Country Profile Template

Contracting Party: SPAIN

Section 1: Summary document detailing

- Relevant national authorities and responsibilities:
  The Ministry for the Ecological Transition and the Demographic Challenge (MITECO) is responsible for granting the necessary licenses at the different life stages of the Spanish nuclear and radioactive facilities, after reception of the report of the Nuclear Safety Council. This report is mandatory in all cases and, furthermore, binding when it is negative and, likewise, binding regarding the conditions established, if it is positive.

  The environmental radioactivity monitoring programmes and the discharge radioactivity monitoring programmes are included within the official exploitation documents of the facilities. The approval of any updates to these programmes is carried out in accordance with the conditions established in the license.

  With respect to the protection against the presence of radioactivity in the environment, MITECO has the following general regulatory functions:
  - The proposal and implementation of the Government's policy against climate change, prevention of pollution, protection of natural heritage, biodiversity, forests, sea, water and energy for the transition to a greener productive and social model.
  - The development of state legislation on water and coasts, climate change, protection of biodiversity, environment, mountains, meteorology and climatology.

  With respect to OSPAR Convention, MITECO, through Deputy Directorate-General for the Protection of the Sea, has the function of participating in international organizations and agreements related to the protection of the marine environment, among others, acting as the national focal point for the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) and the Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention).

  In accordance with Law 15/1980, of April 22th, the Nuclear Safety Council (CSN) is created as an independent institution from the Central State Administration, with its own assets and legal status, independent from those of the State and as the sole competent authority in matters related to nuclear safety and radiological protection.

  The CSN provides annual information to the Spanish Parliament, sending an in-depth report which covers the activities carried out throughout the year. After the modification of CSN creation Law (by Law 33/2007, of 7th November), this obligation has been expanded to the regional parliaments of those regions with

nuclear power plants within their territory. The CSN periodically gives an account of its activities to the Spanish Parliament.

- National legislation and basis for regulation:
  In Spain the basic laws governing nuclear activities are the Nuclear Energy Act (Law 25/1964, of 29th April) and the 15/1980 Law, of April 22nd, creating the Nuclear Safety Council. These laws are further developed in regulations that provide the framework for standards, guidelines and objectives in this field.

  The CSN possesses its own specific regulatory power, although its rank is subordinate to the law and regulations. Its main regulatory instrument are the Instructions (IS), which are technical standards of mandatory compliance for the affected parties and are published in the Official Gazette (BOE). These Instructions develop and complement pre-existing laws and royal decrees. In addition to the Instructions, the CSN issues Safety Guides (GS), which are technical documents of a recommendatory and non-binding nature, intended to guide licensees and professionals on current regulations.

- Application of BAT/BEP in domestic legislation:
  The best available techniques are introduced at different levels of the Spanish legislation and regulation in order to reduce the levels of discharges and the radiological impact to both humans and the environment.

  New regulation has been approved since the latest implementation round, although no major changes have been introduced on the implementation of BAT/BEP.

  Regulation on Nuclear and Radioactive Facilities and other activities relating to exposure to ionising radiation
  The Regulation on Nuclear and Radioactive Facilities and other activities relating to exposure to ionising radiation (approved by Royal Decree 1217/2024, of 3rd December) in its Article 12.2 establishes that the licensee must continuously ensure the improvement of the nuclear safety and radiation protection conditions of its facility. To this end, the Best Available Techniques (BAT) and practices must be analysed, in accordance with the requirements that the CSN establishes, and implemented when suitable.

  Regulation on health protection against the dangers arising from exposure to ionising radiation
  Title V of the Regulation on health protection against the dangers arising from exposure to ionising radiation (approved by Royal Decree 1029/2022, of 22th December) establishes requirements on the system that is set up to limit emissions and discharges, where several articles deal with the system for the limitation, surveillance and control of radioactive effluents. Article 66 specifically stipulates that those facilities generating radioactive waste must be provided with adequate systems for treatment and removal in order to ensure that doses due to the releases are lower than the limits established in the administrative licences and that they are kept at the lowest possible value.

