



European ALARA Network

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Developing a national radon control strategy for Ireland

David Fenton - Radiological Protection Institute of Ireland

Introduction

In November 2011 the Irish Government announced the establishment of an Inter-Agency Group tasked with developing a National Radon Control Strategy for Ireland. This new inter-agency group comprises representatives from those state agencies who have a role in radon control. This important announcement was very much welcomed by the Radiological Protection Institute of Ireland (RPII) who for many years had recognised that radon

must be tackled through a Government-led strategy which co-ordinated the work of all relevant state agencies. This paper looks at the work done in recent years that led to this decision. In addition the framework for the work programme of the Group is reviewed.

The RPII and radon

Radon is an important component of the work of the RPII. In recent years, it has concentrated on working bi-laterally with a number of key State agencies as part of its efforts to reduce the radon hazard in Ireland. These agencies include the Public Health Authority in Ireland called the Health Service Executive (HSE), the Department of the Environment,

Community and Local Government (DECLG) who is the relevant Government Department, the Health and Safety Authority (HSA) who is responsible for implementing regulations governing safety in workplaces and Local Authorities especially those in the High Radon Areas. Such bilateral work is key to driving the radon message on a local and national basis. However, the RPII had long recognised that a Government-led National Radon Control Strategy which pulls together these bi-lateral relationships was needed.

Work with other State agencies in Ireland

Health Services Executive (HSE) – radon and public health

In April 2010, the RPII and HSE jointly published a Joint Position Statement on radon gas in Ireland. This Statement recognised radon as an important public health issue. The single recommendation was the immediate establishment of an expert group to develop a radon strategy for Ireland. Such an approach was consistent with international best practice as set out by the WHO in 2009.

Health and Safety Authority (HSA) - radon in workplaces

Since 2009 the HSA has included radon in their workplace inspections. In addition to this, radon was also included in RPII inspections, including inspections of underground workplaces where the radon has to be managed on an ongoing basis. These efforts, comprising over a thousand workplace inspections, have resulted in a noticeable increase in enquiries from employers on radon.

Local Authorities – radon in social housing

In recent years the RPII has engaged with

Local Authorities on radon especially those in counties most at risk from radon. This work was largely aimed at supporting Local Authorities to assess and communicate the radon risk to their tenants. To date, the measurement programmes in social housing in Ireland has resulted in about 10,000 homes being tested for radon. To put this in context in Ireland over the past 20 years 49,000 private homes have been tested for radon. The radon programmes of the Local Authorities have therefore resulted in a very important dataset of information which, in addition to improving the picture of the radon risk in these areas, contain important information on the effectiveness of the current building regulations as well as the effectiveness of different remediation methods. The data will help inform development of the national radon control strategy.

National Radon Forum

The National Radon Forum is organised annually by the RPII and brings together stakeholders from both public and private sectors who have a role to play in the control of radon. Last November, the ninth National Radon Forum was held in Dublin and was opened by the Minister for Environment, Community and Local Government, Mr Phil Hogan T.D. The Minister used the opportunity to announce the establishment of the Inter-Agency Group, referred to above.

Public Awareness on radon

Over recent years the RPII has implemented integrated publicity campaigns in High Radon Areas. The campaigns include advertising on local radio and newspapers as well as interviews, promotional activities, developing web and Facebook pages,

public meetings and tailored briefing sessions for local elected public representatives and community and business/industry groups. To date campaigns have been held in counties Sligo, Carlow, Tipperary, Waterford, Galway and Kerry.

Developing a National Radon Strategy for Ireland

The Inter-Agency Group, tasked with developing a National Radon Strategy for Ireland, has met three times since it was established in November 2011. It is chaired by the Department of Environment, Community and Local Government, and comprises representatives of four Departments (Department of Environment, Community and Local Government, Department of Health and Children, Department of Jobs, Enterprise and Innovation and the Department of Communications, Energy and Natural Resources) and six Agencies (the Radiological Protection institute of Ireland, the Health Services Executive, the Health and Safety Authority, Sustainable Energy Authority of Ireland, the City and County Managers Association and the Geological Survey of Ireland).

