European ALARA Network

8th Workshop on "Occupational radiological protection control through inspection and self-assessment", Uppsala, Sweden, 22-24 September 2004

Introduction to- and scene setting for- occupational radiological protection control.

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INTRODUCTION

This is the 8th workshop organised by the EAN. Although the topics of inspection and self-assessment have arisen during previous workshops, this is the first time that they have been the main subjects. The trend established in previous workshops is continued, i.e. the focus is on participants working in groups, to discuss the issues raised by presentations, and to develop proposals for improving the implementation of radiation protection. To facilitate this, the attendance at the workshop is deliberately restricted, normally to a maximum of 80-100 persons.

The objective of the workshop is to assess how the different types of control contribute to achieving ALARA for occupational exposure. Specific questions arising from this objective are listed at the end of this presentation. First, however, to help set the scene, a short description of the assessment and control process and the results from an EAN questionnaire on regulatory bodies resources and practices, are presented as well as some results from another EAN/EFNDT questionnaire on mobile industrial radiography.

THE ASSESSMENT PROCESS

The full scope of the assessment is illustrated in Figure 1[3]. It comprises five layers, of which two correspond to external assessment, and three to self-assessment. The five layers are as follows:

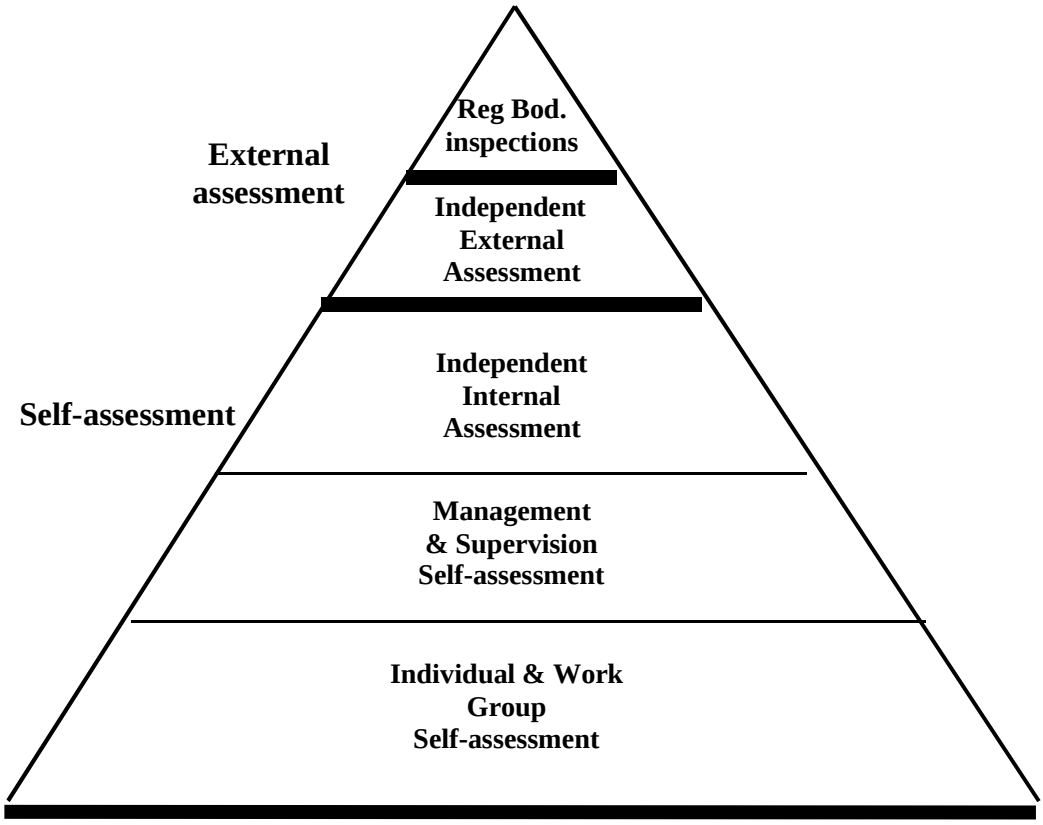
- Regulatory inspections, where the regulatory bodies devote time and resources for verifying that occupational radiological protection regulations, and particularly the ALARA principle, are being implemented by employers.
- Independent external assessments; these are carried out by a body external to the employer/licensee. IAEA OSART, INPO and WANO peer reviews are examples of independent external assessment in the nuclear sector. Outside the nuclear sector, some countries

