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# ASIAN NUCLEAR SAFETY NETWORK

# Proposal for the Organization and Data Storage of Nuclear Safety Training Materials

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# ORGANIZATION AND DATA STORAGE OF NUCLEAR SAFETY TRAINING MATERIALS

## Background and Introduction

A considerable amount of training and educational materials related to the safety of nuclear facilities have been developed by the IAEA and by member countries. These materials were developed for a number of different audiences with different backgrounds, levels of education and experience. Further, they are available in a variety of formats, usually text and slides, and in different electronic media including videotape and CD-ROM. The goal of this project is to develop a network using the Internet by which existing training materials can be identified and shared among member nations.

In any plan to organize and catalogue a set of international training materials electronically it becomes necessary to identify a number of attributes of each block or unit of materials that will determine its usefulness and effective as a tool for training in a particular set of circumstances.

The local instructor will have many options at his/her disposal regarding the use of these materials. Some materials may consist of a set of overhead slides and accompanying text in a specific language, which may be just right for a knowledgeable instructor to obtain and use in a classroom lecture. In other cases, the instructor may wish to obtain some self-instruction, exploring the topic in greater depth before going forward to present the materials before a group of students.

In some cases, it may be necessary to translate the written materials from a foreign language into the native language of the students. This combined with a native language presentation by the instructor adds great value to the materials. In such a case, the new materials can then be made available to other instructors in the same country who may choose to use these materials also.

In some cases still, if the students are knowledgeable of the foreign language, it may be useful to have a videotaped presentation given by an expert in a foreign language along with a facilitator who can answer questions and provide additional discussion in a native language.

The key idea of this project is to take advantage of work that has already been done by others to improve the quality and lower the costs of providing training and education in the area of nuclear safety.

## Objectives

The intent of this project is to develop a means of identifying all types of existing training materials that are available from the Agency and from member nations that are willing to

share these materials, and then make them easily available to all members who need them.

**Definitions**

A **block** or **unit** of training material is a discreet element in this database. For example, a set of lecture notes or slides may be a single block or unit, as would be a book or booklet, as would be videotape or a CD-Rom containing a single lecture or several lectures. The intent of the programme is that the block or unit will be the smallest element of information stored in the database. When it is stored, its attributes will be stored with it.

A **Module** is a group of similar and related blocks or units of training material. For example, six related lectures on the regulation of research reactors would comprise a Module of training materials. Each lecture in that module would be considered a block or unit, and would be stored and identified separately.

A **Course** is usually a collection of one or more Modules presented over a period of time. Recognize that in addition to traditional courses taught by teachers in a classroom, it is possible to have a complete course made up of material that is presented only on a computer. For example, a person may take a whole course on reactor physics by self-study of materials presented in electronic form on a computer.

An **Attribute** is a characteristic of a block or unit that distinguishes it from other blocks or units.

**Attributes of Education and Training Materials**

The following broad areas seem to apply generally to training materials that have typically been used in IAEA courses. A more detailed description of each attribute will be provided below:

1. **Area of Competency** – Location of a block or unit in a logical taxonomy (i.e. identification by type of material or subject matter)
2. **Technical Area** - technical areas to which specific materials apply
3. **Level of expertise**
   - Suitability of material for various audiences
4. **Prerequisites** - Knowledge or training that a student should have prior to attending any training on this block or unit.
5. **Abstract of Materials -** in text form, concise and accurate
6. **Contact Person** or Author. Someone who knows about this unit.
7. **Format and Medium** – the form of the material
8. **Language** – of written and spoken materials
9. **References** – to other relevant materials, courses
10. **Date**: date the material was created
11. **Comments -** by reviewers and users

12. **Keywords** that are unique to the block or unit and which help to describe the subject matter.

Material with copyrights or which require special permission for its use will not be included in the database.

A detailed description of each area is presented below.

**Specific Attributes**

**1. Area of Competency - Taxonomy for the Content and Subject Matter of Nuclear Safety Training Materials -- Structure of the Knowledge Base**

The materials that are generally taught in IAEA Courses tend to be technical in nature, and assume that the person(s) being taught are professional level people who have either been educated at the college level or have some prior training or experience in the area of nuclear technology. In some cases a degree in engineering is assumed, in other cases it is not.

A taxonomy is proposed for the classification of the training material. The classification considers the general area of competence and the technical area related to the training material.

The areas of competence indicated in Table 1 below are those defined in the IAEA Strategy for Education and Training in Nuclear Safety (AGM, March 2001).

