European Network on Education and Training in Radiological Protection (ENETRAP) – Current status

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Abstract. The ENETRAP project is a coordination action supported by the EU FP6 Programme (contract number FI6O-516529, April 2005-March 2007). The overall aim of ENETRAP is to determine mechanisms that in the longer term will facilitate better integration of education and training activities (with a view to mutual recognition across the EU) and to ensure the ongoing provision of the necessary competence and expertise at the level of the Qualified Expert. In a number of work packages strategies are developed to better harmonise the often largely different approaches to education and training in terms of technical content, duration, level, content and duration of practical work periods, etc. and to mutually recognise the qualification acquired in other European countries.

1. Introduction

The ENETRAP project aims to establish a sustainable Education and Training (E&T) infrastructure for radiation protection as an essential component to combat the decline in expertise and to ensure the continuation of the high level of radiation protection knowledge. This infrastructure needs to offer both the initial training (“Education”, knowledge based, in general provided by the universities to students) and the continued maintenance of appropriate competencies (“Training”, usully provided by research and training centres, on all aspects of radiation protection and at all levels).

The main objectives of the ENETRAP project are:

- to better integrate existing education and training activities in the radiation protection infrastructure of the European countries in order to combat the decline in both student numbers and teaching institutions;
- to develop more harmonized approaches for education and training in radiation protection in Europe and their implementation;
- to better integrate the national resources and capacities for education and training;
- to provide the necessary competence and expertise for the continued safe use of radiation in industry, medicine and research.

These objectives are achieved via the establishment of a European-wide E&T network in radiation protection which will:

- assess training needs and capabilities;
- identify the potential users and their future involvement in order to insure the sustainability of the network;
- launch a consortium of universities with the aim of create an European Master in Radiation Protection;
- review the scientific contents of current E&T activities;
- explore the effectiveness of on-the-job training and identify options for additional programmes;
- propose recommendations for the recognition of courses and competencies of radiation protection experts;
- make recommendations for revising the current European Radiation Protection Course (ERPC) to include a system for credit points and modern educational tools, such as distance learning.

The main deliverables of the ENETRAP project are:

- comment on the status, value and appropriateness of current education and training initiatives within the EU;
- recommendation to EUTERP regarding the way forward with respect to (i) required developments in education and training resources to support the radiation protection expert, and (ii) establishing a system for mutual recognition of training and competencies;
- the delivery of a pilot session for a revised ERPC;
- a proposal for the establishment of a Universities Consortium.

2. Work programme

The objectives of ENETRAP will be reached by a number of distinct activities, to be carried out in several work packages. With the aim of ensuring the sustainability of the network, the co-ordination, co-operation, follow-up and transfer of information have to be considered as a complementary task, to be carried out in a separate work package. This work package can be described as a managerial activity. To achieve the aims of the different co-ordination and managerial activities, the work programme for the ENETRAP network is divided in the following work packages:

- WP1 Implementation and co-ordination of ENETRAP
- WP2 Assessing the training needs and capabilities within the EU Member, the New Member States and the Candidate States
- WP3 Recognition of competencies and diplomas
- WP4 On-the-Job Training (OJT) programmes
- WP5 New concepts and new tools for an ERPC

- WP6 Comparison of the current ERPC syllabus with IAEA E&T modules and EU requirements
- WP7 Validation of the results and recommendations for a pilot course
- WP8 Establishment of a consortium of universities

WP1 deals with running the network and its work programme. In a first stage, a Steering Committee was implemented to take the decisions, to deal with the follow-up, to propose improvements and to organize the exchange of information. This Steering Committee is composed by one representative of each partner institute. Detailed information and follow-up of the ENETRAP work is possible through the project website: www.sckcen.be/enetrap. This WP is lead by the coordinator SCK•CEN.

For WP2, information will be gathered form the various countries about the needs in specific areas of radiation protection, the audience concerned and the expected results. This includes an analysis regarding the human, organizational, structural and material needs. This WP is coordinated by HPA-RPD, with collaboration of ENEA.

A key deliverable of WP3 is the formulation of recommendations regarding a common approach to the recognition of the Radiation Protection Expert. In the first instance this requires an analysis of the relevant requirements of national legislation in order to compare the conditions for RPE recognition. This work includes consideration of conditions for the recognition of E&T provided in other countries where such an arrangement exists. An additional outcome WP3 will be the establishment of a database detailing those institutions providing appropriate E&T in radiological protection. Two sub tasks are planned in order to ensure the collection of the information (WP 3.1) and the production of the recommendations (WP 3.2). This WP is coordinated by NRG, in collaboration with HPA.

