

# IAEA Education and Training in Radiation Protection, Transport and Waste Safety: new developments and challenges towards sustainability

G. Sadagopan and K. Mrabit

*Policy and Programme Support Section, Division of Radiation, Transport and Waste Safety  
International Atomic Energy Agency, Austria*

## Abstract

IAEA's education and training activities follow the resolutions of its General Conferences and reflects 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 implementing the strategy, IAEA is organising training events in the regional level and assisting the Member States at the national level by providing them the exemplary quality of training material developed at the Agency. This work will continue ensuring its completeness in all areas of radiation protection. An Inter Centre Network between the Agency and regional, collaborating national training centres is established to facilitate information exchange, improve communication and dissemination of training material. There is a challenge to enhance the technical capability of the Member States to reach sustainability. This is intended through organising number of Train the Trainers workshops to develop a pool of qualified trainers. The new developments include web enabling the approved training packages and establish Elearning, developing a syllabus for training of Radiation Protection Officers, a working material 'Template for National Training Programme' and the protocol for education and training appraisal, which also identifies the training needs in radiation protection. These are aimed at assisting Member States attain self sustainability.

## 1. Introduction

The statutory safety functions of the International Atomic Energy Agency cover the establishment of and provision for the application of safety standards for protection of health, life and property against ionizing radiation. The *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (the so called BSS) are based on the presumption that a national infrastructure is in place enabling the Government to discharge its responsibilities for protection and safety. Education and training is an essential element of the infrastructure and is one of the main IAEA's mechanisms of the provision for the application of safety standards. The education and training provided by the IAEA follows the resolutions of its General Conferences and reflects the latest IAEA standards and guidance. Several General Conference resolutions have emphasized the importance of education and training [e.g. GC(XXXV)/RES/552 in 1991; GC(XXXVI)/RES/584 in 1992; GC(43)/RES/13 in 1999 and more recently GC(44)/RES/13 in 2000]. In response to GC(44)/RES/13 in 2000, the 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. This Strategy was endorsed by the General Conference resolution GC(45)/RES/10C in 2001, that, inter alia, urged the Secretariat to implement the Strategy on Education and Training, and to continue to strengthen, subject to available resources, its current effort in this area, and in particular to assist Member States' national, regional and collaborating centres in conducting such education and training activities in the relevant official languages of the IAEA. In the General Conference resolution GC(46)/RES/9C adopted in September 2002, the IAEA was requested to continue implementing the strategic plan, including the convening of a steering committee to oversee and advise on the implementation of the strategic plan for a sustainable education and training programme. In addition it also encouraged IAEA to implement e Learning in radiation protection, which is presently paper based Distance Learning. Resolution GC(47)/RES/7 of September 2003 underlined the fundamental importance of education and training, welcomed the continued implementation of the strategy and urged the secretariat to continue to strengthen its current efforts in this area. GC(48)/RES/10 of September 2004 supported the establishment of network of regional centers and implementing the programme of "train the trainers"

workshops, GC(49)/RES/9 supported the IAEA's focus on developing sustainable educational and training programmes through its implementation of the strategic plan.

## **2. Current modalities of education and training**

The range of education and training in radiation protection activities currently undertaken by the Agency can be summarized as follows:

- Post-Graduate Educational Courses in Radiation Protection and Safety of Radiation Sources.
- Specialized Training Courses.
- On-the-Job Training (OJT).
- Scientific Visits.
- Workshops and Seminars.
- Distance Learning.

In addition, the Agency carries out other activities that support the aforementioned training modalities. These support activities include: (a) preparation of standardized training aids and material; (b) promotion of and assistance to Regional Training Centres, and co-operation with Collaborating Centres; and (c) publications relevant to education and training.

### ***2.1 Postgraduate educational course in radiation protection and safety of sources***

The Post Graduate Educational Course in Radiation Protection and Safety of Radiation Sources (PGEC) is a comprehensive training programme aimed at training young professionals at graduate level or the equivalent for initial training to acquire a sound basis in radiation protection and safety of radiation sources, some of them would be expected to become the trainers in due time. PGEC is designed to provide both theoretical and practical training in the multidisciplinary scientific and / or technical bases of international recommendations and standards on radiation protection and their implementation. The Agency has been assisting the organization of the regular PGECs in different Regional Centres and in different Agency's official languages. These include Argentina (Spanish), Greece(English), Syria (Arabic), Malaysia (English), Morocco (French) and Belarus (Russian).

