

Training in Radiation Protection: Developing expertise and culture in radiation protection

(Outputs from a dedicated SFRP symposium organized in 2016 in Paris, France)

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SUMMARY

Organised by the Teaching Commission and the Technical Protection section of the SFRP (Société Française de Radioprotection - French Radiation Protection Society), this symposium was held in Paris on June 14-15, 2016. The objectives of this symposium were to provide the actors of radiation protection with a clear vision on the radiation protection expertise and culture issues.

Three main domains have been addressed, (i) initial and continuous education for radiation protection professionals, (ii) development of a radiation protection culture for professionals, patients and citizens, and (iii) evolution of educational methods.

Balance between professional training in radiation protection and needs of the stakeholders has been discussed.

A radiation protection culture is of prime importance for professionals - not only those directly exposed to ionizing radiation but also their managers, to promote a more efficient radiation protection. Such a culture applied to general public and patients allows them to apprehend more efficiently available information on that matter.

Concerning the evolution of educational methods, emphasis was to reinforce the notion of skills vs. knowledge. Introduction of new educational tools based on recent communication technics, has been discussed.

Finally, the main output of this symposium is: training is a key element to implement radiation protection.

INTRODUCTION

Patient radiation protection is based mainly on the implementation of the justification of examinations and the optimization of delivered doses principles (L 1333-1). It's a duty (safeguarding of care, quality of treatment) and an obligation inscribed in the code of public health. Many elements are involved (intervention of the Medical physicist, quality control of machines, etc.), including the compulsory Radioprotection of patients TRAINING (R 1333-74).

The decree of 18 May 2004 defined compulsory contents of training by profession, and imposed a decennial pace of renewal. The findings (inspections of ASN [Autorité de Sûreté Nucléaire - Nuclear

Safety Authority] and evaluation of the system in 2010) showed that this training with standard contents but non-proportioned to the stakes and imposed by regulation, without advocating the methods or evaluation, little improved the practice or culture of radiation protection.

Starting in 2012 and with the help of experts in training engineering, the ASN tested an experimentation with professionals: appropriating the general training objectives and defining the pedagogical and then operational objectives as close as possible to the stakes and daily practices, reasoning in terms of concretely expected competences, and advocating durations, methods, training materials, and evaluation process.

Given the success of this experimentation, which has won the support of professionals, and the opportunity offered by the transposition of the Euratom Directive 2013/59, the generalization of the experimentation will regulatory take place in 2016.

A technical decision of the ASN currently under consultation will define the general objectives and headings (pedagogical objectives and expected competencies, overall duration of teaching, required skills for training, the pace of training renewal...), that professionals will have to decline themselves and formalize in professional guides. These guides validated by the ASN, will be guidelines to follow in order to provide training, and specifications guaranteeing both the adequacy and the harmonization of training.

A training strategy (expected objectives and competencies) directly linked to the practice and a graduated approach commensurate with the issues, should ensure a better effectiveness of training. Training needs identified by professionals themselves, an appropriate pace, responses to specific needs, should ensure the support of the greatest number.

The involvement of professionals in the definition of their training, in response to specific needs, appears to be a strong additional asset for acquiring skills and change practices.

INITIAL AND CONTINUOUS EDUCATION AND TRAINING FOR RADIATION PROTECTION PROFESSIONALS

Development of a competency framework

The development of a competency framework is at the heart of professional certification. It is a collaborative process that must go beyond the competency framework to an evaluation framework in order to provide proof of professional mastery. It is an indispensable step that helps to improve the professionalization of the training courses developed by teachers and trainers.

During this symposium, the INSTN (Institut National des Sciences et Techniques Nucléaires, National Institute for Nuclear Sciences and Technologies) presented such a development concerning the branch of radiation protection technicians.

The reference to the expected professional skills of the labor market is a pivotal point of the process. Developing a skills repository results from the analysis of a trade, a job, a function. This analysis is valid only if it is a collective and shared analysis. This involves setting up working groups involving the players in this occupation, job or function, with specialists in the analysis of tasks and professional activities and employers directly concerned or potential. This analysis resulted in a document, generally referred to as the "professional activity reference framework", which describes precisely the activities and tasks characteristic of the trade concerned. The description of the tasks, grouped into coherent activities in professional terms, generally specifies what actions are expected, in what context and what results are expected. Then comes the drafting of the competency framework itself.

A competence is a set of knowledge, know-how and behaviors organized in order to appropriately perform an activity.

INSTN has worked out with nuclear safety professionals, four standards in a logic of professionalization as a continuum of training. They each have a skills repository and an evaluation repository based on a precise definition of the professional activities carried out by an operator, a technician, a senior technician and an engineer assistant in radiation protection.

