Education, training and staffing: what are the new challenges?

P.N.Lirsac[a], T.Juhel[b], A.Schmitt-Hannig[c], G Sadagopan[d] and K. Mrabit[d]

[a] CEA, DSV, DPTTS, 91191, France.
[b] CEA, MR, DPSN, 92265, France.
[c] BfS, Germany.
[d] NSRW, IAEA.

Abstract

Today, numerous countries are facing serious problems to meet growing education and training (E&T) needs in radiation protection in different practices such as industrial radiography and other industrial applications, medical applications and the new developments in this area and to build capacity and sustain adequate competent regulators. To build their national competence in radiation protection, safety and security of radiation sources, and to meet the growing national education and training needs, countries could adopt different possible approaches, which are based on international, regional and national experience. As a complementary and key element to these approaches, appropriate staffing has to be developed at a national level to reach a sufficient number of adequately trained and qualified people. This paper discusses the good experience gained by the International Atomic Energy Agency (IAEA), the positive results of the European projects and suggested national steps that may be adopted for capacity building.

Introduction

Since decades, building and maintaining the competency of radiation workers and professionals has been identified as a key issue for the radiation protection and the safe and secure management of radiation sources. The mobilisation of resources and the commitments of the international organisations and relevant stakeholders regarding the education and training in radiation protection is visible. This question is broader than radiation protection and recently, the Nuclear Energy Agency has issued a report on nuclear education and training programmes at university level [1]. This report points out as a main concern, the deterioration of nuclear education and the lack of young faculty members to replace ageing and retiring members.

In an effective radiation protection programme, adequate development at a national level of competency in radiation protection and the safe and secure use of radiation sources and the dissemination of the radiation protection culture is essential to ensure the protection of patients, public and workers. Robust regulatory infrastructure and a critical mass of educated and trained people is also required for the management of routine and emergency situations, to fight efficiently against illicit trafficking, malevolent acts and or to cope with new medical and industrial application challenges. To build such a regulatory infrastructure, both staffing and training of regulators needs to be considered. This is the first necessary but sufficient step.

Today, many countries are facing problems to meet growing Education and Training (E&T) needs in radiation protection related to industrial radiography and the fast development of medical applications, and other practices such as introduction or expansion of nuclear power, uranium mining …etc. However, it is difficult to quantify exactly the existing E&T needs at the national and also at the regional level. This is part of the national strategy for building competence in radiation protection and the safe and secure management of radiation sources, which may not yet exist for a regulatory body at

an early stage of development. The immediate issue in such countries is the training of the regulatory body staff.

To collect on a systematic basis, the information on E &T needs, the IAEA started in 2007 a survey based on a questionnaire sent to approximately one hundred member states currently receiving IAEA assistance. Despite a return rate close to 67 % at this preliminary stage, only general observations concerning the E&T needs could be made. It was observed that (i) there appears to be a high need for training in medical practices, linked to the fact that in almost all regions, the medical area dominates the number of sources/facilities, (ii) there are almost no countries with low training needs, (iii) there are many countries where there are no (or few) practices in place at present, and these countries might have a high priority training need in the future if additional practices are implemented.

E&T needs to be met should therefore be established considering both, the job categories (e.g. qualified expert, radiation protection officer, operator/technician, and other occupationally exposed..) as well as the practices in place in the country.

The possible approaches, based on international, regional and national levels that could be adopted in the countries to build their national competence in radiation protection in a sustainable way, are subsequently detailed. As a complementary and necessary element, staffing, meaning a sufficient number of adequately trained and qualified people will be discussed.

1. The IAEA has developed and is implementing an ambitious approach to Education and Training

The IAEA is authorized by its Statute: *to foster the exchange of scientific and technical information on the peaceful uses of atomic energy; and to encourage the exchange and training of scientists and experts in the field of peaceful uses of atomic energy.* In addition*, the* statutory safety functions of IAEA cover the establishment of and provision for the application of safety standards for protection of health, life and property against ionizing radiation. Education and training is a major element of the IAEA's mechanism for the application of safety standards and for strengthening radiation safety infrastructures in its Member States. The education and training activities follow the resolutions of its General Conferences and reflect the latest IAEA standards and guidance.