[1] NRPB, Occupational Services Department, Leeds, UK
[2] CEPN, Fontenay aux Roses, France
[3] Mainly taken from IAEA TECDOC –1125 "self assessment of operational safety in NPPs".

require that a similar type of assessment is undertaken, for example by suitably qualified or accredited external body.

- Independent internal assessment; where an individual or group within the organisation, but independent of the relevant line-management chain, carries out the evaluation. Although labelled as independent, this is regarded as a self-assessment process.
- Management and supervision self-assessment, where the plant/source management routinely evaluates the effectiveness of performance in their respective areas of responsibility.
- Individual and work group self-assessment, where individuals/ teams self-assess their individual or group performance against a set of mutually agreed performance expectations.

FIG. 1.Triangle of the assessment process



EAN QUESTIONNAIRE ON REGULATORY BODIES

To assist in setting the scene for this workshop, a questionnaire on national regulatory bodies, dealing with the first layer of the triangle in Figure 1, was distributed through the EAN. The purpose was to obtain a summary of the resources devoted to regulatory inspections, as well as brief details on the organisation and operation of the different national bodies. Answers from sixteen

countries (among 18 countries participating to EAN) have been collected. Their results are summarised below.

Regulatory inspection resources

Information was requested on the financial resources (e.g. annual budget) and on the human resources (i.e. the number of inspectors). Some financial information was provided, however, in many cases, it is difficult to identify what proportion is related specifically to inspections. Consequently, no analysis of the financial data provided has been made. In any case, it is considered that the number of national inspectors is a better indicator of the "size" of the regulatory body. A summary of the information provided is given in Table 1. As well as the number of inspectors, this table also includes the information provided on the number of practices and exposed workers in each country.

Some caution is needed when comparing the data in Table 1, for example:

- **Number of workers** – in some cases is the total number of monitored workers, in others it is only the number of Category A workers. The data do not include any NORM-related workers, except in a few cases in which small numbers (less than 100 per country) of miners are included.
- **Number of practices** – in many cases, this is based on the number of licensees, however certain practices (e.g. dentists) are not necessarily subject to licensing in all countries.

Notwithstanding the above, it is possible to draw some broad conclusions from Table 1.

- Although the data is incomplete, the total number of inspectors[4] within the EU would appear to be well below 1000. In terms of individual countries, the numbers range from less than 1 (Croatia), to more than 200 (France). However, in the majority of countries, the number of inspectors is quite low, with most being in the range 5 to 25.
- Countries with the most nuclear sites also have the largest number of inspectors, which is not unexpected given the typical inspection regimes applied to such sites.
- In terms of comparisons:
    - on average there are approximately 1 - 2 inspector(s) per million per head of population, although the range of national values is up to a factor of four either way;
    - for every national inspector, there are typically a few thousand monitored **workers**;

[4] In terms of full man-years devoted to occupational radiological protection control

- in terms of non-nuclear **practices**, there are typically a few hundred per national inspector, although there are some notable national variations. In Spain, for example, the ratio is only 55:1; and
- for nuclear sites the ratio of inspectors to licensees is much lower (nearer to 1:1), although this is based on quite limited data.

The overall conclusion is that the number of persons undertaking regulatory inspections is typically quite small, especially when compared to the numbers of (non-nuclear) practices. Consequently, regular inspection of all these practices is simply not possible. Instead, an average inspection frequency of once every few years is indicated.

