

The Role of NCRRP in Education and Training on Radiation Protection

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Abstract. Radiological protection is in constant motion, raised by new developments and research in the medical and industrial sectors. Radiation protection and safety associated with the application of ionizing radiation depends strongly on the skills and expertise of the professionals. The International Basic Safety Standard places great emphasis on education and training for all persons engaged in activities relevant to the protection and safety. For the professionals involved the most critical aspect it is the radiation protection. NCRRP is an established research center for education and training in radiation protection. Training is conducted by expert trainers with years of experience in the field of radiation protection. NCRRP organized courses and individual training on topics related to radiation protection: enhancing the qualifications of professionals from the medical and non medical fields; specialized training in radiation protection of different groups of professionals working with ionizing radiation sources; postgraduate education in radiation protection education of PhD within existing academic programs and give guidance to Master Students. In parallel the NCRRP aims to play a role in national and international policy through participation in European programs. Such is “CONCERT European Joint Programme for the integration of Radiation Protection Research”. The NCRRP develops, publish and distribute programs, newsletters, manuals and information materials for the benefit of the society. The implementation of a coherent approach to education and training becomes crucial in a world of dynamic markets and increasing workers’ mobility.

Keywords: education, training, radiation protection, NCRRP.

1 Introduction

Radiation protection (RP) is a major challenge in the different applications of ionizing radiation. The scientific world of radiological protection is in constant motion, triggered by new research as well as by developments and events in the daily industrial and medical sectors.

Within this perspective, maintaining a high level of competency in RP is crucial to ensure future safe use of ionising radiation and the development of new technologies in a safe way. Moreover, the perceived growth in the different application fields requires a high-level of understanding of radiation protection in order to protect workers, the public and the environment of the potential risks. A sustainable education and training infrastructure for RP is an essential component to combat the decline in expertise and to ensure the availability of a high level of radiation protection knowledge which can meet the future demands. Such structure would make the work in radiation protection more attractive for young people and to provide attractive career opportunities, and the support of young students and professionals in their need to gain and maintain high level radiation protection knowledge.

2 The Context of Developments

The quest for excellence in radiation safety calls for an integrated approach to education and training. Radiation protection is, by and large, multidisciplinary field comprising interrelated parts of applied physics, chemistry, biology, nuclear technology, and other specialized areas.

Today, radiation technologies and radioactive sources are widely used around the world, mostly in medicine (diagnostic radiology, radiotherapy, nuclear medicine) as well as in industry, agriculture, and research.

3 Analysis of Needs

Radiation protection and nuclear safety are primarily a national responsibility. All countries using ionizing radiation or committed to nuclear power programs are engaged in some education and training activities in these fields.

An issue which will continue to receive emphasis is the enhancement of radiation safety for nuclear personnel in the workplace, an area in which training remains in high demand. Each category of workers has its own particular needs, depending on the occupation in question. Exposed workers or workers likely to be exposed can be grouped by various fields – the nuclear industry and transport of radioactive materials; hospitals and other medical institutions (radiotherapy, diagnostic radiology, nuclear medicine centres); industrial plants and projects using radiation sources; universities and research centres; institutions and groups involved in emergency operations (medical services, civil defence, local police, for example).

In industry, training must be accessible to the greatest number of workers and be based on a balance between the level of knowledge they require for the purposes of their occupation, and the level needed for radiation protection.

In medical teaching and research, training is needed for groups of professionals having a sound scientific educa-

tion but inadequate knowledge of radiation protection. There is a particularly growing demand worldwide for training of radiation safety officers (health physicists) and medical personnel, including medical doctors, in departments of radiotherapy, diagnostic radiology, and nuclear medicine. Refresher courses for this group are needed on a regular basis to keep personnel abreast of radiation safety requirements. Attention must be accorded to nurses, a group having a very important impact on public perception of radiation risk.