The Work Programme for the Group is organised in terms of a series of work packages, listed below. These work packages will be undertaken by working groups (WG) drawn from the membership of the Inter-Agency Group and including, where appropriate, external experts. Stakeholder consultation is key to the process and feeds into the deliberations of each WG.

The Inter-Agency Group is to present an interim report to the Minister by November 2012. The Group intends putting a draft radon control strategy for

public consultation early in 2013 with a view to making a recommendation to Government by November 2013.

No.	Work package
1.1	Radon prevention in new buildings
1.2	Increasing the rate of radon testing through the use of administrative/ legal measures such as conveyancing
1.3	Increasing the rate of radon testing and remediation through the provision of public information
1.4	Competence of remediation contractors
1.5	Competence of radon measurement services
1.6	Radon in workplaces

Summary

The RPII has for many years advocated that a cohesive Government led strategy is a cost effective long-term solution to the radon problem in Ireland. It is indeed welcome that such a strategy is now under development. Radon will remain a central part of the work of the RPII and the RPII will therefore continue to work with other state agencies and stakeholder to develop of a national radon strategy.

Development and dissemination of ALARA culture

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Introduction

ALARA culture is at the heart of radiation protection culture and is based on the hypothesis of a linear dose-effect relationship without a threshold for

stochastic effects. It should result in attitudes and behaviours of individuals and organisations, which are always committed to searching for an acceptable level of risk taking into account societal and economic factors.

The need to further develop and disseminate ALARA culture comes at a time when there is an increase of the awareness of risk, a constant development of scientific knowledge about radiation health effects [1], the introduction of new exposure situations, and an increase in the number of applications of ionising radiations.

The ALARA principle

Justification of radiation exposures, optimisation of radiation protection and application of individual dose limits are the three radiation protection principles, as adopted for the first time in ICRP publication 26 [2] and incorporated in the subsequent Commission's recommendations [3, 4]. Publication 103 states that optimisation of protection is the process by which "*the likelihood of incurring exposures, the number of people exposed, as well as the magnitude of their individual doses should be kept As Low As Reasonably Achievable taking into account economic and societal factors*"[4].

The principle of optimisation of radiation protection is a direct consequence of the adoption of the linear dose-effect relationship with no threshold for "stochastic effects". It resulted in a search for risk reduction whatever the level of exposure. The wording of the ALARA principle has evolved through the various ICRP publications, integrating the question of how far the risk should be reduced. At the beginning, the

Commission proposed a radiation protection philosophy based on a minimum or even zero level of risk. This philosophy was expressed as a recommendation to "reduce doses to the lowest possible level" [5]. In 1959 the initial wording changed [6] to "as low as practicable" and in 1966 to "as low as readily achievable economic and social considerations being taken into account" [7]. In its 1990 Recommendations [3], ICRP introduced the current wording of the optimisation principle, known as the "ALARA" principle - As Low as Reasonably Achievable. The acronym "ALARA" has been used for more than 20 years by radiation protection professionals. It is considered that the two expressions - optimisation of radiation protection and ALARA - are synonymous and interchangeable [8].

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 an obligation of means, and not an obligation of results, in the sense that the result of ALARA depends on processes, procedures, and judgments and is not a given value of exposure. The acceptable level of exposure depends on the exposure situation as well as the societal and economic considerations.

According to ICRP 101 [9], optimisation is a frame of mind, always questioning whether the best has been done in the prevailing circumstances. It requires a forward-looking iterative process aimed at preventing exposures before they occur. It is continuous, taking into account feedback experience as well as technical and socio-economic developments. It requires both qualitative and quantitative judgments.

Why think about "ALARA culture"?

The European ALARA Network (EAN) has been discussing the issue of "ALARA culture" for a long time. A definition was proposed during the 10th EAN Workshop (Prague 2006) as follows [10]:

"ALARA culture is a reference framework, a state of mind and attitude

- *Allowing an individual and/or an organisation to act in a responsible way in order to manage radiation risks and giving radiation protection the priority it should have;*
- *Characterised by risk awareness, balanced judgement of risks and benefit, and the capability to develop and use required skills and tools for risk assessment and management, balance of resources and economic and societal considerations;*
- *Realized through transdisciplinary education and training tailored at each level;*
- *Supported by management commitment, guidance and supervision of competent authorities on European and national level;*
- *Making use of a clear definition of responsibilities.*

It should have a continuous character covering all processes where radiation protection is involved. It should have full support of authorities and professional organisations while systematically integrated in continuous quality improvement".

