP; in the event of emergencies and during the performance of exercises, the data are sent less frequently than every hour.

With regard to arrangements for reporting to neighbouring countries, the agreements and methods of bilateral collaboration that allow for this are indicated in section 16.1.8 of this report.

Article 17. Siting

17.1. Assessment of site-related factors

17.1.1. Regulatory provisions and requirements relating to site selection and site assessment for nuclear installations, 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 RSN regulation and in the Council Instructions IS-26 *on basic nuclear safety requirements applicable to nuclear facilities* and IS-27 *on general design criteria for nuclear power plants*, compiling both the Spanish practice that had already been applied and the standards in force of the international organisations to which the Spanish State belongs (IAEA 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 and revised in the year 2021.

The RSN dedicates its Chapter II to site requirements, specifying what must be carried out in its initial assessment and the obligation to establish monitoring programmes throughout the life cycle of the installation in order to adequately monitor site conditions. Article 13 of the RSN reinforces that PSRs should be carried out every ten years and include site aspects in their scope and objectives, in particular as part of the programmes for continuous safety assessment and applicability of regulatory changes in the relevant ten-year period.

The safety analysis of the installation should include the identification and assessment of the design parameters of the site, resulting from an appropriate combination of deterministic (maximum foreseeable) and probabilistic (allowing uncertainties to be limited) studies, validated by expert judgement.

IS-26 dedicates its fourth section to the site and addresses the general criteria to be applied and the monitoring of site conditions over time. Any potential site for a nuclear installation 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 installation. 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 safety of the installation and the protection of the popu-

lation, 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 installation, the risks associated with external events (natural or attributable to human activities) and the environmental conditions that may be affected by the operation of the installation are subject to surveillance and monitoring throughout the life of the installation, from start-up to decommissioning.

Instruction IS-27, on general design criteria for nuclear power plants, includes two criteria dedicated to siting. Criterion 2, design basis for natural hazard protection, which provides for consideration of the most severe historically recorded events, 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 the nuclear power plant licensees requiring the performance of a seismic risk reassessment of each site, as detailed in section 17.3.1, the execution of which was completed in 2022 with the issuing of the final report drawn up by the licensees within the deadlines established by the CSN.

In all cases, the design parameters associated with a site (seismological, hydrological, meteorological, etc.) must be obtained through an appropriate combination of deterministic studies (maximum foreseeable) and probabilistic studies (which allow uncertainties to be limited), validated with an appropriate treatment of expert judgement. The identification and assessment of design parameters should be included in the safety analysis of the installation.

In accordance with the aforementioned principles, and in compliance with Article 3.19 of Council Instruction IS 26, and following the recommendations contained in CSN Safety Guide 1.10, " *Periodic safety reviews at nuclear power plants*", the Spanish facilities have been carrying out periodic safety reviews every ten years (PSRs), the scope and objectives of which include aspects relating to the site; in particular, within the programmes for on-going safety assessment, the review of off-site risks and the applicability of changes to the standards during the corresponding ten-year period.

17.1.2. Regulatory review and control activities

The surveillance programmes of the nuclear facilities are periodically inspected by the CSN (every four years at the most), in order to verify that their operation is adequate throughout the operating lifetime of each facility.

The CSN also has a specific plan for periodic inspections at each nuclear power plant relating to site parameters, which form part of the so-called Integrated Plant Supervision System (SISC). The plan is to carry out two types of inspection, one of general scope (every two years), and one of limited scope (every six months). The general scope includes all those risks relating 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 operating

experience and the licensee's corrective action programme are reviewed. On the other hand, the six-monthly specific scope inspections are carried out on structures, systems and components previously selected for their impact on the safety of the plant, and which may be significantly affected by severe weather conditions or external flooding. The objective, scope and frequency of inspections relating to site parameters are included in the corresponding CSN technical procedures.

17.2. Impacts of the installation on individuals, society and environment

17.2.1. Criteria for assessing the likely safety impact of the nuclear installation 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 potential impacts are kept within acceptable ranges or, if not, to intervene with appropriate measures to duly limit such impacts.

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

In terms of interaction with ground and surface water, the plants have developed Hydrogeological Monitoring 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 Monitoring Plans.

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

- monitoring of 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 for possible mitigating actions (repairs, clean-up, etc.);
- detailed knowledge of the hydrogeological behaviour of each site and of the possible effects of groundwater on the constructive 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 On-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 safety effects caused.

All the Spanish plants have established programmes for the surveillance of the meteorological parameters of the site, with adequate instrumentation and transmission of the information recorded to the control room of each plant and to the CSN emergency room (Salem). Some installations 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 licensing process

In the licensing and re-licensing processes, all those aspects likely to produce an interaction between the environment and the nuclear facility are analysed, evaluated and documented.

From the process of the Prior Authorisation of a nuclear facility, as in any other project with a potential impact on the environment, Law 21/2013 of 9 December, on environmental assessment, provides for the submission on the part of the licensee of the corresponding Environmental Impact Assessment, which is defined as *the set of studies and technical systems that make it possible to estimate the effects that the execution of a given project, work or activity causes on the environment*, which constitutes a common feature of all industrialised countries and is 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 or not to carry out a project or activity, by making it possible to choose, from among the different possible alternatives, the one that best safeguards general interests from an overall perspective and taking into account all the potential effects.

As regards the licensing process of a nuclear power plant, both the "Preliminary" and the "Final" "Safety Studies" include an extensive "Site Characterisation" section, including an exhaustive study of the most important aspects of the site, including site design basis; geography and demography; industries, transport and nearby military installations; 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 conditions initially considered 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 authorisation.

As already indicated, in licence renewal processes nuclear facilities are required to carry out a Periodic Safety Review (PSR), the scope of which includes aspects relating to the site, specifically with regard to the continuous safety assessment programmes, the review of off-site risks and the applicability of changes in the standards during the period covered by the PSR. Precisely 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 Analysis Report, if necessary, in accordance with the results obtained from 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 associated design bases 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 installations remains acceptable and is carried out in accordance with appropriate standards and practices

During the stress tests performed in 2011 by the Spanish nuclear power plants, the design bases corresponding to natural events were reviewed and their adequacy was verified. The effectiveness of preventive measures adopted in the design, or additionally incorporated, was also verified according to the principle of defence in depth. 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.

Furthermore, 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 envisaged 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 (known as the seismic CTI), which required the performance of a reassessment of the seismic risk of each site, for which geological and palaeoseismic data are analysed to characterise the possible existing capable faults. The process has been carried out jointly for all sites and concluded in 2022, meeting 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 might be maliciously caused by man, in 2011 and 2012 the CSN issued two CTIs in which it required the implementation of mitigating measures that would allow this type of event to be dealt with. Some of the measures then required reinforce those included in the Post-Fukushima action plans, and focus on the human and material resources necessary to control and mitigate the consequences of this type of event, especially the capacity to control large fires beyond those postulated in the design bases of the plants and the capacity to limit doses to the exterior 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 aircraft.

In addition, the licensees 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 was verified at all 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 were considered: inaccessibility between 0 and 4 hours, inaccessibility between 4 and 24 hours and inaccessibility greater than 24 hours.

In addition to what is requested in the CTIs, a collaboration agreement has been signed between the Military Emergency Unit (UME) and CEN, in situations of extreme gravity, which is referred to in Article 16. The tasks entrusted to the UME in relation to access to the installation include: the transfer of persons and components to the nuclear power plant, especially in conditions of severe deterioration of access infrastructures; release or conditioning of access routes to the nuclear power plant, as well as release or conditioning of access routes within the site.

17.3.2. Results of recent revaluation activities

The results obtained within the framework of the 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 period 2016-2018, studies and analyses derived from the results of the stress tests continued to be carried out, including the review, where appropriate, of the possible combinations of natural events, their foreseeable impact on the facilities and the improvement measures to be taken, if any.

Earthquakes

All plants have reviewed the design basis for earthquake resistant structures, systems and components. The findings indicate that the design basis is adequately met. In addition, the plants have reviewed the data on earthquakes occurring in the vicinity of their site, 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 within the installation have been analysed by considering explosions and fires, 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 analyses has been extended to the SSCs necessary 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 reviewed or proposed the review of equipment margins used to achieve safe shutdown if necessary, to cope 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 intensity of the earthquake 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 base design earthquake. It has also been analysed whether these dams can withstand higher earthquakes and the seismic margins available at each dam have been quantified.

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

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.

- Improvement actions taken

The improvements already made by the 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 SSCs used to achieve, if necessary, safe shutdown, to cope with a complete loss of power supply*(station blackout*, SBO) and a severe accident situation, by implementing the necessary modifications on SSCs with lower values or by carrying out their replacement.

Floods

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

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

- Improvement actions taken

The improvements already made by the 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 the natural features of the terrain (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 watertightness of doors, buildings and drainage 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 events, other than earthquakes and floods, which could have a safety impact at each site. The following external events, among others, were 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 checked that plant structures and components in outdoor areas are adequately designed. Efforts have also been made to verify the existence of safety margins beyond the design basis for credible events at each site, and various reinforcement measures have been implemented.

- Improvement actions taken

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

- Specific reassessment of external natural events (hail, extreme temperatures and lightning strikes) 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 biannual plant inspections on extreme weather conditions and flooding, and final heat sink. Furthermore, although they are not integrated in the SISC, the CSN periodically carries out planned inspections of the plants' seismic surveillance systems.

The process of designing and implementing the measures required by the CSN at the post-Fukushima CTIs 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 installation

One of the strategic lines of action of the CSN is the drive for institutional relations policies and communications with other bodies in the international sphere. For that, the CSN participates actively in different international forums with the aim of exchanging experiences and technical and regulatory knowledge in the area of nuclear safety and radiation protection, establishes best practices to reinforce the safety of facilities in our country and to strengthen international coordination of emergency response plans. 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.

Moreover, 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 installations requires the competent regulatory authority to engage, where appropriate, in cooperative activities on nuclear safety of nuclear installations with the competent regulatory authorities of other Member States in the vicinity of a nuclear installation, inter alia, through the exchange and/or sharing of information.

17.5. Vienna Declaration

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

Section 17.1 has explained that in compliance with Council Instruction IS 26, and following the recommendations contained in CSN Safety Guide 1.10 *Periodic safety reviews of the NPPs*, the Spanish nuclear power plants have been carrying out periodic safety reviews (PSRs) every ten years that include, in their scope and objectives, aspects of the site; in particular, within the programmes for the continuous safety assessment and applicability of changes in the standards during the corresponding ten-year period.

Section 17.2 describes the regulatory basis for analysing, assessing and documenting all those aspects likely to produce an interaction between the environment and the nuclear facility in the licensing 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. It also includes information on the 'Preliminary' and 'Final' Safety Studies and their contents related to the characterisation of the site, which is updated throughout the lifetime of the nuclear power plants.

Section 17.3.2 details the results obtained within the framework of the European stress tests on the response of nuclear power plants to external natural events beyond their design basis, showing that there is a high degree of resistance to these phenomena. It also details the improvement actions adopted to strengthen the capacity of the 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 area of nuclear safety and radiation protection and promoting cooperation between regulatory authorities.

Article 18. Design and Construction

18.1. Implementation of defence in depth

18.1.1. Regulatory provisions and requirements for 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 contemplates the principles of defence in depth, in accordance with the applicable international standards, such as those of the IAEA, the WENRA reference levels and the technical standards of the countries of origin of the technology of the Spanish nuclear power plants. Those listed below are the most relevant in design and construction, with a wide range of additional Safety Instructions and Guides equally applicable, although not specifically related to these phases of the installation.

The RINR establishes the requirements for the design and construction of a new nuclear power plant in Chapters II "preliminary authorisation" and III "construction authorisation", detailing the documentation to be submitted. This regulatory framework was completed by the RSN, in force since November 2018, which transposed Directive 2014/87/Euratom and, with it, the objective of Principle 1 of the Vienna Declaration to prevent accidents and, should they occur, to mitigate long-term off-site contamination. These objectives apply to all stages of the life of the installation, with design and construction addressed in Chapter II Siting.

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.

18.1.2. Status regarding the implementation for all nuclear intallations of the defence in depth concept, which provides for multiple levels of fuel protection, primary pressure boundary and containment, and taking into account internal and external events and the impact of related sequential natural external events (e.g.; tsunami caused by an earthquake, mudslide caused by heavy rains)

The principle of defence in depth (DiD) is fully implemented within the Spanish regulatory framework. The RSN reinforces the application of this principle and explicitly provides for it in Article 11, applicable to plant design and operation. Specifically, it states that "...including internal events, external events and severe conditions, doses received by workers and external releases should be minimised insofar as possible," and goes on to

elaborate on the levels of defence to be maintained through the design and construction of appropriate physical barriers and technological safeguards.

Furthermore, both Article 11 *defence in depth* of RD 1400/2018 approving the Regulation on nuclear safety at nuclear facilities (RSN) and CSN Instruction IS-26 require the incorporation of multiple barriers to prevent and mitigate releases of radioactive material to the outside world above the authorised limits during the design, construction, operation, dismantling, transport and management of the radioactive waste generated.

All the Spanish nuclear power plants incorporate these levels of protection, both in their physical design and in their procedures and guidelines for action, as was confirmed in the response process to the Fukushima accident, through the European stress tests, the associated peer reviews and the implementation of the National Action Plan resulting from the analyses of response to extreme natural events and all their plausible combinations.

18.1.3. Extent of use of design principles such as passive safety or fail safe, automation, physical and functional separation, redundancy, and diversity

During the period in which the different Spanish nuclear power plants were being built, improvements were introduced in the designs as a result of the evolution of internationally accepted standards, applying more updated and stricter criteria of physical separation, redundancy, diversity, analysis of new types of accidents, etc. to the design basis of the plants.

Subsequently, during the renewal of the OAs, the CSN has required the introduction of design improvements and modifications to increase the safety of the facility in accordance with the most demanding regulatory criteria, a practice that is currently carried out fundamentally within the framework of the Periodic Safety Reviews (PSRs). The wide range of standards related to PSRs allows the safety level of all Spanish nuclear power plants to be homogenised.

Among the most relevant standards related to the PSR are the RSN, in its Article 13 explicitly dedicated to the *Periodic Safety Review,* and Guide GS-1.10 Rev.2, revised in the period 2016-2018, as identified in section 18.1.1 and earlier in the report. GS-1.10 contemplates different phases of analysis of the configuration of the plant, with strict supervision by the CSN based on the establishment of milestones for favourable appreciation by the Plenary, in accordance with the assessment of the "safety factors" determined to identify possible improvements or modifications to the plant, in accordance with safety and defence in depth criteria.

18.1.4. Implementation of design measures or design changes (plant modifications, refurbishments) 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 are due to the safety improvement processes already in place since the beginning of their operation, the post-Fukushima NAcP was completed during this period.

