

Nuclear Safety Council Report to the Parliament

Summary of 2018

CSN

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Table of Contents

Introduction	5
CHAPTER I. THE NUCLEAR SAFETY COUNCIL.....	7
1. The Nuclear Safety Council	9
1.1. The CSN Board	10
1.2. CSN Commissions	10
1.3. CSN Relationships.....	11
1.4. Advisory Committee for Public Information and Participation	20
2. Strategy and Resource Management	22
2.1. Strategic Plan	22
2.2. Management System	22
2.3. Research and Development.....	24
2.4. Resources and Means	25
CHAPTER II. REPORT ON ACTIVITIES	29
3. Overview of Nuclear Safety and Radiation Protection, 2018	31
3.1. Safety at the Facilities	31
3.2. Application of the Radiation Protection System	34
4. Monitoring and Control of Facilities and Activities	40
4.1. Regulations and Standards	40
4.2. Nuclear Power Plants	41
4.3. Nuclear and Radiative Facilities in the Fuel Cycle, Radioactive and Research Centers	48
4.4. Facilities under Permanent Shutdown, Dismantling and Decommissioning Phase. Restoration of Mining Sites	53
4.5. Radioactive Facilities	55
4.6. Service Organizations, Licensed Personnel and other Activities	59
4.7. Transport of Nuclear and Radioactive Materials.....	63
4.8. Activities and Facilities not Covered by Nuclear Regulations	64
5. Radiation Protection of Exposed Workers, the Public and the Environment	66
5.1. Radiation Protection of Workers	66
5.2. Discharge Control and Environmental Radiation Monitoring.....	69
5.3. Protection against Natural Radiation Sources	75

6. Monitoring and Control of Irradiated Fuel and Radioactive Wastes Management.....	77
6.1. High-Activity Radwaste and Irradiated Fuel.....	77
6.2. Mid- and Low-Activity Radwaste Managed at the Nuclear Power Plants	77
6.3. Very Low-Activity Radwaste.....	78
6.4. Declassified Radwaste	79
6.5. End-of-Life Consumables.....	79
7. Nuclear and Radiological Emergencies. Security	80
7.1. Capacities and actions of the Nuclear Safety Council in the Event of Emergencies	80
7.2. Participation of the Nuclear Safety Council in the National Emergency Network	82
7.3. On-site Emergency Plans at the Facilities.....	82
7.4. International Collaboration in Emergencies and other Collaborative Activities	83
7.5. Security of Nuclear Materials and Facilities	83
Appendix. List of Abbreviations and Acronyms.....	85

Introduction

As with every year, it is a pleasure for the Nuclear Safety Council (*Consejo de Seguridad Nuclear* or CSN) to comply with its obligations before Parliament. The result of the work of the entire regulatory body is this Annual Report, which details the activities carried out by this organization during 2018.

The most important aspect of 2018 remains that of regularity in the operation of nuclear and radioactive facilities in Spain. The latter have operated safely, guaranteeing the radiological protection of workers, the population and the environment, incorporating, of course, the new standards issued by the CSN.

In 2018, Spain welcomed the International Atomic Energy Agency's (IAEA) joint IRRS-ARTEMIS peer review mission, in which the Nuclear Safety Council played a significant role both in organisational and technical terms. For the first time, the IAEA conducted two reviews, each of a different scope, which were combined into a single mission. One of these, known as the Integrated Regulatory Review Service (IRRS), was aimed at reviewing the Spanish regulatory framework for nuclear safety and radiological protection. The other, the Integrated Review Service for radioactive waste and spent fuel management, Decommissioning and Remediation (ARTEMIS) reviewed the regulatory framework of Spain's radioactive waste management programme.

Similarly, in 2018 a sizeable delegation from the CSN attended the sixth review meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, whose contracting parties meet every three years. The exchange of information in this forum was very fruitful.

As regards the licensing and control activities of nuclear and radioactive facilities, it should also be pointed out that the Plenary Meeting of the CSN issued a favourable report on the authorisation of the first proton-therapy facility requested in Spain, as an advanced radiotherapy technique using high-energy protons.

Finally, it should be pointed out that 2018 brought with it the offer of public employment as 25 new posts were created in the Nuclear Safety and Radiological Protection Corps of the Nuclear Safety Council, the rejuvenation of CSN's staff remains one of the great challenges for the future of the regulatory body.

The Chairman

Chapter I. The Nuclear Safety Council

1. The Nuclear Safety Council

The Nuclear Safety Council is a public organisation, independent of the central state administration, with full legal personality and assets its own legal personality and budget, independent from those of the State, created by Law 15/1980, of 22nd April, on Creating the Nuclear Safety Council, as the only competent organism in matters relating to nuclear safety and radiological protection.

The legal status regulating CSN actions is based on the prevalence of its constitutive Law and its Statute, with the supplementary nature of the organisational rules and legal regime common to the Central State Administration. It acts with organic and functional autonomy, fully independent from the Central State Administration and stakeholders, without prejudice to being subject to parliamentary and judicial control.

The Statute of the Nuclear Safety Council was approved by the Government by Royal Decree 1440/2010, of 5th November, in accordance with the provisions of Law 15/1980.

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

The CSN is responsible for the performance of all the functions established in Article 2 of Law 15/1980 and in Title I of the Statute, as well as for the performance of those others that, in the framework of nuclear safety, radiation protection and security are attributed to it by law, regulation or in accordance with international treaties.

In addition, Article 11 of Law 15/1980 establishes that, on an annual basis, the Nuclear Safety Council shall submit to both chambers of the Spanish Parliament and to the local parliaments of those autonomous communities in whose territory nuclear facilities are located, a report on the development of its activities. This report complies with this such requirement.

The highest governing bodies of the CSN are the Board and the Presidency, whose members, as of 31st December 2018, were:

- President: Fernando Marti Scharfhausen (Royal Decree 1732/2012 of 28 December). Extended since 28 December 2018.
- Vice-President: Rosario Velasco García (Royal Decree 138/2013 of 22 February).
- Commissioner: Fernando Castelló Boronat (Royal Decree 139/2013 of 22 February).
- Commissioner: Javier Dies Llovera (Royal Decree 934/2015 of 16 October).
- Commissioner: Jorge Fabra Utray (Royal Decree 1028/2017 of 7 December). Extended since 28 December 2018.

The Board is assisted by a General Secretariat, whose head, on 31 December 2018, was Manuel Rodríguez Martí, appointed by Royal Decree 280/2017 of 17 March.

The General Secretariat of the Nuclear Safety Council, the Technical Directorate of Nuclear Safety, the Technical Directorate of Radiological Protection, the Directorate of the Technical Cabinet of the Presidency and the Sub-Directorates are the governing bodies of the Nuclear Safety Council, under the direction of the Presidency and the Board

The Presidency and the members of the Board carry out activities in the exercise of the competences assigned in Articles 26 and 36 of the Statute.

The Council also has an Advisory Committee for public information and participation, whose function is to propose and issue recommendations to improve transparency, access to information and public participation in matters within the competence of the Nuclear Safety Council

1.1. The CSN Board

The Board of the Council is the highest management body, responsible for the adoption of agreements on the exercise of all the duties foreseen in Article 2 of Law 15/1980, as well as on the exercise of any other functions attributed to the Nuclear Safety Council, as the only competent body in relation to nuclear safety and radiation protection.

In 2018, the Board held 30 plenary sessions or meetings, in which a total of 300 agreements were adopted. Practically all of these agreements were adopted unanimously.

The minutes of the Board sessions or meetings of the Nuclear Safety Council and the decisions supporting the agreements reached by the Board are available to the public at the CSN's institutional website (www.csn.es), in accordance with Article 14.2 of Law 15/1980.

1.2. CSN Commissions

In accordance with Article 24.4 of the Statute, "The Board may agree to create internal working commissions for the exercise of the specific functions determined for this purpose and with respect to which the final decision corresponds to the Plenary. The commissions of the

the Council have promoted the activities recommended to the organisation both in the areas of nuclear safety and radiation protection and in that of its regulations.

The Council's commissions are as follows:

Commission on Nuclear Safety and Radiation Protection

The Commission on Nuclear Safety and Radiation Protection is chaired by the President of the CSN and serves as the forum for the exchange of technical information between the members of the Board and the technical directorates of the regulatory body

Its objective is to inform the members of the Board on the projections regarding the issues to be raised to them in the short term as well as to favour open dialog on specific thematic areas and issues of significant interest and technical complexity.

In 2018, this commission held a session in which two single-issue presentations were made, one on the treatment of anomalous conditions in nuclear power plants and the other on exposure to radon.

Standards Committee

The Standards Committee is chaired by Counsellor Javier Dies Llovera. Representatives of the CSN bodies with responsibilities in the processes of drawing up standards, as well as members of the Ministry for Ecological Transition, participate in this meeting.

Its mission is to promote, monitor and control the CSN's regulation programme.

In 2018, the Standards Committee met once. Included among the matters reported to this committee during this period is the analysis of the elaboration process of Royal Decree 1400/2018, of 23 November, approving the Regulation on nuclear safety at nuclear facilities and the analysis

of the impact of Ministerial Order 1185/2017, of 21st November, regulating the declassification of residual materials generated at nuclear facilities.

Review Committee for Sanction Proceedings (CRES)

The priority function of the committee is to analyse proposals for sanction proceedings, warnings, precautionary measures, intervention, prohibition and cautions referred to article 2e) of Law 15/1980 and chapter XIV of Law 25/1964.

This committee is chaired by the General Secretary, Manuel Rodríguez Martí, and is made up of a representative from each of the two Technical Directorates as vice-presidents, as well as participants from different sub-directorates and units of the CSN. A lawyer from the Legal Advice Sub-Directorate acts as secretary thereof.

In 2018, the committee met six times. At these meetings, the starting of seven warnings and five sanction proceedings was proposed to the Board of the CSN.

The Management System and Information Security Committee

The Management System and Information Security Committee held seven meetings throughout the year. The issues dealt with in them are described below under heading 2.2 on the management system.

1.3. CSN Relationships

1.3.1. Institutional relations

One of the functions of the Nuclear Safety Council is to maintain official relations with State institutions at national, regional and local levels, as well as with professional associations and non-governmental agencies, highlighting, due to its special relevance and singularity, the institutional

relationship of the Nuclear Safety Council with the Congress of Deputies and the Senate.

Parliament

On an annual basis, the CSN submits to both Houses of the Spanish Parliament a report on the development of its activities in the field of nuclear safety and radiological protection.

During 2018, the Nuclear Safety Council was requested by the Ministry for Ecological Transition to provide information on a total of seven initiatives coming from different deputies and senators that made reference to issues related to nuclear safety or radiation protection.

The President of the CSN appeared on 11 April 2018 at the Commission for Energy, Tourism and the Digital Agenda in the Parliament, to respond to requests for appearance made by various parliamentary groups of the Commission. Likewise, on 6th November 2018, the Commissioners Javier Dies and Jorge Fabra, as well as the technical directors of Nuclear Safety and Radiological Protection, Antonio Munuera and M^a Fernanda Sánchez, respectively, reported in the paper about relations with the CSN, on the Ecological Transition Commission of the Spanish Parliament, in relation to the reports on the activities carried out by the Nuclear Safety Council during 2017.

During 2018, the Nuclear Safety Council submitted to Parliament information relating to the 1st, 42nd and 15th periodic resolutions deriving from the CSN activity reports for 2002, 2006 and 2007, respectively. Resolutions 1 and 42 on a three-monthly basis, and 15 on a six-monthly basis, are aimed at informing on technical specification compliance exemptions granted by the CSN to the licensees of the nuclear power plants, on the operation of these installations and on the results of the Integrated Plant Supervision System (SISC, in its Spanish acronym), respectively.

In relation to the resolutions of the Energy, Tourism and Digital Agenda Commission derived from the Activity Reports for 2014 and 2015, all those addressed to the Nuclear Safety Council were replied to, forty-eight in total, as well as to thirty resolutions of the CSN Activity Report for 2016.

Central State Administration

In the performance of its functions, the CSN maintains a relationship, established by its Law of Creation, with the Ministry for Ecological Transition, such that the CSN is required to issue reports to the aforementioned ministry, relating to nuclear safety, radiation protection and security, prior to the resolutions adopted by the latter in relation to the granting of authorisations, among others, for nuclear and radioactive facilities, transport, etc. Such reports shall be mandatory in all cases and shall also be binding when negative in their findings or when denying the granting of a licence and, likewise, as regards the conditions they lay down, if any. Collaboration is also maintained with this Ministry in the areas of meteorological information, nuclear safety and radiation protection through the State Meteorological Agency (AEMET). In addition, the CSN has agreements and develops activities with other ministries: with the Ministry of the Interior in matters relating to the security of nuclear installations; with the Ministry of Defence through collaboration with the Military Emergency Unit (MEU); with the Ministry of Public Works in relation to surveillance and control in the field of radioactive material transport; and with the Ministry of Health, Consumer Affairs and Social Welfare in matters relating to radiation protection for the safe use of procedures with ionising radiations.

Regional Administrations

The Nuclear Safety Council, according to the third additional provision of its Law of Creation, may entrust the autonomous communities with the exercise of some of its legally assigned competences

in accordance with the general criteria for their development agreed by the Council itself.

There are currently nine autonomous communities that have an agreement with the Nuclear Safety Council on inspection functions: Asturias, the Balearic Islands, the Canary Islands, Catalonia, Galicia, Murcia, Navarra, the Basque Country and Valencia. In the case of Catalonia, the Basque Country and the Canary Islands, the assignment covers the evaluation of certain radioactive facilities. For each of these communities there is a Joint Monitoring Commission made up of representatives of the autonomous community and the CSN, chaired by the General Secretariat of the Council, which meets at least once a year.

Decision agreements are subject to the audit plan established in the CSN Management System. During 2018, the CSN Inspection Unit carried out an audit of the assignment agreements established with the autonomous communities of Navarra, the Basque Country and the Canary Islands.

Local Administrations

As regards the institutional relations maintained by the Nuclear Safety Council with local administrations, its participation in the Local Information Committees should be highlighted, in accordance with the provisions of Article 13 of the Regulation on Nuclear and Radioactive Facilities, as well as its collaboration with the Association of Municipalities hosting nuclear Power Plants (acronym: AMAC).

Universities

In 2018, the CSN awarded the nominative subsidies foreseen in the General State Budgets to the Universidad Politécnica de Madrid, for the CSN Chair Juan Manuel Kindelán and the CSN Chair Federico Goded; to the Universidad Politécnica de Cataluña, for the CSN Chair Argos; and to the Universidad Politécnica de Valencia, for the CSN Chair Vicente Serradell. Each grant

entails funding by the Council for each Chair to the value of € 70,000 in an annual basis.

The purpose of the Nuclear Safety Council Chairs is to promote and encourage the training of highly qualified technicians in nuclear safety and radiation protection, through their own curricula, specialisation courses and active participation in related research projects.

Transparency and Good Governance Council

The Nuclear Safety Council is an organisation with the same obligations with respect to compliance with Law 19/2013, of 9th December, on Transparency, Access to Public Information and Good Governance, as the rest of the public administrations, as included in Article 2.1.c) of said law.

A specific Transparency section has been added to the CSN's institutional website, containing all the information corresponding to the Transparency Council's recommendations on voluntary transparency. A section has also been incorporated which includes those Resolutions of the Council for Transparency and Good Governance regarding complaints about requests for information from the Nuclear Safety Council.

1.3.2. International relations

The CSN's internal policy and strategy is translated into a set of technical and institutional activities carried out on two different planes: the multilateral, through international organisations, institutions and forums such as the European Union, the International Atomic Energy Agency (IAEA) and the European Nuclear Agency (NEA); and the bilateral, through technical cooperation and collaboration agreements with peer organisations, mainly with the United States Nuclear Regulatory Commission (NRC) and the French Nuclear Safety Authority (ASN). The different international conventions ratified by

Spain and in which the CSN participates, within its sphere of competence, in implementing the commitments acquired take on a special character.

1.3.2.1. Multilateral relations

European Union

Among the fundamental treaties that form the backbone of the European Union is the Treaty establishing the European Atomic Energy Community (Euratom), which addresses, among other issues, the basic regulatory framework in the field of nuclear safety and radiation protection.

Prominent in 2018 was the preparation of the second national report on the implementation of Council Directive 2011/70/Euratom of 19 July 2011 which established a common framework for the responsible and safe management of spent nuclear fuel and radioactive wastes. The latter also established participation in the organisation and development of the first European topical peer review on the management of ageing of EU nuclear power plants, an activity under the Nuclear Safety Directive 2014/87/Euratom.

The second national report on the application of Directive 2011/70/Euratom was submitted to the European Commission in August 2018.

Atomic Questions Group (AQG)

It is the working group of the Council of the European Union devoted to the study of issues referred to in the Euratom Treaty. Prominent among these activities is the participation and advisory work provided by the CSN to the Ministry for Ecological Transition, and to the Permanent Representation of Spain before the European Union in the context of the EU Council's Atomic Questions Group (AQG).

The presidency of the AQG is rotated by country every six months. In 2018, it was Bulgaria's turn during the first half of the year, and Austria's in the second half.

Among other matters, issues raised during the first half of the year included those about the coordination and participation in the 6th review meeting of the Joint Convention on the Safety of Spent Fuel Management and about the Safety of Radioactive Waste Management, and the revision of the Regulation on information requirements under Article 41 of the Euratom Treaty, concerning the obligation to notify the European Commission about new projects and industrial activities. In the second half of the year, during the Austrian presidency, proposals were initiated for the approval of the Council Regulation on assistance for the decommissioning of the Ignalina nuclear power plant in Lithuania, the Council Regulation for a financial programme for the decommissioning of nuclear installations and radioactive waste management, and the new Regulation of the European Instrument for International Cooperation in the area of Nuclear Safety.

European Nuclear Safety Regulators Group (ENSREG)

The European Nuclear Safety Regulators Group (ENSREG) is an independent consultative group made up of experts from the regulatory authorities of the EU Member States, set up in 2007 to advise the EU Council, Parliament and the Commission on nuclear safety and the safe management of radioactive residues.

In 2018, the CSN participated in the first safety *Topical Peer Review* on managing the ageing of nuclear power plants in the EU, an activity required by the 2014/87/Euratom Nuclear Safety Directive. The final report of the review exercise was adopted under the European Regulators' Association (ENSREG) in October 2018. The CSN contributed not only to the conception of the review process and to the review itself as a member of the ENSREG association, but also by providing experts for coordination and review on the part of

the thematic groups created to coordinate and lead the review process.

Within the scope of this association, the CSN has since 2014 headed the working group dedicated to Nuclear Safety and International Cooperation (WG1). From this group, the CSN has coordinated the revision of the ENSREG work plan and has followed up on the obligations of the Nuclear Safety Directive, as well as other promising commitments assumed within the scope of the association.

Regulatory Assistance Activities

The Atomic Questions Group of the Council of the European Union addressed the revision of the European Instrument for International Cooperation on Nuclear Safety (INSC) in 2018. Under this instrument, the CSN participates in the development of several INSC projects dedicated to the improvement of the regulatory infrastructure of beneficiary countries. Specifically, in 2017, the European Commission awarded the Moroccan nuclear regulator assistance project (INSC MO3.01/15) to the consortium in which the CSN participates, in which it leads all the technical content. The project was launched in 2018.

In parallel, the CSN has representatives on expert committees on various Articles of the Euratom Treaty itself (Articles 31, 35, 36 and 37) and participates in other initiatives, committees and working groups of a technical nature arising from it.

ENSREG members are invited to contribute providing experts in technical cooperation activities with neighbouring countries. In this respect, in March 2018, the CSN participated in the international review team regarding the results of the endurance tests in Belarus.

International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency (IAEA) is an agency under the United Nations system

whose mission is to promote the contribution of atomic energy to peace, health and prosperity throughout the world. One of its fundamental objectives is the development and promotion of high standards of technological and physical safety in the peaceful applications of nuclear energy in its Member States, which it advocates through the development of regulations of an advisory nature.

The CSN actively participates in the IAEA activities, both in the governing bodies of the organisation and in technical committees and working groups in the field of safety and security, and in scientific and technical meetings, as well as in IAEA international missions.

In addition to the technical participation of experts, the CSN also makes economic contributions to the maintenance of the programmes and activities of the Organisation. In 2018, it provided a contribution of € 452,920 to radiological and nuclear safety projects in Latin America, a translation of safety standards, and technical cooperation projects in regions of interest to the CSN and Spain (especially Latin America and Africa).

General Conference

The IAEA General Conference is held annually in Vienna. In 2018, it was held between 17 and 21 September. The CSN delegation was headed by the President of the CSN. The CSN supported Spain's Department of Foreign Affairs and International Cooperation (MAEC) to draft the national statement.

In parallel to the general conference, meetings were held with senior officials of the International Agency and several gatherings and meetings were held within the framework of the Ibero-American Forum of Radiological and Nuclear Regulatory Bodies (FORO), the International Nuclear Regulators Association (INRA), as well as

bilaterally with Australia, the United Arab Emirates, Japan and Poland.

Committees and working groups

The IAEA develops and continuously reviews a standard regulatory framework of advisory character, agreed internationally and used as a reference by Member States to develop their own national frameworks.

The IAEA has the Commission on Safety Standards (CSS), in which national participation and representation is assigned to the CSN commissioner Javier Dies.

The CSN actively participates in the working groups and development and revision committees of the IAEA standards and reference guides.

During 2018, CSN experts attended various meetings in which topics such as the control of radioactive sources, response to nuclear and radioactive emergencies, management of severe accidents, security, safety of facilities in the face of seismicity or knowledge management were dealt with.

IAEA International Missions

The IAEA coordinates international review missions regarding compliance with standards, requirements or good practices in the field of nuclear safety, radiation protection and security in Member States. The CSN supports the development of peer review missions to other countries at the request of the IAEA, through the participation of CSN representatives in the review teams.

In 2018, the CSN contributed experts to the International Regulatory Review Service (IRRS) missions in Chile and Luxembourg, and to the management review of radioactive residues and spent fuel, dismantling and remediation programmes (ARTEMIS) mission in France. In

addition, in 2018 Council technicians participated in other IAEA missions in Mozambique, Ecuador, Costa Rica, Panama, Belarus, Cuba and the United Arab Emirates.

Joint IRRS-ARTEMIS Mission

Special mention should be made of the joint IRRS-ARTEMIS mission hosted by Spain from 15th to 26th October 2018, organised by the Nuclear Safety Council (CSN), the Ministry for Ecological Transition (Miteco) and the Spanish radioactive waste management agency (ENRESA). This was the first time that the IAEA conducted two different peer reviews missions combined in a single one.

NEA/OECD

The mission of the Nuclear Energy Agency (NEA), of the Organisation for Economic Co-operation and Development (OECD), is to assist Member States in the development and maintenance of the scientific, technological and legal bases necessary for the peaceful, safe, economical and environmentally sound use of nuclear energy.

In 2018, the CSN continued to participate actively in the NEA Steering Committee and the main technical committees, which make up different working groups and supervise international research projects and databases in their thematic area.

At present, the CSN participates in the main committee and in seven of the eight major committees of the NEA, in more than 30 working groups and subgroups and in specific activities dependent on them, as well as in some 15 research projects and international databases coordinated by the international association.

Other regulatory groups

Within the multilateral framework, the CSN is a member of several regulators associations freely set up on the common will to cooperate in addressing

global regulatory policy issues and challenges and to identify and explore opportunities to improve the regulation of nuclear safety, radiation protection and security.

International Nuclear Regulators Association (INRA)

This association brings together the most experienced regulatory bodies in the field of nuclear regulation (Canada, France, Germany, South Korea, Spain, the United States, the United Kingdom, Japan and Sweden).

In 2018, the CSN participated in the meeting held in Vienna during the IAEA General Conference. It addressed issues such as the new International Nuclear and Radiological Events Scale (INES) manual and cybersecurity requirements at nuclear facilities.

Western European Nuclear Regulators Association (WENRA)

The WENRA association comprises the regulatory authorities of countries with operating or decommissioned nuclear reactors in the EU, Switzerland and the Ukraine. The main objective of this association is to harmonise the main technical standards and regulatory practices on nuclear safety and radioactive waste management among its member countries, contributing to the continuous improvement of safety. The CSN participates both in the meetings of the WENRA plenary group and in its technical working groups. The 2018 WENRA meetings served to guide the strategy on the future of membership, in which its objectives were redefined and its organisational structure and possible future activities were discussed.

Ibero-American Forum of Radiological and Nuclear Regulatory Bodies (FORO)

The FORO is an association comprising the radiological and nuclear safety regulatory bodies of Argentina, Brazil, Chile, Colombia, Cuba, Spain, Mexico, Paraguay, Peru and Uruguay. Its main

objective is to promote a high level of safety in all practices using radioactive materials or nuclear substances in the Ibero-American region.