Organisational arrangements

The control of the implementation of the regulations in occupational radiological protection is always performed by national regulatory bodies (see Table2), except in Belgium where it is split between a federal agency (FANC) and three private companies (AVC, AVN, TT), and in Croatia where it is split between two national agencies (NRG and health inspectorate of the Ministry of Health) and some approved technical services.

Regulatory bodies operate at the national level in half of the countries[5] (see Table 3). In Germany (a federal country) and the Netherlands, the organisation operates at a regional level. In the other countries[6], including most of the "big" countries, it effectively operates at both levels. Italy is a special case, as the inspection regime involves local administrations, as well as operating at a national and regional level.

In 8 of the 16 countries[7], a single regulatory body is responsible for all types of use of ionising radiation. In other countries, there are two or more bodies with regulatory responsibilities. In Belgium, Croatia, France and Spain, each body still has responsibilities for all types of practice. This is not the case in Italy and the Netherlands, where one institution covers the nuclear field and another the non-nuclear field. The situation is even more specific in Switzerland where three institutions cover respectively the nuclear field, the medical and research field, and the non-nuclear industry field.

Whatever the number of regulatory bodies, the nuclear field, when it exists, is covered (Belgium is the one exception) by a specific team or department, or institution (see Table 4). The situation is different for the other sectors: in most cases, the medical field and the non-nuclear industrial fields are separated from each other. However the research sector is sometimes linked with the medical field (Switzerland), and sometimes with the industrial field (Norway and Sweden). The resources devoted to the inspections of these two sectors are quite variable:

[5] BE, CZ, DK, FIN, GR, IRE, NO, SW
[6] CZ, FR, SP, SWI, UK
[7] CZ, DK, FIN, GR, IRE, NO, SW, UK

about 90% of all (non-nuclear) inspection resources have been devoted to the medical sector in France[8], 60% in Spain and Finland, compared to only 30% in Sweden.

There are a number of examples of unique organisational arrangements. In Denmark, for example, the three regulatory sectors are medical (x-ray excuded), non-medical, and x-rays (including both medical and non medical). In Finland, for example, there is a regulatory team specifically devoted to the protection of aircrew.

In conclusion, all respondent countries have organisational arrangements for undertaking external regulatory inspections. These vary in complexity, and they differ from one country to another both in terms of human resources, the number of institutions concerned, and in their organisational approach. What is important during the workshop, is to exchange information and ideas on the methods and tools of inspection, and how these lead to improvements in control in practice.

The regulatory bodies, and their organisational arrangements and resources, are only a factor in respect of the first layer of the assessment triangle. A brief introduction to the other layers is given below.

THE ROLE OF INDEPENDANT EXTERNAL ASSESSMENT

It is suggested that there are two main categories of this type of (non-regulatory) external assessment. The first is a peer-review process, whereby (normally) a group of suitable experts from outside an organisation, but belonging to similar organisations (the reason why they are called peers) will review its radiation protection performance (perhaps as part of a wider review). This process has evolved considerably within the nuclear power plants, for example through IAEA, OSART, INPO and WANO peer reviews. Such reviews are, by nature, more “friendly” than a regulatory inspection and also include a two-way sharing of information and ideas. They do, however, provide the necessary degree on independence required for an external assessment.

Such peer reviews are not normally a feature of non-nuclear practices. Many of these practices do, however, receive external advice on occupational radiation protection from a Qualified Expert. Site “inspections” by Qualified Experts, at least once a year but often more frequently, are usually a prerequisite of providing the necessary advice. In addition, advising on regulatory compliance (“keeping the inspectors happy”) will often be one of the key roles of the Qualified Expert in practice.