Although the actions are specific to each plant, the following are of general application:

- Measures to deal with extensive damage accident scenarios, addressing interfaces between existing plant facilities, availability of portable resources and equipment, safe location of portable resources and equipment, construction of heliport, etc., and definition of a new emergency response organisation, with consequent modification of the IEPs.
- 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 (AMCs).
- Procurement of 380 Vac portable diesel generators to supply the critical loads defined in the extended SBO scenario and installation of emergency connection systems for this equipment.
- Procurement of portable diesel pumps for extinguishing large fires coinciding with the loss of external electrical power or damage to the power plant's fire-fighting systems. These pumps are also sized to supply water to the reactor vessel or containment, if necessary.
- Establishment of protocols to support nuclear power plants for voltage recovery from nearby hydroelectric power plants.
- Development of extensive damage management and mitigation guidelines GMDE and GEDE.
- Implementation of filtered containment venting systems (FCVS).
- Implementation of Passive Autocatalytic Hydrogen Recombiners in Containment (PAR)

The incorporation of these improvements in the configuration of the plants was complemented by regular emergency drills, in which the use of severe accident guidelines has already been contemplated. They are also considered among the contents of the training given to nuclear power plant personnel with responsibilities in their application, as well as in the processes for obtaining operating licences.

All of these security improvements, together with those resulting from the PSRs, enable compliance with principles 1 and 2 of the Vienna Declaration.

18.1.5. Implementation of special measures to maintain the integrity of the containment to prevent long-term off-site contamination, in particular measures taken or planned to address natural hazards more severe than those considered in the design basis

To prevent the failure of the containment, the EOPs and SAMGs were modified to improve the management of hydrogen generated in a severe accident, taking into account the installation of the PARs in the areas of the containment (primary or secondary) most susceptible to the risk of hydrogen accumulation and also incorporating the necessary instructions to allow the operation, taking into account the prolonged loss of electrical power, of the SVFC as a protective measure against failure due to enclosure overpressure, reducing the radiological limitation with the incorporation of the filter.

In addition, strategies were designed to reduce/mitigate the release of fission products to the outside, such as the external spraying of the containment, or any other building, as well as the spraying of the surface of the spent fuel pool.

Improvements were incorporated into the PHC upgrade programmes.

18.1.6. Improvements implemented in the NPPs' designs as a consequence of the deterministic and probabilistic safety analyses carried out since the previous national report of the convention and overview of the main improvements implemented since the commissioning of the nuclear facilities

Nuclear power plants have continued to make various applications of PSAs 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 maintenance efficiency at nuclear power plants, the supervision of refuelling programmes in accordance with the Outage Safety Guide or the implementation of programmes to optimise the maintenance of the equipment most significant for 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:

- Almaraz NPP has completed the adoption of the risk-informed standard NFPA-805 as the licensing basis for fire protection systems. Almaraz NPP has the Floods PSA, levels 1 and 2 and the Other Sources PSA that can be periodically updated as established in IS-25.
- Ascó NPP has also completed the process of adopting the NFPA-805 standard as a licensing basis, having carried out independent verifications of both the fire PSA and the power level 1 and 2 PSAs. Within the framework of the new models, the PSAs for the irradiated fuel pool are available and the PSA level 2 models for power flooding have been carried out, and the PSA level 1 and 2 for Fire in Other Modes and the PSA level 2 for Flooding in Other Modes have been carried out and are subject to periodic updating as set out in IS-25
- Vandellós NPP is in the process of drawing up a seismic PSA arising from the seismic hazard re-evaluation exercise for the sites and has issued the new level 2 PSA for fires at power and in other modes, taking into account the methodological improvements derived from the PSR.
- Cofrentes NPP has developed the PSAs required under instruction IS-25, the PSA Level 1 and Level 2 for floods in other modes of operation and the PSA Level 2 for fires in other modes of operation, thus completing the scope of the PSA studies required under instruction IS-25, which are subject to periodic updating, as are the rest of the PSA studies published, as established in IS-25. The RI-ISI (Risk Informed In-Service Inspection of Pipelines) and RI-IST (Risk Informed In-Service Testing of Pumps and Valves) programmes are also currently being updated.

During the period 2022-2024, the plants have planned, designed or implemented the following design modifications, in addition to those included in previous sections:

Almaraz I & II NPP

- New routing for pressure relief valve cables (to avoid LOCA in case of fire on safeguard bars in U2).
- New cable routing associated with AFW turbo at U2 (FDN enhancement of fire APS)

- Improvements in systems against gas intrusion.
- Implementation of the component changer cleaning system, functional after an earthquake.
- Improved UHS margins (increased capacity in the essential reservoir, improved margins for consumers).
- Improved availability of the pool cooling system.
- Flooding improvements in rooms of the electrical building.
- Improvements to electrical penetration protection devices.
- Installation of local position indicators on valves.
- Improved margins against air ingestion in containment spray pumps in the switching to the recirculation phase in case of LOCA.

Ascó I & II NPP

- Densification of the existing ISF and project for the construction of a new ATI-100 in the process of being licensed
- Physical improvements in PCI systems resulting from the conditions associated with the adoption of NFPA-805 as a licensing basis
- Seismic capacity provision to the boric acid addition system (13).
- Replacement of the heat exchangers of the safeguards isolation system with newly designed ones
- Implementation of the extended range neutron flux signal in the Ascó I and II NPP Remote Shutdown Panels
- Installation of wide-range level instrumentation of sumps in Containment

Cofrentes NPP

- Complementary amendments to the CPI system
- Connection between P40 and E12 division I.
- Improved ATWS inhibition logics.
- Modification of Division III diesel generator logics.
- Replacement of 125VDC circuit breakers in Busbars B and E.
- Replacement of the generation switch.
- Replacement of racks in batteries A and B and E22 system distribution improvements.

CNSMG

At the beginning of the shutdown and in view of the possibility of a new OA, the plant carried out improvements to the installation, until such authorisation was denied in August 2017. Since then, no major modifications have been carried out and activities have focused on the removal of operational waste from the facility, the isolation and deactivation of systems that are no longer required and the preparation for the transfer of fuel from the spent fuel pool to dry storage casks. As explained above, the facility began phase I of its decommissioning on 13/07/2023.

Trillo NPP

- Replacement of METRÓN switches
- Replacement of the generation switch
- Improved filling and venting TH (NEI 09-10 1a_A)
- Modification in safeguards/emergency batteries

Vandellós II

- Various design modifications aimed at resolving obsolescence.
- Implementation of a new automatic triggering of Reactor Coolant Pumps to minimise risk
- Implement new RCS pressure measurement instrumentation
- Improved lighting and autonomous blocks in the field of local actions in case of fire and emergency conditions, including post-Fukushima actions.

In terms of importance, both the project for the construction and commissioning of the ISF and some modifications arising from the specific plan associated with the seismic CTI, following the re-evaluation of the seismic hazard of the sites with the project for the construction of a new recharge water tank, are noteworthy, although they have not yet been finalised.

18.1.7. Regulatory review and control activities

In order to verify that the nuclear power plants operate in accordance with the applicable standards and the requirements established by the regulator, and that the actions required in the different authorisations and approvals are suitably implemented, the CSN systematically carries out the necessary assessments and inspections. Within these, the BIP defines a biannual inspection specific to each plant on a component design basis, the objective of which is to verify that the plant's SSCs adequately comply with their design basis, which incorporates the concept of defence in depth.

Furthermore, as has been explained in Article 14 and in accordance with CSN Instruction IS-21 on requirements applicable to modifications at nuclear power plants, for each design modification the licensee must carry out a specific analysis and, depending on the results of this analysis, the modifications must be previously authorised by MITECO, following a favourable report by the CSN, or favourably assessed by the CSN.

18.2. Incorporation of proven technologies and methodologies

Article 31 of the RSN states that the operator of the installation must ensure that no modification to the installation can degrade the ability to operate the installation safely, ensuring compliance with the primary safety functions and the safety objective of the installation.

In addition, Article 5.16 of CSN Instruction IS-26 on basic nuclear safety requirements applicable to nuclear facilities establishes that the design of SSCs important for safety should be based on technologies proven and validated 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 novel design, a pre-approval process must be in place to demonstrate through analysis, test programmes, previous experience or a combination of the above that the design is suitable. As the Spanish nuclear power plants are of US or German design, the technologies and methodologies incorporated into the designs in most cases have previous application experience.

Article 30 of the RINR, *Modifications to the installation,* establishes that in the event that a design modification implies a change to the criteria, standards and conditions on which the OA is based, the licensee shall request the modification authorisation, which shall be effective prior to the entry into service of the modification or to the performance of the tests.

For its part, Article 113 of the RINR defines the conditions for requesting favourable assessment by the CSN of new designs or models, and Article 114 establishes the conditions for favourable assessment for the validation of new designs or models for use in Spain.

CSN Instruction IS-21 on design modifications at nuclear power plants requires identification of the modifications that the licensees must submit for authorisation, identifying the documentation that must accompany the request. Also Article 30 of the RINR provides that where, in the opinion of the regulatory authority, a modification is major, the operator must apply for authorisation for implementation and installation.

Finally, Article 5.16 of CSN Instruction IS-26 on basic nuclear safety requirements applicable to nuclear facilities establishes that the design of SSCs important for safety must be based on technologies proven and validated under operating conditions similar to those of operation.

18.2.2. Actions taken by licensees to implement these technologies

The components of the safety systems are subject to an environmental and seismic qualification process, which takes into account the conditions in which they must perform their function, as specified in the equipment environmental qualification manual. In addition, the modernisation of safety-related systems using digital electronic equipment has made it necessary to extend the qualification to this equipment to ensure its electromagnetic compatibility with existing equipment in plants, meeting the highest quality and safety requirements in software design, as well as taking into account cybersecurity aspects.

In previous periods, methodologies for the dedication of software-based instrumentation and control equipment were developed, considering industry standards from the country of origin of the technology to be applicable in these cases. Currently, the electricity sector is tackling a pilot project for qualification/dedication of equipment with embedded or “smart” software.

In the period 2022-2024, the Spanish plants have implemented or initiated the following I&C design modifications with digital technology:

Almaraz I & II NPP

- Stockpiling spare parts for area and process radiation monitors.
- Modernisation of seismic instrumentation recorders.
- Improving cybersecurity in equipment.
- Improved control systems configuration, as a result of operational experience.
- Control room interface improvements: Incorporation of large monitors and fire monitoring assistance system.
- Renewal of qualified life safety instrumentation (I&C systems subject to environmental qualification).
- Renewal of power supplies and control and protection system boards.
- Spare parts stockpile Sensors Radiation flux External neutron.

Ascó I & II NPP

- Replacement of fire detection systems in buildings such as control room, control building, auxiliary building and electrical penetrations building.
- Cybersecurity improvements in different equipment, such as the process computer or the electrohydraulic turbine control system.
- Implementation of backup and restore systems for digital process systems.
- Renovation of several PLC automatons of process systems.
- Updating of set points of several radiation monitors related to different processes, including radioactive effluents.
- Installation of new wireless access points.
- Replacement of control boards for the main feed water turbopumps.
- Implementation of improvements to the reactor digital control system controllers.
- Improvements in seismic instrumentation.
- Replacement of the voltage regulators of the safety diesel generators.
- Adaptation of plant instrumentation to improve measurement uncertainties.
- Replacement of the vibration monitoring system and loose parts of the primary circuit.
- Migration of the digital data acquisition system from the process computer (EDS).
- Replacement of the regulation and control systems of the polar crane.
- Renewal of instrumentation due to obsolescence and life.

Cofrentes NPP:

- Refurbishment of radiation monitors of the backup gas treatment system
- Continued improvement in cyber-security systems
- New phase of improvements to the distributed control system: renewal of controllers and addition of control loops for the radioactive waste system and the feedwater cleaning system
- Modernisation of hardware and software of the plant computer
- Modernisation of level, temperature control loops in various systems
- Modernisation of recorders in waste control room
- Renewal of auxiliary boiler controls
- Modernisation of fire protection switchboard systems and detection systems
- Renewal of positioners on pneumatic valves
- Improving seismic monitoring instrumentation
- Implementation of an online monitoring system (OLM)

Trillo NPP

- Modernisation of area radiation monitors.
- Renovation of Motorised Valve Control Actuators.
- Safety and non-safety recorders.
- Improving cybersecurity in equipment.
- Renewal of chemistry analysers and other instruments.
- Improved configuration of bar control systems, resulting in operational experience.
- Packaging of I&C cards and instruments and purchase of additional stock.
- Modernisation of the control of the main pump decontamination system.
- Modernisation of the control of the Solid Waste Treatment system.
- Renewal of the alternator monitoring system.
- Renewal of the control of the pressuriser shower valves.
- Modernisation of the Reactor Control System and Feedwater Control System (ongoing).
- Modernisation of the Reactor Coolant Pumps Triggering System (ongoing).
- Modernisation of seismic instrumentation recorders (ongoing).

Vandellós II NPP

- Improving cybersecurity in communication between digital equipment.
- Cybersecurity improvements in different equipment, such as the process computer or the electrohydraulic turbine control system.
- Securitisation measures between the process network and the management network.
- Implementation of backup and restore systems for digital process systems.
- Installation of new wireless access points.
- Improvements in seismic instrumentation.
- Updating of set points of several radiation monitors related to different processes, including radioactive effluents.
- Complete replacement of the electro-hydraulic turbine control system.
- Replacement of the regulation and control systems of the polar crane.
- Renewal of instrumentation due to obsolescence and life.
- Renovation of several PLC automatons of process systems.

18.2.3. Regulatory review and control activities

Design modifications incorporating new technologies and methodologies and requiring authorisation or favourable assessment, or those implying modifications to the official operating documents, are subject to a regulatory assessment process, within which the CSN may perform specific inspections, known as “licensing” inspections.

In order to guarantee compliance with the requirements of Article 30 of the RINR and Article 5.16 of Instruction IS-26, the CSN procedure applicable to the assessments establishes the need to confirm the level of safety required and that the technical solutions have been tested or qualified through testing or experience.

Moreover, the BIP provides for biannual inspections of each plant on design modifications, whether physical, documentary or methodological. These inspections verify, under the IS-21 criteria, the previous analyses and safety assessments carried out to determine wheth-

er or not they require authorisation, the physical implementation and the commissioning tests.

The checks carried out during BIP inspections include the conditions set out in the equipment environmental qualification manuals, which can be considered particularly important for modifications introducing new technologies (e.g. digital instrumentation).

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

18.3.1. Regulatory provisions and requirements for reliable, stable and easily controllable operation, with special consideration of human factors and human-machine interfaces

As established in CSN Instruction IS-26, SSCs must be designed, manufactured, installed and operated in accordance with their safety classification and taking into account maintenance, inspection and testing capabilities to ensure their functional capability during the lifetime of the facility. When the intervention of a system is required for planned operational events and rapidly evolving accidents, it should be automatic, without manual intervention by operating personnel for sufficient time to take the necessary corrective action. Likewise, SSCs must be designed to ensure the safety functions under the environmental and seismic conditions considered in the expected operational events and design basis accidents, incorporating adequate safeguards against external and internal events.

The CSN considered it necessary for the licensees of nuclear facilities to formally include, within their design modification management procedures, the requirements relating to human factors, with the participation of specialists in this discipline. Thus, CSN Instruction IS-27 on general nuclear power plant design criteria establishes that: “the design of SSCs important to safety shall take into account human factors engineering principles and techniques”, and the IS-21 instruction on modifications at nuclear power plants includes among its requirements that “Human factors methods and criteria shall be appropriately incorporated into all phases of the modification process and activities”. Likewise, the Regulation on Nuclear Safety at Nuclear Installations, published in 2018, requires “taking into account the influence of human and organisational factors on nuclear safety, throughout the life cycle of the installation.”