TABLE 1. TAXONOMY FOR THE TRAINING MATERIAL

| Areas of Competence / Technical Areas | Basic Professional Training | Fundamentals of Nuclear Engineering | Regulatory Control of NPPs | Safety Assessment of NPPS | Operational Safety of NPPs | Safety of Research Reactors | Safety of Other Nuclear Installations |
|---|---|---|---|---|---|---|---|
| Neutronics | | | | | | | |
| Reactor statics, Criticality, Kinetics and Control | | | | | | | |
| Thermal-hydraulics | | | | | | | |
| Nuclear materials | | | | | | | |
| Fuel Safety Technology | | | | | | | |
| Instrumentation and Control | | | | | | | |
| Power plant Technology | | | | | | | |
| Research reactors Technology | | | | | | | |
| Radiation and Health Physics | | | | | | | |
| Emergency planning | | | | | | | |
| Safety principles and philosophy | | | | | | | |
| Regulatory aspects | | | | | | | |
| Regulations and Guides | | | | | | | |
| Safety design | | | | | | | |
| Safety documentation | | | | | | | |
| Deterministic accident analysis | | | | | | | |
| Probabilistic accident analysis | | | | | | | |
| Severe Accidents | | | | | | | |
| Safety in operation and utilization | | | | | | | |
| Safety review and assessment | | | | | | | |
| Ageing | | | | | | | |
| Safety Assessment | | | | | | | |
| Safety Culture | | | | | | | |
| Operational Experience | | | | | | | |
| Safe Shutdown | | | | | | | |
| Physical Protection | | | | | | | |
| Safe Maintenance | | | | | | | |
| Siting | | | | | | | |
| Quality Assurance | | | | | | | |
| Training | | | | | | | |
| Criticality Safety | | | | | | | |
| Operational Limits and Conditions | | | | | | | |
| Commissioning | | | | | | | |
| Decommissioning | | | | | | | |

## 2. Technical Area

This attribute identifies the technical subject of the training material. Hence, a search on a particular technical area will produce all of the areas of competence that are available to be taught under that category.

## 3. Level of Expertise

It is important to remember that there are a number of different levels of materials taught in IAEA courses. While some material is intended for the general public, other materials may be intended for experienced Ph.D. level people who are experts in some highly specialized field such as Material Science or Computational Fluid Dynamics.

We recommend the identification of four levels of materials or Audiences:

1. **General Audience** including the General Public: Materials in this category can be suitable for the general public or for Secondary school students. In general no equations would be used.

2. **Non-specialized Professionals**: Materials in this category would be suitable for Professional people who are degreed in non-scientific or engineering disciplines. Introductory scientific concepts such as Force, Mass, Energy, Pressure, Radioactive decay, statistics fundamentals, etc. are acceptable at this level. Simple equations can be used at this level. Safety Concepts, Safety Management, Organization and Administrative issues are appropriate for this level.

3. **Specialized Professionals**: This level assumes college level training or comparable work experience in areas related to the materials being taught. In this case, the material would be college level material in the fields of science or engineering.

4. **Advanced Materials**: This level is for graduate level topics, such as highly specialized topics of Physics, Mathematics, or other branches of Science. It assumes an audience of graduate level professionals who have several years of education or work experience in the specific technical field.

The use of these four categories will enable us to perform a broad screen of the levels of the materials. This will enable us to avoid the need for instructors to look at materials that are not appropriate for certain audiences.

The final decision on the level of the material to be presented always lies with the instructor who is planning for its use.

## 4. Prerequisites

If a particular block or unit of training material would not be effective unless the student had certain other training, that previous training should be noted here. For example, Before receiving a significant amount of training on NPP Safety the student should probably have received a fair amount of the Basic Professional Course or equivalent, and also the Fundamentals of Nuclear Engineering or equivalent.

## 5. Abstract of Educational and Training Materials

In order for materials to be surveyed by prospective users, it is important for the general information about each block of materials to be readily available on the relevant web site and that a brief abstract of the material be presented in a few sentences for the potential user. Here are some items that would be useful to a teacher looking for training materials:

- A descriptive title of the material
- Description of materials presented
- Typical use of materials including time and target audience
- How this material fits in with other materials, e.g. as part of a Course
- Some remarks about the media
- Time needed for successful presentation
- One or two relevant remarks from previous teachers (see attribute No. 17)

Here is an example of a typical Abstract:

Title: **Conduct of Operations**

This is a video of a 50-minute lecture on Conduct of Operations presented by a retired executive from a large U.S. Utility. Mr. Steven Perry was the Site Vice-President of the Dresden NPP, now operated by Exelon during a period of time when the plant was being changed from marginally successful performance to very high performance. He offers valuable insights from an operating manager's perspective.

It was recorded during a three-week Basic Professional Training Course in 2001 and subsequently used as a one-hour segment in an eleven-hour Module on Operational Safety in a four-week "Train-the-Trainer" course conducted at Argonne National Laboratory in June 2002.

The video and the slides are available on a single CD. The free software "Quick-Time" is needed to view the video. A projector driven by a laptop computer was used to present the video and slides on a single large screen.

Teachers have noted that the video is not as effective as the live presentation, but the presence of a live facilitator for questions and answers can offset this somewhat.