In 2018, the Forum's plenary met in Brasilia, highlighting as the most important issue the Strategy Action Plan 2017-2022, with challenges aimed at strengthening the culture of safety in the region. In addition, within the framework of the IAEA General Conference in Vienna, the representatives of Foro were received by the IAEA's Deputy Director General for Nuclear Safety and the Deputy Director General for Technical Cooperation to strengthen and certify cooperation between the two organisations, in addition to presenting the latest developments in ongoing projects.

Heads of European Radiological Protection Competent Authorities (HERCA)

The objective of this association is the analysis of the practical application of European directives and regulations on radiological protection, with a view to promoting harmonised working practices.

The CSN participates in the meetings of the HERCA plenary group, as well as in its working groups. The HERCA Steering Committee met twice in 2018. On both occasions with the participation of a delegation from the Council led by the vice-president of the CSN, Rosario Velasco. In the first meeting, the actions developed by the medical activities working group were highlighted. In addition, the results of the first meeting of the working group on sources of natural radiation were presented. At the second meeting, the conclusions of the survey carried out by the countries in relation to the activity of this association (HERCA) during the last ten years were presented.

European Nuclear Security Regulators Association (ENSRA)

The CSN continues to participate in the European Nuclear Security Regulators Association

(ENSRA), which is independent of the European Commission and was created by the interest of the associates themselves as a forum for the safe exchange of information and experiences on the application of different practices of security in nuclear power plants and other nuclear facilities.

International conventions on nuclear safety, radiation protection and security

Convention on Nuclear Safety

The Convention on Nuclear Safety was established in 1996 with the objectives of achieving and maintaining a high level of nuclear safety throughout the world and preventing accidents with radiological consequences and mitigating them should they occur.

The contracting parties to the Convention on Nuclear Safety hold review meetings, at three-yearly intervals, at which national reports drawn up by the contracting parties are examined with a view to exchanging information and sharing lessons learned with the other contracting parties, with a view to improving the nuclear safety of nuclear power plants. A new review meeting of the Convention on Nuclear Safety will be held at the end of March 2020. In October 2018, in preparation for this meeting, which will conclude the work of the eighth review meeting of the convention, the organisational meeting was held at IAEA headquarters, which served to discuss and reach a consensus on issues related to the practical development of the review process and in particular with the next review meeting.

Joint Convention on Safety of Spent Fuel Management and Safety in Radioactive Waste Management

This convention addresses the safety of radioactive wastes and spent fuel management, establishing as its main objectives to achieve and maintain throughout the world a high degree of safety in the management of spent fuel and radioactive wastes, in order to protect people and the environment,

both now and in the future, and to prevent and mitigate accidents with radiological consequences.

The sixth review meeting of the Joint Convention was held in Vienna from 21 May to 1 June 2018. Spain's national report and presentation to the Joint Convention summarized the activities carried out in fulfilling the obligations of the Joint Convention and the commitments made since its previous edition.

Convention on the Protection of the Marine Environment of the North-East Atlantic (OSPAR)

The fundamental objective of the Ospar Convention is to conserve marine ecosystems, human health and to protect and restore as far as possible marine areas that have been negatively affected by human activities by preventing and eliminating pollution.

The CSN participates as Spain's representative on the Ospar Convention's Radioactive Substances Committee (RSC). Subjects covered include those related to nuclear and non-nuclear facilities and activities (radioactive facilities and NORM industries), which may result in radioactive releases into the Atlantic Ocean, either directly or through river basins. In February 2018, experts from the CSN attended this committee in Sweden. The Nuclear Safety Council will host the meeting of this committee in 2019.

1.3.2.2. Bilateral relations

For the CSN, relationships with counterpart regulatory bodies in other countries are of great importance. Along these lines, the Council has signed several bilateral cooperation agreements, the main objective of which is to lay the foundations for co-development and the exchange of technical information and regulatory experience.

During 2018, close cooperation with the regulatory agencies of the United States and France continued through numerous joint activities at

institutional and technical levels. In addition, bilateral relations with countries of geo-strategic interest in the regions of Latin America, North Africa and the Middle East and with Australia, Bangladesh, China, Japan, Jordan and Russia were fostered in 2018 on the basis of high-level bilateral meetings, technical visits and information exchanges with representatives of their regulatory bodies. The activities carried out with Portuguese and Moroccan regulators were of special importance.

United States of America

The framework agreement between the United States Nuclear Regulatory Commission (NRC) and the Nuclear Safety Council regulates the continuous exchange of technical information and cooperation in the field of nuclear safety. In 2018, as on previous occasions, the CSN participated in the Regulatory Information Conference (RIC), an event organised annually by the NRC with the aim to disseminate its lines of work. In parallel with the conference, meetings with senior NRC representatives and other technical meetings are organised.

The exchange of information and technical visits between the CSN and the NRC continued throughout 2018, the emphasis being on technical cooperation in areas such as probabilistic safety analysis, the use and maintenance of codes and calculation tools in different areas, the capacities and requirements for training at nuclear fuel cycle facilities, the organisation and resources available for emergency response, the standards applicable to temporary wastes storage and transport of casks for spent fuel and the licensing examinations of nuclear power plant operating personnel.

France

The CSN continued to collaborate actively with the French Nuclear Safety Authority (ASN) during 2018. Specifically, mention should be made of the collaboration between experts from both countries

in different working groups, and especially the Spain-France Nuclear Industry Conference held in Paris at the Spanish Embassy in March 2018, during which Commissioner Javier Dies gave a presentation on the main regulatory functions and activities of the Nuclear Safety Council. In addition, he referred to the most relevant aspects for the safety of nuclear power plants, such as the ageing mechanisms of structures, systems and components, or the application of lessons learned, the evaluation of radiological impact and the training of personnel.

Morocco

On the occasion of the establishment of a regulatory body in Morocco, the Moroccan Agency for Nuclear and Radiological Safety (AMSSNuR), the CSN promoted the drawing up of a Memorandum of Understanding (MoU) for this purpose, which was signed by the President of the CSN and his Moroccan counterpart in 2018.

1.3.3. Public Information and communication

In accordance with the Law by which it was created, the Nuclear Safety Council must inform the public on matters within its field of competence. This obligation on the CSN, as a body under public law, is of special importance. Thus, the empowerment, systematization and characterization of a comprehensive information and communication system at the CSN, has established itself as a transparency-related strategic line within the existing Strategic Plan.

Information for the media and other activities

In 2018, 109 informative briefing notes were issued, addressed to the media and to institutions interested in the body's areas of competence. In addition to the incidents registered at nuclear and radioactive facilities, prominent from a thematic point of view were the main agreements of the Board, the most significant actions of the Council

in institutional and international spheres, as well as the mandatory emergency drills carried out each year. Thirty-three articles and reviews relating to reportable events were published on the CSN institutional web page, in accordance with the current incident reporting criteria.

In addition, replies were provided to 149 requests for direct information made by the media, special attention being paid to issues relating to the dissemination of information and the management of communication relating mainly to three issues: the licensing process of the Centralised Temporary Storage facility in Villar de Cañas, the licensing process on the activities of Berkeley Minera España in Salamanca and the radiological surveillance maintained by the CSN on potential radioactively contaminated sites, such as: El Hondón, Palomares, Banquetas del Jarama, phosphogypsum pools, etc., where it is estimated that there is no significant radiological risk.

The communication area developed a specific Communication Plan in 2018 for the monitoring and dissemination of the results of the combined IRRS-ARTEMIS peer review mission, which the International Atomic Energy Agency (IAEA) carried out on the infrastructure and the national regulatory system during October and organised a press conference to inform the media about the preliminary results of this verification mission.

CSN on the Internet

A new feature for 2018 was the creation of the section's institutional website: "Radón", through which the public can consult the cartography of Spain's radon potential via two links: a map of Spain's radon potential and a map of the municipalities in which part of the population resides in priority action areas.

Throughout 2018, the necessary work was also carried out to feed the "Transparency" section of the institutional website, launched in 2017, in

compliance with Law 19/2013 of 9 December on Transparency, Access to Public Information and Good Governance. This section contains information included in the active advertising section, including institutional and organisational, regulatory and economic information.

In the section on social networks, the regulatory body's Twitter account (@CSN_en) reached 4,398 followers in 2018 and has consolidated itself as an efficient tool for transmitting information on regulatory news, the updating of standards, advances in nuclear safety and radiological protection or relevant activities at institutional and international level.

Information for citizens

One of the challenges facing the CSN is to bring information closer to society and to maintain a proactive policy using all the means and tools at its disposal in order to try to reach citizens directly using the following channels:

Edition of publications

During 2018, a total of 11 new titles were published in paper format (books; the *Alfa* magazine, regulations, brochures and posters) within the framework of the publication plan, with a circulation of 13,900 copies and two more publications in exclusively electronic format. Twenty-three works were reprinted with a print run of 31,800 copies, most of which were distributed from the Information Centre and the various congresses.

Distribution of publications: 41.646 copies: just over half were distributed from the Information Centre.

Information Centre

The CSN Information Centre celebrated its 20th anniversary in 2018. Since its inauguration in 1998 until 31 December 2018, it received a total of 135,659 visitors. This year it received 322 visits

from a total of 8,036 visitors, 7,823 of the visitors were from educational centres, 204 from different institutions and nine were private individuals. For the first time, the centre received more than 8,000 annual visitors.

In addition, as is customary, in November 2018, the CSN collaborated with the Community of Madrid in the open days that are held every year as part of the activities of the Science Week, receiving visits from groups and individuals interested in learning about the activities of the Nuclear Safety Council.

A new feature is the implementation of an application for mobile devices, in the form of an augmented reality game that has been made available to visitors.

Other activities

Among the activities carried out by the organisation to get information to the public is its attendance of congresses, seminars and exhibitions that are organised during the year. Thus, the CSN was visible during 2018 as it had a stand at:

- The 44th Meeting of the Spanish Nuclear Society held from 25th to 28th September in Ávila.
- Conama 2018 (the national congress on the environment), held from 26th to 29th November in Madrid.
- The 10th Conference on Quality in Environmental Radioactivity Control, held from 19th to 22th June in Bilbao.

1.4. Advisory Committee for Public Information and Participation

The Advisory Committee for public Information and Participation on nuclear safety and radiation protection was created under article 15 of Law 15/1980, with the

mission of issuing recommendations to the CSN on bolstering and improving transparency, access to information and public participation in matters within the competence of the CSN. It comprises representatives from civil society, business community, trade unions and public administrations, at state, national, regional and local levels.

All the information on the activities of the Advisory Committee can be found on the CSN website (www.csn.es).

Two meetings were held during 2018:

First, on 7th June 2018, the 15th meeting of the Advisory Committee took place, which presented the status of compliance with the recommendation proposals received by the members of the committee and the actions taken.

Second, the 16th meeting of the Advisory Committee was held on 16th November 2018, during which the Chairman reported on the IRRS-ARTEMIS mission carried out by the IAEA from 15th to 26th October 2018. Addressing the Spanish State, he reported on the nature of the review mission led by the International Atomic Energy Agency (IAEA) regarding the regulatory infrastructure in relation to nuclear safety and radiation protection. The CSN also provided information on the radiological situation in the existing ditches on the banks of the Canal Real del Jarama (Banquetas del Jarama) As well as announcing that 25 new posts would soon be available on the CSN's Technical Divisions on Nuclear Safety and Radiation Protection, as part of the public employment offer for 2018.

2. Strategy and Resource Management

2.1. Strategic Plan

The main objective of the 2017-2022 Strategic Plan is safety, which is understood to comprise nuclear safety, radiation protection and security, based on credibility as a basic sub-objective, and on four instrumental objectives: effectiveness and efficiency, transparency, neutrality and independence. Furthermore, the values on which the CSN relies for the performance of its functions and for compliance with its objective are established. The values defined are: independence, rigour, truthfulness, competence, excellence, responsibility and commitment.

The Plan establishes the strategic objectives and identifies the instruments for achieving the objectives and policies of the organisation, which, together with the compliance indicators for their measurement, form the strategy to be followed by the organisation during the coming years and which should be specified in the annual work plans that include the outstanding activities and other activities to be carried out during the year, as well as numerical objectives (scorecard indicators), these plans being approved by the CSN Board. It also incorporates a chapter relating to CSN policies, in which the main policies of the Organisation developed in the Management System Manual are set out.

The Strategic Plan is developed in plans and programmes, including the Annual Work Plans (AWP), approved by the Council Plenary. The 2018 AWP was approved at the Plenary Meeting of 7th March 2018 and includes the outstanding activities for 2018 approved in the Plenary Meeting of 12th December 2017.

2.2. Management System

The management system is driven by the Management System and Information Security Committee, which in 2018 was chaired by Commissioner Fernando Castelló, with Commissioner Javier Dies acting as vice-chairman and whose functions include proposing the CSN's strategy as regards the management system, developing it and overseeing its implementation. As well as carrying out the review of the management system, analysing the evaluations of the processes and activities of the CSN, proposing, implementing and supervising the improvement plans.

Procedures and in-house audits

The CSN has implemented a process-based Management system based on the requirements of the IAEA (GS-R-3, Facility and Activity Management System) and the ISO 9001 standard: 2008 Quality management systems Requirements. The system is described and developed in manuals and procedures.

The *Management System Manual* contains a general system description, as well as an overall description of documentation developing the system. As part of the IRRS (*International Regulatory Review Service*) action plan, the CSN is revising the Management System Manual in order to adapt it to the requirements of the IAEA, GSR part 2 Leadership and management for safety and to the ISO 9001-2015 standard.

During 2018, 32 procedures were edited or revised, of these 18 were management procedures, nine were administrative procedures and five were technical procedures.

The management system implemented at the CSN requires that the entire organisation be subject to a process of continuous improvement. In addition to the evaluations of compliance with plans and

objectives, the CSN has an in house audit plan in place and is systematically subject to external assessments by national and international bodies. The basic plan of in house audits is divided into two parts, one for the activities of the CSN and the other for the activities performed by the autonomous communities where specific functions have been delegated.

At the meeting of the Management System and Information Security Committee held on 16th December 2017, it was agreed that only the in house audits planned for the Autonomous Communities would be carried out, and the audits planned for 2018 would be completed with the review of subjects covered by the IRRS mission.

In 2018, the CSN carried out in house audits of the functions of the Autonomous Community of Navarra, the Community of the Basque Country and the Community of the Canary Islands.

The processes audited in the IRRS-ARTEMIS mission carried out by the IAEA in October 2018 were:

- Responsibilities and functions of the Government.
- Global nuclear security regime.
- Responsibilities and functions of the regulatory body.
- Sanctioning system and coercive measures.
- Management of the regulatory body.
- Authorisation of nuclear and fuel cycle installations.
- Evaluation of nuclear and fuel cycle facilities.

- Supervision and control of nuclear and fuel cycle installations.
- Authorisation and evaluation of radioactive facilities.
- Supervision and control of radioactive installations.
- Authorisation, evaluation, supervision and control of technical services (RPS, PDS, and TURP).
- Transport.
- Control of medical exposures.
- Occupational Radiation Protection.
- Radiological surveillance and control of the public and the environment and the situation of existing exposures.
- Emergency response and preparedness.
- Development of regulations and guides.

Training Plan

The Nuclear Safety Council has paid close attention to the training of all its personnel since its creation. This is materialised in the annual training plans.

In 2018, the Training Plan was structured into seven programmes: nuclear safety and radiation protection technician (subdivided into four sub-programmes: nuclear safety, radiological protection, transversal management areas and initial technical training); managerial development; administrative and legal management; prevention; information technology; languages and skills.

The total number of training activities carried out was 113. The total number of hours of staff training was 21,467.

The Budget approved by the Plenary for the Training Plan was € 560,000, having executed € 250,049.46, which is 44.65%.

Knowledge Management

Knowledge management is defined as an integrated and systematic approach aimed at identifying, managing and sharing the knowledge of an organisation, and enabling groups of people to collectively create new knowledge to facilitate the achievement of the organisation's objectives.

In 2016, the CSN developed an action plan on this subject, focusing on the preservation and recovery of the knowledge and experience of CSN technicians nearing retirement age. As a result of this action plan, 16 knowledge books have been developed; each one including the workplace profile, the domains of knowledge, the relational framework, documents linked to the workplace (procedures and processes), experiences, knowledge gained (narratives, fact sheets, audiovisual pills), and knowledge products (series, transfer workshops, etc.). This knowledge management process has been named the RECOR process.

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

In 2018, with the help of an external organisation specialised in this area, progress was made in the development of the methodology and implementation of knowledge management, which should be understood as the set of all the activities needed to generate an environment in which to detect, produce, transfer, use and improve the knowledge of the organisation.

In 2018, the RECOR process was continued, validating all the processes of previous years, recording the documentation obtained in success cases, lessons learned or good practices from its ordinary activities and/or special projects.

Communication Plan

The thirty-seventh resolution approved by the Commission on Ecological Transition of the 2014 and 2015 annual reports of the Nuclear Safety Council urged the CSN to publish the Communication Plan on its institutional website. For this reason, in April 2018, the full publication of the aforementioned Plan was carried out, which can be consulted in the Transparency section of www.csn.es.

Likewise, in the first semester of 2018, this document was translated into English so it could be consulted by the group of experts that composed the Joint IRRS-ARTEMIS mission, if they considered this appropriate.

2.3. Research and Development

One of the functions of the CSN is to establish and monitor research plans in relation to nuclear safety and radiation protection. One of the elements for compliance with this function is the CSN R&D Plan. In 2016, the CSN approved the R&D Plan for the period 2016-2020.

Throughout 2018 a total of 50 R&D projects were managed, of which 11 are new projects approved in 2018 by the Plenary Meeting of the CSN. During 2018, the closure was completed of projects subsidised by the CSN through the call for R & D grants published in the BOE (Official State Gazette) of 26th July 2012.

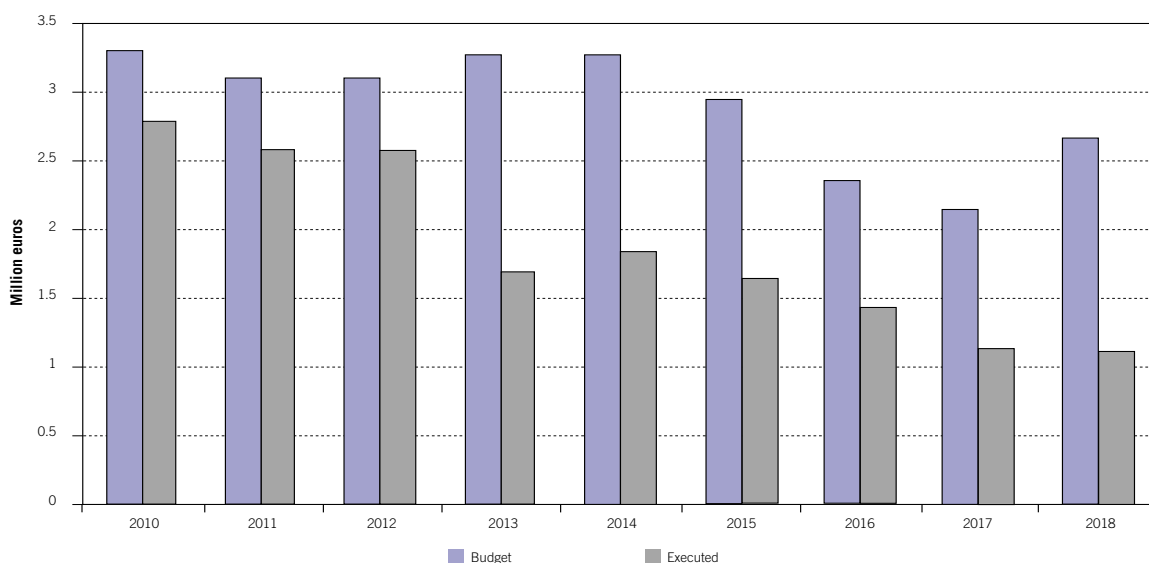
The budget allocated to R&D in 2018 was € 2,675,000. € 1,126,850 was paid out of this budget, representing an execution of 42.13%. The

evolution of the CSN R&D budget in recent years is shown in figure 2.3.

In 2018, the annual R&D workshop was held at the CSN headquarters. The overall R&D

results for 2017 were presented, along with the results and returns for several R&D projects in which the CSN participated, in the areas of both nuclear safety and radiation protection.

Figure 2.3. Evolution of the CSN R&D budget (2010-2018)



2.4. Resources and Means

2.4.1. Human Resources

As of 31 December 2018, the total number of personnel in the Agency was 439, as detailed in table 2.4.1.

The number of women in the Nuclear Safety Council represents 52% of the total workforce, the remainder, 48%, being men. The average age of the Agency's staff is 53 years.

The qualifications of the personnel who lend their services on the Council are: higher qualification 70.39%, average qualification 5.70% and others 23.91%.

By Royal Decree 1417/2018, of 3rd December, Antonio Eduardo Munuera Bassols ceased to be the technical director of nuclear safety.

In 2018, eight jobs were filled under the free designation system.

By Resolution of 27th December 2018, of the Presidency of the Nuclear Safety Council, eight new technician on nuclear safety and radiation protection, civil servants, for the Council were appointed, corresponding to the 2017 government job vacancies announcement.

Royal Decree 955/2018, of 27th July, approved the public employment offer for 2018, offering twenty-five places in the technical

staff on nuclear safety and radiation protection, which were called for by Resolution of 15th November 2018, of the Presidency of the Nuclear Safety Council.

The thirteenth application of the model for recognition of the career experience of officials serving on the Council took effect on 1st October 2018 and affected 20 officials.

Tabla 2.4.1. Distribution of Nuclear Safety Council personnel as of 31 December 2018

	Council	General Secretary	Technical directorates	Total
Senior officials	5	1	1	7
Officials of the Technical Corps of Nuclear Safety and Radiation Protection	7	14	196	217
Officials from other Public Administrations	5	88	35	128
Temporary staff	25	–	–	25
Employees	2	42	18	62
Totals	45	144	250	439

2.4.2. Financial resources

In economic and financial matters, the CSN is governed by the provisions of General Budgetary Law 47/2003, of 26th November 2003, in as much as it is an entity that forms part of the state administrative public sector and is, therefore, subject to the public accounting scheme and to the Accounting Regulations and rules applicable to the State's Administration.

Economic aspects are broken down into into budgeting items and financial items. The Regulatory body's accounting complying with the requirements of the general public accounting plan (Order EHA/1037/2010, of 13th April).

Annually, the CSN draws up a proposal for the pre-assumption of expenses and revenues, which is integrated into the General State Budget for approval by the Parliament. The CSN's initial budget for the 2018 financial year, amounted to €

46,937 thousand. This total initial budget did not change during the year. The budget increased 0.92% compared to the previous year.

The total year's net recognised rights, as a result of the income management process, amounted € 46,075 thousand. As regards revenues, service fees were the main source of financing for the CSN, representing 96.91% of the total, the remaining 3.09% corresponding to current transfers and subsidies, financial revenues and other management revenues.

In terms of expenditure, staff costs accounted for 61.90% of the total. Staff costs include personnel wages, social security contributions made by the employer and social welfare costs.

In second place were external supplies and services (30.60%), the fundamental components of which were jobs carried out by contractor companies, the cost of consumable supplies and communications.

The remaining costs relates to depreciation allowances (3.49%), transfers and subsidies for nuclear safety and radiation protection, postdoctoral fellowships and transfers abroad (2.22%). Lastly, there are other minor expenses that include taxes, financial expenses, other ordinary management expenses and the impairment of financial assets.

The year showed a positive result of € 6,202 thousand.

2.4.3. IT resources

The use and improvement of corporate applications that incorporate technological and usability upgrades has continued in 2018, 27 corporate applications were subject to technological modifications. The CSN's ICT adaptation process to Law 39/2015, of 1st October, on the Common Administrative Procedure of Public Administrations, has for all intents and purposes been completed, in relation to the Electronic File, Telematic Registration, Virtual Office, Platforms of intermediation with the National Government, Notifications, etc. There are special access configurations to large organisations such as ENRESA, the Community of Madrid, etc.

The development of the new application (INUC) for optimized CSN activity management, has been completed: electronic files on the nuclear and fuel cycle installations.

During 2018, an independent entity carried out the mandatory risk analysis/security audit of the CSN information systems by virtue of compliance with the requirements of the National Security Scheme (NSS). Among its conclusions, it is worth highlighting that in the three frameworks: organisational, operational and protection, the CSN presents an average degree of maturity of around 69%; in the emergency room continuity centre, 70%; and, in the contingency centre of the CSN calculation centre, 78%.

