

## **GREEK ATOMIC ENERGY COMMISSION**

**Report of Greece on the implementation of Council  
Directive 2009/71/Euratom of 25 June 2009  
establishing a Community framework for the nuclear  
safety of nuclear installations, as amended by the  
Council Directive 2014/87/Euratom of 8 July 2014**

**July 2020**

# Table of Contents

A. Introduction .....	3
B. Abbreviations .....	4
C. Reporting article by article .....	5
Article 4 – Legislative, regulatory and organizational framework .....	5
Article 5 – Competent regulatory authority .....	9
Article 6 – Licence holders.....	14
Article 7 – Expertise and skills in nuclear safety.....	17
Article 8 – Transparency.....	17
Article 8a: Nuclear safety objective for nuclear installations.....	20
Article 8b: Implementation of the nuclear safety objective for nuclear installations .....	21
Article 8c: Initial assessment and periodic safety reviews .....	22
Article 8d: On-site emergency preparedness and response .....	23
Article 8e: Peer reviews.....	24

# A. Introduction

Greece has no nuclear power plants and no intention to build any in the foreseeable future. A nuclear research reactor exists (licensed for extended shutdown), as well as two sub-critical assemblies for research and educational purposes (one fully dismantled and one in operation).

The research reactor (GRR-1) is situated within the premises of the National Centre for Scientific Research (NCSR) "Demokritos". The reactor is out of operation. All used HEU fuel elements were returned to USA in 2005, following the terms of fuel purchase agreement between the U.S. Department of Energy and the Greek Government. Moreover, all used LEU fuel elements have been repatriated to USA since February 2019. The current licence granted to GRR-1 for extended shutdown is due to renewal in October 2024. The hazards associated with the reactor are considered to be substantially less, in comparison with those of a research reactor in operational state. Safety assessment within the licensing and regulatory supervision of the reactor is currently focused on radiation protection of the reactor staff.

Regarding the sub critical assemblies the one is located at the National Technical University of Athens and is dismantled (fuel is under secure in-situ storage); the other assembly is located at the Aristotle University of Thessaloniki and used for educational purposes.

The transposition of the Council Directive 2009/71/Euratom of 25 June 2009 has been effectuated by the Presidential Decree 60/2012 (Government Gazette Folio No. 111/A/03.05.2012). Following the provisions of the Presidential Decree the Ministerial Decision P/112/305/2012 (Government Gazette Folio No. 2877/B/26.10.2012) has been issued and later amended by the Ministerial Decision No. 91175/2017 (Government Gazette Folio No. 1991/B/09.06.2017) transposing also the Council Directive 2014/87/Euratom of 8 July 2014.

The present report has been prepared according to the ENSREG Guidelines regarding Member States' reports, as required under Article 9.1 of Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations, as amended by the Council Directive 2014/87/Euratom of 8 July 2014 (HLG\_M(2019-38)\_429).

# B. Abbreviations

EC: European Commission

ECURIE: European Community Urgent Radiological Information Exchange

EEAE: Greek Atomic Energy Commission

ESARPEA: Special Response Plans in case of a Radiological or Nuclear Emergency

EUTERP: EUropean Radiological Data Exchange Platform

GRR-1: Research reactor

HEU: Highly enriched uranium fuel

IAEA: International Atomic Energy Agency

IMS: Integrated Management System

IRRS: Integrated Regulatory Review Service

LEU: Low enriched uranium fuel

MD: Ministerial Decree

NCSR “Demokritos”: National Centre for Scientific Research (NCSR) “Demokritos”

PD: Presidential Decree

RPR: Radiation Protection Regulations

USIE: Unified System for Information Exchange in Incidents and Emergencies

# C. Reporting article by article

## Article 4 – Legislative, regulatory and organizational framework

The Greek legislative and regulatory framework for nuclear safety is listed below.

- 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. 610/1978, 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 not to implement a nuclear power programme to generate nuclear electricity. Therefore, the above two pieces of legislation have never been used and can be considered as archival.*

- 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 (*herein after referred as PD60*);
- Ministerial Decision No. P/112/305/2012, Basic requirements – principles of nuclear safety and regulatory supervision of nuclear research reactors, Government Gazette Folio No. 2877/B/26.10.2012 (*herein after referred as MD305*);
- Ministerial Decision No. 91175/2017, Amendment of Decision No. P/112/305/2012 (B 2877 / 26.10.2012) “Basic requirements – principles of nuclear safety and regulatory supervision of nuclear research reactors” transposition of the Council Directive 2014/87/ Euratom of 8 July-2014 amending Directive 2009/71/Euratom of 25 June 2009, Government Gazette Folio No. 1991/B/09.06.2017 (*herein after referred as MD305\_amd*).

The main pieces of legislation with regard to radiation protection (radiation protection regulations RPR) implemented in nuclear installations include the following:

- 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 (*herein after referred as PD101*);
- 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;

- 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. 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.

Moreover, the framework for the establishment of the regulatory authority includes the following:

- 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.

In addition, EEAE issues guidelines to facilitate compliance with the radiation protection and nuclear safety regulatory framework. The guidelines are published at EEAE website.