Finally, associated with the renewals of the operating authorisations for 2020, 2021 and 2024, the nuclear power plants were required to include a chapter on Organisation and Human Factors in the Safety Analysis. The nuclear power plants have developed a first version of this chapter, the Safety Analysis being an official document of their authorisations. One of the disciplines addressed in this chapter is Human Factors Engineering.

18.3.2. Implementation of measures taken by the licence holder

Modifications at Spanish nuclear power plants are planned taking into account the human factors methodology of the USNRC’s NUREG-0711, analysing the 12 elements of human factors engineering in the 4 phases of planning and analysis, design, verification and validation, and commissioning and operation.

The fundamental objective of this methodology is to design the user-system interface in a way that minimises human error and avoids generating tasks or activities that exceed human capability, or that lead to error precursor situations. During the period 2022-2024 the licensees have developed procedures to systematise the application of this methodology to design modifications.

Almaraz I & II NPP

- Installation of a safety-related and functional post-seismic cleaning system for the CC/SW switchers on both the A and B-train.
- Design of a Human Factors Engineering plan for the implementation of the design modification of the Individualised Storage Facility (ISF) 100.
- Systematic application of the human factors engineering criteria in the remaining design modifications and verification of the human factors engineering aspects according to NUREG-0711, depending on their classification as special or ordinary.

Trillo NPP

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

Ascó I & II NPP

- Systematic application of human factors engineering criteria in design modifications and verification of the human factors engineering aspects of the displays of control and monitoring systems, according to NUREG-0711, as classified as special or ordinary.
- Design of a human factors engineering plan for the implementation of the individualised storage facility (ISF) 100.

Cofrentes NPP

- Systematic application of human factors engineering criteria in design modifications and verification of human factors engineering aspects in accordance with NUREG-0711, according to their classification as special or normal (ordinary).

Vandellós II NPP

- Systematic application of human factors engineering criteria in design modifications and verification of the human factors engineering aspects of the displays of control and monitoring systems, according to NUREG-0711, as classified as special or ordinary.
- Design of a human factors engineering plan for the implementation of the individualised storage facility (ISF) 100.

18.3.3. Regulatory review and control activities

Design modifications requiring authorisation or favourable appreciation, or involving modifications to the plant's official operating documents, are subject to an assessment process that analyses the impact on safety, including those aspects of human factors and human-machine interface deemed significant. As part of the process of assessing a design modification such as this, licensing inspections may be performed at the discretion of the CSN. The scope of the BIP also includes inspections of design modifications, at any stage, for the systematic and periodic monitoring of human factors and human-machine interface aspects.

18.4. Vienna Declaration

First principle of the Vienna Declaration: *the design, siting and construction of new nuclear power plants shall be consistent with the objective of preventing accidents during commissioning and operation and, should an accident occur, of mitigating releases of radionuclides that may cause long-term off-site contamination, as well as avoiding early radioactive releases or radioactive releases 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, in terms of design and operation, to existing plants. Indeed, much of the action taken in the wake of the Fukushima accident is aligned with this principle. On the other hand, the other two principles reinforce the application of the first principle to operating plants, from the double 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 the principles of defence in depth, covers compliance with Article 11 of RD 1400/2018 approving the Regulation on nuclear safety at nuclear facilities (RSN), as well as with CSN Instruction IS-26, which requires the incorporation of multiple barriers to prevent and mitigate the off-site release of radioactive material in excess of the authorised limits, during the design, construction, operation, dismantling, transport and management of the radioactive waste generated, and then developing the levels of defence to be maintained through the design and construction of adequate physical barriers and technological safeguards. Also noteworthy is the existence of regulatory provisions referring to plant design, including the standards issued by the CSN, among which the IS-36 instruction on emergency operating procedures and severe accident management and the IS-37 instruction on design basis accident analysis are particularly significant in this respect.

Particularly important from this perspective are sections 18.1.4, which details the measures applied in the design to prevent beyond design basis accidents and to mitigate the radiological consequences in the event of such accidents; and 18.1.5, which sets 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 part of the response actions following the Fukushima accident and of the programme for action in the event of accidents with losses of large areas of the plant (both programmes have been developed simultaneously and in a coordinated manner in Spain). The main design mod-

ifications carried out and in progress at each plant with the aim of improving plant safety are detailed.

Often, the design improvements 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 the Spanish nuclear power plants. It also lists the most important modifications implemented in this area at Spanish nuclear power plants in the period 2022-2024.

A key aspect in the implementation of design modifications, and especially those with a high impact on safety, such as those related to 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 the modifications, and in the subsequent operation of the plant. The consideration of these aspects at the Spanish nuclear power plants to guarantee reliable and safe operation is summarised in section 18.3.

Article 19. Operation

19.1. Authorisations

The RINR sets out the requirements for the initial authorisation of nuclear power plants. These requirements are defined, for each nuclear power plant, in the suite of documents that must accompany the application for the preliminary, construction, and operating authorisations (OA).

The site (or prior) authorisation constitutes formal recognition of the licensee's proposed objective and the suitability of the selected site. It grants the licensee the right to apply for a construction authorisation and to commence the preliminary infrastructure works, subject to authorisation.

The construction authorisation permits the licensee to begin construction of the facility and to subsequently request authorisation for facility operation.

The OA enables the licensee to load nuclear fuel or admit nuclear substances into the facility, to conduct the nuclear testing programme, and to operate the installation in accordance with the conditions set out in the authorisation. This authorisation is provisional pending the satisfactory completion of nuclear testing. Thereafter, it is granted for a defined period, typically ten years, with provision for renewal in accordance with Article 7 of the RINR.

The granting of the above authorisations is the responsibility of MITECO, following a mandatory report from the CSN. This report is binding where unfavourable, as are any conditions attached to a favourable report.

No initial authorisations for nuclear power plants have been granted in Spain since the 1980s.

19.2. Operating limits and conditions

19.2.1. Regulatory provisions and requirements for defining the safe boundaries of operation and establishing operational limits and conditions

Article 24 of the RINR sets out the required content of the documentation to be submitted as part of each plant's application for an operating authorisation (OA). A standardised model of the operating authorisation is provided in Annex 19A.

This submission must include, among other items, the following documents, which constitute the plant's Official Operating Documents (OODs):

a) Safety Analysis Report (SAR).
b) Operating Regulations (OR).
c) Operating Technical Specifications (OTSs).
d) On-Site Emergency Plan (OSEP)
e) Quality Guarantees Manual (QGM)
f) Radiological Protection Manual (RPM)
g) Radioactive Waste and Spent Fuel Management Plan (PGRRCG).

CSN Instruction IS-32 on the Operating Technical Specifications (OTS) for nuclear power plants sets out the applicable requirements for the preparation and maintenance of this document.

The requirements and conditions set out in the Operating Authorisation (OA) and the Official Operating Documents (OODs) together define the envelope configuration of the plant, adherence to which ensures its safe operation.

19.2.2. Application of operational limits and conditions, associated documentation, training, and accessibility for personnel with safety responsibilities

The Technical Operating Specifications (OTS) set out the safety-related variable limits, automatic protection system operating thresholds, minimum functional requirements, and programmes for the review, calibration, and periodic inspection of structures, systems and components (SSCs). Together, these requirements form the set of technical criteria that define the safe operational boundaries of Spanish nuclear power plants.

For each facility, the OTS represent a site-specific adaptation of the reference standards from the technology's country of origin, underpinned by the assumptions used in the plant's accident analysis.

The OTS follow a clearly defined structure, typically comprising the following sections:

- Definitions.
- Safety limits and set points for safety systems, including their technical justifications
- Limiting Conditions for Operation (LCOs) including required actions in case of non-compliance with LCOs and monitoring requirements (MR).
- Design characteristics
- Administrative controls
- Basis for LCOs and MRs.

The LCOs incorporate OTSs, which support the planning of monitoring requirements. These OTSs include monitoring procedures (MPs) that specify the frequency, execution methods, and acceptance criteria applicable to each requirement.

The OTSs are a core element of the training and qualification programmes for personnel undertaking safety-related functions, particularly those operating within the control room. Familiarity with, and proficiency in, applying the OTS form part of the competency assessment conducted by the CSN as part of the licensing process for control room operators.

Within the LCOs, the OTSs define operability requirements for SSCs and establish corresponding actions and timeframes in the event of SSC non-operability.

When SSC operability is uncertain, the component is deemed to be in an "Anomalous Condition" (AC), a generic classification that includes both "Degraded Conditions", where SSC qualification or functionality is reduced, and "Non-Compliant Conditions", where an SSC does not meet a Licensing Basis requirement. In such cases, the licensee must carry out an "Operability Determination" using approved procedures to assess whether the SSC remains operable under the AC or must be classified as inoperable. Pending resolution of the AC, the licensee is required to implement compensatory measures to ensure the continued maintenance of the required level of nuclear safety and security. All associated actions and decisions must be fully documented to support traceability and oversight.

The procedures followed by nuclear power plants in addressing ACs have been implemented in accordance with the sector-specific guide CEN-22, which has been endorsed by the CSN. Revision 1 of this guide, published in February 2016, introduced the concept of reduced reliability. Each site develops a plant-specific implementation guide based on the adaptation of the CEN-22 framework to its own operating context.

The Power Plants continue to apply OTSs in accordance with the required standards. In parallel, licensees have been transitioning to Enhanced Technical Specifications (ETS), which are structured to support improved usability by operational personnel during shift work, enhancing clarity and reducing the potential for application errors.

With regard to anomalous conditions, power plants have progressively consolidated the implementation of the applicable process, broadening its application in line with operational experience and the outcomes of associated analyses and follow-up actions. In 2024, the CSN convened a dedicated workshop aimed at communicating regulatory expectations to licensees concerning the management of anomalous conditions as set out in Instruction IS-21. This initiative followed internal training conducted by the CSN to enhance regulatory oversight of this process.

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

Given the critical importance of the OTSS for the safe operation of Spanish nuclear power plants, any amendments thereto require formal authorisation. A technical assessment accompanied by a favourable report from the CSN is mandatory prior to implementation.

The routine OTS review process may be initiated under the following circumstances:

- At the request of the CSN, which may directly require Spanish nuclear power plants to undertake a review;
- At the licensee's initiative, in order to align the OTS with operational experience, evolving regulations, or other relevant developments.

Proposed modifications are initially reviewed by the Plant Nuclear Safety Committee (PNSC), the licensee's highest internal advisory body on matters of nuclear safety and radiation protection. Following a favourable assessment by the PNSC, the proposal is then examined by the Operator's Nuclear Safety Committee (CSNE), which serves as the senior advisory body to the plant's Directorate General for nuclear safety. Subsequent to the re-

ceipt of the CSN's mandatory report, formal approval of OTS revisions is granted by the Ministry for the Ecological Transition and the Demographic Challenge (MITECO).

Both the PNSC and CSNE are maintained at the nuclear power plants, fulfilling their advisory roles on nuclear safety and radiation protection. These bodies play a pivotal role in the review and processing of potential OTS modifications, particularly within the scope of the routine review process.

The role of the PNSC in the plants' day-to-day operations has been further strengthened with the aim of enhancing its advisory capacity to the licensee on nuclear safety and radiation protection matters.

19.2.4. Regulatory review and control activities

The CSN exercises regulatory oversight to verify the licensee's compliance with the LCOs established in the OTSs, as well as with the broader requirements set out in the OODs.

At nuclear power plants, this oversight is conducted on a routine basis and forms a core part of the daily activities of the CSN's resident inspection programme. Compliance with the surveillance requirements specified in the OTSs is further verified through scheduled inspections, which are carried out on a biennial basis and integrated within the SISC.

As previously noted, any proposed modification to the OTS must be formally notified to MITECO by the CSN, in accordance with mandatory procedural requirements.

19.3. Procedures for operation, maintenance, inspection and testing

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

At Spanish nuclear facilities, activities related to operation, maintenance, inspection, and testing must be conducted in accordance with approved procedures, with the objective of minimising the potential for human error during their execution. This approach reflects the principle of defence-in-depth, as reinforced in Article 16 of the RSN, which further establishes in Article 28 the requirement that licensees maintain a comprehensive set of procedures and guides. These documents must be consistent with the facility's design, appropriately validated and updated, and incorporated into the training programmes for personnel involved in their implementation. These requirements apply across all operating modes of the facility and are further detailed in CSN Instruction IS-26, which sets out the basic nuclear safety requirements, and in CSN Instruction IS-36, which addresses the development and application of emergency and severe accident management procedures, including the EOPs, SAMGs, EDMG) and Emergency Shutdown Action Guides (ESAG).

CSN Instruction IS-19, which defines the requirements for licensees' management systems, specifies that all activities associated with regulated processes must be carried out in a controlled manner, using procedures or equivalent instruments, and must be subject to periodic review to confirm their continued suitability and effectiveness.

In addition, CSN Instruction IS-32, relating to OTSs, requires that surveillance tests for SSCs within the OTS scope be performed using written procedures that clearly define the acceptance criteria for determining operability. Similarly, CSN Instruction IS-23 on In-Service Inspection stipulates that functional testing of pumps and valves must be executed in accordance with written procedures specifying the test methodology, applicable reference values and limits, and associated acceptance criteria.

CSN Instruction IS-36 also mandates that all procedures be subjected to a formal verification and validation process, and that personnel authorised to use them receive periodic instruction and training.

During the 2022–2024 period, nuclear facilities have consolidated the processes required to ensure compliance with the aforementioned CSN Instructions. In the area of emergency response, particular emphasis has been placed on the use of full-scope simulators for procedural training and validation, as well as on field verification of instructions, including the identification of resources and support systems essential to ensuring procedural success.

Within the same timeframe, management processes and associated performance indicators have been reviewed and refined to improve operational efficiency and strengthen their implementation across the operations of the nuclear power plants.

19.3.2. Establishment of operational procedures: implementation, periodic review, modification, approval, and documentation

Operational procedures encompass the activities necessary for the installation and its associated SSCs to fulfil the safety objective established in Article 6 of the RSN, under all operating modes. These procedures address aspects such as the flow of information and the assignment of responsibilities among the organisational units involved.

Plant management systems include administrative procedures that define the processes for reviewing and updating operational procedures.

These processes must comply with the requirements set out in CSN Instruction IS-21 on design modifications, which also applies to procedural changes.

The operational procedures of nuclear power plants are grouped into the following categories:

- General Operating Procedures: applicable to SSC manoeuvres for plant operation under different normal operating modes, including transitions between modes.
- Auxiliary or Systems Operating Procedures: applicable to the start-up of systems or equipment supporting the execution of general procedures.
- Alarm Operation Procedures: establish actions to be taken in response to alarms triggered in the Control Room or in local panels replicating the Control Room layout.
- Abnormal or Failure Operating Procedures: provide guidance for SSC transients or malfunctions not classified within the accident category.
- EOP: instructions for managing incidents or accidents, including design-basis accidents.
- SAMG: contain strategies aimed at mitigating the consequences of severe accidents.
- EDMG: contain procedures and strategies for responding to the loss of large areas of the plant.

These procedures may be developed from generic references, such as guidance from technology suppliers, owners' groups, or internationally recognised standards. The periodicity of their review is determined by their safety significance and is informed by internal and external operational experience. When changes to procedures may impact nuclear safety, full-scope simulators are used for validation and training purposes. Such changes are subject to review by the PNSC.

