2015 ANNUAL ACTIVITY REPORT

GREEK ATOMIC ENERGY COMMISSION

ANNUAL ACTIVITY REPORT

Athens, July 2016

GREEK ATOMIC ENERGY COMMISSION

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t: +30 211 8003284, f: +30 211 8009301, e: info@grel.gr, w: www.grel.gr

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t: +30 210 5156810, f: +30 210 5156811, e: info@kambili.gr, w: www.kambili.gr

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Safety is our choice!

GREEK ATOMIC ENERGY COMMISSION

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Foreword

This report of the Greek Atomic Energy Commission (EEAE) summarizes the actions taken for the whole range of its activities, throughout 2015. The regulatory work, the inspections and the services provided by EEAE are briefly and concisely described, with reference to their quantity and significance.

2015 has been a year of heavy workload. It is worth mentioning the following important developments:

› **The drafting of a national regulatory framework for the safe management of spent fuel and radioactive waste.** After public electronic consultation, ministerial decisions were issued on the national policy and the national program for the management of radioactive waste. Also, a presidential decree bill was promoted. These legislative initiatives attest the will to establish a long-term policy on the safe environmental management of the - limited nevertheless - radioactive materials and sources in our country.

› **Assessment of the radiation doses to population from natural and artificial radiation sources.** The average annual radiation dose in Greece has been estimated to be 4.5 mSv. This is the beginning of a regular effort for a periodic assessment of the radiation doses received by the population in the country. This has been the main subject of "PRISMA" project (KRIPIS national program, National Strategic Reference Framework) and a strategic goal of EEAE that upgrades the radiation protection system and the role of EEAE as regulator.

› **Operation of a new licensing model for medical radiation laboratories.** 2015 has actually been the first year that EEAE operated as the licensing authority for medical radiation laboratories (before, the special operation licenses were issued by the prefectures, on the basis of EEAE certificate of compliance). Application processing time for the issuance, renewal or amendment of the license has significantly decreased, while the stakeholders involved are highly satisfied. The advantages of the new licensing model are already visible, the most important of which being the assurance of an integrated approach in the licensing process for the medical radiation laboratories.

› **Operation of the National Observatory for Electromagnetic Fields.** A successful pilot run has been carried out and the project was delivered to EEAE in late 2015. The operation of an extended network of 500 stations for the measurement of high frequency electromagnetic radiation throughout Greece permits a continuous and direct observation of the compliance of the population exposure with the established limits. Direct (online) access for the public to the measurement results is available at http://paratiritirioemf.eeae.gr.

› **Vice-Presidency of the European Nuclear Safety Regulators Group (ENSREG).** Through ENSREG, EEAE contributes to the common European actions for the enhancement and further improvement of transparency in the field of nuclear safety.

› **Design of a new website: www.eeae.gr.** The new web profile of EEAE is an information portal on radiation, covering issues of interest for all visitors. The new website was developed in-house by EEAE personnel. Emphasis is placed in open access to information and the provision of e-services.

Thus, 2015 has been a year of significant developments, during which important strategic goals were achieved. This Report enables readers, whether experts in radiation or not, to realize the broadness of the regulatory field and to be informed on the multiple actions that EEAE undertakes for safeguarding the safe use of radiation and the reliable information provision to all interested parties.

Christos Housiadas
EEAE Chairman

Internal organization

Profile

The Greek Atomic Energy Commission (EEAE) is the national regulatory authority, competent for the control, regulation and supervision in the fields of nuclear energy, nuclear technology, radiological and nuclear safety, and radiation protection.

EEAE mission is to protect the public, those who are occupationally exposed to and the environment from ionizing and artificially produced non-ionizing radiation.

Vision

To operate as a **modern regulatory authority,** in the fields of radiation protection and radiological and nuclear safety, enjoying trust and recognition at national and international level, and **as a model public service** fulfilling its tasks responsibly.

Values

› **Integrity and impartiality.** We make decisions based on objective criteria and we recognize our individual responsibility towards serving the public interest.

› **Competence.** We ensure that our personnel hold expertise and we avail them with opportunities of continuous scientific training.

› **Quality and Reliability.** We provide highly specialized accredited services, in compliance with international and european standards.

› **Transparency.** We disclose the results of regulatory control related to public health and environment protection, and information related to the EEAE's operation as well.

› **Social Responsibility.** We are aware of our responsibility towards the society.

› **Excellence.** We aspire to be a point of reference in the fields of radiological protection and nuclear safety.

› **Openness.** We are seeking the development of relations and exchange of knowledge with other relevant bodies at national and international level.

Human resources

EEAE is currently employing **76 persons;** most of them hold higher education degrees, postgraduate qualifications and specialization skills in scientific knowledge and expertise. Continuous training and participation in scientific networks is encouraged, in order to enhance their knowledge and experience, as required for the fulfilment of their tasks.

In the charts 2 to 6 information is provided on the EEAE personnel regarding gender, age, employment relationship and level of education for the year 2015.

EEAE is governed by a seven-member Board. Its composition is the following:

Chairman
C. Housiadas
Research Director, National Centre for Scientific Research "Demokritos"

Vice-chairman
S. Simopoulos
Professor Emeritus, National Technical University of Athens

Member
V. Kondylis
Assistant Professor, National and Kapodistrian University of Athens

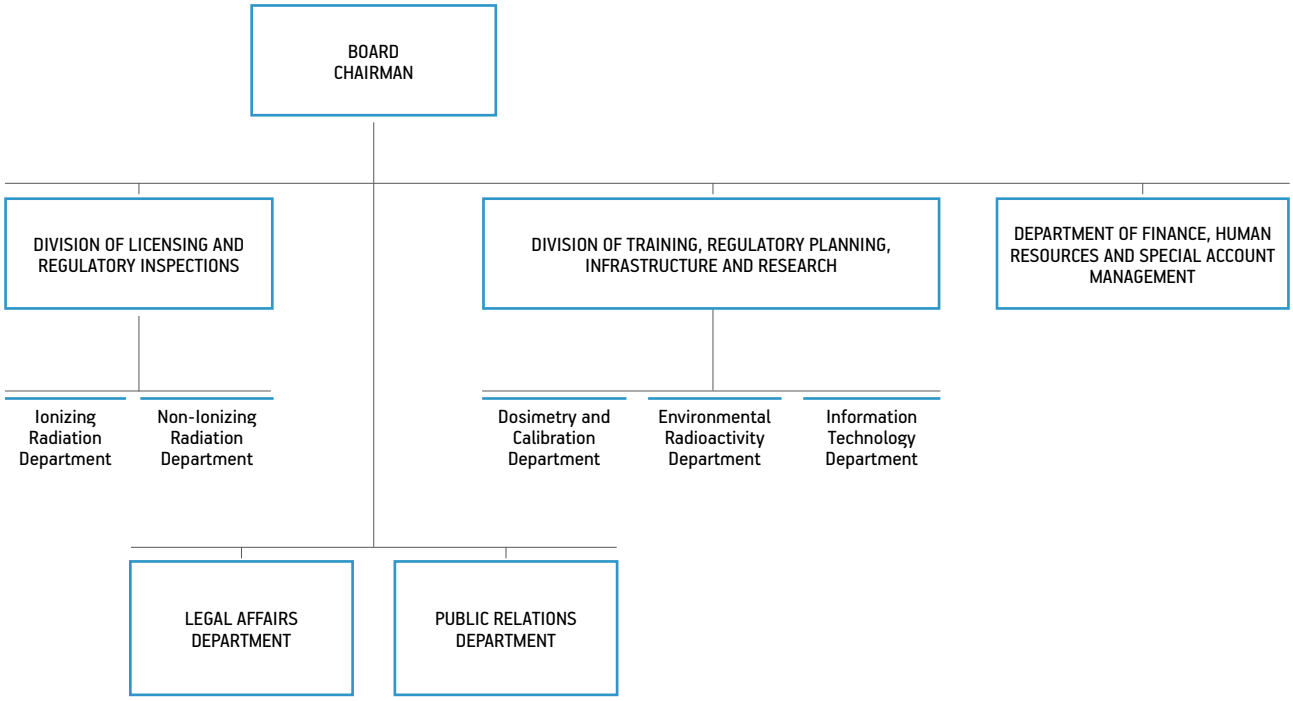
Member
E. Georgiou
Professor, National and Kapodistrian University of Athens

Member
K. Striggaris
Associate Professor, National and Kapodistrian University of Athens

Member
G. Nikolaou
Associate Professor, Demokritus University of Thrace

Member
G. Panagiotakis
Professor, University of Patras

Figure 1: EEAE Organization Structure (approved by the Government Council for Public Administration Reform; the related presidential decree is to be issued).



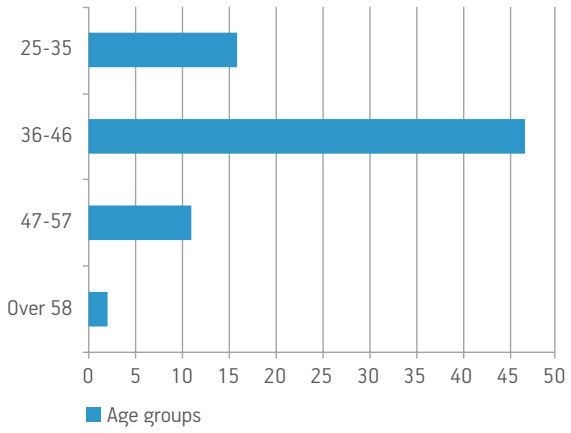


Figure 2: Distribution of personnel by age

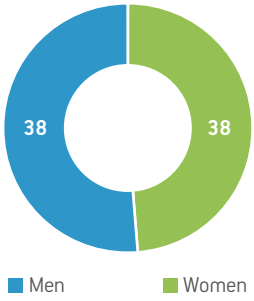


Figure 3: Distribution of personnel by gender

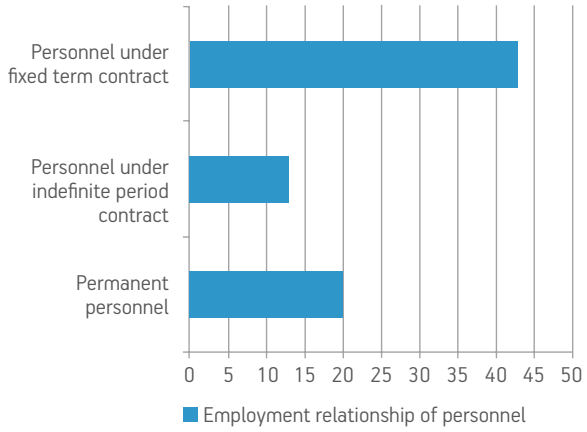


Figure 4: Employment relationship of personnel

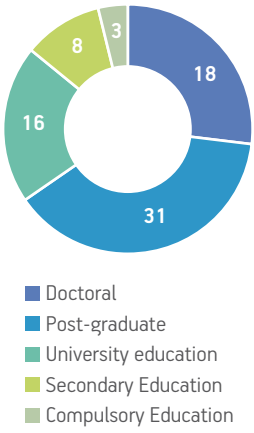


Figure 5: Education level

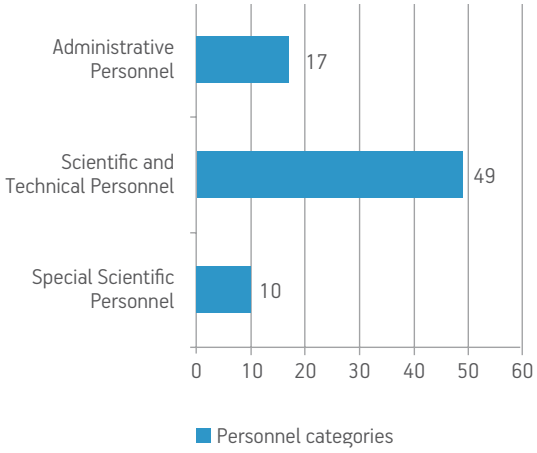


Figure 6: Personnel categories

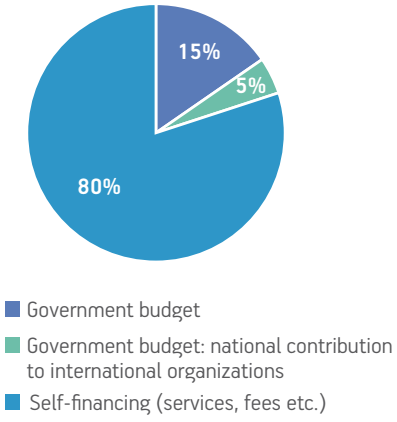


Figure 7: Financial resources

Financial resources

Pursuant to Law 4310/2014, EEAE, as a regulatory authority, enjoys complete administrative and financial independence. EEAE is financed by two sources:

› government funds and

› revenues from services, fees, funds coming from research and development projects (Special Account).

The proportion of each source to EEAE income for the year 2015 was 80% and 20% respectively.

The government budget covers permanent personnel costs and a small part of operational costs. A part of the governmental financial support (25% in 2015) is used for the annual national contributions to international organizations (OECD, IAEA).

Most operational expenses (travel, equipment, consumables etc.) and a significant part of personnel costs are covered by EEAE Special Account, i.e. by self-financing.

In 2015, for once more, a budget surplus has been achieved with revenues increase (invoiced revenues) by 8.5% and expenditure restraint.

Annex II presents detailed financial reporting for both funding sources.

Integrated Management System

Having set safety as a top priority at all operational levels and as a key factor at its decision-making procedures, EEAE has been implementing an integrated management system. Our policy is to serve public interest in compliance with our vision, mission and values, by providing high quality services and regulatory work.

The **integrated management system** has been certified since December 2013 according to **ISO 9001:2008 standard** requirements and incorporates all EEAE functions.

Moreover, EEAE is accredited/certified for the following:

› activities accredited according to ISO/IEC 17025 standard:

- measurements of low-frequency and high-frequency electromagnetic fields;
- measurements with whole body and extremity dosemeters;
- gamma spectrometry measurements
- radon measurements;
- calibrations in radiotherapy, diagnostic radiology, radiation protection, individual monitoring.

› EEAE is accredited as a Type A Inspection Body, according to ISO/IEC 17020 standard, to perform inspections in medical, industrial, research and educational facilities where ionizing radiation is used.

› EEAE is certified according to ISO 29990 standard for the design, development and provision of non-formal education and training in radiation protection and nuclear safety.

In the framework of continuous improvement, EEAE aims at the full harmonization of its integrated management system with internationally established requirements governing radiation regulatory authorities and facilities (IAEA Safety Standards, The Management System for Facilities and Activities, GS-R-3).

Strategic goals

1. **Safety as a top priority: ongoing improvement of the radiation safety and protection at radiation facilities and applications**

   Determination of the general population collective radiation dose from natural and artificial sources of radiation.

2. **Establishment of a modern and effective regulatory framework for radiation uses, in line with international developments**

   Complete implementation of an action plan resulted from the international evaluation (IRRS peer review, 2012).

3. **EEAE participation to current management processes and up-to-date science**

   › Development of an integrated information system for the collection and dissemination of radiation-related data and information in the country.

   › Ongoing improvement of the quality of provided services.

   › Participation in research programs and enhancement of scientific expertise for supporting the regulatory role of EEAE.

   › Active participation in policy-making bodies and scientific networks in the field of radiation protection and nuclear safety at European and international level.

Safety culture

EEAE firmly intends to incorporate safety culture in its management system and to further enhance safety culture in its internal structure.

Information systems

EEAE has developed an integrated information system supported by high-end technological infrastructure. During 2015, most upgrading and improvement work was related to:

- the establishment of a back-up microwave coupling with the Greek Research and Technology Network (GRNET), which shall safeguard the unfailing web access of EEAE and the services it provides;
- the connection of the National Observatory of Electromagnetic Fields with the GRNET through firewall and the implementation of an independent network circuit for the devices exclusively related therewith. Registered with DNS server under subdomain paratiritirioemf.eeae.gr;
- the creation of a new server room based on the new safety standards which safeguard the crucial functioning of the main servers.