Finally, Greece has ratified the Convention for Nuclear Safety in 1997 and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management in 2000. Since then Greece fully fulfills its obligations by reporting and participating in all review meetings.

#### Article 4.1(a)

The PD60 provides for the general legislative, regulatory and organizational framework for nuclear safety of nuclear installations. In PD60 general nuclear safety principles are provided and the responsibilities are allocated to the regulatory authority (EEAE) and the licence holder. Following PD60, the MD305 was issued to provide for more specific nuclear safety requirements and principles and regulatory control for research reactors in compliance with the IAEA NS-R-4 “Safety of Research Reactors: safety requirements”, Vienna, IAEA, 2005. MD305 was amended by the MD No. 91175/2017 (MD305\_amd) for the transposition of the Directive 2014/87/Euratom (Nuclear Safety Directive). Other radiation protection requirements, including dose limits for public and occupational exposure, are provided in the RPR following the European Basic Safety Standards Directive 2013/59/Euratom.

The Minister competent for EEAE, as provided in article 4.1 of PD60, is responsible for the coordination between the relevant state bodies.

In PD60 it is explicitly stated that the licensee holds the prime responsibility for the nuclear safety of the research reactor.

The licences 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,

construction and decommissioning licences are issued by the relevant Minister, after EEAE agreement. Commissioning, operation and extended shutdown licences are issued by EEAE.

The existing GRR-1 is covered by transitional provisions in chapter 4, article 24, of the MD305. After an application by the operator, EEAE granted a licence in 2014 for extended shutdown of the GRR-1, according to the requirements of article 17.1 of MD305, which was renewed in 2016 and later in 2019. In case the licence holder decides the re-activation of the refurbishment project and the re-operation of the reactor, a licensing procedure similar to that of construction of a new reactor shall be followed (articles 17.2 and 24.3 of MD305 as amended by MD305\_amd), including assessment of all nuclear safety aspects and approval of the works for the refurbishment. Fuel loading in the reactor core is allowed only after the refurbishment or reconstruction works licensing and approval of the commissioning program.

#### Article 4.1(b)

The safety requirements regarding the responsibility of the licence holder, the nuclear safety management, the evaluation and verification of safety and the radiation protection (with reference to the RPR) are specified in chapter 2 of the MD305, as amended by MD305\_amd and cover all life stages of research reactors including the following:

- siting evaluation;
- design and construction;
- commissioning, operation;
- maintenance modification and utilization;
- extended shutdown;
- decommissioning and
- waste management.

#### Article 4.1(c)

In article 4.1a of PD60 it is stated that EEAE is responsible for the licensing for nuclear installations and for the prohibition of operation without a licence. Moreover, following article 4.1c of PD60 EEAE is responsible to suggest actions to enforce the legislative requirements, including suspension of operation and amendment or revocation of a licence. To fulfill its responsibility, EEAE is provided with unrestricted access to any place and documentation of a nuclear installation.

More specific information about the licensing process and system and licensed activities and the renewal is given in MD305 as amended by MD305\_amd. In chapter 4 (articles 14-18) the licensing procedure for the various stages of a nuclear installation is covered. In article 19 of MD305, as amended by MD305\_amd, the details about the safety analysis report submitted by the licence holder are described. The safety analysis report shall demonstrate thoroughly the achievement of a high level of safety, including data for:

- nuclear safety management

- nuclear safety evaluation and verification
- human health and environmental protection
- evaluation of the facility site
- design and construction
- commissioning programme
- operational limits and conditions
- decommissioning programme
- management of radioactive residues throughout the life-cycle of the facility.

The validity of the establishment permit, the operating licence and the extended shutdown authorization may not exceed 3, 10 and 5 years, respectively.

For the renewal process, the licence holder shall submit a relevant application at least one year prior to their expiry. The licence renewal procedure shall be the same as the licensing procedure, as determined, based on the stage of the nuclear installation. The licence holder shall submit the information required, to the extent that this has changed.

Article 4.1(d)

Based on the provision of article 22 of MD305 EEAE is entitled to perform regular and non-routine checks and inspections in the facility, which may or may not be announced to the licence holder, to ensure compliance with the requirements and with the terms of the licences. The findings of the inspections, including any recommendations or requirements for improving the nuclear safety of the facility, are recorded in inspection reports, which are notified to the licence holder and to all interested parties with a legitimate interest.

In practice the inspection program for the research reactor includes a frequency of at least once a year. The program takes into account the current licence for the extended shutdown phase

EEAE is also entitled, if there are non-conformities with the safety requirements to amend, suspend or revoke the applicable licence or make an appropriate recommendation to the competent Minister if the licence has been granted by ministerial decision. The issue of new licences or authorisations shall follow the procedures described in the reporting section for Article 4.1 (c) of the Directive.

Moreover, in article 23 of the MD305 as amended by MD305\_amd the findings of EEAE from the evaluation of the nuclear safety of the research nuclear reactor during the licensing procedure shall be recorded and substantiated, with clear and specific references made to the specific safety requirements, in safety evaluation reports.

