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TRASNUSAFE: Training Schemes for Managers on Nuclear Safety Culture

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ABSTRACT

TRASNUSAFE, a Project supported by the European Commission (FP7 - GA 249674), aims at designing, developing and validating two training schemes on nuclear safety culture for professionals operating at a high level of managerial responsibilities in nuclear installations. One of the training schemes is related to the nuclear industry, while the other is related to the other installations making use of ionizing radiation based technology, mainly the medical sector including the transport of radioisotopes. Both training schemes have a common basis reflecting the challenging approach to risk management, followed by sector-specific specialised modules..

The first section of the paper deals with a general presentation of the Project running since end 2010, including its objectives, structure and methodology. Associating 15 organisations from 9 different countries, 3 international associations, including EITA, the European Isotopes Transport Association, and a large set of important potential users, TRASNUSAFE is a joint effort of universities, research centres, regulators and industrial companies. The final product will consist in a package of five training modules for managers of both industrial and medical sectors, ready for use after validation through pilot sessions foreseen in 2013. The Project started with a wide analysis of the needs. It was followed by the work of two reflection groups organised within the "European ALARA Network" (EAN) and the "European Training and Education in Radiation Protection Foundation" (EUTERP) networks.

The second section of the paper presents the five training modules. A common generic introductory module is entitled "Managerial Competences and Leadership for Safety Culture (Nuclear and Radiation)". This module is designed for senior managers. Its purpose is to raise the knowledge and understanding about safety culture in order to avoid incidents occurring as a result of human errors or organizational deficiencies and to develop adequate concern about the importance of radiological protection issues in the operation of facilities, hospitals and others. For the managers, these topics are closely linked to economical operation and societal responsibility. The four specific modules involve:

For the Medical sector: "Setting up a Management System", and "Economic Relevance of Safety Culture in Medical Applications";
For the Nuclear Industry: "Observation Techniques", and "Compliance of contractors with safety systems".

INTRODUCTION

Safety culture has developed after the Chernobyl accident when it became clear that although the plant had trained operators using clear procedures backed up by safety management systems, deficiencies in the attitudes to safety in the organisation had let to a nuclear disaster. Since 1986, the use of the terms 'Safety Culture' and the application of the concept have spread not only over the nuclear industry, but also to other sectors including Process Industries, Rail, Aviation, Air Traffic Management, Medical and Food [1]. Here, we refer to the concept of Nuclear Safety Culture (NSC) proposed by the International Nuclear Safety Advisory Group of the IAEA. In INSAG-4 [2] safety culture is defined as: "*that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance*."

INSAG-15 [3] identified three phases in the development and strengthening of Safety Culture in an organization:
"(1) Safety is compliance driven and is based mainly on rules and regulations. At this stage, safety is seen as a technical issue, whereby compliance with externally imposed rules and regulations is considered adequate for safety.
(2) Good safety performance becomes an organizational goal and is dealt with primarily in terms of safety targets or goals.
(3) Safety is seen as a continuing process of improvement to which everyone can contribute".
It is clear that a culture of safety (and also of security) that governs the attitudes and behaviour of individuals needs to be integrated in the management system, and that leadership is central to safety culture. Several IAEA publications of safety standards provide useful guidance: see for example [4].

TRASNUSAFE, a Project supported by the European Commission (FP7 - 249674), aims at designing, developing and validating two training schemes on nuclear safety culture for professionals operating at a high level of managerial responsibilities in nuclear installations. One of the training schemes is related to the nuclear industry, while the other is related to the other installations making use of ionizing radiation based technology, mainly the medical sector. Both training schemes will have a common basis reflecting the common challenging approach to risk management for both groups, followed by sector-specific specialised modules.

The project is running since end 2010 for a period of four years. It is structured in five parts, denoted "WP" in Fig 1. It started with an analysis of the needs (WP 1), and with the work of two reflection groups focused on the links between nuclear safety culture and radiological risks (WP 2). Based on the results of the analysis of the needs and the conclusions of the two reflection groups, the design and development of a generic training module, common to the two training schemes, and the definition of the contents of four specialised modules (WP 3) were performed. After the completion of the preparation of the five training modules, a pilot session is being organised (WP 4) to test each of them on a representative sample of trainees, and to develop any necessary corrections. At the end of the project, the two training schemes will be considered as validated and ready for current use. Note that the Project, supervised by a Coordination Committee (WP 5), is performed under Quality Assurance and benefits from the inputs of the members of two user groups. TRASNUSAFE is performed by 15 organisations from 9 different countries, 3 international associations, and a large set of important potential users. It is a joint effort of universities, research centres, regulators and

industrial companies to set up a European package of five training modules on nuclear safety culture for managers of both industrial and medical sectors.

