



**ΕΕΑΕ** ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΑΤΟΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ  
GREEK ATOMIC ENERGY COMMISSION

# JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

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# SECTION A.

## INTRODUCTION

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Greece has signed the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management on 5 September 1997. The Convention has been ratified and entered into force on 16 March 2000.

The present report is the National Report of Greece for the 7th Review Meeting to the Convention, which will take place in 2021. The report has been prepared in accordance with the Guidelines regarding the Form and Structure of National Reports (IINFCIRC/604/Rev.3, 18 December 2014), established by the Contracting Parties under Article 29 of the Convention.

Greece has no nuclear power plants. As such, the management of spent fuel is relevant only in connection with the research reactor (GRR-1) at the National Centre of Scientific Research (NCSR) "Demokritos". GRR-1 is currently licensed for extended shutdown and all used LEU elements have been repatriated to the USA since February 2019, based on a pre-existing agreement with the US Department of Energy.

Radioactive waste in Greece originates from medicine, research and industry, including waste from the past operation of GRR-1 (resins, irradiated objects, etc). In 2013 the Presidential Decree (PD) No. 122/2013 "Transposition of Council Directive 2011/70/EURATOM establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste" (177/A/12.08.2014) was issued for the transposition of the EC Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. In 2017, PD No.122/2013 was amended by PD No. 91/2017 "Legislative, regulatory and organizational framework for the responsible and safe management of spent fuel and radioactive waste and amendment of the Presidential Decree 122/2013" (130/A/01.09.2017). In this latter document it is included, among others, the general safety requirements for radioactive waste management covering the whole lifetime of a management facility and the definition of the various licensing stages. The national policy for the safe management of spent fuel and radioactive waste is included in the Ministerial Decision (MD) No.131207/2015 (1858/B/27.08.2015). Finally, the second national program for the radioactive waste management has been recently published in MD No. 97529/2020 (4317/B/02.10.2020).

A facility for interim storage of radioactive waste ("New Radioactive Waste Interim Storage" (NRWIS)) exists at the premises of the NCSR "Demokritos" and operates under the Institute of Nuclear and Radiological Sciences & Technology, Energy & Safety (INRASTES) of the NCSR "Demokritos". The license of the facility includes interim storage of radioactive waste and disused radiation sources, low activity sources dismantling, characterization of radioactive waste, re-packaging and re-sorting of radioactive waste and radioactive sources and de-characterization and clearance of radioactive waste. The legislative basis for the licensing of the facility lies in the Radiation Protection Regulations (PD No. 101/2018 and Ministerial Decision No.45872/2019) and the PD No.122/2013 as amended by PD No.91/2017. IAEA safety standards are also used by EEAE for the review and assessment of the safety of the facility.

Regarding the policy of sealed radioactive sources, a legal written declaration from the source manufacturer for accepting back the source after its useful life is necessary prior to its import, as well as a legal written declaration from the source user for undertaking all financial and administrative provisions to export the source back to manufacturer or other licensed storage/recycling facility abroad. The import and transport of all radioactive sources are authorized by EEAE.

In 2017, a follow up mission of the initial Integrated Regulatory Review Service (IRRS mission) was conducted. Radioactive waste management was included in the scope of the mission. As

indicated in the follow up report the progress made since the initial mission in 2012 includes, inter alia, the following: (i) the update of the regulatory framework, (ii) the development and implementation of an integrated management system in EEAE (iii) the implementation of the graded approach in the main regulatory function and (iv) the enhancement of the national regulatory framework for the management of radioactive waste.

Finally, an ARTEMIS mission has been invited to Greece in order to obtain an independent expert opinion and advice on radioactive waste and spent nuclear fuel management, decommissioning and remediation. The mission is scheduled for 2023.

## SECTION B.

# POLICIES AND PRACTICES

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Article 32      Reporting, paragraph 1

In MD No.131207/I3/2015 the national policy for the management of spent fuel (SF) and radioactive waste (RW) is described in detail. According to this document “The national policy aims to ensure the management, from generation to disposal, in Greece of all types and streams of radioactive waste falling under the jurisdiction of the Greek State, as well as to look into the possibility of concluding cross-border agreements for the shipment of radioactive waste abroad for recycling or final disposal”.

Moreover, there are the following provisions which address the respective points of the Article 32:

*(i) SF management policy*

According to Article 4.1c of PD No.122/2013, SF shall be returned to a supplier or producer country, according to an agreement in place before the import of the fuel in Greece. Spent fuel final disposal in Greece is not presently considered as part of the Radioactive Waste Management National Policy.

*(ii) SF management practices*

The HEU of the GRR-1 was returned to the USA in 2005. The LEU has been repatriated to the USA in 2019, under an agreement with the US DoE.

The nuclear material existing in Greece is subject to the control and regular inspection of IAEA and EURATOM Safeguards.

*(iii) RW management policy*

According to Article 4.1 a and b of PD No.122/2013, RW produced in Greece shall be disposed within the national territory, unless an agreement is in place for export of the waste abroad, in line with European Union legislative requirements. Until the establishment of a national disposal facility, waste shall be stored safely in a licensed storage facility.

Regarding sealed radioactive sources, according to the Article 5.6 of MD No.131207/I3/2015, formal acceptance of the importer and manufacturer shall be in place prior the import of a sealed source to return the source back to the manufacturer after the end or its utilization period.

Other important elements of the national policy are as follows:

- The import of SF&RW for disposal purposes within the borders of Greece shall be prohibited.
- An SF&RW producer shall have the primary responsibility for the management of the SF&RW concerned, until their natural decay to the regulated clearance levels or their shipment to an authorized spent fuel or radioactive waste management facility in Greece or abroad. In any case, the SF&RW producer shall undertake all obligations deriving from the management method and shall bear the cost of their management.
- The radioactive waste producer shall take all necessary measures to minimize the volume and activity of the radioactive waste, where reasonably feasible. These measures shall be authorized by EEAE in the context of licensing of the relevant practice.

- All bodies involved in the use or management of radioactive sources shall ensure that the radioactive sources may be reused by other interested parties, where possible, before they become radioactive waste.
- Storage is not a final management solution.
- Radioactive materials and radioactive waste resulting from emergencies, accidents or incidents, as well as radioactive materials or waste and orphan sources, whose existence, in EEAE's opinion, entails a risk to radiation protection or public health, shall be temporarily stored in an authorized interim SF&RW storage facility pending a final decision concerning their management.
- Safety shall be the highest priority of the national policy on SF&RW management, and it shall also promote a safety culture, by properly adopting the relevant legal provisions and providing education, training and information.
- The necessary information concerning the planning and implementation of SF&RW management actions shall be posted on the Internet, where it shall be publicly accessible.
- The requirements, decisions taken, proposed solutions, as well as regulatory inspections and checks concerning safe SF&RW management shall follow a graded approach.

Greece supports the idea of sharing of common activities, practical solutions and R & D programs in the context of agreements between the countries, taking into account the conditions specified in the EC Directive 2011/70/Euratom.