During the 2022–2024 period, plant procedures have been reviewed and updated based on:

- Results derived from internal operational experience
- Operational experience from other nuclear power plants
- Findings from independent audits and oversight activities
- Improvements identified in relation to human factors and their incorporation into procedures
- Needs reported by the personnel responsible for implementation and oversight
- Validation and training conducted using simulators for revised procedures and action guidelines
- Implementation of recommendations issued by external organisations such as WANO and INPO
- Analysis of technical bulletins and recommendations received from technology providers and subject matter experts

19.3.3. Availability of procedures for relevant nuclear installation personnel

The Spanish nuclear power plants maintain a document management system for the filing and distribution of official documents, including operational procedures. The systems ensuring the availability of procedures to the personnel required to use them fall within the scope of regulatory oversight by the CSN and are subject to inspection as defined in the established inspection programmes.

Given the significance of operating procedures and the associated operating environment, this constitutes a defined area of knowledge within the training programmes for the licensing of operating personnel at Spanish nuclear power plants.

During the 2022–2024 period, improvements have been introduced in the training processes and requirements associated with the knowledge of operating procedures and their application context. Internal and external operational experience has become a key mechanism for identifying and updating training needs, as operational performance indicators have improved and the number of reportable events has decreased at the nuclear facilities.

The generational renewal underway in Control Room staffing has led to enhancements in the scope and scheduling of training activities, both within the regulatory framework for the issuance of new operator and supervisor licences, and in the processes related to licence renewal. These efforts have been driven jointly by the regulatory authority and the licensees. As a result, the quality and accessibility of procedures have been strengthened, reinforcing their role as a vehicle for consolidating and applying the requisite knowledge in day-to-day plant operation.

19.3.4. Involvement of relevant nuclear facility personnel in the development of procedures

At Spanish nuclear facilities, operational procedures are prepared by plant personnel, with initial drafting carried out by specialists in the relevant SSC or technical area. These drafts are then reviewed by the corresponding line managers and subsequently approved by the highest level of plant management. Furthermore, any procedure with implications for nuclear safety or radiation protection must undergo review by the PNSC prior to final approval.

Any proposed changes to procedures are subject to the process of preliminary review, safety evaluation, and safety analysis, as established in CSN Instruction IS-21. These tasks are likewise carried out by facility personnel.

During the reporting period, the level of staff engagement in the preparation and review of procedures has increased, driven by the broader scope of procedural development, enhanced sharing of operational experience, and the active encouragement of personnel to identify and propose potential improvements for implementation.

19.3.5. Incorporation of operating procedures into the management system of nuclear installations

Plant management systems include administrative procedures that define the processes for reviewing and updating operational procedures. These processes must comply with the requirements set out in CSN Instruction IS-21 on design modifications, which also applies to procedural changes. In addition, the management systems adhere to the requirements established in CSN Instruction IS-19, aimed at ensuring the safe, reliable, and efficient management of all activities. This includes specific guidelines for the control, preparation, review, and approval of plant procedures.

During the 2022–2024 period, operational procedures have been reviewed and updated in accordance with the established processes, in line with the technological modifications and improvements implemented at the Spanish nuclear facilities. The recent renewals of operating licences granted in this period have entailed the implementation of new requirements, modifications, and improvements. These have necessitated the corresponding updating of existing procedures, as well as the development and incorporation of new procedures.

These renewals are based on the verification of proper plant operation and the maintenance of a level of safety that supports continued operation. They also assess the capacity of the plant to meet current regulatory requirements, which are more stringent than those applicable under the original design basis. Proposals for safety enhancements submitted by the plants in the framework of the Periodic Safety Review (PSR) process have also been taken into account. Furthermore, the renewals have considered the verification of the licensee's compliance with the conditions of the previous operating licence. Approval of the licence renewals is supported by the results of the safety assessment, which is documented in a set of detailed technical evaluation reports. In parallel, the process has included a review of the findings from CSN inspections conducted throughout the period of validity of the authorisation being renewed.

19.3.6. Regulatory review and control activities

In accordance with Article 24 of the RINR, applications for the OA of each nuclear installation must be accompanied, among other documentation, by a Quality Assurance Manual and an OR. These documents define, respectively, the scope and content of quality programmes and set out the organisation and functions of facility personnel, including education and training programmes, as well as standards for operation under both normal and accident conditions.

These documents, along with others forming part of the facility's configuration baseline, are subject to regulatory oversight through CSN inspection plans. These include both periodic and systematic inspections carried out under the BIP, as well as other inspections, including those conducted by the CSN resident inspectors. During these inspections, the CSN verifies the licensee's adherence to approved procedures. Any deviation from written procedures is classified as an inspection finding, to be evaluated in accordance with the procedures established under the SISC.

Among the BIP activities of particular relevance to the verification of operator compliance with procedures are the HOF inspections, which focus on staff training and human and organisational factors, as well as inspections addressing the implementation and application of the CAP and compliance with CSN Instruction IS-19. In all cases, the various inspection programmes encompass the full range of activities deemed significant within the regulatory authority's remit for supervision and control.

19.4. Procedures for responding to operational occurrences and accident

The Spanish nuclear power plants maintain a comprehensive set of written procedures that cover all defined modes of operation, including those applicable to operational incidents and accident conditions. Specifically, the current EOPs were implemented at the US-designed plants in the late 1980s, followed by the implementation of SAMG in the late 1990s, in alignment with the schedule adopted in the United States. For CN Trillo, which is based on German design, the procedure development and implementation have followed the corresponding national programmes and timeframes.

The suite of procedures addressing operational incidents has been further expanded in recent years as part of the post-Fukushima enhancement initiatives. These include the incorporation of SAMG and EDMG, with specific improvements aimed at optimising accident management at multi-unit sites and extending coverage to include scenarios originating during shutdown conditions or in the spent fuel pool. Additionally, new procedures have been developed, and existing ones adapted, to support the implementation of new SSCs, such as passive reactor coolant pump seals, the SVFC, and PARs.

Further procedural updates have been undertaken as a result of advances in Safe Shutdown analyses, fire protection studies, PSA for non-power operational modes including Loss of Coolant Accidents (LOCA) during shutdown states, and postulated events in individualised storage facilities (ISFs) etc.

All of the aforementioned procedures and guidelines form part of the plants' continuous improvement frameworks and have therefore been reviewed and updated accordingly to incorporate operating experience, external benchmarking, and applicable recommendations.

19.4.1. Regulatory provisions and requirements on response procedures to planned operational incidents and accidents

As previously indicated, CSN Instructions IS-36 and IS-26 establish the regulatory requirements for the development and maintenance of accident management procedures and associated guidance.

The abnormal operating procedures and emergency operating procedures were developed on the basis of generic references produced by the BWR and PWR owners' groups, incorporating applicable lessons learned from operational experience, including those derived from the Fukushima accident. Adaptation of these generic procedures to the specific context of each plant was carried out in accordance with established procedure writing guidelines and through the conduct of specific implementation studies. This activity is subject to the internal verification and validation process described above.

In accordance with Royal Decree 1308/2011, of 26 September, on the physical protection of nuclear facilities and materials and radioactive sources (as amended by Royal Decree 1086/2015, of 4 December), the deployment of the Civil Guard Response Unit at all operating Spanish nuclear power plants was completed in 2019. As a result, the Site Emergency Plans of these facilities, along with the corresponding implementing procedures, were updated to incorporate the considerations and instructions arising from this deployment.

Furthermore, CSN Instruction IS-44, of 26 February 2020, on emergency planning, preparedness and response requirements for nuclear facilities, published in Official State Gazette (BOE, according to its initials in Spanish) No. 63 of 12 March 2020, sets out "the applicable requirements related to nuclear and radiological emergency preparedness and response at the site level for Spanish nuclear installations. *This instruction is applicable to all nuclear facilities throughout all phases of their lifecycle."*

Following a process of internal review and analysis, all Spanish nuclear power plants incorporated the requirements of this Instruction into their Site Emergency Plans and the associated procedural documentation.

In addition, and in accordance with Royal Decree 1029/2022, of 20 December, which approved the Regulation on health protection against risks arising from exposure to ionising radiation, the Spanish nuclear power plants have updated their Site Emergency Plans and corresponding procedures to reflect the references, considerations and requirements established in the Regulation.

19.4.2. Establishment of operating procedures for event- and/or symptom-based emergencies

The initial event-based structure of EOPs implemented in nuclear power plants was revised following the 1979 Three Mile Island accident, which prompted a transition to a symptom-based approach. This approach focuses on the evolution of key plant parameters to trigger appropriate mitigating actions, irrespective of event diagnosis. In the aftermath of the accident, the owners' groups for Westinghouse technology plants - PWROG and BWROG - were established. These groups developed the Emergency Response Guidelines (ERGs),

which were subsequently adopted as the basis for the EOPs at Spanish nuclear power plants employing this technology.

For plants using Westinghouse PWR technology, EOPs are categorised into optimal recovery procedures, used in scenarios where event diagnosis is possible, and functional recovery procedures, used when diagnosis is not possible. The latter are structured to prioritise the maintenance and recovery of safety-critical functions via a functional tree approach. In the case of BWR plants, the EOPs are presented in the form of symptom-based flowcharts.

All generic changes to EOPs identified by the relevant owners' groups as a result of the Fukushima accident were incorporated into the Spanish nuclear power plants, following approval of the corresponding updates to the reference guidelines. Furthermore, all procedure changes associated with the implementation of new systems, such as CAGE, PAR, and SVFC, were completed during the 2016–2018 period.

All of the aforementioned procedures and guidelines form part of the plants' continuous improvement frameworks and have therefore been reviewed and updated accordingly to incorporate operating experience, external benchmarking, and applicable recommendations.

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

Severe accidents are defined as accident conditions that go beyond the design basis and involve significant core degradation. Accordingly, the actions defined in the EOPs are primarily aimed at preventing such scenarios. Conversely, the SAMG are designed to support the mitigation of severe accidents. These guidelines define strategies to maintain containment integrity, terminate core damage progression, and minimise the release of radioactive material. The development and implementation of the SAMG followed a process similar to that applied for EOPs. Likewise, the EDMG and EDEM were developed to enhance the plant's capacity to respond to widespread damage scenarios, as identified in the aftermath of the Fukushima accident.

The scope of the EOP and SAMG development programmes includes defining the transition criteria between EOPs and SAMG, as well as revising the IEP and other supporting emergency management documentation. These documents are part of the facility's configuration management and have been subject to updates stemming from the deployment of post-Fukushima systems and the improvements identified through PSRs and other ongoing processes.

These procedures and guidelines form an integral part of the Spanish nuclear fleet's continuous improvement framework and, as such, are regularly reviewed and updated to incorporate applicable recommendations, operational experience, and relevant external insights.

19.4.4. Establishment of procedures and guidance for managing accident situations at multi-unit and/or multi-site nuclear facilities

Following the Fukushima accident in 2011 and within the framework of the Stress Test process, the CSN issued a series of CTIs requiring licensees to analyse beyond-design-ba-

sis events, including external hazards such as earthquakes and flooding. These analyses considered prolonged loss of electrical power and/or ultimate heat sink, with the objective of enhancing the facilities' capabilities to manage such extreme scenarios.

In parallel, nuclear power plant owner groups implemented several enhancements to the EOPs and SAMG, among which the incorporation of new portable and autonomous equipment, deployed as part of the EDMG, was particularly significant. These were prepared in accordance with IEN 06-12 (B.5.b Phases 2 & 3 Submittal Guideline, Revision 2, December 2006) to implement strategies such as injection of water into the reactor vessel and spraying or filling the spent fuel pool.

Other modifications to the EOPs and SAMG were aimed at integrating systems such as PARs and SVFC, reinforcing hydrogen control strategies and containment pressure management under prolonged station blackout conditions. These upgrades complemented other strategies, such as external spraying of the containment or other buildings.

Modifications associated with the implementation of a CAGE and the establishment of a national CAE at each site were also included. These were intended to ensure the availability and transfer of personnel and equipment to the affected site within 24 hours. The analyses undertaken also led to the identification of additional measures to improve emergency management, including the establishment of agreements with external support organisations to enhance nuclear safety. Of particular note is the collaboration protocol signed between the Spanish Nuclear Industry Forum (Foro Nuclear) and the UME to provide support in extreme emergencies.

At multi-unit sites, licensees conducted evaluations that considered the potential for simultaneous involvement of multiple units. Accordingly, site-specific EOPs, SAMG, EDMG, and EDEM were developed, integrated into training programmes, and validated using full-scope replica simulators. The emergency response organisation of these facilities was reinforced and the necessary means of support (portable equipment, CAE, safe area, etc.) were identified. It should also be noted that the safety assessments conducted as part of the PSR process enabled the identification of further improvements in this area.

All of the aforementioned procedures and guidelines form part of the plants' continuous improvement frameworks and have therefore been reviewed and updated accordingly to incorporate operating experience, external benchmarking, and applicable recommendations.

All such actions are in alignment with the principles outlined in paragraph 2 of the Vienna Declaration.

19.4.5. Regulatory review and control activities

The inspection plan established in the CSN Annual Work Plan (AWP) includes periodic inspections conducted under the BIP, which enable verification of various aspects related to the implementation of EOPs and SAMG within the facility configuration. These inspections are carried out in the context of annual emergency drills or exercises addressing protection against flooding and extreme weather events, and are complemented by inspections specifically targeting the equipment implemented following the Fukushima accident. The AWP also provides for other types of generic inspections focused directly on the implementation, updating and training in EOPs and SAMG.

19.5. Engineering and Technical Support

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

As previously mentioned, Article 5 of the RSN, Article 12 of the Regulation on RINR, CSN Instruction IS-19, and other applicable standards concerning configuration management and control systems, establish requirements obligating licensees to identify and oversee the participation of external organisations, while maintaining full responsibility for the associated processes.

The engineering firms and equipment suppliers involved in the original construction and commissioning of the Spanish nuclear power plants have remained actively integrated within the operating organisations. They continue to support design maintenance and ongoing upgrades aimed at facility improvement, including enhancements implemented following the Fukushima accident, as well as national and international R&D projects focused on addressing operational experience and ageing management challenges.

The broader technical support capability, both in engineering and in the provision of goods and services related to nuclear safety, comprises contributions from national electricity utilities, the nuclear fuel manufacturer Enusa, and the national radioactive waste management company Enresa. These entities, in coordination with other governmental organisations, are involved in a wide range of site and perimeter activities, including effluent monitoring and control, development and implementation of emergency response plans, and decommissioning operations at facilities such as Vandellós I, José Cabrera, and, more recently, the CNSMG nuclear power plant.

The findings from studies led by the CEIDEN Technology Platform, Spanish Capacities to Support a New Nuclear Project and Supply Chain for the Construction of a Nuclear Facility, remain valid and confirm that the Spanish industry continues to possess the necessary technical capabilities to provide comprehensive support in all areas related to nuclear plant construction and long-term operation.

Between 2022 and 2024, alongside the implementation or completion of modifications stemming from operating licence renewal processes, modernisation projects have been executed, primarily to address equipment obsolescence and drive progress in digitisation, applying state-of-the-art technologies currently available on the market. Additionally, under a collaborative R&D&I agreement established between the Spanish Nuclear Industry Group (CEN) of the Foro Nuclear, the nuclear power plants, and a consortium of national companies and institutions, a network of specialised engineering firms with proven expertise in various areas of the nuclear sector has been consolidated. This initiative helps ensure the sustained availability of technical support necessary to maintain the nuclear fleet under conditions of high safety, reliability, and competitiveness. Among the key functions of these engineering firms is the evaluation of technical documentation issued by the EPRI, assessing its specific applicability to the Spanish nuclear context.