### ***2.2 Practice specific specialized training courses and workshops***

The specialized or task-specific/practice-specific training courses are usually shorter in duration. These courses last one or two weeks and are in principle given to those who have already attended PGEC. Workshops are also task or practice specific and provide more opportunity to the participants for hands-on training and exchange of information. The training courses and workshops cover, inter alia, a wide range of topics including regulatory framework, occupational exposure (external and internal), patient protection (diagnostic radiology, radiotherapy and nuclear medicine), radioactive waste management, transport of radioactive materials, emergency response and preparedness, safety and security of radioactive sources, safety in industrial applications etc. They are frequently organized as national or regional or inter-regional courses for different target audiences like regulators, radiation protection officers, technicians, etc. The Agency is annually supporting more than 50 national and regional events.

### ***2.3 Fellowships and scientific visits***

Fellowships and scientific visits are also supplementing the education and training courses. They are meant to provide individual practical training in well-recognized national and/or regional centres. Duration of fellowships ranges from one month to six months. Scientific visits are shorter in duration ranging from one week to a maximum of one month for visiting one or more centres in other organizations abroad. They are usually meant for decision makers/managers, senior level persons, and specialists requiring exchange of information and observation of other facilities for transfer of know-how, joint collaboration, etc. The Agency arranges annually more than 200 fellowships and scientific visits on radiation and waste safety from approximately 100 countries.

### ***2.4 Distance learning***

Distance learning is also a complementary IAEA radiation protection-training programme for strengthening national infrastructures. This type of self training is very useful for people who live far from training centres. It can be used also as refresher training or be used for equalizing/harmonizing purposes to prepare an individual(s) to reach a certain level for successfully attending a training event. An IAEA/RCA project on paper- based Distance Learning in Radiation Protection is completed. The participating countries were Australia (co-ordinator), Korea, Indonesia, Mongolia, Thailand, The Philippines and New Zealand. The results of the trials (I and II) and feedback have proved this to be

one of the effective mechanisms of radiation safety training. Feasibility of web-based training is also being considered by the IAEA. This would reduce the global resources required and would potentially address a much larger audience.

### **3. Implementation of strategy**

The Agency already had a significant training programme, addressing a wide range of radiation protection and safety issues. The development of a strategy, prioritized the needs, specified overall objectives for education and training and development of a training system based on those objectives and using an approach which optimizes use of resources. The three important functions of the strategy are:

- 1) Establishment of a Steering Committee with a remit to advise on the policy development, and implementation of the strategic plan for education and training.
- 2) Develop standardized training packages to put in place an appropriate education and training programme as a mechanism for the implementation of the BSS and other relevant safety standards.
- 3) Develop a pool of qualified trainers in Member States through the methodology of Train the Trainers.

#### **3.1. The Steering Committee**

The Steering Committee was formed in 2002, with nominated members, representing regional, collaborating training centres, European Union and Professional organization (IRPA). The first meeting was held in Vienna in November 2002 with 19 members. The objective of the meeting was to provide the Agency with relevant advice on its education and training activities, and also review the standardized training material developed, advise on the establishment of inter centre network. The committee meets annually. In its second meeting in November 2003, the committee addressed issues related to the selection of students for IAEA training activities, notably the train the trainers courses and PGEC; the development of a mechanism for the identification of training needs of member states and the harmonization of PGEC courses in all the regional centres. The objectives of the meeting in 2004 were to validate and quantify the performance indicators for the assessment of progress made in the implementation of the strategic plan, to recommend any necessary amendments to the strategic plan in the light of the progress made over the years and to provide advice on the prioritization of the tasks required.

The committee observed that a considerable amount of work has been undertaken over the past years in pursuance of the strategic aims for education and training, and that the work programme is progressing satisfactorily and that the overall objective of self-sustaining training activities within member states by 2010 remains achievable. At present no amendments to the strategic plan and key milestones are considered to be necessary.

#### **3.2. Development of standardized training packages**

Training Packages for thematic or specialized training courses postgraduate educational courses and for distance learning have been developed in modular form based on the standard syllabus. More than 30 training packages developed for specialized courses have been reviewed by the Steering Committee and disseminated to training centers and in the training events. The current status of the training materials developed and under development are in Annex 1.

