



IAEA Education & Training Programme in Nuclear Safety

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ABSTRACT

This paper presents the IAEA education and training (E&T) programme in nuclear safety. A strategic planning for the programme implementation is described in terms of objectives, outputs and activities. A framework based on areas of competency and the level of depth of the training is presented as well as the main achievements to date.

1 BACKGROUND

In March 2001, the Secretariat convened an Advisory Group on education and training in nuclear safety [1]. The Advisory Group considered the question of the structure, scope and means of implementation of an IAEA Programme of Education and Training in Nuclear Safety.

The Advisory Group recognized that there is a need for long term, sustainable programmes of education and training in nuclear safety in Member States and that a gap exists between the nuclear safety knowledge required in Member States and the ability of the Agency to provide training. It concluded that, as a complement to training courses, the Agency should concentrate on helping Member States to establish sustainable national education and training programmes that are consistent with international safety standards.

The Advisory Group encouraged the Secretariat to provide, on request, advice to Member States wishing to evaluate their national training needs and to organize and assist with the required training. Also, it suggested that the Secretariat consider establishing an advisory service as a means of providing advice in a comprehensive and consistent manner.

2 STRATEGIC PLANNING

The education and training policy in nuclear safety is described in terms of objectives, outputs and activities, as follows:

OBJECTIVES

1. A “Sustainable Education and Training System” should be in place in Member States to develop and maintain competence in nuclear safety, consistent with IAEA safety standards and best practices.

2. An “Education and Training Support Programme” should be further developed by the IAEA in co-operation with Member States, and as appropriate, other international

organizations, to extend and augment the existing IAEA training programme and support the above objective.

OUTPUTS

1. A Training Support Programme in nuclear safety, including a standardized and harmonized approach for training developed by the IAEA and in use by Member States.
2. National and regional training centres, established to support sustainable national nuclear safety infrastructures.
3. Training material for use by lecturers and students developed by the IAEA in English and translated to other languages.
4. Establishment of a network on E&T to share Member States experience and training material.

ACTIVITIES

A part from the regular training activities and following the established strategy, the following activities should be emphasized:

1. Assist Member States in identifying their needs in education and training;
2. Develop standards and other safety related documents on education and training;
3. Develop standardized training material;
4. Support the establishment or further development of national training centres for the provision of regional/national education and training programmes;
5. Develop exemplary train the trainers programmes;
6. Exchange information through meetings to harmonize and facilitate co-operation;
7. Conduct follow-up missions to review regional/national programmes, courses, use of standardized material, to assure adherence to the IAEA Safety Standards;
8. Develop and support the use of distance learning training programmes.

3 FRAMEWORK

The framework to implement the education and training programme in nuclear safety is shown in Figure 1. The axes of the figure show the areas of competency on which training is to be focused (horizontal) and the level of detail to be pursued by the training (vertical). Also indicated on the horizontal axis are the target groups to which training in a particular area should be primarily directed.

The areas of competency (at the specialized knowledge level) are identified according to the structure of the IAEA Safety Standards to emphasize the fact that all the training provided by the IAEA is based on its own standards and recognized international practices. The same approach is to be adopted by Member States providing nuclear safety training.

At the level of basic knowledge, training is intended to provide a broad overview of nuclear safety concepts and their application to NPP and RR design and operation. Its nature and scope are primarily oriented to junior professionals recently involved in nuclear safety related activities. It is also appropriate for some highly specialized professionals who lack a broader view of nuclear safety. The Basic Professional Training Course (BPTC) is the main course to be offered at this level. This course is unique and fulfils a recognized gap in the education and training of nuclear safety worldwide. Versions for different reactor types and translation to different languages are envisaged.

Recent experience indicates the need to provide some academic education in fundamentals of nuclear engineering, including basic topics such as reactor physics, thermal hydraulics, instrumentation and control, materials, reactor technology, etc.