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 the nuclear facilities

The technical support capability described in the previous section is structured around a shared organisational model across the nuclear fleet, incorporating both centralised emergency response resources and a corporate-level organisation that ensures independent oversight of plant operations, in addition to the site-specific resources deployed at each facility. The structure and responsibilities of these resources are defined in the Operating Regulation (OR), which constitutes the Official Operating Document (OOD) for each facility. The OOD is developed and supported by a hierarchy of documentation, including the Organisation and Operation Manuals and associated lower-tier procedures.

Among the strategic priorities linked to shared resources and asset management are investment planning and R&D activities, nuclear fuel and radioactive waste management, framework agreements with the plant's SSC, and the provision of emergency response equipment and infrastructure. However, the support of the competent areas of the plant is essential for a unified management to optimise safety objectives.

The procedures for allocating centralised resources to individual plants are aligned with the monitoring and execution of strategic plans and their associated directives, as defined by the governing bodies of the company responsible for plant operation.

19.5.3. General situation regarding reliance on consultants or contractors to provide technical support to nuclear installations

The availability of contractors equipped with qualified technical personnel and appropriate resources is essential to ensuring the safe and efficient operation of nuclear installations. As referenced in section 19.5.1, the report developed by the CEIDEN Technology Platform confirms that the Spanish industry possesses adequate capability to provide the technical support required across all areas related to the construction and long-term operation of nuclear power plants.

The organisational reliance on contractor support is structured across three levels:

- At the first, technological level, critical suppliers include those responsible for the nuclear island, turbine-generator sets, diesel generators, main transformers, and associated design engineering, particularly with respect to core design and fuel supply. The high level of dependence in this area necessitates the establishment of long-term agreements maintained throughout the operational life of the plant.
- At the second level are contractors from specialised service companies engaged in activities such as training, inspection, diagnostics, maintenance, quality control, essential repairs, and equipment supply. Their in-depth knowledge of the installation and qualifications for radiological work justify the need for a sustained medium-term relationship with the facility.
- The third level of contracting comprises companies providing services with lower qualification requirements, including cleaning, scaffolding, area surveillance, and similar support tasks. While there is no technical dependency on these contractors, engagement with them is typically influenced by social, historical, or geographical factors.

19.5.4. Regulatory review and control activities

The CSN has established a range of mechanisms for the oversight and supervision of licensee processes related to organisational resources, supply chains, engineering services, and technical support. As previously noted, the regulatory framework defines oversight mechanisms applicable to the licensees' organisational structure, requiring that these be clearly documented in the facility's Operating Regulation. This includes the management of interactions with external organisations within the scope of this process. The Operating Regulation is subject to the change control process outlined in IS-21 and the Operating Permit itself. Under this system, any modification to the Operating Regulation must be approved by MITECO, following a favourable report by the CSN.

Organisational and quality-related aspects fall within the scope of the CSN's supervision and regulatory oversight, as described above.

Systematic inspections conducted under the BIP include: inspections of modifications at nuclear power plants, covering changes to the OODs and any physical or documentary modifications which, in accordance with the specific analysis required under IS-21, may necessitate authorisation from MITECO or a favourable assessment by the CSN, processes in which the plant's technical support resources may have been involved; quality assurance inspections focused on the CAP; and routine inspections by the resident inspector, addressing various aspects of plant operations and reported on a quarterly basis. Additionally, an annual inspection of the contractors involved in refuelling activities is scheduled, along with any other inspections deemed necessary.

Each year, licensees are required to submit to the CSN a report detailing any organisational changes or initiatives aimed at optimising human resources. This information is used by the CSN to inform the planning of inspections in this area.

19.6. Reporting incidents significant to safety

19.6.1. Regulatory provisions and requirements regarding the reporting of safety significant incidents to the regulator

CSN Instruction IS-10 sets out the criteria governing the reporting of events occurring at nuclear power plants, based on their relevance to nuclear safety or radiation protection. Such events are notified to the CSN Emergency Response Centre (Salem) through the submission of a Reportable Event Report (RER). In accordance with internal CSN procedures, these reports are also disseminated to the remaining Spanish nuclear power plants and communicated to the public via official press releases and publication on the CSN website.

19.6.2. Criteria and reporting procedures established for safety significant incidents and other occurrences such as near misses and accidents

IS-10 typifies the reportable events at the Spanish nuclear power plants, the deadlines and the means and formats for their notification and the criteria for submitting additional information and reviewing the reports issued.

IS-10 is currently in its second revision, dated September 2023, which entered into force in February 2024. The main features of the event reporting framework within the Spanish regulatory system are summarised as follows:

- A total of 35 reportable events are grouped into eight categories: A. Records; B. Occupational Health and Safety; C. Spills and Releases of Radioactive Materials or Substances; D. Operating Technical Specifications (OTSs); E. Operation; F. Safety Systems; G. Other Risk Situations; and H. External Events. E. Operation, F. Safety systems, G. Other risk situations and H. External events.
- Notification timeframes are set at either 4 or 24 hours, depending on the safety significance of the event.
- Initial notification is made using the RER format and is followed, within 30 days, by a comprehensive report including, among other elements, a chronological account of the event, cause identification, root cause analysis, corrective actions taken, and the licensee's conclusions.

Spanish nuclear power plants have developed internal procedures for event notification that are fully aligned with IS-10, and incorporate validated reference material to support correct application and interpretation of the reporting criteria. Additionally, licensees have implemented procedures for conducting root cause analyses in accordance with internationally accepted methodologies. These methodologies incorporate the evaluation of direct and root causes, as well as the extension of analysis to assess whether similar vulnerabilities, latent or active, may be present in other processes or SSCs of the facility.

The consistency of administrative procedures at Spanish nuclear facilities with the requirements of IS-10 is independently verified by the CSN through its inspection programmes, including BIP inspections covering the operating experience programmes of the plants.

19.6.3. Statistics of reported incidents of safety significance

All events reported to the CSN during the 2022–2024 period were classified at Level 0 on the IAEA International Nuclear and Radiological Event Scale (INES), with the exception of the four cases detailed below:

Ascó I NPP INES 1
16/06/23

Initiation of the shutdown sequence required by the OTS due to the unavailability of the automatic trip signals for overpower and overtemperature. The failure to carry out the calibration of the reactor protection system instrumentation rendered the reactor inoperable. The event was classified as Level 1 on the INES scale, based on the application of the defence-in-depth criterion, with no initiating event and no additional aggravating factors.

Trillo NPP INES 1
18/12/22

Inoperability of Redundancy 3 safeguards diesel generator due to water intrusion in the lubrication oil circuit. The event was classified as Level 1 on the INES scale, based on the

application of the defence-in-depth criterion, with no initiating event and no additional aggravating factors.

Trillo NPP INES 1.
05/04/22

Storage of crankcase make-up oil for safeguards diesel generators in a location not qualified to meet seismic requirements. The event was classified as Level 1 on the INES scale, based on the application of the defence-in-depth criterion, with no initiating event and no additional aggravating factors.

Vandellós II NPP. INES 1.
07/10/22

Non-compliance with Performance Specifications due to inoperability of the reactor coolant loop 3 flow transmitter, resulting from a signal deviation that exceeded the established acceptance criteria. The event was classified as Level 1 on the INES scale, based on the application of the defence-in-depth criterion, with no initiating event and no additional aggravating factors.

19.6.4. Documentation and dissemination by licensees and the regulatory body of reported events and incidents

The RERs issued by the Spanish nuclear power plants, in accordance with the provisions of IS-10, are submitted to the CSN Emergency Response Centre (Salem), from where they are disseminated broadly, both internally and externally, in line with the applicable procedures, as previously outlined in earlier national reports under the Convention.

19.6.5. Policy on the Use of the INES Scale

The CSN has established a procedure for the classification of events using the INES scale, referencing the INES User's Manual as the guiding document. The Head of the CSN's Operational Experience Area serves as the National INES Coordinator, with responsibilities that include notifying the IAEA INES Secretariat of any event rated above level 1.

For events at nuclear installations with a provisional classification above level 0, a verification process is initiated in coordination with the licensee to confirm the accuracy of the reported data. If the event is confirmed as level 1, the CSN Plenary, relevant authorities, and the public are notified simultaneously. In cases where the classification is level 2 or higher, the CSN's Secretariat General convenes the members of the Plenary to confirm the classification and, if appropriate, to formally communicate the event to the public.

19.6.6. Regulatory review and control activities

Reportable events are communicated to the CSN through the issuance of RERs, in accordance with the provisions of IS-10. In addition, the CSN's resident inspectors review these

RERs to assess their adequacy and may supplement them with additional information, which is submitted as part of a preliminary assessment circulated internally within the organisation.

The RERs are subsequently analysed during monthly meetings of the CSN's Incident Review Panel (IRP), which comprises representatives from various departments specialising in nuclear safety and radiation protection. These reviews include an assessment of the information provided, an evaluation of the corrective actions proposed, and a determination of whether further regulatory action is warranted. Each event is then categorised based on its safety relevance as significant, generic, of interest, or not relevant. Events classified as significant are subject to ongoing monitoring by the relevant technical divisions and are also reviewed as part of the biennial operational experience inspections under the BIP.

Among the CSN's most significant regulatory actions are those concerning events deemed generic, due to their potential implications for other plants. In such cases, the CSN may request that licensees conduct an applicability analysis, the outcomes of which are subject to regulatory oversight and may lead to the establishment of corresponding follow-up actions.

19.7. Exchange of information on operational experience

19.7.1. Regulatory provisions and requirements for licensees to collect, analyse and exchange operational experience

The CSN takes a dual approach to analysing operating experience: by overseeing the licensees' internal processes for event analysis and by independently reviewing and monitoring RERs issued by both domestic and international nuclear facilities. This is carried out in accordance with CSN Instruction IS-26, which sets out the requirements for managing both internal and external operating experience. (A new CSN Instruction specifically addressing operational experience is currently under development.) In parallel, the OA includes a general condition on the treatment of operational experience, which is further detailed through a CTI defining the contents of the annual report on internal and industry-wide operating experience that licensees are required to submit to the CSN.

The CSN supports its review and oversight functions with various tools, including the national and international Incident Review Panels (IRP and PRIN, respectively), the use of international databases, and active participation in forums dedicated to the exchange of operating experience. These activities are aimed at identifying events with potential relevance to Spanish nuclear facilities and assessing the applicability of preventive measures to avoid recurrence.

19.7.2. Licensees' programmes for the exchange of operational experience from their own installations, other national facilities and international sources

As previously noted, the CSN requires each nuclear power plant, through a CTI associated with the OA, to submit an annual report on operating experience. This report must cover the following areas of experience, as detailed below:

- RER of Spanish nuclear power plants.

- Reports issued under the Site Emergency Plan, specifically those related to emergency activations at Spanish nuclear power plants.
- Experienced communicated by the competent bodies in the area:
  a) For plants with Westinghouse and General Electric designs: significant events (INPO Event Reports, IER Levels 1 and 2) as reported on the WANO platform.
  b) For German-design plants: operating experience reports (*Weiterleitungsnachricht*) issued by the German Technical Support Organisation (GRS).
- Supplier recommendations documented in technical bulletins (SAL, SR, RICS-IL, *Technical Bulletins*, etc.), notifications of safety equipment deficiencies, as well as U.S. NRC notices under 10 CFR 21 and KWU service and operational experience reports.
- Operating experience analyses specifically required by the CSN.

All information related to these analyses is consolidated in the annual report required by the CTI associated with the OA, which is used by the CSN to support inspection planning and other follow-up activities.

Furthermore, the external operating experience programmes of the Spanish nuclear power plants include the review of any additional documents deemed of specific relevance to each facility.

Information sharing is also facilitated through the CEN Operating Experience Group of the Foro Nuclear, which enables coordination and resource sharing among plants for the analysis of events.

In parallel, Spanish nuclear power plants participate in the global network for the exchange of operational experience within the nuclear sector, WANO, through which significant events are reported, allowing the broader industry to draw lessons learned and apply them across nuclear facilities worldwide.

19.7.3 Procedures for analysing national and international events

For many years, Spanish nuclear power plants have maintained established processes for the analysis of national and international events, with the objective of integrating lessons learned into the operational practices of each facility. These processes have undergone repeated evaluation by leading industry organisations such as WANO, INPO, and the IAEA, each concluding that they fully comply with established industry requirements and standards. All the plants have relevant bodies that can be assimilated to committees for reviewing the results of the analysis of the most significant events.

Operational experience is analysed using internationally recognised methodologies (such as HPES, MORT, etc.), selected according to the nature of the event, its causes, and contributing factors. In addition, methods jointly agreed upon by the Spanish nuclear power plants are employed, including common cause analyses developed within the CEN Operating Experience Group of the Foro Nuclear.

19.7.4. Procedures for drawing conclusions and implementing necessary modifications to the facility, staff training programmes, and simulators

All plants maintain procedures or methodological guides for analysing operating experience, including criteria for conducting root cause analysis, with HPES being the preferred methodology. Beyond the individual assessment of each incident, trend analyses are performed to identify latent weaknesses and opportunities for organisational improvement.

A key tool in managing operational experience is the Corrective Action Programme (CAP), which enables the categorisation of events and prioritisation of identified actions, often encompassing modifications to design, procedures, and training initiatives. This information is utilised by the plants' training units to prepare the annual training programme, facilitating the design of instructional and simulator training sessions aimed at optimising knowledge transfer from operational experience.

CSN Instructions IS-11, regarding nuclear power plant operating licences, and IS-12, concerning the qualification and training of non-licensed personnel both on-site and off-site, mandate that training programmes incorporate relevant in-house and external operating experience applicable to the plant.

19.7.5. Mechanisms for exchanging relevant experience with other operators

As noted in section 19.7.8, the CSN and the CEN of the Foro Nuclear, representing the Spanish nuclear power plants, actively participate in the NEA's Working Group on Operating Experience (WGOE). This expert group is of significant interest to regulators, focusing on knowledge that supports improvements in plant operational management, including the development of new inspection practices.

Within the framework of the CEN of the Foro Nuclear, the Spanish nuclear plants maintain a permanent Operating Experience Working Group composed of the operating experience coordinators from each plant. This group meets quarterly to share knowledge on events and the management of operating experience. During the period 2022–2024, notable activities include:

- Activation on demand of the Sectoral Incident Analysis Group (SIAG), an expert body governed by the CEN-29 guide, responsible for performing root cause analyses of incidents.
- Production by the Operational Experience Group of ICEO Reports, these are analogous to the industry's annual INPO/WANO IER and SOER publications, with reports issued in 2022 on "Common cause analysis of incidents relating to human factors at Spanish nuclear power plants" and in 2023 on "Good practices and recommendations on trend, repeatability and recurrence analysis."
- The exchange of international operating experience comprises:
- Regular submission of events to WANO for inclusion in the *WANO Event Report* (WER).
- Participation in international seminars.
- Deployment of experts to WANO Peer Reviews and IAEA OSART missions.
- Hosting of WANO and IAEA review missions at Spanish plants, including OSART, SALTO, and ISCA (Independent Safety Culture Assessment) missions.
- Meetings of the Operating Experience Group to make sectoral comments on the current CSN Instruction on Operating Experience.

