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"ALARA IN EXISTING EXPOSURE SITUATIONS"
SUMMARY AND RECOMMENDATIONS

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WORKSHOP OBJECTIVES AND PROGRAMME

The concept of "*existing exposure situations"* was introduced by ICRP in Publication No. 103 (2007), and is defined as exposure situations that already exist when a decision on control has to be taken. Examples include radon in homes, aircrew exposure to cosmic radiation, remediation of historically contaminated land, and post-emergency situations.

Optimisation is the key radiation protection principle for existing exposure situations, although it is not always clear how to apply this in practice. Consequently, the aim of the 14th EAN workshop was to focus on how the ALARA principle can be applied to the whole range of existing exposure situations, considering the wider principles and strategies that might be adopted, as well as specific methods for implementing ALARA in practice.

The Workshop was officially opened by Mr Fergus O'Dowd, Minister of State at the Department of Communications, Energy and Natural Resources and the Environment, Community and Local Government. There were 66 participants from 17 different countries, with half the programme devoted to presentations, and half to Working Group discussions based on the following topic areas:

- ALARA challenges and practicalities at the national and regional level
- Considerations in choosing dose reference levels
- Economic and technical factors, and endpoints of optimisation
- Societal factors and stakeholder engagement

On the final day, the reports from the four working groups were presented and discussed, and form the workshop conclusions and recommendations. These, plus individual presentations (slides and papers), are available to download from the EAN website (http://www.eu-alara.net/).

Some key themes and issues did emerge from the workshop, and these are also summarised below.

THEMES AND ISSUES ARISING

Characteristics of existing exposure situations

The basic definition of existing exposure situations is simple: they already exist when a decision on control has to be taken. However, such situations are diverse – from radon in homes to post-nuclear emergencies – and a theme to emerge from the scene-setting presentations was how to define some common characteristics. It is clear that they encompass natural and man-made sources, public and occupational exposures, and also a very wide range of radiation doses: from small fractions of mSv/y in some site remediation case studies, to several hundred mSv/y (or more) in some radon studies. Furthermore, often there are broad individual dose *distributions*, which become an important factor when considering reference levels.

From an EAN perspective, an important question is the potential for optimisation, which clearly varies according to the type of existing exposure situation. For example, there is very little scope for restricting cosmic ray exposures to aircrew. On the other hand, there is clearly a huge scope for reducing exposures to radon, both in the home and the workplace.

Another feature of existing exposure situations, which emerged repeatedly throughout the workshop, is the wide range of stakeholders involved. This includes a range of actors and decision-makers, many of which are outside the traditional radiation protection community. For example, there is often a need for a wider governmental involvement, with equally important roles for the media and other communicators. There is also an emphasis on individuals being able to reduce their own radiation exposures, for example through radon remediation measures at home, or through modifying living habits in contaminated areas. However, it was clear from a number of presentations that such "self-help" protection actions cannot be forced on people, and, in fact, actions are required at all levels to achieve optimisation. Indeed, a significant conclusion from the workshop was that traditional mechanisms of control, such as regulation (ie as applied to planned exposure situations), may be of limited value in the context of existing exposure situations. If so, alternative frameworks, which can be supported by local actors, need to be considered.

When should they be treated as planned exposure situations?

Although the focus of this Workshop was on existing exposure situations, inevitably this raised the question of the relationship with planned exposure situations. ICRP has recommended that some existing exposure situations should (for the purposes of control) be treated the same as planned exposure situations. This would include occupational exposures to radon, whereby gas concentrations cannot be reduced below the reference level (e.g. in specific workplaces or activities, such as underground workplaces or spas), and the system of control for planned exposures should be applied. Subsequently, in the international BSS, similar proposals have been made for NORM industries, based either on occupational dose (typically 1 mSv/y) or activity concentration (typically 1 Bq/g for U-238/Th-232).

The above approaches provide a basis for differentiating widespread (or "natural") exposures from those that might be considered high enough to warrant further attention. Equally importantly, they are also based on practical considerations of which existing exposures might be amenable to control, ie through a regulatory system. However, there is potential for confusion here with the concepts of exclusion and exemption, especially for NORM industries and NORM in building materials, where such concepts have traditionally played an

important role. Thus, clarification from ICRP on the relationship between these different concepts would be useful.

Implementation of ICRP103

The ICRP system of exposure situations has been incorporated into the (interim) IAEA and (draft) European Basic Safety Standards. Presentations at the Workshop suggested that there are already differences in interpreting how the requirements for existing exposure situations should be implemented. A key example is radon in homes, for which the approach is very similar to that used currently for Action Levels. This is not simply a question of terminology: remedial action is required above action levels, but optimisation is required above and below reference levels. While it is easy to view this trend as a dilution of the ALARA principle, it is important to consider the wider context and history of the radon problem. Although there are some notable success stories (as several presentations highlighted), the overall impact in terms of dose reduction has been very low. This is true even in Ireland where a very impressive campaign to tackle radon has been mounted.

In practice, we may need to accept that there are limitations on what can be enforced and achieved, even though (in most cases) radon exposures can effectively be reduced. It was noted at the start of the workshop that existing exposures may be characterised as not requiring urgent action. However, what emerged from the workshop is that there is a need for action now, but we must accept that success will require time. In the case of radon, this requires a focus on prevention (for new buildings), and a prioritised campaign for existing buildings based on what can reasonably be achieved, even if it does not (yet) fully embrace optimisation in all cases.