*(iv) radioactive waste management practices*

RW in Greece originates from medicine, research - including the past operation of the GRR-1 - and industry. The vast majority of them are VSLW, VLLW and LLW. Eventually, a very small amount of ILW waste may eventually arise, mainly from some parts of the dismantled core of the reactor. This type of RW is stored in safe place in the reactor building.

Nuclear medicine and other research and industrial laboratories waste is appropriately stored on site until decay or repatriation to the country of origin or transport for disposal or recycling and reuse to an authorized facility. Special retention tanks might be required in nuclear medicine laboratories performing therapeutic procedures with I-131. Liquid waste is disposed through the laboratory dedicated and marked pipelines to the municipal sewage system. On site storage of radioactive waste and sources is covered by the operational license of the facility. Disused sources or some other radioactive material (e.g. consumer products, such as lightning rods and smoke detectors) are also stored on site countrywide under regulatory control.

Regarding orphan sources, EEAE has taken provisions for the safe and secure interim storage of the orphan sources or sources that cannot be exported to their manufacturer or other source management facilities (e.g. in case of bankrupt, facility closure, etc). These provisions include an interim storage in the NCSR "Demokritos" facility, where the sources could be collected, temporarily stored and then exported for recycling. Furthermore, financial resources to cover intervention costs relating to the recovery and management of orphan or disused sources are provided by a financial security fund operating within the Special Account of EEAE.

RW is also stored in the building of the research reactor. This waste comprises historical waste, originating mainly from the past operation of the reactor.

*(v) criteria used to define and categorize radioactive waste*

A criterion of 100 days and 30 years half-life applies for distinguishing between very short lived and long lived RW, respectively. Very low level waste (VLLW) contains isotopes with half-life less than 30 years and activities about two orders higher than the exempted values. Waste with radionuclides with higher half-life are considered as VLLW, too (e.g. <sup>226</sup>Ra), if the activity is very low. Examples are objects using <sup>226</sup>Ra for luminance, smoke detectors with <sup>241</sup>Am etc. The majority of waste in Greece are classified as VSLW, VLLW or LLW, due to their activities and form. A very

few RW which concern regeneration bed resins and activated or contaminated objects in connection with GRR-1 operation have not been classified yet.

The inventory of radioactive waste, sources and other radioactive material is maintained by EEAE and includes the necessary basic information, i.e. facility, location, source form, activities, etc.



## SECTION C.

# SCOPE OF APPLICATION

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### Article 3          Scope of Application

- a) As already mentioned in Sections A and B, spent fuel management in Greece concerns only the GRR-1 whose spent fuel has been repatriated to the USA. There are no reprocessing facilities in Greece.
- b) The facilities responsible for the activities involving NORM are under regulatory control following the provisions of the Radiation Protection Regulations (PD No. 101/2018 and Ministerial Decision No.45872/2019).
- c) Greece has not declared as radioactive waste for the purposes of the Convention any waste within military or defense programs.

## SECTION D.

# INVENTORIES AND LISTS

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Article 32 Reporting, paragraph 2

### *(i) Spent fuel management facilities*

There are no spent fuel management facilities in Greece.

### *(ii) Inventory of spent fuel*

There is no spent fuel in Greece.

### *(iii) Radioactive waste management facilities*

The only facility in Greece, serving currently as a centralized facility for management and storage of RW that cannot be discharged on site, is the NRWIS. The facility was refurbished in 2003 and one year later a new building was built. It is located within a safe and secure area of the NCSR “Demokritos” and is operated by INRASTES, which is also the operator of the GRR-1.

The NRWIS facility is used for the safekeeping of disused sealed and orphan sources (without back-end agreement) and primary unconditioned radioactive waste. The sealed orphan sources in the country – not being able to be exported - and disused sources and radioactive waste of the NCSR “Demokritos” are transferred and temporarily stored at prescribed locations in the NRWIS. Radioactive waste resulting from activities within the NCSR “Demokritos” is segregated at the origin based on: (i) the information given by the licensee of the particular practice; (ii) results of radiological survey and (iii) material composition.

The NRWIS facility consists of two storage compartments. The first compartment is used for:

- radioactive waste produced from research activities at the NCSR “Demokritos” that should be kept for more than 2 years before sorting and/or clearance and
- historical radioactive waste after sorting and characterization.

The second room is for:

- disused/orphan sources and objects;
- radioactive and contaminated objects, mainly with alpha emitters, that are found within the country and characterized as radioactive waste, as for example: lightning rods using Ra-226, parts of aircraft engines with thorium or items found in scrap metals, objects with luminance (Ra-226) material (e.g. vehicle speed meters, etc);
- radioactive waste from the GRR-1.

Besides the storage rooms, the facility operates also as radioactive waste characterization laboratory. The legislative basis for the licensing of the facility are the Radiation Protection Regulations (PD No. 101/2018 and MD No.45872/2019) and the PD No.122/2013 as amended by PD No.91/2017. Furthermore, the IAEA safety standards are considered as further guidance, especially the IAEA Safety Standards WS-G-6.1, Storage of radioactive waste, safety guide.

### *(iv) Inventory of radioactive waste*

The most recent data for the national inventory of radioactive waste are provided in Annex I.

EEAE is responsible for keeping the inventory containing information about the location of the main features of the radioactive sources such as radionuclides, activity, volume mass, etc, where applicable.

*(v) Nuclear facilities in the process of being decommissioned*

None. As mentioned in Section A the nuclear facility in Greece is the research reactor at NCSR “Demokritos” is currently licensed for extended shutdown.

## SECTION E.

# LEGISLATIVE AND REGULATORY SYSTEM

### Article 18 Implementing measures

The Joint Convention has been ratified and entered into force in Greece on 16 March 2000 by the Law No. 2824/2000 (Government Gazette Folio No. 90/A/16.03.2000) "Ratification of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management".

### Article 19 Legislative and Regulatory Framework

A list of the legislative documents relevant to this Convention are given below.

#### Radioactive waste

- Presidential Decree No.122/2013, Transposition to Greek legislation of Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, Government Gazette Folio No. 177/A/12.08.2013;
- Presidential Decree No.91/2017, Legislative, regulatory and organizational framework for the responsible and safe management of spent fuel and radioactive waste and amendment of the Presidential Decree. 122/2013, Government Gazette Folio No. 130/A/01.09.2017;
- Ministerial Decision No.131207/I3/20.08.2015, National policy on the management of spent fuel and radioactive waste, Government Gazette Folio No. 1858/B/27.08.2015;
- Ministerial Decision No.97529/18.09.2020, National program of spent fuel and radioactive waste management- Second version, Government Gazette Folio No. 4717/B/02.10.2020.

#### Nuclear installations

The legislative framework with regard to nuclear installations is as follows:

- Act No. 854/1971, On the terms regarding the establishment and operation of nuclear facilities, Government Gazette Folio No. 54/A/18.03.1971;
- Presidential Decree No.610, Establishing terms and procedures in licensing Public Power Corporation to construct a nuclear power plant on a specific site, Government Gazette Folio No. 130/A/23.08.1978;

*In early 1980s, a decision was made to exclude nuclear power electricity generation. Therefore, the above two pieces of legislation have never been used and can be considered as archival pieces of legislation.*

- Presidential Decree No. 60/2012, Establishing a National framework for the nuclear safety of nuclear installations (transposition of the Council Directive 2009/71/ Euratom of 25 June 2009), Government Gazette Folio No. 111/A/03.05.2012.