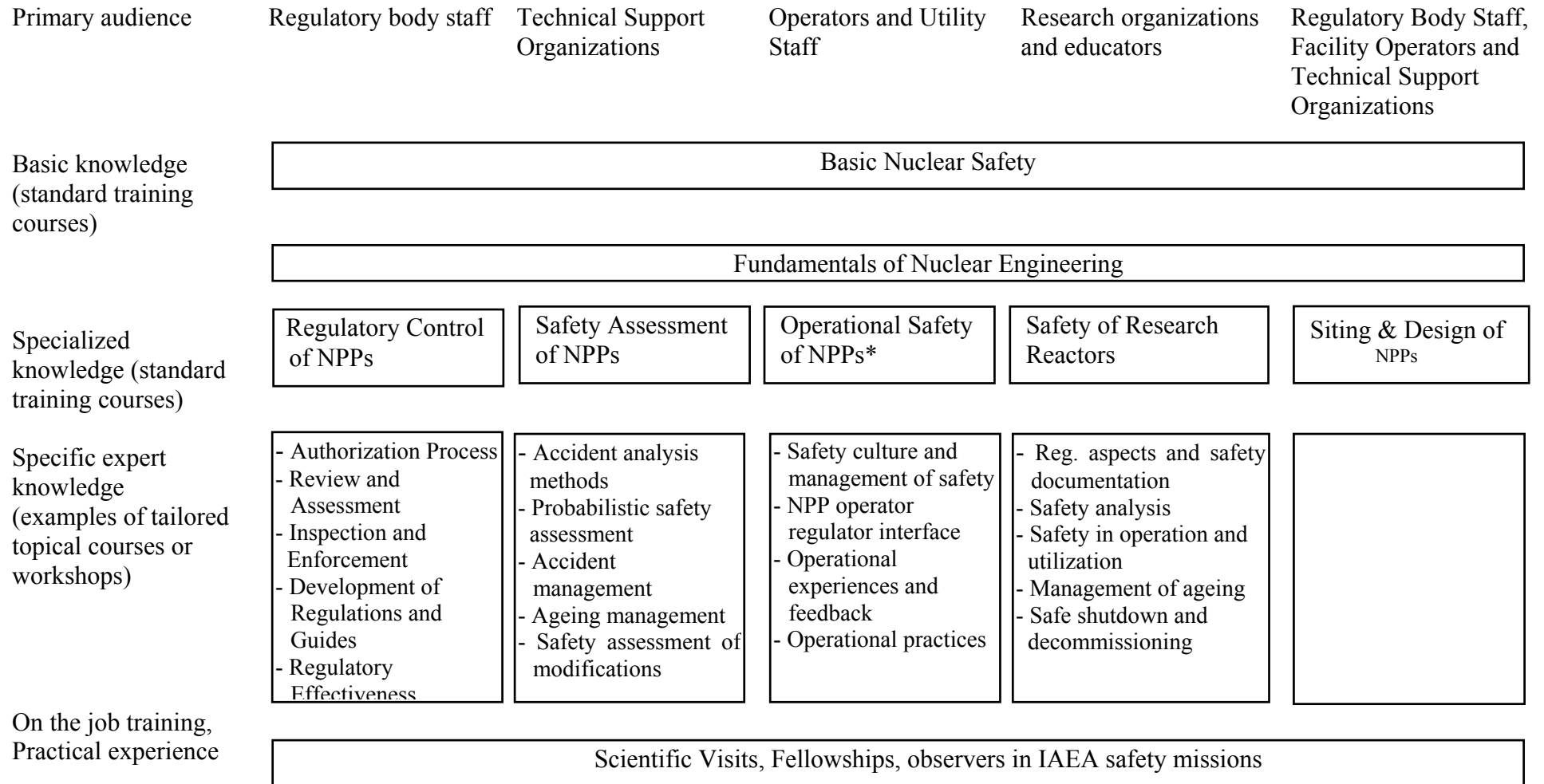


Figure 1: Framework for Education and training in Nuclear Safety

This training is essential to those engaged in the nuclear safety field and is increasingly difficult to obtain due to the phasing out of nuclear engineering programmes in many universities worldwide. The use of distance learning tools for self-study is attractive and work is underway.

At the level of specialized knowledge, standard training courses are offered in all areas of competency. Target groups are technical staff of the regulatory bodies, technical support organizations, NPP operators, RR operators and users, scientific personnel from research institutes, and educators. Textbooks for some of these courses have been drafted others need to be developed.

At a more specific expert level, workshops are generally preferred as they provide more appropriate conditions for an effective exchange of information and experience among practitioners. Some topical courses and workshops at this level are also indicated in Fig. 1.

The framework for education and training is complemented by opportunities for practical on-the-job training awarded as Scientific Visits and Fellowships by the IAEA on a case-by-case basis. This form of training, normally away from the home country, depends on acceptance by the host country and is considered in cases where the other training opportunities have been exhausted.

