Nuclear Safety Council Report to the Parliament

Summary of 2016

CSN

CSN CONSEJO DE SEGURIDAD NUCLEAR

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Introduction

In compliance with the provisions of the Law by which it was created (Ley 15/1980), and as in previous years, the Nuclear Safety Council hereby submits to Parliament this report describing the main activities carried out throughout 2016, in performing its functions as the organisation solely responsible for nuclear safety and radiological protection.

The most relevant aspect of this report is that the nuclear and radioactive facilities existing in the Spanish territory have continued to operate safely and that the measures applied have ensured the radiological protection of the workers, the population and the environment.

The main activities carried out by the Nuclear Safety Council relate to nuclear and radioactive facility supervision, control and licensing tasks, the drawing up of standards and the issuing of proposals regarding sanctions. Specifically, and as regards the continued heightening of nuclear safety and radiological protection levels, it should be pointed out that in 2016, and in the field of regulatory standards, three new Council instructions have been issued, specifically IS-40, on authorisation for the commercialisation of apparatus or technical assistance relating thereto, IS-41, on the physical protection of radioactive sources, and IS-42, on events during the transport of radioactive material.

At international level, I should like to draw attention to the fact that the Second International Conference on Nuclear Security was held in Madrid in May, organised by the Nuclear Safety Council and attended by more than 200 experts in security from 20 countries. In addition to the efforts made in organising this Conference, the CSN has continued to fulfil its commitments with other international regulatory authorities and institutions.

Furthermore, in 2016 and in compliance with resolutions issued by the Spanish Congress, the Nuclear Safety Council has drawn up a Code of Ethics that, on the basis of a set of values, promotes excellence among the workers of the regulatory authority and reinforces the trust deposited by the stakeholders in the mission undertaken by the Council.

Otherwise, throughout 2016 and as in previous years, the Nuclear Safety Council has continued to undertake its tasks with maximum technical rigour, independence, transparency, neutrality, efficacy and efficiency, thereby meeting the instrumental objectives of our Strategic Plan, which concludes this year, and that will continue to be the essential basis of the forthcoming plan for the period 2017-2022.

Fernando Marti Scharfhausen

Chapter I. The Nuclear Safety Council

1. The Nuclear Safety Council

The Nuclear Safety Council (CSN) is an entity existing under Public Law, independent from the General State Administration, with its own legal standing and equity, independent from those of the State, set up in accordance with Law 15/1980, of April 22nd, creating the Nuclear Safety Council as the organisation solely responsible for nuclear safety and radiological protection.

The legal regime to which the activities of the CSN are subject is based mainly on the Council's constituent law and its Charter, and additionally on the organisational and legal standards common to other public bodies linked to the General State Administration. It acts with organisational and functional autonomy and with complete independence from the Public Administrations and stakeholder groups, without prejudice to its being subject to parliamentary and legal control.

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

The mission of the CSN is to protect the workers, members of the public and environment against the harmful effects of ionising radiations, fostering the safe operation of nuclear and radioactive facilities by the licensees and establishing prevention and correction measures to respond to radiological emergencies, regardless of their origin.

The CSN is responsible for the exercising of all the functions set out in article 2 of Law 15/1980, of April 22nd, and in Title I of the Charter, significant among which are the drawing up and issuing of preliminary reports relating to resolutions of the Ministry of Energy, Tourism and the Digital Agenda (MINETAD), to inspection and control, to standards proposals and to the drawing up of instructions, advisory services, etc., as well as for the performance of those others that are attributed to it in the field of nuclear safety, radiological protection and security by standards having the force of law or regulations or by virtue of international treaties.

In addition, article 11 of Law 15/1980 establishes that every year the Nuclear Safety Council shall provide a report on the performance of its activities to the two houses of the Spanish Parliament and to the regional Parliaments of Autonomous Communities housing nuclear facilities. The present report fulfils this precept.

The upper management bodies of the CSN are the Plenary and the Office of the President, the members of which were as follows as of December 31st 2016:

- President: Fernando Marti Scharfhausen (Royal Decree 1732/2012, of December 28th).
- Vice-president: Rosario Velasco García (Royal Decree 138/2013, of February 22nd).
- Commissioner: Cristina Narbona Ruiz (Royal Decree 1733/2012, of December 28th).
- Commissioner Fernando Castelló Boronat (Royal Decree 139/2013, of February 22nd).
- Commissioner Javier Dies Llovera (Royal Decree 934/2015, of October 16th).

The Plenary is assisted by a Secretariat General, the leadership of which was undertaken by Ms. María Luisa Rodríguez López up until December 23rd 2016, on which date the Government published her decision to resign through Royal Decree 711/2016, of December 23rd (Official State Gazette number 310 of December 24th 2016).

The new holder of the post is Manuel Rodríguez Martí, appointed by Royal Decree 280/2017, of

March 17th (Official State Gazette number 66 of March 18th 2017).

Also part of the management structure are the Technical Directorates, the Technical Office of the President and the Sub-directorates.

The Presidency and the members of the Plenary carry out their activities in the exercising of the competences assigned to them in articles 26 and 36 of the Charter.

The Council also has an Advisory Committee on public information and participation, the mission of which is to improve transparency, access to information and public participation.

1.1. The Plenary

The Plenary of the Council is the upper management body responsible for adopting agreements for the performance of all the functions contemplated in article 2 of Law 15/1980, as well as of whatever other functions might be attributed to the Nuclear Safety Council as the organisation solely responsible for nuclear safety and radiological protection.

In 2016 the Plenary of the Nuclear Safety Council held 29 sessions, in which 320 agreements were adopted. Most of these agreements were adopted unanimously.

The minutes of the meetings of the Plenary of the Nuclear Safety Council and the reports supporting the agreements of the Plenary are available for consultation on the CSN website (www.csn.es), in accordance with article 14.2 of Law 15/1980, of April 22nd, creating the Nuclear Safety Council.

1.2. Council Commissions

The Council commissions have driven the activities commissioned to the organisation in the areas of nuclear safety, radiological protection and standards.

Nuclear Safety and Radiological Protection Commission

The Nuclear Safety and Radiological Protection Commission is presided over by the president of the CSN and is the forum for communications between the technical divisions of the organisation and the members of the Plenary, with the mission of reporting on forecasts regarding issues to be subjected to consideration by the Plenary in the short term and of promoting open debate on proposals or matters of greatest interest and technical complexity.

In 2016 this Commission held four sessions and organised 13 subject-specific presentations on a number of different matters.

Standards Commission

The Standards Commission is presided over by counsellor Javier Dies Llovera, with counsellor Cristina Narbona Ruiz acting as vice-president.

This Commission is made up of representatives of those CSN departments that have responsibilities in the processes involved in drawing up standards and of the Ministry of Energy, Tourism and the Digital Agenda.

Its mission consists of driving, tracking and controlling the CSN's standards programme.

In 2016 the Standards Commission met on three occasions, the first on March 29th, the second on July 12th and the third on December 16th.

1.3. CSN relationships

1.3.1. Institutional relationships

One of the functions assigned to the Nuclear Safety Council is the maintenance of official relationships

for collaboration with and the provision of advisory services to State institutions at central, autonomous community and local level, with professional and trade unions organisations and with non-governmental associations and organisations relating to nuclear safety and radiological protection.

Parliament

The CSN report for 2015 was submitted to the Congress and Senate on July 1st 2016.

During 2016 the Nuclear Safety Council did not register any direct question from parliamentary groups, but did transfer information to reply to four questions channelled through the Ministry of Energy, Tourism and the Digital Agenda by different members of congress and senators in reference to matters relating to nuclear safety or radiological protection.

On October 19th 2016 the president of the CSN appeared before the Congressional Commission for Energy, Tourism and the Digital Agenda, on his own request, in order to present the Annual Report of the CSN for 2014 and 2015 and to report on the process of renewal of the operating permit for Santa María de Garoña nuclear power plant, the Centralised Temporary Storage facility and other matters relating to nuclear safety, in response to requests from the House.

After reviewing the CSN's annual report, the Congressional Commission for Energy, Tourism and the Digital Agenda may issue resolutions on matters for which it requires additional information and/or urge the Council to perform specific activities.

During 2016, the Nuclear Safety Council has continued to provide Parliament with information regarding periodic resolutions 1, 42 and 15, deriving from the reports on CSN activities for the years 2002, 2006 and 2007, respectively. The objective of quarterly resolutions 1 and 42 and six-monthly resolution 15 is to report on exemptions from compliance with the technical specifications granted by the CSN to the licensees of nuclear power plants, on the most representative reports on the operation of these nuclear facilities and on the results of the Integrated Plant Supervision System (SISC), respectively.

General State Administration

In performing its functions, the CSN maintains relations with the Ministry of Energy, Tourism and the Digital Agenda, the Ministry of Health, Social Services and Equality, the Ministry of Public Works, the Ministry of Agriculture, Fisheries and Food and the Environment, the Ministry of the Interior, the Ministry of Defence and the Ministry of Foreign Affairs and Cooperation.

Autonomous administrations

In accordance with the third additional provision of the Law by which it was created, the CSN may assign to the autonomous communities the exercising of functions attributed to it, in keeping with the general criteria for performance agreed to by the Council.

There are currently nine autonomous communities that have function assignment agreements with the Nuclear Safety Council, for inspection and in certain cases radioactive facility evaluation: Asturias, the Balearic Islands, the Canary Islands, Catalonia, Galicia, Murcia, Navarra, the Basque Country and Valencia. For each of these communities there is a Mixed Tracking Commission made up of representatives of the autonomous community and the CSN. This Commission is chaired by the secretariat general of the Council and meets at least once a year.

The assignment agreements are subject to the auditing plan established in the CSN Management System. During 2016 the CSN Inspection Unit performed audits on the assignment agreements in

place with the autonomous communities of Galicia and Valencia.

2016 saw the signing of a Framework Agreement between the CSN and the Government of La Rioja on planning and preparedness for and response to radiological emergency situations.

Local administrations

Particularly significant among the institutional relationships between the Nuclear Safety Council and the local administrations is the Council's participation on the Information Committees, pursuant to the provisions of article 13 of the Regulation on Nuclear and Radioactive Facilities (RNRF), along with its collaboration with the Association of Municipalities in Areas housing Nuclear Power Plants (AMAC).

Universities

In 2016 the CSN signed annual agreements with the Polytechnic University of Madrid, for the CSN's Juan Manuel Kindelán and Federico Goded professorships; the Polytechnic University of Catalonia, for the CSN Argos chair and the Polytechnic University of Valencia, for the CSN Vicente Serradell chair. Each agreement signed carries with it CSN funding for each department to the value of 70,000 euros.

The purpose of the CSN professorships is to promote the training of technicians highly qualified in nuclear safety and radiological protection through specific curricula, specialist courses and active participation in related research projects.

1.3.2. International relations

In the field of international relations, the CSN is responsible for collaborating with the Government in relation to international agreements on nuclear safety and radiological protection, relations with international organisations dedicated to these activities and relations with the overseas regulators that are the Council's counterparts. This implies a wide range of activities, summarised as follows:

Multilateral relations

European Union

One of the fundamental treaties that shape the European Union is the European Community Atomic Energy Treaty (Euratom), which, among other questions, deals with the basic legal framework governing nuclear safety and radiological protection. In view of its fundamental nature, the international activities and initiatives deriving from the Euratom Treaty are especially relevant for the CSN.

The CSN participates along with the Minetad in the European Nuclear Safety Regulators Group (ENSREG), set up in 2007 to advise the EU Council, the Parliament and the Commission on nuclear safety and the safe management of radioactive waste. Within the framework of this association, the CSN has chaired the Nuclear Safety working group (WG1) since 2014.

Throughout 2016, the CSN has continued to coordinate the obligations deriving from the European directives on nuclear safety and the responsible and safe management of radioactive waste and spent fuel. It has also collaborated in activities for the transposition of the Euratom directives 2013/59 on protection against dangers deriving from exposure to ionising radiations and 2014/87 on nuclear safety.

The CSN leads the working group created within ENSREG WG1 for the tracking of activities performed by the European Commission in relation to international cooperation activities, fundamentally the Commission's Instrument for Nuclear Safety Cooperation (INSC) projects. Likewise, the CSN advises and collaborates with the Minetad in the preparation and negotiation of

approval for INSC projects within the INSC Committee.

Atomic Questions Group (AQG)

This is the working group of the European Union Council dedicated to the study of matters covered by the Euratom Treaty.

The most relevant matter during the first six months of 2016, under the presidency of Holland, was the publication of the Nuclear Illustrative Programme (PINC) in compliance with article 40 of the Euratom Treaty. Likewise, the EC continued to organise workshops to provide support for the member States in the process of transposing Directive 2013/59 Euratom on protection against dangers deriving from exposure to ionising radiations.

Particularly significant during the second six months, under the presidency of Slovakia, was the presentation of the report on the implementation of Directives 2011/70/Euratom and 2006/117/Euratom, and the revision of the report for submittal during the seventh review meeting of the Convention on Nuclear Safety on behalf of Euratom.

European Nuclear Safety Regulators Group (ENSREG)

This is an independent consultation group available to the UE Council and Parliament made up of experts on nuclear safety and the management of radioactive waste from the regulatory authorities of the member States. The CSN participates in a number of activities, particularly significant among which are the working groups on nuclear safety, the safe management of radioactive waste and spent fuel, regulation and communication and the transparency of the regulatory authorities.

The ENSREG nuclear safety group (WG1), under the presidency of the CSN's technical director for Nuclear Safety, has contributed to the review of the ENSREG working plan and the implementation of the National post-Fukushima Action Plans, and has monitored compliance with the obligations of the Directive on Nuclear Safety and other commitments accepted within the framework of the association. Specifically, throughout 2016 the WG1 group has designed the terms of reference defining the process and methodology to be used as a basis for the first safety review pursuant to the Directive on Nuclear Safety, which will be dedicated to the management of nuclear power plant ageing and performed throughout 2017 and 2018.

The CSN is a member of the Organising Committee for the fourth ENSREG European Nuclear Safety Conference, which will be held in Brussels (Belgium) in June 2017.

Regulatory assistance activities

The International Cooperation Working Group, recently integrated in the ENSREG WG1 group, undertakes tracking of the projects for assistance to third-party nations financed by way of the European Commission's Instrument for Nuclear Safety Cooperation (INSC).

2016 saw the culmination of the first phase of the INSC project initiated in 2014 to strengthen the regulatory capacities of the Chinese regulatory authority and its technical support organisation (TSO). The CSN has participated in the performance and development of this project as part of a consortium formed by European regulatory bodies and their technical support organisations. The study areas addressed were the analysis of loss of coolant accidents in pressurised water reactors using best estimate methods, the regulatory review of the analysis of severe accidents at nuclear power plants and the results of operating experience. Within this project, the CSN has hosted a six-month visit by an expert from the Chinese regulatory authority, for the latter to gain

insight into the CSN working processes applied to the regulatory review of severe accident analysis.

At the end of 2016, the EC awarded the performance of the second INSC project for assistance to the Chinese regulatory authority to the European consortium of which the CSN is part, by means of a public call for bids. The CSN will provide assistance within the framework of this new project in the areas of emergency preparedness and response and dismantling.

International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency (IAEA) is an organisation that reports to the system of the United Nations whose mission is to promote the contribution made by nuclear energy to peace, health and prosperity in the world. One of its fundamental objectives is the development and promotion of high standards of technological safety and security in the peaceful application of nuclear energy in its member States, which it advocates through the drawing up of recommendatory standards.

The CSN participates actively in the activities of the IAEA, this including participation in the management bodies of the Agency, in technical committees and working groups in the field of technological safety and security, at scientific and technical meetings and in the international missions of the IAEA.

Apart from the technical contribution of its experts, the CSN also makes economic contributions to support the Agency's programmes and activities. In 2016 these contributions amounted to 349,370 Euros, destined mainly to supporting the working programme of the Latin American Forum of Radiological and Nuclear Regulators, several technical cooperation projects focussing on the priority regions of North Africa and Latin America and programmes and projects of technical interest for the CSN.

General Conference

The CSN participated in the General Conference of the IAEA, held in Vienna from 26th to 30th September 2016. The Spanish delegation was headed by the President of the CSN. The conference dealt with the main activities of the IAEA in 2016 and presented forecasts and commitments for the following year.

As on previous occasions, the CSN provided support for the Ministry of Foreign Affairs and Cooperation (MAEC) in the drawing up of the national statement and meetings were held with the director general of the IAEA and the IAEA deputy director general for Nuclear Safety and Security.

Committees and working groups

With a view to favouring the creation of a national safety standard guaranteeing a high level of radiological nuclear safety and security at nuclear facilities and in nuclear activities, the IAEA develops and continuously reviews an internationally agreed to standard legal framework of a recommendatory nature that serves as a reference for the member States to develop their own national frameworks.

For the coordination and tracking of all technical standards development and review activities, the IAEA has a Commission on Safety Standards (CSS). Spain's national participation and representation on this Commission is assigned to the CSN counsellor Dies Llovera.

During 2016, CSN experts participated in meetings on different issues such as materials ageing, activities relating to nuclear security or safety in the transport of radioactive and nuclear materials. As regards technical cooperation, the CSN was invited by the IAEA to participate in the planning and coordination of several projects to which it contributed economically. The CSN was also involved in coordinating the drawing up, review and translation of IAEA standards,

guidelines and other documents in its realm of competence.

International IAEA missions

The IAEA coordinates international missions for the review of compliance with standards, requirements or good practices in the fields of nuclear safety, radiological protection and security in the member countries. The CSN supports the performance of peer reviews in other countries through the participation of CSN representatives in the review teams in response to IAEA requests. In 2016 the CSN contributed experts for regulatory review system missions (IRSS missions) to Japan, Kenya, Italy and South Africa.

In addition, the CSN is participating in the development and organisation of the combined IRRS and ARTEMIS peer review mission that Spain has asked the IAEA to carry out during 2018.

NEA/0ECD

In 2016 the CSN participated actively in six of the seven main technical committees that form the structure of this organisation, each of which coordinates a number of working groups and supervises international research projects and databases in its specialist area. During 2016, the Council has participated in 22 working groups and sub-groups, in specific activities depending on them and in 14 on-going research projects and databases.

From November 17th to 19th, Spain hosted a visit by the director general of the NEA, organised and sponsored by the CEIDEN nuclear fission energy technology platform. This meeting underlined the technological capabilities and the degree of involvement in nuclear safety and the NEA of the Spanish public institutions and the nuclear sector.

Other international organisations

The CSN is a member of several regulatory associations, built on the basis of a common desire to cooperate with a view to addressing questions and challenges affecting overall regulatory policy and identifying and exploring opportunities to improve the regulation of nuclear safety, radiological protection and security.