#### Nuclear research reactors

- Ministerial Decision 84631/07.08.2020, Amendment of the Decision no. P/112/305/2012 (B' 2877) Main requirements – principles of nuclear safety and regulatory control of research reactors as amended by Decision no. 91175/2017 (B' 1991) transposing Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom

establishing a Community framework for the nuclear safety of nuclear installations (L 219 /25.7. 2014);

- Ministerial Decision 91175/31.05.2017, Amendment of the Decision no. P/112/305/2012 (B' 2877/26.10.2012) Basic requirements – principles of nuclear safety and regulatory control of research reactors (transposition of the Directive 2014/87/Euratom), Government Gazette Folio No. 1991/B/09.06.2017;
- Ministerial Decision P/112/305/2012, Basic requirements – principles of nuclear safety and regulatory control of nuclear research reactors, Government Gazette Folio No. 2877/B/26.10.2012.

#### Implementation of the International obligations

- Law No. 2480/1997, Ratification of the Nuclear Safety Convention, Government Gazette Folio No. 70/A/14.05.1997;
- Law No. 1636/1986, Ratification of the Convention on the physical protection of nuclear material, Government Gazette Folio No. 106/A/18.07.1986;
- Law No. 1758/1988, Ratification of the Protocol Amending the Convention on Third Party Liability on the Field of Nuclear Energy of 29 July 1960, as it was modified by the Additional Protocol of the 28 January 1964, Government Gazette Folio No. 44/A/10.03/1988;
- Law No. 1937/1991, Ratification of the International Convention in case of a Nuclear Accident or Radiological Emergencies, Government Gazette Folio No. 35/A/13.03/ 1991;
- Law No. 1938/1991, Ratification of the International Treaty on Early Notification in case of a Nuclear Accident, Government Gazette Folio No. 36/A/13.03.1991;
- Law No. 2824/2000, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Government Gazette Folio No. 90/A/16.03.2000;
- Law No. 3787/2009, Ratification of the Protocol amending the Convention on Third Party Liability in the field of nuclear energy of 29 July 1960, as amended by the additional protocol of 28 January 1964 and by the Protocol of 16 November 1982, Government Gazette Folio No. 140/A/07.08.2009;
- Law No. 3990/2011, Amendment of the Convention of Physical Protection of Nuclear Materials, Government Gazette Folio No. 159/A/13.07.2011.

#### Safeguards and non-proliferation

- Law No. 437/1970, Ratification of the non proliferation treaty signed on the 1 June 1968, Government Gazette Folio No. 49/A/26.02.1970;
- Safeguards agreement between Greece and IAEA signed on 17.11.1972;
- Ministerial Decision No. 5408/E3/2362, Control on transfer of nuclear materials, armament and technologies affecting national Defense and Security, Government Gazette Folio No. 730/B/21.09.1993;
- Law No. 2805/2000, Ratification of the additional protocol, Government Gazette Folio No. 50/A/03.03.2000.

#### Radiological protection

- Law No. 181/1974, Protection against ionizing radiation, Government Gazette Folio No. 347/A/20.11.1974;
- Presidential Decree No. 101/2018, Adaptation of the Greek legislation to Council Directive 2013/59/Euratom of December 5, 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives

89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/ Euratom and 2003/122/ (EE L13/17.1.2014) - Establishment of radiation protection regulations, Government Gazette Folio No. 194/A/20.11.2018;

- Ministerial Decision No. 45872/2019, Procedures for the regulatory control of practices of ionizing radiation – approval and recognition of services and experts, Government Gazette Folio No. 1103/B/03.04.2019;
- Ministerial Decision 135966/30.12.2019, Implementation of existing exposure situation strategies, Government Gazette Folio No. 5116/B/31.12.2019;
- Ministerial Decision 43374/4.10.2020, National action plan for addressing long-term risks from radon exposure, Government Gazette Folio No. 1881/B/13.08.2020;
- EEAE Decision No. 4a/261/2019, Establishment of mechanisms for the recognition of radiation protection experts, medical physics experts and occupational health services, authorization of dosimetry services and the approval of radiation protection officers, Government Gazette Folio No. 2460/B/21.06.2019;
- EEAE Decision No. 4b/261/2019, Establishment of the dose constraints for public exposure from planned operation of a specified radiation source, Government Gazette Folio No. 2460/B/21.06.2019;
- EEAE Decision No. 4c/261/2019, Specific measures for the safe management and control of high activity sealed sources, Government Gazette Folio No. 2460/B/21.06.2019;
- EEAE Decision No. 4d/261/2019, Submission and access to the results of individual monitoring, Government Gazette Folio No. 2460/B/21.06.2019;
- EEAE Decision No. 4/266/2020, Description of incidents involving or possibly involving accidental or unintentional exposure during medical exposure to be reported directly to the Greek Atomic Energy Commission, Government Gazette Folio No. 214/B/03.02.2020.

#### Establishment of the regulatory body

- Law No. 1733/1987, Transfer of Technology, inventions, technological innovation and establishment of the Greek Atomic Energy Commission, Government Gazette, Folio No. 171/A/22.09.1987;
- Presidential Decree No. 404/1993, Organization of the Greek Atomic Energy Commission, Government Gazette Folio No. 173/A/05.10.1993;
- Law No. 4310/2014, Research, Technological Development and Innovation and other provisions (Chapter E' - Nuclear Energy, Technology and Radiation Protection – Greek Atomic Energy Commission (EEAE), Government Gazette Folio No. 258/A/08.12.2014.

#### Emergency preparedness

- Law No. 3013/2002, Upgrade of the General Secretariat for Civil Protection, Government Gazette Folio No. 102/A/1.5.2002, as in force;
- Presidential Decree No. 101/2018, Adaptation of the Greek legislation to Council Directive 2013/59/Euratom of December 5, 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/ Euratom and 2003/122/ (EE L13/17.1.2014) - Establishment of radiation protection regulations, Government Gazette Folio No 194/A/20.11.2018 (Section 5 and Annex XI);
- Ministerial Decision No. 1299/2003, Approval of the General Plan for Civil Protection, under the Code Name Xenokratis, Government Gazette Folio No. 423/B/10.04.2003;
- Decision of the General Secretary for Civil Protection, Guidelines for the management of CBRN threats, October 2020;

- Decision of the General Secretary for Civil Protection, General Plan for Emergency Response due to accidents during Road and Rail Transport of Dangerous Goods according to ADR / RID regulations, 1<sup>st</sup> version, June 2020.