A basic supportive tool for EEAE activities is the National Radiation Protection Database, which lists:

- data regarding radiation facilities (shielding, findings of inspections, licenses, personnel, etc.);
- data regarding the number of medical examinations and therapies involving ionizing radiation and the typical doses to patients;
- the inventory of the radiation sources used in the country;
- the national dose registry, where information related to workers occupationally exposed to ionizing radiation and the recorded doses are kept. This part of the database also includes data about the educational background of the workers;
- data regarding the transport of radioactive material at national level;
- the results of environmental radioactivity measurements;
- the results of in situ inspections and measurements for electromagnetic fields.

Health and Safety at work

EEAE, aiming at ensuring a safe and healthy working environment, disseminates relevant information among its personnel and implements the measures required. To this purpose, EEAE is supported by a Health and Safety Advisor and an Occupational Medical Doctor; a Workplace Health and Safety Committee has been established. Moreover, a Radiation Prorection Officer has been appointed, since a part of EEAE personnel are occupationally exposed workers. In 2015 the efforts to improve the working conditions at EEAE building were focused on the improvement of the thermal comfort, lighting and air quality at indoor spaces. At the same time, an occupational stress survey by the use of a properly formed questionnaire was made. Based on the research results, a number of recommendations were made, with their gradual implementation being already initiated.

The regulatory field and the EEAE contribution

to the national economy and society

In Greece, like in all modern societies, radiation is broadly used in medical applications for diagnosis and treatment, industry, telecommunications, scientific research etc.

Table 1: Number of radiation facilities (2015)

Radiology	1157
Nuclear medicine	176
Teletherapy (linear accelerators)	25
Teletherapy ^{60}Co	7
Brachytherapy (HDR/LDR and seeds ^{125}I)	16
Radiotherapy X-ray	1
Magnetic Resonance Imaging (MRI)	266
Research	192
Industrial units with radiation systems and sources	332
Blood irradiators	13
Isotopes production unit	1
Sterilization unit	1
Veterinary laboratories with x-ray systems(*)	279*
Dental laboratories with x-ray systems(*)	7493*
Special facilities:	
- Research Nuclear Reactor	1
- Tandem Accelerator	1
- Interim storage of radioactive sources and waste facility	1

* the number of dental and veterinary laboratories that have been integrated in the licensing procedure and registered in EEAE database.

Table 2: Radiation systems and sources (2015)

Radiotherapy		Diagnostic radiation		Nuclear medicine	
Linear accelerators	39	Radiography units	919	PET/CT	10
^{60}Co Teletherapy	8	Radiology units	398	γ-camera systems	158
Stereotactic systems	3	Fluoroscopy units	25	Scintigraphy units	2
^{125}I - ^{106}Ru Brachytherapy	6	Digital angiography systems	70	β counters	6
^{192}Ir Brachytherapy	9	Coronary angiography units	55	γ counters	181
^{137}Cs Brachytherapy	1	Computer tomography units	391		
Computer tomography simulators	16	Mammography units	658		
Conventional simulators	13	Mobile radiographic units	485		
		Mobile fluoroscopic units	302		
		Bone density meters	856		
		MRI units	268		

Dentistry		Industry		Research	
Conventional dental radiography systems	7774*	Sources	896	Counters (β & γ), XRF, X-ray, etc	132
Orthopantomographs	558	Radiography	40***	Radioactive sources	1508
Dental computer tomographers	41	Soil composition systems	81**		
		XRF & X-ray equipment	99		

Other applications					
Isotope production unit	1	Sterilization unit	1	Veterinary X-ray	279*
Blood products irradiators	15	Isotope production unit	1		

* the number of dental and veterinary laboratories that have been integrated in the licensing procedure and registered in EEAE database.

** refers to apparatuses - usually each apparatus includes two (2) sources.

*** due to frequent change of radiographical test sources(^{192}Ir & ^{75}Se), the number of sources is variable.

A full list of the medical laboratories using ionizing radiation and magnetic resonance imaging throughout the country is available at EEAE website. It is a constantly updated map where the laboratories and their operation aspects (equipment, persons in charge, licensing documents) are listed.

Regarding the non-ionizing radiation facilities, inspections carried out by EEAE concern **over 10,000 mobile phone base stations,** electric power transfer lines and substations, radio and TV antennas, radars and satellite earth stations. A detailed recording of the mobile phone base stations electromagnetic radiation measurements (several thousands) performed throughout the country is available at EEAE website.

At the same time, the operation of the National Observatory for Electromagnetic Fields ensures the ongoing inspection of the emitted radiation in Greece and the direct (online) information of any interested party through the website http://paratiritirioemf.eeae.gr.

EEAE contribution to national economy and society is substantial and multifaceted, as the functions and the regulatory work of EEAE relate to quite a number of people, institutions and economic activities.

Figure 8 presents the key financial sectors to which EEAE contributes.

The interested bodies and the natural persons related to EEAE activities include:

› workers occupationally exposed to radiation - **more than 11,000 workers in our country;**
› examined persons and patients undergoing medical diagnostic examinations and treatments by the use of ionizing and non-ionizing radiation;
› more than **100 enterprises and companies** activated in the fields of industry, trade and service provision;
› local authorities;
› education and training institutions;
› authorities involved with the protection of the environment, public health and civil protection;
› embassies and permanent representations to international organizations.

The mission of EEAE is socially oriented, significantly emphasizing on population, workers and the environment. Indicatively, it is noted that during 2015, hundreds of information requests were submitted to EEAE - **105 of these questions submitted online** - mostly in relation to electromagnetic radiation from antennas, licensing and operation of radiation medical laboratories, education issues and radiation of pregnant women. Pregnant women undergoing medical radiation examinations, either for treatment purposes or because they are not aware of their pregnancy during their examination, usually become extremely concerned on the consequences of the radiation to the foetus. A frequent question is whether pregnancy should be terminated. In all such cases, EEAE thoroughly investigates by estimating or calculating the dose to the foetus, the probability for direct or stochastic effects, as well as the probability for the occurrence of abnormalities or IQ impairment. The investigation of such cases by EEAE has actually entailed life saving **in 25 cases during 2015**, preventing unjustified pregnancy termination.

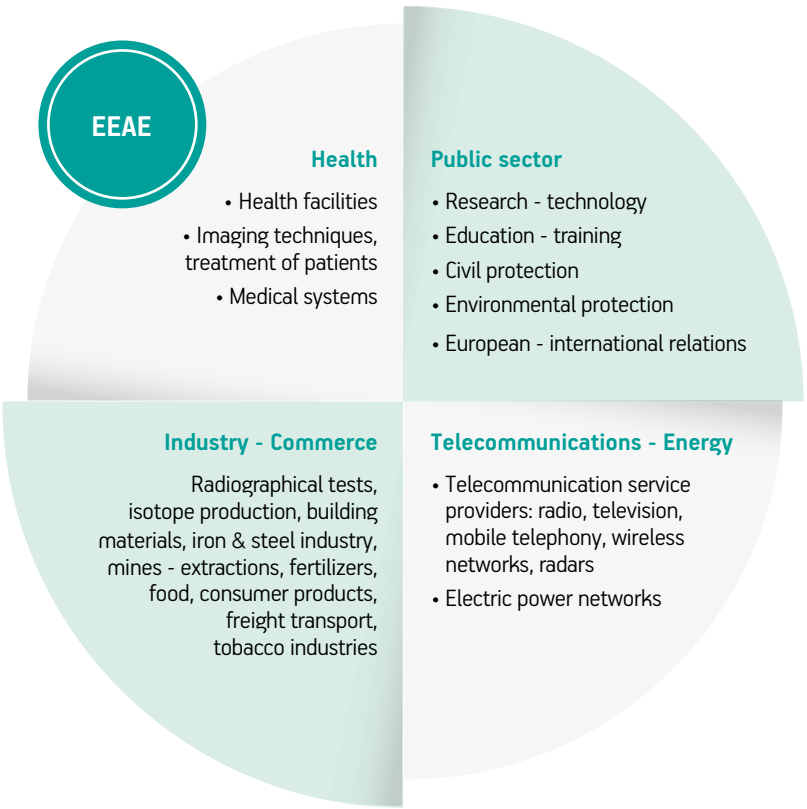


Figure 8:
Sectors where EEAE contributes

Legislation - regulations

EEAE has a regulatory role within the framework of its competency. In this respect, EEAE issues regulatory acts and makes proposals for new legislation, by drafting the respective documents (Laws, Presidential Decrees, Ministerial Decisions).

In particular, EEAE prepares the necessary legislation for the transposition of the EURATOM European Directives to the national legislation. In 2015, the following acts were issued:

- Ministerial Decision no. Π/112/214196/30.12.2015 (Government Gazette no. 2941/B/31.12.2015) on the "National Program for the management of spent fuel and radioactive waste",
- Ministerial Decision no. Π/112/363/13.11.2015 (Government Gazette no. 2488/B/18.11.2015) on "Licensing of MRI laboratories - non ionizing radiation protection requirements" and the supplementary and corrective Ministerial Decision as of 04/12/2015 (Government Gazette no. 2615/B/04.12.2015),
- Ministerial Decision no. 131207/I3/20.08.2015 (Government Gazette no. 1858/B/27.08.2015) on the "Definition of the national policy on the management of spent fuel and radioactive waste",
- Ministerial Decision no. Π/112/237/07.08.2015 (Government Gazette no. 1659/B/07.08.2015) on the "Amendment of Joint Ministerial Decision no. Π/112/345 (B 3271/06.12.2012) on the definition of issues related to the submission and collection by the Greek Atomic Energy Commission of the annual fee for the establishment and operation of each antenna as to the observation of radiation limits",
- EEAE Decision no. 2.1/228/06.02.2015 (Government Gazette no. 947/B/26.05.2015) on "Clarifications on the provisions of Part 6 of Radiation Protection Regulations, management and disposal of radioactive residues from nuclear medicine laboratories",
- EEAE Decision no. 2.2/228/06.02.2015 (Government Gazette no. 947/B/26.05.2016) on "Definition of additional requirements for the issue of special licensing for the operation of mobile X-ray systems for the conduction of X-ray examinations at home",
- EEAE Decision no. 4.1/229/03.04.2015 (Government Gazette no. 947/B/26.05.2015) on the "Use of mammography systems with new technology of a lamp with wolfram (W) or/and Rhodium (Rh) anode",
- EEAE Decision no. 4.2/229/03.04.2015 (Government Gazette no. 947/B/26.05.2015) on "Special requirements for the issuance of a special license for the operation of blood products irradiators".

Furthermore:

- from July 28 to August 7, 2015 the Government publicly and electronically consulted on a presidential decree draft on the "Establishment of a national, regulatory and organizational framework for a responsible and safe management of spent fuel and radioactive waste". 70 comments were submitted in total and a related report was drafted. All files may be found at: http://www.opengov.gr/ypepth/?p=2596,
- the revision of Annex P of "XENOKRATIS" General Plan for Civil Protection in cooperation with the General Secretariat for Civil Protection was continued,
- the preparation of legislative texts for the transposition into the national legislation of the Council Directive 2013/59/EURATOM of 5 December 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/Euratom" was continued.

Assessment of the radiation dose to population

& development of a national information system related to radiation (PRISMA)

The 3-year institutional project PRISMA was implemented by EEAE under the national program "Development Proposals of Research Institutions - KRIPIS", co-funded by the European Regional Development Fund (NSRF 2007-2013). PRISMA was successfully completed in late 2015, substantially contributing to the upgrading and development of the regulatory framework for radiation protection and radiological and nuclear safety.

The goal of the project was to further improve the radiation protection system in Greece. Its main objective was the development of a methodology for the assessment of the overall radiation dose received by the population as a result of exposure to naturally and artificially produced radiation.

The **average annual radiation dose in Greece was estimated to be 4.5 mSv,** with 1.8 mSv corresponding to medical exposure and 2.7 mSv corresponding to natural sources of radiation.

The average annual radiation dose from medical applications was estimated by performing dose measurements in medical radiation laboratories all over the country and collecting the number of medical practices annually carried out per type of practice.

The average annual radiation dose from natural sources was estimated through sampling and measurements of various samples (building materials, soil, water, food, etc.), as well as by radon concentration measurements in residences all over Greece.

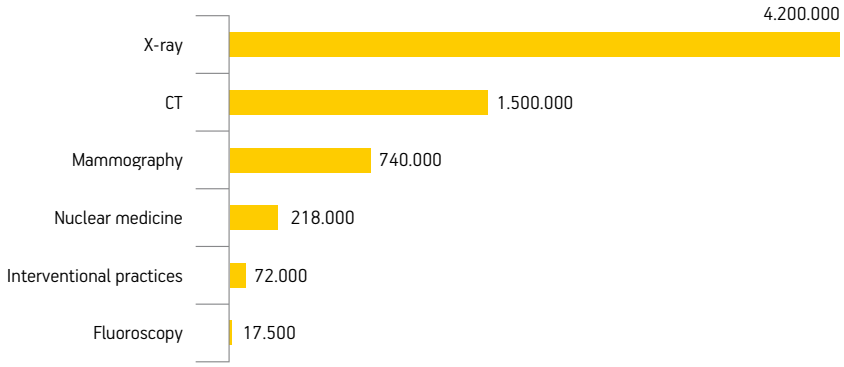


Figure 9: Number of medical examinations / practices in 2014

PRISMA also enabled EEAE for the first time to investigate applications of artificially produced ultraviolet radiation, namely artificially tanning services (solarium), as such radiation has been classified as carcinogenic by the World Health Organization. The investigation indicated that **ultraviolet radiation limits were exceeded** in the two thirds of the measured equipment and highlighted the need for surveillance of the artificial tanning services. In order to regulate the provision of artificial tanning services in Greece and given the lack of related legislation, EEAE has prepared a draft legislative framework.

At the same time, **a web-based platform has been designed and developed for the collection and disposition of data,** which is now the "web profile" of the radiation protection system in Greece. Its main characteristic is the direct access to information related to radiation applications and the direct communication between citizens and EEAE through online services. Besides the improvements to existing digital services, the following new services have been developed:

- map of Greece with the radon concentrations;
- online submission of annual data for diagnostic and treatment practices;
- online submission of data for the determination of the national Diagnostic Reference Levels;
- online submission of applications to the personal dosimetry program;
- online access to the doses of occupationally exposed to ionizing radiation workers;
- information for artificial tanning enterprises.

In addition, a document management software was purchased and tailored to EEAE needs; the building infrastructure was also improved aiming at energy upgrading and improvement of working conditions.

As to the dissemination of the project results:

- **public information events** were held in Athens (15/10 and 11/12), Thessaloniki (02/12), Ioannina (24/11), Irakleio (16/11), Kavala (08/12) and Cyprus (4/12);
- information material was produced covering the following fields: radon, medical exposure to radiation, risks from exposure to artificial ultraviolet radiation (solarium), personal dosimetry;
- EEAE newsletter was set up.

PRISMA project was supported by a funding of **€1.031.600.** The implementation of the project was achieved through the cooperation of all EEAE departments and the majority of its personnel, whilst 3 new posts were created. It is estimated that **523 person - months** were required for the completion of the project.

The actions that started under PRISMA project shall be continued by EEAE, mainly targeting to the monitoring and optimization of the radiation protection system in Greece and the regular estimation of the doses received by the population.

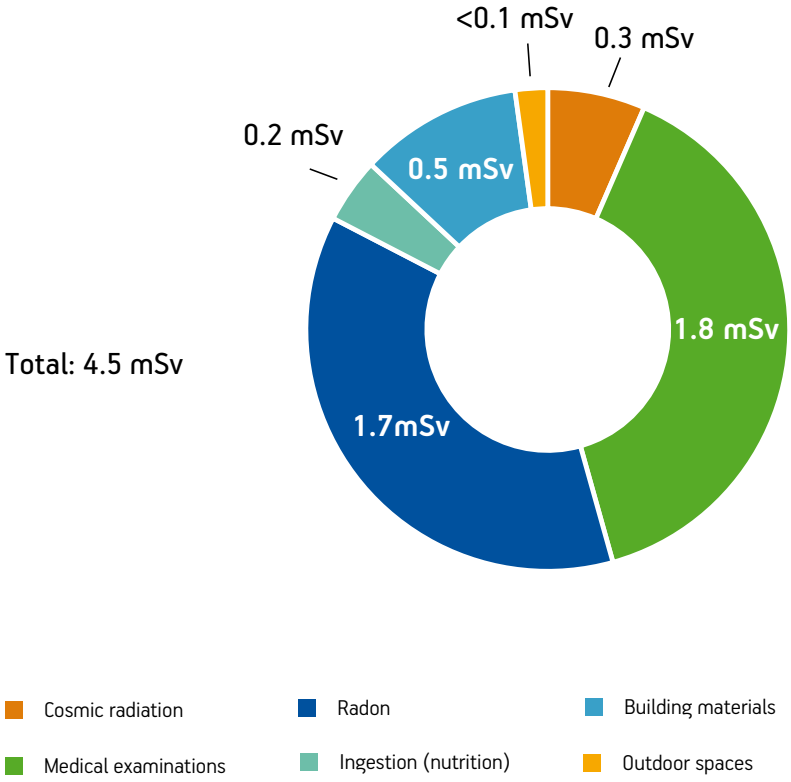


Figure 10:
Radiation exposure sources in Greece

Licensing and Inspections

a. Ionizing radiation applications in medicine, industry and research

EEAE inspects and licenses the facilities and the applications of ionizing radiation, as well as the use of radioactive sources, in medicine, industry and research, and the applications and facilities of non-ionizing radiation in medicine (MRI), by issuing certificates of compliance and special operation licenses.