Stakeholder engagement

This has been a recurring theme at many previous EAN workshops, and is especially relevant for existing exposure situations, for example where home owners are exposed to radon, or where populations are exposed as a result of past events or practices. Several presentation stressed the need for stakeholder engagement at all levels throughout the decision making process. For example, it is important to engage at the emergency planning stage, and not just after an accident has occurred.

Increasingly the question is how such engagement should be conducted, and there was particular emphasis on treating individuals, their cultures and traditions with dignity and respect; exploring shared ethics and values; and "decoding" and optimising two-way communications.

"Soft boundaries"

It was stated at the start of the workshop that dose reference levels were intended to be "soft boundaries", within the optimisation process. The workshop highlighted a number of ways in which this message can be lost in translating ICRP recommendations into practice. The most obvious error is to misinterpret reference levels as limits: however, even if this is avoided it is inevitable that such levels will introduce something of a step-change in the approach to protection. The workshop also highlighted problems with setting unattainable reference levels, and the practical difficulties in verifying compliance, especially where the levels are low.

Other issues

There is not space here to describe all the topics and issues arising from the workshop. Papers and presentations are available on the EAN website, and these include: legacy sites (including heterogeneous contamination and probabilistic exposures, using consistent soil contamination criteria); cosmic rays (exposure of aircrew and ALARA options); post-emergency situations (managing the transition to an existing exposure situation, setting coherent reference levels for foodstuffs and other commodities); and radon (applying health economics to the problem, and dealing, as a priority, with areas with very high radon gas concentrations).

WORKSHOP CONCLUSIONS AND RECOMMENDATIONS

A large number of suggestions and recommendations were made by the working groups, and the full presentations are available on the EAN website. Given below is a short selection from these.

WG1: ALARA challenges and practicalities at the national and regional level

- There is a role for national, regional and site-specific reference levels, depending on the circumstances. National Radon Action Plans require a national reference level set by governments. However, it may be appropriate to also define regional reference levels (for example where radon gas concentrations are very atypical of the whole country),

provided that engagement with local authorities and communities takes place. Site-specific reference levels may be more appropriate for legacy sites, although it needs to be ensured that they fit within an overall national framework.

- When establishing a protection strategy for existing exposure situations, the means by which optimisation can be enforced and/or encouraged should be considered. Regulation offers a more direct means of control, but requires significant regulatory resources, and is clearly not applicable to situations such as radon in existing homes where optimisation will rely on encouragement and assistance. Risk communication and public awareness are important components and should be supported by public health organisations as well as the radiation protection community.

WG2: Considerations in choosing dose reference levels

- The factors to consider when choosing reference levels are the same as those required for the ALARA process as a whole, ie the benefits and detriments, and the associated economic and societal factors. However, there needs to be an even stronger emphasis on practicality and realism about the improvements that might be achieved.
- Reference levels should primarily be established in terms of (actual or expected) effective dose, but when applying these in practice it may be useful to use derived levels, eg in terms of activity concentration. It is possible to set reference levels in terms of risk (ie for potential exposures), but it remains unclear how these would be used in practice.
- The following dose reference levels are suggested:
    - For legacy sites (past practices): 1 mSv/a
    - For radon: 10 mSv/a[1]
    - Post-nuclear emergency:
        - medium term: the lower end of 1 - 20 mSv/a
        - longer-term: 1 mSv/a
    - Air-crew: Between 5 and 10 mSv /a (1 mSv/a for pregnant workers).

WG3: Economic and technical factors; and endpoints of optimisation

- Before any numerical criteria (either reference levels or end-points) are set, there is a need to characterise existing exposure situations. This should include questions such as "who is exposed?" and "who has a responsibility for taking action?" It should also address the inherent uncertainties, for example in terms of the doses received, and the effectiveness of remedial measures.
- Existing exposure situations can involve a complex decision-making process: tools such as cost-benefit (or cost-effective) analysis can provide structure, clarity and rationality to

[1] Some members of the group considered 10 mSv/a too high, and would adopt a lower reference level for the public and non-occupationally exposed workers.

support this process. It is therefore recommended that use of CBA (including the cost of the man-Sv) and other decision-aiding tools, be considered further.

- Optimisation is not minimisation: ALARA must have an end-point, which should be, as far as practicable, below the reference level. However, the actual end-point will differ on a case-by-case basis, and cannot be pre-determined at the start of the process. As an example, in the long term after a nuclear emergency, the levels of exposure should tend towards those in normal situations but it must be recognized that a complete return to "normality" (i.e. as in prior to the accident) will probably not be achievable.

WG4: Societal factors and stakeholder engagement

- Engaging with stakeholders is essential in optimising protection in existing exposure situations. It is important to be proactive in identifying stakeholders at an early stage, and some may need support (e.g. financial, technical, etc.) to effectively participate.
- Stakeholder engagement should start at the emergency preparedness stage, not fatre an accident has already occurred.
- The objectives and "rules of engagement" should be agreed at the start, and management of expectations is important throughout the process. Stakeholders need to know the extent to which their views and concerns can influence decisions, and be aware that engagement does not always equal consensus. Stakeholders will have different levels of 'stake' in a given situation, and the distinction between this and any wider agendas should be recognised.
- It is essential to build trust to encourage engagement: in many cases the active and willing participation of different stakeholders is required (eg radon in homes, post-emergency situations).
- It is important to assess stakeholder feedback and to learn lessons from this.

NEXT EAN WORKSHOPS

The 15th EAN workshop, on "ALARA Culture" is planned for 12-15 May 2014, in Rovinj, Istria, Croatia. Details will be announced on the EAN website.