#### Other relevant legislation

- Presidential Decree No. 83/2010, Transposition of Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel into the Greek legislative framework, Government Gazette Folio No. 147/A/03.09.2010;
- Ministerial Decision P/112/1057/2016/01.02.2016, Establishment of requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption, in compliance with the Council Directive 2013/51/Euratom of 22th of October 2013, Government Gazette Folio No. 241/B/09.02.2016.

#### Legislation in progress

- Presidential Decree for the internal organization of EEAE is in the process of being issued.

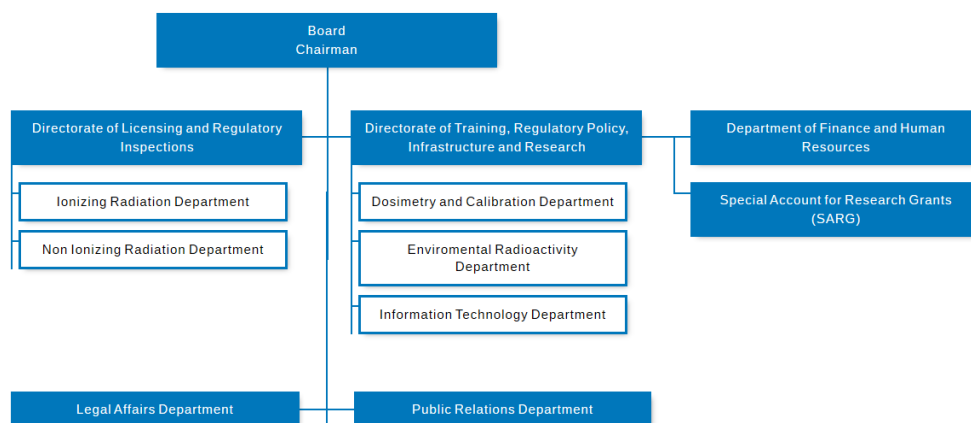
#### Article 20      Regulatory Body

The regulatory body in Greece is the Greek Atomic Energy commission (EEAE). An entity named EEAE was initially established by an Act in 1954 (“Atomic Energy Act”). EEAE has been re-established as competent radiation safety authority in 1987 by the Law 1733/1987. An important milestone in the timeline of the regulatory body itself was brought in 2014. With the provisions in Law 4310/2014 (Government Gazette Folio No. 258/A/08.12.2014) the earlier framework (Law 1733/1987) has been replaced by the current operation framework of EEAE. The basic elements accommodated in the updated framework are summarized below:

- EEAE is explicitly designated as the regulatory competent authority for the control, the regulation and the supervision of the sector of nuclear energy, nuclear technology, radiological and nuclear safety and radiation protection, and its competences are codified in a consolidated text, by completing, extending and clarifying the older provisions;
- EEAE acquires complete administrative and financial effective independence, keeps its scientific character and is given the form of public entity;
- EEAE as regulatory authority is henceforth the licensing administrative authority;
- inspection procedures and inspectors’ role are reinforced significantly;
- legislative enforcement means are provided by specifying administrative and penal sanctions;
- EEAE is provided with the power to conduct hearings and public consultations, and to issue a number of regulations;
- provisions for transparency enhancement, accountability and avoidance of conflict of interests are included;
- provisions ensuring organization’s resources and sustainable financial independence are foreseen;
- EEAE can cooperate with research/academic institutions on educational matters.

The current EEAE operation regime is in line with the international and European requirements for radiation protection and nuclear safety regulatory authorities, enhances the effective independent and regulation of this field and addresses the relevant IRRS mission findings.

EEAE organizational structure was published in the form of a Presidential Decree in 1993. At present, a new Presidential Decree on the internal organization of EEAE is in the final stage of governmental approval. The proposed new organization chart is shown in Figure 1. Following IRRS mission findings, the new internal structure provides for the operational separation between its regulatory functions and scientific and technical services. EEAE is governed by a seven-member Board.



**Figure 1. Organizational chart of EEAE**

EEAE employs a sufficient number of qualified and competent staff (76) to carry out its tasks. Most of EEAE personnel hold a degree of high level education and dispose specialized scientific expertise (M.Sc. and/or Ph.D.). They participate in several working groups and committees at national, European or international level. Their continuous training, the participation in EEAE E&T activities and the participation in scientific networks is encouraged in order to gain the knowledge and experience required to successfully fulfill their tasks.

EEAE financial resources come from the public budget, as well as licensing fees, externally funded projects and the provision of technical services. The accounts and fiscal reports of EEAE are subject to the control of the Audit Council. These data and fiscal reports, together with the budget estimation for the coming year, are published on EEAE website and submitted to the President of the Hellenic Parliament and the relevant Minister as part of the Annual Report.

EEAE implements an integrated management system (IMS); in 2016 it was certified in accordance with the requirements of ISO 9001:2015 standard. The IMS incorporates all functions and accredited activities of EEAE. The integrated management system was designed to respond to the IRRS findings, in line with IAEA safety standards and more specifically to GSR Part 2. Specific attention was given to:

- leadership for safety demonstrated by the executive team (Chairman and Heads of units);
- establishment of a system of Key Performance Indicators (KPIs) to ensure safety and monitoring the achievement of strategic goals;
- the policy document consistent with the vision, mission and principles of EEAE and dissemination of this document to all EEAE staff;
- ensuring interaction with interested parties, especially during the drafting of the new RPR;
- the application of the graded approach in the main functions of the regulatory body (i) the legislative framework, (ii) the regulatory process (notifications and authorization of practices), (iii) inspections and (iv) review and assessment of the documents submitted.



## SECTION F.

# OTHER GENERAL SAFETY PROVISIONS

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### Article 21 Responsibility of the license holder

Article 7.1 of PD No.122/2013 explicitly assigns the prime responsibility for the safety of facilities or activities related to the management of SF&RW to the license holder. Waste management and all relevant actions undertaken by a facility are evaluated by EEAE as part of the authorization process.

### Article 22 Human and financial resources

Article 7.7 of PD No.122/2013 as amended provide for the general requirements for human and financial resources of the licensee in order to fulfill their obligations with respect to the safety of SF&RW management. Information for the available human and financial resources of the NRWIS storage facility were provided in the application documents for the operation license and found adequate in the regulatory review for the current activities in the facility.

Regarding the import of sealed radioactive sources, the licensing procedure imposes that full financial provisions are in place by the licensee for the waste management and/or the return of the sealed sources to the manufacturers.

### Article 23 Quality assurance

According to PD No.122/2013 (Article 7.4) as amended by PD No.91/2017, license holders shall implement an integrated management program, including quality assurance program. Moreover, Article 7.5 of the same document provides that the license holder of a SF&RW management facility shall have a QA program in place, to implement all planned and systematic actions required to sufficiently ensure that a structure, system, component or procedure relating to SF&RW management, at all stages or a part thereof, operates satisfactorily. The quality assurance program shall be approved by EEAE.

The current QA program of NRWIS is based on:

- Document Standardization and Codification.
- Handling of Incoming and Outgoing Documentation.
- Organization and Responsibilities of the personnel.