19.7.6. Use of international databases on operational experience

The two primary international operational experience databases utilised by the CSN for analysis within the PRIN are:

- *Incident Reporting System* (IRS) under the IAEA Group and the NEA.
- *Nuclear Event Web-Based System* (NEWS), under the IAEA.

The CSN has designated a national coordinator for the IRS, responsible for preparing reports on events in Spain that may be of relevance to other countries. These reports undergo a formal review process, including internal CSN assessment and subsequent evaluation by the IAEA.

During the 2022–2024 period, the national coordinator has enabled access to the IRS database for personnel in the operational experience departments of the plants, who already have access to NEWS, thereby enhancing the operational experience activities and facilitating the exchange of information.

19.7.7. Regulatory review and control activities of the licensee's programmes and procedures

The CSN conducts biennial operating experience inspections as part of the BIP, covering the management of both in-house and industry operating experience, including international experience, at Spanish nuclear power plants. These inspections address organisational and resource elements, procedural compliance, and the processes for analysing and implementing findings.

Additionally, the annual operating experience reports submitted by each facility are subject to preliminary evaluation to identify a representative sample of events for more detailed analysis.

A new Operational Experience Safety Instruction has been drafted and is pending approval (expected December 2024). This Instruction sets out the general criteria to be fulfilled by the Operational Experience programmes of Spanish nuclear power plants under operating and decommissioning authorisations, provided fuel remains in the pool, and covers Operational Experience related to the design, construction, testing, operation, shutdown, and decommissioning phases of nuclear power plants.

19.7.8. Programmes of the regulatory body relating to the exchange of information on operational experience and use of existing mechanisms for exchanging relevant experience with international organisations and other regulatory bodies

The CSN utilises a range of tools for the analysis and dissemination of operating experience, including the monthly meetings of the IRP, the four-monthly meetings of the PRIN, the Generic Issues database, international databases, and participation in specialised working groups.

As noted above, the IRP is a working group composed of nuclear safety and radiation protection specialists who convene monthly to analyse relevant events at Spanish nuclear

facilities and within the fuel cycle. Events are classified according to their safety significance as significant, of interest, or not relevant, and identified as generic if they may affect other Spanish plants. In such cases, measures may be required from the operators concerned, and the event is entered into the internal database for follow-up.

The PRIN functions similarly to the IRP, made up of the same areas, which meet every four months to analyse the international operating experience and determine its applicability to the Spanish nuclear power plants and to propose specific actions in relation to such an event.

The CSN integrates the most safety-significant events at Spanish nuclear power plants into the IRS database. Additionally, CSN organisational unit heads participate in annual meetings of national coordinators and in the joint IAEA-NEA annual operational experience meeting focused on IRS-reported events. The INES coordinators convene biennially to discuss key developments in the NEWS database and to harmonise classification criteria.

Furthermore, the CSN is active in the NEA's biannual EGOE meetings, the successor to the WGOE after structural reforms within NEA groups. EGOE's objectives include incorporating operating experience lessons into regulation and facilitating information exchange on plant operation improvements. Like its predecessor, EGOE organises workshops every two to three years on topics of regulatory interest. For example, in 2022, the "Workshop on Inspection of the Operating Experience Programmes of Nuclear Power Plant Licensees" was held in Budapest.

Finally, it is important to note that the CSN participates in the Clearinghouse, a support network for EU regulatory bodies engaged in operational experience analysis.

19.8. Management of spent fuel and radioactive waste onsite

19.8.1. Regulatory requirements and provisions for on-site handling of spent fuel and radioactive waste of spent fuel and radioactive waste on site

In accordance with Article 24 of the RINR, all Spanish nuclear facilities are required to maintain a Radioactive Waste and Spent Fuel Management Plan (PGRRCG), whose preparation must comply with the criteria set forth in Safety Guide GS 9.3. Compliance with this guide is enforced through the CSN's Technical Instruction (TI).

The licensee is obligated to keep the waste inventory current and to minimise waste generation to the extent technically and economically feasible. Additionally, residual materials must be conditioned for their final disposal via an appropriate management route. The GRWP serves as the reference document for the safe and optimised management of radioactive waste generated during the operation, dismantling, and decommissioning phases of nuclear facilities. It covers management aspects of radioactive waste, including potentially declassifiable materials, special waste, and spent fuel. CSN Instruction IS-31 establishes the criteria for the radiological control of waste generated at nuclear facilities.

Moreover, CSN Instruction IS-29 defines the safety criteria applicable to the design, manufacturing, construction, and operational testing of spent fuel and high-level waste disposal facilities, while IS-20 sets the safety requirements for spent fuel cask design and specifies the contents of the Safety Analysis. Both instructions align with IAEA interna-

tional standards, those of the technology's countries of origin, and the WENRA reference levels for storage. In June 2021, the CSN issued an informative circular to all nuclear power plants outlining the regulatory position on spent fuel recovery capacity, particularly considering the potential elimination of spent fuel pools during plant dismantling.

Finally, the 2014 Royal Decree on the responsible and safe management of spent nuclear fuel and radioactive waste transposes Directive 2011/70/Euratom, establishing a Community framework for the responsible and safe management of spent nuclear fuel and radioactive waste.

19.8.2. Spent fuel storage on site

At Spanish nuclear power plants, spent fuel is initially stored in the fuel building pools integrated into the original design of each facility. In recent years, the capacity of these pools has been increased through design modifications such as the replacement of the original storage racks with high-density ones (re-racking), the compaction of waste already stored, and the optimisation of existing storage configurations.

Nevertheless, the progressive saturation of these pools has necessitated the development of on-site Individualised Storage Facility (ISF) facilities for the dry storage of spent fuel in casks. The Trillo NPP has operated its ISF since 2002, and the José Cabrera NPP completed the full transfer of its spent fuel to its ISF in 2009 to enable the commencement of decommissioning. The ISF at Ascó NPP began loading containers in 2013, followed by the Almaraz NPP in 2018. Santa María de Garoña NPP has an ISF authorised in 2018, with the first container loaded in 2022. The Cofrentes NPP commenced operation of its ISF and loading activities in 2021.

The casks currently used at the Trillo, Almaraz, Santa María de Garoña, and Cofrentes are dual-purpose casks employed for both storage and transport of spent fuel. At José Cabrera and Ascó, the storage systems consist of metallic multi-purpose capsules housed in concrete modules, which include a separate transport module for the encapsulated spent fuel.

In accordance with current regulations, the licensing process for ISF includes the approval of the storage system design and of the transport cask as a B(U) package, as well as the authorisation for construction, installation, and commissioning of the facility at the plant site. This process is subject to environmental impact assessment requirements in line with national environmental legislation transposing the relevant European Directives.

Moreover, as set out in the current 7th General Radioactive Waste Plan and in line with the schedule for the planned shutdown of the Spanish nuclear fleet under the 2021–2030 Integrated National Energy and Climate Plan (PNIEC), actions have been initiated during the reporting period to provide operating nuclear power plants with full-capacity ISF. These will allow for the complete unloading of the spent fuel pools prior to the commencement of decommissioning operations. Among the operating plants, only Trillo currently has a full-capacity ISF. It is therefore necessary to expand the existing storage capacity at Almaraz, Ascó and Cofrentes, and to construct a new ISF at Vandellós II. The corresponding applications for construction and installation authorisation were submitted in 2023. The application for Vandellós II was approved in 2024, while the others remain under evaluation by the CSN.

For these full-capacity ISFs, Enresa has planned the deployment of a single cask design, the HI-STORM FW model from Holtec International, which has been licensed for use at various facilities in the United States. Its licensing process in Spain is due to begin shortly.

Further details on the management of spent fuel can be found in Spain's Eighth National Report under the Joint Convention, available on the official websites of the IAEA, MITECO, and CSN.

19.8.3. On-site treatment, conditioning and storage of radioactive waste

Low- and intermediate-level waste generated at nuclear power plants originates either from the plant's operational processes, such as evaporator concentrates, ion exchange resins and filter sludge, or from technological sources, primarily comprising materials from laboratory activities, maintenance operations, gloves and protective clothing. Following conditioning, the waste is categorised into solidified waste (resins, concentrates, sludge), compactable and non-compactable solid waste, and immobilised waste (such as filters). The resulting waste packages are subject to the ENRESA acceptance process, which establishes the criteria for their disposal at the El Cabril disposal facility. This process also defines the methodology for demonstrating compliance with the applicable acceptance criteria.

As of the end of 2024, the total volume of conditioned radioactive waste stored in the Individualised storage facilities of the operating nuclear power plants was 8,181.58 m^3. The level of occupancy of these facilities varies significantly across the different sites.

This section includes updated data on the volume of conditioned radioactive waste stored in individualised storage facilities, measured in 220-litre drum equivalents, and the corresponding percentage of storage capacity occupied as of 30/11/2024:

Table 7. Volume of radioactive waste in individualised storage facilities (30/11/2024)

Location	Waste conditioned in warehouses (m3)	Occupancy rate %
Vandellós II NPP	493.9 (2,287 drums)	30,43%
Ascó NPP	1337.38 (5,353 drums)	78,80%
Almaraz NPP	3028.08 (13,764 drums)	58,46%
Cofrentes NPP	2530.22 (11,501 drums)	57,22%
Trillo NPP	792 (3,206 drums)	27,88%

19.8.4. Activities to keep the quantities of waste generated as low as practicable in terms of volume and activity

In the mid-1990s, the Spanish nuclear power plants, in collaboration with Enresa, implemented the Volume Reduction Action Plan aimed at minimising the generation of low- and intermediate-level radioactive waste. This initiative was complemented by the development of additional measures to optimise the management of radioactive waste. The framework agreement between the Nuclear Power Plants/Owner Companies and Enresa was revised

in 2007 to align with the acceptance criteria of the El Cabril, and further updated in 2009 to incorporate provisions for very low-level radioactive waste. Following the publication of Royal Decree RD 102/2014, Enresa has undertaken a revision of the volume reduction plan.

In 2017, the Joint Sector–Enresa Group on low- and intermediate-level radioactive waste management identified the smelting of metallic scrap as a viable alternative for reducing the volume of waste destined for disposal at El Cabril. This strategy also contributes to optimising the use of the resources allocated to the General Radioactive Waste Plan's Financing Fund. This waste management route has been applied to the operational waste generated at CNSMG.

19.8.5. Established procedures for the clearance of radioactive materials

Under Spanish regulations, clearance is an administrative authorisation that permits certain waste materials generated at nuclear facilities to be managed as conventional waste, exempt from further regulatory oversight in terms of safety and radiation protection.

The CSN has approved standardised procedures applicable across all Spanish nuclear power plants, which define criteria for the clearance of specific waste streams such as metallic scrap, activated carbon, ion exchange resins, waste oils, and wood.

In November 2017, the competent ministry issued Order ETU/1185, which regulates the clearance of waste materials generated at nuclear facilities. This Order is associated with CSN Instruction IS-31, which sets out the criteria for radiological control of such materials. The Order incorporates provisions from Directive 2013/59/Euratom, which establishes basic safety standards for protection against the hazards of ionising radiation. It includes within its scope the clearance of residual materials and the radiological criteria to be applied in the authorisation process for their conventional disposal, recycling, or reuse. Between 2020 and 2024, several test plans for the clearance of residual materials have been approved or are currently undergoing approval.

19.8.6. Regulatory review and control activities

Supervisory and control activities related to the management of low and intermediate level radioactive waste at operating and decommissioning nuclear power plants are conducted through the review of periodic information submitted by the licensees (monthly, annual, and other reports), as well as through SISC inspections. These inspections are scheduled annually as part of the Baseline Inspection Plan (BIP) and encompass both clearance activities and the overall management of radioactive waste.

The principal reference document for carrying out these review and oversight tasks is the facility's PGRRCG, in accordance with CSN Safety Guide GS 9.3, which outlines the content and criteria for the development of waste management plans at nuclear facilities. This plan details the waste streams generated at the facility and the corresponding management measures, whether implemented or foreseen. It also includes the classification of facility areas into either radioactive waste or conventional waste zones, which provides the basis for establishing radiological control barriers for materials exiting the site.

An additional aspect of regulatory oversight includes the inspection of waste acceptance processes carried out by Enresa for final disposal at the El Cabril facility. These inspections are conducted annually and cover both the verification of acceptance criteria and the assessment of compliance with the applicable acceptance methodology.

19.9. Vienna Declaration

Within the framework of the Vienna Declaration, this article addresses relevant elements such as the development and maintenance of Emergency Operating Procedures (EOPs) and Severe Accident Management Guidelines (SAMGs) (refer to Article 19.4). These elements have been reviewed and enhanced at Spanish nuclear power plants following the European stress tests conducted in the aftermath of the Fukushima Daiichi accident, as well as through analyses of scenarios involving the loss of large areas. As a result, Severe Damage Mitigation Guidelines (SDMGs) have been incorporated, alongside the implementation of design modifications to reinforce instrumentation under severe accident conditions and the deployment of redundant or diverse structures, systems, and components to address design extension conditions, including severe accidents.

In this regard, the regulatory framework has been strengthened through the issuance of CSN Instruction IS-36 by the Nuclear Safety Council, which addresses emergency operating procedures and severe accident management at nuclear power plants. This instruction incorporates a significant portion of the WENRA reference levels for Issue F, concerning the extension of design for existing nuclear power plants, which were revised in light of the Fukushima Daiichi accident.

Another area of particular relevance to the Vienna Declaration, as addressed in this article, is the management of operating experience (Article 19.7). This process is comprehensively implemented at Spanish nuclear power plants and is subject to regulatory oversight by the CSN. It also has a strong international dimension, both through the licensees, who, in addition to participating in various international forums, regularly engage in peer review activities through their involvement in organisations such as WANO, and through the regulator. The objective is to proactively identify potential issues and adopt, to the extent reasonably practicable, international best practices and lessons learned at the national level.

This process is supported by the high level of competence and technical capability of engineering and technical support services, further discussed in section 19.5. The proper design, assembly, commissioning, and subsequent maintenance of the design modifications implemented at nuclear power plants require these services to be delivered at the highest standard at all times.

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ANNEX 19.A. Generic Technical Opinion on the renewal of the Operating Authorisation

SUBJECT: FAVOURABLE OPINION ON THE RENEWAL OF THE OPERATING LICENCE FOR THE NUCLEAR POWER PLANT AT _____

In accordance with the roles and responsibilities assigned to the Ministry for the Ecological Transition and the Demographic Challenge, the CSN received the application for the renewal of the operating licence, for a period of ten years, for the _____ NPP _____(Entry No. ___), pursuant to the provisions set forth in the Regulation on Nuclear and Radioactive Installations and other activities involving exposure to ionising radiation. The application was submitted by the licensee in accordance with Provision 2 of the Ministerial Order dated _____, under which the current operating licence was granted to the facility. The application was submitted together with the Periodic Safety Review (PSR) of the installation, the current revisions of the Official Operating Documents, and the updated review of the Probabilistic Safety Assessment (PSA) studies.