In the systems section, the completion of the installation of the CSN's secure network infrastructure in the Emergency and Security Sub-Directorate should be mentioned as a noteworthy project.

In the section on networks and communications, among the most noteworthy actions, mention should be made of the improvement of the CSN's data processing centre and the network access control systems designed to improve the security of the organisation's local network, and to prevent unauthorised access and other threats. Mention should also be made of the updating of operating systems and network switches.

From the point of view of in-training safety, the CSN has continued to apply its plan for adaptation to the national security scheme (PAENS), as a development of Royal Decree 3/2010, as well as Royal Decree 951/2015.

Chapter II. Report on Activities

3. Overview of Nuclear Safety and Radiation Protection, 2018

The overall assessment of the operation of the authorised facilities is performed fundamentally considering the results of the Integrated Supervision System of nuclear power plants (SISC), as well as the inspection, supervision and control of the radioactive facilities; reported events, especially those classified on the IAEA International Nuclear and Radiological Events Scale (INES Scale) with a level greater than zero; the radiological impact; the dosimetry of the workers, the relevant modifications proposed; the warnings and sanctions; and the operating events thereof.

The environmental quality surrounding nuclear installations is maintained in acceptable conditions from a radiological point of view, without any risk to persons as a consequence of their operation or of the dismantling or decommissioning activities performed.

For their part, the radioactive facilities have operated within the established safety margins.

3.1. Safety at the Facilities

3.1.1. Nuclear power plants

The Integrated Nuclear Power Plant Supervision System, SISC, currently constitutes the main instrument for assessing the performance of the plants from the point of view of safety, the planning of the CSN's supervision and control planning and as well as communicating to the public of these two issues.

At the end of 2018, all plants were in licensee response mode (LR), except for the Ascó II nuclear power plant, which had been in

regulatory response (RR) mode since the second quarter of 2018 due to a 'white-colour finding', relative to the downtime of a diesel generator due to the failure of a sleeve whose service life had been exceeded and whose anomalous condition had not been reported. Table 4.2.2.3 shows the state of the action matrix corresponding to 2018.

Table 3.1.1.1 describes the characteristics of the different modes of the action matrix:

The CSN institutional website has a specific link to the SISC (<https://www.csn.es/sisc/index.do>), which includes, updated quarterly results for all the nuclear power plants, as well as system results and the operative information supporting them, as well as the descriptive documentation and the corresponding procedures.

The total number of inspections performed at the nuclear power plants during 2018, including the Santa María de Garoña nuclear power plant, was 158. Of the total number of inspections, 115 are from the Basic Inspection Plan (BIP).

In application of the provisions of CSN Instruction IS-10, on criteria for the reporting of events at nuclear power plants, by which the criteria for the reporting of events to the CSN are established, the licensees of nuclear power plants reported 39 events in 2018. All were classified as level 0 on the International Nuclear Events Scale (INES).

The CSN issued seven warnings in 2018: four to Almaraz nuclear power plant; two to Ascó nuclear power plant and one to Cofrentes nuclear power plant. In addition, the CSN proposed the opening of two sanction proceedings: one against the Vandellós II nuclear power plant and the other against the Ascó nuclear power plant.

Table 3.1.1.1. SISC Action Matrix

Modes	Rationale	Derived actions
Licensee response	A plant is in this column when all the results of the evaluation are <i>green</i> .	The CSN will only carry out the basic inspection programme and the deficiencies identified will be dealt with by the licensee within its programme of corrective actions.
Regulatory response	A plant finds itself in this column when one or two of its results are <i>white</i> , whether they are performance indicators or findings after inspections, on different pillars of safety and where no more than two <i>white</i> results are in one strategic area.	The operator must carry out an analysis to determine the root cause and contributing factors and include the actions necessary to resolve the identified deficiencies in its programme of corrective actions. The assessment performed by the licensee shall be subject to a supplementary inspection by the CSN. Following this inspection, the CSN will hold a meeting with the licensee to analyse the deficiency detected and the actions taken to correct the situation.
A degraded pillar	A pillar is considered to be degraded when there are two or more results in the same pillar, be they <i>white</i> or <i>yellow</i> . A plant finds itself in this column when it has a degraded pillar or three <i>white</i> results in one strategic area.	The operator must carry out an analysis to determine the root cause and the contributing factors, and include in their programme of corrective actions the necessary steps to resolve the detected deficiencies, both with regard to the problems identified in each issue, as well as the set of deficiencies and collective problems that may have been revealed. The assessment performed by the licensee shall be subject to a supplementary inspection by the CSN. Following the inspection, the CSN will hold a meeting with the licensee to analyse the deficiencies detected and the actions undertaken to correct the situation.
Multiple degradations	A plant finds itself in this column when it has several degraded pillars, several <i>yellow</i> results or a <i>red</i> result when a pillar has been degraded for five or more consecutive quarters.	The operator must carry out an analysis to determine the root cause and the contributing factors, and include in their programme of corrective actions the necessary steps to resolve the detected deficiencies, both with regard to the problems identified in each issue, as well as the set of deficiencies and collective problems that may have been revealed. This evaluation may be carried out by a third party, independent of the operator. The CSN will carry out a supplementary inspection to determine the breadth and depth of the deficiencies. After the inspection, the CSN will decide whether additional actions are required on its part (additional inspections, the requesting of additional information, the issuing of instructions and/or the shutdown of the plant).
Unacceptable Performance	The Council places a plant in this situation when it is not sufficiently assured that its operator is able to operate the plant without the latter supposing an unacceptable risk.	The CSN will meet with the licensee's management to discuss the degradation of operation and the actions to be taken before the plant can be brought back into operation. The CSN will prepare a specific monitoring plan.

3.1.2. Juzbado Fuel Assembly Factory

The overall operation of the Juzbado factory worked in an appropriate manner from the point of view of safety, correctly managing any notifiable events that occurred, carrying out the corresponding analyses and applying the corrective actions derived from these analyses. In 2018, the factory reported five events none of them resulting in risks for the workers, the public or the environment

On 13th November 2018, the Ministry for Ecological Transition issued Enusa S.A., the SME owner of the Juzbado factory, with a sanctioning resolution for non-compliance with the Operating Specifications, as regards the hourly surveillance to be performed in the event of the factory's fire protection system being out of order.

3.1.3. El Cabril Radwaste Disposal Facility

From the tracking and control of operations, evaluations of the periodic reports submitted by the facility and the inspections performed by the CSN, it can be concluded that the activities at El Cabril were performed in accordance with with existing regulations and operating license limits and conditions.

The licensee has continued with periodic surveillance regarding the quantity of water accumulated in the water tanks of the leachate collection network in cell 29 of the East platform. The licensee has reported on the collection of water from cell 29 in accordance with the Operating Technical Specifications.

During 2018, there was no notifiable event in the installation.

3.1.4. Public Research Agency for Energy, Technology and Environment (CIEMAT)

CIEMAT is a unique nuclear installation with operating authorisation granted by resolution of

the Ministry of Industry and Energy on 15th July 1980. On 3rd February 1993, the Directorate General for Energy of the Ministry of Industry, Commerce and Tourism issued the centre's catalogue of nuclear and radioactive facilities. In the latter, there are two different groups: one including those facilities: that are not in operation, in the dismantling phase for decommissioning, or that have already been decommissioned; and another group made up of 21 second and third category operational radioactive facilities.

In 2018, the CSN carried out five planned inspections at CIEMAT, it did not propose the opening of any sanction proceedings or issue this facility with any warning.

3.1.5. Facilities under Decommissioning and Permanent Closure

The following nuclear or radioactive facilities involved in the nuclear fuel cycle have ceased operation or are in the dismantling and decommissioning phase: Vandellós I nuclear power plant (in the latency phase following the conclusion of the first dismantling phase); José Cabrera nuclear power plant (undergoing active dismantling); Elefante uranium concentrate plant (dismantled and in compliance period); Quercus plant (in permanent shutdown and with the dismantling and decommissioning request submitted in September 2015); and the Andújar uranium concentrates factory (dismantled and in the compliance period).

At all these facilities, the programmes for environmental radiological surveillance, radiological protection for workers, security and, where appropriate, control of effluent releases and waste management remain operational. There were no deviations in the implementation of any of these programmes.

The activities carried out, according to their respective condition, in each of the facilities were carried out during 2018, within the established safety limits and without undue impact on people or the environment.

3.1.6. Radioactive facilities

The operation of radioactive facilities for scientific, medical, agricultural, commercial and industrial purposes took place during 2018 within the established safety standards, respecting the measures required for the radiological protection of persons and the environment, and there were no situations of undue risk.

In compliance with CSN Instruction IS-18, of 2nd April 2008, on the criteria applied by the Nuclear Safety Council to demand from the licensees of radioactive facilities the reporting of radiological events and incidents, in 2018 such radioactive facilities reported seven events to the CSN.

As a result of the assessment and inspection actions for the control of facilities, the CSN proposed that one autonomous executive's authorisation for a radioactive facility be annulled, and also that its radioactive material be seized. Likewise, the CSN proposed that the Ministry for Ecological Transition revoke the current authorisation of a company authorised to market and provide technical assistance for X-ray equipment, in view of the disappearance of the conditions which served as the basis for the validity of this authorisation.

The CSN issued radioactive facilities and related activities with 58 warnings, and hospitals with 86 warnings for non-compliance in the control of their workers' dosimetry monitoring throughout 2018.

3.2. Application of the Radiation Protection System

3.2.1. Summary of dosimetry data

The number of dosimetrically controlled workers amounted to 115,437, who received a collective dose of 17,941 mSv/person and an average individual dose of 0.65 mSv/year, equivalent to 1.3% of the maximum annual individual dose allowed by law.

Since such data have been extracted from the National Dosimetry Bank, the overall number of workers exposed in the country does not coincide with the sum of the workers in each of the sectors reported, as there may be workers providing services in different sectors throughout the year.

Table 3.2.1.1. shows the dose received by workers in each of the sectors included in the annual report.

It should be noted that:

- Medical radioactive facilities are those with the highest collective dose (12,663 mSv/person), which is logical since these facilities employ the largest number of exposed workers (92,316).
- Radioactive material transport activities are those that record the highest average individual dose (1.8 mSv/year).
- Operating nuclear power plants had 8,641 dosimetrically controlled workers, with a collective dose of 2,904 mSv/person and an average individual dose of 1.03 mSv/year.

During 2018, three cases were reported where the annual dose limit established in the regulations was potentially exceeded, all of them in medical radioactive facilities. In all cases, an investigative process was initiated and is currently ongoing.

Table 3.2.1.1. Dose received by workers in each of the sectors covered in the annual report

Facilities	Number of workers	Collective dose (mSv·person)	Average individual dose (mSv/year)
Nuclear power plants	8,641	2,904	1.03
Fuel cycle facilities, waste storage facilities and research centers (CIEMAT)	1,078	65	0.45
Radioactive Facilities			
Medical	92,316	12,663	0.59
Industrial	7,385	1,663	0.90
Research	6,290	394	0.35
Facilities in phases of dismantling and decommissioning	256	102	1.36
Transport	163	150	1.80

3.2.2. Discharge Control and environmental radiation monitoring

The CSN controls and monitors measures for the radiological protection of the public and the environment, offsite releases of radioactive materials from nuclear and radioactive facilities and their impact on the areas of influence of these facilities, all in order to estimate their radiological impact. In addition, the CSN carries out an environmental radiological monitoring programme throughout the national territory in order to monitor and maintain the radiological quality of the environment throughout the country.

Discharge Control and environmental radiological monitoring in the vicinity of facilities

At the request of the CSN, nuclear and radioactive fuel cycle facilities have established a programme to control radioactive effluents and to keep public doses due to the latter as low as reasonably achievable, always below the values of Spain's Regulation on Sanitary Protection against Ionising Radiations.

In the case of nuclear power plants, radioactive effluents have generally maintained a stable trend over recent years, as can be seen in figures 3.2.2.1, 3.2.2.2, 3.2.2.3 and 3.2.2.4.

Effective doses due to the release of radioactive liquid and gaseous effluents, based on conservative criteria estimates for the most exposed individual in the critical group, did not in any case exceed 1.1% of the authorised limit (0.1 mSv per unit over 12 consecutive months).

This report presents the results of the Environmental Radiation monitoring Programmes (Spanish acronym: PVRA) corresponding to 2017. This is because the processing and analysis of samples did not allow the results of the 2018 campaign to be available in time for inclusion in this report.

Facility licensees are responsible for carrying out these monitoring programmes. During 2017, 6,289 samples were collected in the vicinity of nuclear power plants, 1,312 at the fuel cycle facilities (the Juzbado fuel assembly factory and El Cabril) and 2,527 at the dismantling and

decommissioning facilities, including CIEMAT, the José Cabrera and Vandellós I nuclear power plants, the Elefante and Quercus plants and the

Enusa mining sites, the Andújar uranium factory and the Lobo-G plant that has now been decommissioned.

Figure 3.2.2.1. Liquid radioactive effluents from PWR plants. Standard activity (GBq/GWh)

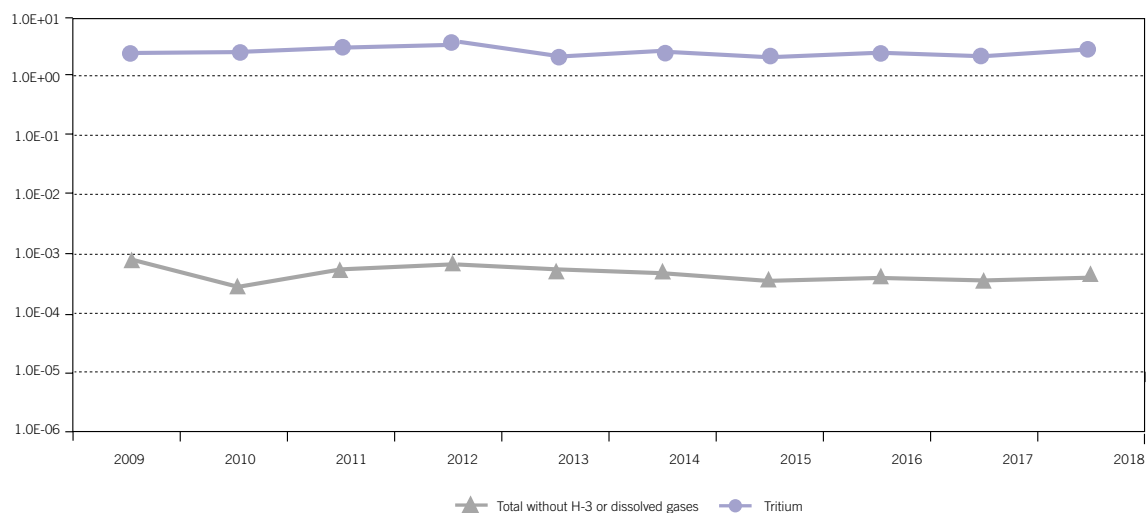


Figure 3.2.2.2. Gaseous radioactive effluents from PWR plants. Standard activity (GBq/GWh)

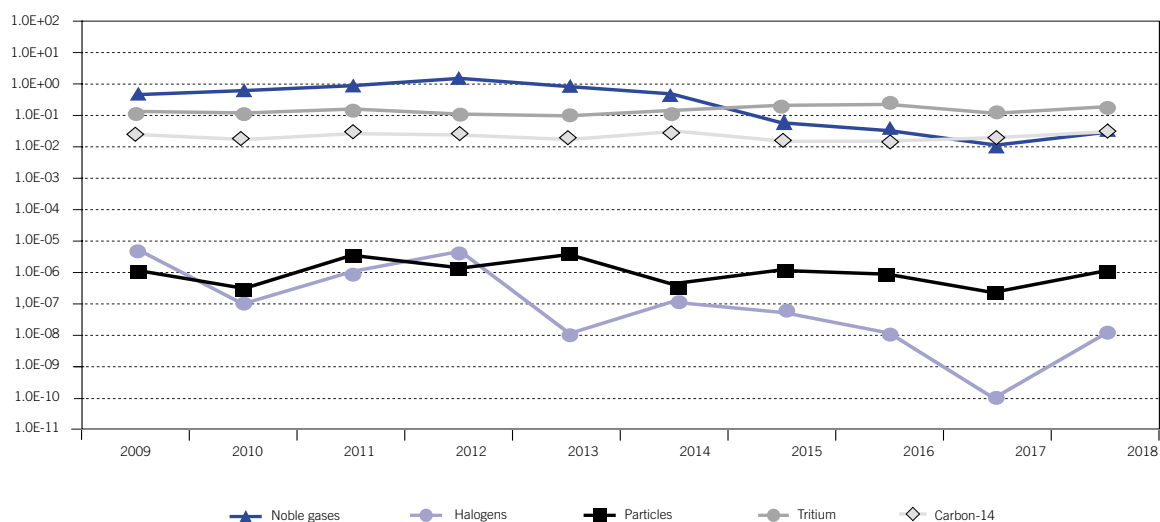


Figure 3.2.2.3. Liquid radioactive effluents from BWR plants. Standard activity (GBq/GWh)

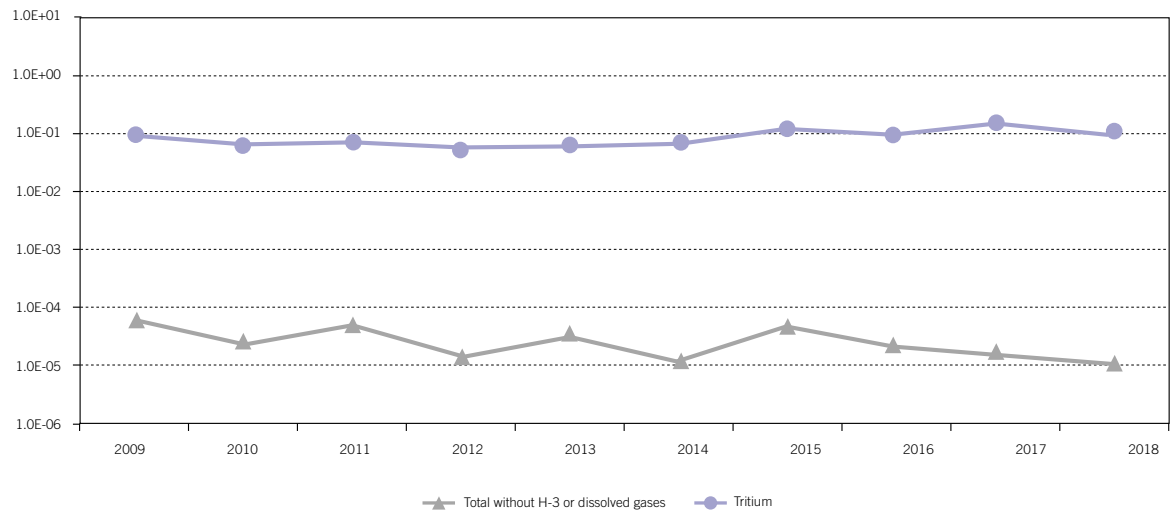
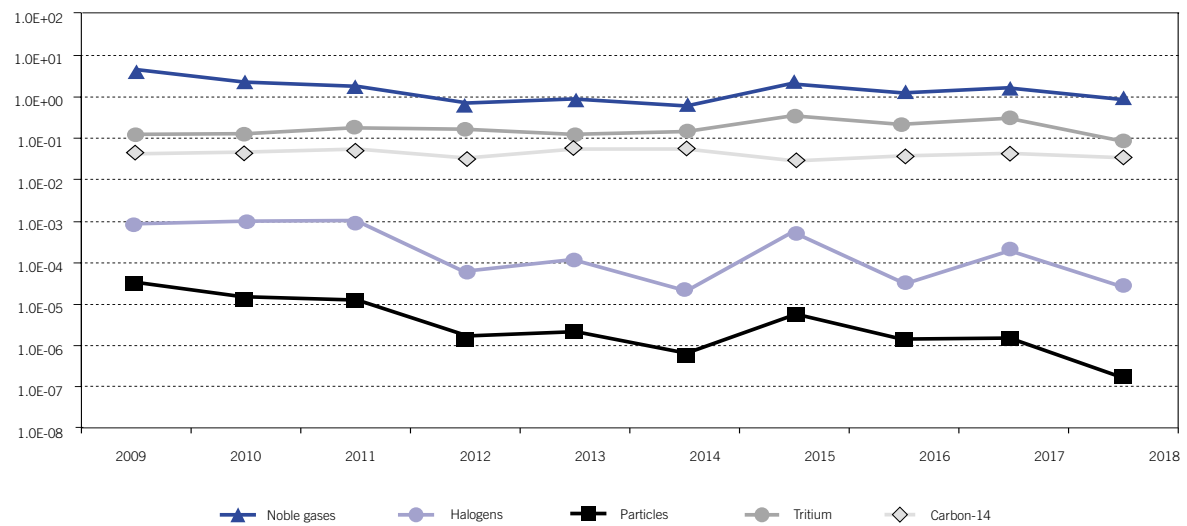


Figure 3.2.2.4. Gaseous radioactive effluents from BWR plants. Standard activity (GBq/GWh)



In 2017, the Nuclear Safety Council, in compliance with the functions assigned to this body in relation to public information and with

the provisions of Law 27/2006 regulating rights of access to information on environmental matters, developed a computer application to provide

public access to environmental radiological surveillance data in Spain, of which the CSN is the depository. On a map, the application displays the sampling stations that form part of the environmental radiological monitoring carried out in Spain, both the monitoring associated with facilities, for which the licensees are responsible, and the national monitoring developed by the CSN.

The new application is accessible to the public on the CSN's website, in the tab "Operating states and environmental data", in a new link called "Environmental values- REM and PVRA": <https://www.csn.es/kprGisWeb/consultaMapa-Puntos2.htm>

The results from the 2017 PVRA campaign are similar to those obtained in previous years, allowing the conclusion to be drawn that the environmental quality around the installations has been maintained in conditions that are acceptable from the radiological point of view, without any risk to people as a result of facility operation or of the dismantling or decommissioning activities performed therein.

In order to verify that the monitoring programmes carried out by the facilities are correct, the CSN carries out independent environmental radiological monitoring programmes (Spanish acronym: PVRAIN)., of which 5% of the volume of such samples and determinations represent those developed by the licensees themselves. The results of these programmes for the 2017 campaign did not show any significant changes from those obtained in the corresponding programmes of the licensees.

Environmental monitoring outside the vicinity of the facilities

The CSN monitors the environment at a national level by means of a surveillance network known as Revira, in collaboration with other institutions.

This network comprises automatic stations for the continuous measurement of atmospheric radioactivity (Spanish acronym: REA, and sampling stations where samples are collected for subsequent analysis (Spanish acronym: REM). This surveillance programme is explained in more detail in the section below.

Network of automatic stations (REA)

Figure 3.2.2.5 shows the average annual gamma dose rate values measured at each of the CSN network's stations: the Generalitat Valenciana network, the Basque Country network and the stations of the Generalidad de Cataluña and the Regional Government of Extremadura networks that measure the dose rate.

The results of the measurements carried out during 2018 were characteristic of environmental radiation background, showing no radiological risk for the people or the environment.

The data from the automatic stations relating to the daily average gamma dose rates of the latter are shared on the CSN website: <https://www.csn.es/mapa-de-valores-ambientales>.