The question of independence is not always straightforward. In the case of the “small user”, i.e. as is typically found in the non-nuclear industry sector, the Qualified Expert will usually be completely external to the organisation. For

[8] data from the year 2003 only

larger practices, such as in the medical or nuclear field, Qualified Experts may often be "in-house", i.e. because this is the most practical arrangement. Furthermore, in all cases, the Qualified Expert is normally paid for by the licencee/operator. It is suggested that Qualified Experts, have an important assessment role, and can clearly undertake this with the necessary impartiality required, the Workshop should consider where this fits best within the assessment triangle.

THE ROLE OF SELF-ASSESSMENT

While external assessment is clearly very crucial, it typically relies on a relatively infrequent inspection regime. There is, therefore, still a need for a more frequent system of performance assessment, preferably involving those with a direct stake in occupational radiological protection. This is the role of self-assessment, which should promote improved safety performance through the direct involvement of personnel in the critical examination and improvement of radiation protection in their own work activities. It should be designed to ensure that line-management is effective in monitoring radiation protection performance, and takes timely corrective actions to improve this where required. It should represent a continuous assessment of occupational radiation protection throughout the whole organisation. A strong commitment to the self-assessment process can motivate staff to seek improvements in occupational radiation protection performance. The self-assessment process is a major factor in reaching the overall performance expectations and maintaining and enhancing radiation protection. And finally, self-assessment can help to improve communication and working relationship across all levels of the organization.

THE EAN/EFNDT QUESTIONNAIRE ON MOBILE RADIOGRAPHY

This questionnaire has been produced by a joint working group comprising representatives from EAN and from the European Federation on Non-Destructive Testing. It includes questions on the regulatory notification and inspection arrangements for mobile industrial radiography in different countries. Data is still being collected from this questionnaire, but already it does show a number of national differences. In terms of the objectives of this workshop, one of the issues to emerge has been the different approach to *arranging* inspections. Specifically, in some countries inspections are agreed in advance between the regulatory body and the radiography company. In others, the radiography company are given of no indication of whether they will be inspected or not. The joint working group has concluded that this difference in approach can affect both the style and the outcome of the inspection, and has agreed that "surprise" inspections are preferred. The workshop might consider whether this, and other factors relevant to the way inspections are undertaken, play an important role in the practical control of occupational exposure.

THE OBJECTIVES OF THE WORKSHOP

The main objective of the workshop is "to assess how the different types of control contribute to achieving ALARA for occupational exposure". The different assessment "layers" have been discussed, and additional objectives are to consider how each of these layers complement each other, and whether any "holes" in the assessment process still need to be filled.

Four working groups are proposed, and in considering the overall objective, the programme committee produced a series of questions that these groups might like to consider, as follows:

1. INSPECTION

- What should inspections consist of? For example, should they focus on the physical safety features, or on issues such organisational arrangements and safety culture?
- How are potential exposures addressed by inspection?
- Should inspections be undertaken according to a specific methodology or protocol?
- What powers of enforcement are there, and what part do these powers play in achieving ALARA?
- What requirements should there be for training (and refreshing training) inspectors?

2. SELF ASSESSMENT

- What is the main aim of self-assessment? Who gains the most benefit?
- Is the focus of self-assessment different to that for regulatory inspections?
- Who should do the assessments, and how often?
- What methods and tools are available for self-assessment? Are tools such as benchmarking and peer review useful in this context?
- How does self-assessment assess whether ALARA is being achieved?

3. WORKERS' INVOLVEMENT

- What exactly is the workers' role during a regulatory inspection?
- Should the regulatory body aim to consult more with workers? Should there be some means of directly exchanging information and views between inspectors and workers?
- What is the workers' role in the self-assessment process? How can they become more involved?
- How can workers' concerns and suggestions be taken into account?
- How can "no-fault" reporting be encouraged?