A complementary and highly effective form of delivering training and exchange of experience among practitioners is that of offering workshops in the frame of the IAEA safety services. This approach has been particularly used in connection to operational safety services in the areas of safety management and safety culture. Training delivered in this is of immediate use in activities related to self-assessment. Training courses for operational safety are an integral part of the operational safety services and associated seminars and workshops.

4 ACHIEVEMENTS TO DATE

Identification of Member States Needs

The Agency now offers a review and advisory service on education and training for nuclear safety [2]. At the request of a Member State, this service will provide an evaluation of the State's education and training programmes relevant to safety and advice on strengthening them. The first such missions were conducted during 2002 to Indonesia, Malaysia, Thailand and Viet Nam.

Training the Trainers

A train-the-trainers course was organized at the Argonne National Laboratory. The four weeks course covered most of the topics important to the safety of nuclear power plants and research reactors. A follow-up activity to assess the utilization of the material in a national level is to be conducted in 2003.

Preparation of Standard Training Material

Standard training material consisting of guidelines and commented viewgraphs were prepared for several areas of competency. Moreover textbooks and workbooks were published for the BPTC and Regulatory Control of Nuclear Power Plants. Table 1 present a list of materials available and their status of development.

Distance Learning Material

With the increased availability of personal computers, many workers have access to a computer in the workplace and this has stimulated the development of computer based

training packages. At present training packages were created as hypertext modules and as multi-media material with video and Powerpoint presentations synchronized. Table 2 presents a list of the materials already available

Asian Nuclear Safety Network (ANSN)

The ANSN is intended to share existing training material and other technical knowledge and practical experience among the countries participating at the Extrabudgetary Programme (EBP) on the Safety of Nuclear Installations in the South East Asia, Pacific and Far East Countries [3]. In the pilot phase the ANSN will concentrate on education and training and the main providers of training material will be the network hubs: Agency, China, Germany, Japan, Korea and USA. Another element of ANSN is the topical groups intended to stimulate discussions among specialists on topics of common interest. At present the operability of the system is being tested and training material is being prepared and uploaded by the hubs. The first topical group on accident analysis for research reactors was created and a moderator appointed to lead the discussions and promote joint activities. After the test phase and depending on the results obtained, it is envisaged to extend the ANSN model to other regions.

Apart from the above activities, the Division of Nuclear Installation Safety continues to conduct a large number of training courses and workshops (more than 80 in 2002) in the five areas of the Nuclear Safety Standards. The main goal of these courses and workshops is to enhance the knowledge and use of the Nuclear Safety Standards by Member States. It is worth mentioning here two of these courses due to its increasing importance to Member States. The first one is the BPTC held in Saclay France. This 6 weeks course is oriented to young professionals and is designed to provide a basic understanding of the broad range of topics that make up the body of fundamental background knowledge in nuclear safety. The second one is the Regulatory Control of Nuclear Power Plants held in Karlsruhe, Germany. This 2 weeks course is oriented to new staff of regulatory bodies and it presents the general practices recommended by the IAEA in its safety guidance as well as country specific examples.

REFERENCES

- [1] ADVISORY GROUP MEETING ON EDUCATION AND TRAINING IN NUCLEAR SAFETY, 27-29 March 2001, Vienna, Austria
- [2] GUIDELINES FOR THE IAEA NUCLEAR SAFETY EDUCATION AND TRAINING REVIEW SERVICE, March 2003, Revision 1
- [3] NUCLEAR SAFETY NETWORK IN ASIA, April 2002, ANSN-01

Table 1: Standard Training Material

Title	Level *	Status	Media	Year
Basic Professional Training Course, Vol. 1, Vol. 2 and Workbook	B	Final	Textbook	2003
Regulatory Control of NPPs	S	Final	Textbook	2003
PSA level 1 and Applications	E	Final	CD, ANSN	2003
Level 2 PSA	E	Draft	CD	2002
Regulatory Aspects and Safety Documentation for Research Reactors	S	Final	CD, ANSN	2003
Research Reactor Ageing and Self-Assessment Methodology	E	Final	CD, ANSN	2003
Emergency Preparedness and Response for Research Reactors	E	Final	CD, ANSN	2002
Safety Assessment of NPPs to Assist Decision Making	S	Final	CD	2003
Management of Operational Safety of NPPs	E	Final	CD, ANSN	2001
Safety Analysis and Computer Code Utilization	E	Draft	CD	2001
Safety Analysis Related to Lifetime Extension	E	Draft	CD	2002