For WP4 it will be necessary to define specific added value of the theoretical and the "On the Job" (OJT) training. This will require information on the capacities, in terms of host establishments, subjects, number of places, scheduling, duration , et cetera and to examine the lessons learnt from the previous experiences related to the OJT. Sub task 4.1 will deal with the collection of information and sub task 4.2 will provide specific input for WP7. This WP is coordinated by FZK-FTU, in collaboration with BfS.

WP 2, 3 and 4 need input from as many countries as possible, preferably from each of the EU Member States, the New Member States and the Applicant countries. The main instrument for getting the input is the distribution of a questionnaire to these countries [1], which was sent out in July 2005. First results are discussed in the next section. The results of these ENETRAP co-ordination activities are also relevant for achieving the aims of the European Platform for Education and Training in Radiological Protection (EUTERP).

In WP5, modern educational tools will be evaluated, such as distance learning. To this end, the feedback from the previous deliveries of the ERPC will be examined, with regard to its content and its methodology but also concerning its feasibility. In addition, a review will be carried out on the evolutions, approaches and methodologies aiming to provide education and training in radiation protection [6]. Attention will be given to existing distance learning packages and contacts established with the IAEA Inter Centre Network. This WP is coordinated by CIEMAT, INSTN and BfS are collaborating partners.

In WP6, a comparison is made between the content of the current ERPC with the requirements published by the EC [2] and other international organizations such as IAEA [3] in order to assure compliance with the European directives on vocational education and training. The result of this study is described in [4]. This WP is coordinated by BfS, with the assistance of FZK-FTU.

In WP7, the results of the other WPs will be validated, with the aim to define recommendations for a revising the current ERPC and for preparing a pilot-run of one or

two modules of the revised course. The results of WP3 and WP6 will be used to contribute to the validation, in order to find a common basis for recognition of the course in the various countries. This will result in recommendations for an adapted, state-of-the-art, course which will reduce the costs for participation and make it more flexible to meet individual students and employers needs. It will lead to a course which empowers individuals to manage their own professional learning in a self determined manner. A pilot session will be given after having decided the topics covered by the pilot session and according to the three criteria: qualification, mutual recognition and mobility. In this WP, INSTN, SCK•CEN, FZK-FTU, BfS, CIEMAT, ENEA, NRG and HPA are all involved.

The aim of the WP8 is to establish a consortium of universities in order to prepare and submit a project of European Master in Radiation Protection. The main deliverable of this work package is the submission of a proposal to the DG EDUC of the EC within the ERASMUS programme [5]. This WP is coordinated by INSTN, in cooperation with the university partners UJF and NHC.

3. Current status of the project and achievements

The following paragraphs give an overview of the information and results ENETRAP has achieved so far.

3.1 The European Radiation Protection Course (ERPC) syllabus

The European Radiation Protection Course (ERPC) was initiated in 1999 at the INSTN in Saclay by a group of interested colleagues from European radiation protection organisations and/or national training centres [(Germany (BfS), The Netherlands (NRG), Belgium (SCK•CEN), Spain (CIEMAT, CSN), Italy (ENEA, ANPA), France (DGSNR, INSTN)] in an attempt to implement EU training requirements for Qualified Experts. The objective of this event was to provide the theoretical knowledge needed for recognition as a qualified expert in radiation protection according to the European community requirements [4]. It was open to postgraduate students (initial training) and professionals (continuous professional development) from all European countries and organised in four independent modules. Lectures, practical work, exercises and visits were given by European lecturers in English. Participants, who could register for one or several modules over one or several years, were either students or professionals from all European countries (thereby satisfying the prerequisite defined by the European board). A written examination was organised at the end of each module and a certificate validating the successfully concluded modules was issued by the INSTN (National Institute of Nuclear Sciences and Technologies). Safety authorities and academic schools of several countries recognise the ERPC. Practical experience (3 to 6 months in a facility dealing with ionising radiation applications in any of the participating country) was mandatory for postgraduate students. For professionals, practical experience was organised upon request of the individual participants. The ERPC was last organised in 2003/2004.

A detailed study of the content ERPC and comparison with European requirements showed that the scientific/technical content of the ERPC is totally in accordance with *the Basic Syllabus of the Qualified Expert in Radiation Protection* in Communication 98/C133/03. The *Additional Material* of this Communication is also covered in detail. Most of the *Additional Topics* of this Communication are covered fully, such as *Medical Applications* and *Accelerators*. Other areas, such as *General Industry, Research and Training* are also covered widely. *Nuclear Installations* are covered to a great extend except for issues of fuel fabrication, processing and storage.

