



## **EAN WORKING GROUP ON ALARA CULTURE**

2<sup>nd</sup> meeting 24-25 November 2010 -  
SCK-CEN Headquarter, Av. Herrmann-Debrouxlaan 40, 1160 BRUSSELS, Belgium

### **Minutes**

#### **Participants**

Sotirios ECONOMIDES - GAEC, Greece  
James GEMMILL – SEPA, UK  
Frank HARDEMAN – SCK-CEN, Belgium  
Caroline SCHIEBER - CEPN, France  
Fernand VERMEERSCH – SCK-CEN, Belgium

#### **Apologies from**

Lorenz BERND - GNS, Germany  
Stefan MUNDIGL - EC  
Cristina NUCETELLI – ISS, Italy  
Serena RISICA– ISS, Italy  
Annemarie SCHMITT-HANNIG – BfS, Germany

#### **Agenda**

The meeting was devoted during the first afternoon to a general discussion around the ALARA culture, starting from the results of the 1<sup>st</sup> meeting.

The morning of the second day was dedicated to a discussion on the possible content on the updated version of the book “ALARA from theory to practice”.

## Discussion on ALARA culture

### *Integrated management system for nuclear installations*

It was noted that, according to the European Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, all nuclear installations should adopt an integrated management system for nuclear safety. The legislation in Belgium is under preparation, based mainly on the recommendations of IAEA, presented in the safety standard *No. GS-R-3 'The Management System for Facilities and Activities Safety Requirements'*.

The link with ALARA culture relies in the fact that such integrated management system favours the elaboration of clear procedures and quality assurance systems. In the field of ALARA, it will lead to define clearly who is in charge of the ALARA evaluations, how these evaluations are done, what is the role of the ALARA Committee or ALARA group, etc.

### *Decision making process and monetary value of the man-Sv*

It is now recognized that the so-called 'cost-benefit analysis', using a monetary value of the man-Sv to evaluate radiation protection options is no more the core of the ALARA procedure. Such analysis may be used, but only for large engineering projects, and the result will only be one part of the decision making criteria.

Several years of applying ALARA have now allowed the decision makers to have a feeling of what is reasonable or not, without always calculating the cost-benefit ratio. It is thus very important in the implementation of ALARA to collect feed-back experience on past implementations of RP options in order to build a knowledge on what can be considered as 'reasonable' (i.e. ALARA) or not.

### *ALARA in case of public exposure management*

The stakeholders in the case of public exposure are different from those to be considered in occupational exposures. The involvement of representatives from the public is thus usually necessary to rise 'acceptable' levels of exposures. The consideration of what is 'acceptable' will thus include quite a lot of criteria, the cost being only one of those criteria. Other values are considered by the public such as the value given to a clean environment, etc...

### *ALARA and the acceptable level of exposure*

The objective of implementing ALARA is to reach an 'acceptable' level of risk, below the dose limit which is the upper bound of the 'tolerable' level of risk.

ALARA is thus an obligation of means, and not an obligation of results, in the sense that the result of an ALARA procedure is not a given value of exposure. The acceptable level of exposure depends on the exposure situation and on the stakeholders involved.

There is a need for transparency to know what is acceptable or not. It can be noticed that in the nuclear field, the transparency around occupational exposure is usually implemented. A lot has however to be done in the medical field, where patients might be exposed to high doses, without a lot of control or notification.

*Need for the designation of a responsible individual (or structure)*

In nearly all exposure situations, the implementation of ALARA implies that a dedicated person (or structure) be nominated for ensuring that the doses are kept ALARA. This person should have benefited of an adequate training.

*ALARA at the design stage of facilities*

A lot can be done for the protection of workers and public at the design stages of the facilities. However this implies that the engineers in charge of the design should be trained in RP and in the implementation of ALARA. A RP specialist should also be integrated in the design project team. The ALARA culture thus does not concern only exposed individuals, but also all those whose activities might impact the level of exposures of other individuals.

*Use of dose constraints*

It is noted that ERPAN has performed a survey on the use and regulation of dose constraint in the non-nuclear sectors in various European countries. This survey has been done in the framework of an OECD/NEA working group (EGOE – Expert Group on Occupational Exposure) which is preparing a document on the use of dose constraint. This document should be available by the end of next year. It contains also a survey performed using the ISOE network on the use of dose constraint by nuclear utilities.

The use of dose constraint at the design stage of facilities can be seen as the establishment of ‘an individual dose target’, which is usually driven by the available technology. It is, in this case, similar to the goals set up in the implementation of BAT in other types of industries (eg chemicals).

*Definition of ALARA culture*

When looking at the definition proposed on the EAN website, it was proposed by the group to add a few sentences in order to precise the following elements:

- The ALARA culture, which is based on the existence of health risk associated with exposures, is at the core of the RP culture.
- The ALARA culture results in attitudes and behaviours of individuals, who are then committed to always search for dose reduction potentialities.

Attitudes are usually the results of a cultural background. The elements contributing to the culture might defer according to the different stakeholders: from RP specialists to the general public. However, one common basis is the knowledge about dose-effect relationship and the search for an acceptable level of risk according to the characteristics of the exposure situation

The assessment of RP culture will usually include elements such as : the state of the knowledge, the legislation, the management structure etc.

The assessment of ALARA culture will usually look at elements such as: what is the strategy adopted to reduce exposures, how is it applied, what responsibilities are given to the management in this specific field of RP, what are the attitudes and behaviour of the various stakeholders, etc.

*Question regarding ALARA in the regulation*

A survey could be done on how ALARA is included in the various national legislations.

