

Training and Tutoring for experts of Nuclear Regulatory Authorities and their TSOs for developing or strengthening their regulatory and technical capabilities

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Abstract - Capacity building for staff of nuclear regulators represents a key achievement to set up an effective nuclear infrastructure in countries operating or developing a nuclear program.

Nuclear Regulatory Authorities (NRA) and their Technical Support Organization (TSO) need to develop a wide range of professional capacities including: legal-regulatory framework; roles & responsibilities; safety objectives and requirements; licensing process; technological aspects of nuclear facilities; analytical tools for independent assessment, regulatory inspection; physical protection; emergency preparedness; public communication.

Training and tutoring (T&T) on these topics need to be specifically planned and implemented by professionals having senior experience as regulators and TSO. The training activity shall be carried out with the view and perspective of the regulatory role. The tutoring needs to be carried out at NRA or TSO headquarter with progressive involvement in concrete activity to effectively transfer approach and working methods.

These basic elements have been adopted and implemented while carrying out the activities of the ‘*INSC Project MC.03/10: Training and Tutoring for experts of the NRAs and their TSOs for developing or strengthening their regulatory and technical capabilities - Lot 1*’ financed by the European Commission.

Thirteen training courses on nuclear and radiation safety topics have been implemented since 2012, most of them specifically developed as “dedicated” courses, with participation of 141 trainees from NRA/TSO of 15 partner countries (PC’s) outside the EU.

Eight tutoring courses for a total of 34 man-months duration have been carried out at NRAs/ TSOs headquarters in EU (Italy, Slovenia, Belgium, Finland, Bulgaria) for staff (19) coming from NRA of Ukraine, Brazil, Vietnam, Mexico, Armenia, Belarus, Jordan, Indonesia, Philippines, Malaysia and Iraq. About 94 Consultant’s senior experts have contributed as trainers and tutors.

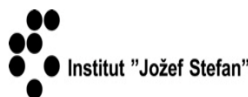
Factors ensuring effectiveness have been the constant relation with the PC’s to identify needs, collect requests, propose T&T modules, select trainees and the extensive experience of the project team composed of a significant number of EU NRA-TSO organizations with 4 Nuclear Regulators.

The feedback from performed activity has confirmed the validity of adopted approach regarding both a) organization/content of T&T activity, b) conduct of T&T activity.

Introduction - The European Commission (EC) has promoted in the frame of the INSC program training and tutoring activity for staff of nuclear regulatory authorities and their TSOs for developing or strengthening their regulatory and technical capabilities. The beneficiary are “Partner Countries” outside the EU who have agreed to cooperate.



The consortium made of **ITER-Consult** “Independent Technical Evaluation and Review” of Italy; **BNRA** - Bulgarian Nuclear Regulatory Agency; **ISPRA** – Italian Nuclear Regulatory Authority; **JSI** - Jožef Stefan Institute of Slovenia; **NRG** - Nuclear Research & Consultancy Group of The Netherlands; **SCK·CEN** – Studiecentrumvoor Kernenergie of Belgium; **SNSA** – Slovenian Nuclear Safety Administration; **STUK** - Nuclear Regulatory Authority of Finland constitutes the **Project Team** - led by ITER-Consult - in charge to implement the LOT1 of the first Phase (36 months from December 2011 to December 2014).



Project wider objective - The main objective of the EC project is the enhancement of capacities of Nuclear Regulatory Authorities (NRA) of the Partner Countries, including their Technical Support Organizations (TSO), in order to allow the NRAs to become reasonably self-sufficient in terms of management and technical capacity.

Specific objectives - The specific objectives consist in enhancing the capability of NRA's staff, and of their supporting TSOs, to conduct independent in depth assessment and review of safety cases, to conduct inspections, to issue regulations and guides and to manage the authorization process and related decision making.

These specific objectives are ensured by the programming and implementation of training and tutoring (T&T) activities based on the needs of the partner countries.

