

Building a Strategy for ESARDA - Education, Training and Knowledge Management

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Executive summary:

This document proposes a new strategy for how the ESARDA organization could work with education, training and knowledge management in nuclear safeguards. With this document we want to anchor these ideas within the organization and its management, in order to have a broad support for this initiative. We propose to activate all ESARDA working groups in the process of identifying, selecting and preparing material for module based education and training. ESARDA could then more effectively broaden its education and training activities and strengthen the connections with academia. In this way, we would also create a way to export knowledge on nuclear safeguards to nuclear education programs on the European level.

We propose to create a task force that addresses a set of identified questions; examples are how to implement the new strategy, how to interact with academia and young professionals and how to develop, maintain, and structure the educational modules. By the end of 2015, the finding of the task force should be presented to the ESARDA management in order to be able to make a more informed decision on how to proceed with the new strategy.

Table of content

1. Introduction	3
1.1 Vision: Building a strategy for ESARDA education, training and knowledge management	3
1.2 Objective of this report	3
1.2.1 Task force	4
1.3 Knowledge management.....	4
1.3.1.NuSaSET.....	5
2. Education and training in nuclear safeguards.....	5
2.1 Module based education and training	5
2.2 The role of the WGs.....	7
2.2.1 WG TKM.....	7
2.3 Revision Board.....	8
3. Networks	8
3.1 Young Generation.....	8
3.2 Partners and partner organizations.....	8
4. The connecting hub – the NuSaSET portal	9
5. Summary	10
6. Outlook.....	10
7. Acknowledgement.....	10
8. References	10

1. Introduction

ESARDA is an association of European organisations formed to advance and harmonise research and development in the area of safeguards. It provides a forum for the exchange of information and ideas between nuclear facility operators, safeguards authorities and persons engaged in research and development. ESARDA was formed in 1969 with the purpose of facilitating collaboration in R&D in the field of safeguards and in the application of such R&D to the safeguarding of source and special fissile materials. Activities take place via

- annual meetings and symposia,
- working groups (WGs),
- education,
- the ESARDA Bulletin and website

The ESARDA Training and Knowledge Management Working Group (ESARDA TKM WG) is one of several working groups in the ESARDA organization. The primary objective of this group has been to offer the ESARDA nuclear safeguards and non-proliferation course to students and young professionals at least once per year. However, there has been a wish from ESARDA to spread the knowledge about nuclear safeguards to more students than those of the ESARDA course, e.g. students taking courses in nuclear technology. Furthermore the wish had been also to encourage these individuals as well as young professionals to join and remain in the safeguards field.

1.1 Vision: Building a strategy for ESARDA education, training and knowledge management

This document describes a vision of how the ESARDA organisation could implement knowledge management in a practical way. In addition, we believe that the ESARDA organisation should work actively to increase awareness of nuclear safeguards by making educational and research material available, thereby promoting education and training in nuclear safeguards to a broad audience.

In the consideration of broadening the education and training activities of the ESARDA organization, we propose to map such activities performed by other networks, institutions and organizations to – if possible – benefit from collaborations and coordination of work.

Preliminary ideas how to develop a strategy for ESARDA and ESARDA TKM were published in the ESARDA Bulletin No. 51 [1]. This document deviates from those ideas to some degree, mainly because we now consider to a larger extent what is realistically doable. One of the differences concerns the degree of control that ESARDA has on the education offered by other institutions e.g. via train-the-trainer courses.

1.2 Objective of this report

The objective of this document is to anchor the proposed vision in the ESARDA organization in order to have this initiative approved for further investigations. Specifically, we need a broad support from the ESARDA management to create a task force comprising individuals representing the ESARDA management (Executive Board and Steering Committee) as well as the different WGs. We also believe that the entire WG TKM should be involved in the process. Of course, other alternatives to the creation of this task force could be discussed, such as including one or two members from the Executive Board and/or Steering Committee as well as members of the Editorial Committee and the other working groups into WG TKM. In both cases, a dedicated group of people working with this issue is required.

1.2.1 Task force

The purpose of the task force should be to investigate a number of questions. Some of them have already been identified, while others will most likely be revealed later on in the process.

Already identified tasks which the task force will need to address and answer are:

- Map external educational and training networks for possible future collaboration
- Identify possible ways of implementing the suggested vision, taking available resources into account
- Identify ways to develop, maintain and structure the educational modules and the content of a train-the-trainer course
- List what material that may already be available for inclusion in the modules
- Consider to what extent the available material should be open-source and to what degree, and using what resources, it should be quality controlled.
- Identify ways to interact with universities, university teachers, students and young professionals
- Engage the different WGs in the process
- Identify possible sources for funding for the proposed work
- To develop a time-plan and suggest responsible actors (persons or organizations) for the implementation

Ideally, the task force would work with these issues and come up with a realistic way to move forward with this initiative during 2015. After presenting the results of this work, it would be up to the ESARDA management to make a decision on what parts to implement and how.