International Nuclear Regulators Association (INRA)

In 2016, the CSN occupied the presidency of the association, organising and hosting the two annual meetings of INRA, an association grouping the regulatory authorities with the widest experience of nuclear regulation (Germany, Canada, South Korea, Spain, United States, France, United Kingdom, Japan and Sweden).

The first meeting was held in Madrid during the month of May, and included a technical visit to the El Cabril low and intermediate level waste disposal facility.

As is normally the case, the second meeting was held in Vienna. At the end of this meeting the CSN President handed over the presidency of INRA to the representative of the United States.

Western European Nuclear Regulators Association (WENRA)

The most significant activity of the association has been the definition of the scope and technical specifications of the first safety review, under the umbrella of the Directive on Nuclear Safety. Furthermore, the process of reviewing the reference levels continued, the aim being to implement and bring into harmony high levels of nuclear safety in the region.

Latin American Forum of Radiological and Nuclear Regulatory Organisations (Foro)

The year 2016 saw the completion of the project for the probabilistic assessment of the risks associated with industrial radioactive facilities and the approval of two new projects, one relating to medical facilities and the other to the development of regulatory competences.

This year the Forum held its annual meeting in Uruguay, this including the approval of the new regulations of the association and the establishment of the basis for definition of a strategy document.

Likewise, at the end of the year the CSN hosted Forum meetings and workshops at its headquarters dealing with exemption criteria at radioactive facilities and the competence of the personnel of regulatory organisations in medical and industrial radiological applications.

Heads of European Radiological Protection Competent Authorities (HERCA)

The objective of this organisation is analysis of the practical application of European directives and regulations dealing with radiological protection, in order to promote harmonious working practices. The CSN participates in the meetings of the plenary group of HERCA and in its working groups.

An important part of the activities performed by this association in 2016 related to the drawing up of guidelines and supporting documents for practical transposition of the Directive 2013/59/Euratom.

The CSN participates actively in the working groups on medical activities, whose efforts this year have focussed especially on the justification of medical practices, clinical audits for the radiological protection of the patient and increasing the awareness of stakeholder groups.

The CSN also collaborates with the emergencies group, leading the working sub-group in charge of following up activities initiated by the IAEA in the wake of the Fukushima accident to improve the response to nuclear accidents. A CSN expert was appointed to preside over the working group on industrial practices and sources.

European Nuclear Security Regulators Association (ENSRA)

The CSN participates in the European Nuclear Security Regulators Association (ENSRA), set up on the initiative of the associate members as a forum for the secure exchange of information and experiences on the application of different practices for the physical protection of nuclear power plants and other nuclear facilities.

International conventions of the International Atomic Energy Agency (IAEA)

Convention on Nuclear Safety

In October 2015, a meeting was held to organise the seventh Nuclear Safety Convention review meeting, which will be held between March 27th and April 7th 2017.

The national report for the seventh meeting was drawn up during 2016, and was approved by the Plenary of the CSN on June 22nd of that year and submitted to the Secretariat of the IAEA in August. The phase of questions on the national reports by the contracting parties took place in September, and the phase of replies to questions received by Spain from the said parties was initiated in December.

Joint Convention on safety in spent fuel management and safety in radioactive waste management

Work began in 2016 on drawing up the 6th national report for the Joint Convention, which will be submitted to the IAEA in mid 2017.

Convention for the protection of the marine environment of the North-Eastern Atlantic (Ospar)

The CSN participates as the Spanish representative on the Radioactive Substances Committee (RSC) of the Ospar Convention. The matters dealt with include those relating to nuclear and non-nuclear facilities and activities (radioactive facilities and NORM industries) that might cause radioactive releases to the Atlantic Ocean, either directly or via river basins.

In 2016, the CSN attended the RSC meeting held from February 9th to 11th in Belgium.

Bilateral relations

The CSN has subscribed to a number of bilateral technical cooperation agreements aimed mainly at establishing a basis for collaboration and the exchange of technical information and regulatory experience. In certain cases collaboration agreements have been signed in specific areas (R&D agreements with the US regulatory authority or on the preparation and management of the response to nuclear emergencies with the French regulator).

Throughout 2016, a close relationship of collaboration was maintained with the regulatory authorities of the United States and France through joint activities at institutional and technical level. Likewise, bilateral relations have been promoted with countries of geostrategic interest in Latin America and the Middle East, as well as with Holland and Poland.

United States of America

The framework agreement in place between the US 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 2016, the CSN participated in the Regulatory Information Conference (RIC), organised annually by the NRC to report on its lines of work. This conference is one of the most important events in the field of nuclear regulation.

France

The bilateral meeting between the ASN and the CSN was held on July 7th in Madrid and included the review and discussion of regulatory and legislative novelties at the two organisations and technical issues such as the dismantling of nuclear facilities, the management of spent fuel and emergency preparedness and response.

Particularly significant among the joint activities carried out in 2016 within the framework of this bilateral agreement were the technical workshops and meetings on medical and high-level waste disposal facilities and on the aging of cables at nuclear power plants.

1.3.3. Information and public communication

Communication and the web

Section ñ) of article 2 of Law 15/1980, of April 22nd, creating the Nuclear Safety Council establishes that the Organisation shall be obligated to keep the public informed in relation to its areas of competence, to the extent and at the frequency that the Council might determine, without prejudice to the publicising of its administrative activities in the legally established terms, ensuring in all cases the highest levels of CSN transparency and credibility in the performance of its functions.

During 2016 a total number of 128 informative notes were issued. Particularly newsworthy, in addition to incidents recorded at nuclear and radioactive facilities, were the main agreements of the Plenary, the most significant Council activities in the institutional and international areas and the emergency drills carried out each year. Twenty-five notes and news items relating to reportable events were published on the CSN website.

There were replies to 223 requests for direct information made by the media.

Special attention was paid to the process of assessing renewal of the operating permit for Santa María de Garoña nuclear power plant, to the alleged irregularities detected at the Le Creussot forge (AREVA) and to information regarding the

essential services cooling system at Almaraz nuclear power plant (Cáceres).

In addition, the institutional Communication Plan has been drawn up, its approval being expected in 2017. This Plan will ensure compliance with the twentieth resolution issued by the Spanish Congress in relation to the CSN's annual report for the year 2013.

Public information

One of the challenges facing the CSN is to bring information closer to society and maintain a proactive policy using all the means and tools available to it, in an attempt to reach the members of the public directly by means of the following channels:

- Issuing of publications

  During 2016 a total 20 new y publications were issued in hard copy format within the framework of the Publications Plan (books, the Alfa magazine, standards, brochures and posters), with a distribution of 15,463 copies, along with four publications in electronic format (951 copies). In addition, seven works were re-edited, with a distribution of 17,600 copies, these mainly being handed out at the Information Centre and at different congresses.

- Distribution of publications: 45,434 copies:

  – Internal distribution: 1,215.

  – External distribution: 10,684.

  – Trade fairs, congresses and working sessions: 7,267.

  – Information Centre: 26,268.

- Other informative materials:

  – Information centre: 15,551.

  All the publications are available to the public for downloading from the documentary centre of the CSN website.

- Information Centre

  Since its inauguration in 1998, the Information Centre has welcomed a total 120,193 visitors (as of December 31st 2016). In recent years the annual average number of visitors has constantly remained above 7,000. In 2016 there were 305 visits involving 7,360 visitors, 7,200 of whom were from educational centres, 120 from different institutions and 40 private individuals.

  During November 2016, the CSN collaborated with the Regional Government of Madrid in activities relating to Science Week.

Other activities

In 2016 the CSN was present with a stand at the following events:

- 9th Working Sessions on Quality in the control of Environmental Radioactivity, held in Sitges from June 15th to 17th 2016.

- 42nd Meeting of the Spanish Nuclear Society, held from September 28th to 30th in Santander.

- National Congress on the Environment (CONAMA), held in Madrid from November 28th to December 1st 2016.

1.4. Advisory Committee on Public Information and Participation

The Advisory Committee on Public Information and Participation in relation to nuclear safety and radiological protection was set up in compliance with article 15 of Law 15/1980, creating the Nuclear Safety Council, with the mission of issuing recommendations to the CSN

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

The Committee is made up of representatives of civil society, the world of business, trade unions and public administrations at state, autonomous community and local level.

The following meetings were held in 2016:

1. The 10th meeting took place on January 21st 2016.

2. The 11th meeting of the Advisory Committee on Public Information and Participation was called for July 21st 2016, but did not finally take place due to the necessary quorum not being achieved at either the first or second call.

3. The 12th meeting was held on November 29th 2016.

2. Strategies and management of resources

2.1. Strategic Plan

The Strategic Plan represents the commitment of the organisation to the fundamental objective of nuclear and radiological safety and the channels open for compliance with it.

In 2011 the Nuclear Safety Council approved the Strategic Plan for the period 2011-2016, which represented its commitment to society for the coming years in relation to the preservation of nuclear and radiological safety in Spain.

The Strategic Plan is enacted by way of Annual Work Plans (AWP) approved by the Council, which include the most significant operational objectives and activities to be performed each year, as well as numerical targets or indicators.

During 2016 work began on updating the Strategic Plan for the following period, through the setting up of an *ad hoc* working group.

The Plenary aims to approve the plan for the new period during the first six months of 2017.

The 2016 AWP defines the objectives and activities to be performed by the CSN organisation throughout the year, the overall planning of dedications, a detailed rundown of activities by facilities, the inspection plans, standards programme, programme on procedures, auditing programme and R&D projects.

The AWP tracking reports incorporate the results of the indicators reflected in the Strategic Plan.

A scorecard is used as a mechanism for tracking of the Annual Work Plan, this including the numerical values of a total 19 indicators, established for the tracking of the most significant activities in the AWP. These values are compared with previously established targets. The values on the scorecard for 2016 reflect a degree of compliance close to the targets set out for the year.

2.2. Management System

The management system is directed by the Management System and Information Security Committee, presided over by counsellor Fernando Castelló, with counsellor Javier Dies acting as vice-president. Its functions are to propose the CSN strategy as regards the management system, analyse the evaluations of the CSN processes and activities and propose, promote and supervise improvement plans.

Internal procedures and audits

The CSN has implemented a process-oriented Management System based on the requirements of IAEA guide GS-R-3 and ISO standard 9001:2008. The system is described and developed in manuals and procedures. The *Management System Manual* contains an overall description of the system and the documentation via which it is enacted.

The management system implemented at the CSN requires the entire organisation to be subject to a process of on-going improvement. In addition to assessments of compliance with plans and objectives, the CSN has an in-house audit plan and is systematically subjected to external assessments by national and international organisations.

Fifteen procedures have been published or reviewed in 2016, of which six relate to management, two are administrative and seven are technical.

The basic internal auditing plan is divided into two parts, one for the activities of the CSN and the other for those of the assigned regional organisations.

During the year, 2 processes have been audited and audits have been performed also with respect to the autonomous communities of Galicia and Valencia. The results of the audits have made it possible to identify non-conformities relating to the management system and its procedures, none of these being safety-related.

Training plan

Since it was set up, the Nuclear Safety Council has paid special attention to the training of its personnel. This materialises by way of annual training plans that set out the annual forecasts for training activities, organised internally or with the collaboration of specialist external organisations, or for the participation of the CSN personnel in activities organised by other institutions of a widely varying geographical and subject-specific nature.

In 2016 the Training Plan was structured around seven programmes: advanced recycling technical programme (divided in turn into four sub-programmes: nuclear safety, radiological protection, support areas and initial technical training), development of management skills, administrative management, prevention, computer systems, languages and skills.

The total number of training activities performed amounts to 120.

Attendance by those involved in training activities amounted to 2.09 activities per person on average.

The budget approved by the Plenary for the 2016 Training Plan amounted to 500,000 Euros, with 415,951.39 Euros (83.19%) having actually been deployed.

2.3. Research and development

One of the functions of the CSN is to establish and oversee research plans relating to nuclear safety and radiological protection.

The CSN R&D Plan is the instrument by means of which bounding conditions are established for the performance of the CSN's research and development activities over a given period, which is normally four or five years.

In 2016 the CSN approved the R&D Plan for the period 2016-2020, incorporating the areas for improvement identified in the application of its predecessor.

The accident that occurred at the Fukushima Dai-ichi nuclear power plant in March 2011 is having an important impact in the world of nuclear safety and radiological protection. In this respect, in 2016 the CSN has continued to participate in international R&D activities relating to this accident, participation in the *Benchmark Study of the Accident at the Fukushima Dai-ichi Nuclear Power Plant* project being particularly significant. The scope of this project was extended in phase 2 with respect to the previous phase. Agreements have also been reached with different national organisations for the performance of various R&D analyses and activities allowing for a better assessment of the accident and of its implications, as well as of the lessons learned from it.

Throughout 2016, 46 R&D projects have been managed in total, these including both those that were under way at the beginning of the year and those initiated during the year. It should be pointed out that during 2016, work continued on the performance of five projects subsidised by way of the call for R&D aids, published in the Official State Gazette of July 26th 2012.

In addition, the CSN continues to perform work in line with what is requested in the 2nd Resolution of the Spanish Congress in relation to the CSN's Annual Report for 2012, urging the "promotion via the CSN of R&D&i tests by the plants, universities and technology centres aimed

at achieving a better understanding of degradation phenomena not initially foreseen". In order to comply with this congressional Resolution, the CSN has set up a Working Group on Materials Degradation within the framework of the CEIDEN R&D technology platform dealing with nuclear safety issues, this including the participation of the CSN and the majority of the organisations involved in R&D activities in this field.

The budget assigned to R&D during the 2016 financial year amounted to 2,374,000 Euros.

2.4. Resources and means

2.4.1. Human resources

As of December 31st 2016, the total personnel of the Organisation amounted to 459 people, as detailed in table 2.4.1.1.

Table 2.4.1.1. Distribution of the Nuclear Safety Council personnel as of December 31st, 2016

	Council	Secretariat General	Technical Directorates	Total
Upper management	5	–*	2	7
Nuclear Safety and Radiological Protection Technical Corps staff	6	13	201	220
Civil Servants from other Public Administrations	5	100	36	141
Temporary personnel	27	–	–	27
Ordinary employees	2	44	18	64
Totals	45	157	257	459

Ordinary employees	
Total	64
Single agreement	62
Outside agreement	2

* The secretary general María Luisa Rodríguez López vacated her position on her own initiative by way of Royal Decree 711/2016, of December 23rd, (Official State Gazette No 310, of December 24th 2016). As of closure of this edition, the new occupant of the post is Manuel Rodríguez Martí, appointed by Royal Decree 280/2017, of March 17th (Official State Gazette No 66, of March 18th 2017).

The number of women at the Nuclear Safety Council represents 52% of the total workforce, and men the remaining 48%.

The average age of the Organisation's personnel is 53 years.

The academic qualifications of the CSN personnel are as follows: post-graduates 69.94%, graduates 5.88% and others 24.18%.

Royal Decree 105/2016, of March 18th, approved an offer of public employment for 2016, consisting

of six places in the Upper Management of the Nuclear Safety and Radiological Protection Division.

On August 25th 2016, nineteen new probationary officials were appointed by a Resolution of the President's Office of the Nuclear Safety Council, these corresponding to the free offer of public employment in 2015.

Throughout 2016, five work posts were covered using the system of free appointment and twenty by means of open competition.

Also taking place this year was the eleventh application of the model for recognition of the professional experience of civil servants appointed to the Council, this affecting 57 such persons.

2.4.2. Economic resources

As regards economic and financial matters, the CSN is governed by the provisions of the General Budgeting Act, Law 47/2003 of November 26th, due to its being part of the public administrative sector of the State in the terms set out in articles 2.1.g) and 3.b.1) of this Law. As a result, it is subject to the Public Accounting system and to the Instruction on Accounting for the Institutional Administration of the State.

Economic aspects are broken down into budgeting items and financial items, with the organisation's accounting being in accordance with the general public accounting plan (Order EHA/1037/2010, of April 13th).

Budgeting aspects

The initial CSN budget for the 2016 financial year amounted to 46,507 thousand Euros. The budget did not undergo any variations during the year.

Neither was there any variation with respect to the definitive budget for the previous year (2015), (table 2.4.2.1.1).

Table 2.4.2.1.1. Initial and definitive budgets for 2015 and 2016 (Euros)

Budget	Exercise 2015	Exercise 2016	Variation%
Initial budget	46,507,130.00	46,507,130.00	0.00
Definitive budget	46,507,130.00	46,507,130.00	0.00

The total net revenue recognitions for the financial year, resulting from the revenue management process, amounted to 45,939 thousand Euros, of which 45,895 thousand Euros (99.9%) corresponded to non-financial operations. Of the total net revenue recognitions, 45,410 thousand Euros corresponded to chapter III (fees, public prices and other revenues), which implied the application of 99.12% of the definitive forecast amount of 45,812 thousand Euros.

Net revenue recognitions in current transfers amounted to 400 thousand Euros, which with respect to definitive forecasts for the same amount implies an application of 100%. Of these recognised revenues no amount has been booked, the sum having been retained by the Treasury.

Furthermore, the net revenues actually booked amounted to the sum of 45,224 thousand Euros, of which 45,095 thousand corresponded to

chapter III Rates and Other Revenues, this representing 99.71% with respect to total net revenues and 98.43% with respect to the budgeting forecasts for the said chapter.

As regards the expenses budget, the variation in application with respect to 2015 amounted to the figure of -1.55%. The commitments acquired, to the sum of 40,752 thousand Euros, represented 87.63% of the definitive budgeting credits.

It should be pointed out that the total liability recognitions amounted to 39,703 thousand Euros, this representing an application of 85.37% of the definitive budget of 46,507 thousand Euros.

Financial aspects

The profit and loss account sets out the expenses and revenues, classified on the basis of their economic nature, occurring as a result of the budgeting and non-budgeting operations carried out by the CSN over a given period.

Personnel expenses were quantitatively the most important, representing 61.95% of the total. These expenses include the remunerations of the personnel, the social security costs covered by the employer and social expenses.

In second place are external supplies and services (31.66%), constituted by work performed by other companies, consumable material supply costs and communications.

In third place are allowances for depreciation (3.29%).

In fourth place are transfers and subsidies relating to nuclear safety and radiological protection, post-graduate scholarships and transfers abroad (2.34%).

Finally, the other non-represented expenses include taxes, financial expenses, other ordinary management expenses and the drop in value of financial assets.

As regards revenues, the rates applied for services rendered constituted the main source of CSN funding, representing 97.52% of the total, the remaining 2.48% corresponding to current transfers and subsidies, financial revenues and other management income.

The financial year gave a positive result of 3,916 thousand Euros.

