HERCA

HEADS OF THE EUROPEAN RADIOLOGICAL PROTECTION COMPETENT AUTHORITIES

HERCA Guidance

Implementation of Radiation Protection Expert (RPE) and Radiation Protection Officer (RPO) Requirements of Council Directive 2013/59/Euratom

November 2017

This document was approved by the Board of HERCA on 3 November 2017

Index

HERCA Guidance

Implementation of Radiation Protection Expert (RPE) and Radiation Protection Officer (RPO) Requirements of Council Directive 2013/59/Euratom

1 Background and Introduction

Education and training (E&T) in radiation protection has been of interest to the Heads of the European Radiological protection Competent Authorities (HERCA) from the beginning of the Association in 2007. The Task Force on Education and Training in Radiation Protection (hereafter TF E&T in RP) was founded in November 2012. The ultimate mandate of the task force was to present to the Board of HERCA a general picture of the state of E&T in radiation protection and to identify the needs for harmonisation among HERCA member states. The approved findings, conclusions and recommendations of the TF E&T in RP led to recommendations from the HERCA board that the European Commission (EC) should develop further guidance on the duties and required practical competencies of the radiation protection expert (RPE) as well as on the role of the radiation protection officer (RPO) and the required training and competencies. The EC funded in 2014 the ENETRAP III project under the seventh Framework Programme for Research and Technological Development (FP7) to further develop the European reference training scheme with additional specialized modules for RPEs working in medical, waste management and NPP [ENETRAP III].

On the occasion of the 14th HERCA board meeting (Stockholm, 21-22 October, 2014), the TF E&T in RP was tasked with the development of criteria/guidelines for the implementation of RPE and RPO making use of results from the European Network on Education and Training in Radiological Protection where appropriate (ENETRAP I, II, III). While developing these guidelines the diversity in the implementation of the Council Directive 2013/59/Euratom laying down the 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 (hereafter EU-BSS) should be respected. A workshop was organized from the 6th to 8th of July 2015 in Paris, France to fulfil these tasks. The workshop provided a platform of exchange that proved to be useful for the facilitation of the implementation of the EU-BSS on RPE and RPO at the national level. Furthermore, it provided a way towards a common understanding of specific issues of the EU-BSS requirements and specific recommendations for those articles and paragraphs where flexibility is allowed for transposition of the EU-BSS. Experts from 17 European Member States (hereafter MS) participating in HERCA plus experts from international organisations such as the EC, International Atomic Energy Agency (IAEA), and International Radiation Protection Association (IRPA) participated in this workshop.

At the 16th board meeting (Athens, 9-10 November, 2015), the HERCA Board approved the proposal of the TF-E&T in RP to establish a Working Group on Education & Training

in radiation protection (hereafter WG-E&T in RP) with a new mandate and action plan throughout the implementation phase of the EU-BSS Directive (2015-2019). The main goal of the WG-E&T in RP is to achieve a common understanding of the EU-BSS Directive requirements considering education and training in radiation protection, while respecting differences within HERCA MS

The first task of the WG-E&T in RP is '*to draft HERCA Guidance for the HERCA MS for the implementation of the EU-BSS directive, taking into account existing useful reports and complementary European documents'.* This task became even more important since the ENETRAP III report of March 2016 is still a topic of continuing discussion in the Article 31 Group of Experts[1].

The HERCA guidance should provide MS with a common understanding regarding the specific requirements on RPE and RPO as described in the EU-BSS directive and should enable MS to compare their national interpretation of RPE and RPO with other HERCA MS. The guidance should function as a framework of exchange that should enable MS to proceed toward a common understanding on education and training in radiation protection. At the 17th Board meeting an inventory of the elements from existing documents (ENETRAP III, IRPA and IAEA) for establishing a common understanding of the EU-BSS articles describing the RPE and RPO requirements was presented as well as the provisional outline of the future HERCA guidance on this topic. This approach and the resulting activities were approved by the HERCA board.

The EU-BSS Directive[2] introduces the radiation protection expert (RPE) which evolved from the former "Qualified Expert" (Directive 96/29/Euratom). The role of the radiation protection officer (RPO) is new and is not mandatory. Having a common understanding on the new requirements for RPE/RPO would facilitate the implementation of the EU-BSS on RPE and RPO at the national level and the way towards harmonisation on this issue. This HERCA guidance describes all possibilities in order to provide the HERCA MS with a full picture of options for implementation of the EU-BSS requirements. This guidance should therefore be of value for all MS since it has high regard for the national legal framework of expertise in each MS. The HERCA guidance will provide an elaboration of the flexibility of the European directive with use of already existing international documents.

The basis of the HERCA guidance for the implementation of RPE and RPO is the EU-BSS Directive. For each requirement of the EU-BSS Directive, possibilities in the implementation thereof were explored by the WG-E&T in RP, which would ultimately lead to a common understanding. In order to further facilitate the implementation of the EU-BSS, relevant existing documents such as those from IAEA, ENETRAP III, HERCA Workshop and IRPA are separately cited in this guidance text. This to enable MS to take note of the underlying source as depicted in the reference list. The country fact sheets will provide information in a uniform lay-out on the national approach towards RPE and RPO implementation in each MS.

The flexibility allowed by the EU-BSS in relation to recognition of RPEs and RPOs means that the required formal recognition, if any in case of RPOs, will be different in the MS, therefore it will be difficult to achieve a straightforward mechanism for mutual recognition. According to ENETRAP III, the main points of attention will be similar for all MS, namely

[1] Article 31 Group of Experts, referred to in Article 31 of the Euratom Treaty

[2] The new EU-BSS articles directly linked to RPE and RPO include: Art 4 (73, 74) – Definitions; Art 14 (2, 3) – General responsibilities for the education, training and provision of information; Art 34 – Consultations with a radiation protection expert; Art 79 – Recognition of services and experts; Art 82 – Radiation protection expert and Art 84 – Radiation protection officer.

the knowledge and understanding of the national legislation in radiation protection, and the official language of the HERCA MS.

The country factsheets will help to achieve a common understanding among the HERCA MS of the recognition requirements for RPE and for RPO (if provided for in national legislation) in each MS.

After implementation of the EU-BSS directive, this information could be the basis for further exploration of the concept of mutual recognition among HERCA MS.

2 Guidance on the implementation of the RPE

2.1 Definition, role and function of the RPE

The EU-BSS defines the Radiation Protection Expert in article 4, definition 73:

4 (73) "radiation protection expert" means an individual or, if provided for in the national legislation, a group of individuals having the knowledge, training and experience needed to give radiation protection advice in order to ensure the effective protection of individuals, and whose competence in this respect is recognised by the competent authority;

According to this definition, 'radiation protection expert' means:

- *an individual or, if provided for in the national legislation, a group of individuals*

According to the definition of the EU-BSS the RPE might be an individual expert or a body with several experts having collective skills. The EU-BSS therefore enables a large spectrum of possible RPE systems.

According to ENETRAP III, the RPE might be an employee of the company but also an external consultant who is contracted to provide expert radiation protection advice. Whether an external consultant or an in-house RPE is more appropriate will depend on the nature and complexity of the undertaking. A nuclear installation, for example may have a team of RPEs on site providing highly specialist advice on a range of complex topics. A company using only level gauges on hoppers might only need to consult with an RPE on an infrequent basis, making the use of an external consultant more cost-effective. [ENETRAP III, p10]

In some countries, several types of "RPE" might be implemented according to the type of facilities. An RPE might be a comprehensive expert or an expert specialized in a specific topic, an individual expert or a body with collective skills, an internal or external expert. [Workshop Paris 2015, p14].

A graded approach is therefore possible when implementing the RPE in national legislation taking into account the nature and complexity of the tasks and of the undertaking.

- *having the knowledge, training and experience needed*

The RPE will need to have a very good understanding of radiation protection principles and how they are applied and implemented in the workplace. The RPE will also need to have a comprehensive understanding of the relevant national legislation and be able to advise on the appropriate actions to be taken. This in order to ensure compliance with the EU-BSS and national legislation. The RPE is not expected to be the person who actually implements aspects of the radiation controls in place e.g. workplace monitoring; this will be the responsibility of other persons. This is not to say that RPEs should not carry out such duties, they could but this would not be part of the RPE role. [ENETRAP III, p7]

The level of knowledge might be obtained through formal education, specific training as well as by work experience. It is recognised that a relevant degree precedes a dedicated radiation protection course. [ENETRAP III]

A broad knowledge of radiation protection could be exemplified, like for example, in the IAEA Standard Syllabus of Postgraduate Educational Courses in Radiation Protection and the Safety of Radiation Sources. Additionally, RPE[3] should have a thorough knowledge of specific topics related to their field of expertise and should keep up to date with developments in that field. Extensive work experience in relevant areas is required to be able to provide the necessary background information and to have the competence to understand new and complex situations, and to give direction and guidance for the solution of problems in topics related to protection and safety. Individual RPEs are unlikely to have expertise in all areas but will probably be specialized in specific topics. A RPE should have a sound understanding of the specific applications to be dealt with. [IAEA RS-G-1.4 §3.21, 3.23, 3.24]

Each MS can define the competence of the RPE (knowledge, training and experience) making use of their national systems for radiation protection education and training since the BSS directive does not state minimal requirements on this point [HERCA Workshop, p19].

Using (parts) of existing examples of training schemes, such as those given in ENETRAP or IAEA documents, however, may facilitate implementation of the EU-BSS in the HERCA MS as well as the common understanding between MS. Country factsheets containing information about the national approach towards RPE and RPO implementation might also facilitate this process.

A more detailed guidance on the 'knowledge, training and experience needed' is further elaborated on in paragraph 2.3 (education, training and retraining of the RPE).

- *to give radiation protection advice*

The RPE is expected to provide high-level specialist advice on radiation protection to undertakings using sources of radiation (EU-BSS). This advice will provide an important input to both the setting up of radiation protection arrangements in the undertaking and the ongoing operation of those arrangements. [*ENETRAP* III, p7]. An indicative list of topics on which the RPE is expected to give radiation protection advice is further elaborated on in paragraph 2.2.

- *in order to ensure the effective protection of individuals*

The expectation is that the RPE will be a source of professional expertise with the primary function being to provide comprehensive, professional and independent advice to the employer/undertaking with respect to required (legal and operational) protection measures to restrict exposure to ionising radiation. [ENETRAP III, p14]

Furthermore, the RPE is expected to promote safety culture4 as required by IAEA RS-G-1.4, and to convey the relevance of the measures to the employer/undertaking to ensure their effective implementation resulting in effective protection of individuals.

- *and whose competence in this respect is recognised by the competent authority.*

[3] RPE in IAEA terms is qualified expert

[4] Safety culture is a very important issue in radiation protection and part of IAEA Safety Standards The Management System for Facilities and Activities for protecting people and the environment / The Management System for Facilities and Activities, No. GS-R-3. The definition of safety culture is: 'The assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance'.

A common understanding of the process of recognition by the competent authority is further elaborated on in paragraph 2.3.