During the period of validity of the current authorisation, the CSN has maintained continuous oversight and supervision of the plant's operations, ensuring compliance with applicable nuclear safety and radiation protection requirements, and has reviewed and evaluated the submitted PSR.

At its meeting held on _____, the CSN resolved to issue the licensee with a Complementary Technical Instruction (ref. _____), requiring the assessment of regulatory developments not previously incorporated into the licensing basis of the facility. The CSN considered that the review of these new standards could result in significant modernisation and enhancement of the plant's safety conditions. The licensee subsequently submitted the requested analyses under the following correspondence, along with the associated improvement plans:

- [List of documents submitted by the licensee, the contents of which, as referenced herein, are included in the plant's Licence Database.]

In accordance with the implementation schedules, the licensee has already undertaken safety improvements at the facility, to be completed with the actions outlined in the attached Conditions.

Additionally, following the Fukushima Daiichi accident [paragraph incorporated in the report for the latest renewal], the CSN issued Complementary Technical Instructions to all Spanish nuclear power plant licensees requiring the performance of stress tests, as agreed within the European Union framework, and the definition of measures to address events beyond the original design basis, including scenarios involving the loss of large plant areas. The _____ NPP, in line with the remaining facilities, must conduct the relevant analyses and implement the required measures to reinforce safety under extreme event conditions.

The CSN will review the submitted analyses and proposals and may issue additional requirements as deemed necessary.

The Nuclear Safety Council, in its meeting held on _____, considered the application submitted by the licensee of the _____ Nuclear Power Plant, as well as the reports issued by the Nuclear Safety Technical Directorate based on the assessments

conducted, and resolved to issue a favourable opinion on the renewal of the operating licence for a further ten-year period, subject to compliance with the limits and conditions set forth in the Annex. This decision has been adopted in accordance with section b) of Article 2 of Law 15/1980, on the Establishment of the Nuclear Safety Council, and is hereby transmitted to the Ministry for the appropriate action.

Madrid, [date] _____

THE PRESIDENT

ANNEX 19.B. Generic Limits and Conditions Attached to the Renewal of the Operating Authorisation

LIMITS AND CONDITIONS ON NUCLEAR SAFETY AND RADIATION PROTECTION ASSOCIATED WITH THE OPERATING AUTHORISATION OF THE _____ NUCLEAR POWER PLANT

1. For the purposes of the applicable legislation, the companies _____, acting as jointly and severally liable entities, are deemed to be the holders of the Authorisation and the responsible operators of the _____.

2. This operating authorisation entitles the licensee to:

   2.1. Possess and store slightly enriched uranium fuel assemblies in accordance with the technical limits and conditions specified in the Refuelling Safety Analysis applicable to each cycle, as well as with the limits and conditions set out in the specific authorisations for the storage of fresh and irradiated fuel.

   2.2. Operate the facility up to the authorised core thermal power of _____ MWt.

   2.3. Possess, store, and utilise radioactive materials, nuclear substances, and radiation sources required for the operation of the installation.

3. This authorisation is granted on the basis of the following documentation:

   a) Safety Study, Rev.
   b) Operating Regulations, Rev.
   c) Operating Technical Specifications, Rev.
   d) Internal Emergency Plan, Rev.
   e) Quality Guarantees Manual, Rev.
   f) Radiological Protection Manual, Rev.
   g) Radioactive Waste and Spent Fuel Management Plan, Rev.

   Operation of the facility shall be conducted in accordance with the above-listed documents, in their current revision, and following the update procedures detailed below.

   3.1. Any subsequent modification to the Operating Technical Specifications or the Site Emergency Plan must receive prior approval from the Directorate General for Energy Planning and Coordination, following a report issued by the Nuclear Safety Council (CSN), before coming into force.

   The Nuclear Safety Council may grant temporary exemptions from any provision within the aforementioned documents. In such cases, the CSN shall notify the Directorate General for Energy Planning and Coordination of both the commencement and termination of the exemption.

   3.2. Within six months of plant start-up following each refuelling outage, the licensee shall update the Safety Analysis Report to incorporate modifications implemented at the facility from the start of the previous cycle through to the end of the refuelling outage, provided these did not require authorisation under the terms of Nuclear Safety Council Instruction IS-21, along with any newly conducted safety analyses. The updated revision must be submitted to the Directorate General for

Energy Planning and Coordination and to the Nuclear Safety Council within one month of its entry into force.

Any revisions to the Safety Analysis Report related to modifications requiring prior authorisation by the Directorate General for Energy Planning and Coordination, in accordance with Instruction IS-21, must be submitted for approval in parallel with the respective modifications.

3.3. Modifications to the Operating Regulations may be made under the licensee's responsibility, provided such changes do not diminish the existing requirements related to nuclear safety and radiation protection functions, organisational responsibilities, staff training and retraining programmes, or the reports, records, and logs specified therein. If any such reduction is proposed, prior approval must be obtained from the Directorate General for Energy Planning and Coordination, following a report by the Nuclear Safety Council. Revisions to the Operating Regulations shall be submitted to the Directorate General for Energy Planning and Coordination and to the Nuclear Safety Council within one month of their entry into force.

3.4. Changes to the Quality Assurance Manual may be introduced under the licensee's responsibility, as long as they do not reduce the commitments established in the current quality assurance programme. Any modification that implies a reduction in these commitments must receive a favourable assessment from the Nuclear Safety Council prior to taking effect.

For the purposes of this clause, commitments are considered to include those elements contained in the current Quality Assurance Manual in the form of applicable standards and guidelines, as well as the description of the quality assurance programme itself, as reflected in the Manual, in accordance with the Complementary Technical Instructions issued by the Nuclear Safety Council on this matter.

All revisions to the Quality Assurance Manual shall be submitted to the Directorate General for Energy Planning and Coordination and to the Nuclear Safety Council within one month of their entry into force.

3.5. Modifications to the Radiation Protection Manual may be made under the responsibility of the licensee, except in cases where such modifications affect fundamental standards or criteria for radiation protection, as specified in the Complementary Technical Instructions issued by the Nuclear Safety Council. In these cases, a favourable assessment by the Nuclear Safety Council shall be required prior to their entry into force.

Revisions to the Radiation Protection Manual must be submitted to the Directorate General for Energy Planning and Coordination 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 made under the responsibility of the licensee, except in cases expressly indicated in the Complementary Technical Instructions issued by the Nuclear Safety Council. In these cases, a favourable assessment by the Nuclear Safety Council shall be required prior to their entry into force.

Revisions to the Radioactive Waste and Spent Fuel Management Plan must be submitted to the Directorate General for Energy Planning and Coordination 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 submit reports to the Directorate General for Energy Planning and Coordination and to the Nuclear Safety Council (CSN, according to its initials in Spanish) addressing the following aspects, with the scope and content set out in the Complementary Technical Instructions issued by the Nuclear Safety Council for this purpose:

   4.1. Operating experience from the plant and other sources applicable to the facility, including a description of actions taken to improve plant performance or to prevent recurrence of similar events.

   4.2. Measures adopted to align plant operation with new national nuclear safety and radiation protection requirements, as well as regulatory developments in the country of origin of the plant's design. In the latter case, the report shall include an assessment of the applicability of the new requirements issued by the regulatory authority of the country of origin to plants of similar design.

   4.3. Results from the environmental radiation monitoring programme. The content of this information must be consistent with that set out in Chapter 6, "Administrative Rules", of the Operating Technical Specifications.

   4.4. Results from personnel dosimetric monitoring, including an analysis of trends in both individual and collective radiation doses received over the previous year.

   4.5. Activities carried out under the Radioactive Waste and Spent Fuel Management Plan, including those relating to residual materials that may be managed as conventional waste, very low-level waste, low- and intermediate-level waste, high-level waste, and irradiated fuel.

   4.6. Education and training activities for all plant personnel whose roles may impact nuclear safety or radiation protection.

5. The Directorate General for Energy Planning and Coordination and the Nuclear Safety Council must be notified at least seven days in advance of the scheduled shipment of packages containing radioactive waste or fissile material from the plant site. Shipments of other radioactive materials must be reported within 24 hours of the decision to proceed and, in all cases, prior to transport. Such shipments shall be subject to the authorisation system established by current regulations.

   Where the licensee is responsible for transporting fissile material to or from the plant and such transport does not require a dispatch authorisation under applicable dangerous goods transport regulations, the Directorate General for Energy Planning and Coordination and the Nuclear Safety Council must also be notified of the planned transport at least three months before the scheduled date.

6. At least three years before the expiry of the current operating authorisation, the licensee may submit an application to the Ministry for the Ecological Transition and the Demographic Challenge for a new authorisation not exceeding a ten-year term. This applica-

tion must be accompanied by: (a) the most recent revisions of the documents referred to in Condition 3; (b) a Periodic Safety Review of the plant, in accordance with the requirements set out in CSN Safety Guide 1.10 "Periodic Safety Reviews of Nuclear Power Plants", Revision 1; (c) an updated review of the probabilistic safety assessment; (d) an ageing analysis of the plant's safety-related structures, systems and components; and (e) an evaluation of the operating experience accumulated over the duration of the authorisation to be renewed.

7. If such an application is submitted, the licensee must provide the Nuclear Safety Council with updated versions of the above-mentioned documents at least one year prior to the expiry of the current operating permit.

8. Should the licensee decide to permanently cease operation of the facility during the period of validity of this authorisation, it must notify the Directorate General for Energy Planning and Coordination and the Nuclear Safety Council at least one year in advance of the scheduled shutdown date, except in cases of unforeseeable circumstances or if shutdown is ordered by the Ministry for the Ecological Transition and the Demographic Challenge. The licensee must demonstrate the nuclear safety and radiation protection of the facility with respect to the activities to be conducted from shutdown until a decommissioning permit is granted, as defined in the Complementary Technical Instructions issued by the Nuclear Safety Council.

9. Throughout the duration of this Authorisation, the licensee shall implement the Plant Safety Improvement Programmes identified in the Periodic Safety Review submitted in support of the renewal application, as amended where applicable by the Complementary Technical Instructions issued by the Nuclear Safety Council.

   The licensee shall also implement the actions proposed in the documentation submitted in support of the renewal request, including those relating to the Periodic Safety Review and the applicable conditional regulations, within the specified timeframes, as well as those actions formally communicated to the licensee as a result of the CSN's assessment.

IV. CONCLUSIONS

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Spain satisfactorily fulfils the obligations arising from the Convention on Nuclear Safety, as evidenced by the information presented across this Tenth National Report.

This chapter outlines the main regulatory developments and commitments met by Spain during the period from January 2022 to December 2024, as well as relevant information pertaining to the first half of 2025.

The measures implemented in response to the challenges identified for Spain during the Joint Eighth and Ninth Review Meeting, which are addressed throughout this report, are described below. In addition, and in a spirit of transparency and ongoing commitment to enhancing nuclear safety, this chapter identifies the future challenges that the regulatory authority is expected to address in the coming years.

In addition, the report contains information on Spain's implementation of the safety principles set out in the Vienna Declaration on Nuclear Safety, in accordance with the commitments undertaken at the 2015 Diplomatic Conference.

Finally, the chapter includes a section in which the licence holders of Spain's nuclear power plants highlight the most significant aspects of their activities during the reporting period.

Development of the regulatory framework

During the period covered by this report, the following legal instruments relevant to the field of nuclear safety have been adopted and issued:

- Royal Decree-Law 6/2022 of 29 March adopting urgent measures within the framework of the National Response Plan to the economic and social consequences of the war in Ukraine.
- Law 2/2023 of 20 February on the protection of persons who report regulatory infringements and the fight against corruption.
- Law 11/2023 of 8 May on the transposition of European Union Directives on the accessibility of certain products and services, migration of highly qualified persons, taxation and digitalisation of notarial and registry procedures; and amending Law 12/2011 of 27 May on civil liability for nuclear damage or damage caused by radioactive materials.
- Royal Decree 1029/2022 of 20 December, approving the Regulation on health protection against the risks arising from exposure to ionising radiation.
- Royal Decree 665/2023, of 18 July, amending the Regulation of the Public Hydraulic Domain, approved by Royal Decree 849/1986, of 11 April; the Regulation of the Public Administration of Water, approved by Royal Decree 927/1988, of 29 July; and Royal Decree 9/2005, of 14 January, establishing the list of potentially soil-polluting activities and the criteria and standards for the declaration of contaminated soils.
- Royal Decree 1217/2024, of 3 December, approving the Regulation on nuclear and radioactive facilities and other activities related to the exposure to ionising radiation.
- Order ETD/374/2022 of 25 April establishing the system of reinsurance to be provided by the Insurance Compensation Consortium for civil liability for nuclear damage. This ministerial order fully covers the new framework for civil liability for nuclear risks established in Law 12/2011.

- Agreement of the Council of Ministers of 7 March 2023 laying down basic safety standards for the protection against the dangers arising from exposure to ionising radiation in the field of civil protection.
- Order PJC/1430/2024 of 16 December, publishing the Agreement of the National Security Council of 15 October 2024, approving the National Civil Protection Strategy.

In addition, the following CSN instructions have been issued in the field of nuclear safety, which are listed in Section 7.2.2 of this report:

- Instruction IS-10, Review 2, of 7 September 2023, of the Nuclear Safety Council, on criteria for reporting events at nuclear power plants.
- IS-46 of 14 May 2024 of the Nuclear Safety Council on physical safety during the transport of nuclear materials and radioactive sources.
- Instruction IS-47, of 9 April 2025, of the Nuclear Safety Council, approving the list of municipalities with priority action against radon and establishing guidelines for radon measurements in the indoor air of workplaces located in them.
- Instruction IS-48, of 9 April 2025, of the Nuclear Safety Council, laying down the criteria to be met by nuclear power plant operating experience programmes.

Finally, the CSN has issued the following safety guides, which are of a recommendatory nature:

- Safety Guide GS-01.03 (Rev.2) Nuclear facility emergency management planning and response.
- Safety Guide GS-01.09 (Rev.2) Emergency preparedness at nuclear facilities and documentation of their management system.

Meeting the Challenges Identified at the Joint Eighth and Ninth Review Meeting of the Convention on Nuclear Safety

At the Joint Eighth and Ninth Review Meeting of the Convention on Nuclear Safety, four key challenges were identified for Spain. This Tenth National Report outlines the actions undertaken by the regulatory body in response to these challenges:

- *Plan and execute efficient licensing and supervision processes, adequately managing human resources*

The national effort to enhance the efficiency of licensing and regulatory oversight has culminated in the adoption of the regulation on nuclear and radioactive facilities and other activities related to exposure to ionising radiation (RINR), enacted through Royal Decree 1217/2024 of 3 December. This regulation sets out the updated conditions and licensing categories applicable to all stages in the lifecycle of nuclear and radioactive facilities. Details on licensing systems and procedures are provided in Section 7.3.

In addition, Article 14 of this report, "Safety Assessment and Oversight," describes the methodologies and verification processes developed to support risk-informed and graded oversight, most notably, the Integrated Plant Supervision and Control System (SISC).

Articles 17 and 18 describe the measures implemented to uphold and strengthen nuclear safety in the design, construction, and operation of nuclear installations, from the perspective of both licensees and regulatory authorities.

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

Section 18.2.2 presents the work carried out to ensure the electromagnetic compatibility of new electronic systems with existing plant equipment. These initiatives meet the highest standards of quality in software design and include provisions addressing cybersecurity.