Within the above framework, EEAE conducts radiation protection and safety inspections to technical equipment and to systems of ionizing and non-ionizing (MRI) radiation. Such measurements and inspections have a two-fold objective:

(a) to ensure the radiation protection of population and workers, including patients and persons undergoing examinations in the case of medical laboratories;

(b) to verify the compliance of the construction, operation and performance of facilities, systems, equipment and devices, as well as of practices making use of ionizing radiation, with the applicable requirements and the terms laid down in legislation.

Moreover, EEAE:

- reviews, assesses and approves design, shielding and operation safety reports for radiation facilities;
- verifies, approves and issues licenses for import, export and transport of radioactive sources-materials, the transport of radiopharmaceuticals, as well as for the management of radioactive waste and radioactive sources and material. EEAE coordinates and participates in the recovery, safe management and storage of abandoned "orphan" and out of use radioactive sources, that may pose radiological risks;
- examines and reviews cases of - intentional or unintentional - pregnant women's exposure to radiation, due to their undergoing diagnostic examinations or treatments and any case of worker's overexposure;
- maintains the national radiation protection database with data on the ionizing radiation facilities / laboratories, radioactive sources and transport of radiopharmaceuticals and radioactive material. The database also includes statistics on medical practices, such as the number of diagnostic examinations and treatments, typical doses to patients, etc.

Issuing special licenses for the operation of medical laboratories

2015 has actually been the first year that EEAE operated as licensing authority for medical laboratories using radiation (before, the special operation licenses were issued by the prefectures, on the basis of EEAE certificate of compliance). EEAE encouraged the online submission of applications and supporting documentation; totally **544 special operation licenses, 127 construction pre-approval documents and 35 other licenses** were issued. Most part thereof were related to radiology laboratories.

The average time needed by EEAE to complete licensing procedures for radiotherapy, nuclear medicine and radiology laboratories for 2015 was: **64, 15 and 52 days respectively.**

The time for processing a request for the issuance, renewal or amendment of a special operation license has been drastically decreased, exceeding - for most laboratories - the initial expectations.

As proven by the evaluation procedure based on a questionnaire, the level of satisfaction is significantly high. **The satisfaction lies both on the fact that EEAE was assigned with the issuance of the special operation licenses and on the practical implementation of the new licensing model.** Other parameters, such as the promptitude of processing, the quality of service and the provision of information by EEAE, complete the overall positive perception of users.

The new licensing model ensures the full supervision of the licensing status for medical laboratories using radiation. It enables the defragmented information of interested stakeholders (Ministry of Health, National Organization for Health Care), the smooth update of the national database on radiation protection and the dissemination of information related to licensing of medical laboratories, through the EEAE webpage www.eeae.gr.

Inspections

During 2015, EEAE carried out **742 inspections** to radiation facilities. The approximate total number of inspected systems-sources is **2.100.** The distribution per type of laboratory / application is presented in Table 3.

The inspections carried out by EEAE are "scheduled"; that means that they are performed within the licensing procedure of a laboratory (issuance or renewal of a license, equipment upgrade, re-inspection) or "extraordinary", i.e. any time during the period that the license remains in force, in order to verify the implementation of radiation protection. In both cases, inspections are "with prior notice" or "without prior notice", based on different inspection protocols.

Indicatively, Table 4 briefly presents the "scheduled", "extraordinary", "with prior notice" and "without prior notice" inspections performed at medical laboratories during 2015.

Figure 11 presents the same data for all radiation facilities.

Table 3: Inspections to radiation laboratories (2015)

Category	Public sector	Private sector	Total	% of total
Teletherapy (linear accelerators)	4	6	10	40%
Teletherapy ^{60}Co	2	1	3	43%
Brachytherapy (HDR and seeds ^{125}I)	2	3	5	31%
Radiology X1	97	156	253	
Radiology X2	16	118	134	39%
Radiology X3	48	13	61	
Magnetic Resonance Imaging (MRI)	5	40	45	17%
Nuclear Medicine A1	8	9	17	
Nuclear Medicine A2	6	30	36	36%
Nuclear Medicine A3	7	3	10	
Dental laboratories	-	35	35	-
Research EP-A	12	-	12	
Research EP-K	15	-	15	18%
Research EP-Σ	7	-	7	
Industrial laboratories	7	43	50	
Industrial radiography	2	5	7	21%
Industrial sources	2	10	12	
Veterinary X-K	1	20	21	-
Blood irradiators	1	3	4	31%
Transport companies for radioactive materials	-	2	2	33%
Other	-	3	3	-
Total	**242**	**500**	**742**	

Table 4: Types of inspections performed in medical laboratories in 2015

4.1 Inspections with prior notice

	New laboratory	Equipment upgrade	License Renewal	Follow-up inspections	Extraordinary	Total
Radiology	29	104	177	16	104	430
Nuclear Medicine	5	-	6	-	3	14
Radiotherapy	1	9	4	1	1	16

4.2 Inspections without prior notice

	New laboratory	Equipment upgrade	License Renewal	Follow-up inspections	Extraordinary	Total
Radiology	-	-	11	2	5	18
Nuclear Medicine	-	-	36	3	10	49
Radiotherapy	-	-	1	-	1	2

The total number of documents issued by EEAE related to inspection and licensing of radiation facilities in 2015 reached **1759.**

Other activities:

› The radioactive waste and disused radioactive sources and materials in Greece were fully recorded; all relevant data were sent to the EU in line with the national and European legislative provisions on the safe and responsible management of radioactive waste. The related data and the National Report are available at EEAE website.

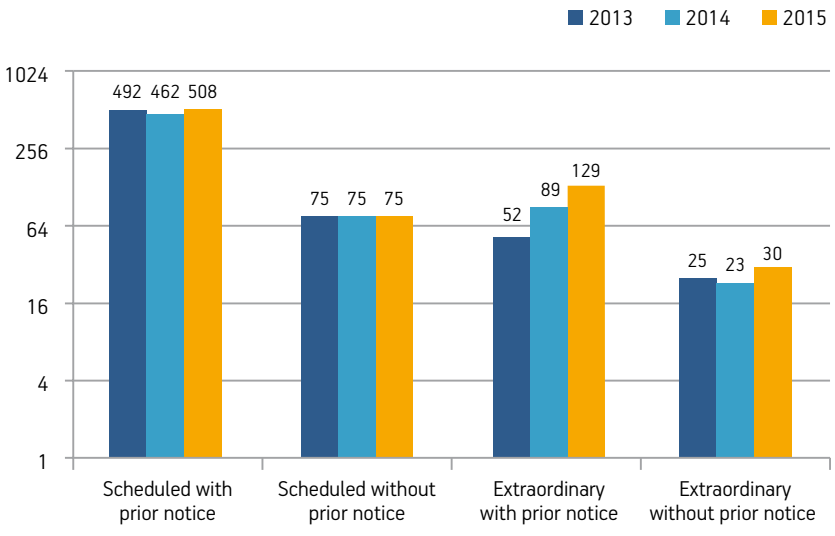


Figure 11: Inspections carried out during the last years, based on their type

› Continuous collection of a) the number of medical practices with radiation (diagnosis - treatment), b) dosimetric information for most radiological examinations, c) quantity and activity data of radiopharmaceuticals administered in nuclear medicine practices, d) analytical data on treatments annually. The analysis of such data is a key tool for the assessment of radiation protection in Greece and for the rational use of existing infrastructure for the provision of medical services with use of ionizing radiation.

› The procedure for the determination of the pediatric diagnostic reference levels for radiological examinations and nuclear medicine examinations is still in progress and expected to be completed during 2016.

› The inspections on the transport of radioactive materials are now performed according to the Technical Guide on the Compliance Inspections by the European Competent Authorities on the Transport of Radioactive Material (Issue 1, February 2015) of the European Association of Competent Authorities, wherein EEAE participates.

› EEAE assumed the Presidency of the Mediterranean Network for the Transport of Radioactive Materials (MedNet), established with the support of the International Atomic Energy Agency and funded by the European Union.

b. Non ionizing radiation applications

EEAE has the statutory responsibility for the protection of the general public and the environment against artificially produced non-ionizing radiation and provides relevant information to any interested party.

High frequency electromagnetic fields

EEAE participates in the licensing procedure of telecommunications base stations, by reviewing the electromagnetic emissions technical studies and environmental studies. Furthermore, EEAE performs in-situ inspections and measurements in the vicinity of antenna stations in order to ascertain their compliance with the general public exposure safety limits.

Electromagnetic emissions studies - issuing expert opinions

In 2015, 2.251 complete files (applications) were submitted to the online platform SILYA of the Hellenic Telecommunications and Post Commission (EETT), accompanied by an equal number of electromagnetic emissions studies. Additional to that, there was a number of electronic files (with corresponding electromagnetic emissions studies), approximately 600, which had been remaining from 2014. **Reports were issued for 1.736 cases** out of the 2.851 electronic files in total. 54 electromagnetic emissions studies on antenna stations were also submitted directly to EEAE under Law 4313/2014.

Environmental impact studies / reports

In 2015, EEAE received 171 environmental impact studies from the Regional General Secretariats and General Secretariats of Decentralized Administrations. EEAE provided its approval for **248 environmental studies**, including pending cases from previous years. As was the case in previous years, for a number of studies further corrections/completions were required.

In-situ inspections and measurements

EEAE performs in situ inspections and measurements in all kinds of antenna stations, in order to ascertain their compliance with the general public exposure safety limits:

a) either in the context of the legal obligation to inspect ex officio, on an annual basis, at least the 20% of the licensed by Hellenic Telecommunications and Post Commission antennas operating in urban areas or

b) upon request by any person or entity.

Within 2015, inspections and measurements were performed with EEAE means or authorized external contractors, in the vicinity of 1.731 antenna stations all over the country, either upon a request or ex officio.

In brief:

› most measurements of high-frequency electromagnetic fields were performed in the vicinity of mobile phone base stations (86,71%), while a small number thereof was performed in the vicinity of fixed telephony base stations and other facilities

of internet services (12,54%), as well as in the vicinity of radio and TV antenna stations (0,75%).

- the percentage of ex officio measurements exceeds the 96% of the total number of measurements performed in the vicinity of antenna stations.
- most measurements (40.44%) concerned antenna stations installed in the Region of Attica.
- 13 ex officio measurements at antenna base stations were performed upon public prosecution orders.
- in-situ measurements were performed in 79 playgrounds: 18 playgrounds in the Municipality of Tanagra, 38 playgrounds in the Municipality of Peristeri, 20 playgrounds in the Municipality of Galatsi, 1 playground in the Municipality of Athens, as well as in two locations in the Municipality of Kalamaria, where playgrounds were to be built, in response to requests by these Municipalities.
- in-situ measurements were performed in the vicinity of approximately 220 radio and TV stations outside urban areas, in areas that actually are "antenna parks" and are not included in the list of the licensed antennas provided by the Hellenic Telecommunications and Post Commission.
- in addition to the aforementioned measurements all over the country, several measurements have been performed at radar facilities of the Hellenic Civil Aviation Authority and the Army, as well as in the vicinity of amateur radio stations (these antenna stations are not included in the EETT list of licensed antenna stations).

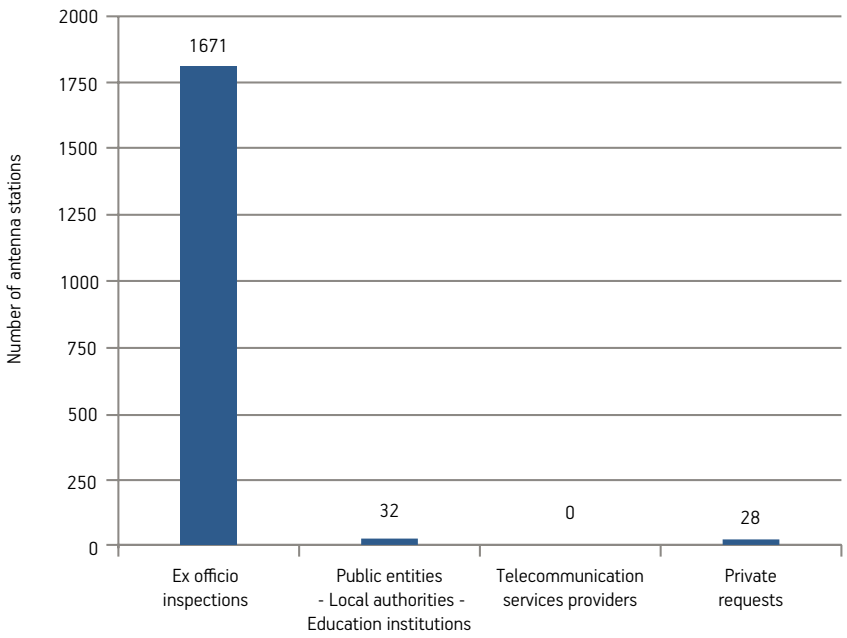


Figure 12: Number of requests and inspections performed

Access to measurement results

Measurement results are being published at EEAE website, www.eeae.gr. The users, through a map interface, can be informed about the levels of electromagnetic radiation, in all regions of the country; these values are also compared with the exposure limits. The website **presents the results of 9.000 radiation measurements** carried out from 01/07/2008 to 31/12/2015. These measurements have been performed in the vicinity of 7.150 antennas. In several antenna stations measurements have been performed more than once (i.e. on different dates), the results of which are presented separately.

Cases of non-compliance with the general public exposure safety limits

In 2015, **13 cases of non-compliance with the general public exposure safety limits** were ascertained in areas accessible by the public. All these cases concerned places outside urban areas in antenna parks, where a large number of antennas providing all kinds of telecommunication services (e.g., radio and TV station facilities, radar, etc.) are located. EEAE following the law requirements, informed immediately the licensing authority (EETT) for each one of these cases. **No case of non-compliance was identified within urban areas.**

National Observatory of Electromagnetic Fields - http://paratiritirioemf.eeae.gr

The project of the National Observatory of Electromagnetic Fields was completed and presented by the contractor SPACE HELLAS S.A. in two events held in Athens and in Thessaloniki (October 14 and 23, 2015, respectively).

The objective of the National Observatory of Electromagnetic Fields is the continuous monitoring of compliance with the safety limits for public exposure to electromagnetic fields, as defined in the legislation. The emissions monitored under the scope of the project cover the broad frequency range of 100kHz - 7GHz, including infrastructure, such as:

- wireless communication networks (mobile telephony networks, fixed wireless access networks);
- radio and television antennas, radar systems;
- wireless networks without licensing provisions (e.g. wireless hotspots).

The Observatory is supported by a network of 500 fixed and 13 mobile broadband and frequency-selective stations for the measurement of electromagnetic radiation and ensures the direct (online) access of the public to measurement results through the website http://paratiritirioemf.eeae.gr.

The project was designed by Information Society SA, EEAE and the General Secretariat of Telecommunications and Post of the Hellenic Ministry of Infrastructure, Transport & Networks. It was implemented under "Digital Convergence" Operational Program (National Strategic Reference Framework), co-funded by the EU. Upon the completion of the project, EEAE is responsible for the operation of the Observatory.