2.4.3. Computer resources

The use of enhanced corporate applications continued throughout 2016, as did the process of adapting the CSN to Law 39/2015, of October 1st, on Common Administrative Procedure for Public Administrations, and Law 40/2015, of October 1st, on the Legal System applicable to the Public Sector.

The applications for the management of Nuclear and Radioactive Facilities are the core of the information system; for this reason the development of a new application (INUC) for better management of the core of the CSN has been initiated. Most of the documents that make up the Documentary System reside in these applications.

As is the case for very year, the risk assessment and risk management plan have been updated in compliance with the requirements defined in the National Security System (NSS). Particularly significant among the conclusions is the fact that in the three areas covered: *organisational, operational and protection*, the CSN presents a degree of maturity of around 69.3%, in the emergency room contingency centre 70.7% and in the CSN calculus centre contingency centre 84.3%. It should be pointed out that the

measures introduced by the NSSS in 2015 have been taken into account.

The Activities Continuity Plan, approved in 2015, is an important document included under the umbrella of the Security Policy in relation to the CSN Security Policy. The on-going updating of this document continues, the aim being to describe the management of the continuity of the CSN activities in defined situations of crisis or disaster.

On-going improvement

As regards systems, mention might be made of the completion of the CSN secured network infrastructure facility in the Sub-Directorate for Emergencies and Physical Protection and continuation of the operation of the CSN contingencies centres.

The distribution of the cabinets in the Calculus Centre was remodelled during 2016 and a new disk storage cabinet was implemented.

In addition, the process of technological innovation and improvement of the CSN Data Processing Centre and of the network access control systems designed to improve the security of the organisation's local network and prevent unauthorised access and other threats has continued, along with the updating of the operating systems and network switches.

Eight new computer applications have been put into production and 20 others have been revised and modified with new evolutionary features.

Two apps for mobile devices were implemented in 2016:

a) CSN News, which displays CSN news items published on the institutional website, events reported by the Spanish nuclear facilities and the environmental values provided by the Network of Automatic Stations.

b) CSN Abbreviations, which identifies in both Spanish and English the acronyms normally used in the glossary of nuclear and radiological terms.

Compliance with the legal framework

Work has begun on adaptation to the requirements of Law 39/2015, of October 1st, and Law 40/2015, of October 1st.

The activities required to consolidate the interoperability of CSN data with the data of other administrations were initiated in 2016.

In the area of cybersecurity, the CSN participates in the National Cybersecurity Strategy, aligned with the National Security Strategy that contemplates cybsersecurity in its twelve areas of activity, some of which impact the mission of the CSN.

Chapter II. Report on Activities

3. Overview of nuclear safety and radiological protection in 2016

Overall assessment of Nuclear Safety and Radiological Protection at the Facilities in 2016

The overall assessment of the operation of nuclear and radioactive facilities is accomplished by considering fundamentally the results of the Integrated Nuclear Power Plant Supervision System (SISC), the inspection, supervision and control of radioactive facilities, reported events, especially those classified at a level higher than zero on the IAEA's International Nuclear Event (INES) scale, radiological impact, the dosimetry of the workers, the relevant modifications proposed, warnings and sanctions and the operating events occurring at these facilities.

All of the nuclear facilities operated safely throughout 2016.

At the end of 2016, all the operational indicators of the Integrated Plant Supervision System (SISC) were green, although during the year there were two indicators in the white band, relating in one case to the reliability of the emergency diesel generators and in the other to emergency preparedness and drills. No inspection finding exceeded the green category.

The plants have been in a situation of normality, with the application of standard inspection programmes and the correction of deficiencies, the situation known as "licensee response" in the SISC action matrix. The only exceptions to the above were Almaraz group II, which was in the "regulatory response" column during the first and second quarters, and Vandellós II nuclear power plant, which was in the same column during the first three quarters, in both cases due to their having an indicator in the white band.

For their part, the radioactive facilities have operated within the established safety standards without situations of undue risk.

The quality of the environment around the facilities remains under acceptable conditions from the radiological point of view, without any risk for people as a result of the operation of these facilities or of the dismantling or decommissioning activities performed.

3.1. Safety of the facilities

3.1.1. Nuclear power plants

The SISC is currently the fundamental instrument for evaluation of the performance of the plants from the point of view of safety, the planning of CSN supervision and control efforts and communication of both questions to the public.

Table 3.1.1.1 shows the status of the action matrix in 2016, where it may be appreciated that at the end of the year all the operating plants were in the "licensee response" mode.

For its part, table 3.1.1.2 describes the characteristics of the different action matrix modes.

The CSN website provides a specific link to the SISC (https://www.csn.es/sisc/index.do), including the quarterly results for all the nuclear power plants and the operating information on which they are based, in addition to descriptive documentation and the corresponding procedures.

Events reported, proposals for sanctions proceedings and warnings

In application of the provisions of CSN Instruction IS-10 on criteria for the reporting of events at nuclear power plants, establishing criteria for the reporting of events to the CSN, the licensees of the nuclear power plants reported 19 events in 2016. Of these events, 17 were classified at level 0 on the International Nuclear

Events Scale (INES) and two, reported by Almaraz nuclear power plant, were classified at level 1, both relating to inoperabilities on one train of the components heat exchangers.

The CSN issued two warnings in 2016, one to Ascó nuclear power plant and the other to Cofrentes. There was no proposal for the initiation of sanctions proceedings.

Table 3.1.1.1. Action matrix status. SISC 2016

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

LR: licensee response. RR: regulatory response.

Table 3.1.1.2. SISC action matrix

Modes	Basis	Derived actions
Licensee response	A plant is in this column when all the assessment of the results are *green*.	The CSN will perform only the basic inspection programme and any deficiencies identified will be dealt with by the licensee as part of the latter's corrective actions programme.
Regulatory response	A plant is in this column when one or two results, either operation indicator or inspection finding, are *white* on different safety pillars and there are no more than two *whites* in any strategic area.	The licensee shall perform an analysis to determine the root cause and contributing factors, and include the activities required to solve the deficiencies detected in his corrective actions programme. The assessment performed by the licensee shall be subjected to a supplementary inspection by the CSN. Following this inspection, the CSN will meet with the licensee to analyse the deficiency detected and the actions implemented to correct the situation.
Degraded pillar	A pillar is considered to be degraded when it contains two or more *white* results or one *yellow*. A plant is in this column when it has a degraded pillar or three *white* results in a strategic area.	The licensee shall perform an analysis to determine the root cause and contributing factors and include the activities required to solve the deficiencies detected in his corrective actions programme, as regards both the problems identified in each subject area and whatever overall collective deficiencies and problems might arise. The assessment performed by the licensee shall be subjected to a supplementary inspection by the CSN. Following this inspection, the CSN will meet with the licensee to analyse the deficiency detected and the actions implemented to correct the situation.

Table 3.1.1.2. SISC action matrix *(continued)*

Modes	Basis	Derived actions
Multiple degradations	A plant is in this column when it has several degraded pillars, several *yellow* results or one *red* result, or when a pillar has been degraded for five or more consecutive quarters.	The licensee shall perform an analysis to determine the root cause and contributing factors and include the activities required to solve the deficiencies detected in his corrective actions programme, as regards both the problems identified in each subject area and whatever overall collective deficiencies and problems might arise. This assessment may be performed by a third party, independent from the licensee. The CSN shall perform a supplementary inspection to determine the amplitude and depth of the deficiencies. Following this inspection, the CSN will decide whether supplementary actions are required (supplementary inspections, request for additional information, issuing of instructions and/or shutdown of the plant).
Unacceptable operation	The Council declares a plant to be in this situation when there is insufficient guarantee that the licensee is capable of operating the facility without causing an unacceptable risk.	The CSN will meet with the management of the licensee to discuss the degradation observed in operation and the actions to be taken before the plant can restart. The CSN will draw up a specific supervision plan.

3.1.2. Juzbado fuel assembly manufacturing facility

The overall operation of the Juzbado manufacturing facility was adequate from the point of view of safety and the reportable events that occurred were managed correctly, with performance of the corresponding analyses and application of the corrective actions deriving therefrom. At no time was there any undue risk for the workers, the public or the environment.

In 2016 the manufacturing facility reported three events, none of which implied any risk for the workers, the public or the environment.

The CSN has not had to propose the initiation of any sanctions proceedings or issue any warnings to this facility.

3.1.3. El Cabril waste disposal centre

The El Cabril disposal centre supervision and tracking system (SSSC) set up operates on a two-yearly basis. The assessment for the period 2015-2016 is that the facility continues to operate adequately overall from the point of view of safety, complying with the established requirements and not posing any undue risk for the workers, the members of the public or the environment.

From the calculation of the operational indicators it may be deduced that throughout 2016 they all remained within the category of Normal Operation, except the one referring to the response to emergency situations and drills, which requires reinforced oversight.

There has not been any reportable event at this facility in 2016.

The CSN has not had to propose the initiation of sanctions proceedings. A warning was issued as a result of non-compliance with a requirement of Instruction IS-31 "Criteria for the radiological control of waste materials generated at nuclear facilities". This non-compliance occurred in 2015.

3.1.4. Centre for Energy-Related, Environmental and Technological Research (Ciemat)

The Ciemat has an operating permit as a unique nuclear facility.

In the catalogue of installations that make up this centre there are two clearly differentiated groups: one including those facilities that are shut down, in the dismantling phase for decommissioning or already decommissioned, and the other comprising 21 second and third category radioactive facilities that are still in operation.

During 2016 there have been no activities within the framework of the PIMIC-Dismantling Project, these having been interrupted on December 31st 2015 on termination of the contractual agreement between Enresa and Ciemat. This is now pending an administrative resolution allowing activities to be renewed for completion of the project. Only surveillance and control activities are now undertaken at the facilities at which the radioactive wastes generated are stored pending removal from the site.

There has been no reportable event at the facility during 2016.

The CSN has not proposed the initiation of sanctions proceedings or issued any warnings to this facility.

As of December 31st 2016, the radioactive waste temporary storage installations present a degree of occupation of 42.39%.

3.1.5. Facilities in the dismantling and decommissioning phase

The following nuclear facilities have ceased to operate or are in the dismantling and decommissioning phase: Vandellós I nuclear power plant (in the latency phase following the first phase of dismantling) and José Cabrera nuclear power plant (in dismantling). The following fuel cycle radioactive facilities are also in the dismantling phase: the Elefante uranium concentrates manufacturing facility (dismantled and currently in the compliance period), the Quercus Plant (definitively shut down and with the dismantling and decommissioning permit applied for in 2015) and the Andújar Uranium Mill (AUM) (dismantled and in the compliance period).

At all these facilities the environmental radiological surveillance programmes, the programmes for the radiological protection of the workers, the physical protection programmes and, where appropriate, the programmes for the control of effluent releases and waste management are kept operational. There have been no deviations in the performance of any of these programmes throughout the year.

The activities carried out in 2016, in keeping with their respective status, have been performed at each of the facilities within the safety limits established and without undue impact on people or the environment.

3.1.6. Radioactive facilities

Throughout 2016, the operation of the radioactive facilities for scientific, medical, agricultural,

commercial and industrial purposes was accomplished within the safety standards established, in adherence to the measures required for the radiological protection of people and the environment, and consequently without situations of undue risk occurring.

3.2. Application of the radiological protection system

3.2.1. Summary of dosimetry data

The number of dosimetrically controlled workers amounted to 110,159[1], with a collective dose of 16,796 mSv·person and an average individual dose of 0.72 mSv/year, this representing 1.44% of the maximum annual dose established in the legislation.

The following is especially noteworthy:

- Medical radioactive facilities are those with the highest collective dose (10,909 mSv·person), this being quite logical since these installations are the ones with the largest number of professionally exposed workers (87,396).

- Facilities in the dismantling phase are those presenting the highest average individual dose (2.9 mSv/year), this being explained by the doses recorded during the dismantling of José Cabrera nuclear power plant.

- The operating nuclear power plants had 9,071 dosimetrically controlled workers, with a collective dose of 2,840 mSv·person and an average individual dose of 0.93 mSv/year.

During 2016 there were four cases in which the annual dose limit established in the legislation was potentially exceeded, all occurring at radioactive facilities. In all these cases a process of investigation was initiated, the conclusion being that in two cases there was no actual overdose, the other two awaiting conclusion.

Table 3.2.1.1. Doses received by the workers in each of the sectors considered in the annual report

Facilities	Number of workers	Collective dose (mSv·person)	Average individual dose (mSv/year)
Nuclear power plants	9,071	2,840	0.93
Fuel cycle and waste storage facilities and research centres (Ciemat)	1,154	61	0.49
Radioactive facilities			
Medical	87,396	10,909	0.64
Industrial	7,183	1,606	0.86
Research	5,842	460	0.42
Facilities in the dismantling and decommissioning phase	323	731	2.90
Transport	166	189	2.22

1 As the dosimetry data have been provided by the National Dosimetry Bank, the overall number of exposed workers in the country does not coincide with the sum of the workers in each of the sectors reported on, since there may be workers rendering services in different sectors throughout the year.

3.2.2. Control of releases and environmental radiological surveillance

The CSN controls and oversees the radiological protection of the public and the environment, off-site releases of radioactive materials from nuclear and radioactive facilities and their impact on the areas of influence of these installations, the aim being to estimate their radiological impact.

Furthermore, the CSN carries out an environmental radiological surveillance programme throughout the national territory, outside the areas of influence of the facilities, in order to watch over and maintain the radiological quality of the environment throughout the country, in accordance with the requirements of the Euratom treaty.

Control of releases and environmental radiological surveillance in the vicinity of the facilities

In keeping with a CSN requirement, the nuclear power plants have established a programme for the control of radioactive effluents and to keep doses to the public as a result of such effluents as low as possible, and in all cases below the values of the Regulation on the Protection of Health against Ionising Radiations.

In the case of the nuclear power plants, the radioactive effluents show a stable or slightly downward trend in recent years, as may be appreciated in figures 3.2.2.1 to 3.2.2.4.

The effective doses due to the emission of liquid and gaseous radioactive effluents, estimated on the basis of conservative criteria for the most exposed individual of the critical group, have not in any case exceeded 2.6% of the authorised limit (0.1 mSv in 12 consecutive months).

With a view to verifying the suitability of the radioactive effluent surveillance and control programmes and of the models of radionuclide transfer in the environment, environmental radiological surveillance programmes are set up in the vicinity of the operating nuclear power plants, fuel cycle facilities and installations currently in the dismantling or decommissioning phase.

This report presents the results of the environmental radiological surveillance programme (ERSP) for the year 2015. This is due to the fact that the processing and analysis of samples has not made it possible to have the results of the 2016 campaign for inclusion in this year's report.

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

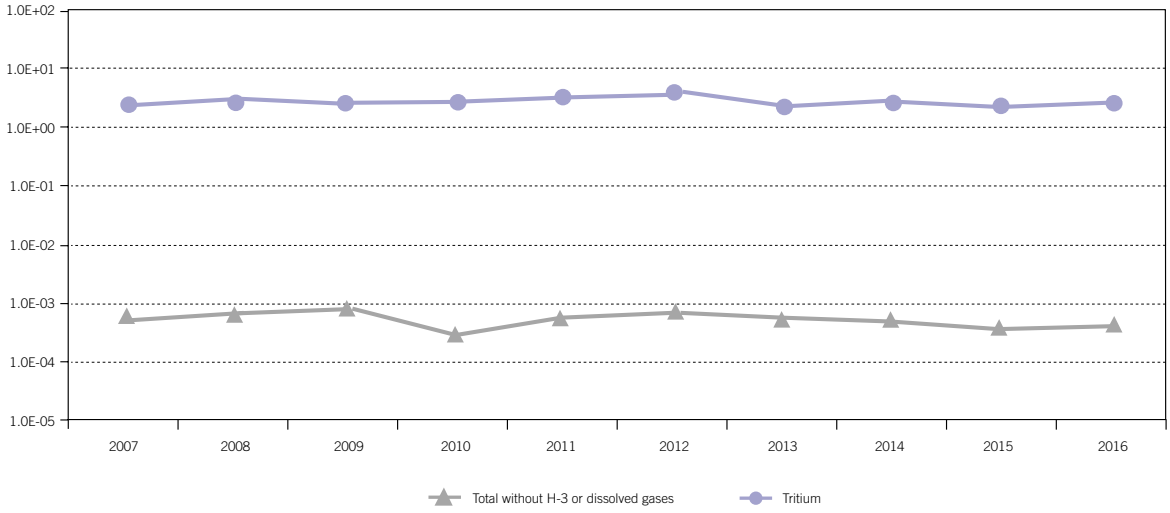


Figure 3.2.2.2. Gaseous radioactive effluents from PWR plants. Standardised activity (GBq/GWh)

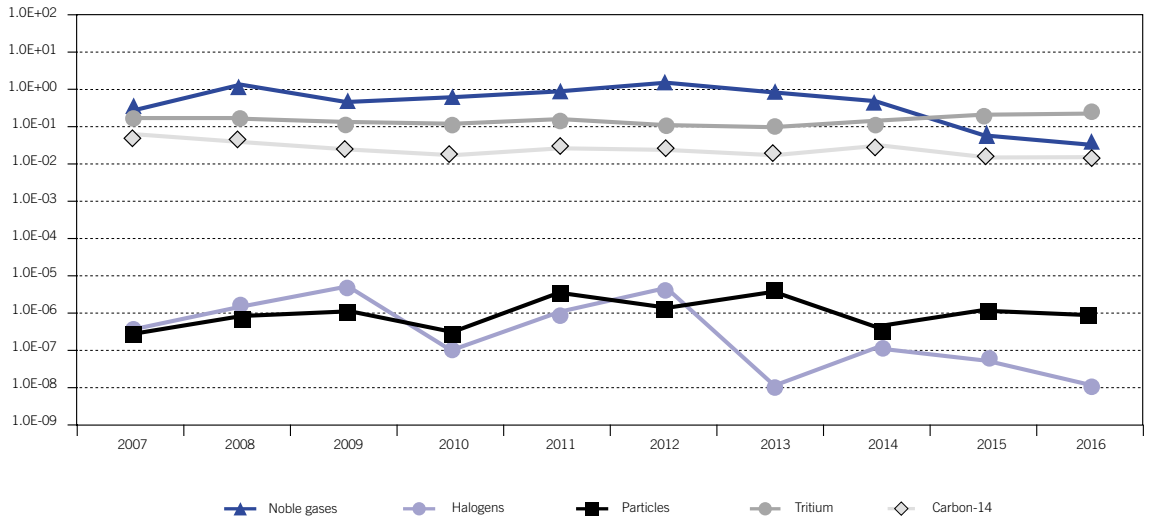


Figure 3.2.2.3. Liquid radioactive effluents from BWR plants. Standardised activity (GBq/GWh)