Article 82.1 of the EU-BSS describes further the role of the RPE:

82.1. Member State shall ensure that the radiation protection expert gives competent advice to the undertaking on matters relating to compliance with applicable legal requirements, in respect of occupational and public exposure.

With regard to the relation between undertaking and RPE, it was recommended by the HERCA workshop that undertakings should present the result of the consultations of RPE to the internal committee in charge of Health, Hygiene and Security. The RPE should be independent, but as independence is a matter of culture and attitude, the RPE can be employed by the undertaking. In that case, RPE should be on the same level as the management of the undertaking. Use of the code of ethics such as IRPA's, may be useful. The advice provided by the RPE on the relevant issues have to be written and controllable; it is recommended to include the process of consultation in the quality assurance system. A review of the advice is part of the process in case of authorization or modification procedures. The knowledge of RPE should help the undertaking to achieve optimization. [HERCA Workshop]

In summary, the role of the RPE could be that of a professional consultant with a high level of expertise as described in the ENETRAP III guidance. Equally, the role of an RPE could be that of a responsible person within an internal structure of an undertaking with appropriate knowledge and training. An RPE might be a comprehensive expert or an expert specialized in a specific topic, an individual expert or a body with collective skills, an employee of the company or an external consultant. Several types of "RPE" might be implemented in one member state according to the type of facilities. The role of the RPE is an advisory one, mainly with respect to occupational and public exposures.

2.2 Tasks of the RPE

2.2.1 General tasks and competencies.

Article 82 of the EU-BSS describes the general tasks (topics of advice) and competencies of the RPE:

82.2. The advice of the radiation protection expert shall cover, where relevant, but not be limited to, the following:

- *a) optimisation and establishment of appropriate dose constraints;*
- *b) plans for new installations and the acceptance into service of new or modified radiation sources in relation to any engineering controls, design features, safety features and warning devices relevant to radiation protection;*
- *c) categorisation of controlled and supervised areas;*
- *d) classification of workers;*
- *e) workplace and individual monitoring programmes and related personal dosimetry;*
- *f) appropriate radiation monitoring instrumentation;*
- *g) quality assurance;*
- *h) environmental monitoring programme;*
- *i) arrangements for radioactive waste management;*
- *j) arrangements for prevention of accidents and incidents;*
- *k) preparedness and response in emergency exposure situations;*
- *l) training and retraining programmes for exposed workers;*

m) investigation and analysis of accidents and incidents and appropriate remedial actions;

n) employment conditions for pregnant and breastfeeding workers;

o) preparation of appropriate documentation such as prior risk assessments and written procedures;

- *The advice of the radiation protection expert shall cover, where relevant, but not be limited to the following'*

The fulfilment of the list of tasks of the RPE can differ depending on the nature of the facility, the equipment (radioactive sources or X Ray generators, sealed or unsealed sources etc.) used and the magnitude of the accompanying potential exposures for the workers and members of the public thereby implementing the graded approach. Extension of the list of tasks is also possible when required for certain applications.

82.3. The radiation protection expert shall, where appropriate, liaise with the medical physics expert.

In some circumstances the duties of RPE and MPE will overlap, with the RPE being responsible for the (advice about) acceptance into service of new or modified radiation sources from the point of view of radiation protection [EU-BSS Article 34(c)] and the MPE being responsible for the (advice about) acceptance testing of medical radiological equipment from the point of view of medical exposure [EU-BSS Article 83(c)]. In view of this, the EU-BSS requires the RPE and MPE to liaise where appropriate. It is important, therefore, that the RPE and MPE have a clear understanding of their own responsibilities and work closely together. The EU-BSS does not forbid a single person to carry out the roles of both RPE and MPE. In that case, recognition for both functions is required.

The MPE is a highly specialised role, which includes the provision of advice on the radiation protection of the patient, optimisation of medical exposure, patient dosimetry, and assessment of equipment used in medical exposures. However, it is fundamentally different from the role of the RPE whose function is to give radiation protection advice in order to ensure the effective protection of workers and members of the public. The two roles will closely interact in the hospital environment with the MPE providing advice on optimisation of the radiation protection of the patient and the RPE providing advice on restriction of exposure to medical staff and the public. [ENETRAP III, p12]

A single person carrying out the roles of both RPE and MPE can be acceptable provided the person satisfies the competency requirements for both roles and holds national recognition both as a RPE and as a MPE. [ENETRAP III, p12]

However, in the HERCA workshop on E&T in RP concerns were raised about this topic since the protection of the patient and the protection of the worker or public may have opposite goals. Therefore, it is of importance to integrate all measures against exposures in an optimized and transparent manner. [HERCA workshop]

82.4. The radiation protection expert may be assigned, if provided for in national legislation, the tasks of radiation protection of workers and members of the public.

No interpretation of this article clause in ENETRAP or HERCA workshop has been provided.

According to the HERCA WG, depending on national legislation the RPE can perform additional tasks like the radiation protection of workers and the members of the public. This may include for example procedures, instructions, and protection measures.

Article 31 of the EU-BSS describes in the first clause the responsibilities of the undertaking to ensure that arrangements are assessed and implemented for the radiation protection of workers.

31.1 Member States shall ensure that the undertaking is responsible for assessing and implementing arrangements for the radiation protection of exposed workers.

2.2.2 Advice to the undertaking with regard to exposures (art. 34, 37, 38 EU-BSS)

The RPE provides advice to the undertaking with regard to occupational exposures, as stated in EU-BSS articles 34, 37 and 38 (Chapter VI, OCCUPATIONAL EXPOSURES).

Article 34 EU-BSS states that:

Member States shall require undertakings to seek advice from a radiation protection expert within their areas of competence as outlined in Article 82, on the issues below that are relevant to the practice:

a) the examination and testing of protective devices and measuring instruments;
b) prior critical review of plans for installations from the point of view of radiation protection;
c) the acceptance into service of new or modified radiation sources from the point of view of radiation protection;
d) regular checking of the effectiveness of protective devices and techniques;
e) regular calibration of measuring instruments and regular checking that they are serviceable and correctly used.

It is a common understanding that for occupational exposures (article 34 EU-BSS), the advice from a RPE is mandatory and depends on the nature of the facility, the equipment (radioactive sources or X Ray generators, sealed or unsealed sources) used and the magnitude of the accompanying potential exposures for the workers and members of the public thereby implementing the graded approach. The graded approach should also be applied in the frequency of the RPE advice. [HERCA workshop]

Article 34 EU-BSS provides some specific requirements for specific circumstances in the life of the facility (licensing new type of facility, new operator, changes, different moments of the facility, review assessment of the facility, etc.). On the contrary, article 82 EU-BSS gives detail topics on which the RPE is expected to give advice on. [HERCA workshop]

In addition, since the undertaking has to take into account the advice from the RPE on the minimum requirements for controlled and supervised areas as described in the EU-BSS articles 37 and 38, this should be part of the RPE competences.

Controlled areas

1. Member States shall ensure that the minimum requirements for a controlled area are the following:

a. The controlled area shall be delineated and access to it shall be restricted to individuals who have received appropriate instructions and shall be controlled in accordance with written procedures provided by the undertaking. Wherever there is a significant risk of the spread of radioactive contamination, specific arrangements shall be made, including for the access and exit of individuals and goods and for monitoring contamination within the controlled area and, where appropriate, in the adjacent area.

b. *Taking into account the nature and extent of radiological risks in the controlled area, radiological surveillance of the workplace shall be organised in accordance with the provisions of Article 39.*
c. *Signs indicating the type of area, the nature of the sources and their inherent risks shall be displayed.*
d. *Working instructions appropriate to the radiological risk associated with the sources and the operations involved shall be laid down.*
e. *The worker shall receive specific training in connection with the characteristics of the workplace and the activities.*
f. *The worker shall be provided with the appropriate personal protective equipment.*

2. Member States shall ensure that the undertaking is responsible for implementation of these duties taking into account the advice provided by the radiation protection expert.

Supervised areas

1. Member States shall ensure that the requirements for a supervised area are the following:

a. *taking into account the nature and extent of radiological risks in the supervised area, radiological surveillance of the workplace shall be organised in accordance with the provisions of Article 39;*
b. *if appropriate, signs indicating the type of area, the nature of the sources and their inherent risks shall be displayed;*
c. *if appropriate, working instructions appropriate to the radiological risk associated with the sources and the operations involved shall be laid down.*

2. Member States shall ensure that the undertaking is responsible for implementation of these duties taking into account the advice provided by the radiation protection expert.

2.2.3 Advice to the undertaking with regard to public exposures (art. 68)

The RPE provides advice to the undertaking with regard to public exposures as described in art 68, EU-BSS, Chapter VIII, PUBLIC EXPOSURES, section 1, Protection of members of the public and long-term health protection in normal circumstances.

Tasks for the undertaking

Member States shall require the undertaking to carry out the following tasks:

a. *achieve and maintain an optimal level of protection of members of the public;*
b. *accept into service adequate equipment and procedures for measuring and assessing exposure of members of the public and radioactive contamination of the environment;*
c. *check the effectiveness and maintenance of equipment as referred to in point (b) and ensure the regular calibration of measuring instruments;*
d. *seek advice from a radiation protection expert in the performance of the tasks referred to in points (a), (b) and (c).*

It is a common understanding that for public exposures, the advice from a RPE is mandatory, since the undertaking has to seek advice from the RPE in the performance of the tasks related to the protection of the members of the public. [HERCA workshop]

2.2.4 RPE carrying out the task of the radiation protection officer

Article 84.3 EU-BSS states that:

84.3. The task of the radiation protection officer may be carried out by a radiation protection unit established within an undertaking or by a radiation protection expert.

While the roles of the RPE and RPO are clearly defined and are different from each other, a single person may carry out the roles of both provided he has the required competencies for both roles (Article 84(3) EU-BSS). [ENETRAP III, p11]

It is a common understanding that if the undertaking decides that tasks of the RPO are performed by an RPE, supervisory-specific competences are necessary as well as practice-specific knowledge. [HERCA workshop]

In that case, the RPE should supervise or perform radiation protection tasks according to the requirements as stated in EU-BSS article 84. The possibility that the RPO tasks are carried out by a radiation protection unit is likely to arise in high-risk complex facilities such as for example in a nuclear facility in which a radiation protection unit is commonly used.

2.3 Education, training and retraining of the RPE

Articles 14.1 and 14.2 of the EU-BSS require Member States to ensure that the RPE receives adequate education, training and retraining.

14.1. Member States shall establish an adequate legislative and administrative framework ensuring the provision of appropriate radiation protection education, training and information to all individuals whose tasks require specific competences in radiation protection. The provision of training and information shall be repeated at appropriate intervals and documented.

14.2. Member States shall ensure that arrangements are made for the establishment of education, training and retraining to allow the recognition of radiation protection experts and medical physics experts, as well as occupational health services and dosimetry services, in relation to the type of practice.