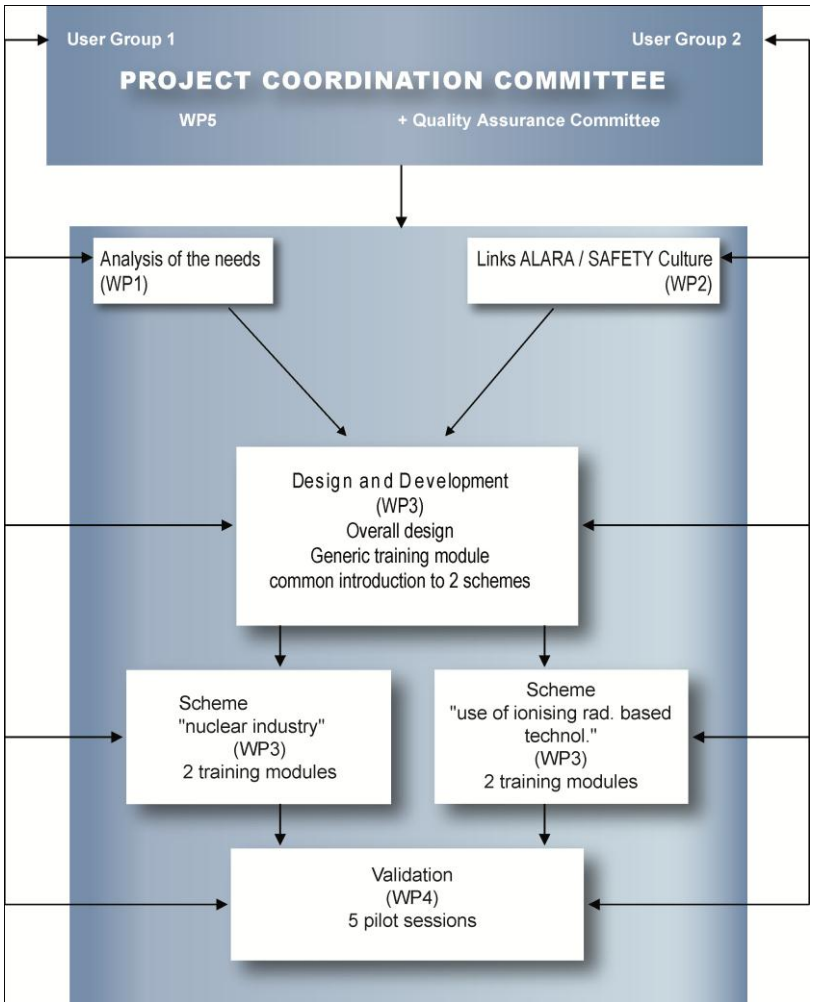

Fig. 1 Structure of the TRASNUSAFE Project

OBJECTIVES, STRUCTURE AND METHODOLOGY

Although the objectives expressed in the introduction were clear, it was necessary to check their relevance among the potential trainees, and try to quantify the "market". Therefore, the Project started with an analysis of the needs based on a questionnaire and a set of five regional workshops. This analysis included the definition of the characteristics of the potential trainees, their scientific background, their professional environment, their responsibilities and their expectations. It was also aimed at getting some quantitative information on the provisional fluxes of managers in charge of safety that can be interested by general or specific trainings on nuclear safety culture.

In the period June 2011 – September 2011, over 450 persons of the European Union were invited by email to fill an online questionnaire. The persons consisted in selected geographically spread coordinators, aiming for a balanced group of respondents knowledgeable about existing safety culture training and training needs. The questionnaire provided 120 replies spread over 25 countries, evenly divided between nuclear industry

(53.5%) and other users of radioactive materials (46.5%). It was noted that less than 25% of the respondents reported on the existence of a specific safety training course in their organisation either as an internal training or with an external national training provider. For 22%, safety training is part of a university or a professional training curriculum, and about 24% take this training at an international level, mostly with IAEA. Most training programmes have an exam (70%), but only 48% provide an official diploma, certificate or accreditation. When summing up the number of people trained in the different programmes, one sees over 100 persons a year attending them.