The question raised is: is there a need to be prescriptive in the way ALARA has to be applied?

## Discussion on the book on ALARA from theory to practice

The group tried to set up a first proposal of what could be the table of content of such a book (see Annex 1). To facilitate this elaboration the CEPN presented two power points of training course on optimisation of radiation protection which were elaborated, one a few years ago for the European Course on Radiation Protection, and the other one for a refresher course on optimisation of radiation protection presented during an ISOE Symposium in 2008.

The main remarks were the following:

- For the presentation of health effects, it will be necessary to include the latest elements known about the non-carcinogenic effects such as cardio-vascular ones.
- In the presentation of the risk coefficients, it is necessary to show not only the coefficients for the general population, but also those for children (especially for the medical exposures). CEPN noticed that the IRSN has elaborated a specific file on low dose on its web site. Some elements could be used.
- The discussion on dose limits should note that while these limits should guarantee the non-occurrence of deterministic effects, such effects have been observed in the medical field (usually in interventional radiology).
- The comparison of risks in the various occupational sectors is interesting (study made by CEPN comparing death risk in various sectors of activities, compared to the risk associated with the dose limit, or with the average occupational exposure). The loss of life expectancy associated with each type of risk could be added.
- The presentation on ICRP recommendations should start directly with ICRP 103, without explaining the difference with ICRP 60. However, an annex could be added presenting the history of ALARA (risk evolution, ICRP recommendations evolution, ...).
- Some 'little boxes' could be included in the text when specific definitions or explanation are useful (eg. a box on dose definition).
- A section on regulatory aspects of ALARA has to be included, as well as a section on the role of the various actors according to exposure situations.
- A section should be dedicated to the management of ALARA, and one on the evaluation of ALARA programmes (auto-evaluation, ALARA reviews, ALARA as part of a quality system, ...).
- In the presentation of ALARA procedure, specific attention has to be paid to the role of sensitivity analysis.
- Some proposal of basic actions to reduce exposure should be presented (time, distance, shielding, ...).
- In the decision making criteria, it is important to include the fact that the other risks have to be taken into account.
- The part on 'optimisation in practice' should make a distinction for the various exposure situations.

## Working Group – to-do list and time table

It was finally agreed that the group could produce two documents:

- *A generic paper on ALARA culture*, on the basis of the discussions of the first and second meeting. The first elements of this paper could be presented in the next IRPA workshop on RP culture (the latter will be held in USA in February 2011. The agenda is not yet well known. If it seems to be of interest, Caroline Schieber could participate on behalf of the EAN working group

to present these main elements). A full paper could be produced by the end of next year and proposed to a RP magazine (Health Physics, ...)

- *The updated book on ALARA from theory to practice*. It is proposed to circulate the proposed table of content within the working group to collect remarks and proposals for completion (action C. Schieber).

The next meeting will be hosted by GAEC in Athens (thanks to Sotirios Economides). The date has to be confirmed:

- first proposal : 31 may and 1<sup>st</sup> June 2011
- second proposal: 17 and 18 may 2011

## **ANNEX 1 – First proposal of table of content for the book on ‘ALARA from theory to practice’**

### **1. INTRODUCTION**

Presentation of the framework of this book: reflections on the ALARA culture and the elements of knowledge contributing to the dissemination of this culture

The ‘AVOCADO MODEL’ : ALARA culture is the core of RP culture

### **2. CREATION OF A RADIOLOGICAL RISK MANAGEMENT SYSTEM - BASIC CONCEPTS**

#### **2.1. International radiological protection standards**

UNSCEAR, ICRP, IAEA, EC, ...

#### **2.2. The effects of ionising radiation on health**

2.2.1. Deterministic effects

2.2.2. Stochastic effects

Give risk factors for all population, but also children ,....

2.2.3. Non cancer disease

#### **2.3. Three principles for responsible management of radiological risks**

2.3.1. Justification

2.3.2. Optimising radiological protection

2.3.3. Limitation of individual doses

#### **2.4. Exposure situations**

2.4.1. Planned exposure situations

2.4.2. Existing exposure situations

2.4.3. Emergency situations

#### **2.5. Legal aspects of optimisation**

### **3. OPTIMISATION IN PRACTICE**

#### **3.1. ALARA process**

- evaluation – follow-up – feed-back experience
- Dose reduction actions:
  - source term, duration of exposure, number of people exposed
- with already examples from various exposure situations
- selecting actions and decision making process – sensitivity analysis

### **3.2. Various actors and their role**

Authorities,  
management  
RP experts  
workers  
other work specialities  
Stakeholders

### **3.3. elements supporting the approach**

- commitment
- structures
- tools

## **4. EXAMPLES OF ALARA IN PRACTICE**

Examples coming from operators, safety authorities, medical actors  
need to address design, operation and decommissioning stages

### **4.1. Worker exposure**

- 4.1.1. Nuclear industry
- 4.1.2. Research activities  
(reactors, laboratories,..)
- 4.1.3. Other industries
- 4.1.4. Medical
- 4.1.5. NORM
- 4.1.6. Mines

### **4.2. Patient exposure**

- 4.2.1. Diagnostic  
role of drl  
adapt to pediatric patients
- 4.2.2. Interventional
- 4.2.3. Radiotherapy

### **4.3. Public exposure**

4.3.1. Exposure from planned exposure situations

releases from “industry”, hospitals  
waste disposal or storage  
transport

4.3.2. Exposure from existing exposure situations

radon  
mine residues  
contaminated sites

#### **4.4. Emergency – post-accident situations**

intervention levels, reference levels