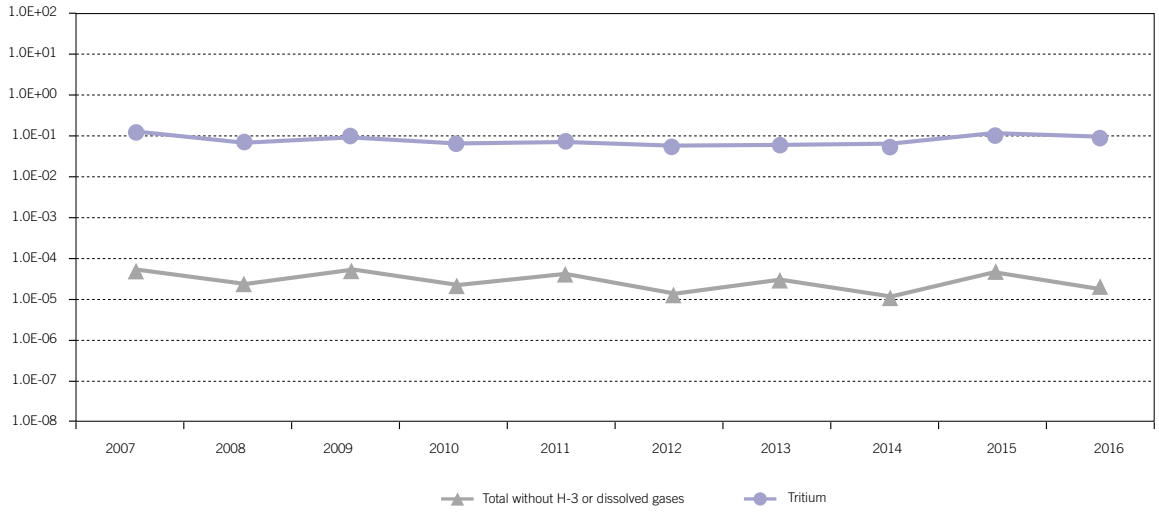
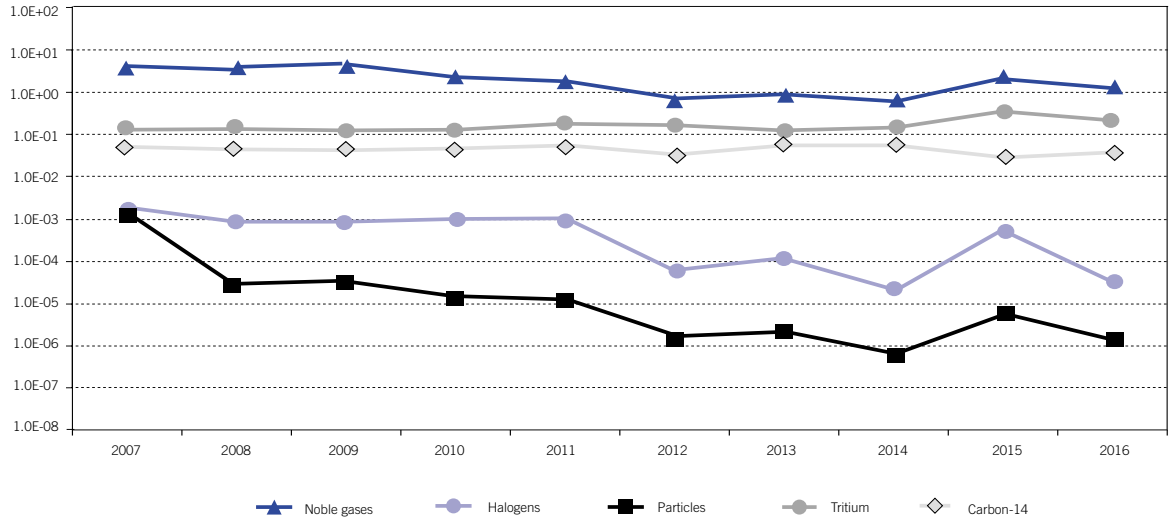


Figure 3.2.2.4. Gaseous radioactive effluents from BWR plants. Standardised activity (GBq/GWh)



The licensees of the facilities are responsible for carrying out these surveillance programmes. During 2015, 6,248 samples were collected in the vicinity of the nuclear power plants, 1,905 from around the fuel cycle facilities (Juzbado fuel assembly manufacturing facility, El Cabril, the Elefante and Quercus plants and the Enusa mining installations) and 1,929 from facilities in the dismantling and decommissioning phase, including Ciemat, the José Cabrera and Vandellós I nuclear power plants, the Andújar uranium mill and the now decommissioned Lobo-G plant.

The results of the 2015 campaign ERSP are similar to those obtained in previous years and lead to the conclusion that the quality of the environment around the facilities continues to reflect acceptable conditions from the radiological point of view, without risk for persons as a result of the operation of these installations or the dismantling or decommissioning activities carried out.

In order to verify that the surveillance programmes undertaken by the facilities are correct, the CSN performs independent environmental radiological surveillance programmes (INERSP), the volume of samples and determinations of which represent around 5% of those performed by the licensees themselves.

The results of these programmes for the 2015 campaign did not show any significant deviations with respect to those obtained for the corresponding programmes of the licensees.

Environmental surveillance outside the vicinity of the facilities

The Nuclear Safety Council carries out surveillance of the environment at national level by means of a network known as Revira, in collaboration with other institutions. This network is made up of automatic stations for continuous measurement of atmospheric radioactivity (ASN) and stations that collect samples for subsequent analysis (SSN).

Automatic stations network (ASN)

Figure 3.2.2.5 (ASN) shows the average annual gamma dose rate values measured at each of the stations of the CSN network, the network of the regional government of Valencia and the network of the Basque Country, and at the dose

rate measuring stations of the networks of the regional governments of Catalonia and Extremadura.

The results of the measurements performed during 2016 were characteristic of the environmental radiological background and indicate the absence of radiological risk for the population and the environment.

Sampling stations network (SSN)

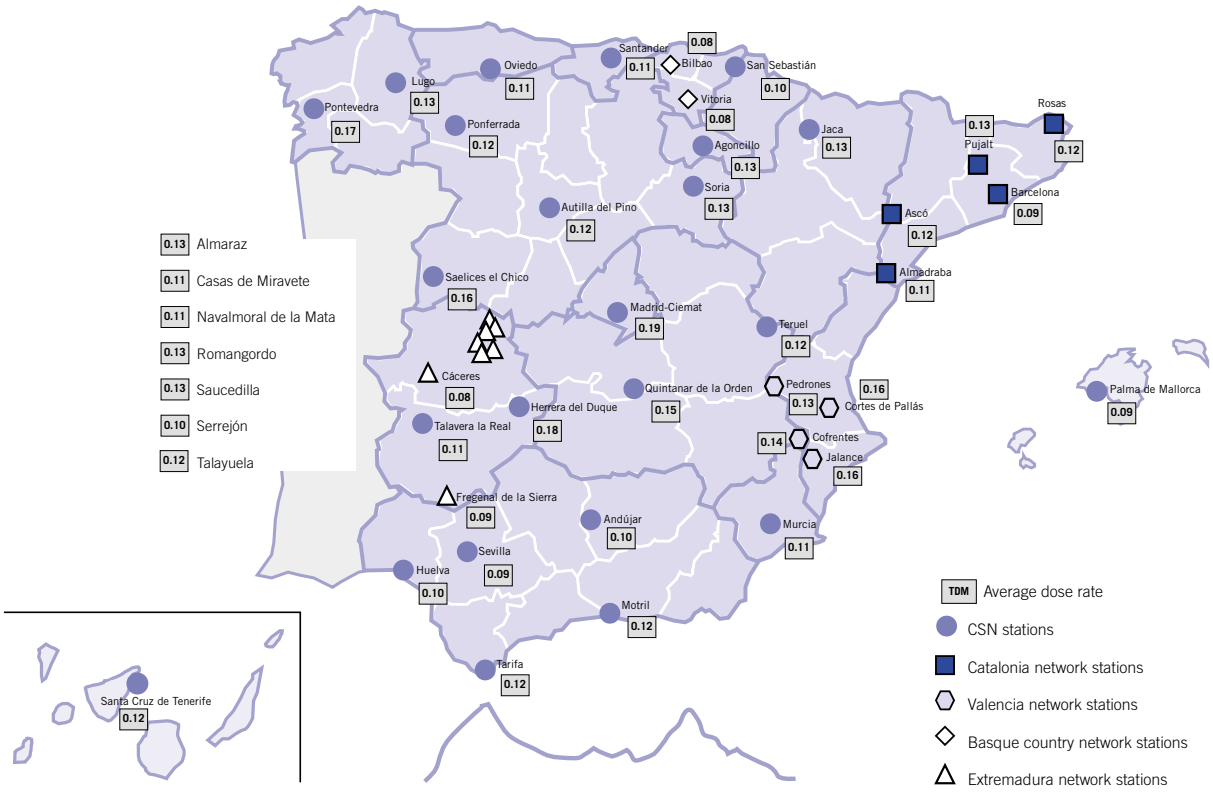
This network collects samples of the air, soil, drinking water, milk, typical diet and continental and coastal waters. Within the network, consideration is given to the following:

- A *Dense Network*, with numerous sampling points allowing the entire territory to be adequately supervised.

- A *Spaced Network*, with very few sampling points, where highly sensitive measurements are required.

The overall evaluation of the results obtained in 2015[2] shows that the values are coherent with the background radioactivity levels and, in general, remain relatively stable over the different periods, with slight variations attributable to the radiological characteristics of the different areas being observed between points.

Figure 3.2.2.5. ASN. Average gamma dose rate values. 2016 (microSievert/hour)



2 This report presents the results of the environmental radiological surveillance programmes (ERSP) for 2015. This is due to the fact that the processing and analysis of samples has not made it possible to have the results of the 2016 campaign for inclusion in this year's report.

4. Tracking and control of facilities and activities

4.1. Standards activity

In 2016 the exercising of the CSN's capacities in relation to standards has led to the approval of the following Council Instructions:

- IS-40, of April 26th 2016, on the documentation to be provided in support of requests for the authorisation of commercialisation and technical assistance activities relating to apparatus, equipment and accessories incorporating radioactive material or generating ionising radiations (Official State Gazette of May 13th 2016).

  The objective of this Instruction is to develop the contents of article 74.2 of the Regulation on nuclear and radioactive facilities. It incorporates the criteria that the CSN considers should be met in order to be able to draw up the mandatory favourable report, establishing the nuclear safety and radiological protection limits and conditions to be applied to the operation of these installations.

- IS-15, revision 1, of May 5th 2016, on requirements for overseeing the effectiveness of maintenance at nuclear power plants (Official State Gazette of June 16th 2016).

  This Instruction is revised on the basis of the experience acquired since it appeared in 2007 and the evolution of the international standards since then, which has underlined certain areas for improvement that need to be covered by the regulation, despite the fact that they were already applied as complementary technical instructions by the nuclear power plants.

- IS-41, of July 16th 2016, approving the requirements regarding the physical protection of radioactive sources (Official State Gazette of September 16th 2016).

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

  The objective is for the security of radioactive sources to include physical protection, in order to avoid, prevent, detect, delay and respond to deliberate malicious actions that might affect these sources. These requirements shall be applied to category 1, 2 and 3 radioactive sources. In the case of sources not reaching category 3 but classified above the exception limits, prudent management practices are described to guarantee their physical protection.

- IS-42, of July 26th 2016, on criteria for reporting to the Council of events during the transport of radioactive material (Official State Gazette of September 22nd 2016).

  The aim of this Instruction is to identify the type of events in the transport of radioactive materials that are to be reported to the CSN and their notification times, specify the minimum information to be provided when reporting and identify those responsible for notification and for the post-event report. This is applicable to transport events occurring or identified in the Spanish territory or in other countries when the origin of the transport has been Spain. Excluded are events during transport by sea or air occurring or detected outside the port or airport, respectively.

- IS-30, revision 2, of November 16th 2016, on the requirements of the fore protection

programme at nuclear power plants (Official State Gazette of November 30th 2016).

It has been considered necessary to update this Instruction in order to clarify and facilitate the practical application of the term "exemption", dividing the term coined in revision 1 into two new terms: "exemption" and equivalent measures", which fit adequately with the regulatory framework in relation to nuclear safety and radiological protection.

The following Safety Guides have been approved during 2016:

- GS-07.06, revision 1, "Content of radiological protection manuals for nuclear facilities and nuclear fuel cycle radioactive facilities". Approved by the Plenary on April 15th 2016.

- GS-01.18, revision 1, "Measurement of the effectiveness of nuclear power plant maintenance". Approved by the Plenary on June 22nd 2016.

At state level, the following provision affecting the regulatory framework of the CSN was approved and published in 2016:

- Royal Decree 314/2016, of July 29th, modifying Royal Decree 140/2003, of February 7th, establishing healthcare criteria regarding the quality of water for human consumption, Royal Decree 1798/2010, of December 30th, regulating the exploitation and commercialisation of bottled natural mineral waters and spring waters for human consumption, and Royal Decree 1799/2010, of December 30th regulating the elaboration and commercialisation of bottled prepared waters for human consumption.

During 2016, the Council participated in the work of the groups in charge of transposing the following Euratom Directives:

- Council Directive 2014/87/Euratom, of July 8th 2014, modifying Directive 2009/71/Euratom, establishing a community framework for the nuclear safety of nuclear facilities.

  A regulatory text (proposal for Royal Decree on Nuclear Safety) has been drawn up. As of December 31st 2016, the arrangements for this text were in the phase of opening of proceedings for stakeholder hearings and public information. The objective continues to be that this Royal Decree enter into force before the limit date established for this transposition, August 15th 2017.

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

4.2. Operating nuclear power plants

4.2.1. General and licensing aspects

During 2016, the Plenary of the Council issued 45 reports for authorisations, most relating to requests for the revision of the official operating documents of nuclear power plants, and 19 favourable reports relating to Complementary Technical Instructions and to the timeframe for the implementation of the requirements contained therein.

The CSN has reported on requests for authorisation of the design modification associated with the development and assembly of the Individualised Temporary Storage (ITS) facility for Almaraz nuclear power plant, as well as the design modifications for the installation of the passive

autocatalytic recombiners (PAR) of the Almaraz and Vandellós II nuclear power plants and the design modification corresponding to the filtered containment venting systems for Almaraz, Ascó and Vandellós II.

A favourable report was also issued on the entry into service of the Alternative Emergency Management Centre (AEMC) of the Almaraz, Ascó, Cofrentes, Trillo and Vandellós II nuclear power plants.

During its meeting of July 30th 2014, the Plenary of the Council agreed to issue complementary technical instruction CSN/ITC/SG/SMG/14/01 on additional documentation and requirements relating to the request for renewal of the operating permit to the licensee of Stª Mª de Garoña nuclear power plant.

The process of evaluating the request for renewal of the operating permit of Stª Mª de Garoña nuclear power plant has continued its course, although certain evaluations have been delayed due to the unavailability of the necessary information, pending delivery by the licensee, and to delays by the licensee in implementing the required modifications.

The overall assessment of the operation of the nuclear power plants is accomplished considering fundamentally the results of the integrated plant supervision system (IPSS), the events reported, especially those classified at a level higher than zero on the IAEA's International Nuclear Events Scale (INES), the radiological impact, the dosimetry of the workers and other aspects such as the relevant modifications suggested, warnings and sanctions and operating events.

Table 4.2.1.1 contains information on the design characteristics of the nuclear power plants an the dates of their site, construction and start-up permits.

Table 4.2.1.2 contains specific data on the plants in 2016, indicating whether or not they underwent a refuelling outage.

Table 4.2.1.1. Basic nuclear power plant characteristics

	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
Electrical output (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	Closed Towers, make-up from Tajo River	Open Ebro River	Closed Towers make-up Júcar River
Number of groups	2	2	1	1	1	1
Preliminary permit group 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 group 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
Start-up permit group 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

Table 4.2.1.2. Summary of nuclear power plant data for 2016

	Almaraz I/II	Ascó I/II	Vandellós II	Trillo	Garoña	Cofrentes
Permit in force	07-06-10 07-06-10	02-10-11 02-10-11	21-07-10	03-11-04	Up 06-07-13 operating permit From 06-07-13 shutdown	20-03-11
Validity (years)	10/10	10/10	10	10	N/A	10
Number of inspections in 2016	33	29	35	25	22	20
Production (GWh) I/II	7,447.79 7,726.47	8,439.802 7,646.235	7,964.778	8,552.966	–	9,177.644
Load factor (%) I/II	84.43 87.17	97.00 88.36	83.41	99.06	–	99.46
Operating factor (%) I/II	86.77 89.10	97.45 89.39	86.15	99.7	–	100.00
Hours coupled to grid I/II	8,784 8,784	8,560.27 7,852.23	7,567.63	8,115	–	8,784
Refuelling outages I/II	04-01-16 20-02-16 (U-I) 06-11-16 16-12-16 (U-II)	– – (U-I) 30-04-16 07-06-16 (U-II)	29-10-16 18-12-16	29-04-16 27-05-16	N/A	N/A

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

The CSN's integrated plant supervision system (SISC) has been in service for more than ten years now and has proven to be a basic tool for supervision of the operation of the Spanish nuclear power plants and the establishment of the necessary corrective actions depending on the results obtained.

The SISC has been completed with new elements that contribute to more detailed tracking of the operation of the plants, especially as regards transversal issues. The Plenary of the Council agreed that the modification of the SISC relating to transversal issues should enter into force as from March 31st 2016. The objective of this new approach is to have available some type of indicators or alerts allowing the CSN to identify possible degradations of organisational and cultural aspects that might impact nuclear safety, in order for appropriate actions to be taken. These indicators or alerts are obtained through the findings of all the CSN inspections at the plants to which the SISC is applicable.

The transversal components chosen correspond to 13 fundamental attributes of the operation of a plant that cover all the safety pillars of the SISC; i.e., initiating events, mitigation systems, barrier integrity, emergency preparedness, occupational radiological protection, radiological protection of the public and security.

Furthermore, following approval in 2014 by the Plenary of the Council of a new supervision and tracking system (STS) for Santa María de Garoña nuclear power plant, adapted to the facility's shutdown situation, this plant no longer appears

within the SISC and has had its corresponding six-monthly assessment reports programmed within the STS.

The following may be singled out from among the nuclear power plant operating results obtained in 2016 using the SISC supervision programme.

As of December 2016, all the operational indicators and inspection findings affecting the action matrix were green.

Throughout the aforementioned period, the plants have been in a situation of normality, with the application of standard inspection and deficiencies correction programmes, a situation known as "licensee response" in the SISC action matrix. The only exceptions have been Almaraz II, which during the first and second quarters of 2016 was in the "regulatory response" column due to a white indicator relating to the reliability of the emergency diesel generators, affecting the safety pillar of mitigation systems, and Vandellós II, which for the first three quarters was in the "regulatory response" column due to the white emergency response and drills indicator.