IAEA prepared a "Strategic Approach to Education and Training in Radiation and Waste Safety" (Strategy on Education and Training) aiming at establishing, by 2010, sustainable education and training programmes in Member States, which was endorsed by the GC(45)/RES/10C in 2001. In line with this resolution, the IAEA has developed a number of different training schemes. The Steering Committee for education and training in radiation protection and waste safety advices the Agency on the implementation of the long term strategic plan. Regional, national and collaborating training centres, international organizations like European Commission and International Radiation Protection Association (IRPA) are represented in the steering committee.

IAEA is taking various measures in building capability in the Member States through

a) organizing and implementing postgraduate education and training courses for professionals
b) establishing network between IAEA and regional training centres
c) running train the trainers courses to increase the number of trainers
d) developing standardized training materials which are practice specific and target audience oriented
e) identifying national needs for radiation protection via the Education and Training Appraisal missions (EduTA)
f) developing the outline of `Training Tool Kit' to aid MS establish national training strategies for radiation protection and safe and secure management of radiation sources.

In all these activities IAEA is working closely with the regional and collaborating training centres. IAEA organises regularly postgraduate educational course in radiation protection and safety of radiation sources in six regional centres. In addition over 25 practice specific thematic training courses are organised every year. The relevant training materials are developed and translated to IAEA official languages. They are available for over 25 topics. To expedite the process of capacity building in member States IAEA organises Train – the Trainer events. In order to better plan the training events, IAEA makes a systematic assessment of training needs through questionnaire sent to Member States or through detailed EduTA missions. So far 5 such EduTA missions are completed and each State receives an action plan for a better education & training strategy.

Having achieved the milestones set forth in its education and training activities, in the future IAEA intends to strengthen the education and training strategic plan, by developing a concept to analyse training needs, which will help better organise and prioritise training events in terms of practices and job categories, developing guidance to radiation safety regulatory bodies on establishing staffing plans and training programmes that enable them to undertake their functions and develop the `Training Tool Kit' to aid MS establish national training strategies for radiation protection and safe use of radiation sources.

IAEA's activities are performed at the global level by working together with the regional training centres. The existing differences in the regulatory framework, academic requirements, infrastructure and culture between the MS are to be dealt with at first on a regional basis through harmonization and networking, to be extended further to national accomplishment.

2. A Regional approach to Education and Training in Europe

Occupational, public and environmental radiation protection is a major challenge in all applications of ionising radiation in medical, research and industrial areas. In Europe, there is a trend of a decreasing number of experts in radiation protection due to various reasons. Therefore, maintaining a high level of competencies in this field is crucial for future applications of ionising radiation. A sustainable education and training E&T infrastructure for radiation protection is an essential component to counter fight the decline in expertise and to ensure the continuation of the high level of radiation protection knowledge in the future.

Studies have shown that a wide variety of national approaches for education and training of the qualified expert, as required in the European basic safety standards, exist in the EU member states, the new member states and the candidate states. The development of a common European radiation protection and safety culture and, based on that, the mutual recognition for radiation protection courses and the acquired competencies of radiation protection experts becomes a real need. The harmonisation of education and training is a good starting point. Moreover, harmonisation will favour the mobility of workers and students throughout the European countries.

Therefore, the EU supports research projects in education and training, such as ENETRAP (European Network on Education and Training in Radiological Protection), and the establishment of the EUTERP Platform (European Training and Education in Radiation Protection).

2.1 The ENETRAP project

The main objectives of the ENETRAP project were:

- to better integrate existing education and training activities in the radiation protection infrastructure of the European countries;
- to develop more harmonised approaches for education and training in radiation protection in Europe and their implementation;
- to provide the necessary competence and expertise for the continued safe use of radiation in industry, medicine and research.

A questionnaire to assess training needs and capabilities was distributed to more than 30 countries in Europe. The results can be summarized in the following conclusions:

- There are significant differences in interpretation of the roles of the RPE and the RPO across Member States. These differences have a strong influence on specified legislative requirements with respect to RPE and RPO as well as on the approaches taken with respect to Education and Training. There are wide ranging approaches to the latter.
- On the basis of the information provided via the ENETRAP questionnaire and given the significant issues with the interpretation of key roles, it is difficult to conclude a workable "de-minimus" level of training for the RPE (or RPO). Further investigation of this issue is required.
- The majority of Member States have mechanisms in place for the recognition (and re-recognition) of the Radiation Protection Expert. However, the approaches taken vary significantly and are difficult to compare.
- Only a minority of countries have a formal system for mutual recognition or RPEs (RPOs and workers) and the study did not elicit a consensus view as to what could constitute minimal requirements for mutual recognition.