At the IRPA 12 Associate Societies Forum held in Buenos Aires in October 2008 [11], an IRPA working group on "Improvement of the Radiation Protection Culture" was launched with the aim of preparing IRPA Guiding Principles on that topic. EAN gave its support to the work of IRPA, focusing on the contribution of ALARA to radiation protection culture. A dedicated

EAN working group on ALARA Culture¹ was then set up to maintain and further develop a high level of radiation protection by:

- Promoting ALARA culture in all fields of application,
- Implementing the ALARA principle into practice, and
- Analysing feedback from implementing ALARA in various sectors.

This paper presents a synthesis of the main elements contributing to the dissemination and development of ALARA culture.

Some elements of ALARA culture

Many elements contribute to a good ALARA culture. Some examples are presented below.

Attitudes and behaviour

Fundamental elements of the ALARA culture are the attitudes and behaviour of the relevant persons towards radiological risk, which are influenced by different cultural backgrounds, personal opinions, existing economic and social conditions or exposure situations. This can explain the differences observed in the degree of implementation of ALARA between different exposure situations or, even within a same type of exposure situation, between individuals, organisations and countries.

Positive attitudes towards radiological risk should include at the individual

¹ Members of the EAN Working Group on ALARA culture are the following: S. Economides (GAEC, Greece), J. Gemmill & A. Wright (SEPA, UK), F. Hardeman & F. Vermeersch (SCK•CEN, Belgium), C. Nuccetelli & S. Risica (ISS, Italy), C. Schieber (CEPN, France), A. Schmitt-Hannig (BfS, Germany)

and/or organisational level:

- A questioning attitude (e.g. did I do what I could to save doses? is the management committed to the introduction of new technologies to save doses or prevent accidents?, etc.);
- Openness and transparency (e.g. open to changing habits, reporting mishaps, explaining radiation protection options, etc.);
- Commitment to dose reduction (e.g. appropriate individual behaviour in the presence of radiation sources, willingness to invest in protection measures, etc.).

Radiation risk awareness

Risk awareness is the basis of ALARA culture. There is thus a need to reach a common understanding of radiation risk among all the stakeholders involved in the exposure situations.

The degree or level of knowledge has to be adapted to the situation, the level of responsibility, the required competences in radiation protection, etc. Therefore, various methods of raising risk awareness may be appropriate: education, training, continuous professional development, communication and information.

Stakeholders' engagement and participation

The efficiency of an ALARA-oriented radiation protection system strongly depends on the engagement and the participation of the stakeholders involved. Different categories of stakeholders can be identified whose main roles and responsibilities in the ALARA process are the following.

Competent authorities are responsible for introducing special optimisation provisions in national legislation

according to international safety standards (IAEA, EC). Moreover, they should establish and apply appropriate methodologies for the verification of ALARA implementation and to issue recommendations and take enforcement actions if required. They set the regulatory objectives for ALARA. Regarding the relationship with the public, they should not only provide transparent information, but also facilitate public involvement in the decision making processes.

Licensees have to show their commitment to ALARA through an adequate organisation, facilitating implementation of the ALARA process, allocating necessary resources, providing training at all levels of the organisation (from senior management to shop floor). They should establish and implement an effective radiation protection management system. Clear management support must exist to translate the regulatory objectives into reality. Therefore, distribution of responsibilities is fundamental for the effective implementation of ALARA. People involved should be well aware of their role and duties and act accordingly.

Manufacturers, suppliers and designers need to ensure that the design and construction of facilities, equipments or sources are based, not only on requirements and limitations introduced by national legislations, but also on considerations about optimisation of radiation protection for their full life cycle (installation, operation, dismantling).

Radiation protection professionals are responsible for the design, establishment, implementation and surveillance of radiation protection systems which are ALARA-oriented. They have a major role in stimulating and supporting ALARA

attitudes and initiatives. Moreover, they should register possible non-compliances, propose corrective actions or improvements and evaluate related results. These non-compliances should be appropriately turned into lessons learnt.