Expected results:

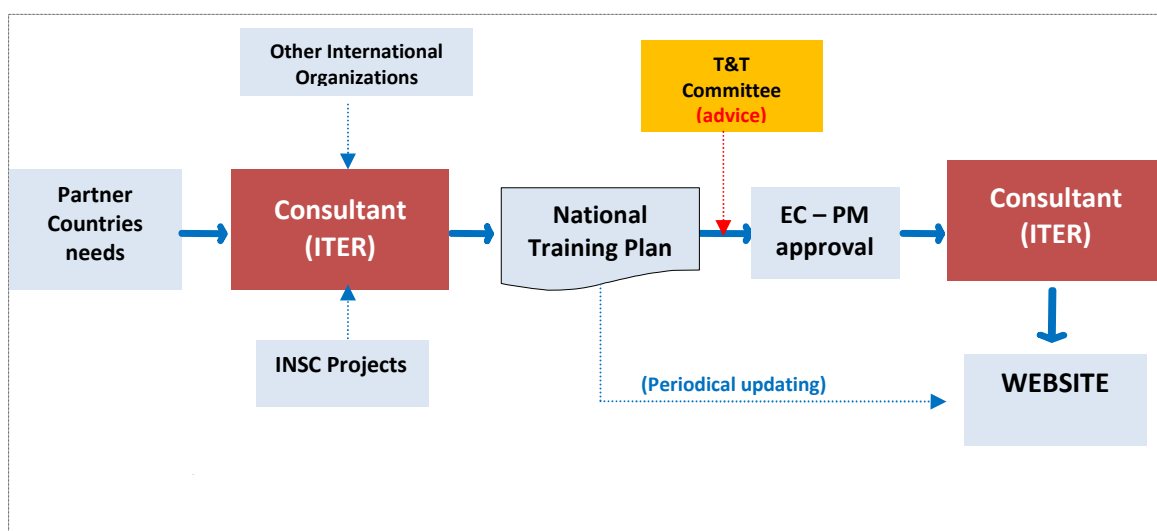
- Training & Tutoring of staff of Nuclear Regulatory Authorities including their TSO;
- Developing a toolkit of training modules on the aspects of Nuclear and Radiation Safety;
- Promoting cooperation of Nuclear Regulatory Authorities between the EU and partner countries by exchange of experience;

Project Management - The management of the project has covered two areas:

- the external relations with the EC Project Manager and the partner countries through the beneficiary organizations to develop the National Training Plan, propose T&T courses and select trainees,
- the internal activity in dealing with the project team members to coordinate the project tasks and their interfaces; to design T&T modules, to define programs, select trainers, manage the interfaces with the T&T committee for approval of T&T programs, plan and schedule for implementation of the T&T activity; to monitor the progress of activity and the assessment of the results.

Moreover the project management has been responsible to: prepare and issue reports, monitor the quality of task output, ensure the interface with the T&T Committee, ensure the administrative management of the project, provide support for travel, visa arrangement and logistic of the trainees from the Partner Countries.