A total number of 144 inspections were performed at the operating plants in 2016, including Santa María de Garoña. The Basic Inspection Programme (BIP) included the performance of 119 inspections, including the 24 quarterly inspections carried out by the resident inspectors.

This number (119) does not include inspections performed in response to operating incidents, special inspections relating to generic issues as a result of new standards and in-house and external operating experience, inspections relating to various licensing issues and other inspections planned as generic interventions or set out beforehand as a result of the plant action plans.

Sanctions proceedings and warnings

In 2016 the CSN did not propose to the Ministry of Energy, Tourism and the Digital Agenda the opening of any sanctions proceedings with respect to the operating nuclear power plants.

The CSN issued the following warnings:

- Ascó nuclear power plant, for non-compliance with Technical Specification 3/4.9 "Refuelling operations".

- Cofrentes nuclear power plant, for non-compliance with Complementary Technical Instruction CSN/ITC/SG/COF/13/05, due to the term established therein being exceeded.

4.2.3. Tracking of actions deriving from the Fukushima nuclear power plant accident

In 2016 the licensees of the plants issued two reports on the status of the requirements of the adapted Post-Fukushima CTI's, one in January corresponding to the second half of 2015 and another in July corresponding to the first half of 2016. The report on activities performed during the second six months of 2016 was issued in January 2017.

During 2016, the CSN performed 15 inspections at the nuclear power plants in relation to compliance with the post-Fukushima CTI's. These inspections included the checking of aspects relating to the stress tests carried out at the plant and to the loss of major areas and extensive damage scenarios.

Particularly significant among the activities carried out in 2016 has been the progress made in the design and implementation of major design modifications: new alternative emergency management centres, passive autocatalytic containment hydrogen recombiners and filtered containment venting systems.

In 2016 the licensees of the Almaraz and Vandellós II nuclear power plants submitted a request for favourable appreciation of the implementation of passive autocatalytic containment hydrogen recombiners (PAR), which were favourably reported on by the CSN. Almaraz group I submitted its request in 2015 and it was favourably reported on in January 2016.

On October 11th 2016, the licensee of Ascó I nuclear power plant requested extension of the period required for compliance with point 2.3.b) of the Complementary Technical Instruction adapting the post-Fukushima CTI's for the implementation of the new passive reactor coolant pump (RCP) seals between December 31st 2016 and the completion of the group's 25th refuelling outage, scheduled for the period 13/05/2017 to 16/06/2017, this being favourably looked upon by the Plenary of the Council.

In 2016 the licensees of the Ascó, Almaraz and Vandellós II nuclear power plants submitted requests for authorisation for the placing in service of the filtered containment venting system (FCVS), these being favourably looked upon by the Plenary of the Council.

Likewise, the licensees of the Ascó, Cofrentes, Trillo and Vandellós II nuclear power plants requested favourable appreciation for the placing in service of their respective AEMC's (alternative emergency management centres), the objective of which is to allow for emergency direction and management alternative to that carried out at the normal centres, such as the Technical Support Centre, Medical Services, etc. in the event of unavailability of the latter due to an emergency with extensive damage or any other emergency whose evolution or consequences leads to the evacuation of any of these centres.

The Council looked favourably upon the requests for the placing in service of the AEMC's and reported favourably on the corresponding modification of the Site Emergency Plan (SEP) to include their use in the event of emergencies.

4.2.4. Safety improvement programmes

Periodic safety review programmes

The CSN considered that it would be appropriate to analyse the systematic approach to be applied for performance of the following plant PSR's, assuming that they will all finish their 40-year design lifetime during the ten-year period following the next renewal of the OP (Almaraz in 2020, Ascó I in 2022, Ascó II in 2025, Cofrentes in 2024, Trillo in 2027 and Vandellós II in 2027).

Following analysis of the practices adopted in our neighbouring countries in relation to PSR and of the recommendations of the international organisations, it was concluded that the systematic approach to PSR performance considered to be best suited to the new stage would be that proposed by the International Atomic Energy Agency (IAEA) in its safety guide SSG-25 Periodic Safety Review for Nuclear Power Plants, of March 2013.

Taking SSG-25 as a reference, the review project relating to CSN safety guide GS- 1.10 is being subjected to external comments following the approval of draft 1 by the Plenary of the Council during its meeting of November 30th 2016.

4.3. Nuclear fuel cycle and radioactive waste disposal facilities and research centres

This section encompasses the Juzbado fuel assembly manufacturing facility, the El Cabril radioactive waste disposal centre, the Centre for Energy-Related, Environmental and Technological

Research (Ciemat) and the Quercus plant, the Retortillo plant and the uranium mining installations.

In 2016 all of these facilities operated within the established safety margins, without there being any situations of undue risk.

Also included is the centralised temporary storage (CTS) facility, which is in the licensing phase.

4.3.1. General and licensing aspects

Throughout 2016 the CSN issued reports on seven requests for authorisation. The reports in question referred to the following facilities:

- Juzbado fuel assembly manufacturing facility: six favourable reports were issued. Two of these related to the renewal of the physical protection authorisation and of the authorisation for operation and manufacturing and the rest were associated with design modifications or changes to official operating documents.

- El Cabril disposal centre: a favourable report was issued relating to the review of the operating specifications.

In addition, in December 2016 the CSN issued a Complementary Technical Instruction (CTI) to Enresa, as the holder of the physical protection authorisation associated with the construction phase of the CTS facility in order to comply with the contents of Royal Decree 1308/2011, of September 26th on the physical protection of nuclear facilities and materials and of radioactive sources. Enresa shall study the scenarios foreseen in the design basis threat and identify the measures to be implemented during the design and construction phase.

4.3.2. Tracking and control of the Juzbado fuel assembly manufacturing facility

The Juzbado facility supervision and tracking system (JST) undertakes assessment of the operation of this installation. The supervision system has a two-year frequency, coincides with the extension of the manufacturing facility's basic inspection plan and is initiated with analysis of the deviations or findings documented during the review period.

Inspections

In performing its respective control programmes, the CSB carried out a total 16 inspections at the Juzbado fuel assembly manufacturing facility.

Reported events

Three reportable events occurred at the Juzbado fuel assembly manufacturing facility, these not posing any risk for the workers, the members of the public or the environment.

Sanctions and warnings

The CSN has not had to propose the opening of sanctions proceedings in relation to this facility or issue any warnings.

4.3.3. Centralised Temporary Storage facility

In January 2014, Enresa submitted requests to the Ministry of Industry, Energy and Tourism for the preliminary or site permit and the construction permit for the centralised temporary storage (CTS) facility for spent nuclear fuel and high level radioactive wastes.

During its meeting of July 27th 2015, the Plenary of the Council reported favourably on the preliminary or site permit, with limits and conditions.

The process of assessment associated with the issuing of the mandatory report relating to the request for the construction permit has continued at the CSN throughout 2016.

In February 2016, the CSN issued a Technical Instruction (TI) on the application to the centralised temporary storage (CTS) facility of Council Directive 2014/87/Euratom of July 8th 2014, modifying Directive 2009/71/Euratom. Among others, this Directive establishes the safety objectives applicable to the design, siting, construction, operation and dismantling of nuclear facilities obtaining their construction permit after August 14th 2014.

In December 2016, the CSN issued a Complementary Technical Instruction (CTI) to Enresa, as the holder of the physical protection permit associated with the construction phase of the facility, in compliance with the provisions of Royal Decree 1308/2011, of September 26th, on the physical protection of nuclear facilities and materials and radioactive sources.

Inspections

Two inspections have been carried out. The first of these referred to the monitoring of complementary site characterisation activities and available results, and the second to the control of the design process and application of the quality assurance procedure.

4.3.4. Tracking and control of the El Cabril radioactive waste disposal centre

In 2014 the CSN established a specific supervision and control system with a frequency of two years.

The supervision process is based on the collection of information from the following sources: the operating indicators reported by the facility to the CSN and the inspections and assessments performed by the latter. The system is based on verification of the operation of the facility, in accordance with the applicable standards and authorisations and other requirements established.

The facility's operating indicators cover the areas of emergency preparedness and sabotage, operational radiological protection and the radiological protection of the public.

The solid low and intermediate level radioactive wastes generated at the nuclear and radioactive facilities are managed at the El Cabril disposal centre, which is equipped with disposal cells for this purpose (north and south platforms). There are also disposal cells for very low level wastes (east platform).

As of December 31st 2016:

- The total number of low and intermediate level disposal units on the north and south platforms amounted to 6,680, 74.45% of the total capacity.
- The total number of very low level disposal units on the east platform amounted to 13,169.
- The total volume occupied in cells 29 and 30 on the east platform amounted to 10,081.90 m^3 and the capacity available in these cells was 81,602.10 m^3.

Likewise, in cells 26, 27 and 28 on the south platform, 95 ISO casks containing wastes from steelyard incidents were in temporary storage.

Cell 19 remained operational throughout 2016. Very low level wastes were disposed of in section I of cell 29 and in cell 30.

Inspections

In performing its respective control programmes, the CSN carried out a total 10 inspections at the El Cabril disposal centre.

Events

There have been no reportable events during 2016.

Sanctions and warnings

A warning was issued in 2016 as a result of non-compliance with a requirement of Council Instruction IS-31 "Criteria for the radiological control of waste materials generated at nuclear facilities". This non-compliance was the result of insufficient understanding by the workers of the procedures applicable to the case, which led to the authorisation of movement from one area of the installation to another of radioactive waste material as non-impacted waste.

4.3.5. Tracking and control of the Centre for Energy-Related, Environmental and Technological Waste (Ciemat)

The dismantling project (Pimic-Dismantling) affects the area that housed the most representative nuclear facilities of the former Nuclear Energy Board (JEN) and is being carried out by Enresa.

The rest of the site is subject to the so-called Pimic-Rehabilitation project and includes those facilities whose dismantling was initiated previously, in addition to restoration activities in radiologically affected areas of the centre.

During 2016 there have been no Pimic-Dismantling project activities, these having been interrupted on December 31st 2015 when the contractual agreement between Enresa and Ciemat came to a close. These are currently pending an administrative resolution allowing activity to be re-started for completion of the project. The only tasks currently being carried out relate to the surveillance and control of the installations in which the radioactive wastes generated are being stored pending dispatch off site.

Inspections

Five scheduled inspections were performed at the centre's facilities during the year.

Events

There have been no reportable events during the year.

Sanctions and warnings

The CSN has not had to propose the initiation of any sanctions proceedings or issue any warnings to this facility.

4.3.6. Uranium concentrates manufacturing plants

4.3.6.1. Tracking and control of the Quercus plant

The Quercus uranium concentrates manufacturing facility is in the definitive shutdown situation, in compliance with the Ministerial Order, ECO/2275/2003, issued by the Ministry of Economy on July 14th 2003 (Official State Gazette 189 of August 8th).

On September 14th 2015, Enusa, the licensee of the facility, requested authorisation for phase I of the dismantling process from the Ministry of Industry, Energy and Tourism.

During 2016 the activities focussed on the treatment of the liquid effluents collected from the different drains of the mining site existing in the area (strip pit waters) and of supernatant liquids from the tailings dyke for conditioning and release. There has been no transport of radioactive material since there are no stocks of uranium concentrates.

Inspections

A total four inspections were performed in 2016.

Events

There have been no reportable events during the year.

Sanctions and warnings

The CSN has not had to propose the initiation of any sanctions proceedings or issue any warnings to this facility.

4.3.6.2. Retortillo Plant

The Ministry of Industry, Energy and Tourism granted the company Berkeley Minera España, SL, (BME) a preliminary permit for the Retortillo Plant as a first category nuclear fuel cycle radioactive facility for the manufacturing of uranium concentrates by means of Ministerial Order IET/1944/2015 of September 17th.

BME requested authorisation for the construction of the plant in writing on September 7th 2016. The Ministry requested the mandatory CSN report on the authorisation of the construction of the Retortillo Plant pursuant to the Regulation on nuclear and radioactive facilities. At year end the documentation was being assessed by the CSN.

Inspections

Two inspections were carried out at the Retortillo-Santidad site in 2016. The first of these was for the monitoring of the activities performed by BME in application of the preliminary permit. The objective of the second was to check certain aspects relating to the preoperational environmental radiological surveillance programme (ERSP), the result of which was to be submitted by BME to the CSN for evaluation.

Events

There have been no reportable events during the year.

Sanctions and warnings

The CSN has not had to propose the initiation of any sanctions proceedings or issue any warnings to this facility.

4.3.7. Uranium mining

Under this heading are included activities relating to authorisations for the exploitation of uranium ore resources and permits for research into such resources, currently carried out by the company Berkeley Minera España, SA (BME).

On April 8th 2014, the Regional Government of Castilla y León granted Berkeley Minera España, SL a permit for the exploitation of the Retortillo-Santidad site. Prior to beginning such exploitation, BME must satisfy a number of radiological protection prescriptions and considerations established by the CSN.

During 2016, BME submitted technical documentation focussed on this objective.

Throughout 2016 work continued in relation to the activities contemplated in the permits for research into mineral resources granted previously.

A single report on compliance with the radiological requirements applicable to work performed during the previous year was submitted to the CSN in 2016, corresponding to permit SA-6605-0 "Alisos".

Inspections

One inspection was performed in 2016. The report drawn up as a result of this inspection points out that BME had only carried out test drilling within the framework of the "Alisos" permit and had consequently submitted only this report on compliance with the radiological requirements.

4.4. Facilities in the dismantling and decommissioning phase

The following fuel cycle nuclear or radioactive facilities are in the dismantling or decommissioning phase: Vandellós I nuclear power plant (in the latency phase following the first phase

of dismantling), José Cabrera nuclear power plant (in the dismantling phase), the Elefante uranium concentrates plant (dismantled and in the compliance period) and the Andújar Uranium Mill (AUM) (dismantled and in the compliance period).

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

This section also contemplates the plans for the restoration of uranium mines.

The activities carried out at each of the facilities, each in its respective status, were performed throughout 2016 within the established safety limits and without any undue impact for persons or the environment.

4.4.1. Licensing, inspection and control

The CSN issued four favourable reports, all associated with José Cabrera nuclear power plant:

- Favourable report on the proposed design modification for the installation of a cutting confinement enclosure (SAS) in the pits of radioactive waste store 1.
- Favourable report regarding the results of start-up testing of the cutting confinement enclosure (SAS) installed in pit number 2 of radioactive waste store 1.
- Favourable report on the proposed design modification for the installation of a soil washing plant.
- Favourable report on the sixth proposed revision of the ventilation systems surveillance programme.

Within the framework of their respective control programmes, the CSN performed a total 24 inspections: two at the Vandellós I nuclear power plant, 19 at the José Cabrera plant, one at the Retortillo facility and two at the Andújar uranium mill.

There were no reportable events in 2016.

4.5. Radioactive facilities

4.5.1. General aspects

Throughout 2016, the operation of the radioactive facilities for scientific, medical, agricultural, commercial and industrial purposes took place in compliance with the safety standards established and with the measures required for the radiological protection of persons and the environment. Table 4.5.1.1 shows the evolution of the number of radioactive facilities.

4.5.2. Licensing

As of December 31st 2016, the following autonomous communities had executive competences transferred to them in relation to 2nd and 3rd category radioactive facilities: 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.

The CSN carries out the licensing of the facilities with the collaboration of the autonomous communities with which it has assignment agreements in place including the function of evaluation of requests for authorisation (Catalonia, the Balearic Islands and the Basque Country).

Diagnostic X-ray facilities are governed by a specific regulation that establishes a system of

Table 4.5.1.1. Evolution of the number of radioactive facilities

Category	Field of application	2012	2013	2014	2015	2016
1st	Irradiation	1	1	1	1	1
	Research	1	1	1	1	1
	Subtotal	**2**	**2**	**2**	**2**	**2**
2nd	Commercialisation	58	67	68	67	69
	Research and teaching	97	98	101	94	91
	Industry	558	538	517	493	485
	Medicine	322	323	329	322	324
	Subtotal	**1,035**	**1,026**	**1,015**	**976**	**969**
3rd	Commercialisation	14	17	17	18	18
	Research and teaching	89	89	83	78	78
	Industry	207	217	220	226	226
	Medicine	38	37	35	29	28
	Subtotal	**348**	**360**	**355**	**351**	**350**
	Medical X-rays	33,625	34,592	35,302	36,293	37,142
	Total	**35,010**	**35,980**	**36,674**	**37,622**	**38,463**

declaration and registration, under the aegis of the autonomous communities.

As of December 31st 2016, a total 1,321 radioactive facilities were authorised to operate (two 1st category, 969 2nd category and 350 3rd category). Likewise the CSN has on record the entry of 37,142 radiodiagnosis facilities in the registers of the autonomous communities.

During 2016, 358 requests were issued in relation to the authorisation of radioactive facilities. The CSN personnel evaluated 261 of these requests:

- 29 for operating permits.
- 31 for decommissioning declarations.
- 201 for the authorisation of different modifications.

The remaining evaluations of requests for authorisation (97) have been carried out by the technical personnel of the respective autonomous communities with which function assignment agreements are in place (Catalonia, the Balearic Islands and the Basque Country).

As regards the process of authorising industrial facilities, the requests reported on this year referred mainly to modification and decommissioning and to a lesser extent to start-up.

As regards medical facilities, in 2016 the dismantling of two cyclotrons was concluded and their decommissioning will now begin. At present there are 16 cyclotrons active in Spain for the production of fluorine-18 and other very short-lived positron-emitting isotopes, used for positron emission tomography (PET) scanning at nuclear medicine installations. As of the end of 2016 there were 95 PET diagnosis facilities in Spain, two of them installed in mobile units. More than 90% of the PET facilities are equipped with mixed cameras incorporating computerised tomography (CT). In recent years the PET cameras are being replaced with PET/TC units.

As regards external radiotherapy (EBRT), the replacement of linear accelerators continued in 2016 through the renewal of older units, without varying the total number, which amounts to 267. This is due to the application of new techniques, in addition to three-dimensional shaped radiotherapy, such as image-guided techniques, modulated intensity radiotherapy (MIRT) or stereotaxic radiotherapy (SBRT). During 2016 these radiotherapy units operated flat out and satisfactorily from the point of view of safety and radiological protection.

In relation to radiotherapy, it may be pointed out that in 2016 the implementation of at least two proton therapy facilities was planned. The construction of one of these will get under way in 2017 and it will be the first proton therapy facility in Spain.

4.5.3. Inspection, tracking and control of facilities

The CSN performs the inspection of these facilities with the collaboration of the autonomous communities with which function assignment agreements are in place.