Professional associations have a role in the dissemination of ALARA culture among their members, for example by providing a forum for exchange of experiences, elaborating radiation protection guidance or protocols specific to their field of activities, etc.

Exposed workers are responsible for properly applying the established ALARA procedures after having received the appropriate training. They should have an attitude towards dose reductions for themselves as well as their colleagues. They should not only follow given guidelines and protocols but also identify and report possible problems, as well as applying the required corrective measures. They should participate in the continuous improvement of radiation protection providing practical feedback.

The public should be allowed to take a proactive role in decision making regarding their protection against ionising radiation. While consultation processes are already implemented in several countries, this approach needs to be applied more often. This will lead to clearer decisions agreed by the public. Therefore, initiatives should be further developed to facilitate an improvement of risk awareness and the radiation protection knowledge of the public.

Challenges related to ALARA culture

Depending on the exposure situation, the current status of ALARA culture varies

significantly:

- In the *nuclear industry*, ALARA has been applied for more than 20 years, resulting in a significant reduction of occupational collective doses. However, the ageing of existing installations, and a large-scale retirement of nuclear workers requires a new focus on maintaining and expanding ALARA culture. In parallel, new nuclear installations (nuclear waste disposal, nuclear power plants, research reactors, etc.) will be built in the near future, requiring the introduction of ALARA at an early design stage, and decommissioning activities will increase in parallel.
- In the *NORM industry*, there has been a continued increase in radiation risk awareness, and elements of ALARA culture have been introduced. The new regulations in this sector (like the IAEA and EURATOM Basic Safety Standards at the final approval stage) will play an important role in this process.
- Regarding the *medical sector*, occupational and patient exposures have to be considered, taking into account benefits and risks for the patient. An increasing awareness of the importance of radiation protection is observed within the medical profession [12]. However, efforts still have to be made to disseminate ALARA culture more widely, as a huge increase in the use of radiation for medical purposes has been seen in many countries.
- For *existing exposure situations*, like radon in dwellings or phosphogypsum landfills, the practical implementation of optimisation of radiation protection is relatively complex. It needs the

involvement of new stakeholders for which the first step is to be informed about radiation risk and ALARA philosophy.

- In *emergency exposure situations*, according to ICRP, optimisation of protection also applies for public and worker exposures. However, due to the complexity that arises in emergency situations, ICRP recently recommended [13] that optimisation should be integrated into the planning stage of protection strategies as well as during the implementation of emergency response.

Role of networks in the dissemination of ALARA culture

Several actors, addressing various stakeholder groups, play a valuable role in the dissemination of elements of ALARA culture; like regulators, education and training organisations, professional organisations, networks, etc. They use a variety of tools, such as symposia, workshops, publications, research projects, web sites, discussion forums, etc.

Several types of network involved in or connected to radiation protection exist, at national, or international levels, like professional societies (e.g. medical physicists, industrial radiographers, radiation protection professionals, etc.) or associations/NGO (e.g. patients, public, environmental associations, etc.). They group together various stakeholders and competences, with the same objectives.

The value of these networks for ALARA culture dissemination is to provide a platform to exchange views and experience and to create relationships. They can also contribute to creating knowledge, providing education and training, and identifying and harmonising

good practices.

In particular, the European ALARA Network (EAN), as well as related ALARA networks, such as the European Medical ALARA Network (EMAN) and the EAN NORM net contribute to the development and dissemination of ALARA culture.

Conclusions

The continuous technological developments in ionising radiation applications and the increasing number of exposure situations highlight the need for further actions to develop and disseminate ALARA culture. At the same time, the number of radiation protection specialists with relevant knowledge and experience is decreasing due to retirement.

Therefore, there is a need to re-establish the elements that constitute ALARA culture (exposure situations, attitudes, responsibilities, etc.) in order to facilitate its practical implementation. That's why the elements presented in this paper will be further elaborated by the EAN working group on ALARA culture in a publication under preparation on "Optimisation of radiation protection (ALARA): a practical guidebook" [14].