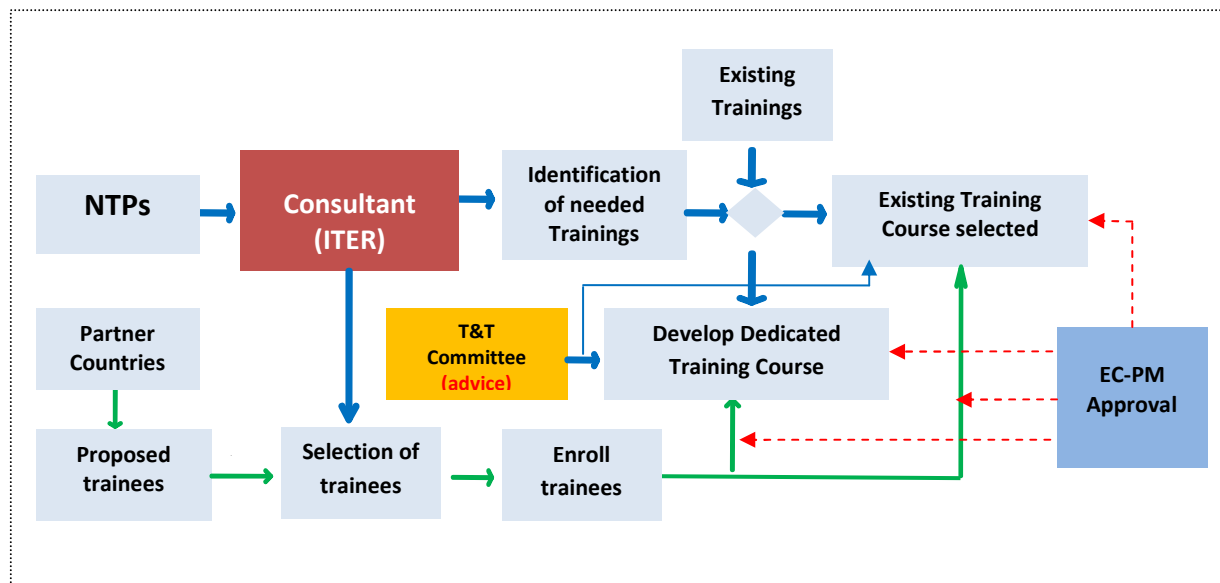
Elaboration of National Training Plan



Project Implementation – The project activity started soon after the Inception Meeting by developing the National Training Plans of the Partner Countries and continued with the development of detailed training/tutoring programs, their organization, implementation and evaluation.

Regarding the training activity the process to define, organize and implement the training activity has been carried out considering the objective to provide the maximum benefit and transfer of knowledge to the trainees (mainly coming from NRA). In this process of particular relevance the role of the internal T&T Committee, made of high level representatives with long lasting experience as regulators, established by the Consultant to provide an internal independent review of T&T programs and contents and advice on the major activities and results during the project implementation.

Selecting courses and trainees



The following topics have been covered in the training activity: legal and regulatory framework, basic safety standards, licensing process, role and function of the NRA, regulatory review and evaluation, use of external support, management of regulatory licensing review, licensing interface with the applicant/licensee, site analysis and safety requirements for NPP, SAR content and requirements, safety objectives and safety requirements for design and operation of a NPP, PSA requirements and regulatory review (PSA methods, tools, initiators, safety functions, safety and non-safety systems, event tree development, fault tree, event tree quantification, data bases, consideration and modeling of common cause failures, human reliability modeling, use for design improvement and decision making), radiation protection requirements, emergency preparedness and role of the nuclear regulator, regulatory review of SAR (postulated initiating events external and internal, classification of SSC, safety functions, implementation of defense in depth, nuclear design, civil structures, safety systems and related requirements, containment structure and function, emergency power system, reactor protection system, I&C, layout of SSC, area events, accident analysis, normal and emergency procedures, RW management , ...), regulatory inspections during construction, commissioning and operation, regulatory inspection for safety systems, management of RW (classification, treatment, conditioning, storage, disposal), decommissioning of a NF (decommissioning plan, decommissioning SAR, step by step process, clearance of buildings and materials), role of NRA in public information and

communication. The list, programs and results of implemented T&T module are available at the websites: <http://nuclear.jrc.ec.europa.eu>; <http://www.iter-consult.eu>

The program for each **training module** developed by the Consultant and reviewed by the T&T Committee was systematically addressing the following aspects associated to the course topic:

- Current state of the art for technological aspects,
- Safety objectives, principles and requirements to be achieved and implemented,
- Content of safety analysis and safety justification to be submitted for licensing approval,
- Approach for regulatory review and interface with the licensee,
- Regulatory inspection approach and content,
- Presentation and discussion of relevant examples from regulatory experience in EU,
- Reference standards and guidelines for regulatory review,
- IAEA applicable standards and other EU and international references,
- Lessons learned from national and international experience,
- Practical applications to be conducted by the trainees in separated groups with final discussion,
- Conclusive summaries, questionnaires and discussions with trainees to check the achieved results.

The program for each **tutoring module** (2 months) developed by the Consultant and reviewed by the T&T Committee was systematically addressing the following aspects associated to the tutoring topic:

- Optimum of transfer of know-how to develop capability complementing the acquisition gained in the previous training course on the same theme,
- Involvement in concrete regulatory activity,
- Familiarization with analytical tools available at NRA/TSO for independent assessment,
- Participation in meetings between NRA and the operators to get familiar with the different roles and way of communication,
- Visits to sites (NPPs and other nuclear facilities),
- Participation in onsite regulatory inspections,
- Familiarization with regulatory technical guides and their application,
- Involvement in definition and management of regulator's plans to conduct regulatory review.

Thirteen training courses have been implemented since the beginning for an overall duration of **13 weeks**. Ten of them developed as "dedicated" and three adopted as "existing".

The training courses included the first "**regional course**" of the EC Project, organized in cooperation with ANNuR (Arab Network of Nuclear Regulators) and carried out in Hammamet (Tunisia) in April 2013 with the participation of 26 trainees.

A total number of **133 trainees** have been involved in the training activity coming from NRA/TSO of the partner countries (some of them have been involved in more than 1 training course so the total of individual participation in training activity is 141).