Radiation protection training for members of emergency teams should be seen as part of the national plan for dealing with nuclear accidents and radiological emergencies. The need for such training at all levels is persistent for many countries in all regions.

The programme for education and training in radiation protection should be based on the following objectives:

- the achievement of national self-sufficiency in education and training programmes;
- the strengthening of national radiation protection infrastructures.

4 The National Centre of Radiobiology and Radiation Protection

The National Centre of Radiobiology and Radiation Protection (NCRRP) has been established in 1963 as a scientific organization and a specialized body of the Ministry of Health in Bulgaria. NCRRP is the main authority of the national system for control of ionizing radiation and health monitoring of radiation exposed population groups.

The mission of NCRRP is protecting Bulgarian population and future generations from the harmful effects of ionizing radiation. Since its creation the NCRRP gives priority to research on issues of societal concern such improving legislative basis in radiation protection, radiation control of working and living environment, including radon public exposure, optimizing radiation protection in medical exposure, health monitoring of radiation exposed population groups, scientific investigations of low dose ionizing radiation effects, radiation risk assessment of Bulgarian population and education and training. The Centre also develops, gathers and disseminates the necessary knowledge through education and communication (medical and non medical sectors).

Thanks to its thorough experience in the field of peaceful applications of nuclear science and technology, the NCRRP has garnered a reputation as a Centre of not only research, but also education and training.

One of the research topics that are strongly developed at NCRRP is radiation protection. From years of experience and recent knowledge that results from the latest innovative research, an extensive range of course modules has grown. Our courses are directed to the medical and non-medical industry the academic world and the general public.

Academic collaborations

NCRRP experts are involved as lecture in academic programs, at Medical University, Medical College "Filaretova" and Sofia University.

Guidance of PhD student

In a conscious desire to increase its pool of highly specialized young researchers and to tighten the links with the universities, NCRRP support PhD candidates and post-doctoral researchers. For the period 2012-2016, 12 students started a PhD in NCRRP. They perform their work in research fields that reflect the priority programs of NCRRP, including the field of radiation protection (Table 1).

Table 1. Number of PhD students in NCRRP in the period 2012–2016 (RH – Radiation Hygiene; MRPhy – Medical Radiation Physics; RB – Radiobiology)

Scientific specialty	Form of education		Thesis defended
	Regular	Independent	
RH	4	4	2
MRPhy	3	1	1
RB	5	1	1

As an organization involved in both the scientific and administrative aspects of radiation protection, the Centre provides suitable conditions for finishing of master degree. The students have the opportunity to use our laboratories and other infrastructures in order to perform scientific experiments to support their thesis work. Since 2003, 32 Master diplomas have been elaborated in NCRRP and successfully defended.

Education

Post-graduate educational courses are designed to meet the educational and initial training requirements of junior staff of graduate level, holding or earmarked for positions in radiation protection. NCRRP is the only institution which conducts training in radiobiology, radiation hygiene and medical radiological physics. Typically, a course spans 1 to 8 weeks during which participants are provided with the opportunity to update and upgrade both their theoretical and practical knowledge and skills. Training courses cover a broad offer. Different modules are foreseen as a "standard", but in principle all our courses are tailored to the specific needs, field of operation, and level of the trainees.

Basic modules

The course provides the theoretical and practical knowledge required for implementing aspects of radiological protection in a medical or non-medical working environment, both in the daily practice and in the management in the long term: Basic principles of nuclear physics; Interaction of radiation with matter; Radiation and dose measurements; Biological effects of ionizing radiation; Gamma spectrometry; Standards and legislation; Principle of radiation protection and safety culture.

The series starts with an introduction to physics that is then linked to a practice-oriented part on radiation and dose measurements. The module on biological effects of

ionizing radiation presents an understanding of the effects of high and low level doses of ionizing radiation on the human body. The series is completed with a state-of-the-art overview of standards and legislation and a rationale on ALARA and safety culture. Depending on the scope of work and level of competence of students the course could start from this basic series, but some modules may be omitted and other more specialized modules can be added upon request. Such as: Radon and increased natural radioactivity; Organization of emergency planning; Radiation risk; Radiochemistry; Biodosimetry.

