Country Profile Template

Contracting Party: SPAIN

Section 1: Summary document detailing

- Relevant national authorities and responsibilities;

  In accordance with Law 15/1980 creating the Nuclear Safety Council (CSN), modified by Law 33/2007, the CSN is set up as an independent institution, separate from both the Central Government and the industry and stakeholder sectors, and as the sole competent authority in matters relating to nuclear safety and radiological protection.

  The CSN provides annual information to the Spanish Parliament, sending a report that covers in detail the activities carried out during the year. After the Law 33/2007 came into effect, this obligation has been expanded to the regional parliaments of those regions with nuclear power plants at their territory. The president of the CSN holds a yearly hearing at the Spanish Parliament to present this report. Apart from that, some ad-hoc appearances of representatives of the CSN have been arranged to give information about specific questions or events, usually related to safety issues.

- National legislation and basis for regulation;

  In Spain the basic laws governing nuclear activities are the Nuclear Energy Act (Law 25/1964, partially reformed by Law 12/2011) and the 15/1980 Law, of April 22nd, creating the Nuclear Safety Council (CSN), amended by Law 33/2007. They are further developed in regulations that provide the framework for standards, guidelines and objectives in this field.

- 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.

  Regulation on Nuclear and Radioactive Facilities

  The Regulation governing Nuclear and Radioactive Facilities (approved by Royal Decree 1838/1999, amended by Royal Decree 35/2008) in its Article 8.3 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 those that are suitable, implemented.

  Regulation on the Protection of Health against Ionising Radiations

  The Title V of the Regulation on the protection of health against ionising radiations (approved by Royal Decree 783/2001, amended by Royal Decree 1439/2010) sets up requirements on the system applied to limit emissions and discharges, where several articles deal with the system of limitation, surveillance and control of radioactive

effluents. Article 55 specifically stipulates that facilities generating radioactive wastes must be provided with adequate treatment and removal systems in order to ensure that doses due to 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 needed for every facility, setting up specific limits, surveillance requirements and conditions for the releases. The authorised limits guarantee that in normal operating conditions, the doses to members of the public will be in accordance with the ALARA principle that is applied in the design of the treatment systems.

According to Article 52 during operation, licensees have to demonstrate that every reasonable effort is made, from the generation of wastes to the operation proceedings of the effluent treatment systems, to reduce releases and to keep the radiological impact as low as it is technically and economically feasible.

Law on the Evaluation of the Environmental Impact

The policy and main precepts governing in Spain the protection of the environment are laid down in the Law on the evaluation of the environmental impact (approved by Law 21/2013, reformed by Law 9/2018). The law involves a wide range of activities, including the generation of nuclear energy, by which a "Declaration of Environmental Impact" will be incorporated into the facility 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 will be to make 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 nuclear safety and radiological protection practices and standards internationally 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, in addition, that it must 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 a dose constraint for nuclear power plants and other fuel cycle installations.

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

  Regarding the discharge limits, an effective dose value of 0,1 mSv/y applies to nuclear facilities both during operation and decommissioning. This value, that is applicable to liquid and gaseous effluents considered as a whole, was established as a proper 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 public 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 system of limitation, surveillance and control of radioactive effluents 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, the conditions on the operability of the on-line monitoring instrumentation and the effluent treatment systems operability requirements. 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 “Offsite dose calculation manual of nuclear installations”, 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 “Radiological surveillance and control of liquid and gaseous effluents from nuclear power plants”.

- Environmental monitoring programmes;

  The environmental radiological monitoring system in Spain consists of three networks:

  a) The network associated to nuclear installations.
  b) The national monitoring network.
  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 radiological situation.

Programmes around nuclear installations

Environmental radiological monitoring programmes 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 lifetime stages of the facilities: pre-operation, operation, dismantling and decommissioning.

The main requirements for the nuclear power plant environmental monitoring programmes are defined in the CSN Safety Guide 4.1 "Design and development of environmental radiological monitoring programmes for nuclear power plants".

The requirements of the environmental radiological monitoring programmes are set out in the operation permits as part of the Technical Specifications, which comprise, the environmental monitoring programme, the internal quality control programme and the land and water use census. The procedural 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, fishes, seafood and soil.

The environmental monitoring programmes around nuclear installations are undertaken by the operators and supervised by the CSN. Additionally, this institution implements its own independent monitoring programmes around these facilities, 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 programmes of the CSN include 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 (REVIRA) additionally to the monitoring networks and programmes associated with nuclear facilities. This network is made up of an automatic monitoring stations network (REA) and a network of environmental sampling stations (REM).

The REA network was originally made up of 25 automatic stations with a nation-wide distribution, but currently, it is being updated to a network of 185 gamma spectrometry automatic stations distributed throughout the country, that are expected to be completely installed in the beginning of 2022. The data are transmitted daily to the European Commission Joint Research Centre according to the EURDEP (European Union Radiological Data Exchange Platform) program (https://remap.jrc.ec.europa.eu/Simple.aspx), since the year 2003. The results obtained from this network are published by the CSN through its website in the following link https://www.csn.es/varios/rea/index.html.