We are aware of that ESARDA as an organization has no available funding and that ESARDA members are involved at their own expense. We also know that any suggestions that require the involvement of people are associated with a cost in terms of time and money. A question whether universities have funding for this has come up, but we cannot see that it is possible. Another option is to ask if and to what extent different ESARDA member organizations may contribute. In conclusion, it is crucial for the task force to investigate what sources of funding that may be available to finance the implementation of the proposed changes which are associated with the new strategy.

1.3 Knowledge management

Considering the comprehensive knowledge of ESARDA, we believe that there is plenty of room for improvement on how to benefit from, and make use of, this knowledge. We need to raise awareness of knowledge management (KM) itself, and at the same time discuss how we best deal with it internally, as it constitutes a new challenge for the organization.

KM is a way to handle and align the knowledge inventory of an organization. By doing this, people, work processes and technology interact constructively and the work as well as the decision making is made effectively and in line with the organization's goals. The knowledge itself can be abstract or know-how, stored on a media or applied in practise. The knowledge is associated to the people in the organization, to the programmes or tools that are used by the people and to the organizational culture and the practises within it. Unless the knowledge within the organization is transferred, shared, transformed, adapted, updated and applied it becomes useless, making the organization more vulnerable to external factors.

KM is since long time an important issue in fields of business administration, management and information sciences, but it is becoming more important as part of the business strategy also in several other fields. Within the IAEA, a special subprogram on nuclear knowledge management is in place [2]. It is aimed at helping governments and nuclear organizations to clearly recognize and meet their responsibilities for managing nuclear knowledge, having a focus on developing and implementing methodologies for KM, facilitating information exchange and providing services related to nuclear KM.

We believe that ESARDA has much to learn about KM and that we may benefit from implementing it. We also acknowledge that we do not need to reinvent the wheel, and that there are several actors that may

be very useful to us in this process. In the long run, we believe that ESARDA may be able to become one of those who are able to educate others on how to implement KM in practise.

1.3.1.NuSaSET

ESARDA currently has a portal for advertising activities of nuclear safeguards relevance. We would like to broaden its use because it constitutes an excellent platform for interaction. We envisage that NuSaSET could be the place for interaction between ESARDA WGs, safeguards lecturers, students at universities, professionals as well as researchers in the fields and the new initiative ESARDA Young Generation. We will elaborate further on the possible expansion of NuSaSET in section 4 of this document.

2. Education and training in nuclear safeguards

The education and training activities of ESARDA are currently restricted to organizing and giving the ESARDA course, arranged by JRC Ispra. It is a very popular course, attended by participants with various academic background and experience, and we think that there is both room and interest for an expansion of education and training activities beyond this course. The new education and training activities could be fitted to different target groups and it is not necessarily ESARDA members or JRC Ispra who are expected to do the actual teaching.

2.1 Module based education and training

When the TKM WG was discussed and established in 2003-2004, the purpose of the WG was to develop several safeguards modules that could be made available to and used by universities in a broader context of education of technical and non-technical students. We revisit these ideas and suggest to develop module-based knowledge repositories for research and educational material. The modules should be made available by ESARDA. This strategy serves several purposes:

- To give researchers and individuals involved in education and training in nuclear safeguards an overview of the current state of knowledge.
- To structure the work performed within ESARDA by clarifying what research that is ongoing and by whom. This would in turn improve the possibilities of internal collaboration by stating what the area of expertise is within each WG.
- To categorize and tag (associate with material with descriptive keywords such as e.g. “Non-Destructive Analysis”) research and educational material
- To make nuclear safeguard material available (e.g. slides together with explaining text in order to minimize the risk for misinterpretation of information) for internal as well as for external use. The idea is that anyone may choose material from different modules to create his or her own safeguard course (see Figure 2).

The actual content of each module could be e.g. one or several texts, e-books, case studies, published research papers, further references, video material etc. Seeing that ESARDA would not perform the teaching but only provide material, we have chosen not to include material for e.g. calculating and laboratory exercises. Instead we suggest to let the user of the material determine how it should be used. In a module based training package, a number of modules can be combined to suit different audiences with different needs. The module material should be kept in an electronic format which is easy to update, edit and “keep alive” and the course participants should be given easy access to download the selected modules. We foresee two levels of difficulty: an overview level, and an in-depth level. Furthermore, we suggest a digital tagging system for each piece of material in order to make it easy to search and access. The material should preferably represent the full competence of the WGs, and the material of each module should be available in the NuSaSET portal. A graphical representation of a module can be found in Figure 1.