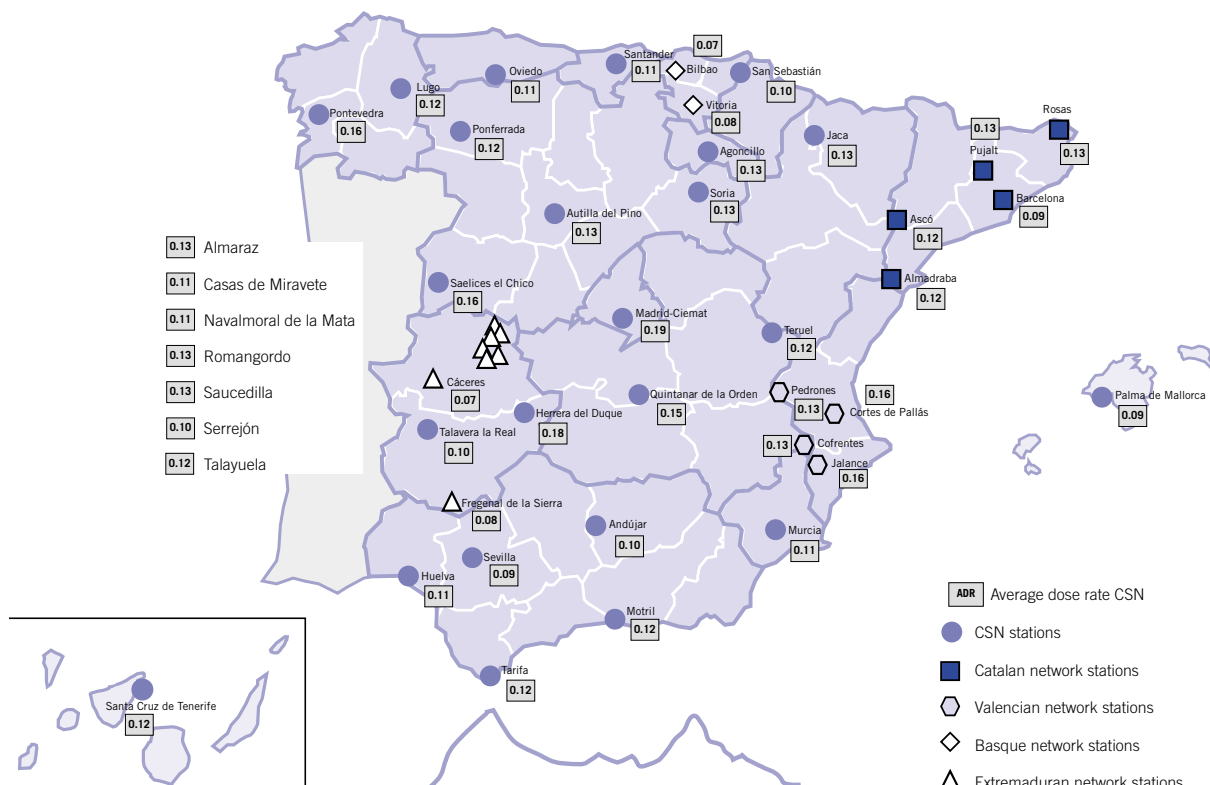
Network of sampling stations (REM)

This network collects samples of air, soil, drinking water, milk, the standard diet and inland and coastal waters. Within it, considered in turn, are:

- A Dense Network, with multiple sampling points, so that the whole territory is adequately monitored.
- A Spaced or high sensitivity Network, comprising very few sampling points, where highly sensitive measurements are required.

Overall assessment results obtained in 2017 show that values are consistent with background radioactive levels and, in general, remain relatively stable throughout the different periods, showing

39



slight variations between points, which are attributable to the radiological characteristics of the different zones.

As shown in last year's report, the radioactive isotope Ruthenium-106, whose origin was artificial, was detected in the atmosphere by several European laboratories in early October 2017.

On becoming aware of the detection, the CSN took measures to carry out special monitoring and to check the possible incidence of this event in Spain.

The results confirmed that the presence of this radionuclide was not detected, concluding that the radioactive cloud did not reach Spanish territory and, therefore, it was not necessary to take any measures to protect the people or the environment.

In 2018, there were no other events, inside or outside our borders, that required the specific monitoring of the national network of sampling stations, which means that the development of the sampling and analysis programmes was maintained at its usual extent, and without affecting their performance.

4. Monitoring and Control of Facilities and Activities

4.1. Regulations and Standards

The Nuclear Safety Council has the power to propose to the Government new regulations and the revision of the existing regulations on nuclear safety, radiation protection and security of nuclear and radioactive facilities and materials, as well as the power to draw up and approve its own technical standards in matters falling within its competence.

Legal and regulatory standards regulating the nuclear sector, and specifically those affecting this Public Body, have become more complete and have improved in recent years. During 2018, and at state level, the following provisions affecting the regulation and operation of the CSN were approved and published:

- Organic Law 3/2018 of 5th December on protecting personal data and guaranteeing digital rights.

This new law covers the principles of data protection, the rights of individuals (access, rectification, deletion, opposition, the right to limitation of processing and the right to portability), and the provisions applicable to specific processing. The figure of the Data Protection Officer was created, which among others, has the function of becoming a means for the amicable resolution of complaints.

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

The eighteenth additional provision of this law includes all the actions to be performed by the CSN in the environmental impact assessment procedure for projects that are to be authorised in accordance with the Regulation on Nuclear and Radioactive Installations (Royal Decree 1836/1999, of 3rd December). In accordance with Law 15/1980, the CSN is responsible for assessing the environmental radiological impact of nuclear and radioactive facilities and of activities involving the use of ionising radiations, in accordance with the applicable legislation.

- Royal Decree Law 5/2018, of 27 July, on urgent measures for the adaptation of Spanish law to European Union legislation on data protection.

Its objective is to bring the European Data Protection Regulation (applicable from 25th May 2018) into line with Spanish law, in those aspects that do not require organic rank, but cannot be delayed, since the Organic Law was published afterwards, on 5th December 2018.

- Royal Decree-Law 12/2018 of 7th September 1998, on the security of networks and information systems.

It transposes Directive (EU) 2016/1148 of the European Parliament and of the Council of 6th July 2016 on measures to ensure a high common level of security of networks and information systems within the Union.

- Royal Decree 1400/2018, of 23rd November, approving the Regulation on nuclear safety in nuclear facilities.

This regulation incorporates Council Directive 2014/87/Euratom of 8th July 2014 establishing a Community framework for the nuclear safety of nuclear facilities into the Spanish regulatory framework.

During 2018, the CSN has been participating in the work of the groups responsible for the transposition of the following Euratom Directive:

- Council Directive 2013/59/Euratom of 5th December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiations and repealing Directives 89/618, 90/641, 96/29, 97/43 and 2003/122/Euratom.

The transposition of this Directive affects 13 rules, among which the following stand out: the Regulation on Health Protection against the Risks of Exposure to Ionizing Radiations, which will replace Royal Decree 783/2001, of 6th July; this draft was submitted for public consultation, the result and complexity of which means that the revision of this regulation does not have a defined period for its promulgation.

However, once the deadline for the transposition of this directive has elapsed, those of its provisions that are clear, transparent and with an obligation or right that is not directly voidable, will come into force, and may be invoked against the Spanish State by individuals affected within the meaning of the directive, even if internal legislation is contradictory.

4.2. Nuclear Power Plants

4.2.1. General and Licensing Aspects

The supervision of nuclear safety and radiation protection of nuclear installations is entrusted to the Nuclear Safety Council, which carries out its inspection and control functions by means of the following activities:

- Periodic inspections to check compliance with the conditions and requirements set out in the authorisations.
- Evaluation and monitoring of the operation of the facility, checking the data, reports and

documents submitted by the licensee, or collecting new data when deemed necessary.

- Warning licensees, if an omission of obligations is detected, or any failure to comply with the requirements of the authorisation, informing them of the corrective mechanisms.
- Proposals to the Ministry for Ecological Transition for the opening of sanction proceedings in the event of detecting anomalies that might constitute a breach of nuclear safety or of radiation protection standards.

In addition, the CSN has a resident inspection team at each of the Spanish nuclear power plants sites.

Table 4.2.1.1 describes the most important characteristics of the Spanish nuclear power plants and table 4.2.1.2 describes the data relating thereto for 2018.

4.2.2. Inspection, supervision and control of nuclear power plants: SISC

The CSN's Integrated Supervision System of nuclear power plants (SISC) is a basic tool, which has been in use for more than ten years, to monitor the operation of nuclear power plants and to establish the necessary corrective actions depending on their results.

As part of the revision and improvement of the SISC, this system was completed with new indicators that contribute to the performance of a more detailed monitoring of the operation of the plants, especially in relation to cross-cutting issues. The objective of this new approach is that some type of indicators or alerts on certain cross-cutting components are available, allowing the CSN to incipiently identify possible degradations in organisational and cultural aspects that might have an impact on nuclear safety, such that the appropriate actions may be taken.

Table 4.2.1.1. Basic characteristics of the nuclear power plants

	Almaraz	Ascó	Vandellós II	Trillo	Garoña	Cofrentes
Type	PWR	PWR	PWR	PWR	BWR	BWR
Thermal power (MW)	U-I: 2,956.60 U-II: 2,955.80	U-I: 2,940.6 U-II: 2,940.6	2,940.6	3,010	1,381	3,237
Electric power (MW)	U-I: 1,049.18 U-II: 1,051.84	U-I: 1,032.5 U-II: 1,027.2	1,087.1	1,066	465.6	1,092.02
Cooling	Open Arrocampo reservoir	Mixed, Ebro River Towers	Open Mediterranean Sea	Closed Contribution Towers Tagus River	Open Ebro River	Closed Contribution Towers Júcar River
Number of units	2	2	1	1	1	1
Prior authorisation unit I/II	29-10-71 23-05-72	21-04-72 21-04-72	27-02-76	04-09-75	08-08-63	13-11-72
Construction permit Unit I/II	02-07-73 02-07-73	16-05-74 07-03-75	29-12-80	17-08-79	02-05-66	09-09-75
Authorisation for commissioning unit I/II	13-10-80 15-06-83	22-07-82 22-04-85	17-08-87	04-12-87	30-10-70	23-07-84

Tabla 4.2.1.2. Summary of nuclear power plant data for 2018

	Almaraz I/II	Ascó I/II	Vandellós II	Trillo	Garoña	Cofrentes
Authorisation in force	07-06-10 07-06-10	02-10-11 02-10-11	21-07-10	03-11-14	From 06-07-13 definitive shutdown	20-03-11
Period of validity (years)	10 10	10 10	10	10	N/A	10
Number of inspections	34	26	41	27	12	21
Net production (GWh)	8,141.109 8,176.543	7,592.827 8,469.717	5,216.635	8,267.246	–	8,803.730
Load factor (%)	88.56 89.37	87.42 97.92	54.78	88.53	–	95.65
Operating factor (%)	90.57 90.96	88.11 97.96	56.87	89.51	–	96.31
Hours connected to the network	7,934.0 7,968.5	7,718.50 8,760	4,981.62	7.841	–	8,436.800
Refuelling outages	29-10/02-12 08-04/11-05	18-11/23-12 NO	12-05/20-07	18-05/06-06	N/A	NO

As a conclusion, the indicators forming part of the SISC, together with the assessment of the inspection links, determine the action matrix, which establishes the actions to be adopted 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.

Following the approval by the Board Meeting of the Council in 2014 of a new supervision and tracking system (SSG) for the Santa María de Garoña nuclear power plant adapted to the cessation of operation condition, this plant no longer appears within the SISC and has had its corresponding six-monthly evaluation reports programmed in the SSG.

From the results obtained in 2018 on the operation of the nuclear power plants under the SISC supervision programme, it can be pointed out that the plants have been in a situation of “licensee response” in the SISC action matrix, which corresponds to a situation of normality, with the application of standard programmes of inspection and deficiency correction. The only exception, as has already been pointed out, was Ascó II, which has remained in the “regulatory response” column since the second three-month period due to the fact that, in diesel generator B, the CSN identified a white finding related to the installation of a

component whose lifetime had been exceeded and which did not have a safety assessment.

All performance indicators have remained in the green band for the past 12 months.

All inspection findings over the past 12 months have been categorised as green with the exception of the Ascó II white finding.

Tables 4.2.2.1, 4.2.2.2 and 4.2.2.3 show the colour of the indicators, the number of green findings in each plant and their position (status and analysis) in the action matrix in the four quarters of 2018.

Sanction proceedings and warning

During 2018, the CSN’s actions in sanction proceedings in relation to nuclear safety and radiation protection, applied to nuclear power plants, were as follows:

- Proposal for the opening of sanction proceedings against the licensee of Ascó II nuclear power plant for non-compliance with CSN Instruction IS-21, which establishes the need to open a procedure for the assessment and resolution of anomalous conditions (AC) in the event that such situations are discovered. In this case, the facility should have analysed the component in diesel generator B, unit 2, whose useful life had been exceeded and which ended up breaking.

Tabla 4.2.2.1. Operation indicators. SISC 2018

	1st quarter	2nd quarter	3rd quarter	4th quarter
Almaraz I	green	green	green	green
Almaraz II	green	green	green	green
Ascó I	green	green	green	green
Ascó II	green	green	green	green
Cofrentes	green	green	green	green
Garoña*	green	green	green	green
Trillo	green	green	green	green
Vandellós II	green	green	green	green

Tabla 4.2.2.2. Category *green* inspection findings (132). SISC 2018

	1st quarter	2nd quarter	3rd quarter	4th quarter	Total
Almaraz I	6	8	3	6	23
Almaraz II	6	7	3	4	20
Ascó I	4	3	3	16	26
Ascó II	3	1	3	9	16
Cofrentes	4	4	3	9	20
Trillo	4	2	–	2	8
Vandellós II	1	3	8	6	18

Tabla 4.2.2.3. Status in the action matrix. SISC 2018

	1st quarter	2nd quarter	3rd quarter	4th quarter
Almaraz I	RL	RL	RL	RL
Almaraz II	RL	RL	RL	RL
Ascó I	RL	RL	RL	RL
Ascó II	RL	RR	RR	RR
Cofrentes	RL	RL	RL	RL
Trillo	RL	RL	RL	RL
Vandellós II	RL	RL	RL	RL

RL: response from the licensee. RR: regulatory response.

- Proposal for the opening of a sanction file against the licensee of the Vandellós II nuclear power plant for non-compliance with Council Instruction IS-09 establishing the criteria to which the systems, services and procedures for the physical protection of nuclear facilities and materials are to be adjusted, and with Article 13.2 of Royal Decree 1308/2011.

In 2018, the CSN issued the following warnings to nuclear power plants:

- Almaraz nuclear power plant: warning for non-compliance with the Technical Specification of Operation (ETF) 3.9.7.2. The inspection detected that a series of movements of the spent fuel cask inside the fuel building of unit I had been performed by means of the crane bridge of

said building, without the previous performance of the Surveillance Requirements required by said Technical Specification of Operation (ETF).

- Almaraz nuclear power plant: warning for non-compliance with Article 8.6 of Instruction IS-32, during the performance of the surveillance test of the containment enclosure sprinkler system, due to not declaring it inoperable and nevertheless maintaining its injection valve closed during the test.
- Almaraz nuclear power plant: warning for non-compliance with section nine of Instruction IS-21, which establishes the need to open a procedure for the assessment and resolution of anomalous conditions (AC) in the event that such situations are discovered. In this case, the

AC should have analysed the decrease in the volume of water in the essential reservoir, detected by the licensee after bathymetry of the reservoir.

- Almaraz nuclear power plant: warning for non-compliance with section nine of Instruction IS-21, which establishes the need to open a procedure for the assessment and resolution of anomalous conditions (AC) in the event that such situations are discovered. In this case, the AC should have been analysed while looking at the acceptance criterion of the surveillance test carried out on the sprinkler system of the containment enclosure, when tested in recirculation, as the test used was not justified.
- Ascó nuclear power plant: warning for non-compliance with the CSN technical instruction on nuclear power plant ventilation systems Ascó CSN/IT/DSN/ASO/13/03, which establishes that “the licensee implants the necessary instrumentation for the periodic monitoring of the negative pressure of those buildings that require it in normal operation”. The inspection found that the licensee had implemented the required pressure gauges, but there was no periodic checking of the pressure in the buildings.
- Ascó nuclear power plant: warning for non-compliance with IS-10 on criteria for the non-qualification of events at nuclear power plants.
- Cofrentes nuclear power plant: warning for non-compliance with the ninth paragraph of Instruction IS-21, which establishes the need to open a procedure for the assessment and resolution of abnormal conditions (AC) in the event that such situations are discovered. In this case, the AC should have been analysed with the flow imbalance experienced by both lines of the main feed water system being

looked at, as the event resulted in the breakage of a retaining valve.

4.2.3. Follow-up of actions resulting from the Fukushima nuclear power plant accident

The post-Fukushima CSN regulatory requirements regarding the Spanish nuclear power plants were incorporated in four Complementary Technical Instructions (ITC, in its Spanish acronym), (ITC-1/2/3/4), issued by the CSN during 2011 and 2012, and finally, in April 2014, the CSN issued a new ITC in relation to the implementation of the post-Fukushima ITC's in order to consistently include the requirements of the previous ITC's that had an end date prior to 1st January 2014.

In the specific case of the Santa María de Garoña nuclear power plant, the post-Fukushima requirements of ITC-1/2/3/4 were adapted to the situation of cessation of operation and have all been implemented.

Table 4.2.3.1 shows the number of inspections performed by the CSN at each plant during 2018 in the performance of checks relating to compliance with the post-Fukushima ITC.

The aspects supervised in these inspections were as follows:

- Electrical and instrumentation systems.
- Protection against major fires.
- Capacity to respond to internal flooding, in the event of an earthquake.
- Ability to respond to external flooding and other extreme natural events.

Tabla 4.2.3.1. Inspections on ITC post-Fukushima compliance in 2018

Nuclear power plant	Number of inspections
Almaraz	3
Ascó	1
Cofrentes	1
Garoña	–
Trillo	1 (GGAS)
Vandellós II	3

- Determination of seismic margins of structure, systems and components.
- Human resources and radiation protection equipment additional to that already existing to deal with severe accidents.
- Follow-up of post-Fukushima actions in relation to radioactive effluents.
- Extensive damage mitigation guidelines.
- Exercises in which teams implanted after Fukushima come into play.

In February 2018, the monitoring of the activities performed by the post-Fukushima ITF Tracking Committee was completed, once concluded the actions of the licensees and practically completed the CSN supervision/assessment process. From this moment on, the tracking of aspects requiring additional specific verification action is integrated into the ordinary supervision and control processes of the CSN.

4.2.4. Operational experience

The objective of the Operating Experience (OE) programmes is to systematically analyse deviations from the expected behaviour of systems and equipment, individuals and organisations that might give rise to undesirable events, with a view

to defining actions that restore or improve safety and prevent the occurrence or repetition of events at the facility itself or at other nuclear facilities.

Within this process, the CSN establishes a series of initiating events of which the CSN itself must be notified in view of their importance for safety and radiological protection and which are included in Instruction IS-10 “Criteria for the non-qualification of events at nuclear power plants”, in revision 1, of 30th July 2014.

The CSN is aware of the occurrence of events through notification by plant licensees and through its resident inspectors. It analyses each event in order to determine its importance for safety, the need to carry out a reactive examination, its classification on the International Nuclear and Radiological Events Scale (INES) and its possible impact on other facilities, and reflects the conclusions of this analysis in a computerised record. The most safety-relevant events are subject to detailed inspection and investigation by the CSN.

The tracking of Notifiable Event Reports, (Spanish acronym: ISN) is carried out at a monthly meeting in which the Incident Review Panel, (Spanish acronym: PRI) comes together. The latter comprises qualified representatives competent in nuclear safety and radiological protection from all areas of the CSN.

Since 2012, the International Incident Review Panel (Spanish acronym: PRIN) has been in operation, the objective of which is to analyse the applicability to Spanish nuclear power plants of events occurring at nuclear power plants in other countries. Its functioning is similar to that of the PRI, although it meets four times a year and events are not categorised.

Each plant submits an annual operating experience report to the CSN reflecting the results of these analyses. These annual reports on operating experience, (IAEO in its Spanish acronym) of the nuclear power plants are reviewed by the CSN in order to analyse any corrective actions.

In 2018, the Basic Annual Inspection Programme, (PABI in its Spanish acronym) had been assigned inspections of the OE processes of the Trillo, Ascó and Vandellós II nuclear power plants; in the latter case an inspector from the Bel-V (TSO, Technical Support Organisation), from the Belgian regulatory body, FANC, acted as an observer as an inter-change of experience between regulators.

4.2.5. Safety improvement programmes

4.2.5.1. Periodic Safety Review Programmes (PSR)

In 2017, Safety Guide 1.10 (revision 2) “Periodic safety reviews in nuclear power plants” was published, based on the guide of the International Atomic Energy Agency (IAEA), SSG-25 “Periodic

Safety Review for Nuclear Power Plants”, of March 2013, which also includes the reference levels of WENRA revised after Fukushima in relation to the periodic safety reviews.

Revision 2 of GS-1.10 establishes, in accordance with SSG-25 and Council Instruction IS-26 on basic nuclear safety requirements applicable to nuclear installations, the need to carry out a PSR every 10 years, leaving the Ministry of Energy, Tourism and Digital Agenda (currently the Ministry for Ecological Transition) to exercise its competence in relation to establishing the period of validity of the administrative authorisation, which may be in line with the PSR or established following other criteria as decided by the government.

The following table summarises the milestones for PSR submission for each plant: expiry date of the operating permit (OP) in force, cut-off date, date of submission of the base PSR document required in the new revision of GS-1.10, which should secure favourable appreciation by the CSN, and the date of submission of the PSR document, following the new systematic approach for PSRs.

It should be pointed out that all the Spanish plants will complete the 40 year period of their design lifetime during the ten-year period following the next renewal of operating permits (Almaraz unit I in 2020 and unit 2 in 2023; Ascó I in 2022 and Ascó II in 2025; Cofrentes in 2024; Trillo in 2027 and Vandellós II in 2027).

	Three years < Expiry OP LTO DOC	Present. BASE Doc PSR	Cut-off date PSR	Present. PSR Doc	Expiry OP
Almaraz	07/06/2017	31/12/2017	30/06/2018	31/03/2019	07/06/2020
Ascó	02/10/2018	31/12/2018	30/06/2019	31/03/2020	02/10/2021
Cofrentes	20/03/2018	31/12/2018	30/06/2019	31/03/2020	20/03/2021
Trillo	16/11/2021	31/12/2021	30/06/2022	31/03/2023	16/11/2024
Vandellós II	21/07/2017	31/12/2017	30/06/2018	31/03/2019	21/07/2020

4.2.5.2. Organisational and Human and factors in nuclear facilities

Since 1999, all Spanish nuclear power plants have had safety evaluation and improvement programmes for organisational and human factors (O&HF). The Juzbado fuel assembly factory was also integrated into this initiative a few years later.

The inspections of the organisational and human factors programmes form part of the CSN's basic inspection plan and are included in the Integrated Plant Supervision System (SISC), as well as in the Supervision System of the Juzbado factory. In 2018, these O&HF programmes were inspected at the Trillo, Almaraz, Vandellós II and Ascó nuclear power plants.

4.2.6. Generic issues

A generic issue is any safety problem identified at any national or foreign nuclear power plant that may affect other nuclear power plants.

The CSN monitors them and promotes the analysis of applicability to Spanish plants, as well as the adoption of the corrective actions resulting from such analysis. Generic issues may also have their origin in the analysis of events occurring at operating Spanish or foreign nuclear facilities, in research programmes or in the new requirements issued by the country of origin of the nuclear power plant project. In this respect, the CSN has two panels of experts: the Incident Review Panel and the International Incident Review Panel.

Throughout 2018, generic issues were opened:

- Specifications regarding pressure barrier leaks.

New information was provided and additional requirements on generic issues were established:

- As-found laboratory testing of safety valves with set points outside $\pm 3\%$.

- Reliability of the grid and the impact on plant risk and the operability of the external electricity supply. (GL 2006-02).

Generic issues have been closed¹:

- Badly sized pneumatic valve accumulators.
- Errors in tank level measurement.
- Seismic considerations, mainly related to tanks (IN 2012-01).
- Corrosion in refuelling water tank fastening bolts of the Ascó nuclear power plant.
- Downtime of diesel generators due to manufacturing defects in their engines' bearings.
- Non-compliance with hourly scheduled FPS.
- Preconditioning of pressure switches before surveillance tests (IN 2012-16).

Throughout 2018, three letters were sent to the nuclear power plants in relation to the review of the international events of the "Incident Reporting System (IRS)" requiring the nuclear power plants to include their applicability analysis in the next annual operating experience report.

All Nuclear Facilities were also required by letter to analyse the applicability of KOBE STEEL quality assurance counterfeits.

4.3. Nuclear and Radiative Facilities in the Fuel Cycle, Radioactive and Research Centers

This section includes the Juzbado fuel assembly factory, the El Cabril radioactive waste disposal centre, the Public Research Agency for Energy,

¹ Administratively, these were closed in the first two months of 2019, but they can be considered closed in 2018.

Environment and Technology (CIEMAT) and the Quercus plant.

All of these facilities remained within the established safety margins in 2018, without undue risk.

In addition, this section includes the Retortillo plant and the centralised temporary storage facility (CTS), which are in the licensing phase, and the mining of uranium.

4.3.1. Juzbado Fuel Assembly Factory

The Juzbado nuclear installation is dedicated to the production of fuel elements of uranium oxide and a mixture of uranium oxide and gadolinium oxide, with a maximum enrichment in uranium-235 of 5% by weight, for use in pressurised light water and boiling light water nuclear reactors.

During 2018, the main deliveries received at the factory were 306,666.497 kg of enriched uranium and 596.060 kg of natural uranium in the form of UO₂ powder from SFL (United Kingdom) and GNF (USA).