Additionally, some of the Spanish Autonomous Communities (Catalonia, Basque Country, Extremadura and Valencia) also have their own regional automatic monitoring station networks, the data of which 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 , and the Spanish Directorate-General for Civil Protection manages a nationwide automatic gamma dose rate stations network (RAR) which can be consulted through their website http://www.proteccioncivil.es/que-hacemos/rar/presentacion 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 being developed 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 limits of detection.

The Spanish coast is surrounded by a series of fifteen sampling stations, six of them in the OSPAR zone. The Centre of Civil Works Studies and Experimentation (CEDEX) of the Ministry of Public Works, 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.

CSN, by means of the CSN publications plan, edits in a yearly basis an assessment of the results of the environmental radiological monitoring programmes, 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 background and efficiency is regularly checked for all instruments) and have written standards for performing their work.

Additionally, since 1992, the CSN has been organising annual analytical intercomparison excercises using samples similar to those analysed in the Radiological Environmental Monitoring Programs (REMP) in which all of these laboratories participate. They also participate in several international intercomparison exercises and proficiency tests, 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.

Critical group/reference group

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 Article 53 of 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 reference group is established. This reference group 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 critical group includes 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 critical group 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 critical group are:

- External exposure to the cloud (only noble gases are considered).

- Inhalation.
- External exposure to deposits on the ground (gaseous effluents) and on the shorelines (liquid effluents).
- Consumption of fish.
- Consumption of leafy vegetables.
- Consumption of vegetables, roots and fruits.
- Consumption of meat (beef, goat).
- Consumption of goat milk.

All release 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 worked in coordination with AENOR (Spanish Organisation of Standardisation and Certification) giving rise to a group of environmental Spanish norms and CSN publications.

  There are no edited norms or standards at the present moment for the protection of the environment from a radiological point of view.

  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 UNE-EN ISO 14001:1996, and in 2003 accredited with the requirements of several essays of the Standard UNE-EN ISO/IEC 17025:2017. 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.

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

- Quality assurance.

  Retention systems performance and data management

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

Liquid effluents can be divided into continuous and non-continuous discharges. Continuous discharges are continuously monitored. If an alarm set point is exceeded, the discharge pump is stopped, automatically or manually, and the liquid is sent to the radioactive liquid treatment system. In addition, a weekly bulk composite sample is collected with an automatic sampling system for laboratory analysis.

Non-continuous discharges are only carried out after gamma spectrometry analyses to determine the isotopic composition and the dilution factor in the discharge channel. Before sampling, the liquid in the tank is re-circulated for enough time to guarantee homogeneity. If the sample activity is not enough low for discharge, the tank content is redirected to the liquid treatment plant.

During the discharge, the control room operator is able to regulate the flow and thus the dilution factor in the discharge channel. There is also an activity monitor in the discharge line, so the control room operator is able to check the actual discharge activity. If this activity deviates more than 50% from the activity result based on the tank sample, the discharge is stopped. In addition, the discharge is automatically interrupted if the activity exceeds a certain value. If the monitor is not operable, the discharge is automatically stopped.

Regarding emissions, gases are also continuously monitored. Likewise discharges, if an alarm set point is exceeded, the emission can be stopped, automatically or manually. Charcoal and particulate filters to quantify the emissions activity are replaced weekly and analysed to determine the isotopic composition.

Instrumentation for continuous discharges and emissions monitoring is calibrated periodically using standard sources. Beside, several checks are carried out, with different periodicity, in order to ensure that monitors work properly.

On the other hand, the laboratory instrumentation used for discharges and emissions activity quantification is periodically calibrated using standards. For gamma spectrometry systems, detector efficiency Q/A plots are produced on a weekly basis in order to control system stability. The system performs an automatic background correction based on a weekly background measurement.

Laboratories from Spanish facilities participates in intercomparison exercises.

Data and parameters related to treatment, discharges and emissions are kept in notebooks and computer files. Data from laboratory analyses are kept in computerised databases.

The facility quality control program also includes procedures and instructions for the suitable data management, as well as their correct filed according to the applicable regulations. During the inspections, the CSN inspectors perform checks on chosen 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 the facilities (on paper and electronic format). That information is checked by the CSN according to the CSN procedure PT.IV.401 "Supervision of the periodical information related to the radioactive effluents", to validate the data and identify discrepancies and mistakes.

Environmental monitoring

The application of 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 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 or have a plan in progress for accreditation. 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 standards for performing their work.

These monitoring programmes are regularly inspected by CSN staff, who perform checks on the documentation associated to the REMP, in the sampling process and in the results reported to the CSN, among others.

In parallel to the operator's Radiological Environmental Monitoring Programme (REMP), the CSN runs a complementary independent environmental monitoring programme by 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 in which all of these laboratories participate. They also participate in several international intercomparison exercises and proficiency tests, as the ones organized by the IAEA and the EC.

Doses estimation

The licensee has verified the computer program suitability through a validation process and this validation has been supervised by the CSN inspectors. Additionally, during the inspections, the CSN inspectors check the doses estimated for a particular month.

On the other hand, the CSN has evaluated the suitability of the site-specific parameters considered in calculations. Furthermore, parallel calculations have been carried out by the CSN, both with own computer programs and excel sheets.