  A specific authorisation is required for every facility, stablishing specific limits, surveillance requirements and conditions for the releases. The authorised limits

guarantee that under normal operating conditions, the doses to members of the public are in accordance with the ALARA principle that is applied in the design of the treatment systems.

According to Article 63, during operation, licensees have to demonstrate that every reasonable effort is made, from the generation of waste to the operation procedures of the effluent treatment systems, to reduce releases and to keep the radiological impact as low as technically and economically feasible.

Law on the Evaluation of the Environmental Impact

The policy and main precepts governing the protection of the environment are laid down in the Law on the evaluation of the environmental impact (approved by Law 21/2013, of 9th December). This law is applicable to a wide range of activities, including the generation of nuclear energy and by which, a "Declaration of Environmental Impact" report must be incorporated into each facility's licensing process.

The Nuclear Safety Council's Instruction IS-26

The instruction IS-26, of 16th June 2010, sets the basic nuclear safety requirements applicable to nuclear installations.

Points 3.19 to 3.21 are related with the Periodic Safety Review (PSR) programme that licensees have to perform on a ten-year basis, following the recommendations of the CSN Safety Guide 1.10. The goal of the PSR is to carry out an overall assessment of the behaviour of the installation during the considered period by means of a systematic analysis of all nuclear safety and radiological protection aspects. According to Point 3.21 the nuclear installations must carry out, within the framework of the PSR, the appropriate modifications to converge, wherever it is feasible, with the best international nuclear safety and radiological protection practices and standards in effect at the time.

Points 3.24 to 3.27 deal with Dose Limits and Restrictions. In accordance with Point 3.25 the release of radioactive effluents into the environment must comply with the established limits, aiming for them to be as low as possible by taking socioeconomic factors and the best available techniques into consideration. In addition, point 3.27 specifies that the design of nuclear installations must ensure that the radiological consequences that are reasonably foreseeable in future generations are not greater than those allowed for the current generation.

- Dose limit, constraints and discharge limit setting rationale:

  In Spain, an effective dose value of 0.3 mSv/y is used as dose constraint for nuclear power plants and other fuel cycle facilities.

  The effective dose over a period of 12 consecutive months has to take into account the contribution of the external exposure during that time along with the committed dose, over a period of 50 years, due to the ingestion and inhalation of radioactive substances occurred over that period.

  Regarding the discharge limits, an effective dose value of 0.1 mSv/y per unit in each facility applies to nuclear facilities both during operation and decommissioning. This value, applicable to liquid and gaseous effluents as a whole,

was established as an adequate percentage of a dose constraint previously defined by the CSN for the nuclear power plants and fuel cycle facilities (0.3 mSv/y), and the dose limit for the public as required in Spanish legislation (1 mSv/y).

In the nuclear power plants the discharge limit is distributed between gaseous and liquid effluents. A different apportionment is applied in each plant, based on specific site characteristics.

- Regulation, surveillance and monitoring:
  The limitation, surveillance and control of radioactive effluents system is included in the operation permits as part of the Technical Specifications, which comprise the discharge limits, the sampling and analysis programmes required to verify compliance and the requirements on the operability of both the on-line monitoring instrumentation and the effluent treatment systems. The procedural details of these Radiological Technical Specifications are developed in an official document, the Offsite Dose Calculation Manual (ODCM). According to the CSN Safety Guide 7.09, the ODCM also includes the methodology and parameters used in estimating offsite doses due to the radioactive emissions and discharges and in calculating the monitoring alarm/trip set points.

  The basic requirements for the effluents monitoring programmes are defined in the CSN Safety Guide 1.04.

- Environmental monitoring programmes:
  The environmental radiological monitoring in Spain consists of three networks:
  a) The network associated to nuclear installations.
  b) The national monitoring networks.
  c) The network made up of the so-called “specific programmes”.

  The specific programmes are those that arise as consequence of an incident, a society request, or an interest in knowing a certain radiological situation.