Following analysis of the experience accumulated and in keeping with the international standards and practices, the Technical Directorate for Radiological Protection decided to modify the radioactive facility inspection programme in order to bring its frequency more into line with the risk of each affected installation or activity to introduce the practice of non-scheduled inspections.

The licensees of the facilities were informed of the new programme in 2016 and the corresponding governing procedures: PG.IV.04 "Inspection of radioactive facilities and other regulated activities" and PG.IV.06 "Control of radioactive facilities and other connected regulated activities", were approved.

Throughout 2016, 1,427 inspections were performed at radioactive facilities.

The special monitoring of dose optimisation at the different types of installations has continued within the framework of radioactive facility control activities, with special attention given to the mobile gammagraphy sector. This is the area presenting the greatest problems as regards radiological protection, although as is shown by recent operating experience, a significant improvement has been achieved in recent years.

Likewise, emphasis has been given to the control of radioactive facilities in a situation of crisis or undergoing bankruptcy proceedings in order to ensure the safety and radiological protection and adequate management of equipment containing radioactive sources.

In 2013, the CSN issued a Technical Instruction on "Problems of Viability of Radioactive Facilities", with a view to requiring action from those facilities whose problems of viability might affect radiological safety. In 2014 the CSN drew up an action protocol for the preparation of an inventory and the control of these facilities. As a result of its application, there is now an inventory including 28 installations subjected to special supervision, with 32 that have been removed from the list due to their having solved their situation, with the radioactive sources having been removed to an authorised and solvent facility, the supplier or Enresa.

The control of encapsulated high-level sources has also been increased. This type of sources is defined in Royal Decree 229/2006, of February 24th on the control of encapsulated high-level radioactive sources and stray sources and is the one posing the highest radiological risk as a result of which it is subject to stricter regulation and control.

During 2016 the CSN has improved the computer application in which the users of these sources load the inventory sheets for each source, as required by the aforementioned Royal Decree. As a result, the number of users has increased from 109 in early 2015 to 167 as of December 31st 2016.

In 2016 the CSN received 1,228 annual reports from radioactive facilities, some 5,000 from diagnostic X-ray installations and 348 quarterly commercialisation reports.

Analysis of the minutes drawn up as a result of inspections, of the annual reports from the facilities, of information on radioactive materials and equipment supplied by commercialisation facilities and of data on waste management provided by Enresa has given rise to the issuing of 308 control letters directly by the CSN, 25 by way of the functional assignment agreement with Catalonia and 26 via the one in place with the Basque Country, in relation to various technical aspects of facility licensing and control.

Also worthy of mention in the field of control is the attention paid to complaints, of which 32 referring to radioactive and radiodiagnosis facilities were received in 2016. In response to these, and wherever sufficient justification was considered to exist, inspection visits were made, the complaining parties being informed subsequently of the situation of the facility and a control letter being sent, where appropriate, to the licensee.

Events reported

Twelve events were reported at radioactive facilities, eight at medical installations, three at industrial facilities and one at a research laboratory.

Sanctions proceedings and warnings

The CSN proposed the opening of sanctions proceedings in relation to two companies authorised for the performance of soil humidity and density measurement, one addressed to the Ministry of Energy, Tourism and the Digital Agenda and the other to the Regional Government of Castilla y León. The reason for such proposals was non-adherence to the technical requirements imposed.

During 2016, as a result of the facility control assessment and inspection activities, 26 warnings were issued by the CSN, nine by the Regional Government of Catalonia and six by the Basque Government, identifying the deviations encountered and requiring that the licensee correct them within two months. In one case, a coercive fine was imposed due to the non-implementation by the licensee of a radioactive facility of the corrective actions required in its warning.

The monitoring of the radioactive facility belonging to Geoinci, Gabinete de Estudios y Proyectos, SL (IRA-2883) has been maximised, due to the disappearance of the licensee of the installation. The operating permit for this facility has been withdrawn by the CSN, which has also proposed that the executive of the Regional Government of Castilla y León close down the facility's equipment.

4.6. Service entities, personnel licences and other activities

This section encompasses companies or entities subject to the nuclear regulation that provide services to third parties in the field of radiological protection. They include radiological protection services (RPS), radiological protection technical units (RPTU), companies selling and providing technical assistance for medical X-ray equipment, personal dosimetry services (PDS) and external companies registered.

In relation to radiological protection services and units:

In 2016 the CSN authorised a new RPS and modified the authorisations previously granted to

six others (five were modified ex officio). As of closure of the financial year, the number of RPS's authorised by the CSN amounted to 86.

Twenty-seven control inspections were performed at authorised RPS's, three by personnel accredited by the CSN and assigned to the autonomous community of Catalonia, five by personnel assigned to the autonomous community of Valencia and four by personnel assigned to the autonomous community of the Basque Country.

No new RPTU's have been authorised this year but the permit previously granted has been modified in two cases; likewise, the temporary suspension imposed upon another RPTU in December 2014 was lifted, as a result of which on closure of the year the number of RPTU's authorised by the CSN amounted to 40.

Seventeen RPTU control inspections were carried out two of which were performed by personnel accredited by the CSN and assigned to the autonomous community of Catalonia.

During 2016 the tests necessary for the granting of the head of radiological protection service diploma were successfully performed by 13 people, ten applied to radiological protection services and three to radiological protection technical units.

In relation to personnel dosimetry services:

No new personnel dosimetry services were authorised in 2016, although the authorisation previously granted to one service was modified and the permits were withdrawn from two other services. As of closure of the year, the number of authorised external dosimetry services amounted to 20.

In the field of internal dosimetry, no new services have been authorised, the number of authorised internal dosimetry services amounting therefore to nine.

Thirteen control inspections were performed, nine at external dosimetry services and four at internal dosimetry services.

In 2016 an agreement was signed between the CSN and Ciemat for the performance of an intercomparison exercise between the different internal personnel dosimetry services authorised by the CSN; this will be carried out in 2017.

In relation to external registered companies:

External companies whose workers perform activities in the controlled zone are obliged to be entered on a register created for this purpose by the Nuclear Safety Council.

At the end of 2016, a total 1,890 companies were entered on this register of external companies, the vast majority of which perform their activities in the nuclear power plant sector.

In relation to companies selling and providing technical assistance for medical radiodiagnosis equipment:

In 2016 the CSN reported on the authorisation of four new sales and technical assistance companies and on the modification of the authorisations granted previously to three more. Furthermore, it closed eight requests for authorisation. On closure of the year, the number of authorised sales and technical assistance companies amounted to 344.

Around 50 annual reports on activities performed by sales and technical assistance companies were assessed during 2015.

As regards the regulatory control of the sales and technical assistance companies, in 2016 the CSN issued an informative circular on the criteria to be taken into account for the performance of acceptance tests prior to the clinical use of X-ray equipment for medical radiodiagnosis purposes.

Personnel licences:

This section provides information on licences for the personnel of nuclear and radioactive facilities, grouped by installation type.

a) Nuclear power plant personnel licences

As of December 31st 2016, the number of licenced workers at the nuclear power plants amounted to 299: 130 supervisors, 149 operators and 20 holding a head of radiological service diploma.

In 2016 the CSN awarded six supervisor licences, 14 operator licences and one for the head of a radiological protection service, and 40 supervisor licences and 21 operator licences were renewed.

b) Licences for the personnel of fuel cycle facilities and installations in the dismantling phase

As of December 31st 2016, the number of licenced workers at these facilities amounted to 206: 81 supervisors, 114 operators and 11 holding a head of radiological service diploma.

Likewise, for these installations three supervisor and four operator licences were granted and 18 supervisor and 30 operator licences were extended.

c) Licences for the personnel of radioactive facilities

As of the closure of the year, the number of licenced workers at radioactive facilities stood at 14,192: 3,983 supervisors, 10,020 operators and 189 holding a head of radiological service diploma.

The total number of persons accredited to direct or operate radiodiagnosis facilities as of December 31st 2016 stood at 143,551, of which 58,773 were accredited to direct such installations and 84,778 to operate them.

Throughout the year the CSN granted the following licences and accreditations:

- At radioactive facilities: 311 new supervisor licences, 1,040 operator licences and 13 diplomas for radiological protection service heads, extending 550 supervisor licences and 1,110 operator licences.

- At medical radiodiagnosis facilities: 152 accreditations to direct and 1,509 to operate.

1,470 accreditations to direct and 2,182 accreditations to operate were registered, corresponding to persons who had successfully completed training courses for personnel directing the operation or operating equipment at X-ray facilities for medical diagnosis purposes.

As regards courses for the training of the personnel of radioactive facilities, two new entities were homologated and the homologation previously granted to another seven was modified. As regards the courses for accreditation to direct or operate radiodiagnosis facilities, three new entities were homologated and the homologation previously granted to another six was modified.

Throughout the year the CSN performed 55 inspections aimed at evaluating 85 courses corresponding to radioactive facilities. In keeping with its assignment, the Basque Country reported on the performance of seven inspections of seven courses corresponding to radioactive facilities during 2016.

Likewise, the CSN carried out seven inspections of courses aimed at accrediting personnel for medical radiodiagnosis facilities.

Other regulated activities: radioactive materials, equipment, apparatus and accessories

During 2016 the CSN issued seven reports relating to the manufacturing of radioactive equipment, three for packaged and non-packaged products inspection equipment, two for equipment for research on small animals, one for aircraft components housing encapsulated radioactive sources with activity levels below the exemption limit and one for process control equipment with radioactive sources.

The CSN has issued 33 favourable reports, 26 in relation to modifications and seven on new authorisations for the approval of 50 radioactive apparatus models. The models approved correspond to (4) X-ray equipment units for instrumental analysis (G/AI), (20) models for the inspection of packaged or non-packaged products on process lines (G/CPIE/INE), (3) models for other radiographic techniques (G/TC), (15) package inspection systems (G/IB) for the identification of explosives, weapons, drugs..., (7) models for the inspection of cabinet products (electronic circuits and others) (G/IP) and 1 item of equipment for the irradiation of samples or small parts. A report was also drawn up on a proposal for the closure of proceedings relating to the non-completion of arrangements for authorisation.

As regards authorisation for the commercialisation and rendering of technical assistance in relation to apparatus generating ionising radiations by companies that, in view of their activities, do not need radioactive facilities, the CSN has issued 24 reports during 2016.

4.7. Transport of nuclear and radioactive materials

In Spain the transport of radioactive material is regulated by a series of regulations on the transport of hazardous goods by road, rail, air and sea that refer to international legal agreements based on the Regulation for the Safe Transport of Radioactive Materials of the International Atomic Energy Agency. Safety in transport rests fundamentally on the safety of the packaging.

The licensing activities performed in this field include: the approvals for transport package designs and authorisations for transport required by the regulation on the transport of hazardous materials, authorisations for physical protection and registration of entities undertaking transport operations that require physical protection measures and authorisations for the transfer of radioactive waste.

Throughout 2016, the CSN reported on eight proceedings relating to the licensing of transport activities:

- Two reports approving the design of packages of Spanish origin.
- One report on authorisations under special conditions for the transport of disused cobalt therapy headers to the Enresa radioactive waste disposal facility at El Cabril (Córdoba).
- Two reports on specific authorisations for the physical protection of category III[3] solid nuclear material waste transport operations to the United States.
- Two reports on authorisation for the registration of entities performing transport operations requiring physical protection measures.
- One report on generic authorisation for the physical protection of category III solid nuclear material waste transport operations.

3 See articles 2.12; 4 and appendix I of Royal Decree 1308/2011, of September 26th on the physical protection of nuclear facilities and materials and radioactive sources.

Throughout 2016, 69 inspections specifically related to transport were performed: 20 by the CSN and 49 by the services undertaking autonomous community function assignments. In addition to these specific inspections on transport activities, the requirements applicable to the transport of radioactive material have been controlled within the framework of the inspections carried out at radioactive facilities including transport among their activities.

Control by inspection is completed with the reception and analysis of the notifications required by the CSN for the transport of fissile materials, high-level radioactive sources and waste, as well as of the subsequent performance reports.

During 2016 a total 60 dispatches of fissile material were carried out.

Special mention may be made of the transport by Enresa of radioactive waste to its El Cabril facility, with a total 157 dispatches of wastes from nuclear facilities (121) and radioactive installations (36).

In 2016 there were ten events during the transport of radioactive material, all affecting Exempted or type A packages. Seven of these were classified as level 0 (off scale, of no safety significance), in accordance with the IAEA's International Nuclear and Radiological Events Scale (INES), and the other three as level 1 (Anomaly). The events in question were as follows:

- Two road accidents, without damage to the load.
- Two events during loading and unloading activities at airports, without radiological consequences.
- Two radioactive package robberies: one Exempted package that had contained radioactive material and one type A package containing soil density measuring equipment, which has not yet been found classified as level 1 on the INES Scale).
- Two inner vial breakage events in the package preparation process, detected on reception at the health centres.

  None of these had any radiological consequences. In view of its repetitive nature, the last of these was classified as INES level 1.
- Two similar events entailing the incorrect preparation of packages transporting disused medical application seeds of I-125 to the same supplier. In view of its repetitive nature, the last of these was classified as INES level 1.

The number of dosimetrically controlled professionally exposed workers carrying out their activities in the field of transport amounted to 166, a slight increase over 2015 (159). Of these, 85 received significant doses (above zero). If consideration is given only to significant non-administrative doses, the dosimetry readings amounted to a collective dose of 189.04 mSv/person and the average individual dose to 2.22 mSv/year, this implying a percentage of 4.44% with respect to the maximum annual dose permitted in the regulation.

4.8. Activities at facilities not regulated by the nuclear legislation

Removal of unauthorised radioactive material

During 2016 the CSN drew up reports for 34 authorisations for transfers to Enresa of various radioactive materials and sources. In 18 of these cases the requesting company or entity did not have any radioactive facility, the remainder of the requesters being the licensees of installations. Five of the 34 reports were drawn up by the functional assignment organisation of Catalonia, one by the Basque Country and one by the Balearic Islands.

Removal of radioactive material detected in metallic materials

As of December 2016, the number of metallic materials treatment and management companies adhering to the *Protocol for collaboration in the radiological surveillance of metallic materials* amounted to 167.

As a result of application of the protocol, 62 cases of detection of radioactivity in metallic materials were communicated to the CSN during the year. The radioactive materials detected were: sources, indicators with radioluminescent paint, ion smoke detectors, radioactive lightning rods, pieces of uranium, products containing radium and thorium and artificially or naturally contaminated parts. These materials were transferred to Enresa for management as radioactive waste, or are awaiting the completion of their characterisation for the performance of such transfer.

The total number of detections reported to the CSN since 1998 amounts to 1,754.

Facilities affected by radioactive source smelting incidents

During 2016 there have been no incidents involving the smelting of radioactive sources.

5. Radiological protection of professionally exposed workers, members of the public and the environment

5.1. Radiological protection of the workers

Control of the radiation doses received by professionally exposed workers was accomplished mainly through individual monitoring by way of passive physical dosimeters There are, however, cases in which, if the radiological risk is sufficiently low, the doses are determined from the results of the radiological surveillance of the areas in which the workers perform their professional activity.

In Spain the dosimetry of workers exposed to ionising radiations is governed by the Regulation on the Protection of Health against Ionising Radiations, which establishes that individual contains the dosimetry must be carried out by personnel dosimetry services expressly authorised by the CSN.

The number of dosimetrically controlled workers who recharged their dosimeters adequately amounted to 110,159[4], with a collective dose of 16,796 mSv·person.

If consideration is given only to workers with significant doses and cases of the annual dose limit being exceeded are excluded, the average individual dose in this group of workers stood at 0.72 mSv/year.

An especially significant fact that is worthy of mention is that, although the maximum regulatory value for effective dose in any official year is 50 mSv:

- 78.77% of the dosimetrically controlled workers (86,770) did not receive any dose.
- 96.17% of the dosimetrically controlled workers (105,944) received doses lower than 1 mSv/year.
- 99.77% of the dosimetrically controlled workers (109,903) received doses lower than 6 mSv/year.
- 99.99% of the dosimetrically controlled workers (110,148) received doses lower than 20 mSv/year.

This distribution highlights the trend shown by the Spanish nuclear and radioactive facilities as regards compliance with the dose limit (100 mSv over five years) established in the Regulation on the Protection of Health against Ionising Radiations.

During 2016 there were four cases of the annual dose limit established in the legislation potentially being exceeded, all at radioactive facilities. A process of investigation has been initiated.

As of closure of 2016, the National Dosimetry Bank contained 23,296,980 dosimetry records corresponding 357,724 workers and 73.91 installations. Each of these records contains the information required to identify the worker and the facility, the occupational area in which the worker carries out his activity and the type of work performed by him.

Table 5.1.1 summarises the dosimetric information (number of workers, collective dose and average individual dose) for each of the occupational areas considered in this report. For their part, figures 5.1.1 and 5.1.2 show the values for collective dose and average individual dose in these sectors.

4 As the dosimetry data have been taken from the National Dosimetry Bank, the overall number of professionally exposed workers in the country does not coincide with the sum of the workers in each of the sectors reported on, since there are workers that render their services in different sectors throughout the year.