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The IAEA/ ILO International Action Plan on Occupational Exposure (IAPORP) (2004/2011)

Christian Lefaure - IAPORP rapporteur, Jizeng Ma - IAEA, Shengli Niu (ILO)

Some findings and recommendations from the Geneva Conference (2002)

In August 2002, the IAEA/ILO Geneva international conference on occupational exposures main findings (*recommendations*) were that:

- Standards were generally satisfactory as a control framework in most countries (*To avoid unnecessary changes, but to harmonise terminologies*)
- The situation with regard to occupational exposures in the Nuclear Sector was satisfactory, making use of ALARA networking such as ISOE. The situation was not so obvious in medicine, and industry; in particular, special attention had to be paid to interventional radiology, industrial radiography and NORM (*To establish similar systems in other domains; To enable all workers to fully participate as stakeholders to radiation protection through information and training packages; To make available analyses and lessons learned from accidents in industry; To propose detailed practical guidance for graded approaches to control occupational radiation protection in NORM industries*)
- Radiation protection was quite often apart from the general health and safety system for workers (to better

integrate them and to develop guidance on application of probability of causation schemes)

In order to facilitate the improvement of the situation, the Conference requested IAEA and ILO to set up an International Action Plan on Occupational Exposure (IAPORP)



The IAPORP main results

IAPORP started in 2004 and ran up to 2011, under the supervision of a Steering Committee comprising representatives of the World regions, other international organisations (WHO, UNSCEAR, NEA, EC, etc.) and other stakeholders. Most of the initial objectives from the Geneva conference have been successfully addressed. Many **guidance documents** are now available (see **Table 1** below).

During the same period **training packages** have been made available for NORM as a whole (2010) and for oil and gas industry workers (2010), a handbook for workers and worker trainers will be published as well as a manual for occupational radiation protection in hospitals. Finally seven posters for target groups of workers have been available since 2011; they deal with:

Industrial radiography	Industrial irradiators
Nuclear gauges	Radioactive tracers
Diagnostic radiology	Nuclear medicine
Radiotherapy	

All these guidance documents, training packages, and posters are accessible and downloadable through the IAEA/ ORPNET website (<http://www-ns.iaea.org/tech-areas/communication-networks/norp/default.asp>)

Three regional **ALARA networks** have been set up by the IAEA:

- In 2005 RECAN (*Eastern and Central Europe countries*);
- In 2007 ARAN (*Asian and Pacific countries*) and
- In 2011 REPROLAM (*Latin American Countries*).

They have organised annual topical workshops and they all intend now to become self-sustainable as NGOs.

Following the example of ISOE, the **ISEMIR** (see the article in that newsletter) system has been set up by the Agency in 2009, it has so far worked on 2 topics: interventional cardiology and industrial radiography. After having set the scene of the practices all over the world through surveys, ISEMIR is now developing an international database on doses and practices.

Finally the IAEA has set up in 2010 **ORPNET** (Occupational radiation protection networks) website as a tool for:

- Introducing each existing (ALARA) network (regional, topical, worldwide, etc.) and creating links between all of them; advertising for their main events, and allowing web searches in all networks websites
- Supporting ISEMIR web-pages
- Providing ALARA material both from IAPORP (posters) or ad hoc consultancies (FAQ on ALARA).

Most of the previous actions are now included into the regular activities of the

IAEA and ILO; the updated guidance for workers protection have been included into the new BSS supported by all the relevant International Organisations. The work on a global approach to occupational risks is still on-going with ILO, IAEA and WHO as core members.

IAPORP has been an excellent opportunity for demonstrating that an efficient cooperation between international organisations is possible.

The situation has widely evolved since 2002 (new ICRP recommendations, new BSS), and new problems (new

technologies in medicine, new stakeholders in radiological protection, NORM, decommissioning of plants, increase role of itinerant workers, post Fukushima) have emerged and there is a room a decade later for a new international conference.