Low frequency electromagnetic fields

In 2015, **41 measurements** of low frequency electromagnetic fields have been performed either upon request or ex-officio. From the measurements performed in 2015, in the vicinity of all types of lines, sub-stations and facilities of the electric power transport and distribution system throughout the country, **one case** of non-compliance with the general public exposure safety limits was identified. The case was related to the exceeding of the electric field intensity limit value, in the vicinity of a high voltage power line, in an area accessible by the general public. EEAE promptly informed the competent bodies about this case in order to take all required remediary actions.

UV radiation measurements in sunbeds

In 2015, EEAE completed a survey of the artificial tanning services sector in Greece. Ultraviolet (UV) radiation measurements have been performed in order to verify the safety of sunbeds in terms of radiation protection. It was found that the 0,3 W/m^2 erythema effective irradiance limit was exceeded in 65% of the cases, while the provision of artificial tanning services failed to comply with the EU recommended standards. A code of conduct for the provision of artificial tanning services was prepared and an e-learning program (through EEAE website) was designed for the training of workers in the artificial tanning sector. Furthermore, a draft legislative framework has been prepared.

Other activities

- Completion of three out of five online tenders, started in late 2014 through an electronic platform hosted by the National Electronic Public Procurement System for the assignment to external contractors of a specific number of electromagnetic radiation measurements across the country. The other two tenders were cancelled and re-launched: one was successfully completed in late 2015 and the other started in December 2015.
- Participation in joint working groups with other competent bodies to recommend improvements for antenna licensing and the SILYA online platform.
- Participation in the Hellenic Organization for Standardization (ELOT) committees on human protection from exposure to electromagnetic fields.
- Participation in the surveillance and monitoring committee of the "National Observatory of Electromagnetic Fields" project.
- Implementation of measurements program in workplaces in order to assess the exposure of workers to high and low frequency electromagnetic fields, under the scope of the cooperation protocol with the Occupational Hygiene and Safety Center (KYAE) of the Hellenic Ministry of Labor, Social Insurance and Social Solidarity.
- Participation (upon an honorary call) in the core group formed by the World Health Organization regarding the development of non ionizing radiation Basic Safety Standards.

Services

a. Individual monitoring of workers occupationally exposed

The individual monitoring of workers occupationally exposed to ionizing radiation (more than 11.000 people) from external exposure is performed by EEAE.

Radiation dose is monitored by the use of passive detectors (thermoluminescent dosemeters), worn by workers on specific parts of their body. According to the instructions given to occupationally exposed personnel, the dosemeter should be worn at chest-level, outside the radiation protection lead apron. Furthermore, it is possible to use two dosemeters, inside and outside the lead apron. In these cases, the dosemeter worn outside the apron is placed near the thyroid collar. Dosemeters are used to ensure compliance with the dose limits specified in the Radiation Protection Regulations. Measurement results are kept by EEAE to the National Dose Registry. In 2015, the National Dose Registry was amended and updated so as to meet the changes made in the public health sector, and more specifically the incorporation of the existing national small health units to seven health regions.

Statistical analysis of doses

In 2015, **125.657** dosemeters were distributed, a number approximately matching 2014 levels. Non-return of dosemeters for 2015 reaches a percentage of 1.82%.

In the following paragraphs, data are presented about the dose recorded by the whole body dosemeters (personal dose equivalent of depth 10 mm) as well as on the effective dose, calculated by taking into account the individual radiation protection measures used at various workplaces.

The mean annual personal dose equivalent of depth 10 mm has increased by 7% compared to 2014 (0.72 mSv and 0.67 mSv for 2015 and 2014 respectively). The mean personal dose equivalent of depth 10 mm for values above the reporting level (2.92 mSv and 2.77 mSv for 2015 and 2014 respectively) has also increased by 5%. The evolution in the annual average personal dose equivalent of depth 10 mm for the period 2001-2015 is presented in Figure 13.

The analysis per occupational category indicates that the increase is mainly attributed to the 15% increased dose received by interventional cardiologists employed in interventional cardiology laboratories.

The mean annual effective dose for 2015 is 0.21 and 0.82 mSv (for all values and for the values over the reporting level respectively).

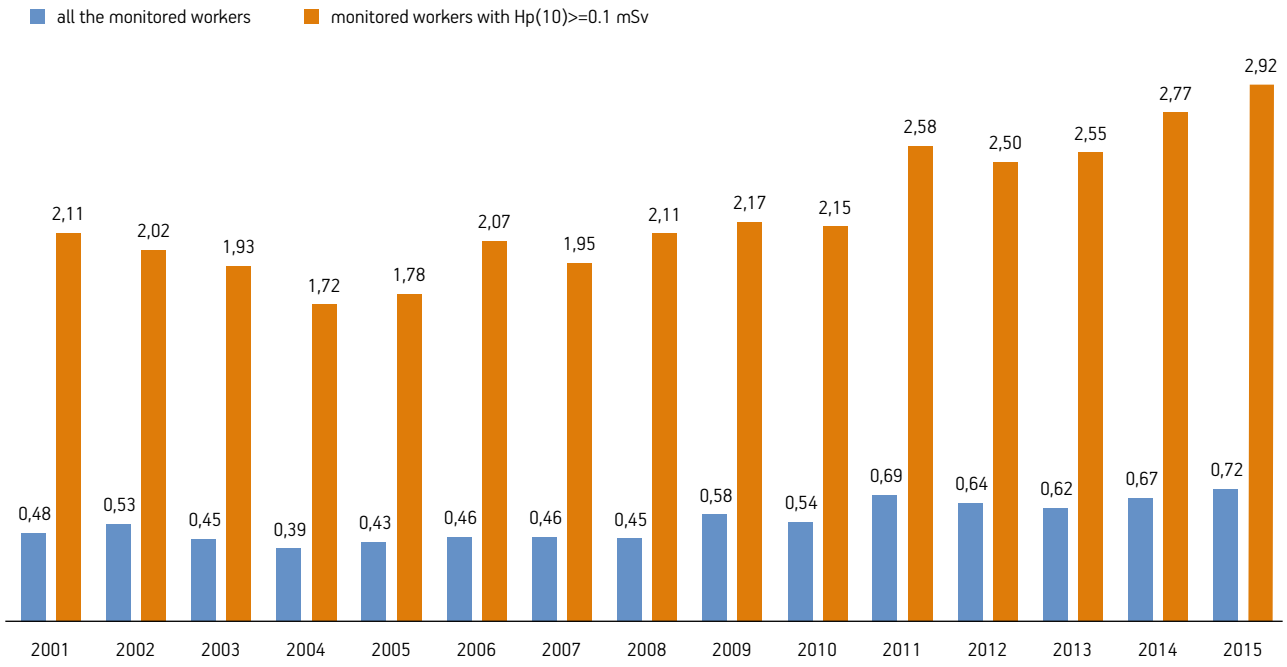


Figure 13: Evolution of the annual average personal dose equivalent of depth 10 mm for the period 2001-2015

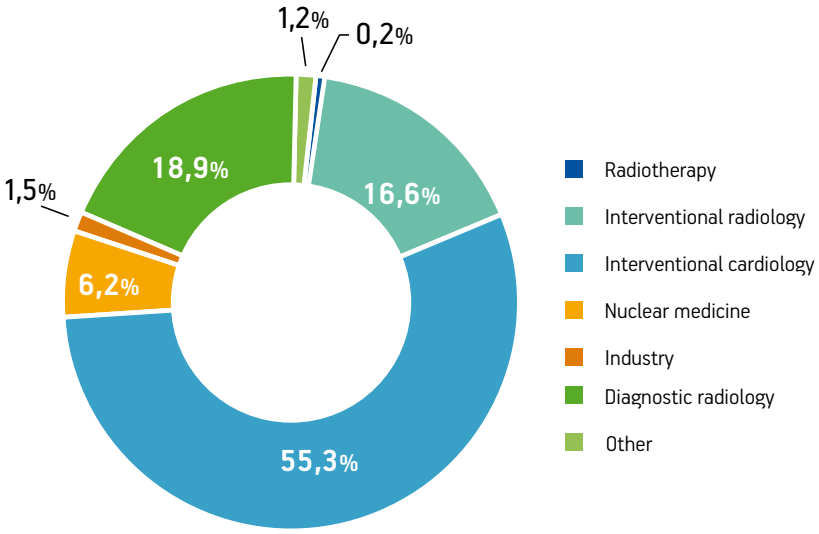


Figure 14: Distribution of doses per workplace

Table 5: Important numbers for the year 2015

Individual monitoring of occupationally exposed workers (external exposure) in 2015	
Total number of persons monitored	11.505
Number of persons monitored receiving doses below the reporting level	8.660 (percentage 75,3%)
Annual average personal dose equivalent of depth 10 mm	0,72 mSv
Mean annual personal dose equivalent of depth 10 mm (values over the reporting levels)	2,92 mSv
Mean annual effective dose	0,21 mSv
Mean annual effective dose (values over the reporting level)	0,82 mSv

With regard to extremity doses, as figure 15 shows, the annual recorded dose from finger dosemeters remains at the same levels as 2014 (9.76 and 25.96 mSv, with and without zero recordings, respectively). Despite such stability, a further analysis indicates a decrease in the dose of finger dosemeters used in interventional laboratories (by 20%), while increase is observed in finger dosemeters used in radiopharmaceuticals production facilities.

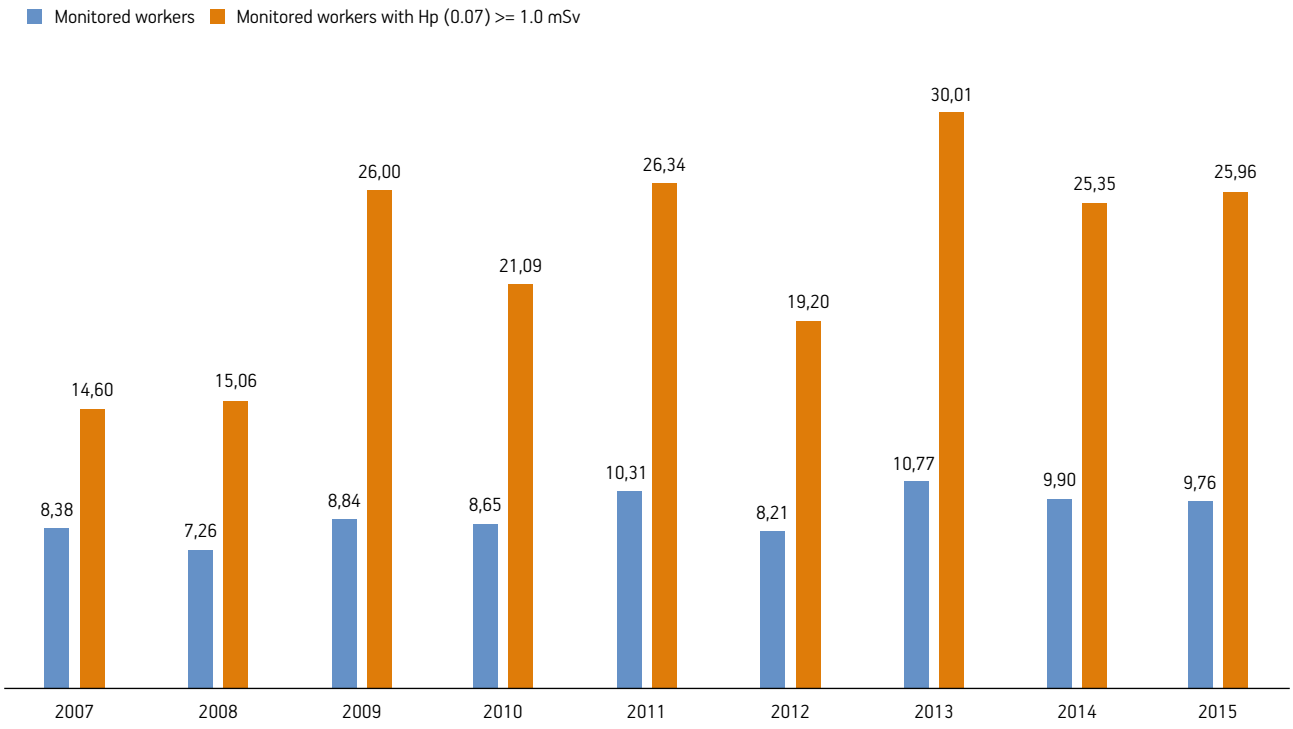


Figure 15: Mean annual extremity dose (personal dose equivalent of depth 0.07mm) in mSv for years 2007-2015

Eye lens dosemeters

In 2015, EEAE started the distribution of dosemeters for the assessment of the dose received by the eye lens, and more specifically for the personal dose equivalent of depth 3mm, Hp(3).

Workers who may need eye lens monitoring are those mostly involved in interventional techniques, as well as those working in nuclear medicine laboratories. In general, eye lens dosemeters may be provided to personnel that may receive to eye lenses an equivalent dose higher than 15 mSv per year. Dosemeters have to be placed as close as possible to the eye mostly exposed to radiation.

Based on pilot measurements, eye lens dose for workers in nuclear medicine laboratories does not exceed 5 mSv per year, while in interventional cardiology laboratories the respective dose is 12 mSv per year. This value may be exceeded in case that the radiation protection means are not properly used or in case of extreme workload.

Investigation of cases where personnel received doses above the limits

In 2015, there has been **one (1) case of occupationally exposed worker exceeding the effective dose limit of 20 mSv.** The investigation showed that the dosemeter was forgotten inside the treatment room at a linear accelerator facility.

Furthermore, **fourteen (14) cases where the effective dose exceeded 6 mSv** (investigation level) were identified, twelve (12) of which were related to whole body dosemeters and two (2) to extremity-finger dosemeters. Figure 16 presents the distribution of cases per workplace.

The investigation showed that:

› improper use of dosemeters was identified in 29% of the cases (4 cases). The dose was not related to the worker himself but to the dosemeter;

› in 36% of the cases (5 cases), dosemeters were placed above radiation protection lead aprons; thus the effective dose estimated by the radiation protection officer was significantly lower than the investigation level of 6 mSv;

› in 14% of the cases (2 cases of extremity dosemeters) the dosemeter had been contaminated; as a result, the dose recorded was not induced to the worker;

› in 21% of the cases (3 cases) the investigation has not been completed by the radiation protection officer.

Figure 17 presents the answers derived from the investigation of the above cases.

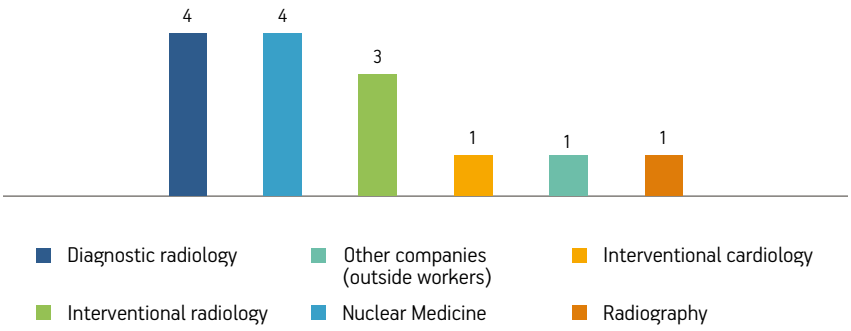


Figure 16: Distribution of cases with doses above the investigation level

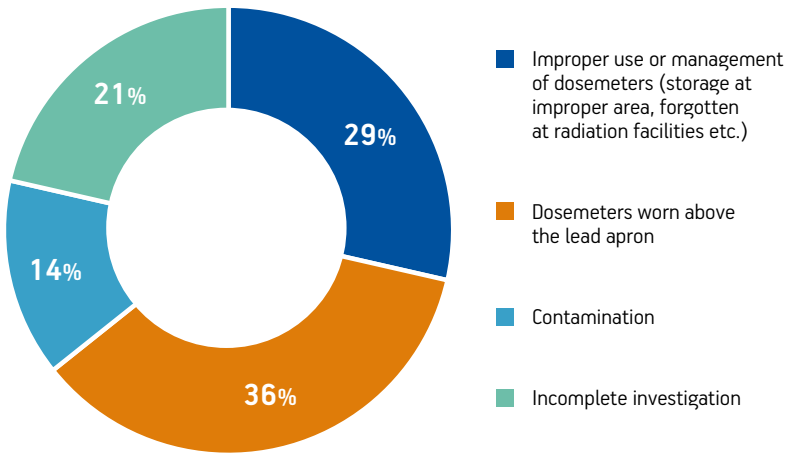


Figure 17: Investigation of 14 cases with effective dose above 6 mSv

During the last years, there has been a significant decrease in the number of the cases exceeding the investigation limit. Figure 18 presents the number of cases investigated, having separated the cases where dosemeters were worn above the lead apron. The decreasing trend is attributed to the persistent and immediate interaction with the radiation laboratories.