4. COMMUNICATION BETWEEN STAKEHOLDERS

- Regulators, licensees and workers are closely involved, but are there any other stakeholders to consider?
- Is the inspector's approach a factor? For example, are they considered as "the Police" or as a source of assistance and advice?
- What is the best way of disseminating the findings of a regulatory inspection? Should they be distributed externally as well as internally?
- Should a regular dialogue between regulators and licensees be established? What form should this dialogue take?
- Should there be more communication between different national regulatory bodies (e.g. such as is being encouraged at this workshop)?

As a further discussion item, figure 2 shows a first attempt to summarise the different types of assessment processes, the concerned stakeholders and the frequencies of assessment. And there is one further question: should the assessment process be a "top down" process, a "bottom-up process", or both?

The above questions reflect some of the issues raised by the programme committee. They are just suggestions for starting the group discussions. The objective of the working groups is to produce recommendations, and to identify which stakeholders these recommendations should be addressed to.

FIG. 2.Triangle of the assessment process: stakeholders and frequencies(outside nuclear)

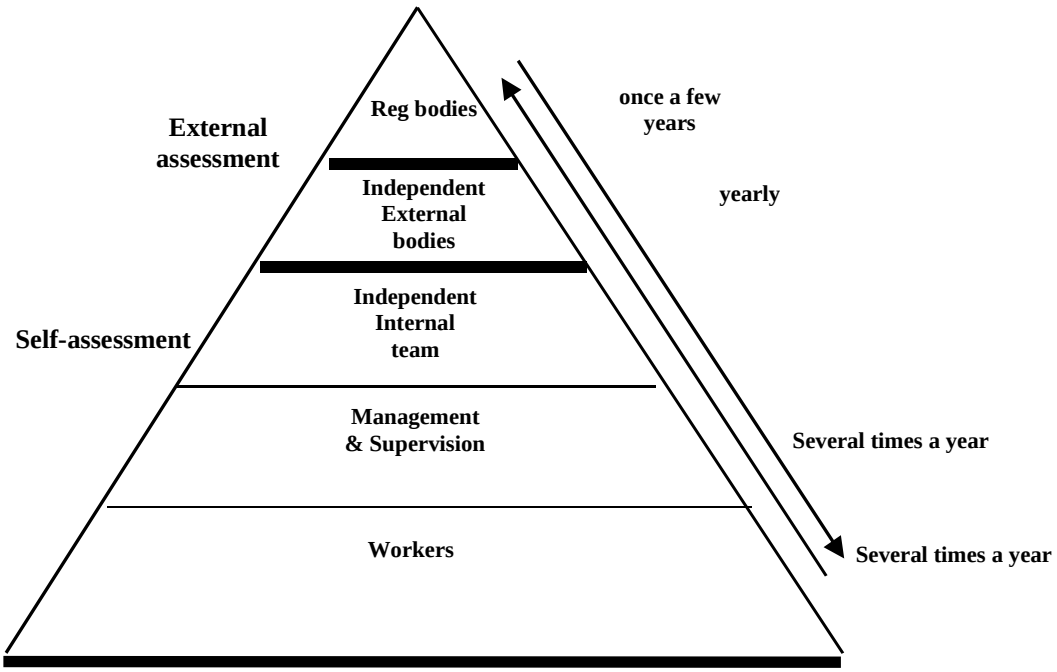


Table 1 – Summary of EAN questionnaire on regulatory bodies

Country	Population (millions)	Workers[1, 4] (thousands)	Practices[2]	Inspectors[3]
Belgium	10.3	44	9400 (15)	53
Croatia	4.4	4.5	430	<1
Czech Rep.[5]	10.3	17.5	5400 (2)	20
Denmark	5.3	10.2	1100	11.5
Finland	5.2	11.2	1,820 (3)	21(5)
France	60.4	267	56,000 (150)	215 (165)
Germany	82.2	313	10,900 (34)	100
Greece [5]	10.6	9.3	3100 (3)	11
Rep of Ireland	3.8	7.7	1400	2.25
Italy	57.7		-	25 [+] (15)
Netherland	15.9	34.9	-	Max 9 (4)
Norway	4.5	7.2	1900 (3)	4
Spain	39.9	89	1300 (11)	25
Sweden	8.9	17.2	-	7.5
Switzerland	7.3	65	17,600 (15)	19 (4)
UK[5]	59.8	8.9	-	16