The most important elements of the QA include Records and Document Control System, Radioactive Waste Management Review, Personnel Meetings, Surveillance and Maintenance of Instrumentation, Sampling Quality Control, Handling, Storage and Shipping, Quality Assurance Records and Training Program.

### Article 24 Operational radiation protection

The activities of the NRWIS fall within the scope of the Radiation Protection Regulations (PD No.101/2018). All radiation protection measures for the public, the exposed workers and the environment are submitted to EEAE for review and assessment.

More specifically, in PD No. 101/2018 there are the following provisions:

- The principles of optimization and dose limitation are applied (Article 5);

- Measures are taken by the licensee for the protection of members of the public and long-term health protection in normal circumstances (Articles 65-68) and emergency situations (Articles 69-70);
- The license procedure includes, inter alia, an environmental study about the impact of the discharges to the environment taking into account that the effective dose expected to be incurred by a member of the public is of the order of 10  $\mu$ Sv or less in a year (Annex 7 and Article 19 of MD 45872/2019).

In particular, the radiation protection program of the NRWIS submitted to EEAE includes:

- General Principles and Policies;
- Dose limits and Dose Constraints;
- Radiation protection program commitments;
- Activity Work Control, Radiation Work Permits;
- Surveys and Monitoring;
- Exposure Control;
- Monitoring of External/Internal Exposure;
- Control of Radioactive Material;
- Instrumentation;
- Radioactive Waste Management;
- Identification of Waste Streams;
- Clearance Criteria and Methods to Verify Clearance;
- Occupational Safety;
- Physical Security; and
- Emergency Plan.

Article 25      Emergency preparedness

a) Internal emergency plans

According to the legislation, in each facility an internal emergency plan shall be in place in case of a radiological accident or event, which is subjected to regulatory review (Article 97 of the PD No.101/2018). Moreover, in PD No.122/2013 (Article 7.3) it is provided that license holders shall implement measures for the prevention of accidents and for the mitigation of their consequences, in order to protect the workers and the public from significant exposures to radiation.

The emergency plan for the NRWIS facility is based on the assessment of the possible hazards that might arise: (i) during the RW management activities; (ii) in case of fire; (iii) in case of larceny. The assessment consists of tracking and recording the dangers and risks that threaten the safety and health of the personnel, the members of the public and the environment.

b) National emergency plans

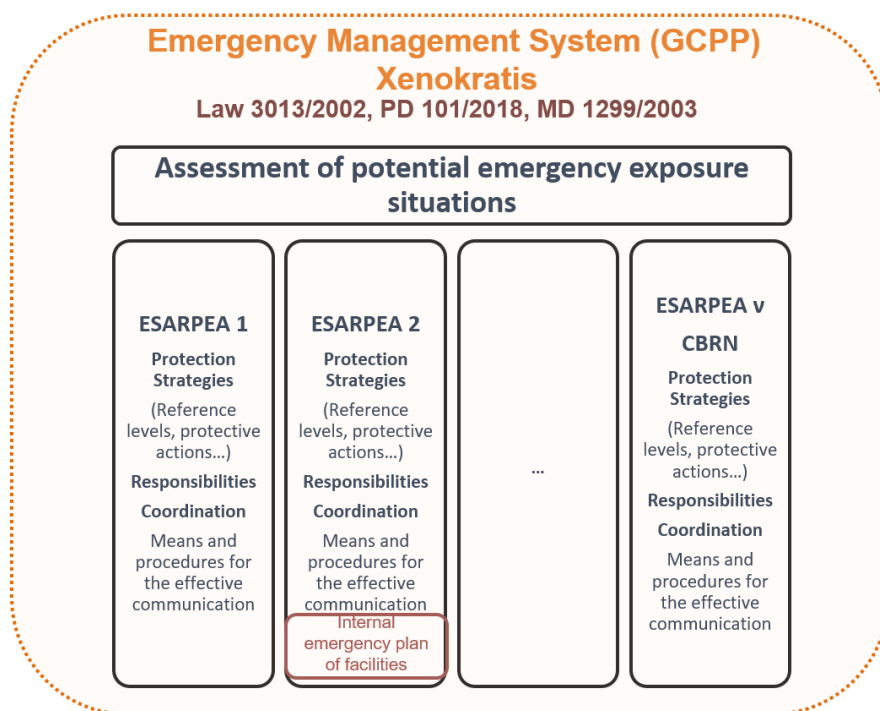
The General Civil Protection, Emergency, Plan (GCPP), under the code name “Xenokratis”, applies to any emergency situation in the Greek territory. It has been revised and re-approved in 2000, after the legislative restructuring of the responsibilities related to facing national disasters of all kinds and the establishment of the General Secretariat of Civil Protection (GSCP). In particular, “Annex R” of GCPP concerns the response to an emergency situation from important and extensive radioactivity contamination due to nuclear accidents taking place outside Greece and is designed

to provide response to accidents involving the release or potential release of radioactive substances.

EEAE is the authority responsible for activating the “Annex R” of GCPP, while the overall management of the emergency response rests with increasing level of responsibility with the following three managing Committees:

- the Staff Office (SO): a three-member committee chaired by the Chairman of EEAE and supported by a properly staffed Information Group;
- the Scientific Committee (SC): a seven-member committee chaired by the Chairman of EEAE, having as main task the assessment of the proposals submitted by the SO and the suggestion to the Ministerial Coordination Board the proper actions and counter measures for the situation in hand;
- inter-Ministerial Coordination Board: is convened in emergency cases according to the provisions of the general emergency plan.

According to PD No.101/2018 a detailed assessment of nuclear and radiation related is performed by EEAE and approved by GSCP (referred to as “ADKEA”), based on the GSR Part 7 methodology. ADKEA is then used for the update of existing or preparation of new emergency response plans (“Special Response Plans in Case of a Radiological or Nuclear Emergency”, referred to as “ESARPEA”). CBRN consists one specific case of ESARPEA. The structure of the GCPP according to the new framework is shown in Figure 2.



**Figure 2. The structure of the General civil protection plan for emergency exposure situations**

Article 26      Decommissioning

The licenses for the various stages of a research reactor lifetime are issued by EEAE or by the Ministry responsible for EEAE, with the agreement of EEAE. More specifically, decommissioning license is issued by the relevant Minister, after EEAE agreement.

Based on the provisions of Article 12 MD P/112/305/2012 decommissioning shall be performed in accordance with the decommissioning program, including measures to ensure the financial resources and analysis of the environmental impact.

GRR-1 is licensed for extended shutdown, with the current license expiring in 2024. According to the documentation submitted for the renewal of the license a decommissioning plan is to be developed in the near future with possible date the end of 2021.

# SECTION G.

## SAFETY OF SPENT FUEL MANAGEMENT

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### Article 4            General safety requirements

As explained previously, Greece has only one research reactor, which is in extended shutdown. There are no plans for a nuclear power program or for additional research reactors. Spent and irradiated fuel from GRR-1 have already been returned to the USA.

### Article 5-9        Existing facilities, Siting of proposed facilities, Design and construction of facilities, Assessment of safety of facilities, operation of facilities

There are not spent fuel management facilities in Greece. It is not foreseen to design or construct any.