As regards outputs from the facility, the following fuel elements were dispatched to several Spanish and foreign nuclear power plants: 620 of the pressurized water type, containing 305,195.031 kg of uranium and 84 of the boiling water type, containing 15,258.269 kg of uranium.

Throughout 2018, the CSN informed favourably on two requests for authorisation: one on the Security Plan and the other on the Operating Specifications; it also favourably appreciated revision 6 of the Dose Calculation Manual.

The CSN carried out 10 inspections of the Basic Inspection Plan for the Juzbado factory, in addition to an inspection of sealed sources in use within the management programme for this type of sources,

and a generic inspection of the implanting of the IS-19 (Management System).

On 13th November 2018, the Ministry for Ecological Transition issued Enusa SA, SME, the owner of the Juzbado factory, with a motion for the resolution of a sanctioning procedure for failure to comply with certain actions associated with the factory's fire protection system, as required in the Operating Specifications.

In 2018, the factory reported five events in accordance with the notification criteria established in the Technical Specifications that did not pose a risk to workers, the population or the environment.

The CSN issued the Juzbado factory with the ITC reference FCJUZ/JUZ/SG/11/12, dated 30th June 2011, on post-Fukushima endurance tests. In 2018, a report was drawn up on the status of the licensee's actions, as well as on the status of the CSN assessments/supervisions, concluding that the requirements established in the ITC were met.

The results obtained in the control of radioactive effluents and environmental radiological monitoring are similar to those of previous periods and do not show any significant radiological incidence for the population.

The annual drill was held on 29th September 2018, in accordance with the requirements established in its On-Site Emergency Plan.

4.3.2. Centralised Temporary Storage Facility (CTS)

In 2018, the CSN continued the assessment process associated with the issue of the mandatory report relating to the construction permit application. In July 2018, this process was interrupted following a communication from the Ministry for Ecological Transition's Secretary of

State for Energy, requesting the CSN to suspend the issuing of the mandatory and binding report on the construction permit for the nuclear installation of the Centralised Temporary Storage for spent fuel and highly radioactive residues, (CTS), located in Villar de Cañas (Cuenca), which is under the ownership of ENRESA.

In September 2018, the documentation activities were completed, reflecting the state of progress in the evaluation of the project as shown in the Plan for suspending the issue of the CSN report on the request for the construction permit for the CTS warehouse, approved by the Board Meeting of the CSN, at its meeting no. 1,453, on 25th July 2018.

In March 2018, an inspection was carried out in order to verify the application of the Quality Assurance Programme (PGC) regarding the activities of the CTS project that is being carried out by ENRESA and its main engineering contractor company.

4.3.3. El Cabril radwaste disposal

This facility carries out operations relating to the reception, temporary storage, treatment, conditioning and definitive disposal in cells of very low, low and intermediate level residues generated by Spanish nuclear and radioactive facilities.

From the tracking and control of operations, the evaluations of the periodic reports submitted by the facility and the inspections performed by the CSN, it may be concluded that the activities were performed in accordance with the limits and conditions established in the operating permit and in the legislation in force.

As of 31st December 2018, the total number of low and intermediate level waste (LILW) storage units stored on the North and South platforms was 6,917, which represents 77.20% of maximum capacity. The available free capacity was 22.80%

which would be equivalent to 2,043 containers. The total number of packages in LILW cells was 133,352 at the end of 2018.

The total number of very low level waste (VLLW) units housed in cells 29 and 30 of the East platform was 18,632 units as of 31st December 2018. The total occupied volume in cell 29 was 25.0% and 11.20% in cell 30.

Likewise, at the end of 2018, 138 ISO containers containing residues from steelworks incidents were temporarily stored in cells 27 and 28 of the southern platform.

In the periodic checks carried out on the quantity of water accumulated in the water tanks of the leachate collection network of cell 29 of the Eastern platform, from December 2017 to December 2018, over several months it was found that the quantity of water collected was higher than the average nominal quantity in the Operating Technical Specifications. According to the licensee, the collected water could have its origin in the heavy rainfall that had taken place.

ENRESA has implemented a series of corrective measures, such as the installation, in part of cell 29, of a detachable roof structure. After the installation of the roof, the amount of water collected in the tanks has been decreasing even with the recent rainfall.

In December 2018, the CSN reported favourably on revision proposal 14 of the Operating Technical Specifications.

During 2018, the facility's supervisory and control system programme was carried out and a total of 8 inspections were completed.

In 2018, the CSN did not propose the opening of a sanctioning file, nor was any warning given.

There were no reportable events in this period.

The results obtained in the control of radioactive effluents and environmental radiological surveillance are similar to those of previous periods and do not show any significant radiological incidence for the population.

On 15th March 2018, the annual emergency drill was held.

4.3.4. Public Research Agency for Energy, Environment and Technology (CIEMAT)

CIEMAT is authorised to operate as a single nuclear facility, granted by resolution of the Directorate General for Energy on 15th July 1980. In addition, the resolution of 3rd February 1993 provides for the centre's catalogue of nuclear and radioactive facilities, in which there are two different groups. One of these includes facilities which are not in operation and shutdown, those in the dismantling phase for their closure or which have already been decommissioned. Another group comprises up of 21 second and third category operating radioactive facilities, which have operating limits and conditions imposed by resolution of the Directorate General for Energy Policy and Mines which are specific to each of them.

In January 2000, CIEMAT's Directorate General drew up an Integrated Plan for the Improvement of CIEMAT Installations (PIMIC). The latter provides for various decontamination and dismantling actions regarding shutdown installations (PIMIC-Dismantling), as well as the rehabilitation of certain installations and areas of the centre not included in the above mentioned decommissioning project. In 2002, the Nuclear Safety Council issued its favourable appraisal of revision 2 of the Master Plan for the execution of the PIMIC.

The PIMIC-Dismantling project affects the area that housed the most representative nuclear facilities of the former Junta de Energia Nuclear (JEN) and has been executed for the most part by ENRESA, although always under the tenure of CIEMAT itself.

On 15 June 2018, the fourth phase of ENRESA's actions on the PIMIC-D project was completed. As from that date, CIEMAT activities have focused on the maintenance and radiological surveillance of the buildings and the temporary radioactive waste storage facilities. While ENRESA has been evacuating and moving them to the definitive El Cabril disposal facility, following the acceptance programming of the destination facility.

As of 31st December 2018, the temporary radioactive waste storage facilities corresponding to the IPICI-Dismantling project had an occupancy rate of 22.75%.

Throughout 2018, the CSN drew up the following reports: Express acceptance, modifying specification 10 of the authorisation resolution for installation IR-33; report on the request for modification of installation IR-17 and favourable assessment of revision 11 of the centre's Radiological Protection Manual. Likewise, the modification of the authorisation of CIEMAT's External Personal Dosimetry Service (EPDS), to incorporate the official dosimetry on limbs by means of ring dosimetry was authorised during the plenary session of July 27th.

In the course of the year, five planned inspections were carried out at the centre's facilities.

In 2018, with regard to CIEMAT, the CSN did not propose the opening of any sanctioning file, nor did it send any warnings.

During 2018, the CSN was notified of the appearance of an unrecorded neutron source of

Am-Be. The source appeared during maintenance operations at the end of the PIMIC-D project. The source was immediately withdrawn by ENRESA for its definitive management.

The radioactive effluents released have at all times complied with the limits authorised in this respect and do not entail any significant radiological risk.

The results obtained in the environmental radiological surveillance programme performed by CIEMAT for the different samples and measurements are similar to those of previous periods and none show any significant radiological incidence for the population.

4.3.5. Uranium Concentrate Manufacturing Plants

4.3.5.1. Quercus Plant

The Quercus uranium concentrates manufacturing plant is currently in the permanent shutdown stage. After various delays due to an eventual restart of the plant, on 14th September 2015, Enusa finally requested authorisation from the Ministry of Industry, Energy and Tourism for phase I of the dismantling and closure of the facility.

Activities during 2018 focused on the treatment of liquid effluents, which were collected in the various drains on the existing mining site in the area (strip pit waters), and on the treatment and release of the supernatant liquids from the tailings dam.

Throughout 2018, there was no non-compliant event regarding operating limit conditions or any incident that had radiological repercussions on the workers or the environment.

In 2018, the CSN granted approval for revision 1 of the Plant Surveillance and shutdown Plan.

During 2018, two inspections were carried out, one of which was for the general monitoring of the activities of the facility and the other for the monitoring of the Environmental Radiological Surveillance Plan.

Since the plant has been in a definitive shutdown situation regarding production activities since 1st January 2003, no gaseous radioactive effluents were generated throughout the year and the only liquid radioactive effluents released arose as a result of the treatment, for conditioning and release, of the site run-off water and of the supernatant liquids from the the tailings dam.

The results obtained in the environmental radiological surveillance programme performed by Enusa at the Quercus Plant for the different samples and measurements are similar to those of previous periods and none show any significant radiological incidence for the population.

During 2018, the CSN did not propose the opening of a sanctioning file or issue this facility with any warning.

4.3.5.2. Retortillo Plant

The Ministry of Industry, Energy and Tourism granted Berkeley Minera España, SL (BME) the prior authorisation, as a first category nuclear fuel cycle radioactive facility of the Retortillo Plant, for the manufacture of uranium concentrates by means of the following Order IET/1944/2015 of 17 September, published in Official Spanish Gazette nº 230 of 25 September.

On 19th October 2016, the Ministry of Energy, Tourism and Digital Agenda requested the mandatory report on the request for the construction permit for the Retortillo Plant from the CSN, attaching the supporting documentation thereof.

At the end of 2018 the documentation was still being evaluated by the CSN. During 2018, the CSN requested additional information from BME in relation to the documentation accompanying the request for the construction permit of the Retortillo Plant.

In 2018, the CSN completed the evaluations of the Underground Water Control and Monitoring Program (PVCAS) and of the results of the pre-operational Radiation Monitoring Program (PVRA). and these were positively assessed in December 2018.

During 2018, an inspection was carried out on the monitoring of the Environmental Radiological Surveillance Programme.

During 2018, the CSN did not propose the opening of a sanctioning file or issue this facility with any warning

4.3.6. Uranium mining

This heading includes activities relating to the processing of authorisations for the exploiting of uranium mineral resources and research permits for such uranium mineral resources.

On 8th April 2014, Autonomous Community Government of Castile-Leon granted BME a permit to operate the Retortillo-Santidad site.

During 2018, BME submitted the corresponding tracking report on compliance with the radiological requirements prior to the commencement of operation. It contains information related to the Environmental Radiological Surveillance Plan, Underground Water Control and Monitoring Program, the characterisation of the mining site and the Operational Radiological Surveillance Programme.

BME is the holder of 27 mining research rights regarding which no work has been performed during 2018 that would affect the environment or modify the radiological background of the site. The licensee has submitted the corresponding annual report on compliance with the radiological protection requirements, which includes the activities performed and the radiological protection measures implemented, with nothing to highlight.

During 2018, the CSN did not carry out inspections and no warnings or proposals were made for the opening of disciplinary proceedings against mining permits.

4.4. Facilities under Permanent Shutdown, Dismantling and Decommissioning Phase. Restoration of Mining Sites

The following nuclear or radioactive fuel cycle facilities have ceased to operate or are in the process of being dismantled and decommissioned: Vandellós I nuclear power plant, José Cabrera nuclear power plant, Elefante uranium concentrate plant and the Andújar uranium factory (FUA).

Vandellós I nuclear power plant

Since the beginning of 2005, the Vandellós I nuclear power plant has been in the latency phase contemplated in its dismantling programme.

During 2018, the CSN continued with the habitual tasks of control and inspection of the facility, without having detected any significant incidents or anomalies. During 2018, the CSN carried out two inspections at the Vandellós I nuclear power plant.

From the evaluation of the results obtained from the environmental surveillance at the Vandellós I nuclear power plant during the year, it may be concluded that the environmental quality has been

maintained in conditions that are acceptable from a radiological point of view, without any risk to people. The CSN has not issued Vandellós I with any warnings or sanctions during 2018.

José Cabrera Nuclear Power Plant

The dismantling activities of the José Cabrera nuclear power plant continue to be performed by ENRESA. During 2018, the performance of the activities associated with the dismantling and decommissioning plan continued, in accordance with the established programme. During the year the activities of decontamination and declassification of walls and the removal of radiological elements in the auxiliary and contention buildings continued. During 2018, dismantling and decontamination activities were also carried out in the evaporator and warehouse 1 buildings, as well as the decontamination and dismantling of other unique effluent treatment elements (refuelling and release control tanks). All of these activities were continuing as of 31st December.

As of 31st December 2018, it was estimated that approximately 86% of the facility's dismantling activities had been carried out.

At the end of 2018, the José Cabrera nuclear power plant had four temporary radioactive waste disposal stores (stores 2, 3, 4 and the Auxiliary Building for Decommissioning, EAD). For the temporary storage of radwastes, initially classified as potentially declassifiable, the facility has warehouses known as "Carpa" and "Warehouse C".

The CSN issued its favourable appraisal of the following issues: report on the results of the start-up tests of the new radioactive liquid waste treatment system; proposal for revision 4 of the Radiation Protection Manual; proposal for the design modification for the adaptation of the scrap yard in the towers area as a very low level radioactive waste storage facility; report on the

results of the tests of the new very low level radioactive waste storage facility in the area of the old cooling towers known as "Warehouse 4"; report on the results of the tests for the start-up of the soil washing plant; report on the results of the tests for the new store for declassifiable material called "La Carpa". It also issued a favourable report on ENRESA's request for approval of the proposal for revision 4 of the Security Plan.

A total of 12 inspections were performed during 2018, of which nine were scheduled and three were unscheduled inspections.

During 2018, the CSN has neither warned nor proposed the opening of sanction proceedings against the José Cabrera nuclear power plant.

From the evaluation of the results obtained during the year, it can be concluded that the environmental quality has been maintained at radiological acceptable levels, without any risk to people as a result of the activities carried out in the installation.

On 6th July, the José Cabrera nuclear power plant carried out its annual emergency drill, in accordance with the provisions of its On-Site Emergency Plan.

Elefante plant

The dismantling of the Elefante Plant was completed in 2004. During 2018, the activities carried out at the Elefante plant were subject to the checks and verifications required by the approved surveillance programme. During 2018, there were no incidents which had radiological repercussions for workers or the environment. The CSN has not carried out inspections at the former Elefante Plant during the year.

Andújar uranium factory

The uranium factory in Andújar is a dismantled facility. The Resolution of the Directorate General

for Energy of 17th March 1995, authorises the so-called compliance period of the restored site of the former Andújar Uranium Factory.

During 2018, an inspection was carried out to verify the general, radiological and hydrological conditions imposed in the surveillance and maintenance plan for the compliance period of the site. No deviations from the established programme were found. The only release of radioactive effluents to the outside world was the radon emission monitored in the Environmental Radiological Surveillance Programme. The results obtained are similar to those of previous periods and do not show significant radiological incidence for the population.

Restoration of uranium mines

Finding itself within the uranium mine restoration plan is Enusa's project for the definitive restoration of the mining operations site of Saelices el Chico (Salamanca), which was approved following a report by the CSN, for the resolution of the Territorial Service for Industry, Commerce and Tourism of the Junta de Castilla y León in Salamanca on 13th September 2004.

On the other hand, in 2006, the Junta de Castilla y León authorised Enusa, to carry out the definitive abandonment of work in the old uranium mines of Salamanca: Valdemascaño and Casillas de Flores requiring prior restoration of the sites in accordance with the conditions imposed by the CSN.

Both mines, whose sites were restored in 2008, are now in the so-called compliance period, in order to check that the restoration works are behaving as planned.

Surveillance at the Valdemascaño site continues to this day, and the results of the programme for the entire Surveillance and Maintenance period corresponding to the Casillas de Flores site are currently being evaluated.

In June 2018, the Junta de Castilla y León requested a report from the CSN on the authorisation for the abandonment of mining works at the former Casillas de Flores mine, which was requested in turn by Enusa.

4.5. Radioactive Facilities

4.5.1. General points

Radioactive installations are subject to authorisation by the Ministry for Ecological Transition's Directorate General for Energy Policy and Mines, or by the bodies of the autonomous communities that have executive powers transferred to them in this area. Said authorisation requires the mandatory and binding report of the Nuclear Safety Council.

As of 31st December 2018, executive powers over 2nd and 3rd category radioactive installations had been transferred to the following autonomous communities: Aragon, Asturias, the Balearic Islands, the Canary Islands, Cantabria, Catalonia, Castilla y León, Ceuta, Extremadura, Galicia, La Rioja, Madrid, Murcia, Navarra, the Basque Country and Valencia.

Diagnostic X-ray facilities are governed by a specific regulation that establishes a declaration and registration system for them, which is the responsibility of the autonomous communities.

The Nuclear Safety Council is responsible for the control of the operation and inspection of radioactive facilities once authorised, including diagnostic X-ray facilities, in application of section d) of Article 2 of Law 15/1980.

As of 31 December 2018, a total of 1,295 radioactive installations had operating permits (two 1st category, 947 2nd category and 346 3rd category). Likewise, the Nuclear Safety Council is aware of the registration of 37,931 radiodiagnostic

installations in the corresponding registers of the Autonomous Communities.

Generic issues

A generic issue is any problem relating to radiological safety that may affect several installations and that entails special guidance on the part of the CSN. Monitoring may include sending instructions or circulars to all facilities or to specific sectors to require action or to report on relevant developments, or to request analysis of experiences that may affect them. Generic issues may arise from the analysis of events occurring in Spanish or foreign facilities, as well as from the analysis of standards issued by international bodies or regulators in other countries.

Such generic actions performed by the CSN during 2018 in relation to radioactive facilities are summarised below:

- Radioactive installations with viability issues

The Technical Directorate for Radiological Protection has established among its priorities the improvement of the control of installations with viability problems, in order to ensure that the radioactive sources they possess do not pose an undue risk to the public or the environment.

At the end of 2018, the Inventory of installations with feasibility problems included 19 installations which were subject to special supervision, as well as 78 installations that had been removed as a result of the resolution of their situation, since the radioactive sources had been removed and taken to an authorised and solvent facility, to the supplier or to ENRESA.

- Application of regulations on the security of radioactive sources

Royal Decree 1308/2011, of 26th September, on the security of nuclear installations and

materials and radioactive sources, imposed strict requirements for the protection of radioactive sources of category 1, 2 and 3, defined in an appendix to the standard itself.

For its application, the CSN agreed to issue Instruction IS-41, approving the requirements on the security of radioactive sources. In accordance with this instruction, the licensees of the radioactive sources to which the aforementioned instruction applies were to adapt or constitute their corresponding security systems within a maximum period of eighteen months. The 18-month period expired on 26 March 2018, and the installations have referred their Security Plan (PPF) for approval to the Executive Body which granted them their operating permits.

In 2018, the CSN had already favourably evaluated the PPF of five installations.

4.5.2. Licensing

Industrial installations

During 2018, the radioactive installation was authorised for the marketing of new proton therapy systems manufactured by the Spanish branch, Ion Beam Applications, SA, which are manufactured by Ion Beam Applications, SA (Belgium) and are going to supply an IBA Proteus®ONE to the Quirón Group that will install it in Pozuelo de Alarcón (Madrid), which will also provide it with technical assistance.

Therapy with protons, or proton therapy, is presented as a further step towards the potential improvement of radio-therapeutic treatment due to the physical and radio-biological properties of these particles which offer dosimetrical advantages compared to photon or electron irradiation of conventional linear accelerators.

A high percentage of the applications for permits made this year refer to material analysis testgun.

The increase in the use of this type of equipment had already been detected in previous years and has continued in 2018.

There has also been a high percentage of decommissioning and closure of delegations of facilities equipped with radioactive equipment for measuring soil density and humidity and industrial scanning (gammagraphy), due to the decrease in civil works.

In 2018, special monitoring was carried out on radioactive installations in crisis situations or in bankruptcy proceedings to ensure the safety conditions and radiation protection of equipment with radioactive sources and their adequate management, in application of the CSN action protocol when there is a risk of abandonment of radioactive sources.

Medical facilities

In relation to the authorisation process, the requests that have been reported during this year have been fundamentally for modification of external radiotherapy facilities.

In public hospitals, all the linear accelerators launched in 2018 come from a donation from the Amancio Ortega Foundation. During 2018, 27 linear accelerators for radiotherapy, most of which are located in public hospitals, were reported to be authorised to operate.

In 2018, the application for a permit to operate the first radiotherapy with protons in Spain was approved, this comprises radiotherapy treatment through beams of protons accelerated in a synchrotron to a maximum energy of 230 MeV.

Diagnostic X-ray installations

During 2018, the CSN continued to receive declaration dossiers for these facilities, also, registrations were made for X-ray facilities for medical diagnosis purposes by the competent

industry authority of Autonomous Communities. At present, there is a higher percentage of amendment declarations for registration than for new installations.

Patient protection

In 2010, the Nuclear Safety Council and the Ministry of Health, Social Services and Equality signed a collaboration agreement on radiological protection.

Collaborative activities were carried out during 2018 in relation to the following issues: The MARRTA project on the application of risk matrix methodology in Radiotherapy Services; Courses for users of radiotherapy facilities in different hospitals, on the methodology of Risk Matrices and Collaboration with the Ministry in relation to the “Strategic Line on Safe Clinical Practices of the National Health System” for the period 2015-2020.

Commercial facilities

During 2018 licensing consisted mainly of modifications to existing radioactive facilities.

In order to shed light on the movement of licensing files and the CSN's capacity to respond to requests for reports, table 4.5.2 shows the requests received during 2018, the reports issued during that year and those pending as of 31st December.

In 2018, 336 opinions were issued on authorisations for radioactive installations. Nuclear Safety Council staff evaluated 247 of these requests. The remaining evaluations of requests for authorisation were made by technical staff from the respective autonomous communities entrusted with this function: Catalonia, 53; the Basque Country, 34 and the Balearic Islands, two.

Tabla 4.5.2. Number of licensing dossiers received, resolved and pending at different types of radioactive facilities

	Type of application			Total
	Operation	Modification	Closure	
Applications received in 2018	20	429	30	479
Applications reported in 2018	29	273	34 ^(a)	336
Applications pending report 31/12/18	10	227	6	243

^(a) Reported closures include those that respond to the request of the licensee and ex officio closures. An ex officio closure is that which is proposed by the CSN on its own initiative, in general when it establishes that the licensee is no longer at the facility and/or has left the facility and that the radioactive sources have been removed.

4.5.3. Inspection, monitoring and control of installations

During 2018, 1,275 inspections were performed on radioactive facilities, distributed as follows:

- 405 were performed by the CSN's own personnel.
- 44 were performed by personnel accredited by the CSN, attached to the autonomous community of the Balearic Islands.
- 299 were performed by personnel accredited by the CSN, attached to the autonomous community of Catalonia.
- 152 were performed by personnel accredited by the CSN, attached to the Basque Country.
- 65 were performed by personnel accredited by the CSN, attached to the Government of Asturias.
- 20 were performed by personnel accredited by the CSN, attached to the autonomous community of the Canary Islands.

- 75 were performed by personnel accredited by the CSN, attached to the autonomous community of Galicia.
- 47 were performed by personnel accredited by the CSN, attached to the autonomous community of the Region of Murcia.
- 53 were performed by personnel accredited by the CSN, attached to the Comunidad Foral de Navarra.
- 115 were performed by personnel accredited by the CSN, attached to the Valencian Community.

In addition to inspections, the review of annual reports constitutes a basic element for the control of installations. In 2018, the CSN received around 1,290 annual reports on radioactive facilities, around 5,000 diagnostic X-ray facilities, as well as 348 quarterly marketing reports.

The analysis of the reports drawn up during the inspections, the annual reports on the facilities, the information on radioactive materials and equipment supplied by marketing facilities and the waste management data provided by ENRESA

led, in 2018, to the sending of 463 control letters relating to different technical aspects of licensing and facility control.

In the field of control, the attention to complaints should also be highlighted, of which 53 occurred in 2018, referring to radioactive and radio-diagnostic installations.

4.5.4. Events

In application of the requirements of Instruction IS-18, of 2nd April 2008, of the Nuclear Safety Council, on the criteria applied by the Nuclear Safety Council requiring licensees of radioactive facilities to notify radiological events and incidents, licensees of radioactive facilities reported seven events during 2018, which were reviewed by the Review Panel of Operating and Regulatory Experiences at Radioactive Installations.

4.5.5. Coercive actions

The CSN proposed to the Executive of the Community of Madrid that the permit for a radioactive facility be annulled, in accordance with section c) of Article 2 of Law 15/1980, on the grounds that the anomalies detected were not susceptible to correction, as well as the seizure of the radioactive material from the facility, in accordance with Article 56 of Law 39/2015, of the Common Administrative Procedure of Public Administrations.