  Programmes around nuclear installations
  Radiological Environmental Monitoring Programmes (REMPs) in the vicinity of nuclear facilities were implemented at the beginning of the Spanish nuclear programme, and they are being developed according to the different lifecycle stages of the facilities: pre-operation, operation, dismantling and decommissioning.

  The main requirements for the nuclear power plants environmental monitoring programmes are defined in the CSN Safety Guide 4.01.

  The requirements of the REMPs are set out in the operation permits and included in the Technical Specifications, which comprise the environmental monitoring programme, the internal quality control programme and the land and water use census. The technical details are developed in the ODCM. This document also includes “Reporting Levels” (RL) of isotopic activity concentrations in environmental samples of air, water, milk, meat, vegetables, fish, seafood and soil. This “Reporting Levels” are derived activities expressed in Bq/kg or Bq/m3 taking into account a dose constrains of 0.1 mSv/y (10 % of the legal limit).

The REMPs around nuclear facilities are undertaken by the operators and the CSN implements an independent programme, the scope of which has been established generally over a range of 5-15% of the number of total samples (External Quality Control Programme). The independent monitoring programme of the CSN includes the same sampling locations and types of samples and analysis as the operator's programme.

Nationwide monitoring network

Since 1992 (rivers since 1984) the CSN runs a nation-wide environmental radiological monitoring network that is independent from the network associated with nuclear facilities. This nation-wide network is made by a network of automatic environmental radiological stations (REA) and a network of sampling stations (REM).

The REA network was originally made up of 25 automatic stations with a nation-wide distribution, but during the period 2019-2021 it has been updated to a network of 185 gamma spectrometry automatic stations distributed throughout the country and 15 mobile stations with similar characteristics. The data are transmitted daily to the European Commission Joint Research Centre according to the program EURDEP (European Union Radiological Data Exchange Platform), since the year 2003. The results obtained from this network are also published by the CSN through its website.

On CSN website (https://www.csn.es), values of daily and monthly average gamma dose rate are shown.

Additionally, some of the Spanish Autonomous Communities (Catalonia, Basque Country, Extremadura and Valencia) also have their own regional automatic monitoring station networks, whose data can also be consulted in the following link https://www.csn.es/c/portal/layout?p_l_id=1724710&p_p_id=portletmapavaloresambientales_WAR_MapaCentralesNuclearesportlet&p_p_lifecycle=0&p_p_state=pop_up. The Spanish Directorate-General for Civil Protection manages a nationwide automatic gamma dose rate stations network (RAR) which can be consulted through their website (https://www.proteccioncivil.es/coordinacion/redes/rar) or through the abovementioned EURDEP website.

The programmes carried out in the network of sampling stations (REM) provide relevant information to ensure that concentrations of radioactive materials do not constitute a risk to the population as a whole. The monitoring system that is currently deployed in Spain consists of two complementary networks: the REM-dense network with numerous sampling points covering the entire national territory, and the REM-sparse network with a limited number of selected locations but able to reach much lower detection limits.

The Spanish coast is surrounded by a series of 15 sampling stations, six of them in the OSPAR zone. The Centre of Civil Works Studies and Experimentation (CEDEX) of the Ministry of Transport and Sustainable Mobility, by means of a collaboration agreement with the CSN, is conducting the aquatic radiological monitoring programme. The Centre of Energetic, Environmental and Technological Research (CIEMAT) also performs some analytical determinations.

In 2024, the OSPAR zone monitoring programme has been extended through collaboration agreements between the CSN and two laboratories belonging to the national environmental radiological surveillance network (REM), located in Galicia and Cantabria regions. This extension of the monitoring implies two additional sampling stations, additional sampling types and increasing some sampling frequencies (e.g., reduction to a yearly basis for seafood and seaweed).

CSN, by means of the CSN publications plan, issues an assessment of the results of the environmental radiological monitoring programmes on a yearly basis. All of these data can be also consulted on the following link https://www.csn.es/kprgisweb2/.