* B...basic knowledge; S...specialized knowledge; E...specific expert knowledge

Table 2: Distance Learning Material

Title	Type	Media	Year
Fundamentals of Nuclear Engineering			
Fundamentals of Thermal-hydraulics	Hypertext	CD, Web	2002
Fundamentals of Reactor Physics	Hypertext	CD, Web	2002
Basic Nuclear Safety			
Basic Safety Concepts	Hypertext	CD, Web	2000
Legal and Governmental Infrastructures for Nuclear Safety	Video	CD	2000
Nuclear Power Plants Operation Safety	Hypertext	CD, Web	2003
Basic Nuclear Safety (material from the Basic Professional Training Course)			
Safety Related Characteristics of Reactors: Introduction	Multi-media	CD	2001
Safety Related Characteristics of Reactors: Radioactive Materials Inventory and Fission Product Decay Heat	Multi-media	CD	2001
Safety Related Characteristics of Reactors: Reactivity Control, Safety Systems, Passive Systems	Multi-media	CD	2001
IAEA Safety Fundamentals	Multi-media	CD	2001
Basic Principles for NPPs: INSAG-3, INSAG-12	Multi-media	CD	2001
Defence-in-depth: INSAG-10	Multi-media	CD	2001
Defence-in-depth – Implementation: The Spanish Experience	Multi-media	CD	2001
IAEA Design Safety Standards	Multi-media	CD	2001
IAEA Siting Standards	Multi-media	CD	2001
Siting Evaluation	Multi-media	CD	2001
Basic Concepts of Deterministic Safety Analysis	Multi-media	CD	2001
Deterministic Accident Analysis – Classification of Events	Multi-media	CD	2001
Design Basis Accident Analysis: Methods and Codes – RELAP 5	Multi-media	CD	2001
Methods for Beyond Design Basis Accident Analysis – Part 1	Multi-media	CD	2001
PSA Utilisation: Risk Management	Multi-media	CD	2001
PSA Utilisation: Design, Inspection, Regulatory Applications	Multi-media	CD	2001
Excellence on Operational Safety – The Vision	Multi-media	CD	2001
Challenging Operational Safety – Examples and Consequences	Multi-media	CD	2001
Assessing Operational Safety: Enhancement, Assessment, Effectiveness	Multi-media	CD	2001
Self-Assessing Operational Safety	Multi-media	CD	2001

Configuration Control	Multi-media	CD	2001
Maintenance & Surveillance Programs	Multi-media	CD	2001
IAEA Requirements for Safe Operation of NPPs	Multi-media	CD	2001
Operating Organization	Multi-media	CD	2001
Conduct of Operations	Multi-media	CD	2001
Enforcement of Standards in Daily Operations	Multi-media	CD	2001
Reducing Human Errors	Multi-media	CD	2001
Introduction to Safety Culture – Basic Concepts & Principles	Multi-media	CD	2001
Management of Safety & Safety Culture at NPPs	Multi-media	CD	2001
Structure and Development of Safety Culture	Multi-media	CD	2001
Safety Culture in an Operating Organization	Multi-media	CD	2001
Specialized Knowledge (material on the IAEA Safety Standards)			
Regulatory Control of NPPs	Hypertext	CD	2003
The Safety Standards Programme Overview	Multi-media	CD	2001
Safety Requirements for Design of NPPs	Multi-media	CD	2001
Safety Requirements for Site Evaluation of NPPs – Part 1	Multi-media	CD	2001
Safety Requirements for Site Evaluation of NPPs – Part 2	Multi-media	CD	2001
Legal and Governmental Infrastructure for Nuclear Radiation, Radioactive Waste and Transport Safety Requirements	Multi-media	CD	2001
Requirements for Safe Operation of NPPs with Comparison to OSART Experience	Multi-media	CD	2001
Overview of Safety Guides for Operation of NPPs	Multi-media	CD	2001
Overview of Safety Guides for Design of NPPs	Multi-media	CD	2001
Overview of Safety Guides for Site Evaluation	Multi-media	CD	2001
Overview of Safety Guides for Legal and Governmental Infrastructure	Multi-media	CD	2001
Code of Conduct on the Safety of Research Reactors	Multi-media	CD	2003
Commissioning of NPPs	Multi-media	CD	2003
Evaluation of Seismic Hazards for NPPs	Multi-media	CD	2003
External Events Earthquakes in the Design of NPPs	Multi-media	CD	2003
Design of Fuel Handling and Storage Systems for NPPs	Multi-media	CD	2003