Interlaboratory exercises

EEAE participated in the interlaboratory exercise organized by the European Scientific Network EURADOS for extremity dosemeters for Hp(0.07). The irradiation has been performed at X, γ and β ray fields, with a view to check on the energy and angle dependence and linearity. The dosemeters response ranged from 0.95 to 1.23 and the results are within the acceptable limits.

Within the framework of introducing eye lens dosemeters, EEAE also participated in a EURADOS intercomparison exercise for eye lens dosemeters. The irradiation has been performed at γ and X ray fields, mostly related to medical applications. The dosemeters' response ranged from 0.98 to 1.23 and the results are within the acceptable limits.

Evaluation of provided services

In December 2015, a questionnaire was distributed to the laboratories making use of dosimetry services with a view to investigate the level of satisfaction in terms of the quality of provided services. The questionnaire is also available at EEAE website for online completion. The response percentage was high, reaching 40%.

Satisfaction level remains high, as the average response value in all answers was higher than 4.5. Responses were significantly satisfactory in relation to eye lens dosemeters.

98% of the respondents replied that they faced no problem as to the quality of the services. Furthermore, they suggested some improvements in relation to:

- the appearance of whole body dosemeters;
- the usefulness of finger dosemeters;
- the decrease in service cost;
- the online access to the measurement results for all monitored workers;
- the online dispatch of the results certificate.

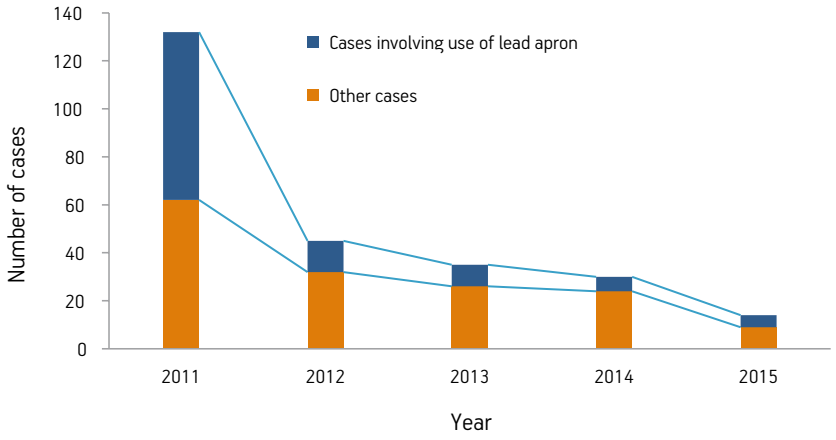


Figure 18: Number of cases investigated during the last five years

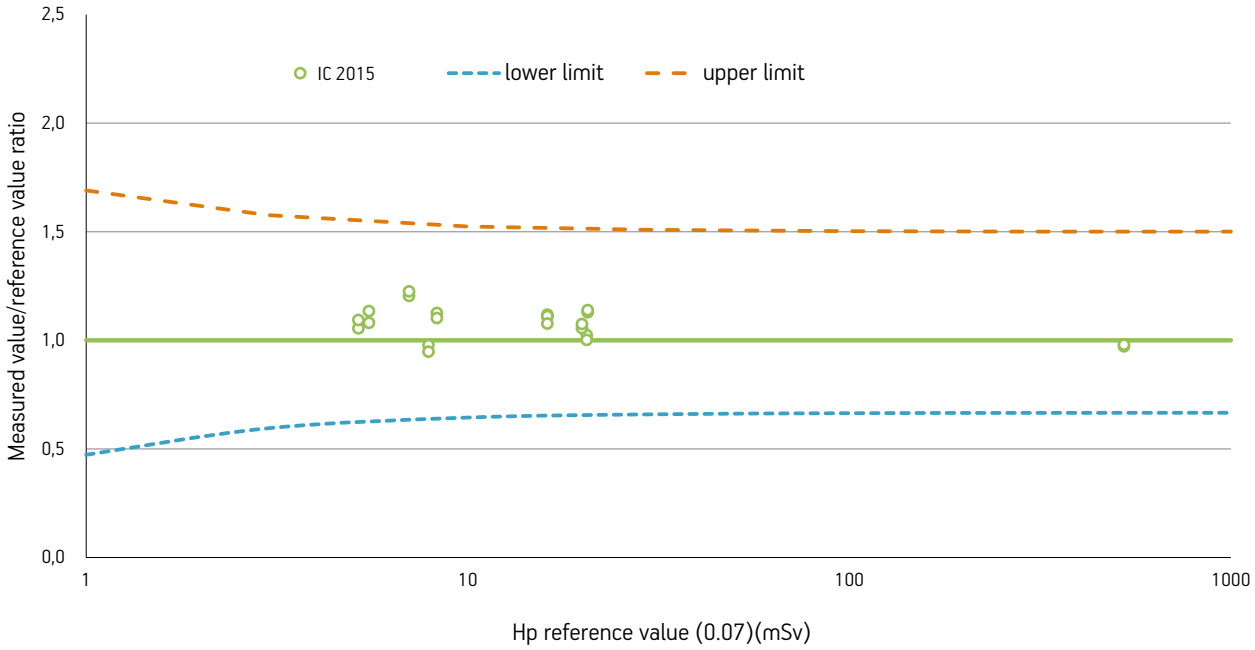


Figure 19: Extremity dosemeters response and respective acceptable limits

b. Calibration of ionizing radiation instruments

The Ionizing Radiation Calibration Laboratory (IRCL) is a secondary standard dosimetry laboratory that has developed and maintains the national reference dosimetric standards (Gy, Sv, Cb/ kg) for ionizing radiation (γ, X and β) and provides calibrations in terms of Air Kerma, Absorbed Dose, Personnel Equivalent Dose Hp(10) and Hp(0,07), Ambient Dose Equivalent H*(10) and Exposure to fields of radiotherapy, diagnostic radiology, mammography, radiation protection and individual monitoring of occupationally exposed personnel. IRCL officially collaborates with the National Metrology Institute.

During 2015:

› IRCL provided calibration services of radiation measurement instruments in all fields of radiotherapy, brachytherapy, diagnostic radiology, radiation protection, individual monitoring. In total **248 certificates have been issued to 114 customers.**

› quality controls have been conducted in approximately 120 parameters (radiation beam quality, dosimetry quantities, radiology parameters, geometric parameters, environmental quantities, etc.). The controls are conducted regularly (monthly, bi-monthly, six-monthly and annually) on the basis of the quality control programme of IRCL, as well as after recorded deviations or repairs in the equipment used.

› customer satisfaction from calibration services reached 4.31 (with 5 for excellence). The assessment is based on the completion of questionnaires and concerns the following fields: technical competency, communication, results, technical support and assistance. Nevertheless, the percentage of customers' response was very low (9 out of 146).

Table 6: Number of calibrations performed during 2015

Field	Number of instruments
Radiotherapy ionization chambers - electrometers	7
Brachytherapy ionization chambers	2
Diagnostic radiology dosemeters	36
Diagnostic radiology kVpmeters - chronometers - polymeters	15
KAP meters	--
Portable radiation detectors - Survey meters	114
Individual dosemeters - TLD	374
Pencil type dosemeters - Electronic personnel dosemeters	70

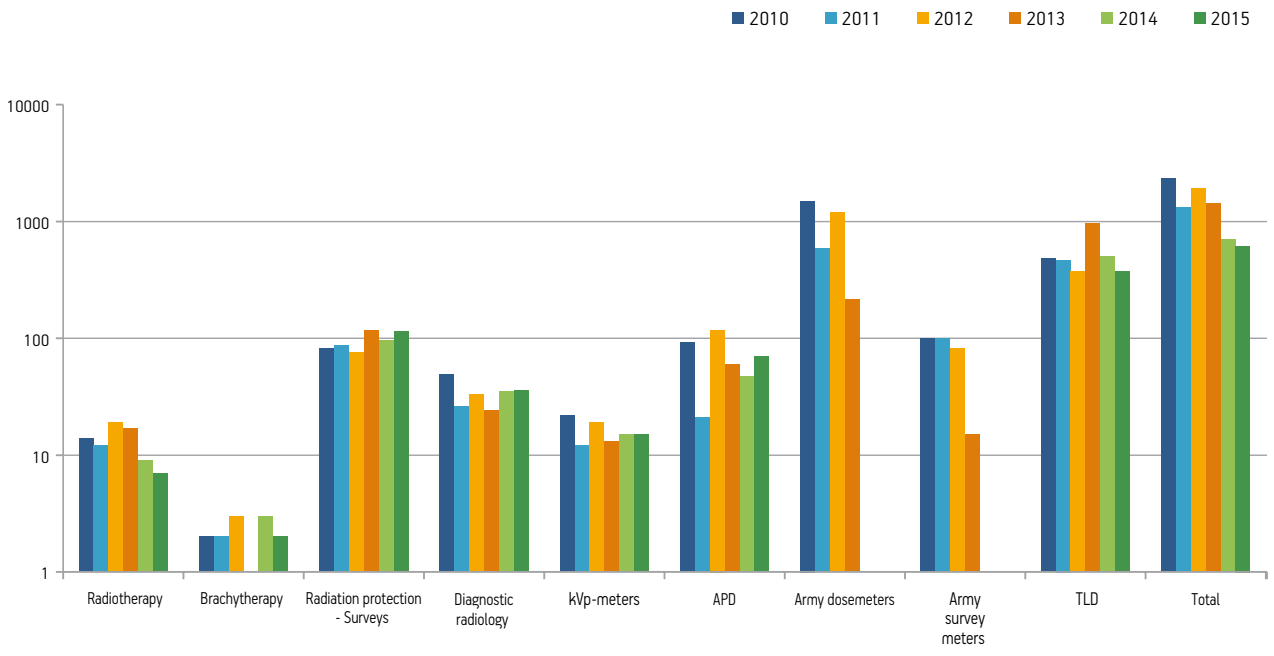


Figure 20: Calibrations performed during the years 2010 - 2015

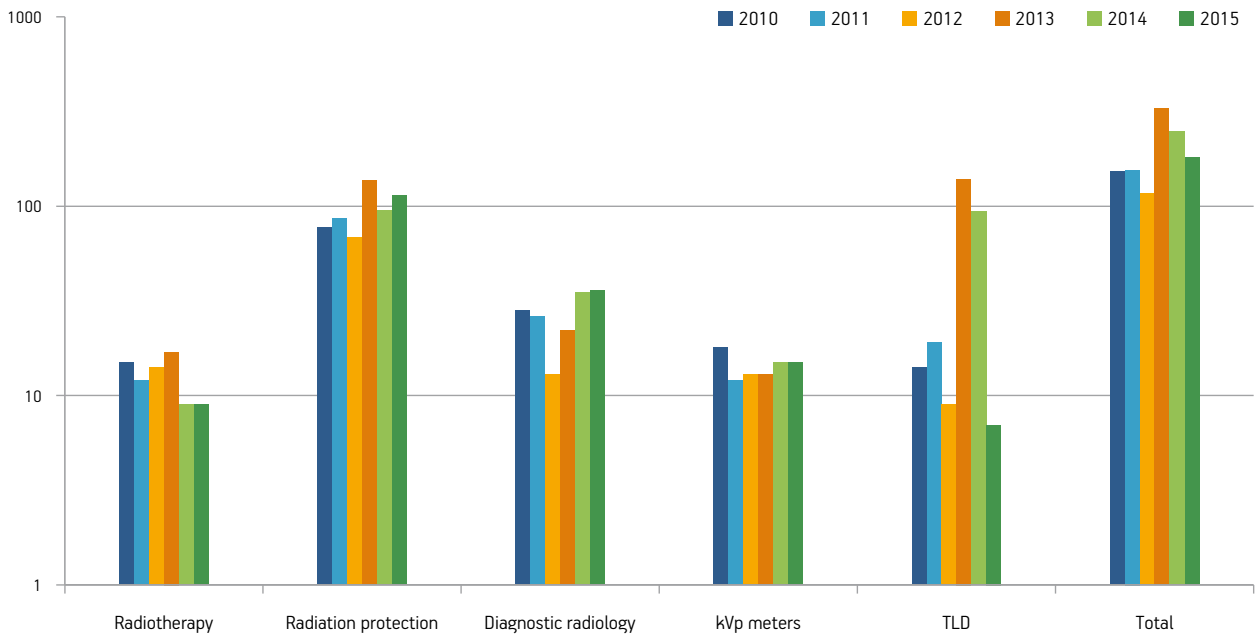


Figure 21: Certificates issued during the years 2010 - 2015

Intercomparison exercises

The table below presents the intercomparisons that took place with the participation of IRCL.

Table 7: Intercomparisons during the years 2013-2015

Time period	Title	Organizer	Field	Test limit	Result
May 2015	SSDL dose quality audit service at radio-therapy level	IAEA	Radiotherapy	deviation limit ±3,5%	deviation 0,0%
November 2015	Radiation protection intercomparison	IAEA	Radiation protection	deviation limit <3,0%	maximum deviation <1,0%
2015	Comparison of pencil type ionization cham-bers - Calibration results and methods between dosimetry laboratories	IRCL	Diagnostic radiology	z-score <1	z-score=0,11 (PKL) z-score=0,05 (Air Kerma)
2014-2015	Mammography inter-comparison	IAEA	Diagnostic radiology	deviation limit <2,9%	maximum deviation <0,9%
2013-2015	EURAMET supple-mentary comparison of the ambient dose equivalent rate for photon radiation BIMP	EURAMET	Radiation protection	expanded un-certainty (k=2) 1,92%	Degree of Equivalence ≈ 1,6% Cs Degree of Equivalence ≈ 1,0% X rays

Other activities

› The IRCL successfully completed an intercomparison program in the field of diagnostic radiology metrology for Air Kerma (K, mGy) and Air Kerma Area Product, KAP (P_{KA}, mGy cm^2), which is the first large scale official intercomparison in diagnostic radiology worldwide. The intercomparison was performed under the EURAMET (European Metrology network), defined as EURAMET RI (I) - S9 (supplementary comparison) - EURAMET 1177 project, and enabled the 22 participating laboratories to:

- check the national reference values of dosimetry standards and their calibration procedures;
- to officially establish the limits of their metrological capabilities through Degrees of Equivalence;
- to submit, upload and support the Calibration & Measurement Capabilities (CMCs) to the official international database of BIPM (Bureau International des Poids et Mesures): http://kcdb.bipm.org/appendixc/search.asp?reload=1&branch=1.

The report and the results were uploaded to the official BIPM database and published in "Metrologia" scientific journal. The full report and further information may be found below:

http://kcdb.bipm.org/AppendixB/appbresults/EURAMET.RI(I)-S9/EURAMET.RI(I)-S9_Final_Report.pdf

http://kcdb.bipm.org/appendixB/KCDB_ApB_info.asp?cmp_idy=1117&cmp_cod=EURAMET.RI(I)-S9&prov=exalead

› A CT dosemeter (pencil type chamber) intercomparison was performed with the participation of 8 countries, with IRCL/EEAE-EIM (Hellenic Institute of Metrology) acting as the pilot laboratory. The results were published in "Physica Medica - European Journal of Medical Physics" scientific journal.

c. Environmental radioactivity monitoring

EEAE coordinates and implements a) the environmental radioactivity monitoring program and b) the nuclear security program, which mainly deals with combating radioactive material illicit trafficking.

In this context, EEAE:

› monitors environmental radioactivity levels through laboratory measurements and its telemetric radioactivity monitoring network;

› keeps the national registry of environmental radioactivity measurements and informs the Hellenic Statistical Authority, European and international organizations;

› drafts technical reports of safety assessments and environmental radiological impact assessments;

› participates in the European and international early notification networks;

› conducts in vivo and in vitro internal dosimetry measurements.