Article 4.1(e)

EEAE is entitled to take effective and proportionate enforcement actions, including, suspension of operation and modification or revocation of a licence based on the provisions of PD60 article 4.1c. Moreover, Law 4310/2014 article 46 provides for

reinforced inspections and enforcement functions, namely administrative penalties and fines, criminal sanctions and fines and civil claims. Moreover, graded approach is applied since the type and severity of the sanction is proportional to the seriousness of the offense.

#### Article 4.2

According to PD60 (article 4.2), EEAE is responsible for the improvement of the national framework, taking into account operating experience and experience gained from safety analyses for the operation of the nuclear installations, the development of technology and results of relevant safety research.

One example relevant to the improvement of the national framework is the self-assessment procedure of the framework before the Integrated Regulatory Review Service (IRRS) missions took place in Greece as well as the missions themselves. The SWOT analysis reports of the self-assessments and the report of the missions (initial IRRS in 2012 and IRRS Follow up in 2017) were used as an opportunity to improve the legislative framework and its implementation.

Following the IRRS mission results an ARTEMIS mission has been invited in Greece 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).

### **Article 5 – Competent regulatory authority**

#### Article 5.1

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 organizational structure of EEAE is described in PD404 (Government Gazette Folio No. 173, First issue, October 5, 1993 "Organization of the Greek Atomic Energy Commission"). However, a new Presidential Decree on the internal organization of EEAE is in the course of governmental approval.

The responsibilities of EEAE in the field of nuclear safety of nuclear installations are further analysed in chapter 2 of PD60, and in particular in articles 4, 5 and 8. As stated in these articles, EEAE is responsible for:

- introducing or issuing pieces of legislation;
- the implementation of the licensing system and the prohibition of operation without a licence;
- the implementation of regulatory supervision system;
- proposing actions for enforcement;
- proposing actions for maintenance and improvement of the national framework for nuclear safety;
- proposing new or complementary regulations and issuing guidelines, instructions and explanatory circulars;
- requiring from the licence holder the demonstration of safety;
- providing information to the public in the field of its competence;
- providing education and training to workers in the fields of radiation protection, nuclear safety and security.

Moreover, EEAE participation in the "General Civil Protection Plan" entails responsibilities for the prevention, preparedness and response to radiological emergencies. EEAE participates also in the "National Emergency Plan for Nuclear, Radiological, Biological and Chemical Threats" (CBRN).

#### Article 5.2(a)

In the article 5.2b of PD60 it is clearly stated that EEAE shall be functionally separated from any other body or organization concerned with the promotion, or utilization of nuclear energy, including electricity production. Moreover, the IRRS Team concluded in 2012 that EEAE is effectively independent and has functional separation from entities having responsibility or interests that could unduly influence its decision making.

To be more specific about the position of EEAE in Greek organizational system, it is mentioned that EEAE is an autonomous organization governed by a seven-member Board appointed by the Minister of Development and Investments. The Board has the authority to take regulatory decisions independently from the Ministry; this status applies also to the licensing of nuclear facilities which belong to the same Ministry with NCSR “Demokritos” research centre.

Moreover, within the Integrated Management System (IMS) implemented in EEAE there are requirements to submit a Statement of Interest to identify any conflict of interests that would affect the impartiality of the EEAE decisions.

For issues of independence, impartiality and integrity, all EEAE staff is committed to the requirements of the Civil Service Code. The Civil Service Code requires civil servants to have only one employment. No staff of EEAE is simultaneously occupationally involved in activities relevant to EEAE regulatory responsibilities. The same holds for the members of the Board, although the members of the Board are not employed by EEAE, since the Law does not foresee any stipend for the EEAE Board members (stipend is only possible for the Chairman of the Board). In any case there are specific provisions for the resolution of issues of impartiality and conflicts of interest in Law 2690/1999 (article 7).

#### Article 5.2(b)

EEAE evaluates the nuclear safety of research nuclear reactors on the basis of the requirements laid down in the respective pieces of legislation described in reporting for Article 4 of the Directive. EEAE policy regarding transparency is based on the principles of openness towards interested parties and the general public. EEAE has both formal and informal mechanisms of communication, including meetings, web-based information and public consultation, as appropriate. As a public entity, EEAE is obliged to follow official procedures of communication with all interested parties and the general public (see also reporting for Article 8 of the Directive).

#### Article 5.2(c)

In article 5.2a of PD60 it is stated that EEAE as competent regulatory authority has legal powers and human and financial resources necessary to fulfill its responsibilities.

EEAE financial resources are covered by the governmental budget, as well as by licensing fees, funded projects and provision of technical services. An annual financial audit is performed by certified auditors. 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 following year, are published on EEAE website and submitted to the President of the Hellenic Parliament and the competent Minister as part of the Annual Report.

#### Article 5.2(d)

EEAE employs a sufficient number of qualified and competent staff (74) 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 education & training and R & D activities and the participation in scientific networks is encouraged in order to gain the knowledge and experience required to successfully fulfill their tasks.

As stipulated in the reporting for Article 5.2(a) an Integrated Management System (IMS) is implemented within EEAE. The implemented IMS is based on IAEA GSR Part 2 and certified in terms of ISO 9001:2015. Within this system:

- the process concerning the training program of EEAE personnel is included;
- in Q4 of each year, the heads of the departments draft the training needs, which are then discussed with and approved by the EEAE senior management;
- the approved annual training programme is uploaded in the IMS fileserver and its implementation is monitored by the manager looking after education & training;
- an On-the-Job-Training programme for the EEAE new inspectors is also set-up and implemented within the IMS.