- *Retain, maintain and improve technical knowledge and professional resources, both in the CSN and within the licensees' organisations*

Section 8.1.2 b) highlights the prioritisation of the Senior Corps for Nuclear Safety and Radiation Protection within national public employment policy, aimed at securing generational renewal and ensuring effective knowledge transfer. In December 2024, the CSN adopted its 2024–2030 Human Resources Plan, designed to provide the necessary workforce to meet future technical and organisational challenges, including the incorporation of artificial intelligence. The plan draws on IAEA guidance and outlines measures for talent attraction and development, including implementation of the Systematic Approach to Training (SAT). Annual monitoring through targeted action plans is envisaged. Its adoption is considered a "notable achievement" (see Notable Achievement 4, Annex "Notable Achievements").

Section 11.2 details the measures adopted by licensee organisations and nuclear power plants concerning human and technical resources. These measures comply with CSN regulatory requirements and cover both plant staff and contracted personnel, whether permanent or temporary.

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

Article 14, and specifically, Sections 14.1.3 and 14.2.3, describes the actions undertaken to develop and implement ageing management and long-term operation programmes, aimed at ensuring the continued safe operation of nuclear facilities.

Future Challenges for Spain's regulatory body

Since its establishment in 1980, the CSN has fulfilled its mandate in accordance with the provisions of its founding legislation, with the overarching objective of protecting workers, the public and the environment against the harmful effects of ionising radiation. It does so by ensuring the safe operation of nuclear and radioactive facilities by licensees and by establishing the appropriate measures for prevention and mitigation in the event of radiological emergencies, regardless of their origin.

In parallel, the CSN has consistently promoted an active international presence across key fora in the field of nuclear safety and radiation protection, contributing to technical cooperation and providing support to peer regulatory bodies.

In the immediate future, the following challenges have been identified as strategic priorities:

- **Challenge 1. Maintaining nuclear safety at Spanish nuclear power plants in the context of long-term operation and the transition to decommissioning**

Between 2020 and 2024, all Spanish nuclear power plants obtained renewals of their respective operating permits. As part of this process, each licensee submitted supporting documentation to justify the entry into a long-term operation phase, which will occur during the validity period of the renewed authorisations.

The National Integrated Energy and Climate Plan 2021–2030 (PNIEC) foresees the phased shutdown of Spain's seven nuclear power reactors in a planned and orderly manner. In this context, the shutdown of Unit I of the Almaraz NPP is scheduled for November 2027, with the final two reactors in the fleet expected to cease operation in 2035.

From 2027 onwards, the configuration of Spain's nuclear fleet is expected to evolve such that, alongside reactors in operation, several units will be in various phases of shutdown and decommissioning. This transitional scenario may occur even at dual-unit sites (such as Almaraz and Ascó), where the closure dates of the respective reactors are staggered.

This dual dynamic, long-term operation in conjunction with the progressive transition to decommissioning, represents a significant challenge for licensees, governmental authorities, and the regulatory body.

- **Challenge 2. Attracting talent and generational change**

The overarching objective of the CSN Human Resources Plan is to ensure the availability of personnel and capabilities, both in terms of quantity and quality, required to address the CSN's short- and medium-term challenges and, thereby, to fulfil its institutional mission. This objective encompasses, on the one hand, the recruitment of professionals with the competencies needed to perform both the CSN's core regulatory functions and its supporting activities; and on the other hand, the development and retention of internal talent, with a view to fostering the generation and dissemination of organisational knowledge.

It should also be noted that the current average age of CSN staff is 53 years, indicating a scenario in the short term characterised by a high rate of retirements. Managing generational renewal is, therefore, identified as one of the CSN's principal strategic challenges, one already addressed in the current Strategic Plan and earmarked for further development in the upcoming planning cycle.

To this end, the Human Resources Plan sets out the following specific objectives:

- Increase the CSN's visibility among the general public and in academic institutions that serve as incubators of professional talent;
- Promote the CSN as a compelling workplace for professional development;
- Strengthen the CSN's public image and communicate its role as a mission-driven public authority;
- Increase participation in competitive selection processes for the CSN's technical corps, as well as interest in inter-administrative mobility and promotion opportunities.

- **Challenge 3. Ensuring nuclear safety in the context of climate change**

The occurrence of extreme weather events is increasing, exhibiting patterns that diverge from the conditions typically considered during the original design phase of nuclear installations. In this context, it is deemed necessary to undertake ongoing reassessment of the risks that evolving severe weather conditions, driven by climate change, may to the safety of nuclear facilities.

In fact, the Major Common Issues identified during the Joint Eighth and Ninth Review Meeting of the Convention on Nuclear Safety already included the potential impact of climate change on the safe operation of nuclear installations (see Section 2.1 of this Tenth National Report).

The persistence of this challenge reflects the dynamic and progressive nature of climate change, which demands continuous evaluation of its implications for the threat and risk landscape associated with nuclear safety.

- **Challenge 4. The development of Artificial Intelligence and its cross-cutting application to the activities of the regulatory body**

Despite the progress achieved in recent years by the CSN in the areas of digitalisation and the development of e-government, particularly during the pandemic, the advancement of various initiatives aimed at the full digitalisation of the CSN, and the use of electronic tools and artificial intelligence in both its interactions with facility and activity licensees and the conduct of its administrative functions, must be sustained and further reinforced to enhance the effectiveness and efficiency of the organisation.

Specifically, the modernisation and optimisation of applications and information systems must be pursued, with a focus on integrating the most current and innovative developments in the field. Within this context, AI, as an enabling management tool, has the potential to support informed decision-making, forecast and simulate future scenarios, and automate processes through the structured use of institutional knowledge embedded in information systems. Achieving these objectives will require reinforcing the CSN's capacity with suitably qualified personnel.

Conclusions from the perspective of the licensees

The licensees of Spanish nuclear power plants are primarily responsible for ensuring the safe operation of their facilities, for generating electricity under optimal economic and technical conditions, and for doing so with due regard for environmental protection. This report sets out the activities undertaken and measures implemented by the licensees in their role as those responsible for the safety of their facilities, under the oversight of the CSN and in compliance with its requirements, or, in some cases, going beyond them, in accordance with the principles of excellence.

A summary of the most relevant points is provided below:

- The current configuration of the Spanish nuclear fleet is defined in the National Integrated Energy and Climate Plan 2023–2030 (PNIEC) for the period addressed in this report.

- Throughout the reporting period, all Spanish nuclear power plants have operated safely and with environmental responsibility. No incidents occurred with significant impact on either the public or the environment.
- Within this same period, and in accordance with the Periodic Safety Review process, the licensee of Trillo NPP submitted a request in March 2023 to renew its Operating Permit for a further ten-year period, through to November 2034. This renewal was granted on 11 November 2024, following the favourable assessment issued by the CSN on 26 July of that year.

Applying the methodology established in revision 2 of CSN Safety Guide GS-01.10 for Periodic Safety Reviews, the Trillo licensee proposed safety improvements, which, once authorised, are being implemented in accordance with the schedule required by the CSN.

Other nuclear power plants whose Operating Permits had been renewed in earlier phases have similarly fulfilled the conditions established at the time of renewal. As of April 2024, implementation of those requirements is close to completion, with execution levels at approximately 95%.

- During 2022, 2023, and 2024, a total of seven Peer Reviews were conducted by the World Association of Nuclear Operators (WANO) at Spanish nuclear power plants. In addition, the International Atomic Energy Agency (IAEA) has carried out a Safety Aspects of Long-Term Operation (SALTO) mission at the Ascó plant and conducted an independent assessment of Safety Culture at ANAV.
- In parallel, with regard to participation in technical missions conducted at nuclear power plants both in Spain and abroad, and in addition to the missions directly received by the operators of Spanish facilities, various experts from these plants took part in 2022, 2023, and 2024 in WANO peer review missions, WANO technical missions, and IAEA missions, all of which were carried out at nuclear power plants.

In light of the above and based on the operational experience accumulated to date, the licensees consider the Spanish nuclear fleet to be in optimal condition to continue into the next operating cycle.

ANNEX. Checklist of notable achievements

NOTABLE ACHIEVEMENT 1. RESULTS OF THE IRRS FOLLOW-UP MISSION

Definition	Checklist - Information needed to justify the proposal
A new or revised practice, policy or programme	*Results of the IRRS Follow-up Mission (2025)* • Spain is one of the few countries that has completed a second cycle of IRRS missions with this follow-up mission. • The first IRRS mission was conducted in 2008 and its follow-up mission in 2011 • The second cycle ran from 2018, with the combined IRRS-ARTEMIS mission, to this follow-up mission in 2025.
Significant achievement for a particular Contracting Party	• The twelve recommendations and twenty suggestions reviewed were either fully closed or closed depending on progress made and confidence in their timely and effective completion. • Identification of two best practices, as an exceptional occurrence for this type of mission. – The digital radiation passbook, a digital platform that provides users with real-time dose data, reduces the need for manual data entry and allows the regulator to perform real-time statistical analysis; and – A centralised digital dosimetry system, provided by the CSN, to be used during emergencies for the real-time monitoring of the radiation doses of the workers participating in the emergency of all the off-site response organisations.
Undertaken and effectively implemented	The IRRS team concluded that the CSN staff demonstrates strong commitment and professionalism in fulfilling its mandate to ensure nuclear and radiation safety in Spain. It was confirmed that the Government of Spain and the CSN have systematically taken into account the recommendations and suggestions of the 2018 mission and significant improvements have been implemented in a number of areas. In addition, the following were highlighted as notable results: • Human Resources Plan, including a systematic approach to training (SAT) for all staff • CSN Safety Culture • National Radon Action Plan • CSN collaboration with the Autonomous Communities

NOTABLE ACHIEVEMENT 2. DIGITAL RADIATION PASSBOOK

Definition	Checklist - Information needed to justify the proposal
A new or revised practice, policy or programme	*Digital Radiation Passbook* A digital platform that provides real-time occupational exposure data for external workers and contractor companies.
Makes a significant contribution to nuclear safety	It allows a centralised record of data related to the occupational exposure of external workers to be kept, contributing to the control and supervision of compliance with radiation protection regulations by all parties involved.
Tested and verified by at least one Contracting Party - not widely applied	• The application enables efficient management of worker exposure data by companies and facilities, avoiding the inconvenience of the physical format and optimising the regulator's resources for monitoring. • The application is unique, with no Contracting Party having implemented it in digital format.
Applicable to other Contracting Parties with similar programmes	This would be applicable to any Contracting Party, in particular EU Member States.

NOTABLE ACHIEVEMENT 3. CENTRALISED DIGITAL DOSIMETRY SYSTEM FOR EMERGENCIES

Definition	Checklist - Information needed to justify the proposal
A new or revised practice, policy or programme	*Digital dosimetry control system for nuclear and radiological emergency response personnel, DOSI-APP.* This is a digital system for recording the doses of intervention personnel on NFC cards and sending data via an app to the Nuclear Safety Council for analysis and evaluation.
Makes a significant contribution to nuclear safety	• The system allows centralised monitoring of the doses received by the intervention staff with the aim of ensuring that they are kept below the established reference levels whenever possible. • Dose assessment can be done among other parameters by intervention area, operational group or time period.
Tested and verified by at least one Contracting Party - not widely applied	The system was implemented in 2019, has been tested in nuclear and radiological emergency drills and exercises with different scopes and considered as good practice by the IAEA in the IRRS follow-up mission in 2025.
Applicable to other Contracting Parties with similar programmes	The centralised monitoring of the doses received by the intervention personnel through the use of a digital tool such as DOSI-APP allows the most appropriate radiation protection measures to be adopted at any given time during the emergency, compatible with the mission entrusted, and can therefore be considered an optimisation tool.

NOTABLE ACHIEVEMENT 4. HUMAN RESOURCES PLAN INCLUDING THE IMPLEMENTATION OF THE SAT METHODOLOGY

Definition	Checklist - Information needed to justify the proposal
A new or revised practice, policy or programme	*Human Resources Plan and SAT methodology.* In December 2024 the CSN approved its Human Resources Plan for the period 2024-2030, a forward-looking plan for the human resources of the organisation and their management, with the objective of ensuring, within the framework of the available budgets, the human resources required, in quantitative and qualitative terms, to meet the CSN's challenges in the short and medium term.
Significant achievement for a particular Contracting Party	In drawing up this CSN human resources plan 2024-2030, consideration has been given to the situations pointed to by the IAEA in the IRRS mission held in Spain in 2018, such as the introduction of new types of facilities, new activities or technologies, the ageing of the facilities or the transition from one stage to another in their life cycle; as well as the technological changes that are transforming the way public policies are designed and managed and, particularly, artificial intelligence, which is fast-becoming consolidated as a management tool with multiple applications, especially in human resources management. This Plan has been highlighted as a notable achievement by the IRRS monitoring mission in 2025.
Undertaken and effectively implemented	Among the five lines of action defined in the Plan, it is worth highlighting *line 2. Talent management* describing how the CSN approves its training plan annually and is developing the "*Systematic Approach to Training*" (SAT) project, which serves as a methodology for defining the professional profiles (knowledge and skills) of the CSN personnel for the efficient and effective performance of each position and, on the basis of these professional profiles, defining the training plan for the personnel performing the basic functions of the organisation in a more systematic manner.

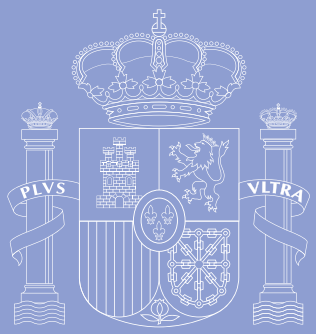
NOTABLE ACHIEVEMENT 5. SAFETY CULTURE IN PARTNER COMPANIES

Definition	Checklist - Information needed to justify the proposal
A new or revised practice, policy or programme	*Promoting Safety Culture in partner companies* • The Spanish nuclear power plants have established a systematic programme for the promotion of a safety culture in the main collaborating companies, so that they define specific actions to reinforce a safety culture among their personnel, aligning these actions with the results of each plant in terms of organisational culture, defining a common system that allows a homogeneous assessment to be made of the extent to which the different collaborating companies implement good safety culture practices and systematically organising the tracking of the performance obtained by each of them. • Membership of these programmes is voluntary, although companies are encouraged to join the initiative in the contracts awarded. • This practice has taken into account international requirements such as the WENRA(*Western European Nuclear Regulators Association*) Reference Levels, the Nuclear Safety Council Directive 2014/87/Euratom and the IAEA document GS Part 2, which urges the operator of nuclear power plants to put in place effective measures with collaborating companies to specify, monitor and control the supply of items, products and services that may affect safety, with an emphasis on leadership and their evaluation.
Significant achievement for a particular Contracting Party	The safety culture assessments carried out, covering both in-house and contracted staff, have shown positive development among these companies in the following areas: • Improve adherence to procedures and the reporting of procedural errors. • Promote cohesion, commitment and job satisfaction. • Improve the safety culture and the perception of thereof among the affected groups. • Reinforce the expectation to correct inappropriate behaviour among peers and managers.
Undertaken and effectively implemented	This practice has been applied by all the Spanish nuclear power plants and promoted jointly, achieving a significant benefit for nuclear safety.

Convention on Nuclear Safety

TENTH NATIONAL REPORT

September 2025



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