Table 5.1.1. Doses received by the workers in each of the sectors considered in the Annual Report

Facilities	Number of workers	Collective doses (mSv·person)	Average individual dose (mSv/year)
Nuclear power plants	9,071	2,840	0.93
Fuel cycle and waste disposal facilities and research centres (Ciemat)	1,154	61	0.49
Radioactive facilities			
Medical	87,396	10,909	0.64
Industrial	7,183	1,606	0.86
Research	5,842	460	0.42
Facilities in the dismantling and decommissioning phase	323	731	2.90
Transport	166	189	2.22

Figure 5.1.1. Collective dose and number of professionally exposed workers by sectors. 2016

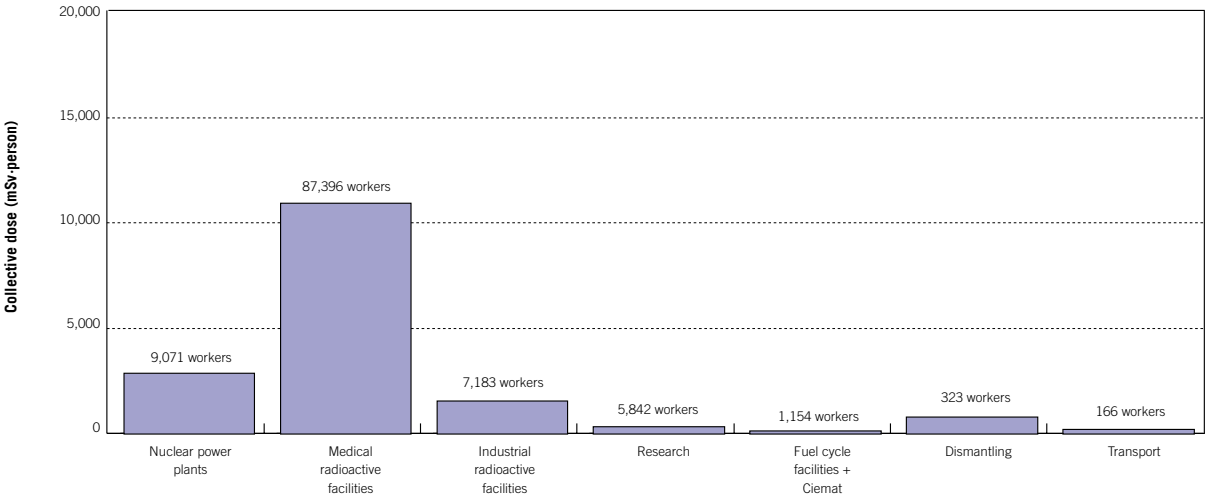
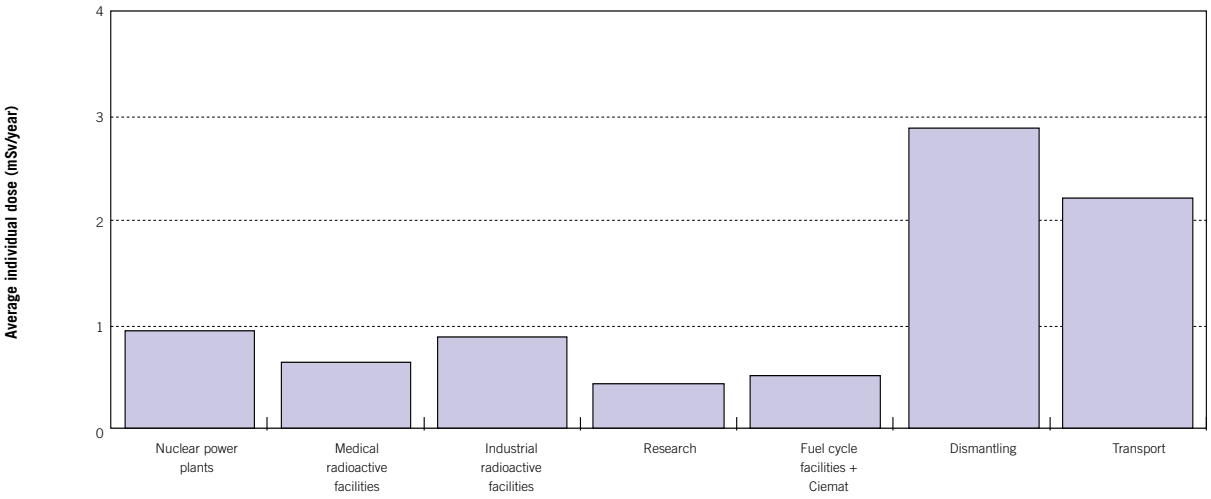


Figure 5.1.2. Average individual dose by sectors. 2016



Analysis of the aforementioned data underlines the following:

- The medical radioactive facilities are those showing the highest collective dose (10,909 mSv·person), this being quite logical when it is remembered that these installations have the highest number of professionally exposed workers (87,396).

- The facilities in the dismantling and decommissioning phase are the ones that register the highest average individual dose (2.90 mSv/year), with the transport activities a close second.

As regards doses in the vicinity of the operating plants, it should be pointed out that the number of dosimetrically controlled workers was 9,071, with a collective dose of 2,840 mSv·person and an average individual dose of 0.93 mSv/year. For the in-house personnel (2,094 workers) the collective dose was 222 mSv·person and the average individual dose 0.53 mSv/year, while for the contracted personnel (7,035 workers) the collective dose was 2,618 mSv·person and the average individual dose 1 mSv/year[5].

As regards internal dosimetry, controls were carried out through direct measurement of whole body radioactivity in all workers faced by a significant risk of radionuclide incorporation, and in no case were values higher than the established recording level detected (1 mSv/year).

Table 5.1.2 indicates the operational collective doses of those nuclear power plants that had a refuelling outage in 2016. It may be seen that in 2016 there was a reduction of the operational collective dose compared to the average figure for this parameter for the period 2006-2015.

Figures 5.1.3 and 5.1.4 show the evolution over time of the three-year collective dose per reactor type for the Spanish nuclear power plants,

5 The data are taken from the National Data Bank and certain contracted workers perform their work at more than one nuclear power plant. As a result, the total number of workers does not coincide with the sum of the workers at each plant.

compared to the values registered at international level.

In order to evaluate the results, the following should be taken into account:

- Pressurised water reactors (PWR):

  During the three-year period 2014-2016 the three-year average collective dose per reactor at the Spanish nuclear power plants is observed to be stable. In 2016 there were five refuelling outages at the Almaraz I, Almaraz II, Ascó II, Vandellós II and Trillo nuclear power plants.

  The situation as regards occupational doses at the Spanish nuclear power plants of this reactor type continues to reflect lower values than the latest data available for the European plants of the same type (three-year period 2013- 2015) and for the US plants (three-year period 2012-2014).

Table 5.1.2. Operational collective dose per refuelling outage in 2016

Nuclear power plants	Collective dose (mSv.p)[1]	Collective dose (mSv.p)[2]	Average individual dose %[3]
Almaraz I	496.16	407.121	82
Almaraz II	536.59	385.849	72
Ascó	647.82	499.388	77
Trillo	362.55	249.736	69
Vandellós	818.95	784.890	96

(1) Mean collective dose during refuelling outages over the period 2006-2015.
(2) Operational collective dose during the 2016 refuelling outage.
(3) The value represents the percentage of the operational collective dose for the 2016 refuelling outage compared to the average operational collective dose over the period 2006-2015.

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

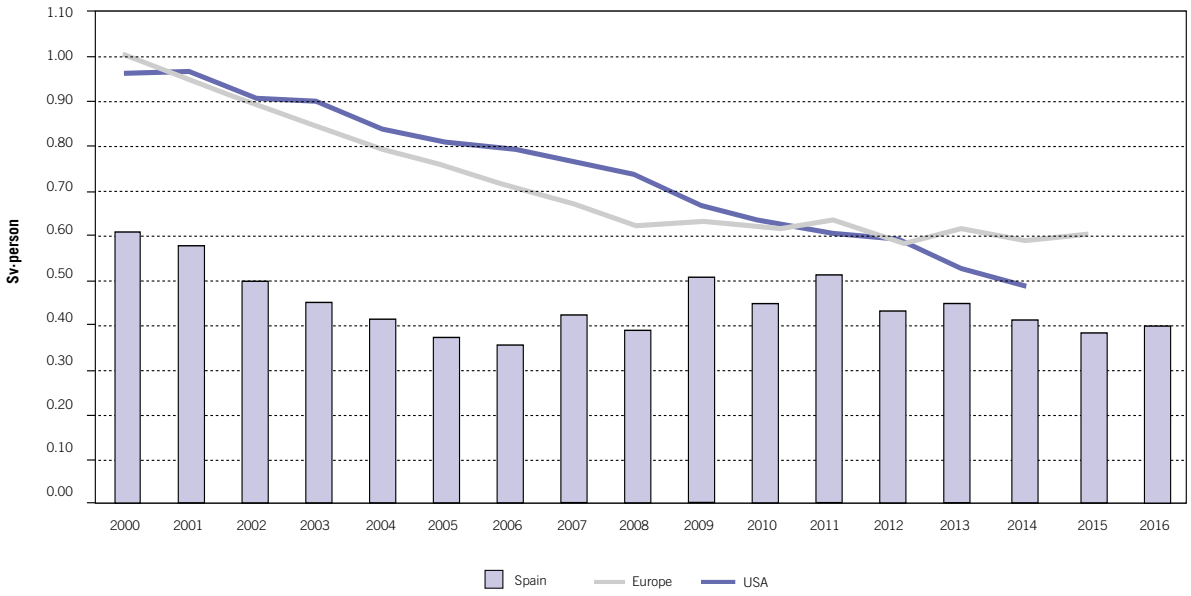
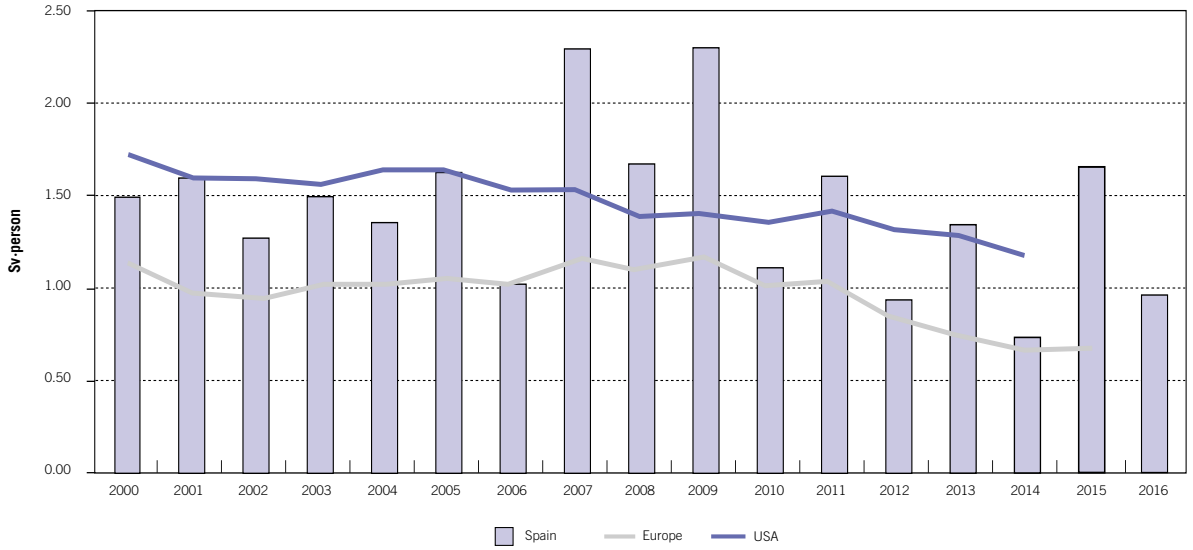


Figure 5.1.4. Average three-year collective dose per reactor for BWR reactors. International comparison



- Boiling water reactors (BWR):

  The value of the average three-year collective dose for BWR reactors during the period 2014-2016 is lower than during the previous three-year period since during the said period there was a single refuelling outage at Cofrentes, while during the period ending in 2015 there were two. There was no outage at the Cofrentes plant in 2016.

  The average three-year collective dose at the Spanish BWR plants during the period 2014-2016 was lower than the latest data available for the average three-year figure at the US plants (three-year period 2012-2014). As regards the European nuclear power plants for the period 2013-2015, the doses are higher in Spain since the only existing plant of this type in operation underwent two refuelling outages.

5.2. Control of releases and environmental radiological surveillance

Control of effluents

The Regulation on the Protection of Health against Ionising Radiations (PHIR) requires that those facilities that might give rise to radioactive waste be equipped with adequate treatment and disposal systems, in order to guarantee that any doses due to releases be lower than the limits established in the administrative authorisations and be kept as low as possible.

At the nuclear power plants, the CSN requires a programme for the control of radioactive effluents and to keep public doses due to these effluents as low as possible, an in all cases below the values of the Regulation on PHIR.

The Radioactive Effluents Control Programme (Procer) is defined in the technical specifications and developed in detail in the Off-Site Dose Calculation Manual (ODCM), which includes the requirements for the control and monitoring of effluents and for environmental radiological surveillance.

The other facilities have similar programmes in place, these being included in different documents depending on the facility.

Radiological surveillance in the vicinity of the facilities[6]

In 2015, 6,248 samples were taken around the operating nuclear power plants within the framework of the environmental radiological surveillance programmes, plus 1,905 at the fuel cycle facilities and 1,929 at facilities in the dismantling and decommissioning phase, including Ciemat, the José Cabrera and Vandellós I nuclear power plants, the Andújar uranium mill and the now decommissioned Lobo-G plant, as indicated in tables 5.2.1 and 5.2.2.

Table 5.2.1. Environmental radiological surveillance programmes: number of samples taken by operating nuclear power plants in 2015

Type of smples	Garoña	Almaraz	Ascó	Cofrentes	Vandellós II	Trillo
Total atmosphere	466	785	847	774	828	780
Total water	195	212	127	142	90	149
Total foodstuffs	111	293	122	103	106	118
Total	772	1,290	1,096	1,019	1,024	1,047

Table 5.2.2. Environmental radiological surveillance programmes: number of samples taken at fuel cycle facilities and facilities in the dismantling and decommissioning phases 2015

Facility	Juzbado	Cabril	Ciemat	Quercus/Elefante	José Cabrera	Vandellós I	AUM	LoboG
No of samples	601	672	729	632	768	334	55	43

The results obtained from these programmes are similar to those of previous years and make it possible to conclude that the quality of the environment around the facilities remains in acceptable conditions from the radiological point of view, without any risk for persons as a result of their operation or the dismantling and/or decommissioning activities performed.

Radiological surveillance of the national territory

The CSN also controlled environmental radiological quality throughout the national territory by means of the following:

Sampling Stations Network (SSN)

The programmes for the surveillance of continental and coastal waters, the atmosphere and the terrestrial medium are undertaken with the participation of a total 21 laboratories that analyse samples of river and coastal waters, air, soil, drinking water and foodstuffs. This network operates in two modes: the so-called dense network, which analyses a large number of samples at numerous places throughout the territory, and the spaced network, which deals with few samples but with a high level of precision.

Overall assessment of the results shows that the values are in keeping with the radioactive background levels and that, in general, they remain relatively stable throughout the different

6 This report presents the results of the environmental radiological surveillance programmes (ERSP) for the year 2015. This is due to the fact that the processing and analysis of the samples does not allow for the availability of the results of the 206 campaign for their inclusion in the said report.

periods, with slight variations between the different points, attributable to the radiological characteristics of the different areas.

Automatic Stations Network (ASN)

Made up of the CSN network with 25 stations distributed throughout the national territory and of the networks of communities of Catalonia, Valencia, Extremadura and the Basque Country. The objective is the continuous measurement of gamma dose rate, radon concentration, radioiodines and alpha and beta emitters in the air.

During 2016 the specific agreements for connection between the CSN network and the automatic radiological surveillance networks of the aforementioned autonomous communities continued satisfactorily. The results of the measurements undertaken were characteristic of the environmental radiological background and indicate the absence of any radiological risk for the population and the environment. There was also compliance with the data exchange commitments deriving from the agreement with the Portuguese Directorate General for the Environment (DGA) and from the CSN participation in the European Union's Eurdep (European Union Radiological Data Exchange Platform) project.

In 2015 the Plenary of the CSN approved the proposal for the functional design of the new network of automatic stations integrated in the Environmental Radiological Surveillance Network (Revira), the performance project of which will cover the period 2016-2018.

The future network that will replace the current one will have the following characteristics:

- It will be a network designed essentially for the management of emergencies, although it might also be used in other situations.
- It will be made up of 200 stations that will make it possible to detect increases in the radiological background as a result of radiological incidents.
- In the event of an emergency, it will be possible to extend the network to 215 stations (15 portable stations), making it possible to assess the radiological consequences of the accident and helping in decision-making.
- It will be operative in the event of major emergencies.

Maintenance will be simpler and more economical, as it will be based on robust sensors operating without the need for consumables.

Intercomparison campaigns

The CSN carries out an annual programme of analytical intercomparison exercises with technical support from the Ciemat, in which some 30 laboratories participate performing low activity measurements, the objective being to guarantee the quality of the results obtained from the environmental radiological surveillance programmes. These campaigns are a means of proven effectiveness to improve the reliability of the results obtained in these programmes. The year 2016 saw the completion of the campaign initiated in 2015, in which the study matrix distributed to the participants corresponded to two types of water: for human consumption and marine, with natural and anthropogenic radionuclides prepared at the *Quality Control Materials Preparation Laboratory* (Mat Control) in collaboration with the Environmental Radiology Laboratory of the Analytical Chemistry department of the University of Barcelona. Forty-four laboratories participated.

The twenty-third session on environmental radiological surveillance was held at the CSN head quarters in November 2016. During this session it

was concluded generally that the participating laboratories were capable of performing determinations of natural and artificial radionuclides in samples of water with low concentrations of activity with a satisfactory level of quality.

In 2016 a new campaign was initiated in which the study matrix distributed to the participants was a calcareous soil with natural and artificial radionuclides prepared at the *Quality Control Materials Preparation Laboratory* (Mat Control) in collaboration with the Environmental Radiology Laboratory of the Analytical Chemistry department of the University of Barcelona. Thirty-nine laboratories participated.

5.3. Protection against natural radiation sources

Title VII of the *Regulation on the Protection of Health* against Ionising Radiations (RPHIR), approved by Royal Decree 783/2001, of July 6th, regulates occupational activities involving natural radiation sources. This title of the RPHIR was complemented by Council Instruction IS- 33, on radiological criteria for protection against exposure to natural radiation, issued in 2012.

Directive 2013/59/Euratom, which is in the phase of being transposed to our national legislation, requires the revision and extension of the current regulatory framework for the control of exposures to natural radiation. In this context, a proposal has been drawn up to include in the RPHIR the new European provisions relating to the control of NORM (Naturally Occurring Radioactive Materials) industries and protection against radon for both the workers and the general population.

Furthermore, in order to facilitate and drive compliance with title VII of Royal Decree 783/2001, and to address the transposition of Directive 2013/59 as regards natural radiation with greater guarantees of success and effectiveness, the CSN has launched a series of initiatives throughout 2016. Thus, on March 22nd 2016 a letter was sent to the authorities competent for industrial matters of the autonomous communities on the application of title VII of the RPHIR. This letter requested the autonomous communities to send the CSN a list identifying the companies in their territories to which title VII of the RPHIR was applicable.

As regards the National Plan for Action against Radon, the CSN has continued to carry out a series of tasks that constitute the technical basis for the future National Plan. The most relevant of these has been the completion of a new radon map covering the entire national territory and integrating the more than 12,000 measurements of radon in homes financed by the CSN, the Marna natural gamma radiation map and the IGME lithostratigraphic map. This map will be published during the first quarter of 2017 and will be available to the public via the website. This map has served to identify those areas that, in view of their radon levels being significantly higher than those of the rest of Spain, are considered to be priority action areas. Additionally, a tool has been developed that makes it possible to establish, by municipal area, the percentages of the population or urban fabric that coincide with these areas. Collaboration continues also with the Ministry of Public Works in order to establish in the Technical Building Code a system for gradual protection against radon in rehabilitated and newly constructed buildings.