#### Article 5.2(e)

As already reported for Article 5.2(a) of the Directive all EEAE staff is committed to the requirements of the Civil Service Code. The Civil Service Code requires civil servants to have only one employment. No staff of EEAE is simultaneously involved in employments relevant to EEAE activities. Moreover, within the IMS that is implemented in EEAE there are requirements to submit a Statement of Interest to identify any conflict of interests that would affect the impartiality of the EEAE decisions. These statements of interest are stricter in case of inspectors since the inspection process is also accredited in terms of ISO 17020:2012.

Furthermore, the new organizational chart for EEAE assures the required effective independence and separation among the technical services and the regulatory function. More specifically, the regulatory functions shall be conducted by the Division of Licensing and Regulatory Inspections while the provision of technical services, exclusively by the Division of Training, Regulatory Planning, Infrastructure and Research.

Although this new PD is not yet formally promulgated, its rationale is implemented to the extent possible in EEAE day to day function, via the practical assignment of responsibilities and signature rights, regarding the technical services and regulatory tasks, as specified in a relevant EEAE decision published in the Government Gazette in 2016.

#### Article 5.2(f)

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 processes;
- issuing of press releases;
- broad distribution of annual reports;

- uploading of national reports at EEAE website: CNS reports, Joint Convention reports, NSD reports, Radioactive-Waste-Directive reports;
- uploading at the website the operating licences (without prejudice to security-related elements of the licence).

Moreover, there is a governmental platform, called “DIAVGIA”, where all the licence documents are uploaded (without, again, prejudice to security-related elements of the licence).

#### Article 5.3(a)

Based on the provisions of PD60 (article 5.3) EEAE is responsible for proposing new or supplementary regulations and issuing guidelines, instructions and guidance document for the purpose of implementation of the provisions of the legislative framework. The proposals and the guidelines are based on scientific data and relevant guidance, of both the European Commission and the International Atomic Energy Agency.

#### Article 5.3(b)

According to article 5.4 of PD60, EEAE is responsible for the regulatory supervision of nuclear installations. To fulfill its responsibility, EEAE is provided with unrestricted access to any place and documentation of any nuclear installation. In article 22 of MD305 it is provided that EEAE has the authority for announced or unannounced inspections in research reactors, in order to verify the compliance of the licence holder with the safety requirements and the licence terms and conditions. EEAE, in case of incompliance, has the authority to modify, revoke or suspend the licence that has been issued or to make appropriate proposals, in case of a licence issued by the Minister.

#### Article 5.3(c)

In addition to the reporting for Article 5.3b of the Directive it is also mentioned that EEAE, as stipulated in article 23.1 of MD305, is the competent authority for assessing the safety of research reactors. Whenever EEAE deems, it has the authority to require any information and clarification, including information concerning contractors. No restriction is allowed regarding the provision of information to EEAE (article 23.4 of the MD305). In addition, EEAE has the authority to require from the licence holder improvements, modifications or to take measures, in case of incompliance with the safety requirements or the terms of the licence (article 23.5 of MD305).

In particular for the current state (extended shutdown) of GRR-1, an applicable safety analysis is required to be submitted to EEAE (article 17 of MD305). NCSR “Demokritos”, after a request by EEAE, submitted important chapters of the safety analysis report of the reactor, updated to the present state. Specific issues for further compliance have been posed to GRR-1, in the form of conditions included in the extended shutdown licence. Compliance with the conditions are investigated through EEAE inspections.

#### Article 5.3(d)

Please see reporting for Article 4.1(e) of the Directive.

## **Article 6 – Licence holders**

### Article 6(a)

In article 6.1 of PD60 it is explicitly stated that the prime responsibility for nuclear safety of a nuclear installation rests with the licence holder and that this responsibility cannot be delegated.

Moreover, in article 3 of MD305 as amended by MD305\_amd it is again stated that the licence holder shall have the prime responsibility for the nuclear safety of research nuclear reactors, in particular for ensuring, complying with and implementing, throughout the stages of the facility's life cycle, the safety objectives and the basic nuclear safety principles in accordance with national and EU legislation, as well as the applicable IAEA safety standards. Furthermore, it is stated that this responsibility shall also cover the activities carried out by contractors and subcontractors which may have an impact on the nuclear safety of a nuclear installation.

### Article 6(b)

Please see reporting for Article 4.1(c) of the Directive.

### Article 6(c)

Based on the provisions of article 5 of MD305 as amended by MD305\_amd the licence holder shall evaluate the safety of the research nuclear reactor in a systematic and thorough manner, prior to its construction and commissioning, as well as before any major change to its use or modification. The safety evaluation shall be sufficiently documented in safety analysis report and shall include all stages of the facility's life-cycle, also considering the effects of its ageing.

The safety evaluation and safety analysis report shall be updated periodically, if necessary, taking account of the experience gained from the operation, changes or new knowledge of the specific characteristics of the location and of the facility, international experience and developments in research and technology.