### Article 10        Disposal of spent fuel

Based on the provisions of Article 4.1.c of PD No.122/2013 spent fuel from research reactors shall be permanently shipped to a country where research reactor fuels are supplied or manufactured, taking into account applicable international agreements, which must be concluded upon import of the nuclear fuel.

# SECTION H.

## SAFETY OF RADIOACTIVE WASTE MANAGEMENT

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### Article 11 General safety requirements

General Safety Requirements, pertaining in particular to radioactive waste management, are provided in PD No.122/2013 as amended by the PD No.91/2017, MD 131207/2015 and MD P/122/305/2012 as in force. These requirements include the following (the i to vii points correspond to the respective points of Article 11):

- (i) In Article 19 of the MD P/112/305 a safety analysis report is required for the applicants of research nuclear reactor in order to achieve high-level safety, throughout the life-cycle of the facility. The safety analysis report shall include, among others information to ensure that criticality and removal of residual heat generated during fuel management is adequately considered;
- (ii) In Article 4.3a of PD No. 122/2013 it is provided that the national policy shall be based, inter alia, on the fact that the generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials. This is also endorsed in Article 5.7 of MD No.131207/2015, where it is clearly stated that the radioactive waste producer shall take all necessary measures to minimize the volume and activity of the radioactive waste, where reasonably feasible. The measures shall be authorized by EEAE in the context of licensing the relevant practice, activity or facility.
- (iii) Article 4.3b of PD No.122/2013 states that the national policy shall also be based on the interdependencies between all steps in spent fuel and radioactive waste generation and management.
- (iv) In Article 6.1 of PD No.122/2013 it is provided that EEAE shall (a) monitor compliance with the national regulatory framework and (b) ensure the safety standards set by the International Atomic Energy Agency and the European Commission to protect the workers, the general public, the environment and avoid any undue burden on future generations are met. Article 7.2 and 7.3 of the same document state that license holders, under the regulatory control of EEAE, shall regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner.
- (v) In Article 14.e of PD No.122/2013 as amended by PD No.91/2017 it is stressed that the radioactive disposal facility shall be sited, designed and operate with a view to isolating waste from humans and the biosphere for a prolonged period of time (more than 1000 years). To that end, the natural evolution of the facility's natural environment, as well as any potential incidents that may have an impact on the facility, shall be taken into account. Finally, in the same Decree, in Article 22, it is underlined that the natural, chemical or biological methods applied throughout the processing stages of the RW shall be approved by EEAE, as to the justification of their implementation and the optimization of radiation protection measures.

- (vi) In Article 14b of PD No.122/2013 it is provided that the characteristics of the disposal facility and its surroundings, as well as those of the factors affecting safety after closure, must be sufficiently analyzed for a prolonged time period.
- (vii) Article 1.2a of PD No.122/2013 states that the purpose of this Decree is to supplement and expand the existing national legislative, regulatory and organizational framework in order to ensure the responsible and safe management of SF&RW and avoid any undue burden on future generations.

#### Article 12 Existing facilities and past practices

The operation license of the existing NRWIS interim storage facility was last renewed in 2019. Regarding the overall safety of the facility, areas, where further improvements shall be made, have been identified and included in the current license as additional terms such as (a) the assessment of the radiological hazards to the exposed workers and the members of the public in the context of a safety analysis, taking into account the guidance provided in IAEA safety standard WS-G-6.1, Storage of Radioactive Waste, IAEA, 2006 (b) the improvement of the management system and more specifically the clear definition of the responsibilities of the involved personnel (c) improvement of the safety (e.g. enhanced fire protection measures) and physical protection of the facility (e.g. in an integrated security system of the NCSR “Demokritos”) and (d) the complete characterization of the RW and the disused and orphan sources in the facility.

As mentioned previously the safety of the on-site storage of institutional radioactive waste and sources countrywide is evaluated as part of the operation licensing and through inspections.

#### Article 13 Siting of proposed facilities

*(For the responses to Articles 13-15 it should be taken into account that currently, there are no plans for construction of new storage and disposal facilities in Greece).*

In Article 13.3 of PD No.122/2013 it is provided that the SF&RW management facility site shall be evaluated by taking account of all factors and parameters related to the characteristics of the site, such as geological, hydrological, seismic, population, road network considerations, as well as any other characteristics that may affect the safety of the facility and the environment throughout its life-cycle, considering the graded approach. During the evaluation of the facility site, the potential impact of the facility on the population and the environment, under normal conditions and in case of accident, and the applicability of the emergency plan shall also be assessed

Moreover, the following provisions of PD No.122/2013 as amended by PD No.91/2017 address the (i) to (iv) points of Article 13:

- (i) (Article 14.a of PD No.122/2013 as amended by PD No.91/2017) The evaluation of the site of the radioactive disposal facility must be performed in a way that ensures, to the extent possible, safety by means of passive measures and minimize the need for measures and actions after the facility’s closure. (Article 14.c) The selection of the facility site shall be carried out through multiple safety functions.
- (ii) (Article 14.f of PD No.122/2013 as amended by PD No.91/2017) The radioactive waste disposal facility site shall be examined in detail, in order to understand the characteristics of the site and their evolution in time, taking account of the current circumstances, the possible natural evolution and possible natural events, as well as the existing human projects and activities in the region, which may affect the safety of the facility.
- (iii) In Article 10 of No. PD 122/2013 it is underlined that the Minister responsible for EEAE and the jointly competent Ministers shall ensure that the public is given the necessary opportunities to participate effectively in the decision-making process regarding SF&RW management in accordance with national legislation and international obligations. Also, according to the provisions of Article 15.7 of PD

122/2013 as amended by PD 91/2017 the bodies involved in SF&RW shall be obliged to provide the public with necessary information and capacity to substantially participate in decision-taking relating to the management of SF&RW, in accordance with national legislation and international obligations, on condition that this does not endanger public safety.

- (iv) The obligation to provide the public with necessary information and capacity to participate in decision-taking may also cover the case of the public in a neighboring country (see previous point iii). Also, Greece is signatory part of the Espoo Convention and therefore is subject to the general obligation to notify and consult with other States on projects that are likely to have an environmental impact across boundaries.

#### Article 14 Design and construction of facilities

Regarding the design and construction requirements there are the following provisions in Article 13.4 of PD No. 122/2013 as amended by PD No.91/2017:

- The design of the facility shall include multiple, reliable and mutually independent safety levels, as well as barriers (safety mechanisms) to prevent the release of radioactive materials to the environment. The primary objective of the design shall be the prevention of accidents, and in case this occurs, the mitigation of its effects.
- The facility design shall ensure reliable, smooth and manageable operation.
- The facility design shall also systematically take account of the human factor, human-machine interaction and environmental effects.
- The facility design shall include technology proven for its reliability.
- The design shall aim to keep environmental effects and the exposure of the employees and population to radiation to the minimum logically possible, in accordance with the optimization principle, including the application of dose constraints.
- The facility shall be constructed in accordance with the approved design and modifications and the environmental impact assessment.