**6. Contact Person** or Author. Someone who knows about this unit. Provide a name, title, and at least an email address.

**7. Format and Medium**

The purpose of this attribute is to simply state what form the material is in:

We propose the following list of possible formats and Media. The implication is that that the person recording the information will check all formats that are applicable to the information.

- Book (number of pages)
- Pamphlet (number of pages)
- Paper notes or Slides (number of pages)
- Plastic slides for overhead projector (number of slides)
- Electronic notes: Software: e.g. Microsoft Word 2000
- Electronic slides: Software: e.g. Microsoft PowerPoint 2000
- CD ROM and the Software Required for use: e.g. none, or Quicktime, etc.
- Videocassette: Format: e.g. VHS, PAL, etc.
- Audiocassette
- 35 mm slides
- Other: Please specify: _____
- Special considerations: Please Specify: _____

This information will let the potential instructor know whether the information can be obtained over the Internet, or whether it will have to shipped or sent by mail.

For files over 500 Kb, it would be desirable to specify the size of the file.

If special software is needed it would be desirable to specify this information under "Special Considerations."

In this section it would be extremely valuable to identify the location of the original material. This is especially true for video materials.

**8. Language:**

We will need to specify the language of the written and spoken materials.

In this case, we simply state or check which language the materials are presented in.

**9. References and Hyperlinks to Known Related Materials**

The purpose of this attribute is to identify similar or related materials that may also be useful to other potential users of the block or unit of training materials. These references may be used for example, by the instructor in preparing lecture materials.

References should be presented in plain text.

Hyperlinks would allow the user to click onto or go to an appropriate web site or other document available in from the computer in use.

This information is best supplied by the person supplying the information to the database.

**10. Date Created** Month and year is sufficient

**11. Comments**

This attribute gives instructors who have used the material a chance to comment on its usefulness and/or give tip and advice on how to successfully use the materials in the future. This is an open text format that allows anyone with access to comment on the materials. Perhaps the computer can automatically provide the date and place of the comment. The user can provide a name and email address if desired.

**12. Keywords**

These are words that uniquely identify the subject matter of the particular block or unit of training.

For example, a two-hour lecture that uses a PC-based Simulation of a CANDU reactor might include the keywords: CANDU; Simulator; PC based; Personal computer.

The intention is to make use of Thesaurus.

“A Thesaurus is a terminological control device used in translating from the natural language of documents, indexers or users into a more constrained ‘system language’ (document language, information language).” It is also “a controlled and dynamic vocabulary of semantically and generically related terms which covers a specific domain of knowledge”.

The INIS Thesaurus is one document of the INIS Reference Series. It contains the controlled terminology for indexing all information within the subject scope of INIS (International Nuclear Information System). The terminology is intended for use in subject description for input or retrieval of information in this systems.

## GENERAL QUESTIONS AND ISSUES RELATED TO THE DEVELOPMENT OF A DATABASE

### Material Review and Evaluation

It would be highly desirable to have Material Review and Evaluation function, possibly overseen by an ANSN Steering Committee. The function would provide oversight to the entire ANSN operation.

In the area of Information Collection, Organization and Storage, there almost certainly needs to be some kind of review of the quality, accuracy and timeliness of the training materials. In the initial stages, we will depend upon the information suppliers to provide us with high quality, current information. At later stages we may get input from people seeking information to prepare lectures.

It seems that there should be some kind of systematic review of the materials. This could be time consuming and expensive, and hence is an issue to be considered in the future.

### Oversight and Database Management

A database tends to take on a life of its own, and like a living thing, needs to be nourished and maintained. There will be a certain expense associated with this activity, and it would be good to examine this issue early in the programme and identify ways to keep this tool in good condition for future users.

### Education and Training Programmes at National Centres

Early visits and feedback from countries with emerging programmes suggest that there are many uses that can be made of the information in this database. Every country will use it in a manner that best suites its needs. Some will use it to train new personnel as they enter the nuclear field. Others will use it to help educate the public about the benefits and risks associated with nuclear technology. Others yet will use it to broaden and strengthen their entire network of nuclear facility personnel as they strive to achieve excellence in matters related to nuclear technology and nuclear safety.

The steering committee needs to be aware of these developments and watch how this ANSN is used to achieve the goals of each country. In particular, the committee needs to observe some of the lectures and training sessions to ensure that the materials are of high quality and that good training and education is being conducted.

### Operation and Evolution of the ANSN Design

The materials here can be viewed as representing an initial design of the proposed database. At some point soon, we hope to “freeze” the design and for some period of time begin to build the database. After some reasonable amount of information has been

added to the database, it would be prudent to stop and evaluate the experience, and make improvements to the basic design based on this experience.

This process of stopping, evaluating performance, and modifying the overall design is crucial to developing a useful and efficient tool. Similarly, a broader view of the utility of materials and techniques, the timeliness of information, and changing knowledge needs should encourage us to update and modify the network on a regular basis.