#### **3.3. Train the trainers workshops**

Train the Trainers workshops are organized to build at the national level a sufficient number of trainers in radiation protection with competencies in radiation protection and teaching. Consequently these workshops include both radiation protection aspects and teaching skills. In addition to national trainers, it is also intended to have a pool of international trainers through train the trainers workshops. The selection of participants to the workshops takes into account these requirements. IAEA has so far conducted three regional train the trainers workshops for radiation protection in medicine and radiation protection in industrial applications and an interregional train the trainers event for radiation protection in medicine. The workshops have facilitated in developing expert trainers and create a data base of trained trainers.

#### **3.4. Implementation of Strategy through other approaches**

Implementation of Strategy is undertaken through a range of approaches, including the development of an inter centre network mechanism, the creation of training modules, and the ongoing development

of the various mechanisms of training provision (e.g. on-the job training, e-learning, appraisal system) and through Agency publications.

#### *3.4.1. Agency's publications*

One of the first steps in the implementation of this strategy by the Agency is the development of guidance on how to build competence in Member States in order to help them to achieve the ability to put in place a sustainable and self-sufficient education and training programme in radiation protection. This has been done so far by issuing Safety Guide RS-G-1.4 on "Building Competence in Radiation Protection and the Safe Use of Radiation Sources" (2001)<sup>1</sup> and Safety Report Series No.20 on "Training in Radiation Protection and the Safe Use of Radiation Sources" (2001)<sup>2</sup>. The Safety Guide presents recommendations on how to meet the BSS requirements concerning education and training in radiation safety, guidance to regulatory authorities on the establishment of minimum qualification requirements for personnel involved in radiation protection activities, as well as guidance on a national strategy for building competence in this area. The Safety Report Series document provides detailed guidance on the organization, implementation and evaluation of education and training activities. The Standard Syllabus for postgraduate educational course in radiation protection and safety of radiation sources has been revised taking into account the requirements of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS).

#### *3.4.2. Intercentre network*

Network is considered essential to facilitate implementation of action plans at the working level and to improve the effectiveness of the training centres. There are three categories of Agency training centres: regional, national and collaborating training centres. It is vital for the success of the Agency's training programmes that these centres do not operate in isolation. The establishment of a network to facilitate communication and information exchange would ensure that this does not occur, and it could play an important role in harmonizing the training courses and improving their quality.

Networking broadly means that partners come together to achieve an overall goal, for example the harmonization and sustainability of radiation protection training by defining a strategy and formulating an action plan. In this sense, the Steering Committee, which consists of representatives of the IAEA, of training centres (national, regional), of collaborating institutions and international organizations, can be seen as a network. This, however, does not automatically imply that communication, co-operation and information exchange between the centres takes place at the working level. To achieve this, the creation of an inter centre network (ICN) would serve as an operational instrument of the Steering Committee for achieving its objectives. The ICN is established and is effective by improving communication and ensuring awareness of radiation protection training activities. It is used as a platform to share training related documents and training materials.

#### *3.4.3. Appraisal Methodology*

The Agency has developed an Education and Training Appraisal (EduTA) protocol document which describes the objectives, the methodology for carrying out the appraisal and the expected results of the appraisal. The document was accepted and approved by the Steering Committee. The objective of the EduTA mission is to carry out a detailed appraisal 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.

Member States will benefit by identifying the training needs and in planning future E & T strategy. An EduTA becomes most appropriate and beneficial to a country when the provisions for education and training in radiation safety have been established or are at an advanced stage of development and implementation. Pilot EduTA missions have been implemented.

## **4. Conclusion**

The Steering Committee in its meeting in 2004 observed that the key milestones for the development and provision of train the trainers courses, and the development of training packages, were successfully achieved.

The ultimate effectiveness of the strategic approach to education and training and other IAEA initiatives rests upon the commitment of Member States to develop sustainable training programmes in radiation safety. By working together more progress can be made towards the realization of a harmonized approach for education and training. These steps are essential ingredients for maintaining high standards of radiation safety worldwide.