A list of topics was included in the questionnaire, and the question of their relative importance was submitted. They were: risk concept and risk culture; nuclear safety definition and history; radiation protection principles; radiation safety and radioactive sources; human factors; incident reporting and learning from non-conformities; ALARA[1] principle, implementation and tools; organisational culture; managers responsibilities (legal issues); the societal context of safety culture; case studies. All these topics were scored as important to very important. Some other topics were suggested by the participants, like: working environment psychology in nuclear installations; responsibility at all levels of organisation; types of exposures (planned, medical, non-medical, etc.); specific training on terrorist possible attacks using radioactive dirty bombs and similar; long term operation issues and decommissioning; applicability of standard managerial tools in nuclear industry; implementation of error reduction tools; non radiological/nuclear accidents, even in nuclear facilities; communication of relevant information - the right information to the right people at the right time; etc.

A wide variety of organizational forms was suggested, but a majority of the participants prefers classroom style sessions combined with homework and/or internet based training. On the duration of the training, there was absolutely no consensus. On the contrary, a large consensus was recorded on the need for an exam or test, and the need for a diploma or accreditation (over 80%). However, many suggestions were formulated on non-traditional exams and on-the-job follow-up. Also an European recognition was demanded (70%).

An estimate of the future participation was asked in detail, including per the professional background of the participants. When all the answers are summed with participants estimates per country, a ‘market’ of over 500 trainees / year is predicted for the generic module, while when answering for only the own organization, the figures add up to over 1000 course participants in the next 5 years (over 200 / year).

The regional workshops complemented this information on the needs, and gave more insight into the most relevant contents. Five regional workshops were organised in Brussels, Bucharest, Madrid, Manchester and Ljubljana. The need to develop the safety culture training specifically for high managerial level was recognised. This training is supplementary to the safety training given to the workforce in the nuclear industry or in other sectors working with radioactive sources. While the latter safety training is work related, tuned to concrete working conditions and often organized by (and in) the companies, the safety culture training for managers approaches safety as a risk management issue. As such this safety culture training for managers is largely sector independent. The training needs to address the ‘management perspective’ of safety culture: it will approach safety culture as a risk management challenge. The training will focus on the importance of a safety policy, ways to foster a good safety culture, management systems to manage the safety, tools to measure safety culture,

[1] ALARA = As Low As Reasonably Achievable

consequences of inappropriate safety culture, etc. To be successful, the training should use concepts from management sciences and adopt the 'language' of senior managers. The importance of selecting experienced trainers was also outlined.

As a consequence of the results of the analysis of the needs, it was decided that the generic module of TRASNUSAFE should start from a universal approach to risk management: safety culture is indeed a general challenge for organisations. However for organizations dealing with nuclear material and radioactive sources, the safety culture training also needs to include sector specific elements, such as an overview of the safety systems generally implemented in the sector, and an overview of the system of radiation protection, including attention for protection principles as optimization and justification, and techniques such as ALARA processes. It was also decided that the generic module should have a short duration (2 days) and use highly interactive methods.

Two reflection groups (RG) were organised within the "European ALARA Network" (EAN) and the "European Training and Education in Radiation Protection Foundation" (EUTERP) networks.

The EAN RG, mainly focused its discussions on the optimisation (ALARA) principle and how to improve the ALARA culture of 'safety managers'. To address this issue, the RG examined the target audience who need to improve its competences (knowledge, skills and attitudes) regarding ALARA aspects. It was pointed out that the wording 'safety manager' is not always relevant to designate the potential trainees, especially in the medical and non-electro-nuclear industrial sectors.
The application of radiation protection principles is not developed at the same level in the nuclear and the non-nuclear sectors. Most of the time, in non-nuclear industries and in the medical sector, a greater attention is given to the 'limitation of exposures' principle, the justification and optimisation (i.e. ALARA) principles being less known and applied. As a result, 'Radiation protection' is improperly perceived and reduced in these sectors to the 'prevention of radiological accidents' and the 'limitation of exposures'. In the nuclear sector, the ALARA principles are often better known thanks to initial and continuous training and dedicated organisation (e.g. ALARA committees).

The EAN RG also proposed the minimum content regarding ALARA issues that would be important to add in the generic and specific modules of the TRASNUSAFE training course. In addition to the theoretical aspects, some practical examples of ALARA implementation as well as lessons learned from past radiological incidents/accidents in different sectors ('real case studies'), would be essential. In the generic module, the RG listed the basic elements of the radiological protection system that have to be known by safety managers, and how to knowingly exercise their responsibility for the optimisation of radiation protection in their day-to-day work.
The RG proposed a set of case studies that should be further developed, as training material. For the specific training modules, the case studies will be selected according to the domains of activity of the trainees.