Most of the laboratories are accredited by ISO 17025 or have a plan in progress for accreditation. Within the analysis, all laboratories work with internal quality assurance procedures (certified activity standards are used for calibrations and both background and efficiency are regularly checked for all instruments) and have written procedures (based in Standards) for performing their work.

Additionally, since 1992, the CSN has been organising annual analytical intercomparison campaigns using samples similar to those analysed in the REMPs. All of these laboratories participate in both the CSN campaigns and in several international intercomparison exercises and proficiency tests, such as the ones organized by the IAEA and the EC.

- Radiation dose assessment methods:

  The methodology used to estimate doses, defined in the ODCM of the Spanish NPP is based on calculation models given in the NRC- Regulatory Guide 1.109. To this end, a computer program was developed by the adaptation of the NRC computer programs LADTAP and GASPAR.

  The general aspects of this methodology may be summarised as follows:
  - Local characteristics, population habits, and land and water usage are site specific.
  - Straight-line Gaussian plume models are used for atmospheric dispersion.
  - Hydrological dispersion considers the specific characteristics of the effluent receiving water body (reservoir).
  - Generic values, such as period of animals on pasture, time from production and consumption, etc., are used.
  - Local specific values, such as food consumption rates, irrigation rates, humidity, etc., and site-specific exposure pathways, are also used.

  The dose coefficients used in the calculation of doses to members of the public are:
  - For intake by ingestion and inhalation, those specified in the Spanish Regulation on the protection of health against ionising radiations (approved by Royal Decree 783/2001, July 6th) and in the Euratom 96/29 Directive.
  - For external exposure to the cloud those specified in the BSS (Safety Series No. 115).

- For external exposure to deposits on to the ground and to shoreline deposits, those included in the US EPA Federal Guidance Report 13, CD Supplement.

Representative person

Conservative assessments of doses to the "critical group" are carried out to verify that discharge limits are complied with. In this case the critical group is defined taking into account the most conservative assumptions.

Additionally, according to the Regulation on the Protection of Health against Ionising Radiations, the licensee estimates with more realistic criteria the radiological impact on the members of the public due to the radioactive releases into the environment. In this case a representative person group is established. This representative person corresponds to the critical group as defined by ICRP-60 and is intended to be representative of those people living in the vicinity of the NPP who receive the highest dose.

The dose is calculated for three age groups: infant (1-2 years), child (7-12 years), and adult (>17 years); according to EC Radiation Protection 129, these are the three groups who receive the highest doses.

The representative person is hypothetical but realistic, having combinations of maximum and average habits, based on local knowledge and plausible assumptions. Food consumption rates are based on the result of site-specific habit surveys carried out by the CSN/CIEMAT in 2001. Inhalation rates from ICRP-71, water ingestion rates from ICRP-23, and exposure time to shoreline deposits from EUR 15760 are considered.

Exposure pathways

Taking into account productions, food consumption, occupancy and other usage of the region in the vicinity of the plant site, the specific pathways considered in the assessment of doses for the representative person may be:

- External exposure to the cloud (only noble gases are considered).
- Inhalation.
- Exposure to airborne aerosols
- External exposure to deposits on the ground (gaseous effluents) and on the shorelines (liquid effluents).
- Consumption of fish.
- Consumption of leafy and non-leafy vegetables (vegetables, roots and fruits).
- Consumption of meat (beef, goat/sheep).
- Consumption of milk (goat/sheep, cow).

All releases exposure pathways are individually considered and the total dose is calculated by adding the contribution of each of them.

- Environmental norms and standards:

  Monitoring standards and procedures for the main stages of the environmental sample radioactivity measurement process were developed by a working group formed by staff of the main environmental laboratories of the country and

coordinated by the CSN staff. This working group operated in coordination with AENOR (currently UNE, Spanish Organisation of Standardisation and Certification) giving rise to a group of environmental Spanish norms and CSN publications. During the period 2023-2025, the standards and procedures relating to sampling and sample preparation/preservation have been reviewed and published.