The CSN also proposed that the Ministry for Ecological Transition revoke the current authorisation of a company authorised to market and provide technical assistance for X-ray equipment, in view of the disappearance of the conditions which served as the basis for the validity of this authorisation.

As a result of the assessment and control inspection actions at the facilities, 45 warnings were issued by the CSN, two by the Generalitat of Catalonia, seven by the Basque Government and four by the Autonomous Community of the Balearic Islands, making a total of 58, in each of which the deviations are identified and require correction by the licensee within two months.

In one case, a sanction fine was imposed on a facility licensee because they had not implemented the corrective actions required in their warning.

In addition, the CSN issued the Radiological Protection Services of 86 hospitals with warnings for non-compliance regarding the dosimetry control of their workers.

4.6. Service Organizations, Licensed Personnel and other Activities

This section includes companies or entities that, subject to current regulations, may provide services to third parties in the field of radiological protection. It includes radiological protection services (SPR) radiological protection technical units (UTPRs), medical X-ray equipment sales and technical assistance companies, personal dosimetry services (SDP) and registered external companies.

As regards the SPR, in 2018 the CSN authorised a new SPR, with the result that at the end of the year the number of services authorised by the CSN was 87. Twenty-four control inspections were performed on authorised SPR's, four of which were performed by personnel accredited by the CSN assigned to the Autonomous Community of Catalonia, two by personnel assigned to the Autonomous Community of Navarra and three by personnel assigned to the Valencian Community. In addition, two licensing inspections were carried out to verify aspects relating to the assessments associated with the requests for authorisation.

With respect to UTPRs, no new units were introduced in 2018. The modification of one which had been previously authorised was permitted, while the authorisations of two others were revoked. As of 31st December 2018, the number of UTPRs authorised by the CSN was 39. 14 control inspections of these entities were carried out, two of which were performed by CSN accredited personnel assigned to the autonomous community of Catalonia. In addition, two licensing inspections were carried out.

During 2018, the CSN awarded seven diplomas to heads of radiological protection services, all of them applicable to the SPR.

The dosimetry surveillance of exposed workers must be performed by personnel from dosimetry services expressly authorised by the CSN. In 2018, in the field of external dosimetry, the authorisations for seven dosimetry services were modified (in five of them to incorporate the dosimetry of extremities/ring dosimetry). At the end of the year, the number of authorised dosimetry services was 21.

In the field of internal dosimetry, one authorisation was modified. At year-end, the number of self-sustaining internal dosimetry services was nine.

Eight control inspections were carried out on authorised personnel dosimetry services, and one licensing inspection, to verify aspects relating to the evaluations associated with the request to modify one of them.

As a noteworthy fact, it should be pointed out that warnings were issued to those facilities (a total of 86) that, on having more than ten exposed workers, more than 10% thereof have the assigned administrative doses.

External companies (or contracting companies) whose workers perform activities in the controlled zone are obliged to register in a registry created for

this purpose by the CSN. At the end of 2018, a total of 2,104 companies were registered in the Register of External Companies.

In 2018, the CSN reported the authorisation of twelve new sales and technical assistance companies and the modification of four others, bringing the number of authorised sales and technical assistance companies to 356 at the end of the year.

In order to guarantee the safe operation of the facilities, the Regulation on nuclear and radioactive facilities requires their operators to hold licences. Both such certificates and diplomas are awarded by the CSN.

Table 4.6.5.1 includes the number of licenses granted, renewed and in force at 31st December 2018 for radioactive facilities, except for CIEMAT and fuel cycle facilities.

Table 4.6.5.2 presents the list of licenses granted, renewed and in force at Spanish nuclear power plants as of 31st December 2018.

Table 4.6.5.3 lists the number of licenses granted and renewed at fuel cycle and at dismantling facilities.

During 2018, the CSN issued 188 accreditations to direct and 2,644 to operate medical radiodiagnosis facilities. In addition, the registration of 389 accreditations to direct and 459 accreditations to operate facilities were registered. The latter figures corresponded to persons who had passed training courses for personnel who direct the operation or operate equipment at X-ray facilities for medical diagnostic purposes, in accordance with the minutes sent by the approved entities to carry out said courses.

As of 31st December 2018, the total number of accredited persons was 153,276 of whom 61,600 are accredited to manage and 91,676 to operate radio-diagnostic facilities respectively.

Tabla 4.6.5.1. Concession and renewal of licenses for radioactive facilities. Year 2018

Installation	New licenses and extensions					In force 31/12/18		
	Concessions			Extensions		Supervisor	Operator	Head of Protection Service*
	Supervisor	Operator	Head of Protection Service	Supervisor	Operator			
Radioactive facility 1st category (except fuel cycle facility)	–	–	–	–	1	11	25	1
Radioactive facility 2nd and 3rd category (except CIEMAT)	337	1,369	7	437	1,007	3,486	9,783	195
Total	337	1,369	7	437	1,008	3,497	9,808	196

* Head of Protection Service (this includes the job titles of Head of Services for Radiological Protection Technical Units).

Tabla 4.6.5.2. Concession and renewal of licenses for nuclear power plants

Installation	New licenses and renewals					In force 31/12/18		
	Concessions			Renewals		Supervisor	Operator	Head of Protection Service
	Supervisor	Operator	Head of Protection Service	Supervisor	Operator			
Santa María Garoña	–	–	–	–	–	12	6	2
Almaraz I y II	–	4	–	1	5	27	39	4
Ascó I y II	2	2	–	2	8	31	38	4
Trillo	–	9	1	2	2	17	22	3
Cofrentes	–	7	–	–	–	20	27	4
Vandellós II	–	–	–	–	4	21	19	4
Total	2	22	1	5	19	128	151	21

In 2018, in relation to courses for the training of radioactive facility personnel, three new entities were granted approval and the previously granted approval of eleven others was modified. With regard to courses aimed at accreditation to direct or operate radio-diagnostic facilities, five new entities were granted approved and such approval granted to fourteen others was modified. The CSN carried out 72 inspections in order to carry out the evaluation of 116 courses corresponding to radioactive facilities.

Moreover, in 2018, in accordance with their respective mandates, the autonomous community of the Basque Country reported the performance of twelve inspections of courses, and the autonomous community of Catalonia the performance of seventeen inspections corresponding to radioactive installations. On the other hand, the CSN carried out five inspections of courses aimed at accrediting the personnel of radio medical diagnosis facilities.

In order to facilitate the delivery of these courses and thereby the training of workers, the CSN

develops and maintains a project with educational material for all fields of application of radioactive and radio-diagnostic facilities and has made it available to any user on the institutional web page of the organisation (www.csn.es). During 2018, work continued on updating and improving the contents of this project, including the possibility of self-evaluation.

Article 74 of the Regulation on nuclear and radioactive facilities foresees the need for authorisation, following a report by the CSN, of other activities such as these: The manufacturing of radioactive equipment or generators of ionising radiations, the introduction onto the Spanish market of consumer products incorporating radioactive materials, the marketing of radioactive materials and apparatus incorporating radioactive materials or that generate ionising radiations, the

transfer of unlicensed radioactive materials to any authorised entity and the technical assistance of radioactive apparatus and equipment generating ionising radiations.

In relation to the authorisation for the marketing and technical assistance of apparatus generating ionising radiations, by companies whose activities do not require a radioactive facility, the CSN issued 24 reports during 2018: 14 regarding the modification of existing authorisations, nine for new authorisations and one for decommissioning. The reports on modifications and new authorisations refer to the marketing and technical assistance of X-ray equipment, both with and without type approval and in other cases of the marketing and technical assistance of equipment with exempt/declassified radioactive sources.

Tabla 4.6.5.3. Concession and renewal of licenses for fuel cycle and dismantling facilities. Year 2018

Installation	New licenses and extensions					In force 31/12/18		
	Concessions			Extensions		Supervisor	Operator	Head of Protection Service*
	Supervisor	Operator	Head of Protection Service	Supervisor	Operator			
Juzbado Factory	–	–	1	3	4	13	38	3
Saelices Center (Quercus & Elefante Plants)	–	–	–	–	–	1	7	1
CIEMAT nuclear power plants	–	–	–	1	–	1	1	–
Ciemat radioactive plants	2	3	–	6	12	56	53	2 ⁽¹⁾
El Cabril waste storage plant	–	–	–	1	1	5	7	3
Vandellós I	–	–	–	–	–	3	–	1
José Cabrera	1	–	–	–	1	1	2	1
Total	3	3	1	11	18	80	108	11

* Head of Protection Service (this includes the job titles of Head of Services for Radiological Protection Technical Units). ⁽¹⁾ Also for nuclear installations.

During 2018, the CSN issued two reports relative to the manufacturing of radioactive equipment.

In 2018, the CSN issued 38 favourable reports, 28 regarding modification and ten new authorisation reports for the approval of 60 models of radioactive apparatus. In most cases, type approval of radioactive apparatus is granted for X-ray equipment, the risks of which can be mitigated more effectively by means of good design and adequate maintenance to ensure that the conditions by which such approval was granted are maintained.

The CSN issued an unfavourable report on the non-justification of the type approval of radioactive equipment for the inspection of persons which was applied for by the University of Alcalá de Henares.

4.7. Transport of Nuclear and Radioactive Materials

The transport of radioactive material is regulated in Spain by a series of regulations on the transport of hazardous materials by road, rail, air and sea, which refer to international normative agreements based on the IAEA's Regulation for the safe transport of radioactive materials.

The safety of transport rests fundamentally on the safety of the packaging, while operational controls have a secondary character during the development of the expeditions. From this point of view, the regulation focuses on packaging design requirements and the standards to be met by the Shipper, who prepares the package (packaging plus its contents) for shipment. Packages are classified into five types: excluded, industrial, type A, type B or type C.

Most of the transports carried out in Spain are of radioactive material for application in medicine and in research, within excepted or type A

packages. The transport of radioactive residues from nuclear and radioactive facilities to El Cabril normally requires excepted, industrial type or type A packages. These types of packages are for low or med-risk contents. The contents that pose the highest risk are transported in fissile material packages and type B and C packages.

Licensing activities include:

- Design approvals of transport packages and transport authorisations required by hazardous transport regulations.
- Security authorisations and registration of entities that carry out transports requiring security measures, in accordance with the requirements of Royal Decree 1308/2011, of 26th September, on the security of nuclear facilities and materials, and radioactive sources.
- Authorisations for shipments of radioactive wastes, in accordance with Royal Decree 243/2009, of 27th February, regulating the surveillance and control of shipments of radioactive wastes and spent nuclear fuel between Member States or coming inside or going outside a particular region.
- Authorisations for the reduction of civil liability coverage for nuclear damage, in accordance with the provisions of Article 57 of Law 25/1964, of 29th April, on nuclear energy.

In 2018, one design approval was issued for packages of Spanish origin and three validations of foreign design approval certificates.

During the year a transport authorisation, a radioactive waste shipment authorisation, a security authorisation and a request for reduction of civil liability cover were reported.

During 2018, 67 inspections specifically related to transport were carried out: 22 by the CSN itself and 45 by the services which carry out such Assignments of functions in the Autonomous Communities. In addition to these specific inspections on transport activity, the requirements applicable to the transport of radioactive material were controlled as part of the inspections carried out at radioactive installations, which include transport among their activities. In 2018, no proposal was made for the opening of a disciplinary file relating to the activities of transporting radioactive material.

In 2018, 71 shipments of fissile material were carried out, 43 from the Juzbado factory to various destinations and 28 in the opposite direction.

ENRESA carried out a total of 265 expeditions, 238 from nuclear facilities and 27 from radioactive facilities, their final destination being the El Cabril facility.

In 2018, there were two events during the transport of radioactive material. Both affected type A packages and were classified as level 0 (not on the scale, unimportant in terms of safety), in accordance with the IAEA's International Nuclear and Radiological Events Scale (INES) Manual.

In 2018, the number of workers dosimetrically exposed to hazardous substances as they developed their activity in the field of transport was 163. Of these, 83 received significant doses (above zero). The dosimetry readings represented a collective dose of 149.78 mSv·person and the average individual dose of 1.80 mSv/year, which represents a percentage of 3.6% with respect to the maximum annual dose permitted in the regulations in force.

The individual dose has decreased compared to the value obtained the previous year (1.95 mSv/year),

as well as the collective dose (183.36 mSv·person). The number of users has decreased slightly and the average individual doses have decreased in the different ranges of doses considered.

4.8. Activities and Facilities not Covered by Nuclear Regulations

The CSN also carries out the management of radioactive material detected in activities that are not not subject to nuclear regulations, such as the removal of non-authorised radioactive material, the removal of radioactive material detected in metallic materials and the detection of radioactive materials in ports.

Removal of unauthorised radioactive material

The management of radioactive materials lacking authorisation, probably as result of practices carried out prior to the implementation of nuclear regulations in Spain, is normally accomplished through their removal by ENRESA as radioactive waste.

During 2018, the CSN drew up reports for 29 authorisations for transfers to ENRESA of different materials and radioactive sources. In 20 of these cases the requesting company or entity did not have a radioactive facility and the rest of the applicants were licensees of facilities. Three of the 29 reports were carried out by personnel from the Basque Country and one by personnel from the Balearic Islands.

Removals of radioactive material detected in metallic materials

The Collaborative Protocol for the Radiological Monitoring of Metallic Materials constitutes the reference framework for the radiological monitoring of metals intended for recycling in Spain. As a result of the application of the protocol, during 2018 the CSN was informed of the detection of radioactivity in metallic materials on 81 occasions. The radioactive materials detected

were: isolated radioactive sources, displays with radio-luminescent paint, ionic smoke detectors, radioactive lightning rods, pieces of uranium, products containing radium and thorium, and artificially or naturally contaminated items. These materials have been transferred to ENRESA for management as radioactive waste, or are awaiting completion of their characterisation for the performance of such transfer.

Since 1998, the total number of detections reported to the CSN stands at 1,905.

Facilities affected by radioactive sources melting incidents

During 2018, there were no incidents related to the melting of radioactive sources.

Radiative material detected in seaports

The Protocol for action in the event of detection of inadvertent movement or illicit traffic of radioactive material in ports of general interest

(Algeciras, Valencia, Barcelona, Bilbao, Vigo, Tarragona and Santa Cruz de Tenerife), constitutes the framework for radiological surveillance of goods entering Spain by sea.

In June 2010, the protocol was signed between the Nuclear Safety Council, the Spanish Tax Administration Agency (AEAT), the Ministry of the Interior, the Ministry of Public Works, the then Ministry of Industry, Tourism and Trade, and the National Company of Radioactive Residues (ENRESA).

As a result of the application of the protocol, on seven occasions during 2018 the CSN was informed of the detection of radioactivity in different goods at the ports of Algeciras, Barcelona, Valencia and Bilbao.

The radioactive materials detected were either clarified as exempt/declassified or transferred to ENRESA for management as radioactive waste.

5. Radiation Protection of Exposed Workers, the Public and the Environment

5.1. Radiation Protection of Workers

The majority of radiation doses received by exposed workers are controlled by means of individual monitoring using passive physical dosimeters. There are cases, however, in which, if the radiological risk is sufficiently low, the doses are determined on the basis of the results of the radiological monitoring in the areas in which the workers carry out their work.

The dosimetry of workers exposed to ionising radiations is regulated by the Regulation on Protection against Ionising Radiations, which establishes that individual dosimetry must be performed by the personal dosimetry services expressly authorised by the CSN.

At the close of 2018, the National Dosimetry Bank, contained 25,616,344 dosimetry records, corresponding to 382,504 workers and 79,192 installations. Each of these registers contains the information necessary to identify the worker, the facility and the labour sector in which the worker carries out his activity and the type of work carried out by the worker.

The number of dosimetrically controlled workers and who properly reset their dosimeters was 115,437, corresponding to a collective dose of 17,941 mSv·person; this value represents 22% of the value of the total collective dose (81,481 mSv·person) that would be obtained by including the administrative doses assigned.

A noteworthy fact is that, although the maximum regulatory value of effective dose in any official year is 50 mSv:

- 76.2% of dosimetrically controlled workers (87,984) did not receive doses.
- 96.2% of dosimetrically controlled workers (111,086) received doses lower than 1 mSv/year.
- 99.8% of dosimetrically controlled workers (115,212) received doses lower than 6 mSv/year.
- 99.99% of dosimetrically controlled workers (115,426) received doses lower than 20 mSv/year.

During 2018, three cases were reported where the annual dose limit established in legislation was potentially exceeded, both in radioactive facilities, about which an investigation process has been initiated.

Table 3.2.1.1 summarises the dosimetry information for each of the labour sectors considered in this report. In figures 5.1.1 and 5.1.2 the values of the collective dose and the average individual dose in these sectors are presented.

Analysis of the above data reveals:

- Medical radioactive facilities are those with the highest collective dose (12,663 mSv·person), which is logical considering that these facilities have the highest number of exposed workers (92,316).
- Transport facilities are those that record the highest average individual dose (1.8 mSv/year).

As regards the operating plants, it should be pointed out that the number of dosimetrically controlled workers was 8,641, with a collective dose of 2,904 mSv·p and an average individual dose of 1.03 mSv/year. For permanent staff (2,041 workers) the collective dose was 263 mSv·person and the average individual dose was 0.62 mSv/year and, for contract personnel (6,655 workers), the

Figure 5.1.1. Collective dose and number of workers exposed by sectors. Year 2018

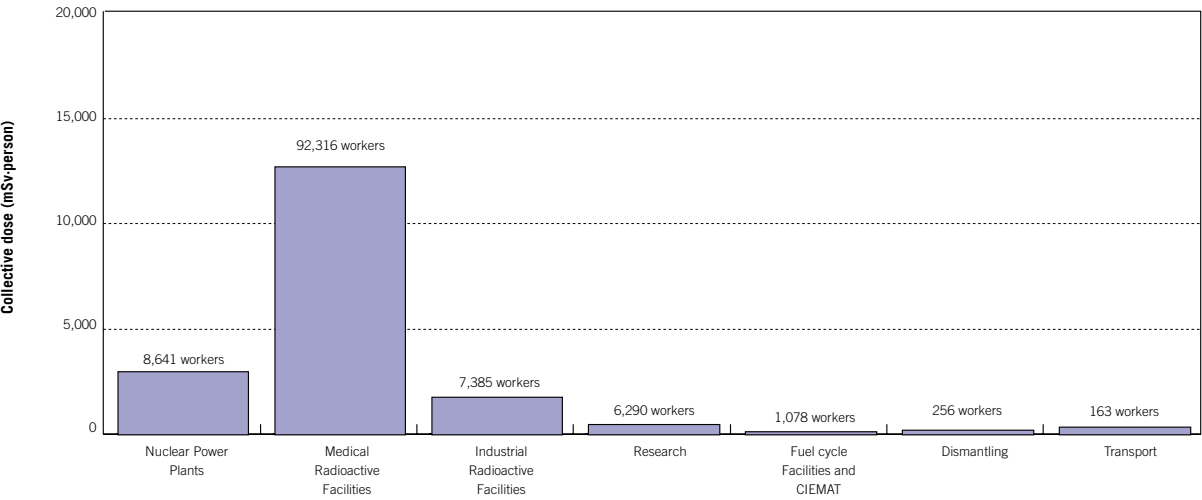
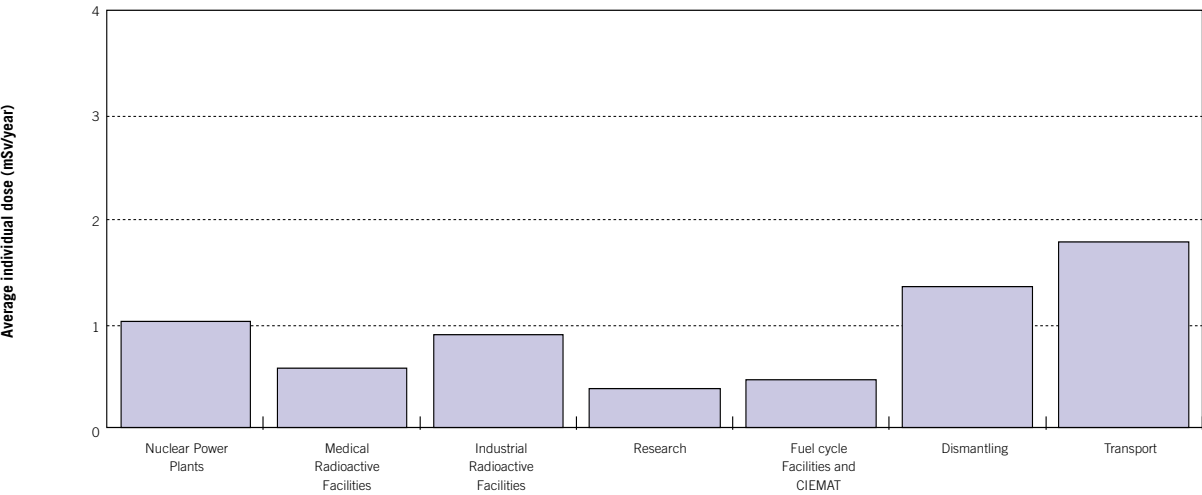


Figure 5.1.2. Average individual dose per sector. Year 2018



collective dose was 2,641 mSv-person and the average individual dose was 1.10 mSv/year.

With regard to internal dosimetry, controls were carried out by direct measurement of body radioactivity on all workers at significant risk of incorporating radionuclides, and in no case were

values detected that were higher than the established recording level (1 mSv/year).

Figures 5.1.3 and 5.1.4 show the time evolution of the three-year average collective dose by type of reactor corresponding to the Spanish nuclear power plants, and comprise the values recorded at international level.

Figure 5.1.3. Average three-yearly collective dose per reactor for PWR type reactors. International comparison

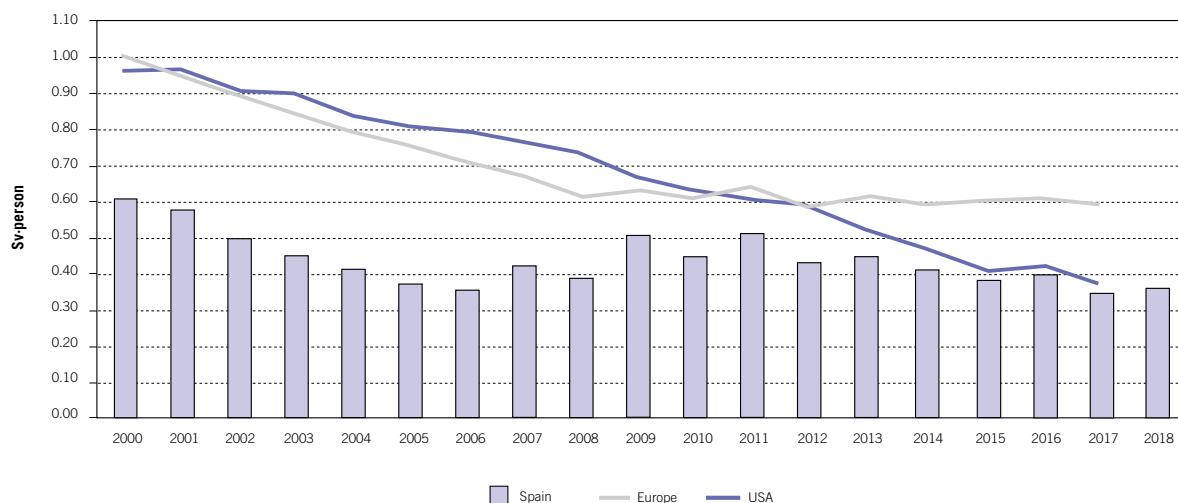
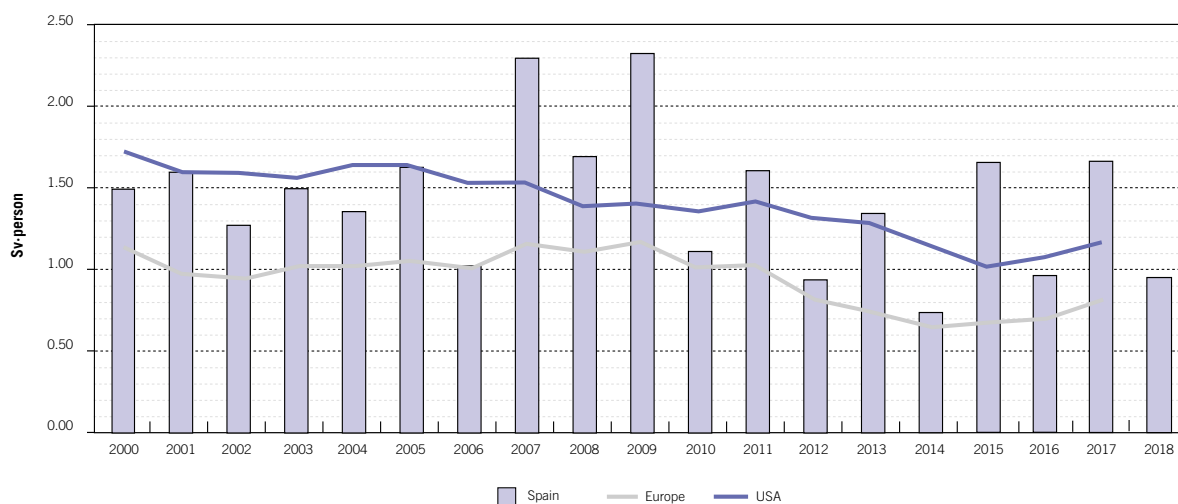


Figure 5.1.4. Average three-yearly collective dose per reactor for BWR type reactors. International comparison



In order to assess the results obtained, it must be borne in mind that:

a) PWR pressurised water reactors:

During the three-year period 2016-2018, there has been a slight increase in the average collective three-year dose per reactor at the nuclear power plants with respect to the previous three-year period. In 2018, there were five refuelling outages at the Almaraz I and II, Ascó I, Vandellós II and Trillo nuclear power plants.