2.3.1 An adequate legislative and administrative framework

According to ENETRAP III, an adequate legislative and administrative framework incorporates the following:

- legislation requiring appropriate education, training and information to be
- provided to RPEs, RPOs and radiation workers
- sufficient arrangements in the Member States for such training to be provided
- assessment of the adequacy of the available training and training providers
- a formal mechanism for the recognition of RPEs

In addition, the administrative framework needs to include a competent authority for the recognition of RPEs. This competent authority cannot be a radiation protection training organisation, a professional radiation protection society or an undertaking that works with

radiation, but must be an independent legal entity with the legal authority and knowledge and competence to carry out the recognition function. [ENETRAP III]

The responsibilities of the regulatory body, as part of the required legislative and administrative framework with regard to education and training, is also described in IAEA Safety Guide No. RS-G-1.4 (§2.1-2.17, p3-7) entitled “Building competence in radiation protection and the safe use of radiation sources”. The regulatory body should provide guidance on qualification requirements for each category of job found in particular practices or intervention situations. This guidance should address the minimum educational level, minimum training and retraining requirements and minimum experience for each job category. In addition, the regulatory body should enforce regulations concerning the recognition of qualifications or authorization processes relating to certain duties and/or responsibilities, such as those of radiation protection officers. Alternatively, the regulatory body should review and approve, if appropriate, proposals regarding training requirements made by employers, registrants and licensees. Training centres and courses dealing with safety and with protection related aspects of nuclear industry, transport and waste safety may be accredited by the regulatory body or by other professional bodies recognized by the regulatory body. The regulatory body should ensure that up to date records are maintained which include:

- Information on accredited training centres and training courses;
- National and international agreements relating to training and educational aspects;
- The records of personal authorizations issued.

[IAEA Safety Guide No. RS-G-1.4]

According to IAEA, a national training programme should include the following components:

- Preparation of a training schedule, which includes:
  - Training objectives,
  - Training topics
  - Selection criteria for trainees
  - Selection criteria for instructors
  - Procedures for assessing trainees’ performance.
- Estimation of the resources required (e.g. lecturers, equipment and facilities).
- Selection and accreditation of centres and/or courses.
- Identification of the availability of new training (nationally or internationally) to remedy any shortfall identified in the analysis of needs.

[IAEA Safety Guide No. RS-G-1.4]

2.3.2 Education and training

As stated by ENETRAP III, article 14.3 of the EU-BSS requires Member States to have education and training arrangements in place that allow recognition of competence. In this context, competence is the ability to provide good and effective advice to ensure the effective protection of individuals. National recognition schemes will need to assess competence of individuals by looking at the components that lead to competence i.e. the required level of knowledge (obtained through education and training), operational experience and communication skills. Training and development schemes for RPEs will need to cover the knowledge and skills required to be able to provide effective advice. Some smaller Member States may not have sufficient national expertise and training capability to be able to provide the required specialist training. The article requires arrangements to be made, and these arrangements may include facilitating access to

suitable training courses held in other countries. In this circumstance, the national recognition scheme will need to be provided with details of the courses available so they can assess the adequacy of the training provided. [ENETRAP III]

ENETRAP III has identified broad criteria that define core competence, i.e. the critical capabilities that must be held by all RPE's, regardless of the sector in which they work.

These criteria are:

i. An education to Bachelor degree either specifically in radiation protection, or in a physical/engineering/mathematical discipline OR an academic equivalent.

Further details on the reasoning behind the recommended educational level can be found in the ENETRAP III guidance document.

According to the HERCA workgroup on E&T in RP, Bachelor degrees in additional disciplines such as medicine and natural sciences, or equivalent, could be adequate. Educational levels below Bachelor degrees could also be considered if the radiation protection work experience and knowledge level is sufficient according to the competent authority. This may be different among the HERCA member states depending on the educational systems and laws and regulations.

ii. knowledge and understanding of fundamental principles of radiation protection

iii. knowledge of operational radiation protection methods

iv. the ability to develop and provide appropriate advice with those topics on which the RPE is expected to provide advice

v. a minimum of 3 year experience working in radiation protection environment.

According to the HERCA WG on E&T in RP, the duration of the work experience depends on the complexity of the practices. For some practises, less than three years work experience might be sufficient.

Further details on the reasoning behind the duration of the work experience can be found in the ENETRAP III guidance document.

With respect to acquired competences ENETRAP III states that besides knowledge gained through education and training, operational competences can be gained from a period of time active in a radiation protection environment. [ENETRAP III]

Other training requirements as suggested by ENETRAP III:

- The primary function of the RPE, specified in the RPE definition, is to "give radiation protection advice in order to ensure effective protection of individuals". It follows that, in order to fully execute this role, RPEs must be able to communicate effectively with those to whom they are providing advice.
- Legislation is clearly a country-specific issue; any RPE advising within a country must have working knowledge of the national radiation protection legislation and be able to interpret, and advise in accordance with the various requirements.

[ENETRAP III]

Training for qualified experts should provide the broad knowledge of protection and safety as suggested in IAEA Safety Reports Series. No.20, 2001 and the standard syllabus of the postgraduate educational course in radiation protection and the safe use of radiation sources. This level of knowledge may be obtained by formal education, specific training and work experience. Additionally, qualified experts need to have a thorough knowledge of specific topics related to their field of expertise and also need to keep abreast of developments in their field. Qualified experts need to have highly developed personal attributes, including communication, analytical and leadership skills, since they provide

training and give advice to a wide range of personnel, such as workers, managers, health professionals or staff of government authorities. [IAEA SRS 20, 2001]

In addition to ENETRAP III, the IRPA guidance on certification of a Radiation Protection Expert (ref. 3) provides guidance on the required education and training in relation to the recognition ('certification') of radiation protection experts. IRPA regards the RPE as a college graduate-level appointment and profession, and as such, a normal requirement would be a college degree, usually in science or engineering, including specialized fields such as radiation protection, medical physics or industrial hygiene. According to national approaches, this would normally be a three or four year degree course. Some current schemes may require a Master's or other postgraduate degree, and some may require specific radiation protection content. However, the intent of these additional requirements may alternatively be met by requirements for demonstrated knowledge and/or experience. Non-graduates can be allowed if compensatory measures are identified, usually including enhanced experience requirements and demonstrated learning via other routes. [IRPA]

Education and training requirements for radiation protection knowledge and skills would cover underpinning science, radiation protection philosophy and principles, management, organisation and practical application techniques and knowledge and skills of applicable legislation and guidance. It can be helpful to specify the level of knowledge required, for example in terms of general awareness, basic understanding and detailed understanding. This allows the assessment process to be prioritised and graded. A model knowledge and skills syllabus is attached to this guidance as annex 3. One option is to specify specific examinable courses, which must be attended and assessed. However, such courses do not always exist, and the approach may be unnecessarily restrictive given the alternative approach of a specified syllabus. [IRPA]

EU-BSS article 14.1 and 14.2 do not state minimal requirements in terms of education and training for the RPE. These minimal requirements will be defined in each member state as part of the required legislative and administrative framework. According to the system implemented (comprehensive expert, or specialized expert), the requirements may be more or less complex. Some countries may have to consider almost ten specializations with specific requirements for each specialization. The difficulty to validate professional competences is underlined. [HERCA Workshop]

For the implementation of the EU-BSS, a graded approach is clearly needed. Different approaches for practises ranging from low to high risk are foreseen. Generally, the requirements for RPE/RPO will be different according to the practice/facilities and its concomitant risk. Different classifications or criteria, more or less complex, may be used in order to organise the level of requirements by type or class of practises in the EU-BSS (category). In many countries, the medical field will be distinguished from the nuclear field, and the industrial facilities from the research facilities/practices. The specificity of transportation is mentioned by a few countries. Regarding education and training, a large range of levels of qualification, competencies or training are required. Those differences raise the issue of boundaries on graded approach: some countries may hence consider that, according the low risk of a practice, no RPE is required for this practice. [HERCA Workshop]

The graded approach, already in place, has to be developed further in the definition of tasks and roles of RPE and RPO, and on the implementation and development of the education and training strategy. [HERCA Workshop]

The training (and retraining) process of RPEs should have to take into account the list of tasks and topics (a, b, c, …) as described in EU-BSS art 82, and the field of specialisation. In addition, the workplace competencies required to fulfil these tasks need to be mapped to the relevant knowledge and skills required. [HERCA Workshop]

These required skills and competencies for the RPE, in relation to the list of topics as described in article 82.2, are provided by ENETRAP III and attached as annex 2 to this guidance document. Please note that the list of topics are in a different order than in the EU-BSS article. [ENETRAP III]

The use of the ENETRAP III guidance, as an EU framework on E&T in RP, is encouraged both for the implementation and for updating of educational syllabi in universities and for the implementation and development of ongoing training for RPE (and also RPO). However, the required competencies can also be achieved with other training schemes and on the job training. [HERCA Workshop]

2.3.3 Retraining

In ENETRAP II, it is stated that the RPE will need to be retrained, i.e. receive refresher training or other means of maintaining competence, with a frequency of 3 to 5 years. [ENETRAP II]

IAEA Safety Reports Series. No.20 (paragraph 3.3, maintaining competence) states that retraining ('refresher training') in general could include the following topics:

- A review of knowledge of radiation protection and safety;
- Information on changes to policies and procedures for radiation safety;
- Changes to equipment, instrumentation or processes;
- Results of internal audits or inspections;
- New or revised regulations;
- Feedback from operational experience and good practices;
- Lessons learned from incidents, accidents or operational failures;
- Topical subjects or events.

The frequency of refresher training may be determined by national regulations. Changes in regulations or notifications of safety issues need to be provided as written instructions as soon as they become available. [IAEA SRS 20, 2001]

The [education and training and] retraining process of RPE should have to take into account the list of tasks and topics (a, b, c, …) as described in EU-BSS art 82, and the field of specialisation of the RPE. [HERCA workshop]

2.4 Recognition of the RPE

Recognition of the RPE (EU-BSS art. 14.2, 79.1c, 79.2 and 79.3).

Article 14.2 of the EU-BSS requires that:

Member States shall ensure that arrangements are made for the establishment of education, training and retraining to allow the recognition of radiation protection experts and medical physics experts, as well as occupational health services and dosimetry services, in relation to the type of practice.

Article 79.1 (c) of the EU-BSS states that

Member States shall ensure that arrangements are in place for the recognition of radiation protection experts

Article 79.2 EU-BSS requires that

Member States shall specify the recognition requirements and communicate them to the Commission

Article 79.3 EU-BSS states that

The Commission shall make the information received in accordance with paragraph 2 available to the Member States

According to ENETRAP III, the recognition of an individual as an RPE is a confirmation that the individual has the necessary competence to give advice in the field of radiation protection, that is, has those specific capabilities that provide the basis for the execution of the RPE role. Competence in this instance is defined as “the ability to provide good and effective advice to ensure the effective protection of individuals”. [ENETRAP III]

The issue of suitability of an RPE should be incorporated into the recognition process i.e. an RPE who is deemed suitable to provide advice for a specific sector, for example the medical sector, may not be deemed suitable for a different sector such as the nuclear sector [ENETRAP III].