The EUTERP RG mainly focused its discussions on the justification principle and the needs for a trans-disciplinary knowledge base for nuclear safety and radiological protection. The RG agreed that there is a need for safety managers, from both the medical and nuclear energy contexts, to improve their competence base with considerations on the broader societal aspects related to the justification of activities involving exposure to ionising radiation. In particular, there is a need for them to develop insight in:

- the functioning of the concept of risk and the meaning of risk justification in society;
- the interaction between science and policy;
- the meaning of 'ethics' in radiological risk governance and the relation of ethics with regulation;
- the meaning of 'participation' of civil society and the general public in R&D and decision-making.

The EUTERP RG agreed that Education & Training programmes for safety managers in the medical and nuclear energy fields should dwell on a common basis dealing with more theoretical reflections and comparative analyses related to the four above presented elements (risk in society, science/policy, ethics/regulation and participation).

TWO TRAINING SCHEMES, FIVE TRAINING MODULES

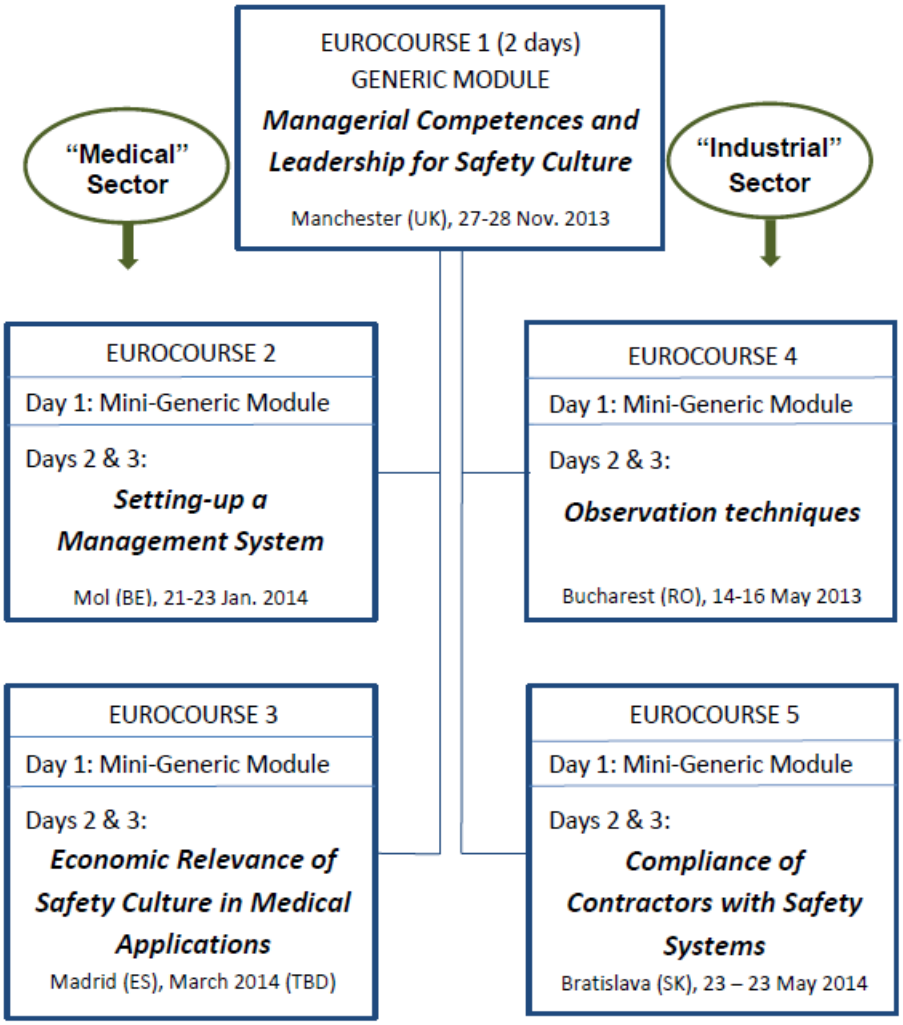

Fig. 2 TRASNUSAFE: the two training schemes ("industrial" and "medical"), and the five training modules

Based on the outcomes of the analysis of the needs, the two training schemes with a common generic module were designed (Fig. 2). The Generic Module is central in the proposed training process. Indeed, it intends to provide managers with the appropriate fundamentals in view of improving the safety culture in their organisations and developing excellence in

human performance to proactively prevent events triggered by human error. Entitled "**Managerial Competences and Leadership for Safety Culture**", the three main learning outcomes of the Generic Module are:

- Knowledge and understanding of essential responsibilities, accountability and the role of management in building, promoting and encouraging safety culture;
- General knowledge of the context of organisational systems for Radiation Protection, Safety and Safety Culture;
- Knowledge and understanding of commercial and safety benefits of a strong safety culture.