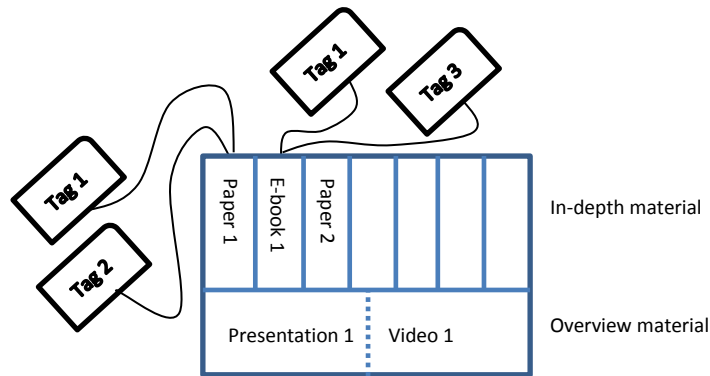


Figure 1. A module is a collection of material on a specific topic. The material is categorized as overview material or in-depth material (represented by the horizontal level in the figure). Each module could contain different material such as videos, books, scientific papers etc. The material is tagged to provide an easy navigation through the material.

Each module is meant to comprise material sufficient to educate participants on a particular subject. The subject matter could be technical or non-technical in its nature, but should be of relevance to nuclear safeguards or a specific ESARDA WG. Modules could for example exist for the following topics: non-destructive assay (NDA), KM in practice, safeguards for geological repositories, the legal framework of nuclear safeguards etc. Modules which are not explicitly part of research on nuclear safeguards and non-proliferation such as nuclear security could be encouraged by the ESARDA management via the Revision Board (see section 2.3). In that case, the topic could become part of an existing WG or constitute a new WG, and the development of the module then becomes the responsibility of that particular WG. It could also be possible to develop modules together with ESARDA partners such as research institutes, universities, educational networks etc. In the more distant future, this could lead to an exchange of modules between several partners.

In the creation of a specific course, e.g. *Non-proliferation and nuclear safeguards for non-technicians*, material could be selected from a number of different modules. Which modules and what level of difficulty depends on the target group for that specific course and it is the person responsible for giving the course who makes the selection.

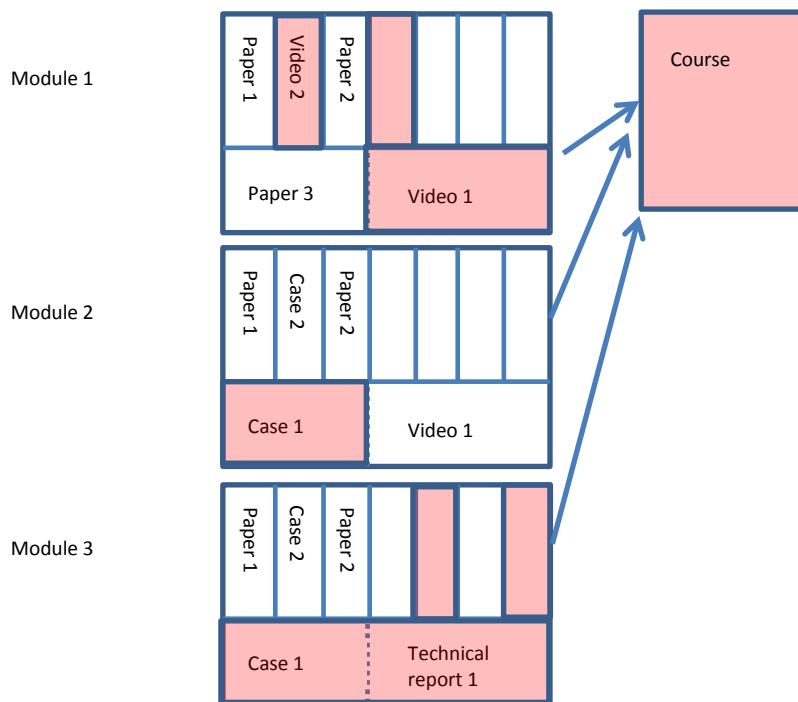


Figure 2. An illustration of how material from different modules is selected for a specific course.