A very important point of the ERPC is that 50% of the training is theoretical and 50% is practical exercises, demonstrations and scientific visits. In addition to this distribution, 3-6 months of practical experience in a company is mandatory (postgraduate) or offered (professionals). This approach reflects the statement in Communication 98/C133/03 that training needs are to be supplemented by practical experience.

The aim of the IAEA Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources (PGEC) is to meet the initial training needs of professionals at the graduate level or equivalent in order to acquire a sound basis in radiation protection and the safe use of radiation sources. It is tailored for a wide range of professionals but does not specifically address the Qualified Expert as defined in the European Basic Safety Standards. The PGEC syllabus gives more emphasis to the basic issues compared with the ERPC syllabus and there is more detailed consideration of legislative framework and regulatory systems. The PGEC adopts a train-the-trainers approach in order to strengthen the sustainability of training activities in the developing Member States of the IAEA. However, in comparing the curricula the ERPC and the PGECV can be considered as very much equivalent. The duration of the IAEA PGEC is 18 weeks and includes theoretical lectures as well as practical exercises, demonstrations and visits, as does the ERPC. The ERPC, however, has a duration of about 13 weeks but requires/suggests an additional 3-6 months of practical experience (on-the-job training).

The comparison of the basic concepts for training in radiation protection shows the much broader approach of the IAEA to training. It would be advantageous to establish a closer cooperation between EU and IAEA in relation to training in radiation protection.

In order to bring a new approach to the ERPC, ENETRAP recommends the introduction of learning objectives for each module or module parts, to be formulated as appropriate. These objectives are the knowledge and skills participants are expected to have attained upon completion of training. The objectives can be seen as performance goals for the participants with measurable outcomes. As far as technical content is concerned, new EC directives should be taken into account and issues such as the control of radioactive sources as dealt with in “Council Directive 2003/122/EURATOM of 22 December 2003 on the Control of High Activity Sealed Radioactive Sources and Orphan sources” should be included. Practical exercises should be described in more detail and references should be given. However, it should be noted that the responses to questions C7-9 of the ENETRAP questionnaire could make modifications necessary.

3.2 Preliminary results of the ENETRAP questionnaire

In July 2005, a survey by questionnaire was initiated with the aim of collecting the necessary information concerning

- the number of RPEs;
- identification of practices;
- national capabilities for E&T in radiation protection;
- regulatory requirements and
- recognition.

This questionnaire was sent out to 31 countries, i.e. the European Member States, the Candidate States Bulgaria, Croatia, Romania and Turkey, and the Associated States Norway and Switzerland. At the time of writing, a total of 24 countries have responded; it is perhaps interesting to note that those countries responding most promptly were the most recent additions to the Member States.

Although a rationalisation of the returned questionnaires has been undertaken, initial analysis of has proved difficult. In part this has been due to the volume of information provided but, inevitably, there are issues of clarification of the information and data

provided and the occasional ambiguity to resolve. As a consequence it is not at this stage possible to draw any firm conclusions or make any significant progress with respect to the key objectives of WP2 and 3. It is, however, perhaps worth noting a couple of interesting observations regarding the data provided to date on the numbers of RPEs in Member States:

- Respondents were asked to provide data with regard to the numbers of RPEs, workers and licensees as well as an indication of whether or not the total number of RPEs is perceived to be adequate or not within any individual country. Consideration of this data suggests (for those countries that responded to this question) a figure of at least 90 seems to represent the lower bound of "adequacy".
- Taking this analysis a stage further and looking at the correlation between the adequacy of numbers of RPEs with respect to the numbers of licensees and the number of workers appears to indicate that those countries with the highest ratio of workers to licensees tend to be those that consider they have an adequacy of RPEs.

As stated above, work is on-going with regard to the questionnaire pursue any still-needed information and to resolve areas of difficulty.

3.3 Submission of the project of Master Course in Radiation Protection

The partners involved in WP8 have prepared an application form for a 2nd year Master Course within the SOCRATES Programme [5]. The project of European Master in Radiation Protection will be proposed as a Curriculum Development. The consortium of universities is the following:

- Joseph Fourier University (UJF), Grenoble – France (applicant);
- North Highland College (NHC), Thurso – United Kingdom;
- Czech Technical University (CTU), Prague – Czech Republic;
- National Institute for Nuclear Sciences and Technology (INSTN), Saclay – France.

The project fulfils the requirements of "Bologna system": if accepted by the DG EDUC the future European Master will be structured in modules, make use of ECTSs and promote mobility of both students and teachers. The partner Universities wish to be able to deliver a joint diploma, recognized in all the partner countries (Czech Republic, UK and France).