Provisions are needed in national legislation/regulation to define a recognition system dedicated to RPE. The choice of the recognition system is under the responsibility of MS, the BSS directive does not state minimal requirements on this point. An RPE recognition process is already in place in many countries with, again, different approaches based on the national legislative arrangements. This is the reason why a common understanding on this topic is not easy to achieve. The BSS opens the possibility to implement a recognition system based on individuals or on a group of individuals with collective skills. This leaves open the question whether this recognition should refer to an individual RPE or a group of RPE. A regulatory body or an approved body may perform the recognition. [HERCA workshop]

Member states shall specify the recognition requirements and communicate them to the Commission as stated in EU-BSS article 79.2. [EU-BSS]

The recognition criteria and competence needed can be different according to the nature of the practice and the corresponding risk thereby applying the graded approach. [HERCA workshop]

The country factsheets will give insight into the national recognition systems for RPE in the HERCA MS.

An **example** of a **general framework for RPE recognition** is provided by the ENETRAP III guidance document in which broad criteria that define the critical capabilities that must be held by all RPEs, regardless of the sector in which they work, are summarized as depicted below:

According to ENETRAP III an individual may be deemed as having the core competence necessary to act in the capacity of a Radiation Protection Expert, and be formally recognized as such by the national competent authority if he/she is able to satisfy the criteria depicted below (also in paragraph 2.3.2):

I. An education to:
   - Bachelor degree level either specifically in radiation protection, or in a physical/engineering/mathematical discipline

   OR

   - An academic equivalent

According to the HERCA workgroup on E&T in RP, Bachelor degrees in additional disciplines such as medicine and natural sciences, or equivalent, could be adequate. Educational levels below Bachelor degrees could also be considered if the radiation protection work experience and knowledge level is sufficient according to the competent authority. This may be different among the HERCA member states depending on the educational systems and laws and regulations.

II. Knowledge and understanding of fundamental principles of radiation protection

III. Knowledge of operational radiation protection methods

IV. The ability to develop and provide appropriate advice with those topics on which the RPE is expected to provide advice.

V. A minimum of 3 years' experience working in radiation protection environment

According to the HERCA WG on E&T in RP the duration of the work experience depends on the complexity of the practices. For some practises, less than three years work experience might be sufficient.

In relation to the European Qualification Framework for lifelong learning (EQF), ENETRAP III states that the role of the RPE would be EQF level 6 to 7 or higher. Further information on EQF levels can be found in ENETRAP III. [ENETRAP III]

An **example** of **arrangements for the recognition** of RPE includes the following according to ENETRAP III:

1. National legislation must provide for a recognition system for RPE by the relevant competent authority.
2. The criteria upon which recognition is awarded must be established including the core competencies and specific required skills and competencies. The criteria, along with the nature and format of evidence that must be provided, must be clearly communicated and understood by those applying for RPE status and those assessing such applications.
3. Suitable assessors must be selected who should be able to meet the core competence for RPE and have significant experience in operational radiation protection. It is recommended that assessors are also members of national Radiation Protection societies and it would also be desirable for them to be active in the international RP arena. They should be professionals in their own right with an expectation that they are able to remain independent and impartial and to act with rigor but remain flexible. It is recommended that where possible a panel of assessors is utilised rather than a single individual.
4. The individuals or organisations with the authority to award RPE status must be identified.

The **routine operation** of the recognition system include the prospective RPE submitting documentary evidence to the Assessor(s). This evidence must then be assessed against the specified criteria. If it is deemed that core competence has been demonstrated, it is recommended that the assessor(s) conduct an interview with the applicant to confirm their knowledge and understanding and assess verbal communication skills. Successful applicants should be issued with a certificate with a validity period of no more than five years and included on a national register of RPEs. It is recommended that the applications/sectors that the RPE has been deemed suitable to provide advice on is included on the certificate/register according to ENETRAP III. [ENETRAP III]

Article 79.1 BSS states that*:*

"Member States shall ensure that the necessary arrangements are in place to ensure the continuity of expertise of these services and experts."

According to ENETRAP III, MS should put in place arrangements for re-recognition of RPE's should the individual wish to continue to practice as an RPE after their initial five-year certificate has expired. These arrangements should include establishing criteria for re-recognition and making provisions for submission and assessment of documentary

evidence of continuous professional development (CPD) activities to demonstrate that professional competence has been maintained. Examples of CPD include operational RP methods, technological advances, scientific insights relevant to RP as well as understanding of changes and developments in national legislation in RP. CPD should be a continuous process and is supported by being active as an RPE as well as by the attendance at appropriate training events, participation in conferences and seminars and active membership of relevant professional bodies and contribution to national and/or international working groups. [ENETRAP III]

Sharing national information on the implementation of RPE and RPO in the country factsheets is of importance to facilitate the implementation of the BSS in each HERCA MS and may help to achieve a common understanding among the HERCA MS. In the future, this national information could be used for the exploration of the possibilities of mutual recognition of RPE and RPO in the MS.

IRPA has provided useful guidance on the recognition ('certification') of a radiation protection expert, in which key attributes of a certification scheme are defined:

- Scheme management and governance.
- A clear understanding and definition of the scope of the role of the RPE (i.e. comprehensive or specialized expert).
- Criteria for recognition.
- Assessment methods.
- A renewal system (re-recognition processes).
- Other possible aspects of a recognition process are considered.

[IRPA]

3 Guidance on the implementation of the RPO

3.1 Definition, role and function of the RPO

According to the EU-BSS art. 4.74 the **definition** of an RPO is the following:

Radiation protection officer (RPO) is an individual who is technically competent in radiation protection matters relevant for a given type of practice to supervise or perform the implementation of the radiation protection arrangements.

Radiation protection officer is a new concept in the EU-BSS. RPO is an individual assigned by the undertaking to supervise or perform the implementation of the radiation protection arrangements. While the designation of an RPO is not mandatory by MS, its competence fields are identified in the EU-BSS. [EU-BSS]

According to ENETRAP III paragraph 2.2 the RPO role is primarily concerned with the oversight and supervision of the radiation protection arrangements in the workplace. The duties will be very specific to the undertaking where the RPO works and are likely to involve close liaison with the workers, supervisors and managers. [ENETRAP III]

The IAEA BSS define the Radiation Protection Officer (RPO): as a person technically competent in radiation protection matters relevant for a given type of practice who is designated by the registrant, licensee or employer to oversee the application of regulatory requirements. The two definitions have slight differences mainly the more direct role of the RPO in implementing RP arrangements in the EU-BSS. Therefore, IAEA guidance can be used for aspects of the implementation of RPO in HERCA MS. [IAEA GSR part 3]

According to the IAEA, the RPO plays a vital role in assisting the employer, registrant or licensee by overseeing the practical application of the relevant requirements of the BSS. In addition to the general duties of assisting with the application of the Standards, the RPO has specific duties related to overseeing the program of occupational monitoring. [IAEA GSR part 3]

3.1.1 Role and function

According to the EU-BSS art. 84.1:

Member States shall decide in which practices the designation of a radiation protection officer is necessary to supervise or to perform radiation protection tasks within an undertaking. Member States shall require undertakings to provide the radiation protection officers with the means necessary for them to carry out their tasks. The radiation protection officer shall report directly to the undertaking. Member States may require employers of outside workers to designate a radiation protection officer as necessary to supervise or perform relevant radiation protection tasks as they relate to the protection of their workers.

According to the EU-BSS art. 14.3:

Member States may make arrangements for the establishment of education, training and retraining to allow the recognition of radiation protection officers, if such recognition is provided for in national legislation.

and EU-BSS 79.1:

If appropriate, Member States may establish the arrangements for the recognition of radiation protection officers.

According to the EU-BSS art. 84.3:

The task of the radiation protection officer may be carried out by a radiation protection unit established within an undertaking or by a radiation protection expert.

This topic is already covered in the RPE chapter (paragraph 2.2.4).

The EU-BSS allows **flexibility** for MS regarding:

- the decision in which practices the designation of an RPO is necessary.
- the person that can carry out the task of the RPO (eg. RPO (national equivalent), RPE or a radiation protection unit).
- the recognition of a radiation protection officer, since MS can decide whether or not to establish specific requirements for the recognition of RPOs. In case MS recognise RPOs, MS should specify recognition requirements and communicate these to the Commission.

According to ENETRAP III guidance document:

- The RPO is primarily concerned with the oversight and supervision of the radiation protection arrangements in the workplace. The duties will be very specific to the undertaking where the RPO works and are likely to involve close liaison with the workers, supervisors and managers.
- The RPO needs to have an understanding of radiation protection principles and arrangements that are relevant to the practice he is involved with.

- Accordingly, the RPO needs to have a practical understanding of the principles of radiation protection, the relevant regulatory requirements and operational arrangements.
- The RPO needs to be effective in the roles of supervision, communication and local management.
- The suitability of a particular person for undertaking the role of RPO is the responsibility of the employer, who will need to consider the person's technical competence, communication and managerial skills and line management position in relation to the work being supervised.

[ENETRAP III]

According to IAEA, the RPO is a key person in the facility's organizational structure. In order to be effective the management will need to ensure that the RPO has sufficient authority, time and resources to carry out the necessary tasks. The RPO will need to be designated by the registrant, licensee or employer, with their role being clearly identified within the management structure of the organization and their associated duties clearly described in writing to ensure that work is carried out safely and in accordance with the relevant national requirements.

Additionally, the RPO should provide the links between the workplace, the registrant or licensee, the qualified expert (RPE in EU-BSS) and the regulatory body, and should be the central point of reference within a company for radiation protection matters.

The RPO will need to be familiar with the operations performed in the facility, its organizational infrastructure and working procedures. The selection of the right person(s) to be an RPO according to IAEA will depend on the complexity of the facility's uses of radiation, for example:

- In organizations where the use of radiation is not a major part of the company's main work, such as the use of gauges for process control the RPO could, for example, be an existing employee with a role that already involves general supervision of work or is a person with responsibilities for general safety matters within the organization.
- In organizations where the use of radiation is fundamental to the main work of the company, such as industrial radiography, the RPO could be a person who has already been specially trained in industrial radiography techniques.
- In medical facilities that use radiation there is likely to be a range of people with some general background in radiation protection who may be suitable for appointment as an RPO, such as medical physicists, technicians or radiologists.

In addition, the EU-BSS, according to the HERCA workshop on the implementation of RPE and RPO, does not specify:

- How many different specializations of RPO can be recognized?
- Minimal requirements regarding the level of education, the training and retraining programme of RPO.

The responsibility for the specification of the above-mentioned topics lies upon the MS and should be specified taking into account the graded approach (e.g. coupled to the authorisation system). [HERCA Workshop]

An overview of the national interpretation of the flexibility in RPO can be found in the country fact sheets.