#### Article 15 Assessment of safety of facilities

Regarding the assessment of facilities in Article 7.3 of PD No. 122/2013 it is noted that as part of the licensing process, applicants for a license are required to demonstrate the safety of the facility and/or activity. This safety demonstration shall cover the development and operation of an activity and the development, operation and decommissioning of a facility or closure of a disposal facility, considering the complexity and size of the facility and/or activity. This process shall ensure safety in the facility or activity during normal operating conditions, potential incidents and accidents.

#### Article 16 Operation of facilities

Regarding the operation of RW facilities there are the following provisions in Article 13.5 of PD No. 122/2013 as amended by PD No.91/2017:

- The operation of the facility shall be carried out in accordance with detailed and explicitly determined operational limits and conditions, including the proper waste reception criteria. The operational limits and conditions shall be updated based on the experience obtained by the operation or on any modifications in the facility.
- The operation, maintenance, modifications and use of the facility shall be carried out by sufficiently trained and/or authorized personnel, based on procedures explicitly determined by the license holder.



- The license holder shall immediately notify EEAE of all incidents relevant to safety and nuclear security, their analysis and all the appropriate corrective actions taken to optimize safety and protection of the employees, population and environment.
- The license holder shall keep a complete and updated record throughout the facility's life-cycle. This record shall include the facility designs and any modifications thereof, maintenance, as well as information important to safety. Moreover, an events file shall be kept.

Moreover, in 13.4(f) of the same Decree it is stated that the facility shall be constructed in accordance with the approved design and modifications and the environmental impact assessment. Regarding the decommissioning, in Article 13.6b it is stated that the operation of the RW facility shall be performed so that the process of the facility's final decommissioning is simplified and the human and financial resources required, and radioactive or other waste produced during the final decommissioning are minimized.

Further requirements exist regarding safety policy and safety culture, management system and recording, emergency plans, management and mitigation of events and accidents, radiation protection and physical protection. Relevant IAEA standards, such as WS-G-6.1, Storage of Radioactive Waste, IAEA, 2006 are also taken into account. The safety of the NRWIS was evaluated taking into account this guidance.

#### Article 17 Institutional measures after closure

The appropriate steps to ensure that after closure of a disposal facility safety is preserved are, among others:

- The closure of the facility shall be performed in a way that guarantees safety by means of passive measures as stated in Article 14.a of PD No.122/2013 as amended by PD No.91/2017;
- The license holder shall keep a complete and updated record throughout the facility's life-cycle. This record shall include the facility designs and any modifications thereof, maintenance, as well as information important to safety as stipulated in Article 13. D of PD No.122/2013 as amended by PD No.91/2017.

It should be taken into account that there are no disposal facilities in Greece.

# SECTION I.

## TRANSBOUNDARY MOVEMENT

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### Article 27      Transboundary movement

Shipment of radioactive waste from Greece to other European countries or to a third country is addressed in PD 83/2010 (147/A/3.10.2010) "Compliance of Greek legislation with Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent nuclear fuel" according to which EEAE shall inform accordingly the EURATOM prior to shipment. Shipment is allowed to countries that have a relevant agreement with EURATOM or they are contracting parties to the Joint Convention and have a national radioactive waste management program and existing management facilities that can handle the type of the shipped waste.

## SECTION J.

# DISUSED SEALED SOURCES

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### Article 28 Disused Sealed Sources

In Greece there are no manufacturers of sealed sources.

All sealed sources are imported. According to Article 87 of PD No. 101/2018, the licensee, in order to import a sealed radioactive source, shall take all the appropriate measures for the safe management of the sources when they become disused, including the foreign supplier's commitment to take the source back the source when it is decommissioned.

Specific measures for the above provisions are described in EEAE Decision 4c/261/2019. According to this document the licensee shall:

- keep the documentation of the sealed source as provided by the manufacturer in accordance with Annex XVI of PD No.101/2018 and especially the certificate of source and certificate of transport container;
- submit to EEAE updated records of the sealed source;
- check uninterruptedly that each sealed source is still located in the appropriate place of use or storage;
- return the sealed source to the manufacturer or supplier or in an approved radioactive management facility before the expiration of the validity of the source certificate or within the term of the contract, regardless if the source is in use or useful for use.

# SECTION K.

## GENERAL EFFORTS TO IMPROVE SAFETY

### **Measures taken to address challenges identified at previous review meeting**

Three challenges were identified for Greece in the previous review meeting. Actions taken to address those challenges are described below.

- Improvements in the format and content of the safety documentation of the interim storage facility: more specifically (a) the security part of the documentation was upgraded with the collaboration with the Committee of Physical Protection of the research center (b) the decommissioning plan of the old part of the building has been drafted (c) the organization chart with the responsibilities and the list of working documents has been updated. The specification of the waste acceptance criteria is still pending;
- Completion of the transposition of the new European Basic Safety Standard Directive: The transposition of the Directive has been completed. A series of legislative documents has been entered into force including a Presidential Decree, 3 Ministerial Decisions, EEAE Decisions and Guidance documents uploaded at EEAE website;
- Implementation of the National Program for radioactive waste and definition of the up-to-end management option for each waste stream: In Section 5 of the second edition of the National Program an initial definition of the waste streams has been performed. More specifically, the existing RW or expected RW to occur in the future are: a) the solid and liquid radioactive waste from GRR-1 past practices (VLLW and LLW); b) material from the decommissioning of the reactor and other facilities like cyclotrons (VLLW, LLW and, maybe a small amount of ILW); c) radioactive material from goods like lightning rods, fire detectors, etc.; d) disused sources and orphan sources that have been collected up to now; e) VSLW from unsealed sources employed in medical, educational and research applications. The most appropriate option for their final management is: engineered near surface disposal facility and/or surface trench for a, b, c; recycling for d; on site storage for decay and release for e.

### **Developments since the last review meeting**

The important developments since the last review meeting can be summarized as follows:

- The national Radiation Protection Regulations have been completely renewed in order to comply with the Euratom Basic Safety Standards Directive (2013/59/Euratom) and to take into account the regulatory experience gained the last 20 years as well as the findings of the international peer reviews;
- The national legislative framework transposing the Nuclear Safety Directive (2009/71/Euratom as amended by 2014/87) has been completed;
- The second version of the National Programme for the management of spent fuel and radioactive waste has been recently entered into force with specific milestones and clear timeframes;
- A detailed assessment of potential emergency exposure situations and associated protection strategies has been completed, based on the GSR Part 7 methodology; Within this assessment it is indicated that even for the worst-case scenario of a big scale fire in the NRWIS with the involvement of the entire quantity of radioactive materials stored in the facility, the estimated effective dose close to the installation was two orders of magnitude

lower than the reference level of 20 mSv, while it does not exceed the value of 1 mSv within the campus of the research center;

- The IRRS follow up mission was successfully completed in 2017. 26 out of 28 recommendations and 9 out of 10 suggestions identified in 2012 have been closed. With the view to continuously improve the safe management of radioactive waste, Greece has invited an Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS mission).