Notes:

1. The total number of workers subject to some form of personal dosimetry, except for the UK which is category A workers only.
2. Is the total number of practices given by respondents. The number in brackets, where given, is the number of nuclear licensed sites included in this total (sometimes including dentits o not..).
3. Many inspectors have responsibilities other than the control of occupational exposure. The figure given represents an estimation of the equivalent number of full-time inspectors concerned with occupational exposure. The number in brackets is the equivalent number of nuclear inspectors that are included in this total. It should be noted that not all countries with nuclear sites provided separate information on nuclear and non-nuclear inspectors.
4. NORM workers: an extra 2000 should be added in Czech republic; 70, 80, 60 are followed respectively in Greece, Ireland and the UK (mainly miners). One could also add the number of aircrew (12000 in the Netherlands, 2500 in Finland...)

Table 2: Organisations in charge of verifying occupational exposure regulation implementation

Country	Public authority		Private Company
Belgium	FANC	Federal agency for nuclear control	AVC AVN TT
Croatia	NRG Min Health	-National regulatory authority -Health inspectorate	Approved technical services
Czech Republic	SONS	State office for nuclear safety	
Denmark	NIRH	National institute of radiation hygiene	
Finland	STUK	Radiation and nuclear safety authority	
France	DGSNR DRT	-Directorate general for nuclear safety and radiological protection (Ministry of health, Ministry of Finance and Industry, Ministry of Environment) -Ministry of Labour; Directorate for labour relationships	
Greece	GAEC	Greek atomic energy commission	
Germany	Competent authorities from "Bundeslaender"		
Ireland	RPII	Radiological protection institute of Ireland	
Italy	APAT Min Labour Local admin.	-National agency for Environment protection -Inspectorate from Labour Department -Surveyors from local health administrations	
The Netherlands	Min. of social affairs and labour Min. of environment	Labour inspection Nuclear physical service	
Norway	NRPA	Norwegian radiation protection authority	
Spain	CSN Competent authorities from "Autonomas"	Nuclear safety council	
Sweden	SSI	Swedish radiation protection authority	
Switzerland	HSK SFOPH SUVA	-Federal office of energy, nuclear safety inspectorate -Swiss federal office of public health -Swiss national accident insurance fund	
United Kingdom	HSE	-The Health and Safety Executive	

Table 3: Geographical levels of the inspection organisation in charge of verifying occupational exposure regulation implementation

Country	National	Regional	National and regional	National, regional and local
Belgium	X			
Croatia	X			
Czech Republic			X	
Denmark	X			
Finland	X			
France			X	
Greece	X			
Germany		X		
Ireland	X			
Italy				X
The Netherlands		X		
Norway	X			
Spain			X	
Sweden	X			
Switzerland	X			
United Kingdom			X	

Table 4: Organisation of the inspection with regards to the different domains of activity

Country	Specific team for nuclear	All domains covered by the same team or inspectors	Different teams or inspectors per sectors	
Belgium		X		
Croatia		X		
Czech Republic			X	
Denmark			X	Medical; non medical; X Rays
Finland	X		X	Medical, Industrial Air crew
France	X	X [1]	X [2]	Medical Industrial
Greece			X	
Germany		X in small Landers	X in big Landers	
Ireland		X		
Italy	X		X	
The Netherlands	X	X		
Norway			X	Medical, Industrial & research environment
Spain	X		X	Medical; Industrial
Sweden	X		X	Medical; Industrial & research
Switzerland	X		X	Medical and research; Industrial
United Kingdom	X	X [1]	X [2]	

1 at the national headquarter level

2 at the regional level