The situation regarding occupational doses at Spanish nuclear power plants using this technology still shows lower values than those in the latest available data for EU nuclear power plants which rely on the same technology (three-year period 2015-2017), and for US nuclear power plants (three-year period 2015-2017).

b) BWR boiling water reactors:

As from 2013, when Santa María de Garoña ceased to operate, the data on the three-year average collective dose per reactor for Spanish BWR reactors have solely reflected the official doses of the Cofrentes nuclear power plant, which influences the results of this parameter.

In the three-year period, 2016-2018, the value of the three-year average collective dose per reactor for BWR reactors was lower than that of the three-year period prior to the one which takes in the refuelling of Cofrentes, whereas in the three-year period ending in 2017 two refuelling actions were accounted for. In 2018, there was no refuelling at the Cofrentes nuclear power plant.

5.2. Discharge Control and Environmental Radiation Monitoring

The CSN controls and oversees the radiological protection measures for the public and the

environment, offsite releases of radioactive materials from nuclear and radioactive facilities and, as well as their impact (one-off or aggregated) on areas near these facilities, all with the aim to estimate their radiological impact and monitor and ensure the radiological quality of the environment throughout the country.

Moreover, Articles 35 and 36 of the Euratom Treaty establish that each Member State must have the necessary facilities to ensure that environmental radioactivity is controlled and that information relating to these controls is communicated regularly to the Commission of the European Union.

As regards environmental radiation monitoring, this report presents, as previously mentioned, the results of the environmental radiation monitoring programmes (PVRAs) corresponding to 2017.

Control and surveillance of radioactive effluents

The Regulation on the Protection of Health against Ionising Radiations (RPHIR) requires that facilities that might generate radwaste to be equipped with adequate treatment and disposal systems in order to guarantee that the doses due to releases are lower than the limits established in the administrative authorisations and that they are kept as low as reasonably achievable.

At nuclear power plants, the CSN requires a programme to control radioactive effluents and to maintain public doses due to such effluents as low as possible and always in accordance with the values of the RPHIR.

The Radioactive Effluent Control Programme (PROCER) is defined in the operating technical specifications and is developed in detail in the Off-Site Dose Calculation Manual (ODCM), which includes the requirements for the control and surveillance of effluents and environmental radiological surveillance. As a consequence of a

homogenisation process carried out with the plants, a revision of PROCER came into force in January 2018.

The remaining installations have similar programmes which are included in different documents depending on the installation.

Table 5.2.1 contains a summary of the limits established for radioactive releases from the facilities. Figures 3.2.2.1, 3.2.2.2, 3.2.2.3 and 3.2.2.4 show the liquid and gaseous radioactive effluents from the PWR and BWR plants.

Each month, calculations are made of the doses due to the radioactive releases from the facilities

to verify compliance with the established limits, always applying conservative criteria and values. The methodology and hypotheses used are common to each type of facility, except for those parameters which are site specific. In addition, in accordance with Article 53 of the RPHIR, public doses are calculated annually with realistic criteria.

The CSN regularly sends information on radioactive releases to the Commission of the European Union, the International Atomic Energy Agency (IAEA) and the OSPAR Convention. This information is included in these organisations' periodic publications together with those provided by other Member States.

Tabla 5.2.1. Release limits. Radioactive effluents

	Limits	Releases	Variable	Value
Nuclear power plants	Operational restrictions	Total	Effective dose	0.1 mSv/a
		Gases	Effective dose	0.08 mSv/a ⁽¹⁾
		Liquids	Effective dose	0.02 mSv/a ⁽¹⁾
El Cabril	Dose limits	Gases ⁽²⁾	Effective dose	0.01 mSv/a
CIEMAT	Instantaneous limits	Liquids	Concentration of activity of known mixture	$\sum \frac{Ci}{CDAi} \leq 0.1$ ⁽³⁾
			Concentration of activity of unknown mixture	$C_{Alfa \text{ Emitters}} \leq 0.1 CDA_{Ra-226}$ $C_{Beta \text{ Emitters}} \leq 0.1 CDA_{Mr-90}$
	Dose limits ⁽⁴⁾	Total	Effective dose	0.1 mSv/a
Juzbado	Dose limits	Total	Effective dose	0.1 mSv/a
Quercus	Increase on river bottom	Liquids	Concentration at Ra-226 activity	3.75 Bq/m ³
	Annual limit	Liquids	Ra-226 activity	1.64 GBq/a
	Annual limit	Gases	Average concentration mineral powder	15 mg/m ³
	Annual limit	Gases	Average concentration concentrate powder	5 mg/m ³
	Dose limit	Total	Effective dose	0.3 mSv/a

(1) Generic values, the distribution between liquids and gases is different in some installations.

(2) Zero releases for liquids.

(3) CDAi: water concentration values derived from the RPHIR effective public dose limit considering an ingestion rate of 657 l/year.

(4) Applicable to all liquid and gaseous radioactive effluents generated by the improvement tasks performed within the framework of the IPICI Project.

Radiological monitoring in the vicinity of facilities

At nuclear and radioactive fuel cycle facilities, an Environmental Radiation Monitoring Programme (PVRA) is required to provide data on the levels of radioactivity along the most important exposure pathways for people at each site, and to allow verification, where appropriate, of the suitability of the effluent monitoring programmes and the transfer models of radionuclides in the environment.

The PVRA is defined in the Operating Technical Specifications and is developed, together with the Programme for the control of radioactive effluents, in the Off-Site Dose Calculation Manual at the plants and other facilities, and at the remaining sites in different documents depending on the facility.

Facilities which are currently in the dismantling and/or decommissioning phase have an environmental radiological surveillance programme which is adapted to their situation and to the type of installation. Such facilities are: the Vandellós I and José Cabrera nuclear power plants, the former Lobo-G uranium ore treatment plant,

the Andújar Uranium Factory (FUA) and the CIEMAT research centre.

Table 5.2.2 provides data on all the samples taken as a result of the application of PVRA's of the nuclear power plants.

All the results are similar to those of previous years, allowing the conclusion to be drawn that the environmental quality around the installations has been maintained in conditions that are acceptable from the radiological point of view, without any risk to people as a result of their operation or of the dismantling or decommissioning activities performed therein.

In 2017, as part of the environmental radiological surveillance programmes at the facilities, 6,289 samples were taken at operating nuclear power plants (including the Santa María de Garoña nuclear power plant); 1,312 samples were taken at fuel cycle facilities (Juzbado + El Cabril) and 2,527 samples at facilities being dismantled and decommissioned (CIEMAT + José Cabrera nuclear power plant + Vandellós I nuclear power plant + Quercus + FUA + LoboG).

Tabla 5.2.2. Number of samples taken by nuclear power plants in 2017

Type of samples	Garoña	Almaraz	Ascó	Cofrentes	Vandellós II	Trillo
Total atmosphere	466	797	837	778	828	780
Total water	193	212	130	142	90	159
Total food	115	297	119	103	105	138
Total	774	1,306	1,086	1,023	1,023	1,077

Tabla 5.2.3. Environmental radiological surveillance programmes: number of samples taken at facilities for fuel cycling, dismantling shutdown and decommissioning in 2017

Installation	Juzbado	El Cabril	Ciemat	Quercus/ Elefante	José Cabrera	Vandellós I	FUA	Lobo G
No. of samples	586	726	725	630	763	331	42	36

Environmental radiation monitoring results obtained by licensees in their areas of influence, are compared to values from CSN control programs (sampling and radiological analyses), known as Independent Environmental Radiation Monitoring Programs (Spanish acronym PVRAIN). They are carried out either directly, through specific collaboration agreements with five university laboratories measuring environmental radioactivity integrated into the Network of Sampling Stations (REM), located in the same autonomous communities as the corresponding facilities, or through the programmes entrusted to the autonomous communities (Catalonia and Valencia) that have contracted four laboratories to carry them out. Sampling points, the type of samples and the analyses carried out coincide with those of the licensees, with a scope accounting for some 5% of the environmental radiation monitoring program carried out by each site.

The results of these programmes corresponding to the 2017 campaign are generally equivalent to those obtained in the corresponding PVRA,s of the different installations, without significant deviations.

Radiation monitoring in the country

The CSN monitors the environment at a national level by means of a surveillance network known as Revira, in collaboration with other institutions. This network is made up of automatic stations that measure atmospheric radioactivity continuously (Spanish acronym: REA) and stations that collect air, soil, water and food samples for subsequent analysis (Spanish acronym: REM).

The monitoring programmes take into account the agreements reached by the Member States of the European Union to comply with Articles 35 and 36 of the Euratom Treaty. The Commission of the European Union drew up the recommendation of 8th June 2000, which establishes the minimum scope of monitoring programmes to comply with

Article 36. This recommendation considers the development of two monitoring networks:

- A Dense Network, with multiple sampling points, so that the whole territory of the Member State is adequately monitored. In Spain, since 2000, the collection of samples of milk and drinking water has been included, having been completed in 2008 with the collection and analysis of samples of the standard diet.
- A Spaced Network, made up of very few sampling points, where very low detection thresholds are required in order to follow the evolution of activity concentrations over time. In Spain, it is made up of sampling points from the so-called high sensitivity network.

The Network of Sampling Stations (REM)

The Nuclear Safety Council maintains a specific agreement with the Ministry of Public Works' Centre for Public Works Studies and Experimentation (CEDEX) relating to the permanent radiological monitoring of the waters of all Spanish river basins within the dense network, and another, which includes the monitoring of inland waters within the spaced or high sensitivity network.

Figura 5.2.1 shows the points comprising the inland water and coastal monitoring network.

The results of the radiological measurements performed during 2017 on these samples confirm the behaviour observed over the years in the different basins, the most noteworthy of which are the following:

- Activity index values for total alpha, total beta and other beta values reflect fundamentally the geographical and geological characteristics of the stream area soils. In addition, the values may be affected by the impact of urban releases,

Dense network

- River water sampling point sea
- Water sampling point
- Nuclear power plant and nuclear fuel cycle facility

High sensitivity network

- Seawater sampling point river
- Water sampling point

For total beta activity indexes, the stations located downstream of large population centres are those with the highest values as a result of urban releases.

With respect to other isotopes of artificial origin, and as has been happening regularly in all basins, during 2017 the artificially produced gamma emitting radionuclides analysed within the dense network programme remained below their corresponding detection limits.

- 73

The dense network programme of environmental radiological monitoring in Spanish coastal waters includes sampling areas located ten miles from the coast. With the exception of samples collected at the mouths of ports, the samples are taken from the surface layer and analyses are performed on total alpha activity, total beta and other beta, as well as gamma spectrometry and tritium in the dense network programme, and analysis of Caesium-137 in the spaced network or high sensitivity network programme.

During 2017, samples were collected at the 15 points shown in figure 5.2.1.

The values of each analytical determination are fairly homogeneous at all sampling points and similar to previous campaigns. The greatest variability is found in the case of tritium where slightly higher values are obtained in some of the points located in the Mediterranean Sea.

As in previous years in the dense network programme, no gamma-emitting artificial isotopes were detected in any of the samples analysed. Cesium-137 was detected in all the analysed samples from the high sensitivity network, it had activity concentration values of around those detected at other European network stations.

Atmosphere and terrestrial monitoring programme

The CSN, through specific agreements with 20 laboratories from different universities and the Public Research Agency for Energy, Environment and Technology (CIEMAT), carries out the so-called dense network and high sensitivity network surveillance programme, taking samples of air, soil, drinking water, milk and standard diet at sampling points located in the vicinity of university, except in the case of milk, which is collected at representative points of national production.

The overall assessment of the results shows that the values are consistent with background radioactivity levels of radiation and, in general, remain relatively stable throughout the different periods, with slight variations being observed between points which are attributable to the radiological characteristics of the different areas.

The Network of Automatic Stations (REA)

The CSN's Network of Automatic Stations (REA) is made up of 25 stations distributed as shown in figure 3.2.2.5. (REA) of this report.

Each network station is equipped with instrumentation to measure gamma dose rate, radon concentration, radioiodines and airborne alpha and beta emitters. Online station data is received and analyzed at REA's supervision and control center, located at the CSN's emergency room (Salem).

An agreement between Spain's Weather Agency (Spanish acronym: AEMET) and the CSN, establishes that REA stations are located next to automatic AEMET stations, having a common communication system, with the exception of REA stations in Madrid (at Ciemat) and Penhas Douradas (Portugal). The latter is in the same location as a station of Portugal's radiological monitoring network. In turn, a Portuguese network station is in the same location as a REA station in Talavera la Real (Badajoz). This enables data comparison.

During 2018, specific connection agreements were developed in a satisfactory manner between the CSN network and the automatic radiation monitoring networks of the autonomous communities of Valencia, Catalonia, the Basque Country and the Regional Government of Extremadura.

The data exchange commitments derived from the agreement with the Directorate General for

the Environment (DGA) of Portugal and from the CSN's participation in the Eurdep project (European Union Radiological Data Exchange Platform) of the European Union were fulfilled.

The results of the measurements carried out during 2018 were characteristic of the environmental radiation background, showing no radiological risk for the population or the environment.

During 2018, the tender for the supply, installation and commissioning of the new network of automatic radiation monitoring stations was resolved, the latter will be implemented over the next 3 years (2019-2021).

Intercomparison campaigns

The CSN carries out an annual programme of analytical comparative exercises, with the technical support of CIEMAT, in which some 40 laboratories take part and carry out low-activity measurements, the objective of which is to guarantee the quality of the results obtained in the environmental radiological surveillance programmes. These campaigns are a means of proven effectiveness to improve the reliability of program results.

The year 2018 marked the end of the campaign started in 2017. In the latter, the matrix under study, distributed to the participants, corresponded to air filters with natural and anthropogenic radionuclides prepared in the Preparation Laboratory for Quality Control (Mat Control) in collaboration with the Laboratory of Environmental Radiology, the Department of Chemical Engineering and Analytical Chemistry of the University of Barcelona. Thirty-six laboratories took part.

In November 2018, the twenty-fifth environmental radiological surveillance day was held at CSN headquarters.

5.3. Protection against Natural Radiation Sources

In 2018, the CSN completed its pilot inspection programme of the NORM industries (processing or generating radioactive material due to their natural radionuclide content) and workplaces prone to radon exposure. This programme, developed in the 2017-2018 biennium, covered all sectors located in Spain (1-14) of the CSN's IS-33 Appendix on radiological criteria for protection against exposure to natural radiation.

During 2018, a gas production facility, an entire steel works, a zirconium mill, a dicalcium phosphate production plant, a spa and an underground work site were inspected and a technical visit to a cement factory was carried out.

The different initiatives implemented by the CSN in previous years to improve compliance with the regulations relating to the control of natural radiation have been reflected in an increase in the number of registrations in the corresponding autonomous registers. As of December 2018, the number of facilities registered at national level was 92, although it should be pointed out that some Autonomous Communities have not provided the CSN or Miteco with copies of the declarations received.

In relation to the management of sites affected by NORM wastes, the CSN has turned to the public company Tragsa, which will complete the works to eliminate the chemical pollution of the Flix reservoir. The latter, in order to guarantee adequate compliance with the regulations in force in relation to protection against natural radiation, and Tragsa has participated in the environmental impact statement process of the project submitted by Fertiberia for the closure of the phosphogypsum ponds in Huelva.

The CSN also took part in two meetings for the preparation of the future National Radon Plan, convened by the Ministry of Health, Consumption and Social Welfare. Within the framework of collaboration with the Ministry of Public Works for the development of a specific regulation limiting the entry of radon into

buildings, the CSN has drawn up, on the basis of its radon potential map of Spain, a zoning map per municipality. Depending on the category assigned to the municipality, which is specified in a document accompanying the HS6 Basic Document, different criteria of radon protection are required in buildings.

6. Monitoring and Control of Irradiated Fuel and Radioactive Wastes Management

6.1. High-Activity Radwaste and Irradiated Fuel

Spent nuclear fuel generated in Spain (with the exception of the reprocessed fuel generated in the operation of the Vandellós I nuclear power plant) is currently being stored in the fuel pools associated with the nuclear reactors and in the dry storage casks in Temporary Individual Storage (ATI) facilities at the sites of the Trillo, José Cabrera, Ascó and Almaraz nuclear power plants.

The high level residues category includes residues from the reprocessing of the fuel from Vandellós I (12 m³, currently in France).

During 2018, the CSN continued to control and supervise the generation of spent fuel, its inventory and the storage facilities' situation at the nuclear power plants, both the storage pools and the ATIs, as well as the manufacture of the spent fuel dry storage casks authorised in Spain.

In addition, during 2018 the CSN continued to carry out licensing activities for new container designs, such as the start of the evaluation of HI-STAR 150, or the design modifications thereof, such as the ENUN 32P, HI-STORM 100 and ENUN52B casks, in addition to other activities associated with the licensing of ATIs at the sites of the Santa María de Garoña, Cofrentes, Almaraz and Trillo plants.

Inventory of High-activity Radwaste and Irradiated Fuel Stored in Nuclear Power Plants

The total number of fuel ASSEMBLIES stored at the nuclear power plants as of 31st December 2018 was 15,838, of which 8,849 were from the PWR

nuclear power plants and 6,989 from the BWR nuclear power plants. Of these:

- 14,085 are stored in the reactors pools, with 4,263 tons of uranium.
- 1,753, with 711 tons of uranium, are in the temporary individual storage facilities at the Trillo sites (736 elements, of which 672 assemblies are in 32 ENSA-DPT casks and 64 assemblies in two ENUN 32P casks); José Cabrera (377 assemblies in 12 HI-STORM 100Z casks), Ascó (608 assemblies in 19 HI-STORM 100 casks) and Almaraz (32 assemblies in an ENUN 32P cask).

In total, these 15,838 fuel assemblies contain 4,974 tons of uranium, representing 74.5% compared to the 6,674 tons of uranium that will be generated in the 40 years of operation of the nuclear power plants, foreseen in the estimates of the 6th General Radioactive Residues Plan. Figure 6.1 shows the inventory of fuel stored in the spent fuel pools of the nuclear power plants and, where appropriate, in the ATIs as of 31st December 2018.

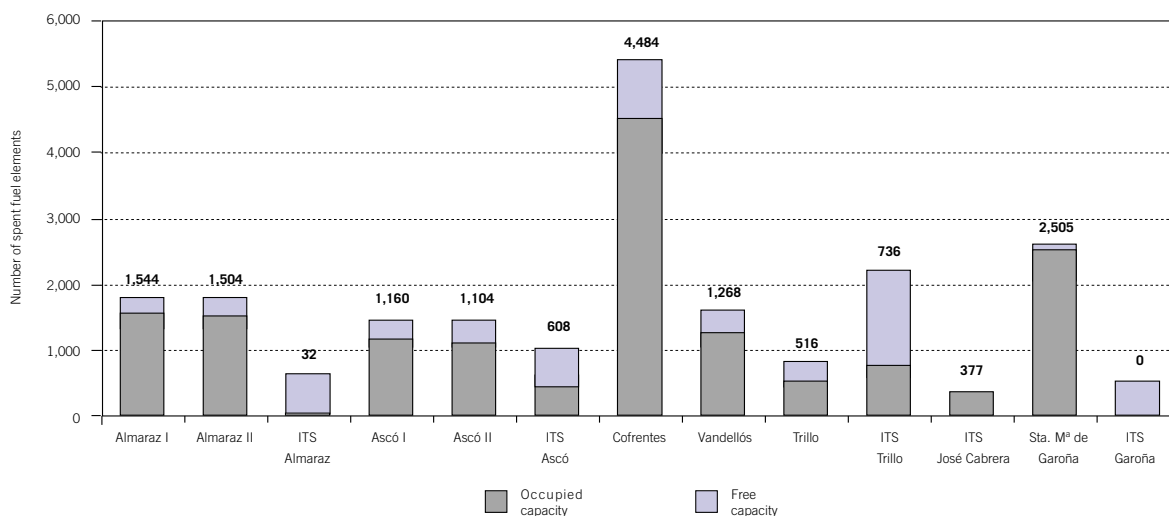
During 2018, the CSN carried out three inspections of the SISC Basic Inspection Plan (BIP) for the control of spent fuel management at the Trillo, Vandellós II and Ascó nuclear power plants, without any significant deviations having been identified.

6.2. Mid- and Low-Activity Radwaste Managed at the Nuclear Power Plants

During 2018, the CSN controlled the management stages of low and intermediate level radioactive wastes, performing the latter at the operating Spanish nuclear power plants. The final management of such wastes is carried out by means of their disposal at the El Cabril facility.

In 2018, the operating nuclear power plants generated 3,261 waste packages of low and intermediate level, and very low level radioactive

Figura 6.1. Status of spent fuel storage facilities at nuclear power plants as of 31st December 2018



solid wastes, with an estimated activity of 24,998 GBq, which were conditioned in metallic drums and containers. Table 6.2.1 provides a breakdown of package generation by facility and of those transferred to El Cabril during 2018.

Table 6.2.2 shows, for each operating nuclear power plant, the occupancy status of the temporary warehouses in terms of both the number of packages stored and the storage capacity expressed in terms of the equivalent of 220-litre drums and the percentage occupancy of the warehouses as of 31st December 2018.

6.3. Very Low-Activity Radwaste

Nuclear facility waste

Very low level residues are produced at all the nuclear facilities and their final management is performed at a specific facility for disposal at the El Cabril facility. The management of these wastes at nuclear facilities is carried out in a manner analogous to that of low and intermediate level radioactive wastes; however, the conditioning must comply with different acceptance criteria. The generation data for 2018 are shown jointly for both categories of radioactive wastes in section 6.2 of this report.

Waste generated in uranium mine reconditioning activities

Quercus Plant

Process waste

In the times of static leaching bed of the Quercus plant, some 1,107,896 tonnes of deplete ore with a granulometry of less than 15 mm were accumulated. Likewise, some 941,338 tonnes of neutralisation sludges were accumulated in the tailing dam of this plant.

Waste is currently generated as a result of treating non-releasable acid waters produced onsite due to rainwater runoff and seepage.

The treatment and conditioning of liquid effluents continued in 2018. The operation of the treatment and release section has functioned without incident; effluent release was interrupted in October 2018.

In 2018, 462,895 m³ of water were released. In the process, a total of 5,784 tonnes of wastes were generated in the form of precipitate cake which were deposited at the static leaching bed crown. The accumulated total at the end of 2018 of this waste amounted to 67,605 tonnes.

Tabla 6.2.1. Packages of radioactive wastes generated at the operating nuclear power plants and transferred to El Cabril during 2018

Installation	Packages generated	Packages transported to El Cabril
Santa María de Garoña	905	63
Almaraz I & II	620	211
Ascó I & II	348	228
Cofrentes	720	463
Vandellós II	298	259
Trillo	370	120
Totals	3,261	1,344

Tabla 6.2.2. Status of temporary storage facilities for wastes from operating nuclear power plants as of 31st December 2018

Plant	Stored packages	Stored packages (equivalent to 220-litre drums)	Warehouse capacity (equivalent to 220-litre drums)	Warehouse occupation (%)
Santa María de Garoña	2,494	4,732	9,576	49.41
Almaraz	8,738	9,052	23,544	38.45
Ascó	5,605	6,076	8,256	73.59
Cofrentes	9,562	9,628	20,100	47.90
Vandellós II	1,712	2,032	9,538	21.30
Trillo	972	972	11,500	8.45
Total	29,083	32,492	82,514	39.38

6.4. Declassified Radwastes

During 2018, the Ministry of Energy, Tourism and Digital Agenda issued the resolution authorising the declassification of residual wood from the Ascó nuclear power plant.