The safety re-evaluation aims to ensure compliance with the existing design basis and detect where there is room for further safety improvement, taking into account the age of the facility, the experience gained during operation and the latest research results and developments in terms of international standards.

In the case of a research nuclear reactor in particular, a re-evaluation shall be carried out at least every ten (10) years.

The safety level of the facility shall be verified through analysis, supervision, controls and inspections, to ensure that this level is maintained throughout all the stages of the facility's life-cycle, in line with the planning, safety analysis, operational limits and conditions, and safety requirements

In particular for the current state (extended shutdown) of GRR-1, an applicable safety analysis is required to be submitted to EEAE (article 17 of MD305). The operator (NCSR "Demokritos") has submitted the updated to the present state chapters regarding radiation protection and conduct of operation, as well as the program for the current surveillance, maintenance and physical protection.

#### Article 6(d)

The national legislation gives due priority to safety in relation to radiation involving activities, including research reactors.

For the research reactor, relevant requirements are explicitly provided in article 4 of the MD305, as amended by the MD205\_amd. Safety culture is strengthened through, inter alia, a management system that prioritizes nuclear safety at all levels of staff, including managers, and promotes the effective implementation of the principles concerned. More specifically, the following are applicable in all stages of the research reactor lifetime:

- policy for the management of research reactors that gives to safety high priority and promotes safety culture, through the appropriate organizational structure;
- quality management system;
- internal safety committee, independent from the reactor manager;
- lifelong learning of the reactor staff with duties connected to safety;
- due consideration of human factors;
- defense in depth concept applied to the design of the research reactor and
- systematic operator safety self-assessment.

EEAE evaluates the nuclear safety of research nuclear reactor on the basis of the requirements laid down in the legislative documents.

The organizational structure of GRR-1 is similar to that of the research reactors worldwide and follows the guidance provided in US NRC and IAEA standards. It includes a safety committee, with responsibility to assess the safety analysis report and the technical specification of the reactor, to make recommendations for actions in important occurrences, to approve the quality assurance programs, to review the physical protection program and the emergency and to review any significant changes in the reactor. Radiation protection of the reactor staff is the prime safety consideration in the current phase of the reactor. The reactor organizational chart includes a health physics committee, responsible for radiation protection, which participates in the evaluation and control of the potential hazards of the various tasks involving radioactive or contaminated material.

The commitment from the licence holder that all operations and experiments in the facility are planned and conducted in such a way that occupational exposure is kept as low as reasonably achievable, is included in the safety reports submitted for the extended shutdown licence.

#### Article 6(e)

In the current legislative framework it is explicitly stated that all licence holders, including GRR-1, shall establish an emergency management system (commensurate with the practices carried out in the facilities), including internal emergency response plans (at facility level with links, where appropriate, to the external plan) and shall report to EEAE any abnormal event immediately.

Safety requirements for prevention of accidents and mitigation of their consequences are provided in MD305. More specifically, in article 4.6 of MD305 as amended by MD305\_amd, it is stated that a plan shall be prepared for preventing and responding to emergencies in the installation, taking due account of the defense-in-depth principle, with organizational infrastructure for readiness for and response to emergencies within the facilities, with clear allocation of duties and coordination between the licence holder and the competent emergency response organizations, taking into account all the phases of an emergency, in accordance with the radiation protection regulations. The emergency plan shall be updated according to the stage of the facility's life-cycle, as well as other factors that take account of changes or new knowledge. A high level of readiness to implement the emergency plan shall be maintained through, among others, the execution of appropriate drills. In article 4.7 of MD305 it is required for the licence holder to establish procedures for managing foreseeable emergencies and responding to incidents or accidents. With regard to the design of a research reactor, article 8 of the MD305 as amended by MD305\_amd refers to the requirement for multiple barriers for preventing radioactivity release (defense in depth). It is also provided that the prime objective of the design of a research reactor shall be the prevention of an accident and the mitigation of its consequences.

EEAE has adopted the IAEA safety guide for assessment of the safety of research reactors (*Safety Assessments of Research Reactors and Preparation of the Safety Analysis Report, Specific Safety Guide, SSG-20, IAEA, 2012*) and US NRC guidance (*Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, NUREG-1537, US NRC*). These guides are not legally binding, though, the licence holder is encouraged to follow the format and content of the above guides.

GRR-1 in its current state (extended shutdown, fuel removed from the core) presents substantially less radiological hazards than a reactor in full operation. Since there is no nuclear fuel in the core or in wet storage no risks in relation to sub-criticality are expected. As it concerns the emergency plan of the reactor, EEAE has requested from the licence holder to update the plan, taking into account the current state of the reactor.

#### Article 6(f)

The requirement regarding the responsibility of licence holders of nuclear installations to maintain adequate human and financial resources is provided in article 6.5 of PD60. This requirement is further addressed in MD305 for research reactors, where it is stated that adequate number of trained and competent personnel shall be involved at all stages of the reactor lifetime (article 4.3 of MD305 as amended by MD305\_amd). Moreover, in article 4.4 of MD305, it is stated that adequate financial resources shall also be provided for the lifetime of the reactor.