In the regional course in Hammamet "non-partner countries" members of ANNuR network were included: Libya (3 trainees), Mauritania (3 trainees), Sudan (4 trainees), Tunisia (3 trainees), Yemen (4 trainees).

Eight tutoring courses have been carried out at NRAs/ TSOs headquarters in EU (ISPRA/ITER, SNSA/JSI, STUK, SCK-CEN, and BNRA) for an overall duration of 16 months. Normally two selected staff from the PCs participated in each tutoring course for a total of **19 persons** coming from NRA of Ukraine, Brazil, Vietnam, Mexico, Armenia, Belarus, Jordan, Indonesia, Philippines, Malaysia and Iraq.

A **total of 34 man-months** of tutoring activity have been implemented up to now.

The following **Partner Countries** are benefitting of the T&T activity: Armenia, Belarus, Brazil, Egypt, Indonesia, Iraq, Jordan, Malaysia, Mexico, Morocco, Nigeria, Philippines, Tajikistan, Ukraine, and Vietnam.

From the Consultant side **about 94 senior experts** belonging to the organization of our project team (NRAs, TSOs and research institutes) have contributed to the activity performed.

Achieving Effectiveness - The constant relation of the Consultant with the PC's to identify the needs, to collect their requests, to provide prompt communication about the planned T&T courses and contents, to select the trainees and consider their needs has shown to be a key aspect for the successful implementation of the project.

The second important factor of successful results is the extensive experience of our project team having the possibility to rely on a significant number of NRA-TSO organizations and in particular on 4 Regulators contributing not only to the training, but primarily to the tutoring activity having the unique know-how and responsibility on regulatory licensing and inspections.

The feedback from the assessment of courses results, final questionnaire, remarks and opinions collected from the trainees has confirmed that:

A) Regarding organization and implementation:

- T&T courses for staff of NRA need to be developed mainly in a dedicated approach: it is hard to find trainings on the market meeting the specific needs of NRA and TSO,
- The training activity needs to be conducted by senior lecturers with long experience in NRA and TSO activity in particular for lectures on regulatory licensing and inspection activity,
- The internal T&T Committee advising on the programs of the proposed T&T modules has a key role in ensuring effective approaches and contents,
- The T&T activity needs to maintain continuous focus on the role and responsibilities of the NRA paying attention to the organization, technical review and internal process of NRA,
- Sufficient human resources (and facilities) as Regulators and TSO to face the T&T needs and offer the best contents and services is essential,
- Complementing, whenever possible, training with tutoring ensures best results for transfer of knowledge and developing competence.

B) Regarding the conduct of training, the importance of:

- Setting clearly goal and objective for T&T,
- Ensuring sufficient background and basic competence of the trainees,
- Adopting methods of delivery combining effectively content and process,
- Promoting continuous interaction with the trainees,
- Taking into consideration the different country situation, trainees background and professional experience,
- Presenting and analyzing case studies,

- Promoting discussion and multilateral communication,
- Providing the trainees the possibility to present shortly their country situation,
- Creating a positive atmosphere in which also the trainees take the responsibility for the training outcomes,
- Creation of working sub-groups for practical application,
- Providing the trainees with the course training material in a paper folder since the start to facilitate their attendance and understanding.
- Performing the final evaluation at the end of the T&T courses,
- Feeding back the identified improvements,
- Complementing training with site visits,
- Considering the trainees opinion on the training implementation in constructive manner.

The technical final questionnaires (40 - 60 questions submitted to the trainees at the end of each course) have provided indication of correct answers ranging as average between 70 and 89 per cent with constant increase in effectiveness.

The EU visibility has been constantly ensured in all performed T&T activity promoting and disseminating the EU legal framework for nuclear and radiation safety and presenting and discussing the EU safety objectives, requirements approaches and practices for regulatory and technical support functions. Feedback from the beneficiaries shows that the provided T&T activity has fulfilled their needs to fill in the gaps of their competence and capacity. Nevertheless the completion of the process to develop the needed competences requires continuous and sustainable effort.

Acknowledgements - ITER management expresses sincere acknowledgments to the project team partners (NRAs and TSOs) and to their experts for the excellent competence, availability and dedication. Thanks also to the Partner Countries for their effective cooperation and to the trainees for their involvement and responsible attitude to the training implementation. All that has allowed us to achieve the shown results.

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