2.2 The role of the WGs

ESARDA is currently divided into several WGs (discipline oriented, facility oriented, ad-hoc, Training and Knowledge Management –TKM, and Editorial Committee). Each WG consists of experts in that particular field, and each WG is in principle independent of other WGs and consequently the communication between the WGs is sparse. The development of the module-based knowledge repository for research and educational material would allow for a larger overlap of activities, since all WGs would need to make their material and expertise available to a broader audience and hence be part of promoting education, training and knowledge management. More specifically, the WGs should, beside their current activities, engage in the following specific tasks:

- 1) ***Identify and update module material*** that is suitable for education and training. The material is created by members or fractions of the WG and can be research papers, reports, videos etc. Each WG shall identify material which they judge is suitable teaching material. The WG categorizes this material into one or several modules and suggests an appropriate tagging for each material. This material should be (continuously) revised by the WG so that it contains also recent research results. We suggest that each WG selects one member who is responsible for the material identified and collected by the WG. This person should in addition participate in the Revision Board for the module-based knowledge repository for research and educational material. In this way, the work of the WGs becomes formalised and become part of the annual assessments of the Executive Board of the WG activities.
- 2) ***Scrutinize the material*** provided by the WGs in order to ensure that it is comprehensive and on the right level. In some cases, WG needs to identify complementing background material, references etc. For each module, a video and/or documentation could be made available, explaining the scope and content of that specific module.
- 3) Actively work to ***attract and keep the involvement of students and (young) professionals*** in ESARDA. In order to be attractive to this target group, the WGs must be able to offer something. We have identified a number of things which the WGs could offer this target group:
 - a. Bachelor and Master thesis projects
 - b. Scientific scrutinizers for projects
 - c. Research material and specialist competence
 - d. Mentors
 - e. Internships
 - f. Job opportunities

The list can be made longer, but what is important is to prioritize this wish-list for students and young professionals and then to identify how we best contribute to that.

2.2.1 WG TKM

Knowledge management within ESARDA is currently done via the annual meetings and symposia, as well as the publishing of the ESARDA Bulletin. We believe that WG TKM, together with the aid from other WGs, also should deal with knowledge management by:

- 1) ***Managing the module material*** that is suitable for education and training as follows:
 - a. Select the format(s) in which the available material should be made available.
 - b. Regularly invite the module responsible persons to a Revision Board meeting. In this forum each module content is presented to
 - i. spread the current status of the research field within the consortium
 - ii. inspire other module responsible persons how to organise their modules
- 2) Offer the ESARDA course at Ispra and/or other places
- 3) ***Identify new research fields*** that should be included in the ESARDA network.

Note that we need to ensure that the knowledge management activities by different actors become constructive and not competitive. We invite representatives of the Editorial Committee to specifically take part in discussions on knowledge management within ESARDA.

2.3 Revision Board

In our current version of this strategy, we propose to create a Revision Board that should make sure that the module material is up to date. However, we are open for other options, proposed by the task force or other actors.

The purpose of the Revision Board is to update the module material that is suitable for education and training during regular meetings. The Revision Board should comprise members of the ESARDA management and each WG. In case there is module material which is not tied to any particular WG, the person responsible for that module should also be in the board.

The Revision Board should meet in connection to the annual meeting and review the material of each module. Depending on the scope and tags of that material, the Revision Board may become aware of material which is beyond the scope of existing WGs. It should then be up for discussion how this knowledge is best managed and if it is motivated to create a new WG.

3. Networks

3.1 Young Generation

The establishment of an ESARDA Young Generation (ESARDA-YG) is an initiative that may tie well into this strategy of promoting education, teaching and knowledge management. It is meant to support and work within ESARDA, and at the same time pay special attentions to its young members. YG will provide a meeting point for students and young professionals involved in different aspects of nuclear safeguards, and the aim is to contribute in the promotion and increase awareness of nuclear safeguards. Via ESARDA-YG, the ESARDA organization will be given access to students and young professionals who are interested in this field. This will hopefully lead to a larger fraction of people who will continue their careers this specific field.

The main objectives of the ESARDA-YG are to:

- Facilitate the attendance to the *ESARDA Symposium*
- Encourage the participation to the *ESARDA Working Groups*
- Plan *technical visits* to nuclear facilities and research centers
- Organize *lectures and workshops* related to nuclear safeguards
- Provide opportunities for *interactions and networking*
- Create an *informal forum* for students and young professionals interested in nuclear safeguards

Like many organizations dealing with nuclear topics, the ESARDA-YG is limited by the low number of young people working with this subject. Therefore, by grouping students and young professionals at European level it is possible to find sufficiently many people to create an active organization.