Regarding radiation protection, there are provisions in RPR for the requirement of properly educated and trained staff. The mechanisms and the criteria for the recognition and approval of experts engaged in facilities and activities is addressed in the new RPR (MD 45872/2019). The provision of training and information shall be repeated at appropriate intervals and documented.

The number of the personnel of GRR-1 has decreased since the period of operation. However, the current staff is adequate for the surveillance and maintenance of the reactor in its current state. Additional information has been requested to be submitted to EEAE, regarding the qualifications and training of the personnel responsible for radiation protection.

Regarding the human resources for contractors and subcontractors in article 4.3 of the MD305 amended by MD305\_amd it is provided that contractors and subcontractors whose activities might affect the nuclear safety of a nuclear installation shall have at their disposal the required adequately qualified and skilled human resources to perform their obligations.

## **Article 7 – Expertise and skills in nuclear safety**

Article 7 of the PD60 provides for the maintenance and further development of expertise and skills of everyone having responsibilities relating to the nuclear safety of nuclear installations and this affects both EEAE and licence holders.

### Regulatory authority

As provided in article 5.2(a) of PD60 EEAE shall have the human and financial resources required to fulfill its responsibilities in relation to nuclear safety. EEAE employs a sufficient number of qualified and competent staff to carry out its functions and discharge its responsibilities, commensurate with the nature and number of facilities and activities to be regulated. EEAE personnel participate in several working groups and committees at national, European and international level. For example, in order to strengthen EEAE nuclear safety expertise, a two-month on-the-job training of EEAE staff to USA NRC research reactor branch has been effectuated in 2013, in the framework of the existing arrangement between EEAE and US NRC for the exchange of technical information and cooperation in nuclear safety matters. The continuous training of EEAE personnel and the training needs are determined and recorded in EEAE IMS as part of a specific procedure.

### Licence holders

Specific requirements regarding expertise and skills of research reactor staff are included in the legislation (see reporting for Article 6(f) of the Directive). Moreover, as provided in article 4.9 of MD305, a specialized radiation protection service shall exist in a research reactor. Furthermore, as stipulated in article 10.2 of MD305, operation, maintenance, modification and utilization of a research reactor shall be made only by adequately trained and/or licensed staff.

Most of the current staff of GRR-1 has gained experience and training from the past operation of the reactor. GRR-1 personnel makes efforts to participate in European and international meetings and forums, regarding the safety of research reactor, in order to maintain and improve its current expertise. Also, GRR-1 personnel carries out scientific work in nuclear safety which is published in recognized scientific journals.

## **Article 8 – Transparency**

### Article 8.1(a)

In article 8 of PD60 the obligation of EEAE to provide information on nuclear safety issues to the workers and the public is established.

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 IMS 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 sometimes 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);
- organisation 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.

#### Article 8.1(b)

##### Regulatory authority

EEAE policy is to upload information about all the incidents and accidents in all exposure situations (including nuclear safety) on its website. A dedicated part on the webpage is designed as such to include in an anonymous way the information of such events. For radiological issues regarding occupational and public exposure there are provisions in article 96 of PD101. In this framework licence holders are asked to perform an analysis of the incidents or accidents and submit it to EEAE. Having received the relevant data EEAE uploads a summary about the event.

In case of an emergency, according to RPR, EEAE is responsible to provide information through appropriate channels to the public based on the integrated governmental emergency system (articles 69, 70, 71 and 97 of PD101).

More specifically, EEAE is responsible that the public is given the required information about ionizing radiation, the risks involved and the measures generally taken in emergency situations, and about the health protection measures applicable to those members likely to be affected in the event of an emergency.

The procedures for informing these members of the public that are actually affected by an emergency situation, the steps to be taken and the appropriate health protection measures applicable, as well as the related competences of the involved bodies are specified in the Special Response Plans in case of a Radiological or Nuclear Emergency (herein after ESARPEA).

Depending on the demand from the public for information, EEAE adopts a range of tools to ensure broad dissemination and transparency. These include press releases and individual responses to media, press conferences and interviews. Real time environmental radioactivity monitoring data (telemetric network) are available through EEAE website during emergencies. A link to EURDEP is also provided.

Finally, it is underlined that EEAE is also the contact point for receiving and communicating information to the IAEA and EC emergency-response systems (USIE and ECURIE respectively), organizes emergency response drills and participates in international exercises. EEAE participates in the IAEA "Incident reporting system for research reactors" and the "Incidents and trafficking database" (ITDB). In addition, EEAE has concluded provisions on a bilateral basis for early notification with Bulgaria and Romania.

##### Licence holder

In article 10.3 of the MD305 amended by MD305\_amd there is requirement for the licence holder to notify EEAE and the facility workers about all incidents or accidents, their analysis and all the appropriate corrective action taken to optimize safety and protection. Information on the normal operation of the installation and a short description of the

incidents or accidents and of the corrective action shall also be made publicly available electronically on a website.

Moreover, within the integrated management system of the licence holder it is provided that the policy governing the management and administration of nuclear research reactors shall give top priority to nuclear safety and promote the safety culture. This policy shall be implemented through appropriate lines of communication.