Telemetric environmental radioactivity monitoring network

The telemetric environmental radioactivity monitoring network consists of two sub-systems: the network of total-gamma ray in air measurements and the network of atmospheric aerosol measurements.

› the network of total-gamma ray in air measurement consists of 24 dose rate monitoring stations throughout the country. Alarm is recorded when the rate values of total-gamma ray in air exceed pre-specified values. The measurements are transferred to the central management station where are recorded in a database.

› the network of the measurements of the aerosol in the atmosphere consists of 3 monitoring stations located in Northern Greece (Alexandroupolis, Serres, Ptolemaida).These stations perform measurements of natural and artificial alpha and beta radiation, as well as gamma spectrometry to detect artificial isotopes (e.g. Cs-137, I-131). The measurements are integrated every 30 minutes and are recorded in a database at the central station of the network.

All monitoring stations work continuously, 24 hours, 365 days a year. The average daily values are available at EEAE website, as well as at the European Radiological Data Exchange Platform (EURDEP).

Laboratory measurements

Laboratory measurements are performed in the context of EEAE monitoring role and in the context of the provision of services. These measurements involve:

› samples of soil, water, food, air filters etc., by alpha and gamma spectroscopic analysis and total α/β radiation measurements,

› radiological analysis of drinking water and water samples from tanks, lakes and drills for detection of artificial radioisotopes,

› food products intended for exportation or domestic distribution,

› imported material and commodities,

› building materials and materials intended for industrial production of building materials,

› materials with increased levels of natural radioactivity (Naturally Occurring Radioactive Material, NORM),

› areas with increased levels of natural radiation (locations of phosphogypsum deposition, areas with increased levels of radon in indoor air),

› objects/materials with increased radiation detected during scrap metal inspection.

The number of measurements performed by each method in 2015 is presented below:

› **α-spectrometry. 217 measurements** were performed.

› **Total α/β radiation. 31 measurements** were performed, mainly related to drinking water samples.

› **Measurements by liquid scintillation counter with high resolution capability. 46 measurements** were performed with a liquid scintillation counter, mainly of tritium and carbon-14, on environmental and biological samples.

› **γ-spectrometry. 361 measurements** were performed using germanium detectors. Figure 23 presents the number of measurements by germanium detectors by sample category, while Figures 24 and 25 present the samples of environmental and building materials analyzed in 2015.

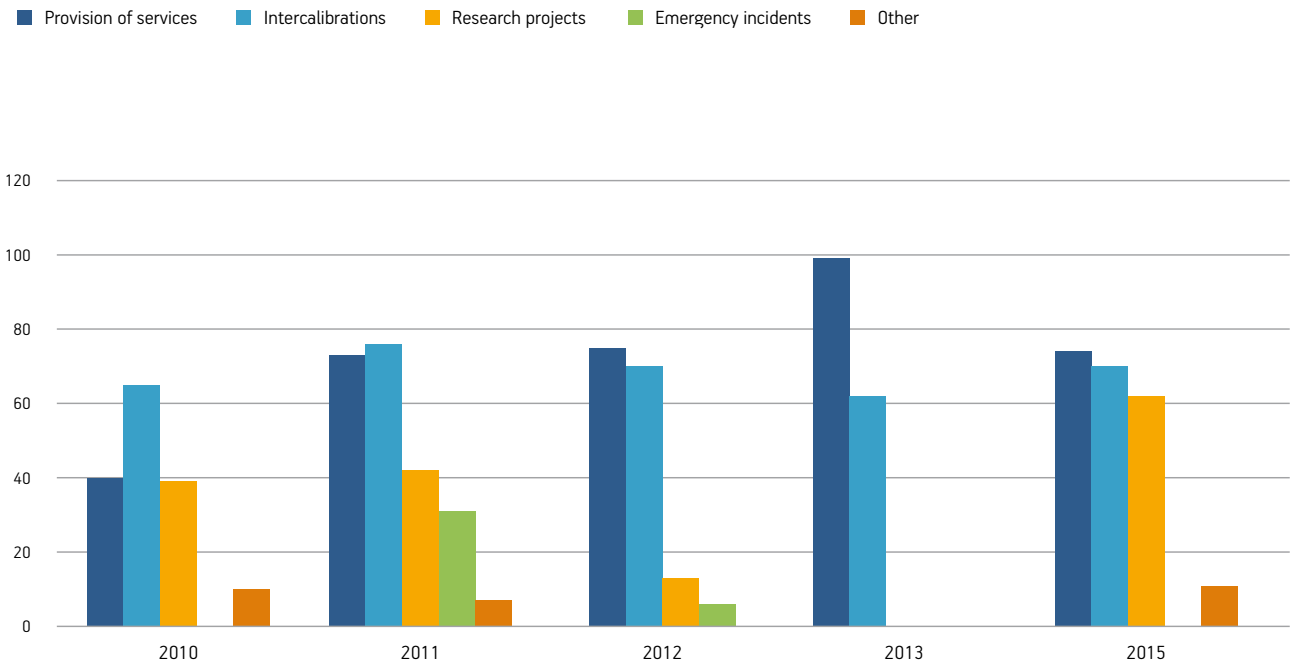


Figure 22: Number of α-spectrometry measurements during 2010-2015

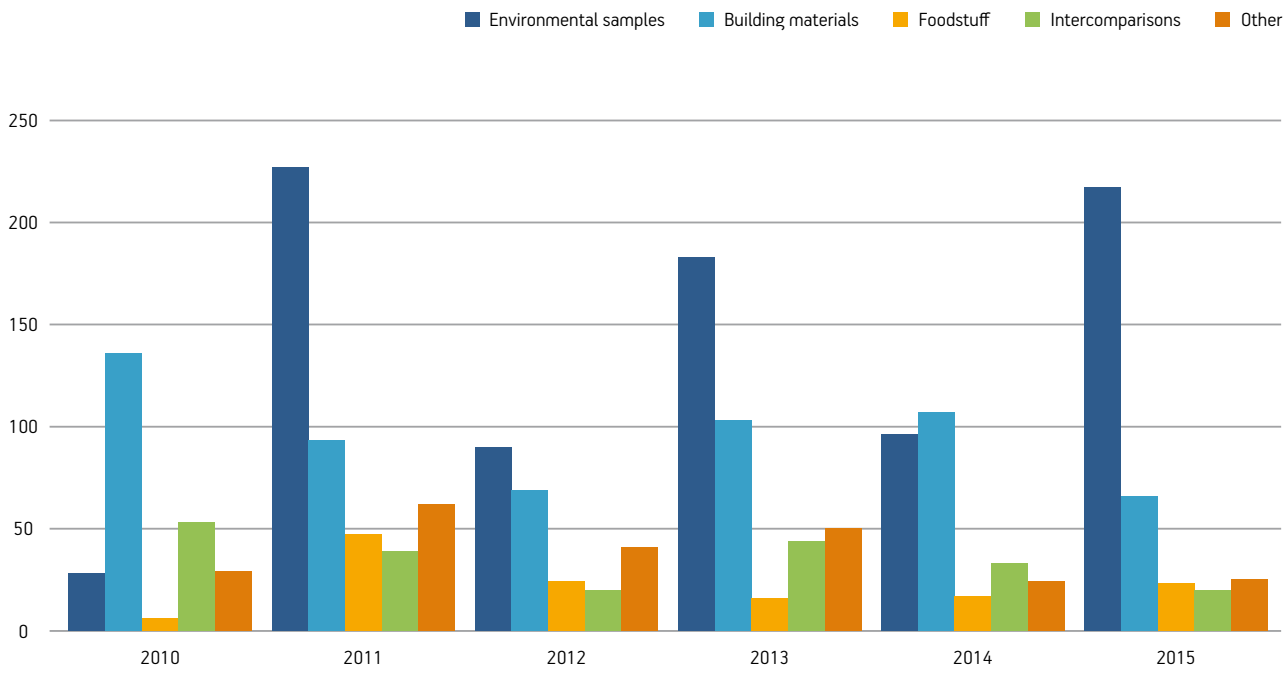


Figure 23: γ-spectrometry measurements by sample category performed during 2010-2015

› Radon measurements

150 radon measurements were performed in residences and workplaces, as well for intercomparison purposes. The majority were performed under the National Radon Map project.

› Internal exposure-whole body radiation measurements

6 whole body radiation measurements were performed for further investigating cases of potential contamination.

Surveys

› Scrap metals import. The import of scrap metals in the country requires a radioactivity measurement certificate, issued by the country of origin. On the basis of this document, EEAE issues the import permit. In situ inspections are performed by EEAE, if required. In 2015, **51 in situ measurements** of total gamma radiation were performed prior to issuing radiation certificates. In 2015, **641 radiation certificates** were issued by EEAE for scrap imports and exports. The fixed radiation detection systems alarms installed in scrap industries all over Greece **were activated 4 times.** All cases of alarms were followed by an in situ inspection by EEAE and identification of the contaminated object.

› Surveys in NORM industries. In situ and laboratory measurements were performed in order to oversee the industries below: Hellenic Fertilizers (ELFE) of Kavala, former Phosphoric Fertilizers Industry S.A. of Thessaloniki, POLYECO, TITAN in Kamari Viotia- Kavala Oil and the Steam Electric Power Station of Public Power Corporation S.A. in Megalopolis in terms of radiation protection of workers and the safe disposal of materials in the environment.

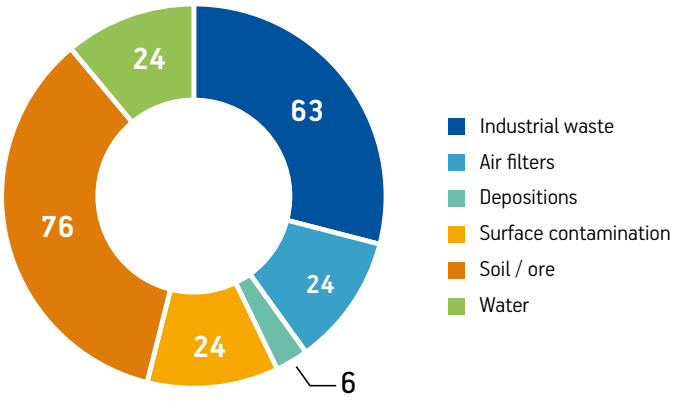


Figure 24: Environmental samples (2015)

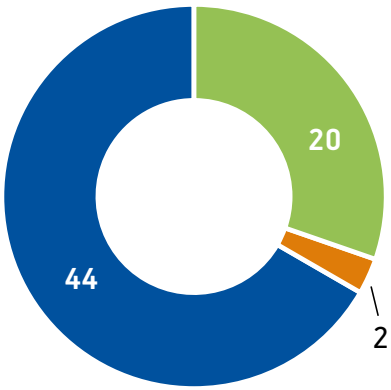


Figure 25: Building material samples (2015)

› **Characterization of industrial waste:** In situ and laboratory measurements were performed on industrial waste and on steel and brass processing byproducts, with a view to export them to recycling companies abroad.

› **NORM material disposal to the environment:** In situ surveys of areas where phosphogypsum is disposed (Aiginio of Pieria, Thessaloniki and Kavala) and of areas where ash is disposed (Megalopolis).

› **Soil and water sampling:** In situ and laboratory measurements with a view to collect the required information for the estimation of the average annual dose from natural radiation sources (PRISMA project). Samples were collected from Thessaly, Eastern Macedonia, Thrace, Lesvos island and Chios island.

› **Combating radioactive material illicit trafficking:** within the framework of actions for combating radioactive material illicit trafficking, radiation detection systems have been installed at entry points of Greece. More specifically, at five customs stations there are automatic radiation detectors installed and portable equipment for performing secondary inspections. Portable devices for radiation detection have been provided to 30 more customs offices, to 20 border police stations and five offices of the Hellenic Coast Guard.

In cooperation with customs authorities, EEAE centrally controls and monitors online all radiation-related incidents. The Greek Customs Authority contracted to EEAE the maintenance and calibration of the detection systems.

In case of emergency, EEAE activates its response mechanisms and updates the IAEA Incidents and Trafficking Database (ITDB) accordingly.

Response to emergency situations

EEAE draws up plans for responding to radiological or nuclear emergencies. At operational level, EEAE is responsible for the implementation of "Xenokratis" General Plan for Civil Protection as to radiological/ nuclear emergencies. Moreover, EEAE participates in the emergency response teams provided for in the National Emergency Plan for Chemical, Biological, Radiological and Nuclear (CBRN) threats. Moreover, it has established an internal emergency plan and it is connected to the early notification systems of the EU and the International Atomic Energy Agency.

Accidents or incidents with radiological consequences for the general population or the environment did not occur in Greece during 2015.

The recorded radioactivity levels (ambient dose rate of total radiation in the air) were normal.

› **In terms of response capability:**

- EEAE organized in cooperation with the Fire Brigade Service of Kropia an exercise (March 3, 2015) with a view to train on the response to car accidents and fires during road transport of Class 7 materials (radioactive materials).
- **An inter-service map exercise** took place in EEAE facilities as to the physical protection and the safety of closed radioactive sources of high activity (June 2-4, 2015). The exercise was organized by EEAE, in collaboration with the Nuclear Security Sandia Laboratories of the US Department of Energy (DoE) and with the contribution of other stakeholders (General Secretariat for Civil Protection, Hellenic Police Force, Fire Brigade Service, etc.). The scope of this exercise was to assess the effectiveness of the coordination and response capabilities of stakeholders in case of malicious acts (theft, terror attack) in venues where such kind of sources are used.

- EEAE participated in two scheduled **early notification exercises** organized by IAEA and the EU. More specifically:
  - » Exercise Convex 2a (March 18, 2015). The exercise scenario involved exposure of workers in a scrap processing facility, due to Co-60 radioactive sources.
  - » ECURIE exercise (October 13-14, 2015). The objective of such exercise was the familiarization with ECURIE communication system and EURDEP database. The exercise scenario involved an accident following an earthquake in the vicinity of Cernavoda NPP in Romania.
- Under IMAGES program ("Implementation of an RN emergency system in Eastern Mediterranean") funded by the European Commission, JRODOS, a decision support tool was installed. JRODOS is an integrated computational tool which assesses and reviews the direct and long-term consequences from a radiological or nuclear accident. The successful installation of JRODOS required the contribution of the Hellenic National Meteorological Service, which had to amend the meteorological products provided to EEAE for using them in atmospheric dispersion computational models. Full operability of the system needs some minor technical works at EEAE main servers, which are soon to be completed. The existing atmospheric dispersion model HYSPLIT (US NOAA) shall keep on being used and maintained, so as to ensure its operational readiness.

Radiological Incidents

› Radioactive contamination in a research laboratory, November 2015

EEAE was informed by a research laboratory worker that she was contaminated with chloride indium (In-111) while performing an experimental exercise. A glass cartridge containing the radioactive isotope slipped from her hand and almost 1/3 of the cartridge content (approximately 140 kBq) diffused on the upper part of her body (face, hair), while she also felt some drops falling to her eye. She was wearing laboratory protective apron and gloves, however, she was not using neither any further protection equipment (panel, glasses) nor her individual dosemeter.

On the same day, EEAE carried out an in situ inspection and measurement at the laboratory venue. A part of the table surface and the floor were actually contaminated. There were performed several measurements at EEAE whole body radiation counter and decontaminations, alternately. In-111 was detected at the upper part of the

body (mainly the head), whilst the next day the remaining quantity was absorbed and equally distributed all over the body. Gamma-spectrometry measurements showed that some personal items, the clothes and the laboratory apron had been contaminated. Doses were assessed based on the performed measurements and a series of presumptions and assumptions based on the incident description.

The assessed dose values are significantly lower than the dose limits for occupationally exposed workers, therefore she was permitted to return to her usual duties. The incident itself and the in situ inspection resulted to a number of recommendations to the laboratory officers and personnel, analytically given by EEAE.

› Radiological inspection by EEAE of waste at Fyli Sanitary Landfill, October 2015

On October 10th, 2015, EEAE was notified - based on the applicable action plan - by Fyli Sanitary Landfill that radiation was detected at waste container. The necessary instructions were given so as to apply the prescribed procedures for the control and isolation of the specific container. On October 12th, 2015 EEAE performed an in situ secondary inspection which revealed that the activation of radiation detectors was triggered by iodine 131 (I-131) at domestic waste. Such isotope is mostly used for the treatment of thyroid neoplasms. The container included domestic waste (clothing) of a person who probably had underwent such kind of therapy. The issue was appropriately tackled in compliance with the applicable procedures. Due to the publicity given to the event, EEAE issued a press release making clear that there is no public health issue or environmental problem.