3.2 Tasks of the RPO

According to article 84 of the EU-BSS:

2. Depending on the nature of the practice, the tasks of the radiation protection officer in assisting the undertaking, may include the following:

a) ensuring that work with radiation is carried out in accordance with the requirements of any specified procedures or local rules;

b) supervise implementation of the programme for workplace monitoring;

c) maintaining adequate records of all radiation sources;

d) carrying out periodic assessments of the condition of the relevant safety and warning systems;

e) supervise implementation of the personal monitoring programme;

f) supervise implementation of the health surveillance programme;

g) providing new workers with an appropriate introduction to local rules and procedures;

h) giving advice and comments on work plans;

i) establishing work plans;

j) providing reports to the local management;

k) participating in the arrangements for prevention, preparedness and response for emergency exposure situations;

l) information and training of exposed workers;

m) liaising with the radiation protection expert.

The RPO will generally be involved in supervising or performing the day-to-day radiation safety arrangements within the undertaking.

According to ENETRAP III 4.1 employees appointed to act as RPO will need to have an adequate level of understanding of concepts related to radiation protection and should also be acquainted with the safe and secure use of radiation sources as relevant to the application in order to perform the duties of a RPO. The level of training required will be very dependent on the complexity of the radiation application the RPO is responsible for, and the associated duties and radiation protection tasks. However, there will be a core level of training that is necessary for all RPOs regardless of the practice or sector in which they work. [ENETRAP III]

According to the IAEA, the specific duties of the RPO will depend very much on the type of work in the facility, and the availability of radiation safety expertise within the practice. In a large facility, for instance, the RPO may have well-defined functions relating to a specific area, with other RPOs carrying out other duties in different parts of the facility. In contrast, the RPO in a company with a simple use of radiation, such density gauge, may be the only person with any knowledge of radiation safety and may have a wider range of non-radiation safety duties to perform.

The duties of an RPO will therefore be dependent on the type and extent of the practice in which they work, as well as the existing safety infrastructure of the facility. However, there are likely to be a range of ‘core-duties’ that an RPO may carry out, regardless of the practice in which they work, such as the list depicted in the BSS (mentioned above).

It is important to note that there is flexibility with regard to whether the RPO is a full-time position or not. In many practices, the RPO's role may only be a small component of that person's work. Conversely, the role of an RPO in a more complex practice may be a full time position, or it may be divided among several people. [IAEA RS-G-1.4]

Some examples of specific tasks of radiation protection officers are given in IAEA RS-G-1.4:

- In a medical facility, a radiation protection officer should have responsibilities associated with radiation safety, including the protection of workers and ensuring the appropriate condition of the equipment used. A medical facility may have a number of radiation protection officers, each with a specific responsibility, such as for diagnostic radiology, radiotherapy and nuclear medicine. They may also be responsible for operations involving radioactive waste management in the facility.
- In a nuclear installation, a radiation protection officer may have duties ranging from controlling occupational exposures to ensuring satisfactory compliance with license conditions, including the safe management of radioactive waste in the facility.

In addition to IAEA, as stated in article 84.3 of the EU-BSS, and as discussed in section 3.1.1 (and 2.2.4), the possibility that the RPO tasks are carried out by a radiation protection unit is likely to arise in high risk complex facilities such as for example a nuclear facility in which a radiation protection unit is commonly used.

Furthermore, ENETRAP III table eight (annex 5) provides detailed explanations of the main tasks of the RPO thereby outlining the main actions to complete the tasks of the RPO as described in the EU-BSS.

3.3 Education and Training and refresher training of the RPO

Article 14.1 EU-BSS states that:

Member States shall establish an adequate legislative and administrative framework ensuring the provision of appropriate radiation protection education, training and information to all individuals whose tasks require specific competences in radiation protection. The provision of training and information shall be repeated at appropriate intervals and documented.

3.3.1 An adequate legislative and administrative framework

Please refer to the guidance provided in paragraph 2.3.1, for the legislative and administrative framework.

3.3.2 Education and training

According to ENETRAP III, employees appointed to act as RPO will need to have an adequate level of understanding of concepts related to radiation protection and should also be acquainted with the safe and secure use of radiation sources as relevant to the application. The level of training required will be dependent on the complexity of the radiation application the RPO is responsible for, and the associated duties and radiation protection tasks. However, there will be a core level of training that is necessary for all RPOs regardless of the practice or sector in which they work. ENETRAP III provides detailed guidance on the RPO duties, core competence, education, training, work experience and other requirements. [ENETRAP III]

In summary:

- The core duties of the RPO, as specified in the EU-BSS, are given in annex 5 of this guidance.

- The core training outcomes and competencies form the basis of all RPO training. They are derived from the duties of the RPO and are specified in annex 6 and 7 of this guidance.
- For many radiation applications, it is sufficient if the person carrying out the role of the RPO has a secondary level of education. In some facilities with complex radiation protection arrangements and the potential for significant dose e.g. nuclear reactors, radiochemistry laboratories using a range of radionuclides, a tertiary educational level may be appropriate.
- An ENETRAP III example syllabus covering the core knowledge requirements for the RPO is given in annex 8.
- The duration of work experience relevant for working as an effective RPO in a specific practice may range between weeks and years, depending on the complexity of the practice, the level of radiation risk involved and the specifics of the working environment.
- Other specific personal attributes identified by ENETRAP III are good communication skills and the ability to exercise sound judgement i.e. be capable of analysing a situation and coming up with a pragmatic course of action.

[ENETRAP III]

According to the IAEA, it is important that RPOs are sufficiently trained to carry out their duties regardless of the facility. To be able to adequately carry out the expected duties, an RPO would normally be expected to have, as a minimum, a secondary educational level that included a scientific or technical background. However, the educational level of an RPO will be dependent on the skills and technical requirements of the job as well as on radiation protection needs. For some complex facilities such as for example in nuclear power plants and in hospitals a tertiary educational level may be appropriate.

Radiation protection officers should have had sufficient relevant training to enable them to supervise effectively any work with radiation sources, to ensure compliance with local rules and national regulations, to ensure a suitable response in the event of an emergency and to train workers in radiation protection and safety. Radiation protection officers should receive further training in their specific area of work, for example in radiation protection at nuclear power plants. [IAEA RS-G-1.4]

An additional prerequisite for radiation protection officers should be suitable experience in a particular practice. This will help to ensure that they understand how radiation protection requirements appropriate to a practice or an intervention can be effectively fulfilled. A radiation protection officer should have specific personal attributes such as communication skills, leadership skills, analytical skills, skills relating to the human–machine interface and multitask management skills. [IAEA RS-G-1.4]

The designation of a radiation protection officer by an employer should depend on an assessment of qualifications to ensure that safety standards are applied in accordance with national regulations. Authorization may be required for a radiation protection officer in a specific practice, as specified in national regulations. The regulatory body may require that it be formally notified of the designation of a radiation protection officer for a specific practice.The IAEA suggested syllabus for the RPO [IAEA syllabus] is divided into 2 parts: (a) a core syllabus common for all RPOs; (b) a practise specific supplementary module. The whole required training of a RPO is schematically given in the following IAEA figure:

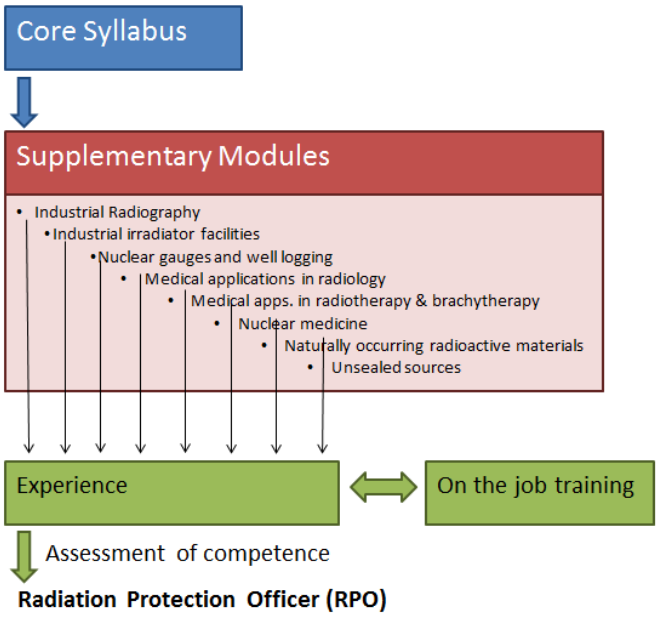


Figure 1: The training programme of the RPO

The Learning Objectives of the IAEA core syllabus are the following:

- obtain a basic understanding of radiation protection principles and source safety;
- obtain a basic understanding of the requirements of the International Safety Standards for radiation protection and the safety of radiation sources;
- understand the role and duties of the RPO

Learning objectives of the IAEA practice-specific supplementary modules:

- have a more detailed understanding of the radiation protection and source safety principles associated with the specific practice;
- better understand the role and duties of the radiation protection officer for the specific practice.
- Participants should fulfil the following prerequisites in order to attend these modules:
    - should have completed the foundation training for RPO's, or can demonstrate they have the equivalent knowledge in all subjects of the RPO foundation syllabus
    - should preferably have prior experience of working in the specific practice

[IAEA RS-G-1.4]

The level of education, the training [and retraining] program of RPOs are defined at the national level (national legislation and administrative framework); the EU-BSS directive does not state minimal requirements on this point. [HERCA workshop]

For the implementation of the EU-BSS directive a graded approach is clearly needed. Different approaches for practises ranging from low to high risk are foreseen. Generally, the requirements for RPE/RPO will be different according to the practice/facilities and its concomitant risk. Different classifications or criteria, more or less complex, may be used in order to organize the level of requirements by type of practise. In almost any case, the medical field will be distinguished from nuclear, industrial or research facilities/practices.

The specificity of transportation is mentioned by a few countries. Regarding Education and training, a large range of levels of qualification, competencies or training are required. [HERCA Workshop]

The graded approach, already in place, has to be developed further in the definition of tasks and roles of RPE and RPO, and on the implementation and development of the education and training strategy. [HERCA workshop]

Regarding RPO implementation further guidance should be developed for RPOs including core competences and practical experience specific for different types of practices. [HERCA Workshop]

The competence fields for RPO are clearly identified and depend on the practice. [HERCA Workshop]

The ENETRAP III guidance on RPO could be a reference for E&T in RP in Europe, which could facilitate HERCA members to go towards a common approach. The promotion of the ENETRAP III guidance, as an EU framework on E&T in RP, should be encouraged for both the implementation or updating of educational syllabi and for the implementation and development of ongoing training for RPO. [HERCA Workshop]

3.3.3 Refresher training (retraining)

According to ENETRAP III, depending on the application, refresher training is needed on a regular basis; 5 years is generally accepted as an appropriate interval but more frequent refresher training (plus participation in an appropriate Continuous Professional Development scheme) may be prudent in high-risk situations/applications e.g. industrial radiography. Employers should provide, as appropriate, necessary means to keep RPOs competence up-to date. [ENETRAP III]

Please refer to paragraph 2.3.3 (Retraining RPE) for the general retraining topics provided by IAEA (Safety Reports Series. No.20, 2001, paragraph 3.3, maintaining competence). [IAEA SRS-20]

The level of [education, the training and] retraining program of RPO are defined at the national level (national legislation and administrative framework); the EU-BSS directive does not state minimal requirements on this point. [HERCA Workshop]

3.4 Recognition of the RPO

Recognition of the RPO is not mandatory, as stated in EU-BSS art 14.3 and 79.1:

14.3. Member States may make arrangements for the establishment of education, training and retraining to allow the recognition of radiation protection officers, if such recognition is provided for in national legislation.