#### Article 8.2

As it is provided in Law 4310/2014 EEAE ensures the provision of adequate information to the members of the public and workers on issues related to its competence by implementing the principle of transparency and taking into account the international best practices. The information is provided in accordance with national legislation and obligations, provided it does not jeopardise other overriding interests, which are recognized in national legislation or in international obligations of the country, such as, inter alia, public order and security.

Regarding the licence holder provision of information please see reporting for Article 8.1(b) of the Directive.

#### Article 8.3

Based on the provision of article 99 of PD101 the Ministry of Foreign affairs, in cooperation with the Ministry competent for EEAE and after EEAE's suggestion, cooperates with other Member States and with third countries in addressing possible emergencies on Greek territory which may affect other Member States or third countries, in order to facilitate the organisation of radiological protection in those Member States or third countries.

Greece has concluded provisions on a bilateral basis for early notification with Bulgaria and Romania.

#### Article 8.4

Based on the provisions of article 23.3 of MD305 as amended by MD305\_amd in case of an establishment, construction, commissioning, operating and decommissioning permit, the evaluation reports shall be put to consultation on EEAE's website and notified by EEAE to the competent Region. The feedback from the Region, the parties concerned and the public shall be submitted to EEAE, in writing or electronically, for evaluation within thirty (30) days.

### **Article 8a: Nuclear safety objective for nuclear installations**

#### Article 8a(1a-b)

Based on the provisions of article 3.2 of MD305 as amended by MD305\_amd the research nuclear reactors shall be designed, sited, constructed, commissioned, operated and decommissioned with the objective of preventing accidents and, should an accident occur, mitigating its consequences and avoiding:

- (i) early radioactive releases that would require off-site emergency measures but with insufficient time to implement them;

- (ii) large radioactive releases that would require protective measures that could not be limited in area or time.

The above nuclear safety objective is achieved if safety analysis demonstrates that the effective dose in any member of the public due to the maximum possible accident, taking into account all routes of exposure, does not exceed 1 mSv in the first year after the accident, without taking protective measures.

Article 8a(2a)

No construction licence has been granted for the first time after 14 August 2014.

Article 8a(2b)

Based on the provisions of article 5.2 MD305 as amended by MD305\_amd the safety evaluation and safety analysis reports shall be updated periodically, taking account of the experience gained from the operation, changes or new knowledge of the specific characteristics of the location and of the facility, international experience and developments in research and technology. The safety re-evaluation aims to ensure compliance with the existing design basis and detect where there is room for further safety improvement, taking into account the age of the facility, the experience gained during operation and the latest research results and developments in terms of international standards.

For practical implementation of these requirements please see the reporting for Article 6(c).

**Article 8b: Implementation of the nuclear safety objective for nuclear installations**

Article 8b(1a-f)

Based on the provisions of article 8.1 of MD305 amended by MD305\_amd the design of the facility shall include different, reliable and mutually independent security levels and multiple barriers (defense-in-depth principle) to prevent the release of radioactive materials to the environment. The primary objective of the design, also taking into account the characteristics of the location, shall be to prevent an accident and, should an accident occur, to mitigate its consequences and avoid emissions. Applying the defense-in-depth principle it is ensured that:

- a) the impact of extreme external natural and unintended man-made hazards is minimized;
- b) abnormal operation and failures are prevented;
- c) abnormal operation is controlled and failures are detected;
- d) accidents within the design basis are controlled;
- e) severe conditions are controlled, including prevention of accidents progression and mitigation of the consequences of severe accidents.

Appropriate organisational structures are in place as reported below for Article 8d(1).

#### Article 8b(2a)

As stipulated in article 4.1 of MD305 as amended by MD305\_amd safety culture shall be promoted, inter alia, through a management system that makes nuclear safety the top priority at all levels of staff and management and promotes the possibility of looking into the effective implementation of the relevant safety principles and practices and of regular safety reporting.

A gap of this requirement has been identified in the provisions of MD305\_amd and an additional amendment of this article has been proposed in order to include the specific content of the management system of the licence holder that gives due priority to nuclear safety and promote the questioning attitude at all levels of staff and management.

Similarly, an amendment of article 23.1 of MD305\_amd is proposed to accommodate the requirement for the promotion of safety culture through the IMS of the regulator authority, EEAE.

#### Article 8b(2b)

As stipulated in article 10.4 of MD305 the licence holder shall keep an appropriate and updated record throughout the facility's life-cycle. This record shall include all technical information, such as the drawings of the facility and the experimental assemblies, as well as records of operation, incidents, modifications, maintenance, and other information that is significant in terms of safety.

#### Article 8b (2c)

As stipulated in article 10.3 of MD305, as amended by MD305\_amd, the licence holder shall notify to EEAE and the facility workers all incidents or accidents, their analysis and all the appropriate corrective action taken to optimize safety and protection. Information on the normal operation of the installation and a short description of the incidents or accidents and of the corrective action shall also be made publicly available electronically on a website

#### Article 8b (2d)

Please see reporting for Article 7.

### **Article 8c: Initial assessment and periodic safety reviews**

#### Article 8c (a)

For the licensing procedure see reporting for Articles 4.1(c) and 8a of the Directive.