› Hospitalization of a patient following a nuclear medicine examination, April 2015

EEAE was informed that a hospital room had been occupied for three days by a patient who had undergone a diagnostic nuclear medicine examination after thyroidectomy. However, the room was also occupied and visited by other patients and their relatives-carers, without taking any significant protection measures. Upon investigation, EEAE assessed the dose that these other persons might have received in the room. Taking into account all information provided, based on the worst-case scenario, it was concluded that such dose would not exceed 0.25 mSv. This assessment coincides with the one made by the hospital. The dose is lower than the dose limit provided for the general public (1 mSv per year) and lower than the dose constraints applicable to the exposure of people due to patients administered with radiopharmaceuticals (0.3 mSv). EEAE informed all involved parties that there is no need to worry about the radiation dose that they might have received. It also uploaded to its website guidelines for nuclear medicine laboratories and radiation protection officers.

Education and training

EEAE provides education and continuous training in the field of radiation protection. The educational activities are supported by EEAE's scientific personnel together with the laboratory infrastructure and the inspection equipment.

Implementation of a three-year Education and Training Program in Radiation Protection

In 2015, the three-year Education & Training Program in Radiation Protection completed its second year of implementation at national level. The program was formed based on the existing educational needs and refers to the specialties of occupationally exposed workers to ionizing radiation, thus any auxiliary, technological, technical and scientific personnel, as well as to the emergency response teams. Viability of the program is safeguarded by its continuous assessment and stakeholders participation in the planning and implementation stages thereof.

The method by which the program was designed and gets implemented is - according to IAEA - a "good practice" and coincides with the methodology suggested thereby. EEAE was invited to present its initiatives on the national education program at the international meeting "Consultative meeting of policy-decision makers on the establishment of a national strategy for education and training in radiation, transport and waste safety", held in Vienna in December 2015.

Under the scope of the aforementioned national program, EEAE and the Department of Veterinary Medicine (Aristotle University of Thessaloniki, AUTH) developed a new series of seminars called "Radiation Protection during conventional radiographic systems in Veterinary Medicine". The seminar mostly addresses to professional veterinarians who use conventional radiographic systems for diagnostic purposes as well as to veterinarians who proceed to radiographic procedures outside their private clinic (for example, breeding units, equestrian clubs, etc.). The seminar is funded by the Lifelong Learning mechanism of AUTH and it is conducted twice a year, in Athens and in Thessaloniki.

With a view to modernize the educational methods applied by EEAE, a proper online platform was created for the provision of e-learning. The first e-learning seminars are to be carried out during 2016. The platform may be found at: edu.eeae.gr.

International Appraisal Mission

In October 2015, EEAE underwent an international appraisal (EduTA - Education and Training Appraisal) for a second time, in order to ascertain the progress it made after its first appraisal (2008). The appraisal was about how the previous recommendations have been addressed within the legislative framework governing the education and training of personnel occupationally exposed to ionizing radiation, in the national policy and strategy on radiation protection education and training, and finally in aspects of EEAE operations as a Regional Training Center. The team of reviewers identified a significant progress and concluded that the former recommendations have been implemented. Some of the initiatives positively appraised were:

- the extension of the national radiation protection database, including information on the radiation protection expertise of all personnel occupationally exposed to radiation;
- the development and application of a quality management system based on international standard ISO 29990:2010 on the design, development and provision of non-typical educational actions;
- the establishment of a three-year national program for education and training on radiation protection;
- the development of an online platform for e-learning services.

Furthermore, the reviewers reckoned that the existing legislative framework on education and training on radiation protection is adequate and highly in conformity with international safety standards. Their belief is that it shall be further enhanced by the transposition of Directive 2013/59/EURATOM in the national legislation.

EEAE has managed to become a point of reference for the international community of the education and training of radiation protection personnel. More specifically, in 2015:

- it assumed the Presidency of the IAEA Steering Committee on Education and Training in Radiation, Transport and Waste Safety for two forthcoming years;
- it assumed the Vice-Presidency of the HERCA (Heads of the European Radiological Protection Competent Authorities) working group on education and training.

In 2015, EEAE implemented the actions below:

1. Provision of continuous training

- **Certificates of competence in radiation protection were granted by EEAE** to the non-medical personnel of ionizing radiation laboratories. Upon their training by the radiation protection officers of the laboratories and their successful participation in written exams (Athens, Thessaloniki and Crete), **65 employees** were awarded with certificates of competence in radiation protection.
- **Two training seminars on radiation protection for industrial radiography personnel.** These seminars were attended by **13 persons.** The purpose was to provide participants with basic background on ionizing radiation and industrial radiography, in order to enhance safety culture in the use of radioactive sources.
- **Two training seminars of advisors for the safe transport of class 7 dangerous goods (radioactive materials).** These seminars were attended by **3 persons.** The purpose was to train the participants in radiation protection and in the safe transport of radioactive materials. The attendance to this seminar is a prerequisite to participate to the written examination of advisors for the safe transport of dangerous goods (class 7).
- **Three training seminars for emergency response teams (first responders).** These seminars aimed at providing to participants **(33 firefighters)** with basic background on the identification and detection of radioactive sources. Particular emphasis was given to emergency response events related to technological accidents or terrorism acts, as well as to the proper use of radiation detection devices.
- **Three training seminars for workers in industrial units where radiation detection systems are installed.** These seminars were attended by **28 persons** and aimed at familiarizing the workers with the systems installed and with the detection and identification procedures of radioactive isotopes.

2. Participation in the Inter-University Postgraduate Course in Medical-Radiation Physics

In October 2015, the Inter-University Program of Postgraduate Studies in Medicine, Physics and Radiation Physics started with the participation of **18 students** for the academic year 2015-2016.

3. Organization of international training seminars in specialized fields of radiation protection, safety of radiation sources and nuclear security.

› **Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources:** the fifth cycle of the Post-graduate Educational Course on "Radiation Protection and the Safety of Radiation Sources", attended by **14 senior staff members of regulatory authorities** from eastern Europe and Central Asia, was successfully completed. The course provided participants with education and practical traineeship, aiming at delivering knowledge on radiation protection and at familiarizing them with the core principles of safety, with a view to strengthen the radiation protection systems of their countries as qualified experts.

› **First Workshop on Developing an Effective Compliance Assurance Regime for the Transport of Radioactive Material in Mediterranean Coastal States and Associated Shipping States:** held in Athens (February 9-13, 2015) and attended by **25 participants from 16 countries.**

› **Regional Training Course on Threat Assessment and a risk informed approach for nuclear radioactive material:** held in Athens (May 19-22, 2015) and attended by **20 participants from 11 countries** of the Mediterranean Network for the Transport of Radioactive materials.

› **International Training Course on Developing a Defence in Depth Approach for the Detection of Transboundary Movement of Nuclear and Radioactive Material out of Regulatory Control:** held in Athens (July 7-10, 2015) and attended by **49 participants from 46 countries.**

› **Regional Workshop on the Authorization and Inspection of the Safe Transport of Radioactive Material with a Focus on the Import and Export of Radioactive Sources (Categories 1 and 2) within the Framework of the Regulatory Infrastructure Development Project:** held in Athens (November 30 - December 4, 2015) and attended by **20 participants from 11 countries.**

In addition:

› under the IAEA projects of Technical Cooperation (TC) and bilateral agreements programs 16 scientists came to Greece for training purposes;

› 3 diploma theses were conducted with the cooperation of EEAE.

› EEAE laboratories were used for the in-service traineeship of three students of several faculties.

Research and development

Research is a pillar of EEAE activities and its results support the operational work and reinforce scientific expertise of EEAE personnel. The research activity of EEAE is reflected through its participation in research programs and the number of publications and presentations in scientific journals and conferences.

Projects funded by national and European sources in 2015*

›"European epidemiological study on Radiation-induced Lens Opacities for Interventional Cardiologists" (EURALOC), European Commission, FP7 - OPERRA

EEAE participates in EURALOC research project, funded by the European Commission, which focuses on the impact of low dose radiation to the lens of the eye. The project will combine the know-how and expertise in the fields of epidemiology, ophthalmology and dosimetry for studying the impact of radiation on the eye's lens, in order to establish a dose-response relationship for low doses. The program, which started in December 2014, is joined by 14 partners and is coordinated by the Belgian Nuclear Research Centre (SCK-CEN).

›"Innovative integrated tools and platforms for radiological emergency preparedness and post-accident response in Europe" - PREPARE, European Commission, FP7 - EURATOM

The project aims to fill the gaps that have been identified in emergency preparedness and response, following the Fukushima nuclear accident. A consortium of 46 partners are co-operating in order to review existing operational procedures in dealing with long-term consequences, the trans-boundary monitoring issues and the safety of goods, to further develop and enhance decision-making support tools, like dispersion models etc. Its duration is 36 months. EEAE participates in the work package on the management of contaminated goods with main task to establish a national panel of stakeholders.

›"Implementation of an RN emergency system in Eastern Mediterranean"(IMaGeS), European Commission

IMaGeS project aims at exploring whether the decision support system "RODOS" for nuclear emergencies may be also used in urban areas, as well as indoors, in case of terror attacks involving "dirty bombs". Computational codes will be developed for the prediction of the dispersion of radionuclides within urban areas. These simulations also integrate data from the existing emergency plans. IMaGeS project is implemented by National Center for Scientific Research "Demokritos" and EEAE, under the scope of the HOME/2011/AG/CBRN program of the Directorate General for Home Affairs of the European Commission.

*the PRISMA project is presented in detail in pages 17-18

›"Blended Learning in Radiation Protection and Radioecology", Erasmus+, European Commission

The project "Blended Learning in Radiation Protection and Radioecology" has been approved within the scope of Erasmus+ program of the European Commission and started in September 2015. It is expected to be completed in August 2017. The project is implemented by 10 partners. The objectives are to develop mixed educational actions (live and e-learning) on radiation protection and radioecology, as well as the ongoing education and training of personnel occupationally involved with radiation protection.

›"Radiation protection and clinical audits in new diagnostic and therapeutic technologies", General Secretariat of Research and Technology, 2015-2016

The project "Radiation protection and clinical audits in new diagnostic and therapeutic technologies" is funded by the General Secretariat for Research and Technology (GSRT) in the framework of the Hellenic Republic-Siemens Settlement Agreement. Its objective is to optimize the doses of patients/examined persons due to their exposure to ionizing radiation when applying new diagnostic and therapeutic technologies. The project has two main pillars: (a) development of dose measurement procedures and risk assessment, as well as development of protocols and quality assurance and (b) development and implementation of clinical audits in radiology, interventional radiology, radiotherapy and nuclear medicine.

The list of publications is presented in Annex I.

International relations

Within the scope of its competence and its international activities, EEAE develops partnerships with counterpart organizations of other states, European institutions, international organizations and scientific networks.

Some of these activities for the year 2014 are highlighted below:

› Assumption of ENSREG (European Nuclear Safety Regulators Group) Vice-Presidency

Upon a unanimous decision of ENSREG members, the Chairman of EEAE was designated in January 2015 as Vice-President of ENSREG. At the same time, he was appointed as Chairperson of one of the ENSREG working groups, more specifically of the Working Group on Transparency.

Through ENSREG, EEAE actively participates in joint European actions for strengthening and further improving transparency in the field of nuclear safety and contributes to the shaping of the European nuclear safety regime.

› 3rd ENSREG conference, June 29-30, 2015

On the 29th and the 30th of June 2015, the 3rd Regulatory Conference on Nuclear Safety in Europe took place in Brussels. The conference was organized by ENSREG (European Nuclear Safety Regulators Group). EEAE was invited to present the topic "Nuclear Safety Directive: Amended Directive compliance challenges", as the agreement for the amendment of the European Directive on Nuclear Safety was reached during the EU Council Greek Presidency in the first semester of 2014.

The presentations are available at: http://www.ensreg.eu/ensreg-conferences

› 6th EUTERP Workshop on the "Legislative change in Europe: the implications for training in radiation protection - Rising to the challenges"

The 6th workshop of EUTERP (European Training and Education in Radiation Protection Foundation) on the "Legislative change in Europe: the implications for training in radiation protection - Rising to the challenges" was hosted by EEAE in Athens from September 30 to October 2, 2015. The workshop, attended by 50 participants from European countries, mainly focused on new European Directive 2013/59/EURATOM and specifically on the changes it entails for the legislative framework on education and training in the field of radiation protection.

› Meeting of radiation protection regulators in Athens

On the 9th and 10th of November 2015, EEAE hosted in Athens the Board of Heads meeting of HERCA (Heads of the European Radiological Protection Competent Authorities). The meeting was attended by 40 representatives of regulatory authorities from 23 European countries.

› Workshop on the Implementation of Decision Support Tools in RN emergencies

On the 12th and 13th of November 2015, in collaboration with National Center for Scientific Research "Demokritos", EEAE organized a workshop on the "Implementation of Decision Support Tools in RN emergencies", within the framework of IMAGES program. The workshop was attended by 44 experts in emergency response from Greece and other European countries.

› One-day event on "Radiation Protection and Nuclear Safety"

Under the provisions of the bilateral agreement between EEAE and the Department of Labor Inspection of Cyprus on the cooperation in the fields of their competence, an event was held on December 4th 2015, in Nicosia, on "Radiation Protection and Nuclear Safety". The event focused on issues related to the exposure of personnel and general public to ionizing and non-ionizing radiation.

› 5th Review Meeting of the Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management

From May 11 - 22, 2015, the 5th Review Meeting of the Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management was held in Vienna. The related files are available at: http://eeae.gr/en/radiation-protection/management-of-radioactive-waste/international-framework-and-cooperation-for-the-management-of-radioactive-waste/5th-review-meeting-of-the-joint-convention-on-the-safety-of-spent-fuel-management-and-on-the-safety-of-radioactive-waste-management

› National Report on the implementation of European Directive 2011/70/EURATOM on safe management of spent fuel and radioactive waste

In December 2015, EEAE prepared and submitted to the European Commission the National Report on the implementation of European Directive 2011/70/EURATOM on safe management of spent fuel and radioactive waste, according to article 14, par. 1 of the Directive. Among others, the report contains as attachments the following:

- the "national program" on the management of spent fuel and radioactive waste,
- the inventory of radioactive waste in Greece.

The report (and its attachments) is available at: http://eeae.gr/attachments/article/5642/national_report_radwaste_2015.pdf

At the same time, EEAE personnel:

› represent Greece in committees:

- of the International Atomic Energy Agency (IAEA). Indicatively: Technical Cooperation Group of Experts, Steering Committee for Educational Training, Nuclear Security Guidance Committee (NSGC).
- of the European Union. Indicatively: EURDEP - European Radiological Data Exchange Platform, ECURIE - European Community Urgent Radiological Information Exchange, Group of Experts under the EURATOM Treaty Art. 31, 35, 36, 37, DG SANCO EMF Group of Experts.
- of the European (CENELEC) and International Electrotechnical Commission (IEC), and the International Commission for Electromagnetic Safety (ICES) of IEEE, for issuing technical standards for electromagnetic field measurements.

› represent Greece/participate in high level fora:

- European Nuclear Safety Regulators Group (ENSREG): high level group of the European regulators on nuclear safety,
- OECD/NEA Steering Committee for Nuclear Energy: Board of the Nuclear Energy Agency,
- Heads of European Radiological Protection Competent Authorities (HERCA),
- European Radiation Dosimetry group (EURADOS): Scientific network of organizations involved in radiation dosimetry,
- European ALARA Network (EAN): as a member of EAN, EEAE participates in the network of European Radiation Protection Authorities Network (ERPAN) and Medical ALARA Network (EMAN),
- Secondary Standard Dosimetry Laboratories Scientific Committee of the IAEA/WHO (SSC): Group of advisors-experts with an advisory role to the International Atomic Energy Agency and the World Health Organization,
- International Advisory Committee of the International EMF Project of the World Health Organization.

› participate in the International Atomic Energy Agency (IAEA) consultancy groups and expert missions.