79.1. If appropriate, Member States may establish the arrangements for the recognition of radiation protection officers.

As previously outlined in section 3.1, in contrast to the requirements for recognition of the RPE, the EU-BSS allows flexibility for MS regarding the recognition of RPOs. MS can decide whether or not to establish specific requirements for the recognition of RPOs. [EU-BSS]

The EU-BSS does not require the competence of the RPO to be recognized by the national authority but does permit Members States to have RPO recognition arrangements in place if the member state considers it necessary.

Irrespective of the implementation of a RPO recognition arrangement, it is recommended that the appointment of an RPO by the employer is documented and communicated within

the organization and to the RPE linked to the installation. The RPE can be involved in the appointment process for the assessment of the technical competence in radiation protection. The RPO should receive the necessary means and support from the management in order to supervise or to perform radiation protection tasks within the undertaking. These means and support should be mentioned in the documentation of the appointment, and can include resources such as time, equipment (for measurement and protection) and the managerial communication and notification arrangements.

According to the ENETRAP III, the appointment of an RPO by an undertaking is not a mandatory requirement of the EU-BSS. It is the responsibility of the Member State to specify what work practices require an RPO to be appointed. [ENETRAP III]

ENETRAP III outlines that there are Member States where the availability of one (or more) competent and suitable RPOs is a condition of the operating license given by the competent authority. The competent authority also verifies the competence of the RPO. Competencies for a RPO may include core competencies along with specific additional competencies depending on the nature of the practice and the specific duties of the RPO in the practice. Therefore, ENETRAP III recommends that any national recognition scheme would either be based on assessment of core competence or would include the assessment of specific competencies for each type of practice. It also recommends that a graded approach should be followed for RPO recognition to avoid excessive knowledge and competence requirements for RPOs working with straightforward radiation uses with only relatively low risk. [ENETRAP III]

In relation to the European Qualification Framework for lifelong learning (EQF), ENETRAP III states that the role of the RPO would be EQF level 5 or higher. Further information on EQF levels can be found in ENETRAP III. [ENETRAP III]

IAEA safety guide no. RS-1.4 states that a trainee e.g. RPO may be formally recognized, if required and that such recognition may be accorded by the employer, by the regulatory body or by a designated board, society, or professional or academic body. The regulatory body may require certain functions to be undertaken by authorized persons. Such authorization to perform the duties or delegate the responsibilities to certain positions should be granted by the regulatory body or by the employer, as appropriate, to suitably qualified persons upon application and review of the person's credentials. Employers, licensees or registrants may have legal obligations to appoint only authorized persons in designated positions, for example as radiation protection officers. [IAEA RS-G-1.4]

According to this IAEA guide, it may be appropriate and convenient for the regulatory body to recognize certain training centres and courses for their quality and suitability. Such recognition can be formally conferred by a process of accreditation. The requirements for accreditation of training centres and courses should be defined by the regulatory body in one or more national standards. The regulatory body should maintain updated records of accredited centres and courses, which should be publicly available. [IAEA RS-G-1.4]

4 National approaches: Country Fact Sheets

The national approaches to the implementation of the EU-BSS requirements in relation to RPE and RPO in the HERCA MS can be found on the country facts sheets that will be published in the near future on the restricted part of the HERCA website.

5 Reference list of useful existing documents:

[1] Task Force on Education and Training in Radiation Protection. Report on the HERCA Workshop. Paris, 6-8 July 2015.

[2] ENETRAP III. European Guidance on the Implementation of the Requirements of the Euratom BSS with respect to the Radiation Protection Expert and the Radiation Protection Officer, March 2016.

[3] IRPA Working Group on Radiation Protection Certification and Qualification. IRPA guidance on certification of a radiation protection expert. Edition 2016.

[4] IAEA Safety Standards Series. Building competence in radiation protection and the safe use of radiation sources. IAEA Safety Guide No. RS-G-1.4, 2001.

[5] IAEA. Training in Radiation Protection and the Safe Use of Radiation Sources. Safety Reports Series. No.20, 2001.

[6] IAEA syllabus. Training course series no. xx. Syllabus for the Training of Radiation Protection Officers at Industrial and Medical Radiation Facilities. Draft November 2011.

[7] IAEA. Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards. General Safety Requirements Part 3, 2014.

[8] ENETRAP II. WP 4.2. Reference Standards for RPE training. December 2012. (http://enetrap2.sckcen.be/en/Documents)

Annex I: European Basic Safety Standards (2013/59/Euratom)

CHAPTER II DEFINITIONS

Article 4

Definitions

(73) "**radiation protection expert**" means an individual or, if provided for in the national legislation, a group of individuals having the knowledge, training and experience needed to give radiation protection advice in order to ensure the effective protection of individuals, and whose competence in this respect is recognised by the competent authority;

(74) "**radiation protection officer**" means an individual who is technically competent in radiation protection matters relevant for a given type of practice to supervise or perform the implementation of the radiation protection arrangements;

CHAPTER IV BSS

REQUIREMENTS FOR RADIATION PROTECTION EDUCATION, TRAINING AND INFORMATION

Article 14

General responsibilities for the education, training and provision of information

1. Member States shall establish an adequate legislative and administrative framework ensuring the provision of appropriate radiation protection education, training and information to all individuals whose tasks require specific competences in radiation protection. The provision of training and information shall be repeated at appropriate intervals and documented.

2. Member States shall ensure that arrangements are made for the establishment of education, training and retraining to allow the **recognition of radiation protection experts and medical physics experts**, as well as occupational health services and dosimetry services, in relation to the type of practice.

3. Member States may make arrangements for the establishment of education, training and retraining to allow the **recognition of radiation protection officers**, if such recognition is provided for in national legislation.

CHAPTER VI BSS OCCUPATIONAL EXPOSURES

Article 31

Responsibilities

1. Member States shall ensure that the undertaking is responsible for assessing and implementing arrangements for the radiation protection of exposed workers.

Article 34

Consultations with a radiation protection expert

Member States shall **require undertakings to seek advice from a radiation protection expert** within their areas of competence as outlined in Article 82, on the issues below that are relevant to the practice:

a) the examination and testing of protective devices and measuring instruments

b) prior critical review of plans for installations from the point of view of radiation protection;

c) the acceptance into service of new or modified radiation sources from the point of view of radiation protection;

d) regular checking of the effectiveness of protective devices and techniques;

e) regular calibration of measuring instruments and regular checking that they are serviceable and correctly used.

CHAPTER VIII PUBLIC EXPOSURES

Section I Protection of members of the public and long-term health protection in normal circumstances

Article 68

Tasks for the undertaking

Member States shall require the undertaking to carry out the following tasks:

a) achieve and maintain an optimal level of protection of members of the public;

b) accept into service adequate equipment and procedures for measuring and assessing exposure of members of the public and radioactive contamination of the environment;

c) check the effectiveness and maintenance of equipment as referred to in point (b) and ensure the regular calibration of measuring instruments;

d) **seek advice from a radiation protection expert** in the performance of the tasks referred to in points (a), (b) and (c).

CHAPTER IX GENRAL RESPONSIBIILITIES OF MEMBER STATES AND COMPETENT AUTHORITIES AND OTHER REQUIREMENTS FOR REGULATORY CONTROL

Section I Institutional infrastructure

Article 79

Recognition of services and experts

1. Member States shall ensure that arrangements are in place for the recognition of:

a) occupational health services;

b) dosimetry services;

c) radiation protection experts;

d) medical physics experts.

Member States shall ensure that the necessary arrangements are in place to ensure the continuity of expertise of these services and experts.

If appropriate, Member States may establish the arrangements for the recognition of radiation protection officers.

2. Member States shall specify the recognition requirements and communicate them to the Commission.

3. The Commission shall make the information received in accordance with paragraph 2 available to the Member States.

Article 82

Radiation protection expert

1. Member State shall ensure that the radiation protection expert gives competent advice to the undertaking on matters relating to compliance with applicable legal requirements, in respect of occupational and public exposure.
2. The advice of the radiation protection expert shall cover, where relevant, but not be limited to, the following:
   a) optimisation and establishment of appropriate dose constraints;
   b) plans for new installations and the acceptance into service of new or modified radiation sources in relation to any engineering controls, design features, safety features and warning devices relevant to radiation protection;
   c) categorisation of controlled and supervised areas;
   d) classification of workers;
   e) workplace and individual monitoring programmes and related personal dosimetry;
   f) appropriate radiation monitoring instrumentation;
   g) quality assurance;
   h) environmental monitoring programme;
   i) arrangements for radioactive waste management;
   j) arrangements for prevention of accidents and incidents;
   k) preparedness and response in emergency exposure situations;
   l) training and retraining programmes for exposed workers;
   m) investigation and analysis of accidents and incidents and appropriate remedial actions;
   n) employment conditions for pregnant and breastfeeding workers;
   o) preparation of appropriate documentation such as prior risk assessments and written procedures;
3. The radiation protection expert shall, where appropriate, liaise with the medical physics expert.
4. The radiation protection expert may be assigned, if provided for in national legislation, the tasks of radiation protection of workers and members of the public.

Article 83

Medical physics expert

1. Member States shall require the medical physics expert to act or give specialist advice, as appropriate, on matters relating to radiation physics for implementing the requirements set out in Chapter VII and in point (c) of Article 22(4) of this Directive.
2. Member States shall ensure that depending on the medical radiological practice, the medical physics expert takes responsibility for dosimetry, including physical measurements for evaluation of the dose delivered to the patient and other individuals subject to medical exposure, give advice on medical radiological equipment, and contribute in particular to the following:
   a) optimisation of the radiation protection of patients and other individuals subject to medical exposure, including the application and use of diagnostic reference levels;
   b) the definition and performance of quality assurance of the medical radiological equipment;
   c) acceptance testing of medical radiological equipment;
   d) the preparation of technical specifications for medical radiological equipment and installation design;
   e) the surveillance of the medical radiological installations;
   f) the analysis of events involving, or potentially involving, accidental or unintended medical exposures;
   g) the selection of equipment required to perform radiation protection measurements;
   h) the training of practitioners and other staff in relevant aspects of radiation protection;
3. The medical physics expert shall, where appropriate, liaise with the radiation protection expert.