### **Possible areas for improvement**

- The export of 40% of category 1 to 3 disused sources for recycling.

### **Challenges for the future**

- Decision making whether the construction of a disposal facility should be considered at a new site or be based on the extension of the existing storage facility. In either case the combination of engineered near surface disposal with surface trench disposal shall be used;
- Update of existing and preparation of new emergency response plans (“Special Response Plans in Case of a Radiological or Nuclear Emergency”, called “ESARPEA”) within the new regulatory framework.

### **International peer reviews**

- The IRRS follow up mission was successfully completed in 2017. The progress made since the initial mission in 2012 includes, inter alia, the following: (i) the update of the regulatory framework, (ii) the development and implementation of an integrated management system in EEAE (iii) the implementation of the graded approach in the main regulatory function and (iv) the enhancement of the national regulatory framework for the management of radioactive waste.
- The reports of both missions are publicly available.
- An ARTEMIS mission been invited in order to obtain an independent expert opinion and advice on SF&RW management, decommissioning and remediation (the mission is scheduled for 2023).

### **Openness and transparency**

EEAE policy regarding information dissemination is based on the principles of transparency and openness, both towards interested parties and the general public; public information activities are based on a graded approach, taking into consideration the risk involved.

Within its integrated management system EEAE has established communication mechanisms, in order to inform interested parties about its decisions and actions. These mechanisms include:

- official letters to interested parties;
- contacts with representatives of professional unions;
- public consultation process;
- issuing of press releases;
- media relations;
- broad distribution of annual reports;
- uploading of national reports at EEAE website: CNS reports, Joint Convention reports, NSD reports, Radioactive-Waste-Directive reports;

- announcements at EEAE website;
- social media accounts (Facebook, Twitter, Instagram);
- preparation and distribution of information material;
- organization of seminars, workshops, events.

The language mainly used for all kinds of information activities is Greek. However, information is also available in English, since:

- part of EEAE webpage is available both in Greek and English version;
- several information leaflets, including the Annual Report, are also issued in English version;
- announcements via Twitter are often made in both languages.

EEAE notifies the interested parties and the public about the principles and criteria for safety used as the basis for the relevant regulations and guides and makes them available upon request. The safety criteria are available to the public or to whom may be interested, since these documents constitute "public documents". Moreover, a list of the legislative acts is available at EEAE website. Furthermore, EEAE website is designed in such a way to facilitate the interested parties familiarize themselves easily with the licensing procedure and system, the templates to be used, the reports to be submitted and all the relevant information.

In case of new guidance issued by EEAE, this is made widely known by EEAE via:

- official notification of professional associations;
- correspondence with the contact persons at the concerned facilities (e.g. nuclear medicine laboratories);
- organization of information events.

In general, EEAE website is a useful tool for public information and includes: data from the telemetric monitoring stations; data on medical radiation laboratories and reports, such as annual activity reports, radiological incidents reports, external evaluation reports (e.g. IRRS mission report), reports submitted to IAEA (CNS, Joint Convention), licensing documents for GRR-1 etc.

# SECTION L.

## Annexes

### Annex I: Inventory of radioactive waste – October 2020

#### NCSR Demokritos

	NRWIS		GRR1		Decommissioning GRR1		Total NCSR	
	m <sup>3</sup>	MBq	m <sup>3</sup>	MBq	m <sup>3</sup>	MBq	m <sup>3</sup>	MBq
VLLW	12,8	26			13		25,8	26
LLW	8	245	0,2	0,3	1,4		9,6	245,3
ILW	0,01	10000			0,7	600000	0,71	610000
Legacy (objects in 100 drums)	20	1000					20	1000
Legacy (objects in 50 drums)			10	1000			10	1000
Legacy (cemented sludge in 50 drums)	10	50					10	50
VLLW (Liquid)			26	570			26	570
Graphite					5,6		5,6	0
Contaminated Soil Pu	0,3	0					0,3	0
Contaminated plates Pu			0,01	0			0,01	0
Contaminated objects (maintenance, house-keeping)			1	50			1	50
Consumer Products (lightning rods)	0,4	8000					0,4	8000
Consumer Products (smoke detectors)	0,2	405					0,2	405
Consumer Products (Vehicle Instr., Lamps, depU blocks)	0,5	500					0,5	500
<b>TOTAL NCSR</b>	<b>52,21</b>	<b>20226</b>	<b>37,21</b>	<b>1620,3</b>	<b>20,7</b>	<b>600000</b>	<b>110,12</b>	<b>621846,3</b>

#### On site storage at facilities

	m <sup>3</sup>	MBq
Contaminated Ash	75	10000
Objects contaminated with NORM	100	2500
Consumer Products (lightning rods)	1,9	28300
Consumer Products (Vehicle Instr., Lamps)	1	500

#### Disused sources (DSRS)

	NRWIS	Facilities
	Number of DSRS	
Category 1		3
Category 2	1	
Category 3	56	4
Category 4	15	57
Category 5	312	210

## Annex II: Overview matrix

Type of Liability	Long term management policy	Funding of Liabilities	Current practice/ Facilities	Planned facilities
Spent Fuel	N/A	N/A	N/A	N/A
Nuclear Fuel Cycle Waste	N/A	N/A	N/A	N/A
Non-power waste	On site storage, decay and release for short live waste. Longer lived waste are stored until final management solution.	Licensee, Government	On site storage, decay and release for short lived waste. Longer lived waste are stored until final management solution	National RW Interim Storage and Management Facility Options for disposal facility to be investigated
Decommissioning Liabilities	Decommissioning waste stream included in the national program waste streams.	Licensee, Government	Decommissioning plan is required in the national regulatory framework	No plans have been submitted yet
Disused Sealed Sources	Return to the manufacturer. Recycling.	Licensee, Government	Return to the manufacturer. Orphan sources are stored in NRWIS	National RW Interim Storage and Management Facility Options for disposal facility to be investigated
Mining & Milling waste	N/A	N/A	N/A	N/A



## List of abbreviations

ADKEA	Assessment of nuclear and radiation related threads
EEAE	Greek Atomic Energy Commission
ESARPEA	Special Response Plans in Case of a Radiological or Nuclear Emergency
EW	Exempted Waste
GCPP	General Civil Protection, <i>Emergency</i> , Plan
GSCP	General Secretariat of Civil Protection
GRR-1	Greek Research Reactor. The only one research reactor in Greece, owned by NCSR “Demokritos”.
ILW	Intermediate Level Waste
INRASTES	Institute of Nuclear and Radiological Sciences & Technology, Energy & Safety of the NCSR “Demokritos”.
LLW	Low Level Waste
LRMM	Laboratory for Radioactive Material Management of INRASTES
MD	Ministerial Decision
NCSR “Demokritos”	National Center for Scientific Research “Demokritos”
NRWIS	New Radioactive Waste Interim Storage
PD	Presidential Decree
RW	Radioactive Waste
SF&RW	Spent Fuel and Radioactive Waste
VLLW	Very Low Level Waste
VSLW	Very Short Lived Waste

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