Juzbado Fuel Fabrication Plant (FFP), in order to continuously improve its environmental performance, implemented in April 1999 an Environmental Management System that was certified by AENOR, in accordance with the requirements of Standard ISO 14001, and in 2003 accredited with the requirements of several essays of the Standard ISO/IEC 17025. Moreover, the factory obtained the AENOR verification of its Environmental Management System and Environmental Declaration, pursuant to the requirements of European Regulation 761/2001, EMAS (VDM-03/10).

In order to comply with the requirements of EMAS, the Environmental Declaration validated by AENOR, is prepared and published on a yearly basis.

Since November 2005, Almaraz and Trillo Nuclear Power Plants (NPPs) have also implemented an Environmental Management System in accordance with the requirements of ISO 14001, certified by AENOR.

- Quality assurance:

  Retention systems performance and data management

  The performance of the retention systems is assured by controlling the fluid activity after treatment.

  Discharges and emissions are monitored upon the nature of the effluents (continuous or non-continuous), either continuously or by analysis and dilution prior to discharge. Either ways, discharges can be and are in fact interrupted manually or automatically whenever the activity readings at the moment of the discharge exceed previously fixed values.

  Instrumentation associated to the discharges and emissions monitoring is calibrated periodically using standard sources. Additionally, several checks are carried out, with different periodicity, in order to ensure that monitors work properly. These requirements are compiled in Licensee's official documents and procedures which are subject to inspection by CSN officials.

  The laboratory instrumentation used for discharges and emissions activity quantification is periodically calibrated using standards and the facilities labs participate in intercomparison exercises.

  Data and parameters related to treatment, discharges and emissions are kept in physical logs and electronic files. Data from laboratory analysis are kept in electronic databases.

  Facilities quality control program also includes procedures and instructions for appropriate data management including the correct filing in accordance with applicable regulations. During the inspections the CSN officials perform checks on

selected samples in order to verify the data transmission chain between initial measurements of the sample and final reporting to the CSN.

Information on discharges and emissions is submitted every month by NPP in operation and Fuel fabrication plant (on electronic format). That information is checked by the CSN according to the CSN procedure PT.IV.401, to validate the data and identify discrepancies and mistakes.

Environmental monitoring

Quality systems that fully integrate the organisation's structure, responsibilities, procedures, processes and resources required for suitably managing quality have been implemented.

Sampling is carried out by specialized facility staff, based on sampling procedures that are permanently available to the personnel. Instrumentation for radiological environmental monitoring is calibrated periodically and several checks are carried out, with different periodicity, in order to ensure that monitors work properly.

Measurement of the samples is mainly subcontracted to an external laboratory. The operator is required in the ODCM to develop an analysis quality control programme which has been implemented by handling a certain percentage (usually between 5% and 15%, sometimes up to 50% depending on the medium) of the samples over to another laboratory different from that performing the analysis of the main REMP for parallel analysis. Both laboratories are accredited under ISO 17025. Within the analysis, these laboratories work with internal quality assurance procedures (Certified activity standards are used for calibrations and background and efficiency are regularly checked for all instruments) and have written procedures (based on Standards) for performing their work.

The results from annual REMP are submitted to CSN's Keeper application (radiological environmental monitoring database), in addition to an annual report with all the information on the corresponding REMP campaign. CSN experts review this information according to the CSN procedure PT.IV.402.

In parallel to the operator's REMP, the CSN runs a complementary environmental monitoring programme through collaboration agreements with laboratories in different universities, which conduct the sampling and analysis programmes.

Additionally, since 1992, the CSN has been organising annual analytical intercomparison campaigns using samples similar to those analysed in the REMPs. All of these laboratories participate in both the CSN campaigns and in several international intercomparison exercises and proficiency tests, such as the ones organized by the IAEA and the EC.