This long-term work with the professionals has highlighted the fast evolutions of the profession in terms of approach to radiation protection in the field (concept of integrated radiation protection).

We are currently considering the establishment of a monitoring mechanism on employment in this sector which would involve the INSTN and the employers concerned.

Companionship as an in-company learning

Another kind of in-company learning is the companionship. Knowledge, know-how and behaviors are transmitted from a senior employee to the newly recruited employee. In that case, a basic training is a prerequisite.

A grip by the field hierarchy is assured. The whole of this grip is formalized and is the subject of a companion booklet whose principle is to list the achievements. They are obtained through personal work on knowledge of work practices and instructions, by a duplicate work with a tutor, by criticizing the practices of a holder to the hierarchy, by carrying out actions monitored by a tutor, and by a final questioning to verify the effectiveness of learning.

Continuous training of PCR

The need to break the loneliness, to maintain a level of competence, to find mutual aid and to share successes and difficulties was the starting point of the creation of PCRs (Personnel Compétent en Radioprotection - Radiation Protection Officers) networks.

Over time, this need has become more prominent with regard to continuing education.

This training need, felt by a large number of PCRs, was largely legitimized by a feeling of "gap" between initial training and the reality of the field. As a result, and in order to meet the expectations of our members, the networks have therefore turned to the setting up of training days to try to optimize the practices and to strengthen the confidence of the field PCRs.

In order to assist networks wishing to enter into a training program, a pedagogical committee was created to propose the necessary tools for the construction of a pedagogical sequence.

Today, these days are a great success with our members so much that it would be necessary to multiply these meetings!

As a general rule, these days are divided between theory and practical workshops, with a part regulatory news and very often, in connection with the current problems. They are often organized in small groups, which allows the interactivity, and always in the conviviality and the mutual aid.

Given this growing success and the very positive feedback on the qualitative aspect, we question the feasibility of having these teaching hours recognized as part of the renewal of the PCR certificate.

The problem is, on the one hand, to integrate the training made within the networks into the certification of the training organization and, on the other hand, to put into practice the dispensations from the last training session.

ENHANCING RADIATION PROTECTION CULTURE AND SKILLS FOR PROFESSIONALS

Evaluating training performance: the EDF experience

Since 2012, EDF has committed to a vast program of renovation of training courses. Among them, two radiation protection training modules, one level 1 module for speakers, and one level 2 module for project managers.

These courses are aimed at a heterogeneous population. They bring together people with different professional and educational backgrounds and are characterized by the diversity of their occupations (electricians, scaffolders, boilermakers, and method engineers), their statutes, their functions and companies.

These courses are thus described as "multi-job" trainings in the company's jargon. They are provided by 250 trainers belonging to a dozen training organizations distributed throughout France.

The "Organizational and Human Factors of SocioTechnical Systems" group (FOHST) of EDF R & D is positioned to design, evaluate these trainings and support the accompaniment of the change with training providers.

The objectives of the evaluation of the training design are to identify areas of progress with respect to three areas of inquiry and reflection:

- Is knowledge the one that will facilitate understanding of the rules and their appropriation?
- Does training provide training in working situations, in particular to reduce the gap between training content and future work?
- Does the training take into account the different learning modalities and lessons learned from adult learning, including experiential learning?

The proposed and designed evaluation methodology is based on a participatory approach Bringing together prescribers, designers, trainers and trainees.

The innovative tool for this evaluation is based on the simulation of intervention scenarios, punctuated by disruption and events, in which the team of trainees must identify the strategy (s) of possible actions to manage these situations of work.

It is therefore clearly distinguished from the practices of assessing the satisfaction of the trainees, the tests of knowledge, or the evaluations of transfer by questionnaire during annual interview with the hierarchical manager.

These results have led to a review of the re-design of some existing training content, the design of new content, while other recommendations have been transformed into a new design criterion for other courses. Some of the recommendations have thus become design requirements.

The ANCCLI experience: Developing Radiation Protection Skills and Culture to promote citizen expertise.

The ANCCLI (Association Nationale des Comités et Commissions Locales d'Information - National Association of Local Information Commissions and Committees) main objective is to develop radiation protection skills and culture to promote citizen expertise.

The ANCCLI promotes the rise in competence and culture of radioprotection of CLIs (Commissions Locales d'Information - Local Information Commissions) in providing information on major nuclear issues. To do so, the ANCCLI builds constructive partnerships. For instance, the ANCCLI and IRSN

(Institut de Radioprotection et de Sûreté Nucléaire - Institute for Radiation Protection and Nuclear safety) jointly organize training seminars for CLI members:

- Waste (HA MAVL - HA MALL)
- Environment and health
- Post-accident
- Dismantling
- Organizational and Human Social Factors
- Transport of radioactive substances

Culture of Radiation Protection: Patients, physicians and nursing personnel are all hospital radiation protection actors.