It is also foreseen to propose, within this course, a harmonized curriculum for Qualified Experts in radiation protection fulfilling the requirements of the EURATOM Directive 96/29 thus favouring the mobility of workers across Europe. This project has been initiated with the minimum required participants in order to facilitate the construction of the course, but it is anticipated that other interested universities could join the consortium as soon as the project has shown its viability.

3.4 Use of new technologies

The use of new technologies in teaching and learning processes is increasing. They aim to facilitate the access to resources and make the remote exchanges of information and collaborations possible. E-learning is also among the objectives of the Information Society Technologies Programme which is part of the EU Research Framework Programme. One of the tasks of WP 5 is to evaluate the e- and distance learning technologies, capabilities and methodologies, providing the pro's and contra's of the existing tools. Concerning the e-learning methodology, which can be defined as the management way of didactical resources in time, place and environment, 3 models were evaluated. Regarding the selection of an e-learning platform, we are proposing a matrix indicating the most adequate platform which can fit the requirements for the implementation and validation of a revised ERPC.

Currently, a free platform based on MOODLE is chosen which in principle should allow all partners a cost free access. At this moment the platform is working and one module is running in a test phase. The course methodology is in preparation.

3.5 On-the-Job training

A suitable qualification for responsible personnel in radiation protection (RPE, RPO, QE, Medical Physicists) must be a combination of theoretical knowledge, and the ability (competency) to practice radiation protection.

The theoretical knowledge is obtained by suitable education and by attending radiation protection training courses (successfully completed by examinations). Training courses should provide a suitable mixture of theory and exercises (practical parts).

Competency and skills as second essential element of E&T in radiation protection can only be obtained by practical experience via either appropriate on-the-job training (OJT) or a period of work experience (WE) or a combination of both.

OJT as form of training requires a suitable environment where the necessary facilities and the infrastructure for the OJT are available. Additionally the direct supervision of an experienced mentor is imperative. The duration of OJT training activities is typically several weeks up to several months and in most practical cases an additional period of time to gain work experience (WE) is obligatory. In WE training activities, employees are actively working within a specific practice and are gaining in-depth knowledge of the practice and experience in relevant radiation protection issues.

Most EU Member States do have legislative requirements on OJT and WE. On-the-job training (OJT) and work experience (WE) is required especially in

- medicine (all specialities) and
- nuclear power plants and other nuclear installations.

4. Conclusion

Although working with a variety of responsibilities and specific professional aims, practitioners dealing with applications of ionizing radiation have three common needs with regard to radiological protection:

- basic education and training providing the required level of understanding of artificial and natural radiation;
- a standard for the recognition of skills and experience and
- an opportunity to fine-tune and test acquired knowledge on a regular basis.

The wide variety of the national approaches of the E&T programmes in radiological protection in Europe, hampers a common European methodology concerning these issues. This is particularly true for the Qualified Expert. Although, in this specific case, the fundamentals of the E&T programmes are given by a European directive, the national differences in for instance, level, duration, subjects, practical and theoretical proportions in a programme etc. create a barrier for the mutual recognition of this expert. The development of a common European radiation protection and safety culture and, based on that, the mutual recognition of radiation protection courses and the acquired competencies of radiation protection experts becomes crucial in a world of dynamic markets and increasing workers' mobility.

The European Network on Education and Training in Radiological Protection ENETRAP will make a study of the current European E&T programmes, regulations and skill recognitions. It will provide a proposal for harmonized programmes for both the educational part and the training in radiological protection and plans to organise a pilot session in which part of the programme will be delivered. In this way ENETRAP will

provide the fundamentals on which a European umbrella organisation can build the organisation, follow-up and recognition of E&T programmes, which will contribute to an enhanced mobility of workers, teachers and students throughout the European countries. Furthermore it will help to increase the reciprocal trust and confidence in the quality and responsibility of the radiation protection experts and workers in the European countries.

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References

[1] See www.sckcen.be/enetrap under "documents"
[2] Council Directive 96/29/Euratom and Communication from the Commission 98/C133/03 (downloadable from www.sckcen.be/enetrap under "documents")
[3] IAEA Training Course Series No. 18 (downloadable from www.sckcen.be/enetrap under "documents")
[4] See www.sckcen.be/enetrap under "documents", ENETRAP WD.03 : Comparison between the content of the current European Radiation Protection Course (ERPC) with the requirements published by the EC and other international organisations such as IAEA, downloadable
[5] See http://europa.eu.int/comm/education/socrates.html
[6] M. Vidal et.al. Available tools for radiological protection training. Proceedings of the CHERNE workshop, March 2006, Valencia, Spain.