More information on the follow up actions can be asked to Jizeng Ma at IAEA (MA@IAEA.ORG) or Shengli Niu at ILO (niu@ilo.org) and on the ORPNET/IAEA website

NORM	IAEA Safety Report (SR) 49 (2006)	"Assessing the need for radiation protection measures in work involving minerals and raw materials"
	IAEA SR n°34 (2006)	Oil and gas industry
	IAEA SR n°51 (2007)	Zircon and Zirconia industries
	IAEA SR n°68 (2011)	Rare earth industry
	To be published	Phosphate industry
Doses monitoring, workers protection	Safety Guide RS-G-1.6 2004	"Occupational radiation protection in the mining and processing of raw material"
	Many Practical Radiation Technical Manuals	"Workplace monitoring", "Individual monitoring", "Personal protective equipment", "Health effects and medical surveillance"
	ILO (2008 to 2010) notes	"General observation concerning convention 115" and "roles and activities of ILO concerning radiation protection of workers"
Doses to embryo and foetus	To be published	
Probability of causation	Occupational safety and health Series 73 ILO 2011	"Approaches to attribution of detrimental health effects to occupational radiation exposure and their application in compensation programmes for cancer"

Table 1. Guidance documents available

FAQ ALARA

On the ORPNET webpage, IAEA proposes a list of frequently asked questions (FAQs) which intends to provide information to radiation protection specialists so that they can answer quickly and correctly the most frequently asked questions. The ALARA Newsletter proposes in each issue a selection of these FAQs

Is it worthwhile to implement ALARA for the workers exposed to radon and for those working in NORM industries?

Yes, according to ICRP 103 and the new BSS it is clear that ALARA should be applied to all these workers in the same manner as for the other workers from the nuclear, medical and research areas.

Reference:<http://www-ns.iaea.org/tech-areas/communication-networks/norp/faq.asp?fq=28>

ALARA NEWS

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www.eu-alara.net

MEDRAPET (*John Damilakis for the MEDRAPET Consortium*)

The EC-funded project MEDRAPET (MEDical RAdiation Protection Education and Training, MEDRAPET) was initiated to assess the implementation of the Medical Exposure Directive provisions related to radiation protection education

and training of medical professionals in the EU Member States. The main task of the project is the development of the new guidelines on education and training in radiation protection for medical exposures.

MEDRAPET



Medical Radiation Protection
EDUCATION AND TRAINING

The professional organizations involved include the European Society of Radiology (ESR), the European Federation of Organizations for Medical Physics (EFOMP), the European Federation of Radiographer Societies (EFRS), the European Society for Therapeutic Radiology and Oncology (ESTRO), the European Association of Nuclear Medicine (EANM) and the Cardiovascular and Interventional Radiological Society of Europe (CIRSE).

As part of the MEDRAPET project, an EU-wide study has been conducted in order to establish the status, legal and practical arrangements in the European member states regarding radiation protection education and training of medical professionals. The results of this study were discussed during a workshop organized in Athens, Greece from 21 to 23 of April, 2012. The conclusions of the workshop have lead into the elaboration of a European guidance document on

radiation protection education and training of medical professionals, which will be available after the end of the project in 2013 on www.medrapet.eu.

Through workshop discussions it became obvious that education and training in medical radiation protection is of great importance for all health professionals working with ionizing radiation. High-standard training courses harmonized at EU level are needed to develop methods for dose optimization. Interventional societies should develop curricula and offer dedicated training in radiation protection for fluoroscopically-guided procedures. A European body for accreditation in medical radiation protection is needed for evaluation and accreditation of courses. All stakeholders in radiation protection should ensure that proper education and training are in place, in particular with regard to new technologies and complex medical exposure procedures.

With 108 participants from 29 different countries, fruitful discussions and contributions, the workshop can be counted as a starting-point of a sustainable collaboration in the area of Radiation Protection Education and Training (<http://www.medrapet.eu/workshop-presentations2.html>).

Detailed information about MEDRAPET can be found at the project website: www.medrapet.eu. MEDRAPET is financially supported by the European Commission.

Publication from CSN (Spain) of primary and secondary education guides on radiation and radiation protection

http://www.csn.es/images/stories/publicaciones/otras_publicaciones/guia_radia_web.pdf

http://www.csn.es/images/stories/publicaciones/otras_publicaciones/guia_didactica_primaria.pdf

The 20 EUROPEAN ALARA NETWORK Contact Persons



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