## **Training Packages developed by the Division of Radiation, Transport and Waste Safety**

### **Regulatory Oversight**

- IAEA Training for Regulators on Authorization & Inspection of Radiation Sources in Nuclear Medicine
- IAEA Training for Regulators on Authorization & Inspection of Radiation Sources in Nuclear Gauges and Well Logging
- IAEA Training for Regulators on Authorization & Inspection of Radiation Sources in Industrial Radiography
- IAEA Training for Regulators on Authorization & Inspection of Radiation Sources in Radiotherapy
- IAEA Training for Regulators on Authorization & Inspection of Radiation Sources in Industrial Irradiators
- IAEA Training for Regulators on Authorization & Inspection of Radiation Sources in Diagnostic & Interventional Radiology
- IAEA Training for Regulators on Authorization and Inspection of Cyclotron Facilities
- IAEA Training Course on Customs Radiation

### **Emergency Preparedness**

#### Training Courses Available

- Classification of Reactor Emergency
- Medical Response
- Monitoring in a Nuclear or Radiological Emergency
- Radiological Accidents
- Nuclear Exercise
- Public Information
- Radiological Medical Exercise
- Radiological Response
- Research Reactors
- Response to Nuclear Accidents
- Response to Malicious Acts
- Medical Preparedness and Response

### **Patient Protection**

- IAEA Training Course on Radiation Protection in Diagnostic and Interventional Radiology
- IAEA Training Course on Radiation Protection in Nuclear Medicine
- IAEA Training Material on Radiation Protection in Radiotherapy
- IAEA Training Material on Radiation Protection in Cardiology
- IAEA Training Material on Prevention of Accidental Exposures in Radiotherapy.

### **Source Safety & Security**

- IAEA Training Course on Radiation Protection and Safety in Industrial Radiography
- IAEA Training Course on Radiation Protection and Safety at Industrial Irradiation Facilities
- Concepts of Radiation Protection and the Safety of Sources

### **Occupational Radiation Protection**

- IAEA Training Course on Assessment of Occupational Exposure due to Intakes of Radionuclides
- IAEA Training Course on Assessment of Occupational Exposure due to External Radiation Sources
- IAEA Training Course on Occupational Radiation Protection
- Radiation Protection and the Management of Radioactive Waste in the Oil and Gas Industry
- IAEA Training Course on Neutron Dosimetry

**Quality Management**

- Quality Management Systems for Technical Services in Radiation Safety

**Waste Management**

- Reference Training Material on Safety Assessment of Near Surface Low and Intermediate Level Radioactive Waste Disposal Facilities

**Transport Safety**

- IAEA Publication – Safe Transport of Radioactive Material – Third Edition - Training Course Series 1-2002

**PGEC**

Part I to XI  
Instructions to Practical lessons

**Distance Learning**

23 lessons in 4 Modules

**E-learning**

Lessons from module 4 of Distance Learning developed as pilot modules

## **IAEA PUBLICATIONS IN THIS AREA**

- [1] *Safety Standards Series RS-G-1.4, Building Competence in Radiation Protection and the Safe Use of Radiation Sources, IAEA, Vienna, 2001.* This Safety Guide provides guidance for the regulatory bodies for the establishment of training and qualification requirements and a strategy for building competence. The Safety Guide is jointly sponsored by WHO, PAHO and ILO;
- [2] *Safety Report Series No.20, Training Courses on Radiation Protection and Safe Use of Radiation Sources, Vienna 2001.* This report provides assistance to trainers and training providers on how to set up training courses, distance learning and on the job training as well as to establish training centres. It addresses the development and provision of training in protection and safety in a range of activities involving work with ionizing radiation. It supersedes the IAEA Technical Reports Series No. 280 on Training Courses on Radiation Protection that was published in 1988.
- [3] Training Course Series 18, Standard Syllabus for the Postgraduate Educational Course in Radiation Protection and the Safe Use of Radiation Sources, IAEA, Vienna 2001 is intended to facilitate the implementation of such courses by Universities and training centres. The course is aimed at professionals in the early stage of their careers. The structure of the syllabus follows the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. This syllabus supersedes the one published in 1995.

### *Corresponding Author:*

Geetha Sadagopan

IAEA

Wagramerstrasse 5

A-1400 Vienna

Austria

T: +43 1 2600225532

F: +43 1 260007

e-mail: [g.sadagopan@iaea.org](mailto:g.sadagopan@iaea.org)