The ENETRAP project developed a syllabus, the so called "ENETRAP Training Scheme" (ETS), with the aim of harmonizing the large diversity of approaches for education and training in Europe. ETS uses a modular approach and modern educational tools, such as e-learning modules developed during the ENETRAP project, as well as modules using on-the-job training to provide better chances for future job opportunities and to increase international mobility. The ETS scientific content fits European legislative requirements as well as the standard syllabus of the IAEA.

Within the ENETRAP project, a consortium of universities has been established working on the implementation of a European Master in Radiation Protection and the first master courses are being carried out.

IAEA worked closely with the ENETRAP project. The sharing of experience was mutual. IAEA's syllabus for the postgraduate educational courses in radiation protection and the safety of radiation sources and guidance developed for the implementation of on the job training were useful as reference materials for the ENETRAP team The good experience of the ENETRAP team in the identification of training needs in EU states and the development of a platform for e-learning modules were useful to IAEA.

2.2 The EUTERP Platform

The main objective of the EUTERP Platform is to support harmonisation in the field of education and training systems for radiation protection experts and better integrate radiation protection education and training systems into general vocational training and education infrastructures. Broad agreement has to be reached on the criteria for recognition of diplomas and qualifications of Radiation Protection Experts, on the definition of their role and on a jointly agreed syllabus. Part of the results of the ENETRAP project will be used by the platform to gather knowledge of the different national criteria for recognition of radiation protection experts and to come to an agreement on these criteria, thereby facilitating the free movement of these experts within Europe.

Among other achievements, recommendations on the definition of the RPE (Radiation Protection Expert) and the RPO (Radiation Protection Officer), guidance on the roles, duties, competencies and recognition of the RPE and RPO have been made and are under consideration now at the European Commission.

The still existing differences in the approach to education and training within Europe will be dealt with by increasing networking and harmonisation efforts as well as by revising the European Safety Standards with regard to mutual recognition of acquired competencies in radiation protection.

IAEA participates in all the meetings of the Steering group of EUTERP as well in their annual workshops. The continuing involvement of the Agency with EUTERP is an important and valuable opportunity to work closely with the European Commission.

3. At the operational level, education and training are closely connected to staffing

3.1 Staffing is a systematic and integrated managerial process

Very often, licensees focus only on education, qualification, experience and skills of their personnel. However, this is not sufficient to ensure the safe and secure management of radiation sources aiming at having appropriate human resources at the workplace. A staffing approach must be developed to meet the goal of undertaking properly the tasks within the facility, clearly defining the tasks assigned to the individuals, promoting the continuous professional development and sizing up adequately the staff .The staffing is a systematic and integrated approach of management from the recruitment of personnel up to the update of their competence and qualification.

According to the national regulatory framework, the staffing process starts with the analysis of the safety needs for a practice, and comes out with the development of individual training plans. This approach is relevant for the regulatory body, as well as for the licensees. Establishing staffing plans includes the following steps:

- Assessment of the staffing needs, i.e. the number and type of staff (legal, scientific, engineering, managerial or clerical)
- define the key competencies of the staff
- define and develop appropriate job descriptions for the recruitment of staff
- identify training needs of staff
- establish a training programme for staff
- develop an individual training plan

Agency has developed a Guidance for Radiation Safety Regulatory Bodies in the Establishment and Maintenance of a Staffing Plan and A Training Programme' This document provides practical guidance to radiation safety regulatory bodies to a) assess staffing needs, b) define staff competencies, c) identify the training needs of staff and d) establish a training programme for staff. In addition, the Agency has also developed a Self Assessment Tool for the regulatory body, and organizes workshops to train the Member States on the use of this tool.

3.2 Regulatory body must develop appropriate staffing.

The staffing of the regulatory body is a pending question in several countries where the regulatory infrastructure is not yet established or has been just setup. In addition, a specific attention has to be paid to this issue in case of a substantial increase in the number of licensees, or when new types of practices emerge in the country.

The regulatory body should have an optimal number of staff with qualifications needed to perform the range of functions identified in GS-R-1 [2]. The staffing plan identifies the number and type of staff, including the specific knowledge and skills of each type of staff, needed to undertake the functions and responsibilities of the regulatory body. The forecast of the training needs of any organization based on an assessment of the training needs of its staff is called a training programme.