Doses estimation

Estimation of dose is based on calculation models given in the NRC- Regulatory Guide 1.109 and performed through tailored computer programs. The licensees have verified these computer programs suitability through a validation process which has been supervised by the CSN inspectors. Additionally, during the inspections, the CSN officials check the estimated doses for a particular month.

Also, the CSN evaluates the suitability of the site-specific parameters considered in calculations and carries out parallel calculations.

Section 2: Nuclear Power Plants

Name of nuclear facility: Almaraz Nuclear Power Plant

- Location of nuclear power plant: The plant is located in the municipal area of Almaraz, province of Cáceres, at the tail end of the Arrocampo reservoir on the left bank of the Tajo River, 180 km WSW far from Madrid.
- Year for commissioning/licensing/decommissioning: The first group initiated operation in 1981 and the second in 1983.
- Receiving waters and catchment area: The Almaraz I&II reactors are cooled, through an open circuit, by water from the Arrocampo reservoir, on the Tajo River. Discharges take place into this reservoir whose capacity is 3.55E+07 m^3.
- Other voluntary relevant information that does not tend to change: There is no additional relevant information.

Name of nuclear facility: Trillo Nuclear Power Plant

- Location of nuclear power plant: Trillo NPP is located alongside the river Tajo in the municipal area of Trillo, in the province of Guadalajara, approximately 100 km E from Madrid.
- Year for commissioning/licensing/decommissioning: Trillo NPP initiated operation in 1988.
- Receiving waters and catchment area: The plant is cooled by water from the Tajo River through a close circuit. The plant discharges into that river. The average annual flow rate of the Tajo River as it passes through the power plant were:

Year	2019	2020	2021	2022	2023	2024
Average flow rate of the Tajo River (m^3/s)	11.02	16.00	13.56	10.02	12.87	22.87

- Other voluntary relevant information that does not tend to change: There is no additional relevant information.

Section 3: Reprocessing facilities

N/A.

Section 4: Fuel fabrication facilities

Name of fuel fabrication facility: Juzbado Fuel Fabrication Plant

- Location of fuel fabrication facility: The plant is located in the municipal area of Juzbado, in the province of Salamanca, 26.55 km from Salamanca city.
- Year for commissioning/licensing/decommissioning: The plant was commissioned in 1985.

- Receiving waters and catchment area: Radioactive liquid effluents are discharged to the Tormes River, tributary to the Duero River. The average annual flow rate of the Tormes River were:

Year	2019	2020	2021	2022	2023	2024
Average flow rate of the Tormes River (m^3/s)	12.7	24.0	21.0	17.5	17.4	25.0

- Other voluntary relevant information that does not tend to change: There is no additional relevant information.

Section 5: Radioactive waste treatment facilities

N/A.

Section 6: Research reactors

N/A.

Section 7: Decommissioning activities

Name of nuclear facility: José Cabrera Nuclear Power Plant

- Location of nuclear facility: José Cabrera NPP is located in the municipal area of Almonacid de Zorita, in the province of Guadalajara, approximately 66 km E from Madrid.
- Year for commissioning/licensing/decommissioning: Start-up took place in 1968. The plant, also called Zorita, ceased its activity on April 30th 2006 (Ministerial Order by the Ministry of Industry, Tourism and Trade of April 20th 2006). Since February 1st 2010 it is under dismantling.
- Receiving waters and catchment area: Radioactive liquid effluents flow into the Tajo River through two successive reservoirs (Zorita and Almoguera). The liquid effluents are discharged to the Zorita reservoir from where the water flows into the Almoguera reservoir that is located 20 km downstream from the nuclear power plant.
  The Zorita reservoir capacity is 2.7E+06 m^3, while the Almoguera´s capacity is 6.5E+06 m^3. The average annual flow rate of the Tajo River is 10.50 m^3/s (value obtained from the average in the Tajo River at the outlet of the Almoguera reservoir in the period Sept-2020 to Dec-2024).

- Other voluntary relevant information that does not tend to change:
  The dismantling of Jose Cabrera NPP finalized by 2023. The Site Restoration Plan was initiated in 2022 and is currently ongoing.