Article 84

Radiation protection officer

1. Member States shall decide in which practices the designation of a radiation protection officer is necessary to supervise or to perform radiation protection tasks within an undertaking. Member States shall require undertakings to provide the radiation protection officers with the means necessary for them to carry out their tasks. The radiation protection officer shall report directly to the undertaking. Member States may require employers of outside workers to designate a radiation protection officer as necessary to supervise or perform relevant radiation protection tasks as they relate to the protection of their workers.
2. Depending on the nature of the practice, the tasks of the radiation protection officer in assisting the undertaking, may include the following:
   a) ensuring that work with radiation is carried out in accordance with the requirements of any specified procedures or local rules;
   b) supervise implementation of the programme for workplace monitoring;
   c) maintaining adequate records of all radiation sources;
   d) carrying out periodic assessments of the condition of the relevant safety and warning systems;
   e) supervise implementation of the personal monitoring programme;

f) supervise implementation of the health surveillance programme;

g) providing new workers with an appropriate introduction to local rules and procedures;

h) giving advice and comments on work plans;

i) establishing work plans;

j) providing reports to the local management;

k) participating in the arrangements for prevention, preparedness and response for emergency exposure situations;

l) information and training of exposed workers;

m) liaising with the radiation protection expert.

3. The task of the radiation protection officer may be carried out by a radiation protection unit established within an undertaking or by a radiation protection expert.

Annex 2.: ENETRAP III: Required skills and competencies for the RPE. (Ref. 2)

Table 3: Required skills and competencies for the RPE

Topics for Advice	Required Skills	Specific Competence

Optimisation and establishment of dose constraints	• The ability to identify appropriate control procedures to restrict exposures commensurate with ALARA.
	• The ability to interpret and apply data. For example, workplace monitoring results, manufacturers' data, dose histories, shielding calculations.
	• To recognise what constitutes ALARA for a given set of circumstances.
	• The ability to judge on whether or not the use of dose constraints is appropriate, and if so
	  ○ The value at which they should be set, and
	  ○ The period of usefulness/validity
		• The estimation of doses that could be received during both routine and accident situations
		• The formulation of advice. concerning the provision of engineering controls and/or working procedures - commensurate with the presented radiological hazard/risk.
		• The formulation of appropriate advice with respect to the content of written procedures/local rules all consistent with the principles of ALARA.
		• The formulation of advice with respect to the appropriateness of local rules.

Plans for installation and the acceptance into service or new or modified radiation sources in relation to any engineering controls, design features, safety features and warning devices relevant to radiation protection	• The ability to interpret supplier/provider information with respect to inherent radiation hazard, conditions and restrictions on use etc. • To understand and be able to apply any specific requirements of accepted radiation protection standards and good practice and any relevant requirements set in national legislation. • Be able to recognise potential exposure pathways, undertake shielding calculations. • Be able to recognise and formulate a judgement on the adequacy and efficacy of engineered controls, design features and safety and warning features.	• The estimation of doses that could be received during the use and/or operation of the facility/sources. • The formulation of a judgement on ALARA and compliance with any specified or legislative requirements. • The formulation of advice with respect to the acceptability of the proposed new installation/sources – with a rationale for any required changes. • Appropriate input to any developments or revisions plans and/or design.

Preparation of appropriate documentation such as prior risk assessments and written procedures	• The ability to distinguish between a "hazard" and a "risk" and understand the practical application of both concepts in the workplace. • The ability to identify and assess risks of actual and potential exposure. • The ability to interpret and apply data. For example, workplace monitoring results, manufacturers' data, dose histories, shielding calculations. • To form a judgement with respect to the aspects and detail to be addressed in written procedures, local l rules etc. • The ability to formulate written procedures etc in a manner that is readily accessible and understood by the target group.	• The appropriate evaluation of hazards and risks arising from exposure and potential exposure to ionising radiation in the workplace. • The effective review and evaluation of existing risk assessments taking all relevant parameters into account. • The preparation and documentation of risk assessments and/or written procedures and local rules on behalf of the employer/undertaking, OR, the provision of information and advice sufficient to enable others to prepare appropriate documentation.
Categorisation of controlled and supervised areas	• The ability to identify the need for area categorisation as controlled or supervised. • The ability to identify appropriate access control measures for controlled and supervised areas. • The ability to propose the appropriate categorisation of a work area.	• Evaluation of dose, dose-rate and contamination data. • Estimation of potential doses from monitoring data. • Effective provision of advice with respect to administrative and practical arrangements associated with controlled and supervised areas, including: ○ Monitoring and dosimetry ○ Access restriction ○ Required procedures ○ Access control
Classification of workers	• The ability to identify the need for classification of workers and to advise in respect of the associated administrative and practical requirements. • The ability to identify appropriate protection measure and to assess the effectiveness of any procedures in place.	• Evaluation of dose, dose-rate and contamination data. • Estimation of potential doses from monitoring data. • Application of outcome of risk assessment. • Formulation of advice with respect to administrative and practical arrangements. associated with classification of workers, including:

	• The ability to propose the appropriate classification of an exposed worker.	○ Appropriate personal dosimetry ○ Health surveillance ○ Required procedures ○ Training needs
Workplace and individual monitoring programmes and related personal dosimetry	• To determine the appropriate instrumentation, devices or techniques to obtain the required information. • To determine appropriate calibration regimes. • The ability to obtain, apply and interpret data. • To formulate appropriate record keeping regimes. • The ability to liaise effectively with Regulators and Occupational Health Services.	• The estimation of doses on the basis of the results of monitoring. • Formulation of advice with respect to legislative requirements. • Analysis of the outcome of a risk assessment: ○ Exposure pathways ○ Circumstances that could result in exposures ○ Need for ongoing monitoring ○ Shielding requirements ○ Effectiveness of engineered controls ○ Appropriate instrumentation or measurement techniques • Formulation of advice with respect to the adequacy and relevance of obtained data.
Employment conditions for pregnant and breastfeeding workers	• Be able to analyse and interpret relevant data, assess and re-assess risk and estimate doses. • The ability to assess the potential impact and significance of the working environment , particularly with regard to exposure pathways.	• Evaluation of dose, dose-rate and contamination data. • Estimation of potential doses from monitoring data to worker and foetus. • Application of outcome of risk assessment. • Formulation of advice with respect to administrative and practical arrangements associated with pregnant and breastfeeding workers: ○ Appropriate personal dosimetry ○ Required procedures ○ Training needs
Quality Assurance	• The ability to identify appropriate and relevant QA procedures.	• Draw up QA procedures for: ○ Dosimetry ○ Radiation monitoring ○ Source handling ○ Record keeping

Environmental monitoring programme
 	
Appropriate radiation monitoring instrumentation
	• The ability to assess and interpret the circumstances and to match requirements to instrumentation and monitoring regime.
	• Ability to advise on the set-up of an appropriate environmental monitoring programme.
		• The estimation of doses on the basis of the results of monitoring.
		• Formulation of advice with respect to legislative requirements.
		• Analysis of the outcome of a risk assessment:
		  ○ Exposure pathways
		  ○ Circumstances that could result in exposures
		  ○ Need for ongoing monitoring
		  ○ Appropriate instrumentation or measurement techniques
		• Formulation of advice with respect to the adequacy and relevance of obtained data.

Arrangements for radioactive waste management	• The ability to identify potential sources of radioactive waste.
	• Undertake, or ensure, effective waste assay.
	• The ability to determine appropriate waste management regimes up to and including ultimate disposal.
		• Application of best available techniques in relation to:
		  ○ Minimisation of risk
		  ○ Facility design and operation
		  ○ Abatement of discharges
		  ○ Decommissioning
		• Effective application of waste management hierarchy:
		  ○ Avoidance, minimisation, reuse, recycle, disposal
		• Effective implementation of treatment, storage and disposal options.

Arrangements for prevention of accidents and incidents **Preparedness and response for emergency exposure stations** **Investigation and analysis of accidents and incidents and**	• Determination of required arrangements for the prevention of accidents and incidents on the basis of a comprehensive risk assessment. • Formulation of effective and appropriate contingency plans for enactment in the event of a reasonable foreseeable accident or incident.	• The effective evaluation of hazards and risks and the assessment of potential exposures to ionising radiation in the workplace. • Assessment or estimation of doses. • Retrospective application of dosimetric methods. • Use of appropriate instrumentation and techniques for the measurement of dose rates and contamination.

appropriate remedial actions.	• Determination of an appropriate rehearsal interval for contingency plans. • The ability to analyse available dose information in order to identify possible health effects as well as any issues associated with ALARA and legislative compliance.	• The formulation of advice with respect to required remedial actions. • Effective liaison with specialist services, for example Occupational Health Services.
Training and re-training programmes for exposed workers.	• The ability to identify training and re-training needs. • The ability to determine the format and content of training that will satisfy the training objectives and achieve the desired outcomes.	• The effective evaluation of hazards and risks and the potential for exposure to ionising radiation. • Identification of arrangements and precautions required to achieve ALARA and to ensure legislative requirements • Effective communication.

Annex 3: IRPA model RPE knowledge and skill syllabus (from ref. 3)