The methodology that regulatory body may follow includes the four following steps [3]:

a. Establish optimal staffing levels with information on the number of staff it requires and qualifications they must possess;
b. Develop job descriptions and person specifications for key positions;
c. Use the job descriptions and the person specifications for recruitment;
d. Determine the training needs of new and existing staff in terms of academic component, on the job training and their continuous professional development, elaborating a training programme.

A training programme may be developed following the development of a staffing plan, as a means of achieving and maintaining the level of competence that is necessary to operate and continue to operate an effective regulatory body. The knowledge acquired through formal education is often not sufficient for meeting the knowledge and skills needed for a regulatory staff. A well planned and structured training programme is essential comprising of:

a. a knowledge of the role and responsibility of each key position within the regulatory body
b. an evaluation of the current knowledge and skills of occupants in each position
c. a systematic and time bound plan to fulfil any identified gaps between (a) and (b) above, and
d. a formal process for recording and tracking progress and evaluating competence.

The training programme is for the whole regulatory body and it is elaborated and implemented through individual training plans. Ensuring that staff members of a regulatory body are competent to work in their designated specialist areas provides confidence and reassurance to the stakeholders. All presumably achieved competences should be evaluated by the supervisor and appropriately certified and recorded on the personnel file.

Among its tasks, the regulatory authority has the specific duty to elaborate a national strategy for building competence in radiation protection and waste safety. A method to issue this national strategy is described in the IAEA relevant publications [3]. This national strategy is based on the requirements for E&T applicable to all licensees for their staffing. In particular, the definition of the requirements for QE and RPO are of main importance.

The IAEA Integrated Regulatory Review Service (IRRS) is designed to strengthen and enhance the effectiveness of the national regulatory infrastructure of States for nuclear, radiation, radioactive waste and transport safety and security of radioactive sources whilst recognizing the ultimate responsibility of each State to ensure safety in the above areas. The adequacy of national regulatory policies that influence the efficiency and effectiveness of both the legal framework and the regulatory infrastructure are appraised and identifies opportunities for improvement, as well as successful strategies that might be shared with other States.

In considering international regulatory issues, trends and challenges, IRRS missions provide a balance between technical and policy discussions among senior regulators and the opportunity to share regulatory experiences, to harmonize regulatory approaches among States and to create mutual learning opportunities among regulators. The IRRS regulatory review process compares the nuclear and radiation regulatory infrastructure in a State against international standards and guidance and where appropriate, good practice elsewhere. This will help in planning the staff requirement.

However, to effectively provide assistance to Member States and to design training activities, it is essential to evaluate and identify the Member States training needs in a systematic manner and to assess their education and training infrastructure. For this purpose, The IAEA Education and Training Appraisal in radiation protection and the safety of sources (EduTA) was developed. The objective of the appraisal mission is to carry out a detailed assessment of the status of the provision for education and training in radiation protection including the identification of the national education & training needs and areas where provisions should be improved to meet the national E & T needs as well as international standards and best practices. The appraisal of the national infrastructure for education and training covers all institutions/organizations, related documents, facilities and equipment and personnel (faculty, decision makers,) that are totally or partially associated with education and training

in Radiation Protection and the Safety of Radiation Sources. The appraisal focuses on three major areas: (a) regulatory requirements for education and training; (b) national strategy for building competence; and (c) education and training infrastructure. Member States benefit from EduTA by identifying the training needs and in planning future E & T strategy. Using the IAEA EduTA protocol document, any individual Member State could also conduct a self-appraisal

3.3 For the licensee, regulatory requirements and good management practices are important issues for safety

For the licensees, except for some specific practices, there are very often only very few staffing requirements or guidance available. At national level, for specific practices (industrial radiography, well logging, transport of radioactive sources …) some staffing requirements may exist. Thus, in the absence of these requirements or guidance, the training and the sensitisation of managers to staffing processes and to the good management practices (IAEA standards, ISO 9001 – 2000 or equivalent system) are of crucial importance to maintain a suitable level of safety in the facility.

For staffing purposes, the licensee may have to ensure that in addition to initial training personnel may need additional training to update the competency. This can easily be achieved through different training methods, including classroom-based training, distance learning, on the job training, or mentoring.