All courses are announced on the website of the NCRRP at the beginning of each calendar year.

Training workshops

Shorter (1 to 2 weeks), intensive training takes place at workshops designed to enhance skills of people working in both major fields. The emphasis is always on practical elements of training and upgrading experience. Generally, there are specialized laboratories, computer-aided, or field work. Apart from provision of expert services, the NCRRP provides training material.

Specialized education in radiation protection

Specialized training for qualification to work with sources of ionizing radiation. The training under licensed courses for qualification to work with sources of ionizing radiation started in 2003. About 65% of all courses are for medical specialists.

Qualification

Developing of research potential by providing further education and training is essential for the competitiveness of the NCRRP. Participation in national and international projects allows increase of qualification of the staff by participation in courses, seminars, fellowships, workshops, publication etc.

Lecturers

Among the NCRRP lecturers are medical doctors, physicists, biologists, engineers who all bring insights and ideas from their specific background into the course programs. As NCRRP staff members, they have a solid knowledge and experience in their field, and can thus directly transfer their theoretical knowledge and practical experience into the various courses. National and international positions of lecturers are very good, both in terms of education as well as research. Direct measure of work showed scientometric data - a large number of scientific publications, some of which in international journals with impact factor, and monographs. A significant part of the published writings resonates in international journals. Quality management training is done through periodical reports of academic staff.

Information materials

All these types of activities are supported by reference materials. These basically include the International Atomic Energy Agency's safety-related publications (standards,

guides, training series, radiation safety manuals, etc.) and other information materials specifically developed for educational and training courses.

International project

From an executive perspective, education and training are undoubtedly the two basic pillars of any policy regarding safety in the workplace. The radiological protection rationale that serves as the basis for this policy is the same all over the world, going beyond cultural differences and disciplinary applications. In this sense, the implementation of a coherent approach to education and training in radiological protection becomes crucial in a world of dynamic markets and increasing workers' mobility. Through participation in international programs, NCRRP aims to contribute to a better harmonization of training practice and skills recognition on a national and international level.

NCRRP participate European Joint Programme for the integration of Radiation Protection Research—CONCERT" (www.concert_bfs@bfs.de). The CONCERT under "Horizon 2020" is operating as an umbrella structure for the research initiatives jointly launched by the radiation protection research platforms MELODI, ALLIANCE, NERIS and EURADOS. CONCERT is a co-funded action that aims at attracting and pooling national research efforts with European ones in order to make better use of public radiation and development resources and to tackle common European challenges in radiation protection more effectively by joint research efforts in key areas. CONCERT is organized in seven Work Packages. NCRRP participate in Work Package 7 (Education and Training). The aims of this package are: To respond to the challenge of developing and maintaining new competence; Support of Education and Training in the sciences underpinning radiation protection in general, and in particular specific research areas such as the hazards from low-dose radiation, medical applications of ionizing radiation, radioecology, emergency and recovery management and dosimetry. CONCERT has the mission to further reduce uncertainties in the assessment and management of radiation risks to the environment and to humans by targeted science.

5 Conclusion

The implementation of a coherent approach to education and training becomes crucial in a world of dynamic markets and increase the mobility of workers. RP training in NCRRP has a rich tradition and a good prospect. In the long history of NCRRP quality of education and research in the scientific specialty has always been high. NCRRP has the capacity and desire to develop the teaching of RP. NCRRP is an institution that allows for a higher level of training in radiation protection through scientific achievements of faculty and good facilities. The training of graduate students, specialists and other medical and non-medical professionals enables experts with good theoretical knowledge, technical skills and ability to analyze the results that may be involved in solving specific scientific and practical problems.