Public information

The provision of information to the public and the State authorities is an institutional obligation of EEAE. Within this framework, in 2015:

› seven press releases have been issued;

› information has been provided to 11 questions posed by members of the Hellenic Parliament in the context of parliamentary control. Most of the questions were related to electromagnetic radiation issues;

› information material (brochures) was prepared;

› school visits have been organized where students had the opportunity to be informed about the daily uses of radiation and had a tour around EEAE laboratories;

› EEAE participated in the event "Researcher's Night" organized on September 25, 2015;

› EEAE participated in the 2nd Science and Technology Festival held during March 17-22, 2015 (interactive exhibition and presentation titled "Let's talk about artificial tanning");

› EEAE personnel were invited to participate in several information events organized by other bodies and stakeholders.

www.eeae.gr: an updated website

On October 9, 2015 EEAE launched its new website. The website eeae.gr was re-designed and updated to a modern and practical web-portal on all issues related to radiation, radiation protection and nuclear safety.

The development, design and implementation of the new website is based on high-end technology and it was conducted by EEAE own means and personnel. Standing out for its content, usefulness, easiness to information search and its renewed design, eeae.gr is a reference point for (a) those looking for direct and credible information on radiation, radiation applications and risks, (b) professional groups involved with radiation and looking for specialized information.

Among others, the new electronic portal on radiation includes:

› detailed results of thousands in situ electromagnetic radiation measurements at mobile telephony base stations in Greece;

› access to the National Observatory of Electromagnetic Fields;

› detailed presentation of medical radiation laboratories;

› access to environmental radioactivity measurements in Greece;

› a number of digital services for professionals, aiming at establishing online procedures for the licensing of radiation facilities;

› the legislation on the use of radiation.

Furthermore, through its new website, EEAE offers to several professional groups the possibility to:

› submit online the required supporting documents for the licensing of medical radiation laboratories;

› have online access to the dosimetric data for the personnel occupationally exposed to ionizing radiation;

› submit online information data on diagnostic and treatment actions entailing ionizing radiation;

› apply online for starting or terminating individual monitoring.

The new website is compatible with the standards set for public organizations websites, runs on mobile devices and has a reading software for visually impaired people.

EEAE Newsletter

In 2015, two issues of EEAE newsletter were released, with a content related both to professional groups and to the general public. The registration to the newsletter list of recipients is possible through EEAE website.

Social media

EEAE keeps official accounts on Facebook and Twitter social networks to facilitate the dissemination of information to a wide audience.

E-governance

In 2015, EEAE posted at the national platform of electronic governance "Diavgeia" 3,968 administrative documents relating to procurement assignments, individual administrative acts, approval of missions and travel expenses, etc.

Open data

Pursuant to Law 4305/2014 (Government Gazette no 237/A/2014), providing for the public disposition and further use of public documents, information and data, which transposes the provisions of European Directive 2013/37/EU, EEAE recorded all documents and data at its disposal and issued a relevant Act on their open access. The webpage of the Ministry of the Interior and Administrative Reconstruction provides a link to EEAE website where the aforementioned are hosted: http://www.data/gov.gr/organization.eeae.

Annex I

Publications

Publications in scientific journals

E.P. Nicolopoulou, I.N. Ztoupis, E. Karabetsos, I. F. Gonos, I.A. Stathopoulos, **"An interlaboratory comparison programme on radio frequency electromagnetic field measurements: the second round of the scheme"**, *Radiation Protection Dosimetry, Vol. 164, Issue 3, pages 316-324, April 2015, doi: 10.1093/rpd/ncu275*

E. Carinou, P. Ferrari, O. Ciraj Bjelac, M. Gingaume, M. S. Merce and U. O'Connor **"Eye lens monitoring for interventional radiology personnel: dosemeters, calibration and practical aspects of Hp (3) monitoring. A 2015 review"**, *Journal of Radiological Protection 35 (2015), R17-R34*

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V. Tafili, V. Kamenopoulou, C. Hourdakis, C. Potiriadis, **"Discussion of national stakeholders on management of contaminated goods",** *Workshop on Management of Contaminated Goods after a nuclear accident, 12-13 November 2015, Paris*

S. Economides, S. Vogiatzi, C.J. Hourdakis, V. Kamenopoulou **"Establishment of the national Diagnostic Reference Levels (DRLs) for paediatric patients",** *European Diagnostic Reference Levels for Paediatric Imaging (PiDRL) Workshop, October 15-17, 2015 Lisbon, Portugal*

M. Nikolaki, G. Takoudis and C. Potiriadis, **"Natural Radioactivity Determination in Building Materials in Greece",** *International Conference Environmental Radioactivity, 21-25 September 2015, Thessaloniki, Greece*

A. Petri, E. Karabetsos **"Measurements results and inspections findings in artificial tanning devices",** *11th Hellenic Conference of Dermatology, 25-28 June 2015, Thessaloniki*

G. Gourzoulidis, E. Karabetsos, N. Skamnakis, A. Xristodoulou, C. Kappas, K. Theodorou and T. G. Maris, **"The electromagnetic environment of magnetic resonance imaging systems. Occupational exposure reveals RF harmonics",** *International Conference on Bio-Medical Instrumentation and related Engineering and Physical Sciences (BIOMEP 2015), June 18-20, 2015, Athens*

V. Tafili, E. Carinou, G. Drikos, C. Hourdakis, V. Kamenopoulou, E. Karabetsos, G. Karantzia, K. Karfopoulos, C. Potiriadis, C. Housiadas **"Integrated approach of communication by a radiation safety regulatory authority",** *International Conference on Risk perception, communication and ethics of exposures to ionizing radiation (RICOMET 2015), June 15-17, 2015, Slovenia*

V. Tafili, E. Carinou, E. Karabetsos, C. Housiadas, **"Communicating safety culture within the radiation safety regulatory authority",** *International Conference on Risk perception, communication and ethics of exposures to ionizing radiation (RICOMET 2015), June 15-17, 2015, Slovenia*

E.Carinou, P. Askounis, C. Koukorava, G. Kyranos, H. Kyrgiakou, E. Nirgianaki, E. Papadomarkaki and V. Kamenopoulou **"First attempt to assess the eye lens doses to interventional cardiologists in Greece",** *International conference on Individual Monitoring of ionizing radiation 2015, April 20-24, 2015, Bruges, Belgium*

C. Potiriadis, K. Kehagia, M. Kolovou, M. Nikolaki, D. Xarchoulakos, D. Mitrakos, H. Dalla **"Determination of the internal exposure of Greek citizens return from Japan immediately after the Fukushima accident",** *International conference on Individual Monitoring of ionizing radiation 2015, April 20-24, 2015, Bruges, Belgium*

I. Clairand, M. Ginjaume, F. Vanhavere, E. Carinou, J. Daures, M. Denoziere, E. Honorio da Silva, S. Principiand and L. Van Rycheghem **"First EURADOS intercomparison exercise of eye lens dosemeters for medical applications",** *International conference on Individual Monitoring of ionizing radiation 2015, April 20-24, 2015, Bruges, Belgium*

P. Askounis, E. Carinou, G. Kyranos, C. Kyrgiakou, E. Nirgianaki, E. Papadomarkaki and V. Kamenopoulou **"The relationship between the years of experience and the mean annual doses of occupationally exposed workers in the medical field",** *International conference on Individual Monitoring of ionizing radiation 2015, April 20-24, 2015, Bruges, Belgiu*

Annex II

Financial Report

Pursuant to Law 4310/2014, EEAE as a regulatory authority enjoys complete administrative and financial independence. EEAE is financed by two sources:

- government funds and
- revenues from services, fees, funding of research and development projects (Special Account).

The governmental budget covers personnel costs and a small part of operational costs. A part of the governmental financial support is used for the annual national contributions to international organizations (OECD, IAEA).

Most operational expenses (including travel, equipment and consumables) and a significant part of salaries are covered by EEAE Special Account, i.e. by self-financing.

Regarding 2015:

- the proportion of contribution of each financial source to the revenues for the year 2015, has been 20% from the State budget and 80% from the Special Account,
- transfer payments to international organizations reached 25% of the total government funds,
- for another year EEAE achieved a surplus budget. The amount of invoiced revenues of the Special Account reached 4.432.916,83 euro (excempt interest), presenting an increase by 8.5% compared to 2014,
- the expenses of the Special Account reached 2.350.482,69 euro (excempt depreciation), reaching the same levels compared to 2014.

Article 45 of Law 4310/2014 provides that the fees and any fines collected by EEAE are used for funding the costs of any nature, as required to ensure sufficient financial and human resources for the support of EEAE work, in order to achieve its goals and responsibilities and to improve its efficiency. Upon EEAE decisions, EEAE reserve funds are used for the needs of its purposes and responsibilities, and to fully meet potential needs arising from its operation as a European Regional Training Centre, in accordance with the long-term agreement with IAEA, ratified by the Law 4085/2012.

The following pages present:

- Special Account budget-report for 2015, including the respective balance sheet (the relevant Audit Report is expected later within 2016),
- Governmental budget data for 2015, and
- The budget estimations for both funding sources for 2016.

Agia Paraskevi, 23/5/2016

STATEMENT OF FINANCIAL POSITION AS OF DECEMBER 31st, 2015 OF THE EEAE SPECIAL ACCOUNT (amounts in euros)

ASSETS

	Acquisition cost			Amounts of previous year 2014		
	Acquisition cost	Depreciation	Net book value	Acquisition cost	Depreciation	Net book value
C. FIXED ASSETS						
II. Tangible Assets	4.209.957,70	4.209.957,70	0,00	4.090.191,92	3.857.580,46	232.611,46
Total Tangible Fixed Assets	4.209.957,70	4.209.957,70	0,00	4.090.191,92	3.857.580,46	232.611,46
D.CURRENT ASSETS						
II. Receivables						
1. Receivables-trade			3.132.509,59			2.535.298,94
12. Receivables-other			20.648,93			67.139,06
IV. Cash and cash equivalents						
1.Cash in hand			202,73			198,17
3. Cash at banks			16.883.650,14			15.090.074,92
TOTAL CURRENT ASSETS (DII + DIV)			20.037.011,39			17.692.711,09
TOTAL ASSETS			**20.037.011,39**			**17.925.322,55**

LIABILITIES

	Amounts of year ended 2015	Amounts 2014
A. NET ASSETS		
V. Surplus funds carried forward		
Surplus funds carried forward	19.959.520,06	17.725.087,59
Total Net Assets	19.959.520,06	17.725.087,59
C. LIABILITIES		
II. Short term Liabilities		
1. Payables-trade	0,00	102.493,13
5. Taxes-Duties payable	55.523,77	77.560,99
6.Social Security Contributions Payable	21.967,56	20.180,84
Total Liabilities	77.491,33	200.234,96
TOTAL LIABILITIES	**20.037.011,39**	**17.925.322,55**

Head of Special Account Secretariat

Dimitris Bouras

SPECIAL ACCOUNT INCOME STATEMENT AS OF DECEMBER 31st, 2015

(1st January - 31st December 2015, amounts in euros)

I. OPERATING RESULTS	Amounts of the year ended 2015		Amounts of previous year 2014	
Turnover (Services rendered)		3.832.069,55		3.643.021,20
Less Cost of Services rendered		1.398.575,83		1.193.263,57
Gross Operating Results		**2.433.493,72**		**2.449.757,63**
Plus Other Operating Income		600.847,28		447.880,81
Total		**3.034.341,00**		**2.897.638,44**
LESS 1. Administrative Expenses		907.709,59		837.803,84
Operating Results before interest		2.126.631,41		2.059.834,60
PLUS 4. Interest received and receivable	107.801,06	107.801,06	176.070,31	176.070,31
Total Operating Results		**2.234.432,47**		**2.235.904,91**
II. PRIOR YEAR ITEMS				
PLUS 3. Prior year's income	0,00	0,00	0,00	0,00
LESS 3. Prior years's expenses	0,00	0,00	20.367,72	20.367,72
Operating and Prior year items		2.234.432,47		2.215.537,19
LESS				
Total Depreciation	142.705,94		15.242,96	
Less Depreciation forming part of the operating cost	142.705,94	0,00	15.242,96	0,00
Surplus funds		**2.234.432,47**		**2.215.537,19**

SURPLUS FUNDS ACCOUNT

	Amounts of Year Ended 2015		Amounts of previous year 2014	
Surplus funds for the year		2.234.432,47		2.215.537,19
Surplus funds brought forward		17.725.087,59		15.509.550,40
Surplus funds carried forward		**19.959.520,06**		**17.725.087,59**

Head of Special Account Secretariat

Dimitris Bouras

SPECIAL ACCOUNT OPERATING AND CASH BUDGET YEARS 2015 AND 2016 (amounts in €)

	FINANCIAL DATA	2015 BUDGET	REPORT 31.12.2015	2016 BUDGET
	YEAR'S EARNINGS			
1.	Rendering of services - Duty paid by way of fees or duties	3.400.000,00*	3.832.069,55*	3.800.000,00*
2.	Other operating income (interest)	200.000,00	107.801,06	120.000,00
		3.600.000,00*	3.939.870,61*	3.920.000,00*
	PROGRAMME SUBSIDIES			
1.	NSRF (PRISMA)	600.000,00	400.000,00	0,00
2.	IAEA (RTC), EU, other	150.000,00	200.847,28	150.000,00
		750.000,00	600.847,28	150.000,00
	TOTAL INCOME	**4.350.000,00***	**4.540.717,89***	**4.070.000,00***
	YEAR'S EXPENSES			
1.	Staff wages and expenses **	830.000,00	907.709,59	920.000,00
2.	Utilities	15.000,00	8.537,56	15.000,00
3.	Travel expenses	300.000,00	266.103,75	260.000,00
4.	Purchase of equipment	150.000,00	142.705,94	100.000,00
5.	Exhibitions, demonstrations and conference expenses	50.000,00	39.940,74	50.000,00
6.	Donations - Subventions	10.000,00	0,00	0,00
7.	Consumables	100.000,00	42.958,56	50.000,00
8.	Third party fees (project assignments via bidding procedures e.g. antenna measurements)	550.000,00	28.605,30	150.000,00
9.	Operating expenses	215.000,00	467.261,32	200.000,00
10.	Regional Training Centre (RTC)	0,00	169.851,20	200.000,00
11.	VAT payments	210.000,00	276.808,73	250.000,00
12.	Depreciation	20.000,00	232.611,46	20.000,00
	TOTAL EXPENSES	**2.450.000,00**	**2.583.094,15**	**2.215.000,00**

*It refers to invoiced income within the year (actual estimated minus 900.000€).

** It refers to total personnel cost (personnel under an employment contract)

GOVERNMENTAL BUDGET APPROPRIATIONS FOR EEAE, YEARS 2015 AND 2016 (in €)

	2015 BUDGET	2015 REPORT	2016 BUDGET
Personnel cost (public servants and employees with indefinite period private law contracts)	836.000	835.710,72	867.000
Transfer payments (current and unpaid from previous years)	2.263.000	255.222,61	2.400.000
Goods and capital equipment supplies	29.000	15.760,10	29.000
TOTAL	**3.128.000**	**1.106.693,43**	**3.296.000**

2015 in photos

1. *Informing visitors of Athens Science Festival 2015 about radiation, March 7-22, 2015* ***2.*** *6th EUTERP Workshop on education and training, Athens, September 30 - October 2, 2015* ***3.*** *Address by EEAE Chairman at the presentation event of the National Observatory of Electromagnetic Fields, October 14, 2015* ***4.*** *EduTa mission group, October 2015* ***5.*** *Visit of the General Secretary for Research and Technology, Prof. Th. Maloutas, to EEAE, July 24, 2015*

6. *Stakeholders meeting at EEAE facilities for the regulatory framework for the management of radioactive waste, July 22, 2015* ***7.*** *Board of Heads meeting of HERCA (Heads of the European Radiological Protection Competent Authorities) in Athens, November 9-10, 2015* ***8.*** *Two-day event of IMAGES program, May 7-8, 2015* ***9.*** *Presentation of PRISMA project results, Thessaloniki, December 2, 2015*

Greek Atomic Energy Commission (EEAE)
P. O. Box. 60092 | Agia Paraskevi | Postal code 15310 | Athens
t: +30 210 650 6700 | f: +30 210 650 6748 | e: info@eeae.gr
www.eeae.gr

www.facebook.com/eeaegr

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