As everybody knows, top managers are very busy people who do not have much time to spend in training. Attending more than one training session in a few months could appear unfeasible for some of them, who would like to send their line managers to some of the other parts of the training. Nevertheless, the fundamentals taught in the Generic Module are considered as a prerequisite for all other training modules. Therefore it was decided to duplicate the Generic Module in a compressed one-day version at the beginning of each of the training modules specific for the "medical" or the "industrial" sectors.

Let us briefly review the learning outcome of the four specific modules. They involve the same outcomes as those of the Generic Module, plus the following ones.

The primary intent of the module entitled "**Setting-up a Management System**" is to make managers of radiation user facilities familiar with the concept and implementation of an integrated management system linked to their management responsibilities. The main learning outcomes are:

- Knowledge and understanding of the concept and implementation of an integrated management system, with special focus on resource management and process implementation;
- Knowledge and understanding of measurement, assessment and improvement of the management system.

The module entitled "**Economic Relevance of Safety Culture in Medical Applications**" is intended to make senior and safety managers of radiation user facilities aware of the economic impact of lack of safety culture, and thus the need to follow the road to accident prevention. The main specific learning outcomes are:

- Understanding the economic impact of accidents and unplanned losses; developing or enhancing the current safety culture as a necessary task if an organisation wants the stay in business;
- Understanding the importance of management's attitude towards workers for safety.

"**Observation Techniques**" is a module aimed to make managers of industrial facilities familiar with the management tools that can be used to identify latent weaknesses in the organisation. These are mainly undetected deficiencies in organisational processes or values that create workplace conditions that provoke errors (error precursors) or degrade the integrity of defences (flawed defences). The specific learning outcomes are:

- Knowledge and understanding of the barriers and defences, as ways and measures to prevent undesired events and their precursors;
- Ability to identify effective questioning techniques to use when conducting observations;
- Ability to recognise good practices and areas for improvement;
- Ability to explain reasons for performance gaps and possible countermeasures;
- Knowledge and understanding of techniques providing feedbacks and coaching, as well as reporting requirements.

Finally, the module entitled "**Compliance of Contractors with Safety Systems**" is designed to make managers of both contracting companies and contractors aware of impacts of their activities to nuclear safety of facilities in built, operation or decommissioning. Its outcomes will focus on

- Knowledge about management system and understanding of possible impact of decisions on nuclear safety.

All modules will be facilitated in a **highly interactive manner**, including dynamic exercises as icebreakers and also hands-on activities of the learning by doing type. Therefore the numbers of trainees will be limited (typically twenty per module), while the teams of trainers will be composed of at least two Facilitators, several Lecturers, and an External Coach/ Mentor. The figure of the **External Coach / mentor** provides first-hand experience to the participants. He or she is in charge of accompanying the trainees in their personal application of the concepts developed during the training, providing guidance, support and experience, instilling an optimistic approach and telling the participants positive stories about organisations in which a good actuation in terms of safety culture has produced good economic results and better work environment. A **Coordinator – facilitator** is the head of the training team, and stays during the whole duration of the module; he/she is assisted by one (or two) additional **facilitators** during the whole duration of the module; it is considered that the importance of the interactions with the trainees requires at least two "facilitators"; a few **lecturers** are invited to join the team for some specific parts of the sessions, for example, in the Generic Module, the part on radiological protection and/or the part on risk justification.

Pre-course activities will be suggested, in the form of pre-course readings that all participants will receive before the session (IAEA documents, reference documents).

All modules will include a solving problem session where the participants will be requested to identify at least one non-technical leadership and safety related challenge that is adversely affecting the performance of their group. A short description of this challenge, written in a pre-established form, should be given at the beginning of the training to the mentor for possible selection.

A Certificate of Attendance will be provided to all trainees at the end of the session, and for those requiring a Certification of Successful Completion of the Training, a quick assessment of the acquired knowledge will be proposed.

CONCLUSIONS

Based on an extensive analysis of the training needs in the European Union for managers of the various types of nuclear installations, followed by a collaborative design study performed by experts from universities, research centres, regulators and industrial companies, the TRASNUSAFE project has reached the point where five training modules grouped in two training schemes are ready for validation through a prototype exercise. This exercise consists in five EUROCOURSES planned for the period between November 2013 and May 2014, as detailed in Fig. 2, and advertised at www.trasnusafe.eu. Each of these training courses will be assessed by the participants, providing the organisers with some useful information for further improvement. In the last step of the project, ending end of October 2014, the internal assessments made by the training teams, and the external assessments provided by the trainees will be analysed and improvements will be implemented in the design of the five training modules in order to make the whole validated package ready for future use.

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