The levels of responsibility in radiation protection for individuals and the related appropriate levels of competency are expected to be defined by each country in the national regulation, considering the type of practices. However the IAEA Basic Safety Standards defines two main qualification levels: the Qualified Expert and the Radiation Protection Officer. Depending on the type of facility and practice, meeting the staffing needs (i.e. the number and type of staff) may imply the recruitment of Qualified Expert(s) (QE) or of Radiation Protection Officer(s) (RPO). The role, duties and training required for both the QE and the RPO are defined at the international level and transposed into the national regulation.

Regarding the QE, the situation is evolving. A definition was initially provided in the glossary of the *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (the so called BSS)* and in the Euratom Treaty in 1996, where specific missions are detailed.

In October 2007 IRPA suggested a more precise definition and missions of what is called a “Radiation Protection Expert” (RPE). Anyhow, these multiple notions and definitions are quite confusing and raise difficulties:

- for example, in the case where a specific part of the competence must be acquired abroad, the licensee could face difficulties to obtain from his national regulatory, the formal recognition of the training of his employee due to different definition of some qualifications levels.
- In addition the difficulties to recognize the qualification of individuals from, a collaborating country may also impact some transnational co-operations.
- This situation is limiting the mobility and the use of human resources. When a person recognized as a QE in one country is moving to work in another country, he needs to be recognized as a QE, upon condition he has a good knowledge of the national regulation, if not there might be is a loss and a waste of competency.

In April 2008, during the second EUTERP Workshop, recommendations of the definition, role and function of RPE and RPO were further elaborated. Result can be concluded, that there is a strong and urgent need for clarification and harmonization. For this purpose, the revision under process of the BSS 115 could be considered as a major opportunity toward a clarification and harmonization of the definition and role of the qualified expert.

In the revision of International Basic Safety Standards, IAEA contemplates to continue to use QE in a broader term as an individual who, by virtue of certification by appropriate boards or societies, professional licences or academic qualifications and experience , is duly recognized as having expertise in a relevant field of specialization, e.g. medical physics, radiation protection, occupational health, fire safety, quality assurance or any relevant engineering or safety speciality, where as the EUTERP considers that in the future revision of the EU-BSS the "Qualified Expert" could be replaced by the "Radiation Protection Expert" (RPE)".

Conclusion

For future years and maybe decades, the major challenges for most countries will be to identify and meet the growing education and training needs in radiation protection and the safe and secure management of radiation sources. These needs include the initial education (at several educational levels) as well as the specialization and the refresher trainings in industrial or medical applications. The diversity of topics and levels to be covered is broad and the consistency and coherence at national level must be carefully considered by the national regulatory bodies, in particular when developing their own staff.

Nevertheless the steps for building competence are similar from one country to the other. To be effective, shortening the delay in implementation and taking benefit from lessons learned, each country has the opportunity to use as far as needed the large IAEA panel of relevant E&T tools and take advantage of the support and experience of the regional training centres.

This approach mixing national, regional and international action levels could help in harmonizing some definitions (Qualified experts) that impact the free movement of student and workers, making international training and exchanges more difficult. Adopting International Basic Safety Standards will certainly contribute to significantly resolve the disparity and bring about harmonization.

This education and training issue is already a crucial investment for the future and effectiveness is necessary to attract young generation choosing radiation protection as their career.

References

1. Nuclear Energy Agency, Organisation for Economic Cooperation and Development, *Nuclear education and training: cause of concern? a summary report*, NEA Publications (2008)
2. International Atomic Energy Agency, International Labour Organisation, Pan American Health Organization and the World Health Organization, *Building Competence in Radiation Protection and the Safe Use of Radiation Sources*. Safety Guide, Safety Standards Series, RS-G-1.4, IAEA, Vienna (2002)
3. International Atomic Energy Agency, International Labour Organisation, Pan American Health Organization and the World Health Organization, *Legal and governmental Infrastructure for nuclear, radiation, radioactive waste and transport safety*. Safety Requirements, Safety Standards Series, GS-R-1, IAEA, Vienna (2004)
4. International Atomic Energy Agency, *Guidance for radiation safety regulatory bodies in the establishment and maintenance of a staffing plan and a training programme* - Draft document, IAEA, Vienna (2007)
5. *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Source.* Safety Series No. Vienna (1996)
6. European Directive EC 96/29, ECOJ, (May 1996).