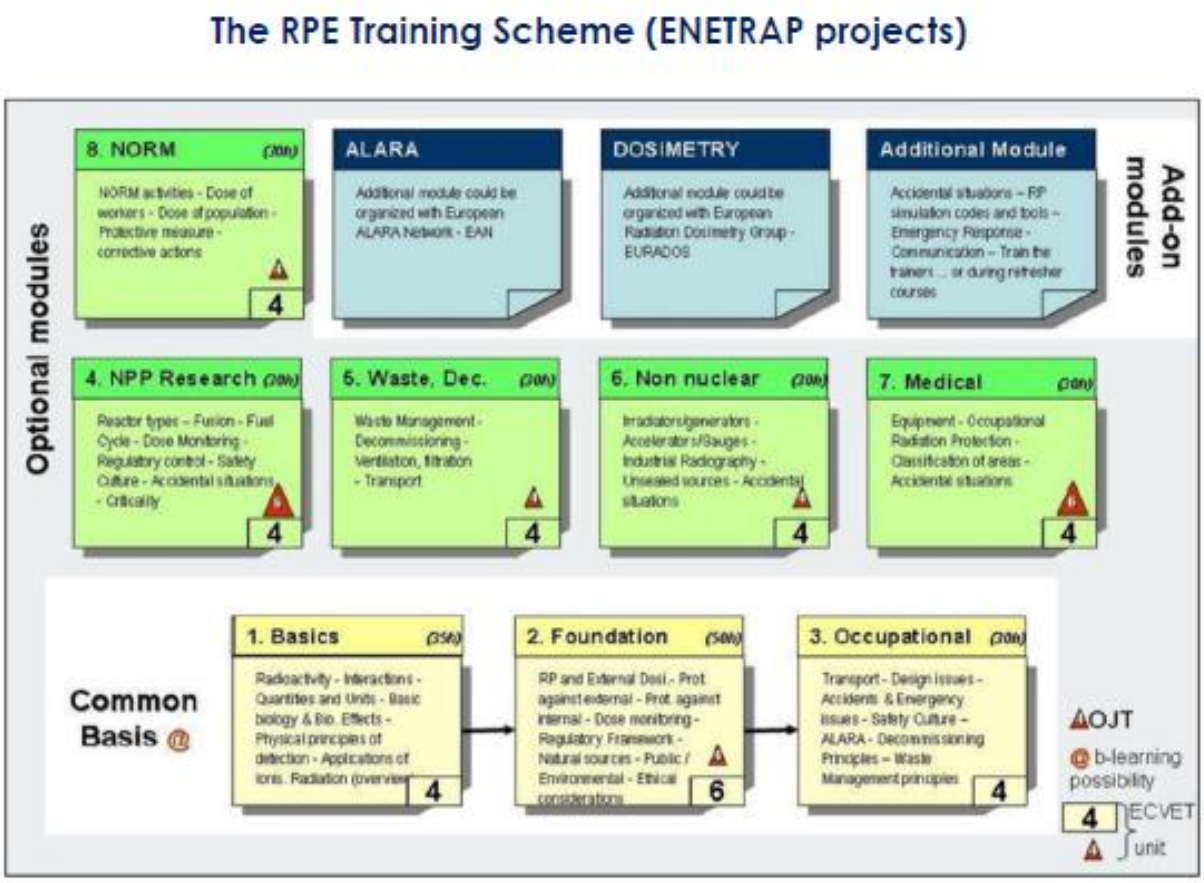
Model RPE Knowledge and Skill Syllabus*

Topic	Sub-topics
Basic atomic and nuclear physics	Atomic structure and composition of the nucleus Stable and unstable isotopes, activity Types of radioactive decay Nuclear fission Half life and decay constants Radioactive equilibria The effects of time, distance and shielding
Basic biology	Basic radiation chemistry Effects of radiation on cells and tissue
Interaction of radiation with matter	Charged particles, photons and neutrons Types of nuclear reactions Induced radioactivity
Biological effects of radiation	Deterministic biological effects of ionising radiation Stochastic biological effects of ionising radiation The dose–response relationship Effects of whole body irradiation Effects of partial body irradiation
Detection and measurement methods	Principles and theory of detection and measurement (e.g. efficiency, background, geometry, statistics) Types of detection instruments (e.g. gas filled, ionisation chambers, scintillators, thermoluminescence, neutron detectors) Choice of detection instruments Interpretation of instrument measurements
Quantities and units (including dosimetry underlying regulatory quantities)	Units Dose terms (absorbed dose, equivalent dose, effective dose, committed dose) Dose limits and constraints Dosimetric calculations
Basis of radiation protection standards	Linear hypothesis for stochastic effects Threshold for deterministic effects Epidemiological studies
ICRP principles	Justification of practices Optimisation of protection from radioactive substances Dose Limits
Legal and regulatory basis	international standards and recommendations for radiation protection national standards and recommendations for radiation protection, regulations and legislation
Operational radiation protection	types of sources (sealed, unsealed, x-ray units, accelerators); hazard and risk assessment (including environmental impact); minimisation of risk; control of releases; monitoring: area, personal dosimetry (external, real time and internal), biological; critical dose concept/dose calculation for critical group; ergonomics (e.g. user-friendly design and layout of instrumentation); operating rules and contingency planning; emergency procedures; remedial action/decontamination;

Topic	Sub-topics
	analysis of past incidents including experience feedback
Organisation of radiation protection	role of qualified experts; safety culture (importance of human behaviour); communication skills (skills and ability to instil safety culture into others); record keeping (sources, doses, unusual occurrences, etc.); permits to work and other authorisations; designation of areas and classification of workers; quality control/auditing; dealing with contractors
Waste management	principles of management; principles of disposal
Transport	Transport of radioactive materials Packaging of radioactive materials and waste for transport Security of radioactive materials during transport Transport documentation – dispatch and receipt

*. Adapted from the U.K. Scheme

Annex 4: RPE training scheme (ENETRAP II WP 4.2, ref. 6)



Annex 5: Primary duties and main actions of the RPO (ENETRAP III, ref. 2)

Table 8: Primary duties of the Radiation Protection Officer

Duty	Main actions
Ensuring work carried out in accordance with procedures or local rules	Carry out close supervision of the work activities associated with sources of radiation and ensure that the local rules and relevant procedures are followed. Provide guidance and instruction to the workers to ensure safe working.
Supervise programme for workplace monitoring	Carry out or oversee the periodic dose rate and/or contamination monitoring around sources of radiation in the workplace. Maintain a record of the monitoring results. Review the results of the monitoring and initiate any required remedial actions.
Maintain radiation source records	Maintain the source accountancy record and ensure that it is always up-to-date. Enter the details of any new radioactive sources and record disposal details of old sources. Carry out or oversee the regular checks on the location of the radiation sources in the practice and enter details in the source accountancy record. Implement the relevant actions in the event of a source going missing.
Carry out periodic assessments of safety & warning systems	Oversee or carry out periodic checks on the satisfactory operation of interlock systems and visual/audible warnings. Maintain a record of these checks and arrange for the repair of any faulty systems.
Supervise personal monitoring programme	Oversee the provision of personal dosimeters to the relevant workers and maintain the associated dose records. In collaboration with the RPE, initiate a review of

	any unusually high recorded doses and promptly investigate any overexposures.
Supervise health surveillance programme	Arrange the pre-classification medical examination for new workers and the periodic health review for all category A workers.
Provide new workers with introduction to local rules and procedures	Explain the content of the local rules and associated procedures to all workers. Ensure that they have read the local rules and understand the safety procedures they must follow.
Advising on work plans	Provide advice to management on the radiation protection implications of any new work plans or proposed changes to existing work plans. Where any new plans or changes to existing plans have potential dose significance, advice should also be obtained from the RPE.
Establishing work plans	In collaboration with the RPE, draw up any required new work plans to ensure doses to workers and members of the public are optimised.
Providing reports to local management	Periodically provide reports to the local management giving an update on the current status of the radiation protection arrangements in the workplace, and the level of radiation doses being received by the workers. Promptly report any potential incidents, high dose or overexposures. Provide recommendations on actions needed to optimise the radiation protection arrangements. Take account of the recommendations of the RPE.
Participating in emergency exposure response arrangements	Carry out the actions specified for the RPO in the exposure response arrangements.
Provide information and training for exposed workers	Provide or arrange for relevant information and training to be provided. Ensure retraining is provided at appropriate intervals.
Liaise with the RPE	Provide the RPE with regular updates on the status of radiation protection in the practice. Promptly inform the RPE of any unusual high exposures or overexposures to persons, and significant changes to work practices that will have radiation dose implications. Consult the RPE on the radiation protection aspects of new equipment or proposed work plans.

Annex 6: Core learning outcomes for the RPO: radiation protection principles (ENETRAP III, ref. 2) [1].

Learning outcomes in terms of skills, knowledge and competences are according to EQF

Table 9: Core learning outcomes for the RPO: Radiation protection principles

Knowledge (facts, principles, theories, practices)	Skills (cognitive & practical)	Competence
K1. Understand basic atomic structure. K2. Be aware of the laws of radioactive decay K3. Understand radiation quantities and units K4. Be aware of the mechanisms for the production of x-rays K5. Understand the fundamentals of radiation detection K6. Have a basic understanding of the biological effects of radiation K7. Understand the differences between deterministic and stochastic effects K8. Understand the general principles of radiation protection K9. Understand the application of the inverse square law. K10. Understand the shielding properties of different materials (e.g. paper, aluminium, steel, lead) K11. Understand the concepts of justification and optimisation.	S1. Explain the relative risks of different types of radiation and the shielding requirements for each. S2. Correctly interpret dose, dose rate and surface contamination data. S3. Calculate dose rates at varying distances from a source. S4. Select appropriate shielding material for a range of sources.	C1. The application of the principles of radiation protection to workplace situations.

Annex 7: Core learning outcomes for the RPO: operational requirements (ENETRAP III, ref. 2)

Knowledge (facts, principles, theories, practices)	Skills (cognitive & practical)	Competence
K12. Understand the regulatory requirements for local rules and procedures.	S5. Be able to draw up appropriate local rules and safety procedures for a range of applications.	C2. Draw up and issue suitable local rules for a practice and supervise their implementation.
K13. Understand the regulatory requirements for workplace monitoring. K14. Be aware of the different types of monitoring equipment that are available for the measurements of dose rate and surface contamination monitoring, and the advantages and limitations of each type of monitor.	S6. Be able to carry out measurements using dose rate and contamination monitors. S7. Be able to interpret the monitoring results for comparison with the relevant criteria.	C3. Carry out a programme of workplace monitoring: - The selection and use suitable radiation monitors - Interpretation of results - Associated record keeping
K15. Understand the regulatory requirements for source accountancy.		C4. Maintain suitable records of the sources of radiation at the practice.
K16. Know the required safety and warning systems for the radiation equipment in use at the premises and understand the testing criteria and safety standards for these systems.		C5. Carry out periodic assessments of safety and warning systems.
K17. Understand the regulatory requirements for health surveillance and personal monitoring. K18. Be aware of the different types of personal dosimeter available and their suitability for different types of radiation. K19. Understand the national requirements for the maintenance of dose records.	S8. Select the appropriate dosimeter for different types of radiation.	C6. Oversee the maintenance of a health surveillance programme. Select suitable personal dosimeters for the radiation practice. Provide suitable dosimeters to the persons working with radiation and keep appropriate dosimetry records. Review dose records and initiate remedial action.
K20. Understand the emergency response arrangements in place at the practice and the RPO's role in these arrangements. K21. Understand the regulatory requirements for emergency response arrangements including any requirement for the periodic rehearsing of these arrangements.	S9. Be able to draw up emergency response arrangements for a range of common applications	C7. Draw up emergency response plans for the practice in collaboration with the RPE. Implement the emergency response plans.
K22. Be aware of general design and safety principles for a range of common practices.	S10. Draw up shielding and safety & warning system requirements for common practices.	C8. Liaise with the RPE in the specification of safety systems and procedures for new installations.

Annex 8: RPO training course example (ENETRAP III, ref 2)

A training course covering the core knowledge requirements for RPOs

Syllabus

I Radiation protection principles

Basic concepts

- Atomic structure
- Radionuclides
- Concept of radioactive decay
- Production of x-rays
- Radiation quantities and units

Biological effects of radiation

- Interaction of radiation with cells and tissues
- Stochastic and tissue (deterministic) effects
- Effects of low doses

Legal requirements

- Radiation protection legislation
- Codes of practice, guidance
- Dose limits

The principles of radiation protection

- Justification, optimisation, dose limits
- Time, distance, shielding
- Application of the inverse square law

II Operational requirements

Practical aspects of radiation protection

- Common uses of radiation
- The practical application of ALARA
- Safety and warning systems
- Local rules

Tasks and duties of the Radiation Protection Officer

- Source accountancy
- Supervision of work
- Environmental monitoring
- Dose record keeping
- Maintenance of safety and warning systems
- Health surveillance
- Source storage and security
- Waste disposal
- Liaison with the RPE

Radiation protection measurement techniques

- Environmental monitoring
- Dose rate and surface contamination monitoring
- Radiation monitoring instruments
- Personal dosimetry
- Types of personal dosimeters
- Regulatory requirements for monitoring

Emergency response planning

- lessons learned from incidents and accidents
- Regulatory requirements
- Emergency response arrangements
- The RPO role in emergency response


HERCA
HEADS OF THE EUROPEAN RADIOLOGICAL
PROTECTION COMPETENT AUTHORITIES