6. Tracking and control of irradiated fuel and radioactive waste management

6.1. Irradiated fuel and high level radioactive waste

The spent nuclear fuel generated in Spain (with the exception of that generated during the operation of the Vandellós I nuclear power plant and at Santa María de Garoña up until 1982), is currently being stored in the fuel storage pools associated with the nuclear reactors and in dry storage casks located at the individualised temporary storage (ITS) facilities on the sites of the Trillo, José Cabrera and Ascó plants.

In addition to the waste from the reprocessing in France of fuel from the Vandellós I plant, the category of high level waste includes nuclear power plant operating and dismantling wastes that, in view of their activity, do not fulfil the criteria de disposal at the El Cabril definitive disposal facility, which are grouped under the heading "special wastes".

Throughout 2016 the CSN performed the assessments associated with approval of new cask designs or modifications, in particular those relating to the ENSA-DPT dual purpose cask for spent fuel from Trillo nuclear power plant, as well as the assessments associated with the licensing of the ITS facilities planned for the sites of the Santa María de Garoña and Almaraz plants.

Inventory of irradiated fuel and high-level radioactive waste stored at the nuclear power plants

The total number of fuel assemblies stored at the plants as of December 31st 2016 amounted to 15,082, of which 8,345 assemblies were from pressurised water (PWR) plants and 6,737 from boiling water (BWR) plants; of this total number, 13,681 fuel assemblies are stored in the pools associated with the reactors and 1,401 are in the dry storage casks kept at the ITS facilities at the following sites: Trillo (672 assemblies in 32 ENSA-DPT casks), José Cabrera (377 assemblies in 12 HI-STORMZ casks) and Ascó (352 assemblies in 11 HI-STORM casks).

Table 6.1.1 shows the inventory of spent fuel in storage as of December 31st 2016 in the spent fuel pools of the nuclear power plants and, where appropriate, at the existing ITS facilities. Indicated for each plant is the total capacity and effective capacity (total capacity minus the reserve for a complete core), the occupied capacity (in terms of the number of fuel assemblies stored), the degree of saturation with respect to effective capacity, and the saturation dates foreseen for the pools with current operating cycles.

In 2016 the CSN performed four inspections of the ISC Basic Inspection Plan (BIP) for the control of spent fuel and high level or special waste management, three at the Vandellós II, Trillo and Ascó nuclear power plants and one at the José Cabrera ITS facility.

6.2. Low and intermediate level radioactive waste

Nuclear power plants

In 2016 the operating nuclear power plants generated 2,859 packages of solid low and intermediate level and very low level radioactive waste, with an estimated activity of 29,006 GBq, conditioned in drums and metallic containers. Table 6.2.1 shows a breakdown of waste package generation by facility and of those transferred to El Cabril in 2016.

Figure 6.2.1 shows the percentage by facility of the total generation of radioactive waste packages by the operating nuclear power plants in 2016.

Figure 6.2.2 shows the percentage distribution by facility of the activity content of the wastes generated in 2016.

Table 6.1.1. Inventory of irradiated fuel and situation of the Spanish nuclear power plant storage facilities at the end of 2016

Nuclear power plant	Total capacity	Core reserve	Effective capacity	Occupied capacity	Free capacity	Degree of occupation	Year of saturation
	In number of irradiated fuel assemblies					%	
José Cabrera ITS	377	NA	NA	377	–	100%	NA(1)
Santa María de Garoña (p)	2,609	NA(2)	NA(2)	2,505(2)	104	96.01(2)	NA(2)
Almaraz I (p)	1,804	157	1,647	1,456	191	88.40(3)	2020(4)
Almaraz II (p)	1,804	157	1,647	1,440	207	87.43(3)	2021(4)
Ascó I (p)	1,421	157	1,264	1,164	100	92.09(3)	NA(4)
Ascó II (p)	1,421	157	1,264	1,168	96	92.41(3)	NA(4)
Ascó ITS (c)	1,024	NA	1,024	352	672	34.38	
Cofrentes (p)	5,404	624	4,780	4,232	548	88.54(3)	2019(4)
Vandellós II (p)	1,594	157	1,437	1,212	225	84.34(3)	2021(4)
Trillo (p)	805	177	628	504	124	80.25	NA(4)
Trillo ITS (c)	1,680	NA	1,680	672	1,008	40.00	
Total (p)	16,862		12,667	13,681	1,595	88.68	
Total ITS (c)	3,081		3,081	1,401	1,680	37.19	

(p) Pool (c) Casks

Reading of the table

– *Total capacity*, or total number of positions in the pool.

– *Core reserve*, or positions in the pool reserved for the fuel assemblies of a complete reactor core loading if necessary.

– *Effective capacity*, or useful storage capacity of the pools (equal to the total capacity minus the stand-by positions for a complete core).

– *Occupied capacity*, corresponding to the number of irradiated fuel assemblies stored in the pool as of December 31st.

– *Free capacity and degree of occupation*, as of the date indicated, in both cases referring to the effective capacity, maintaining the reserve capacity of the core (condition for plant operation).

– *Date of saturation* (estimated considering current operating cycles): this refers to the last possible refuelling in which the effective capacity of the pool would be completed, with the plant able to operate to the end of the cycle, maintaining the reserve for the core.

(1) All the spent fuel stored in the pool at José Cabrera (377 assemblies) is in 12 HI-STORM casks located in the individualised temporary storage (ITS) facility, which as a capacity for 16 casks, 12 containing spent fuel and four with special wastes. The complete capacity (100%) foreseen for this purpose has been covered

(2) The pool of the Santa María de Garoña nuclear power plant, with the unloading of the complete core in December 2012, has a degree of occupation of 96.01%, with 104 positions currently free.

(3) The degree of occupation of the pools at the Almaraz, Ascó, Cofrentes and Vandellós II plants refers only to the positions occupied by fuel assemblies, with no consideration given to positions occupied by other materials and positions that cannot be used, where appropriate, as a result of which the actual occupation is higher than that indicated.

(4) The pool saturation dates refer to the last possible refuelling in which the effective capacity of the pool would be completed, with the plant able to operate to the end of the cycle. Saturation of the pool has not been considered in the case of the Ascó and Trillo plants, since they both have an ITS facility.

Table 6.2.1. Radioactive waste packages generated at the operating nuclear power plants and transferred to El Cabril in 2016

Facility	Packages generated	Packages transferred to El Cabril
Santa María de Garoña	304	92
Almaraz I and II	644	150
Ascó I and II	549	289
Cofrentes	929	327
Vandellós II	246	175
Trillo	187	142
Totals	2,859	1,175

Figure 6.2.1. Distribution of the 2,859 conditioned radioactive waste packages at the operating nuclear power plants in 2016

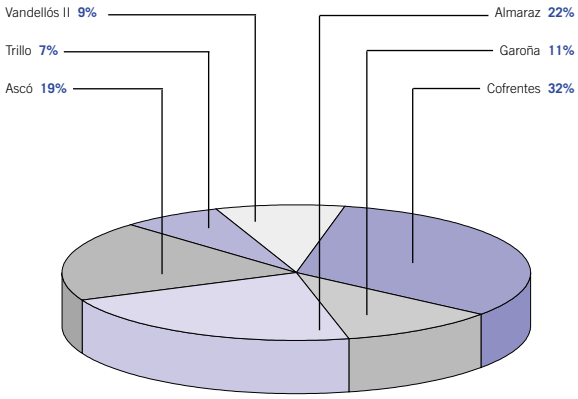
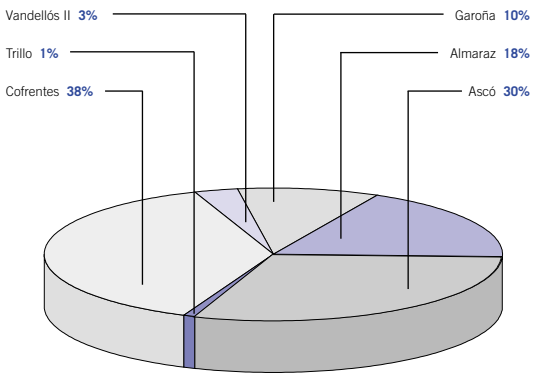


Figure 6.2.2. Distribution of the activity (29,006 GBq) contained in the radioactive waste packages generated during 2016 at the operating nuclear power plants



6.3. Very low level waste

Nuclear facility waste

Very low level wastes are produced at all nuclear facilities and their final management is carried out at a specific installation for their definitive disposal at the El Cabril centre. The management of these wastes at the nuclear facilities is analogous to that of low and intermediate level wastes, although their conditioning is required to fulfil different acceptance criteria. In 2016 a total 2,859 waste packages were dispatched to El Cabril.

Wastes generated in uranium mine restoration activities

Quercus Plant Wastes

Processing wastes

At the static leaching bed of the Quercus plant, some 1,107,896t of depleted ore were accumulated with a granulometry of less than 15 mm. In addition, some 941,338t of neutralisation sludges were accumulated in the tailings dyke of this plant.

Water treatment wastes

Wastes are currently generated as a result of the treatment of acid, non-releasable waters generated on the site due to rainwater runoff and seepage. The treatment and conditioning of effluents continued in 2016. Operation of the treatment and releases section was accomplished without events; the releases of effluents were interrupted on November 30th 2016 as planned.

In 2016, 294,716 m^3 of water were released. During this process a total 4,998 t of waste were generated in the form of precipitate cake, these being deposited at the crown of the static leaching bed. The total waste of this type accumulated as of the end of 2016 amounted to 53,678 t.

Both the processing wastes and those arising as a result of water treatment are pending definitive disposal, an issue contemplated in the new dismantling project for the Quercus Plant.

6.4. Declassified wastes

The Spanish nuclear facilities have authorisations for the declassification of waste materials with low radioactivity contents, allowing them to undertake the management of such materials by conventional routes, these being understood as being those not subject to radiological regulatory control, without prejudice to the legal framework applicable to them in view of their specific characteristics and nature.

No new declassification authorisation was issued by the competent authority in 2016.

6.5. Disused consumer products

Radioactive lightning rods

The Resolution of the Directorate General for Energy of June 7th 1993 authorised Enresa to undertake the management of these headers. The lightning rods removed are sent to Ciemat where the radioactive sources are removed and subsequently sent to the United Kingdom.

During 2016, 20 lightning rods were removed, the total number collected now amounting to 22,821. No sources of americium-241 have been sent to the United Kingdom this year. The total number of sources now sent to this country stands at 59,796.

7. Nuclear and radiological emergencies. Physical protection

7.1. Nuclear Safety Council capacities and actions in response to emergencies

7.1.1. Emergency room

The CSN has an Emergency Response Organisation (ERO) that guarantees the manning of the emergency room (Salem), 24 hours a day, 365 days a year, with an emergency stand-by team of 12 technicians who would clock in at the Salem in less than one hour from activation.

In 2016, two new emergency stand-by groups were set up, pursuant to the CSN's Emergency Action Plan (EAP), one as part of the coordination group and the other as part of the information and communication group in charge of public information. Likewise, the development of a system of command (SICME) has begun with a view to improving the tracking of real and simulated emergency situations at nuclear power plants.

7.1.2. National and international exercises and drills

During 2016, the CSN participated in five IAEA exercises: ConvEx-2a (February 17th), in which the scenario set up was a steam generator tube rupture at Almaraz I nuclear power plant, ConvEx-1a (March 23rd), ConvEx-1c (April 6th), ConvEx-2b (June 21st and 22nd), the scenario in the latter case being the request for and offer of assistance in response to a general emergency at a PWR plant, and ConvEx-1b (September 20th). The EMERCON formats suitable for each type of request and emergency were completed at the Salem and sent to the IAEA's Incident and Emergency Centre (IEC), and information was transmitted to the Directorate General for Civil Defence and Emergencies (DGPC y E).

The European Commission has an Ecurie (*European Community Urgent Radiological In- formation Exchange*) system for the prompt exchange of notifications and information in the event of situations of radiological emergency in the European Union countries, which has carried out three communications tests with the Salem to check on its availability as a national contact point for the said system.

For 2016 the OECD Nuclear Energy Agency (NEA) proposed the performance of the INEX-5 bureau exercise in Spain, the national organiser being the Nuclear Safety Council. The purpose of this exercise is to address notification, communication and interfaces between the organisations participating in the emergency response of each country. This was carried out at the Organisation's headquarters in June and included the participation of representatives of different organisations and institutions: Delegation of the Regional Government of Valencia, the Directorate General for Civil Defence and Emergencies (DGPC y E), the Military Emergency Response Unit (MEU), Cofrentes nuclear power plant, the Civil Guard, and a municipal representative from zone I of the Nuclear Emergency Plan of Valencia (PENVA), as well as stakeholder groups and a representative from Portugal. The exercise began with a simulated radiological event at Cofrentes nuclear power plant that subsequently developed into an event with radiological consequences off site, aggravated by a catastrophic natural event.

At national level, the Radiological Group performed different exercises within the framework of the five nuclear emergency off-site plans, in activities related fundamentally to radiological access controls (AC) and classification and decontamination stations (CDS), in

compliance with the annual programme mapped out. In total ten Radiological Group exercises were carried out: one AC exercise and one CDS exercise in each of the five provincial nuclear emergency off-site plans: PENBU, PENCA, PENGUA, PENTA and PENVA.

The scheduled nuclear facility SEP emergency drills were performed; in all cases the CSN's ERO was activated to respond to the scenario of each drill.

7.1.3. Tracking of incidents

During 2016 there was no incident that gave rise to the activation of the CSN Emergency Response Organisation.

Various notifications were received at the Salem relating to accidental irradiations of technicians or workers, the contamination of facilities, the failure, deterioration or theft of equipment containing radioactive sources and incidents occurring during the transport of radioactive packages. Notifications were also received in relation to the detection of high levels of radiation in containers at sea ports where the protocol is in place for action in response to the detection of inadvertent movement or illicit trafficking of radioactive material at ports of general interest. In no case were there any significant radiological consequences.

Finally, it should be stressed that the CSN Salem has continued to manage information received from the IAEA in relation to the accident at the Fukushima Dai-ichi nuclear power plants (Japan).

7.2. Nuclear Safety Council Participation in the National Emergencies System

The document "CSN Participation in the National Civil Defence System" includes the organisation's list of services relating to its collaboration in preparations for, the planning of and response to nuclear and radiological emergencies.

The activities that the CSN performs within this framework may be grouped into activities for coordination with the Directorate General for Civil Defence and Emergencies o the Ministry of the Interior (DGPCE), collaboration with the Military Emergency Response Unit (MEU) and the State security forces, coordination with the autonomous communities, basically in relation to radiological emergencies and preparedness and planning for nuclear power plant off-site emergencies, and collaboration with the respective managements of these plans, as well as collaboration with public bodies participating in the national emergencies system.

7.3. Facility site emergency plans

During 2016 the CSN has participated in and supervised the performance of the nine site emergency plan (SEP) drills performed at nuclear facilities.

In the case of the nuclear power plants, the Operational Control Centre (CECOP) of the corresponding provincial office of the Government was activated, in addition to the Salem, which in all cases monitored the licensee's drills.

Furthermore, the site emergency plans of the Juzbado fuel assembly manufacturing facility and all the nuclear power plants were revised in 2016. In the case of Juzbado, this was part of the periodic safety review, while at the nuclear power plants it was aimed at implementing improvements deriving from the stress tests and at incorporating the on-site participation of the Military Emergency Response Unit in emergencies of extreme seriousness, as well as the operational start-up of the Alternative Emergency Management Centres (CAGE) constructed at the different sites.

7.4. International collaboration in emergencies

During 2016 the Council has continued to collaborate in coordination with the competent international authorities, pursuant to article 7 of the IAEA Convention on Prompt Notification (Group of Competent Authorities of the Convention on Prompt Notification and Assistance). In this respect, the CSN participated in the technical meeting on the exchange of information in the event of radiological or nuclear incidents or emergencies, with a view to improving the IAEA manual on the official communication of incidents and emergencies, held in Vienna, and in the two-yearly meeting of representatives of the Competent Authorities of the Convention on Prompt Notification and mutual Assistance in the event of a nuclear accident or radiological emergency, which took place in June at the IAEA headquarters (Vienna).

As regards collaboration this year between the CSN and the ASN (French nuclear safety authority), the protocol for communications and information exchange between the two bodies in the event of an emergency has been tested in a number of drills.

The CSN invited a representative of the Portuguese Environmental Agency to participate as a general observer and to intervene in the coordination of bilateral communications during the INEX-5 exercise, held at CSN headquarters in June.

Throughout 2016 the CSN has actively participated in the working groups associated with the management of nuclear emergencies and belonging to different international organisations (IAEA, OECD-NEA) and international regulators associations (ENSREG, WENRA, HERCA).

7.5. Physical protection of nuclear materials and facilities and of radioactive sources and transport operations

Nuclear Safety Council Instruction IS-41 was published in the Official State Gazette on July 26th 2016, approving requirements for the physical protection of radioactive sources in compliance with what was set out in the Transitory Provision of Royal Decree 1308/2011, of September 21st on the *physical protection of nuclear materials and facilities, transport operations and radioactive sources*. The objective and scope of application of this IS-41 is to describe the general and specific requirements to be met by the systems for the physical protection of category 1, 2 and 3 radioactive sources in order to achieve the protection objectives set out in the aforementioned Royal Decree.

The CSN has collaborated with the Nuclear Facility Protection Units (UPRIN), belonging to the Reserve and Security Group of the Civil Guard, in drawing up a Protocol for Coordination between these Units and the nuclear power plants.

In 2016 the basic inspection programme (BIP) was applied within the strategic area of security of the SISC, a total number of five inspections being carried out at the Trillo, Ascó, Almaraz, Vandellós and Cofrentes nuclear power plants. Outside the BIP, the security area performed a supplementary inspection at Ascó nuclear power plant. An inspection was also performed at Santa María de Garoña nuclear power plant within the framework of the specific integrated supervision programme established for this facility.

Inspections were performed with respect to the security systems of the following three nuclear facilities: the Enusa fuel assembly manufacturing facility at Juzbado (Salamanca), the El Cabril low and intermediate level waste disposal facility (Córdoba) and the individualised temporary

storage (ITS) facility at José Cabrera nuclear power plant (Guadalajara).

Finally, the CSN the CSN performed an inspection of the physical protection of nuclear material transport operations carried out by the company Express Truck SA.

The CSN organised the *Second International Security Regulators Conference* in Madrid, in cooperation with the USNRC, with the aim of providing the exchange of information and discussions between the competent authorities on current problems and good practices relating to the supervision and control of systems for the physical protection of facilities, cybernetic security, the protection of classified information, the transport of nuclear materials and radioactive sources, etc.

Nuclear Safety Council Report to the Parliament

Summary of 2016

CSN CONSEJO DE SEGURIDAD NUCLEAR