The culture of radiation protection in the medical field has increased considerably over the last twelve years. There are, however, areas where much remains to be done: in the operating room, where there is little or no training in radiation protection and among doctors who are very unaware of GBU (Guide du bon Usage en radiologie - Good Practice Guide in radiology).

The upcoming revision of radiation protection training for patients, as well as the introduction of radiation protection into the initial training of all doctors, must make it possible to overcome these shortcomings.

In addition, new generation facilities, especially scanners, offer a great potential for optimization that professionals must learn to use to the best advantage.

The increasing number of PSRPMs (Personne spécialisée en radiophysique médicale -Medical Radiophysics Specialist) actually involved in imaging is an asset in this context since optimization is at the heart of their missions. It is therefore necessary to be optimistic, but vigilant. The ASN inspection reports and the IRSN periodic reports concerning the collection of doses under the NRD (Niveaux de Référence Diagnostiques - Diagnostic Reference Levels) and the exposure of the French population related to diagnostic procedures will make it possible to measure and to follow in time the impact of all the measures taken.

INTEGRATION OF NEW EDUCATIONAL TECHNIQUES AND METHODS

Distance Learning:

Based on the feedback analysis from the creation and functioning of a professional License in Nuclear Techniques and Radiation Protection (TNRP) an experiment done at the University of Strasbourg, Strengths and weaknesses of distance learning were studied.

The TNRP Pro license is a training which aims to give skills to work overall the professions of the nuclear sector and includes 450h excluding tutored project and internship .

Strengths were:

- providing training to those prevented
- Personalized and customized follow-up
- Attractive technological innovation
- Educational inputs
- didactic inputs

Weaknesses were:

- Opening threshold set at 7 registrants
- technical problems
- Presence required for on-site lab and exams
- Risk of isolation and abandonment
- Need for recognition by the institution

The pedagogical team regretted the one-shot operation of this training with regard to the investment of more than five years to carry out this project. However, the majority of the teachers involved recognized that they had been led to reflect on their educational practices. They say they have not really changed their courses in face-to-face at the end of this distance learning experiment.

Computer-assisted training at work in glove box

The alpha risk generated by Plutonium requires the use of this material in a glove box. The interventions require a lot of practice, serenity, reflex during routine manipulations but also in the face of degraded situations. A

Constant and repeated learning is justified by the risk of injury or inhalation during operations in glove boxes.

The training of the participants is essential in these activities where the control of the gesture of the operator must be precise and appropriate. A simulation tool was created to contribute to good practice training. It allows simulating the normal working and degraded situations.

This pedagogical tool is interactive. It allows 3D simulation in real time. To increase its pedagogical effectiveness, it simulates the actual working environment. The operator controls his avatar on a touch screen with a great freedom of action.

The role of SIBAG is also to train oneself to the good reactions in degraded situations. In this type of configuration, perfect knowledge and mastery of procedures are essential for the operator to properly handle an incident and limit the consequences. This knowledge and mastery of all the situations can only be obtained through a very regular training. It does not require the presence of an Instructor.

Automatic reporting allows stakeholders, their hierarchies and trainers to follow the progress of the learners and to orient the training sessions that complement this self-training on simulator.

Integration of new information and communication technologies into training: Risk and Opportunity.

Initial training (and recycling every 3 years) cannot alone respond to the challenges. Should these actions be integrated into a global approach and change the paradigm between companies and operators?

- The learning enterprise: young generation will have 13 different occupations during its career, what is role of the company in this context and the role of the national education?
- The extended enterprise : To have a shared base of pedagogical modules between the companies and the operators to take into account the specificities

It is a matter of extending the professionalization actions in accessing to a shared and collaborative knowledge base. Such a digital training puts the individual at the center and authorizes the development of a digital culture of actors by the overcoming of barriers.

The reorganization of skills development through the networking effects allows the alliance with the multitude of users and the developers of educational content (increasing yield). For one who knows, it means going from the production of a specification for a production line to the live production of content.

In the end, the increase in the efficiency of training is followed by the increase in the factors of production.

The risk is thinking the digital transition from the trainer's point of view alone, and the opportunity is thinking about the digital transition from the point of view of the learner and the necessary involvement of his / her management.

CONCLUSION

At the end of this symposium, the general point of view was that culture and competency in radiation protection are always in demand. Whatever your field of expertise, whatever your own knowledge, the future of radiation protection resides in training, may it be initial education, continuous training, using either classic or digital tools.

Finally, the main output of this symposium is: training is a key element to implement radiation protection.