6.5. End-of-Life Consumables

By Resolution of the Directorate General for Energy of 7th June 1993, ENRESA was authorised

to carry out the management of radioactive lightning rod headers.

The removed lightning rods are sent to CIEMAT, where the radioactive sources, which are sent to the United Kingdom, are disassembled.

In 2018, five lightning rods were withdrawn, bringing the total number of those withdrawn to 22,868. No sources of Am-241 have been sent to the UK this year. The total number of sources sent to this country as of 31st December 2018 was 59,796.

7. Nuclear and Radiological Emergencies. Security

7.1. Capacities and actions of the Nuclear Safety Council in the Event of Emergencies

The CSN has established an Emergency Response Organisation (ORE), which is presented in the scheme shown in figure 7.1.1 (organisation chart of the emergency response organisation).

Once activated, the ORE guarantees to provide the Emergency Room, Salem, with attention 24 hours a day, 365 days a year, with an emergency team comprising up to 12 technicians who would arrive at the Salem in less than an hour.

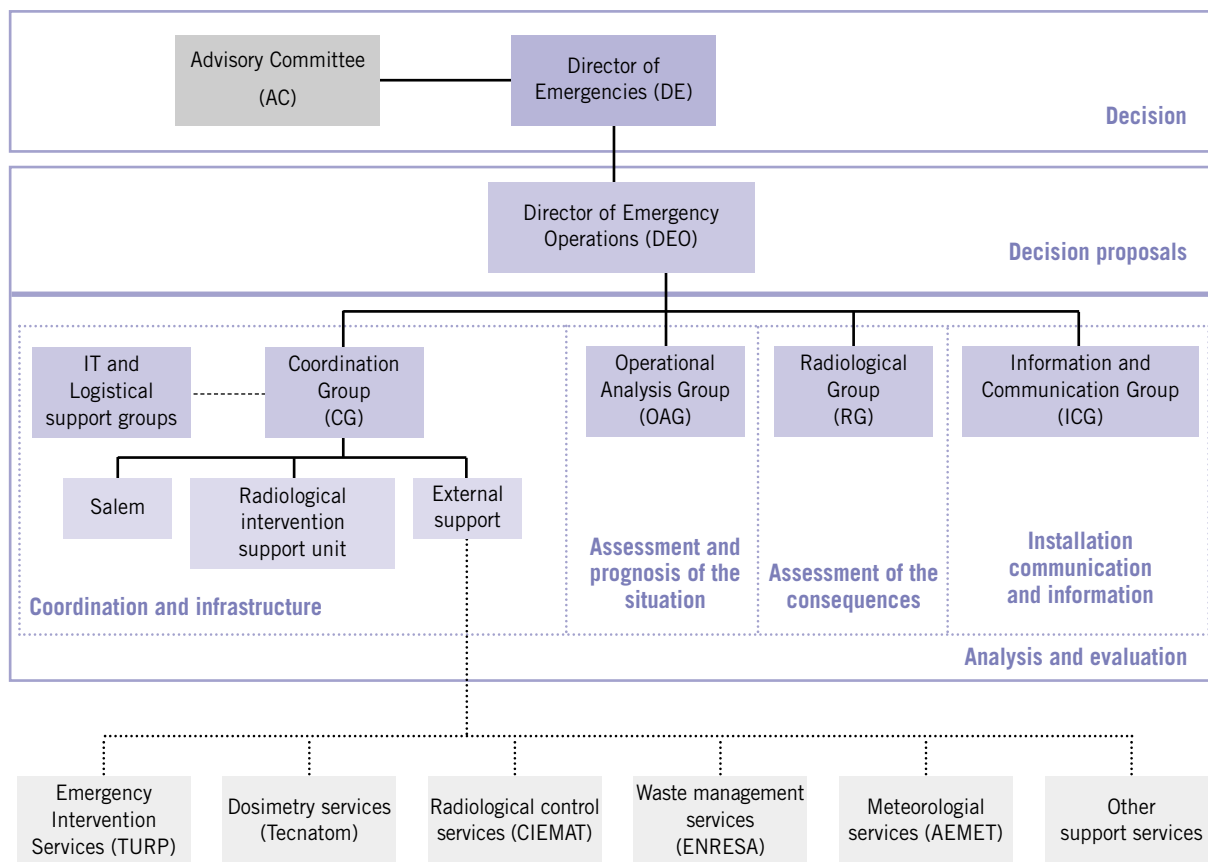
In 2018, the CSN acquired 15 portable dose rate measuring stations so they could be used for radiological surveillance during accidental situations.

During 2018, the CSN continued to elaborate and update the procedures developing its Emergency Action Plan, in parallel with the procedures relating to its participation in the National Emergency System.

7.1.1. Emergency room

The CSN has an emergency centre (Salem). Functionally, the Salem can be defined as a centre for the acquisition, validation and analysis of available information about the emergency. It is

Figura 7.1.1. Chart of the Emergency Response Organisation



also the centre that brings together or from which all the teams, tools and systems required for CSN emergency response can be used and activated.

The CSN also has an emergency contingency room (Salem 2) located at the headquarters of the Emergency Military Unit at the Torrejón de Ardoz air base (Madrid). At least once a year this room is activated to verify the correct functioning of its systems.

7.1.2. National and international exercises and drills

The International Atomic Energy Agency (IAEA) has developed a system (EMERCON) for official emergency communications and requests for assistance. This system has a web USIE (*Unified System for Information Exchange in Incidents and Emergencies*) through which communiqués are published and transmitted, as well as the classification of events on the INES scale.

At the same time, the European Commission has an Ecurie system (*European Community Urgent Radiological Information Exchange*) for the early exchange of notifications and information in the event of radiological emergency situations in the countries of the European Union.

During 2018, the CSN participated in three IAEA exercises: ConvEx-2a (March 8), ConvEx-1a (April 24), and ConvEx-2c (November 27). In ConvEx-2a, the scenario proposed by the IEC (*Incident and Emergency Center of the IAEA*) had to be adapted to a situation on Spanish territory. In ConvEx-2c the IEC raised as a scenario the explosion of a dirty bomb in a convention centre in Dublin.

On 28th March the European Commission carried out a communications test with Salem to check the availability of Salem as the national contact point for the Ecurie system.

In addition, on 19th November the European Commission carried out an Ecurie exercise (ECUREX-2018) based on the detection of high levels of radioactivity (Cs137) in different locations in Romania. The exercise was followed up from Salem through the Ecurie website (information exchange system with the European Commission) and the EURDEP website (*European Radiological Data Exchange Platform*), where the radiological data from European radiological surveillance stations can be accessed.

Throughout 2018, different Radiological Group exercises were carried out in the five off-site nuclear emergency plans in activities fundamentally related to radiological access controls (CA) and classification and decontamination stations (ECD) stations, in compliance with the planned annual programme. A total of eleven Radiological Group exercises were carried out.

Furthermore, in 2018 a radiological emergency exercise was scheduled with the objective of ensuring that both the personnel of the Technical Radiation Protection Unit contracted by the CSN to respond to this type of situation and the personnel of the CSN's own Radiological Intervention Support Unit maintain adequate preparation and training for the performance of their functions in this type of situation.

7.1.3. Incidence monitoring

During 2018, the CSN Emergency Response Organisation was activated in reduced response mode, due to the emergency alert declared at the Vandellós II nuclear power plant, on 3rd June 2018, due to a fire lasting more than ten minutes which did not affect security systems. The fire was then controlled and had no radiological consequences.

On 24th August, the CSN's Technical Unit for Radiological Protection (UTPR) in support of emergency management was activated following the discovery of a piece of depleted uranium on a private property in San Cristóbal de la Laguna (Tenerife). The area where the piece was located was made out-of-bounds until it was removed by ENRESA on 13th September.

Throughout the year, seven notifications of incidents relating to equipment or radioactive facilities were received at Salem. In addition, notifications were received regarding the detection of anomalous levels of radiation in containers in maritime ports of national interest where the protocol known as MEGAPORT applies. Under no circumstances were there any significant radiological consequences.

In 2018, two European Union Ecurie warning messages were received at Salem, concerning the detection of radioactive contamination by Th-232 and U-238 in consumable goods, in the port of Rotterdam, inside containers coming from China.

Likewise, 16 notifications or reports of international radiological incidents that occurred during 2018 were received through the IAEA's USIE website.

7.2. Participation of the Nuclear Safety Council in the National Emergency Network

The document approved by the Board of the Council, entitled "Participation of the CSN in the National Civil Protection System", includes the body's Service Charter relating to its collaboration in nuclear and radiological emergency preparedness, planning and response.

The activities performed by the CSN within this framework may be grouped into the following action lines:

- Coordination activities with the Directorate General of Civil Protection and Emergencies of the Ministry of the Interior (DGPCE).
- Collaborative activities with the Military Emergency Unit (UME).
- Collaborative activities with country's security and police forces
- Coordination activities with autonomous communities, basically in relation to radiological emergencies.
- Activities related to aspects of emergency preparation and planning in the former nuclear power plants and collaboration with the Directorates of such plans (Government Offices and Sub-Offices).
- Other collaborative activities with public entities participating in the national emergency system.

7.3. On-site Emergency Plans at the Facilities

During 2018, the CSN participated in the ten drills carried out by the nuclear facilities of their respective on-site emergency plans (PEI). In the case of the nuclear power plants, in addition to the Salem that followed the licensee's exercise in all cases, the Operational Coordination Centre (CECOP) of the corresponding local Government Office were activated.

For the nuclear power plants and Juzbado, a simultaneous inspection was carried out, framed within the CSN's PBI for the implementation of the PEI and their maintenance in the corresponding installation.

In 2018, the on-site emergency plans (PEI) of the operating nuclear power plants were revised to include the consideration of operational actions to

counteract possible actions deriving from an initiating event relating to physical safety. To this end, coordination procedures were developed in all PEIs, which include the contents of the Action Guide in Emergencies when faced with events that threaten physical safety, agreed between the CSN and Unesa and published in April 2018.

In 2018, four of the licensees (Almaraz I and II, Vandellós II, Cofrentes and Trillo) revised their OSEP's, making use of the mechanism that the Ministry authorised in 2017, modifying the operating permits and their conditions, known as PEI modifications via minor changes.

In addition, the PEID (On-site Emergency Plan under Dismantling) at the José Cabrera facility was revised; and the PEID (On-site Emergency Plan on Shutdown) at Santa María de Garoña is being revised. In both cases so that these two facilities' plans take in the new associated radiological risks.

7.4. International Collaboration in Emergencies and other Collaborative Activities

During 2018, coordination was continued with the competent international authorities, in accordance with Article 7 of the IAEA Early Notification Convention (Group of Competent Authorities of the Convention on Prompt Notification and Assistance); and Council Decision 87/600/Euratom, which requires Member States of the European Union to provide urgent notification of protective measures taken in the event of a nuclear or radiological accident.

Since 2000, the CSN has participated in the EURDEP programme, sending daily radiological surveillance data from the Automatic Surveillance Network. In this respect, the CSN attended the EURDEP information day (2018) organised by the European Commission in Ispra (Italy).

As regards CSN-ASN (French Nuclear Safety Authority) collaboration, in 2018 the protocol for communications and information exchange with the ASN in the event of an emergency, in force since 2015, was tested.

During 2018, the CSN actively participated in the working groups associated with the management of nuclear emergencies of different international organisations (IAEA, OECD-NEA, international associations of regulators ENSREG, WENRA, HERCA).

7.5. Security of Nuclear Materials and Facilities

During 2018, the CSN Instruction IS-41 approving the requirements on the security of radioactive sources was fully applied.

In 2018, the Basic Inspection Programme (PBI) was applied within the strategic area of security of the CSN's Integrated Plant Supervision System of nuclear plants (IPSS). The PBI of 2018 was met as planned, with a total of five inspections being carried out at the Trillo, Ascó, Almaraz, Vandellós and Cofrentes nuclear power plants. Outside the scope of the BIP, two supplementary inspections were carried out at the Vandellós nuclear power plant in order to check that the observations detected by the inspectors had been corrected.

Similarly, within the specific integrated supervision programme established for the Santa María de Garoña nuclear power plant, this plant was also inspected. Likewise, and in accordance with a specific defined supervision programme, an inspection was performed on the SECURITY systems of the El Cabril radioactive waste DISPOSAL facility.

February 2018 saw the annual meeting of the Technical Commission for the Monitoring of the Specific Agreement signed between the Ministry of the Interior (Secretary of

State for Security) and the CSN. This covered matters regarding the security of nuclear and radioactive facilities, activities and materials.

In relation to security training, the CSN, together with the IAEA and the Directorate General of the

Guardia Civil, organised the “International School for Nuclear Security” at the College of Civil Guards in Valdemoro (Madrid) from 21st May to 1st June, which was attended by participants from most Latin American countries, as well as members of the Guardia Civil and the National Police.

Appendix. List of Abbreviations and Acronyms

AE	Operating permit.	Ceiden	Technology Platform for R&D in fission energy (in its Spanish acronym).
AEAT	Spanish Tax Administration Agency.	CIEMAT	Research Centre for Energy, Environment and Technology.
AEMET	State Meteorological Agency.	CN	Nuclear power plant.
AEyF	Operating and Manufacturing Permit.	CODAP	Component Operational Experience Degradation and Ageing Programme.
AGE	Central State Administration.	COMS	Cold Overpressure Mitigation System.
ALARA	As Low as Reasonably Achievable.	Conama	National Environment Congress (in its Spanish acronym).
ANAV	Ascó-Vandellós II A.I.E. Nuclear Association.	Convex	IAEA International Emergency Exercise.
AMAC	Association of Municipalities in Areas of Nuclear Power Plants.	CSN	Nuclear Safety Council.
AQG	Atomic Questions Group of the Council of the European Union.	CSITCF	Post-Fukushima ITF Tracking Committee.
ASER	Compañía Industrial Asúa Erandio, SA.	CSNI	Committee on the Safety of Nuclear Installations.
ASN	French Nuclear Safety Authority: <i>Autorité de Sûreté Nucléaire</i> .	CSS	IAEA Commission on Safety Standards.
ATC	Centralised Temporary Storage.	CTBG	Transparency and Good Governance Council.
ATI	Individualised Temporary Storage.	CTE	Technical Building Code.
ATWS	Anticipated transient without “scram”.	DAM	Data acquisition module.
BDN	National Dosimetry Bank.	DGPCE	Directorate-General for Civil Protection (in its Spanish acronym).
BOE	<i>Boletín Oficial del Estado</i> (Official State Gazette).	DGPEM	Directorate General for Energy Policy and Mines (in its Spanish acronym).
Bq	Becquerel.	DOE	US Department of Energy.
BRR	Reactor cooling pumps.	EAD	Auxiliary Dismantling Building (in its Spanish acronym).
BWR	Boiling Water Reactor.	Ecurie	European Community Urgent Radiological Training Exchange Exercise: European Community Urgent Radiological Information Exchange System.
CAGE	Alternative emergency management centres.	EEAA	<i>Empresarios Agrupados</i> , consortium of businessmen and women (in its Spanish acronym).
CAT	Technical Support Centre.	EEUU	United States.
CCNN	Nuclear power plants.	EF	Performance Specification (in its Spanish acronym).
CECOP	Operational Coordination Centre (in its Spanish acronym).		
CEDEX	Ministry of Public Works’ Centre for Public Works Studies and Experimentation.		

EFS	Final Safety Study (in its Spanish acronym).	GTREA	Technical Group for the renewal of the Automatic Stations Network.
Emercon	Emergency communication system and assistance request.	GV	Steam generators (in its Spanish acronym).
Enac	National Accreditation Entity.	GWh	Gigawatt hour.
ENRESA	National Company of Radioactive Residues.	HERCA	European Association of Competent Authorities in Radiological Protection: Heads of European Radiation Control Authorities.
ENRSA	European Association of Nuclear Physical Safety Regulators.	HI-STORM	Spent Fuel Dry Storage System - Holtec International Storage and Transfer Operation Reinforced Module.
ENS	National Security Scheme (in its Spanish acronym).	IAEA	International Atomic Energy Agency.
ENSREG	European Nuclear Safety Regulator Group, formerly European High Level Group on Nuclear Safety and Waste Management.	IAEO	Annual operational experience reports (in its Spanish acronym).
EO	Operational experience.	I+D	Research and Development.
EPCISUME	Practical Schools of Emergency Information and Telecommunication Systems (in its Spanish acronym).	IEC	IAEA Incident and Emergency Center.
EPS	Preliminary Safety Study (in its Spanish acronym).	IFSM	Functional indicator of the mitigation system (in its Spanish acronym).
ESC	Structures, systems and components (in its Spanish acronym).	IGME	Geological and Mining Institute of Spain (in its Spanish acronym).
ETF	Operating Technical Specifications (in its Spanish acronym).	IINN	Nuclear facilities.
Euratom	European Atomic Energy Community.	IIRR	Radioactive facilities.
FANC	Belgian Industry Regulatory Body.	IN	Information Notices.
Foro	Ibero-American Forum of Organisations. Radiological and Nuclear Regulators.	INES	International Nuclear Event Scale.
FUA	Andújar uranium factory (in its Spanish acronym).	INEX	OECD Nuclear Energy Agency Exercise.
GBq	Gigabecquerel.	Ingesa	National Institute of Sanitary Management (in its Spanish acronym).
GDE	Emergency diesel generators (in its Spanish acronym).	INRA	International Nuclear Regulators Association.
GIETMA	UME Technological and Environmental Emergency Intervention Group.	INSC	European Union Instrument for Nuclear Safety Cooperation.
GS	CSN Safety Guide.	IPA	European Union pre-adhesion projects (in its Spanish acronym).
		IR	Radioactive facility.
		IRRS	Integrated Regulatory Review Service.
		IRS	Incident Reporting System.

IRSN	Institut de Radioprotection et de Sûreté Nucléaire.	NEA	OECD Nuclear Energy Agency. Nuclear Energy Agency.
IS	Nuclear Safety Council Instruction (in its Spanish acronym).	NORM	Naturally Occurring Radioactive Materials.
ISCIII	Carlos III Health Institute (in its Spanish acronym).	NRBQ	Chemical, Biological, Radiological and Nuclear.
ISO	International Standardization Organization.	NRC	Nuclear Regulatory Commission (U.S. Regulatory Agency). Nuclear Regulatory Commission.
ITC	CSN Complementary Technical Instruction (in its Spanish acronym).		
IAEA	Japan Atomic Energy Agency.	NSGC	IAEA Physical Safety Standards Committee (in its Spanish acronym).
LID	Lower Limit of Detection (in its Spanish acronym).	NUSSC	IAEA Nuclear Safety Standards Committee (in its Spanish acronym).
LPR	Licensee Performance Review.		
MAEC	Ministry of Foreign Affairs and Cooperation (in its Spanish acronym).	OAR	Other regulated activities.
Magrama	Ministry of Agriculture, Food and Environment.	OCDE	Organisation for Economic Co-operation and Development.
Mapama	Ministry of Agriculture and Fisheries, Food and Environment.	OIEA	International Atomic Energy Agency.
MARR	Project Risk Matrices in Radiotherapy (in its Spanish acronym).	OLP	Long-term operation.
MCDE	Off-Site Dose Calculation Manual.	OM	Ministerial Order.
MD (SISC)	"Multiple Degradation" situation in the SISC Action Matrix.	ORE	CSN Emergency Response Organisation.
Megaports	Protocol for action in the event of inadvertent movement or illicit trafficking of radioactive material in ports of general interest.	OSART	Operational Safety Review Team of the IAEA Operational Safety Review Mission.
MIR	Ministry of the Interior (in its Spanish acronym).	Ospar	Convention on the Protection of the Marine Environment of the North-East Atlantic (Oslo-Paris Convention).
Minetad	Ministry of Energy, Tourism and Digital Agenda.	OyFH	Organisation and human factors.
Minetur	Ministry of Industry, Energy and Tourism (in its Spanish acronym).	PABI	Annual Programme Inspection Base (in its Spanish acronym).
Miteco	Ministry for Ecological Transition.	PAC	Programme for identification and resolution of problems in the plant (in its Spanish acronym).
mSv	Milisievert.	PAENS	Adaptation plan to the national security scheme (in its Spanish acronym).
MW	Megawatt.	PAMGS	Vandellós II Plant Safety Management Improvement Action Plan (in its Spanish acronym).
N/A	Not applicable.	PAT	CSN Annual Work Plan (in its Spanish acronym).

PBI	CSN Basic Inspection Plan.	PWR	Pressurised Water Reactor.
PCI	Fire Protection System.	PYMES	Small and medium-sized enterprises.
PD (SISC)	“Degraded Pillar” situation in the SISC Action Matrix (in its Spanish acronym).	RADICAM	Radiological Risk Emergency Plan of the Canary Islands.
PEI	On-Site Emergency Plan.	RAMP	Radiation Protection Computer Code Analysis and Maintenance program.
PENVA	Valencia Nuclear Emergency Plan (in its Spanish acronym).	RARE	Radiological Alert Network Extremadura (in its Spanish acronym).
PEPRI	National R&D Platform in P.R. (in its Spanish acronym).	RASSC	IAEA Radiological Protection Standards Committee.
PGC	Quality Assurance Programme (in its Spanish acronym).	RCS	Reactor Coolant System.
PGRR	Radioactive Residues and Spent Fuel Management Plan (in its Spanish acronym).	RD	Royal Decree.
PIMIC	Integrated Plan for the Improvement of CIEMAT Installations.	REA	Network of Automatic Sampling Stations.
Plaben	Basic Nuclear Emergency Plan.	REM	Network of Sampling Stations.
POE	Emergency Operating Procedure.	RHWG	Reactor Harmonisation Working Group, i.e., the working group for the management of nuclear reactor safety requirements.
PR	Radiation Protection.	RIC	Regulatory Information Conference.
PRES-UE	European Union International Drill (in its Spanish acronym).	RINR	Regulation on Nuclear and Radioactive Facilities.
PRI	Incident review panel (in its Spanish acronym).	RPS	Radiological Protection Services.
PRIN	International Incident Review Panel (in its Spanish acronym).	RPSRI	Regulation on the Protection of Health against Ionising Radiations.
PROA	Activity Planning and Control System (in its Spanish acronym).	RR (SISC)	“Regulatory Response” in the SISC Action Matrix.
PROCER	Radioactive Effluent Control Programme (in its Spanish acronym).	RT (SISC)	“Licensee Response” in the SISC Action Matrix.
Procura	Organisational, Cultural and Technical Reinforcement Plan of the Ascó-Vandellós II A.I.E. Nuclear Association.	RTC	IAEA regional training course.
PVCAS	Groundwater Surveillance and Control Programme (in its Spanish acronym).	SAC	Criticality Alarm System.
PVRA	Environmental Radiological Surveillance Programme.	Salem	CSN Emergency Room.
Pvrain	Independent Environmental Radiological Surveillance Programme.	SAREF	Senior Expert Group on Safety Research Opportunities Post-Fukushima
		SDP	Personal Dosimetry Service.
		SEFM	Spanish Society of Medical Physics (in its Spanish acronym).

SEPR	Spanish radiological protection society.	Unesa	Spanish Association of the Electrical Industry.
SISC	Integrated Plant Supervision System (CSN).	Unesa-CEN	Generic guides of the Nuclear Energy Committee of Unesa.
Sismicaex	European Union project on seismic catastrophe Extremadura-Portugal.	UNESID	Union of steel companies.
SPR	Radiation protection service.	UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation.
SSG	Supervision and monitoring system.	UPM	Polytechnic University of Madrid.
SSJ	Supervision and monitoring system of the Juzbado factory.	USIE	Unified System of Information Exchange in Incidents and Emergencies.
SSSC	Supervision and monitoring system of the El Cabril storage center.	UTPR	Technical Radiation Protection Unit.
STEL	Liquid effluent treatment system.	WANO	World Association of Nuclear Operators.
Sv	Sievert.	WASSC	IAEA Committee on Safety Standards for Waste Management.
SVAC	Ventilation and air conditioning system.	WENRA	Western European Nuclear Regulators Association.
SVFC	Containment filtering venting system.	WG1	Nuclear Security and International Cooperation Working Group.
TIC	Information and communications technologies.	WGOE	Working Group on Operating Experience.
TRANSSC	Transport safety standards committee.	WGWD	Working Group on Waste and Decommissioning.
T1/2/3/4	Quarters 1/2/3/4.		
UE	European Union.		
UMA	Handling unit authorized.		
UME	Military Emergency Unit.		

**Nuclear Safety
Council Report to the
Parliament**

Summary of 2018