The ESARDA-YG could offer its members an introduction to the safeguards community. The ESARDA association will benefit from the interactions with motivated students and professionals that bring innovative approaches to tackle current R&D. ESARDA-YG consequently benefits both safeguards newcomers and field experts.

3.2 Partners and partner organizations

There are a number of other organizations which engage in education and training activities related to nuclear power and nuclear education (such as e.g. INSEN, ENEN). The scope of activities within these

organizations is not known to the authors at this moment, but we have identified a need to map them in order not to duplicate work and to possibly initiate collaboration.

In addition, we have also identified a need to map initiatives and organizations that more generally deal with nuclear safeguards. Such organizations are e.g. be the IAEA and Institute for Nuclear Material's Management (INMM), with which ESARDA already now has collaborations, but also possible new partners should be included.

4. The connecting hub – the NuSaSET portal

The **N**uclear **S**afeguards & **S**ecurity **E**ducation and **T**raining portal (www.nusaset.org) is an international initiative of the INMM, ESARDA and the IAEA. The portal provides support to professionals in the field of Nuclear Safeguards and Security, specifically to promote the provision of training and education of students. We would like to expand the use of NuSaSET in several ways since we see it as the natural platform for internal as well as external collaboration.

- 1) Each WG should make their module material that is suitable for education and training available for lecturers and students here.
- 2) It could constitute a forum for discussions and the sharing of experience on how to educate and train people on specific modules. It could also be the place where teachers could upload their own material (e.g. slides and exercises) and keep in touch with other professionals etc.
- 3) University students taking nuclear safeguards courses could sign in on NuSaSET in order to download the course material as well as getting information on thesis subjects and PhD positions among the ESARDA community.
- 4) YG members could interact with each other and with professionals and students.
- 5) By activating both students and young professionals on NuSaSET , we allow for
 - o cross-European collaborations among students, and
 - o a (further expanded) platform for advertisement of thesis subjects, nuclear safeguards courses, future PhD positions as well as positions in companies all over Europe.
- 6) The “train-the-trainer” course could be made available through NuSaSET.

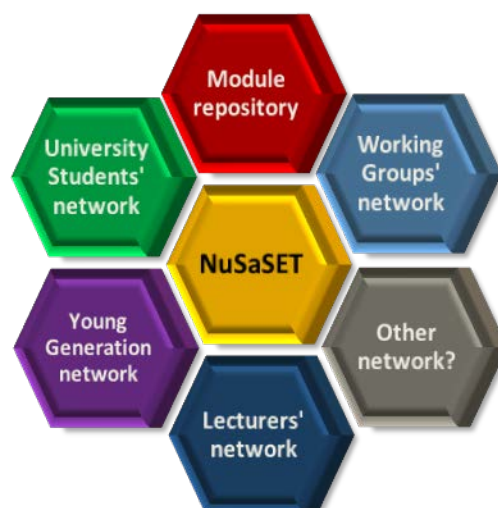


Figure 3. Different actors on NuSaSET.

5. Summary

In this document, we have described a vision of how ESARDA could deal with education as well as training and knowledge management in a more effective way. We have described a development towards a module-based knowledge repository for research and educational material, aimed to facilitate awareness of nuclear safeguards and non-proliferation to both students and young professionals. In the process of developing and maintaining the material, we foresee a larger overlap between the ESARDA WGs and a way to implement knowledge management in practice into the organization.

We believe that the proposed strategy will greatly expand the extent to which ESARDA engages in education and training. It will make education and training more flexible and provides the possibility to offer different nuclear safeguards courses depending on different needs and target groups.

We also suggest that the TKM WG should take steps to develop a train-the-trainer course in order to stimulate further interest in academia for teaching in the safeguards and nuclear non-proliferation field.

6. Outlook

In the nearest future we suggest to form a Task Force that will develop the thoughts in this document as well as implementing them. Ideally the task force consists of members from all WGs (including steering committee). Therefore we urge the steering committee to rally a Task Force from the members of the WGs.

During 2015 this Task Force develops and deepens the thoughts presented in this document and pays special attention to the funding of further development. By the end of 2015 the Task Force presents a more detailed plan for 2016. This plan should consist of an action plan for how and who to implement the changes.

7. Acknowledgement

This report has been supported by the Swedish Radiation Safety Authority (SSM).

8. References

[1] S. Grape, K. Persson and T. Jonter, *Visions for the development of ESARDA and ESARDA TKM WG*, ESARDA Bulletin No 51, December 2014

[2] IAEA program on knowledge management - Nuclear Knowledge Management (NKM), www.iaea.org/nuclearknowledge