Otherwise the Article is not really applicable for Greece since no construction licence has been granted after 14 August 2014.

#### Article 8c (b)

The national framework for the systematic re assessment of the safety reactor is described in the reporting for articles 6(c) and 8a (2b) of the Directive.

The latest evaluation of the nuclear safety of the research reactor was performed in November 2019 and is posted at EEAE's website:  
([https://eeae.gr/files/adeies\\_uploaded/reactor\\_ekthesi\\_axiologisis\\_2019.pdf](https://eeae.gr/files/adeies_uploaded/reactor_ekthesi_axiologisis_2019.pdf))

## Article 8d: On-site emergency preparedness and response

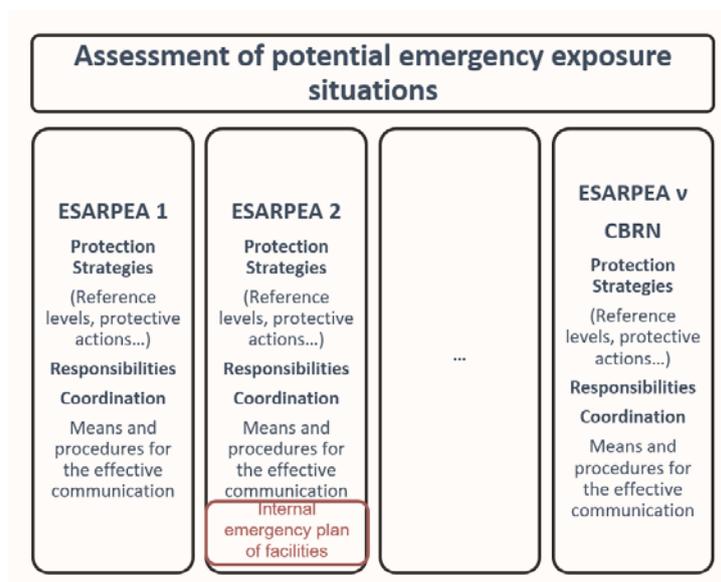
### Article 8d (1)

According to the provisions of 4.6 of the MD305 as amended by MD305\_amd a plan shall be prepared for preventing and responding to emergencies in the installation, taking due account of the defense-in-depth principle, with organizational infrastructure for readiness for and response to emergencies within the facilities, with clear allocation of duties and coordination between the licence holder and the competent emergency response authorities and organizations, taking into account all the phases of an emergency, in accordance with the radiation protection regulations. The emergency plan shall be updated according to the stage of the facility's life-cycle, as well as other factors that take account of changes or new knowledge. A high level of readiness to implement the emergency plan shall be maintained through, among others, the execution of appropriate drills.

The radiation protection report of the research reactor includes Chapter H where the system for emergency is described with the allocation or responsibilities, the tasks during the emergency and specific measures to be taken during an emergency. During the last evaluation it was observed that there is no assessment of the potential emergencies in connection with the present status of the reactor (extended shut down). The licence holder was asked to update the report.

### Article 8d (2)

According to PD101, which is the main legislative document for the transposition of the Directive 2013/59/Euratom EEAE shall be competent for the assessment of potential emergencies inside or outside the Greek territory, which may entail radiological risk for the country. In 2019, a detailed assessment of nuclear and radiation related threads has been completed based on the IAEA safety standards methodology. This first assessment of potential emergencies has been approved by EEAE and submitted to General Secretariat for Civil Protection to be used for the update of existing or preparation of new emergency response plans (ESARPEA). The internal plan of the licence holders is accommodated in the ESARPEA, thence in the national emergency system, as illustrated in Figure 1.



**Figure 1. The structure of the General civil protection plan (GCPP) for emergency exposure situations as laid down in PD101**

## **Article 8e: Peer reviews**

### Article 8e (1)

An IRRS mission took place in 2012 with the IRRS follow-up was completed in 2017. The reports were made available to the public (<https://eeae.gr/en/eeae/international-reviews>) Also, an ARTEMIS mission has been arranged to take place in 2023.

The report of the IRRS mission was submitted to the Commission, in line with Article 9, paragraph 3 of the Directive.

However, a gap of the requirement regarding the peer reviews has been identified in the provisions of MD305\_amd and an additional amendment of article 23 has been proposed to include the arrangements for periodic self-assessments and peer assessments of the national framework and competent regulatory authority.

### Article 8e (2 - 4)

As already mentioned the reactor has no core and no fuel stored (all spent fuel has been returned to the USA), and therefore the obligation for Topical-Peer reviews, or for peer reviews after an off-site emergency situation can be considered as non-applicable.

## **GREEK ATOMIC ENERGY COMMISSION**

P.O. BOX 60092, Agia Paraskevi,

Postal Code 15310 Athens

**T:** + 30 210 650 6700

**F:** + 30 210 650 6748

**E-mail:** [info@eea.gr](mailto:info@eea.gr)

**Website:** [www.eea.gr](http://www.eea.gr)

[www.facebook.com/eeaegr](https://www.facebook.com/eeaegr)

[www.twitter.com/eeaegr](https://www.twitter.com/eeaegr)