NEWSLETTER

50th ISSUE • NOVEMBER 2023

EDITORIAL

Dear Readers,

This is the latest issue of the European ALARA newsletter, and it carries the number 50. Such a long way since issue number 1 (July 1996)!

The EAN was initially established by the European Commission to further topics of research dealing with the optimization of radiation protection for exposure in industry and research and to facilitate the dissemination of good practices in ALARA. The bi-annual Newsletter was one of the key outputs of the network, along with the annual themed workshop.
In June 2005, the EAN became a self-sustainable network, operating under unanimously agreed Terms and Conditions. In 2010, the first Strategic Agenda was introduced to describe the expected work of the EAN for the years to come taking into account the (future) challenges in the implementation of ALARA.

But what was the content of the EAN newsletter issue 1? *Managing the radiation risk, ALARA principle an obligation, a state of mind* by Jacques Lochard and Christian. Lefaure remains very much relevant. Of course, the European Directive and national regulation have changed but the concepts underpinning ALARA (science, ethics), the process (the importance of preparation, follow-up and feedback of experience) and its application (merely common sense!) haven't aged a day.

In *Dose distribution in Germany and the UK*, John Croft and Anne-Marie Schmitt-Hannig compared the dose distribution of the occupationally exposed workforce of the two countries and explained the major trends following the introduction of ALARA and the work of RP experts and regulators. Exposure in the NORM industry was not mentioned at all (regulatory requirements were introduced later) whilst radiological inventory, characterization and dose estimation for workers and the public from NORM industries in Italy is the topic of the article from Gennaro Venoso and Cristina Nuccetelli on **p. 8** of this issue.

The last article *ALARA in practice: a regulator perspective from Sweden* from Thommy Godås was focused on the ALARA requirements for the Swedish nuclear industry and how the regulator can play a role in dose reduction after a situation with high collective dose – and this text find echoes in the actions undertaken by the same regulator in Kinsarvick, a high radon area which are presented on **p. 3** by Ingvild Finne et al.

So, whatever the period, the ALARA process remain a matter of science, ethics, of well-balanced procedures to seek compromise in the reduction of the exposure, that must be shared by the authorities/regulators and all the concerned persons. This is why the EAN newsletter must continue to disseminate results of ALARA in different fields, and share good practices and recommendations from workshops. On this regard, you can see the recommendations from EAN's 20th Workshop on **p 12.**

One topic that could not have been presented in issue 1 is the work of peer networks. There has been an expansion in the number of networks since the inception of the EAN and we are very happy to host contributions from the Asian and the Pacific Regional ALARA network (ARAN, rebooted in 2021) on its activities (**p. 16** by Qinjian Cao et al.), as well as feedback from the last workshop hosted by the Platform on European Training and Education in Radiation Protection (EUTERP, created in 2006) on **p. 18**

The EAN Newsletter will continue to give visibility to the activities of the other networks with an interest in radiation protection.

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Kinsarvik, a high radon area. Current perspective and situation

INGVILD FINNE[1], ANNE LIV RUDJORD[1], BÅRD OLSEN[1], MARIA LARSSON[1], OLA FREDIN[2], JAN HØST[3], REGINALD HERMANS[2,3] AND JAN STEINAR RØNNING[2,3]

[1] Norwegian Radiation and Nuclear Safety Authority, DSA
[2] Norwegian University of Science and Technology
[3] The Geological Survey of Norway

Introduction

"*In 1988, very high levels of radon were detected in a kindergarten in Kinsarvik, a village by the Hardanger Fjord at the west coast of Norway. In 1996-97, an extensive radon measurement and mitigation project was carried out. The radon measurement results revealed that most buildings in this area had very high or extremely high radon concentrations.*"

The exact same introduction as above was used in this newsletter in 2013 (Rudjord et al., 2013). The article pointed out that very high radon concentrations, with annual radon concentrations up to 56,000 Bq/m^3 and overall annual mean of several thousands (4,340 Bq/m^3), were found in the residential area of about 100 dwellings (Sundal et al. 2007). A new measurement campaign was performed in 2011–2012 and 41 dwellings were measured. The highest radon concentration was 16,633 Bq/m^3 and the mean radon concentration was 2,822 Bq/m^3. Hence, the mean radon concentration was still exceptionally high.
Even the outdoor radon concentrations are exceptionally high and could exceed an annual average of 200 Bq/m^3, which is equal to the current national reference level for indoor radon concentrations (Jensen et al, 2006).

Extreme and unusual seasonal variations in the residential area of Kinsarvik was described in the 2013 EAN article (Rudjord, 2013) and in the referenced literature (Sundal et al. 2007). Normally, radon concentrations in dwellings are highest in the cold winter season. In Kinsarvik, the radon concentrations are highest in summer in the lower part of the residential area, and highest in winter in the upper part. This is due to thermal convection of radon-rich air in the highly permeable masses.

Figure 1 – Kinsarvik (Photo: DSA).

Figure 2 – Overview map of parts of the southern Norway (https://www.norgeskart.no)

A new geological understanding

Since the EAN Newsletter in 2013, the Geological Survey of Norway (NGU) has done extensive and thorough work in Kinsarvik. The previously established geological model of the Kinsarvik area did not seem to be entirely correct and contrasted several new observations, and it could not explain the extremely high radon concentrations. The established geological understanding classified the Kinsarvik deposits to be an ice-marginal moraine (Holtedal 1975, Sundal et al. 2004, 2007). This type of deposit, glacial till, is typically characterized by a large proportion of fine-grained material (silt and clay). It is thus a non-permeable sediment not allowing significant flow of radon rich air. Contrary, NGU suspected that the fan like deposit where Kinsarvik resides, together with the large angular boulders at the surface (figure 3) and other characteristics of the deposit originated from a post glacial rock avalanche. Hence, a project, partly sponsored by DSA, was initiated to find a better geological understanding of the area (Rønning et al. 2023).

Figure 3 – Angular boulder (Photo: DSA)

To better understand the Kinsarvik terrain, NGU carried out airborne and ground gamma ray spectrometry, LIDAR data studies (Light detection and ranging) of surface geomorphology, description of internal structures in an exposure of the hummocky deposit (figure 4), terrestrial cosmogenic nuclide (TCN) dating and, finally, modelling of the size of the deposit.

Figure 4 – Studies of internal structures in an exposure of the hummocky deposit. (Photo: DSA)

The airborne gamma ray spectrometry showed low uranium concentration in the south-west and higher uranium concentration in the north-east of Kinsarvik. The average uranium content of the earth´s crust is 2.8 ppm. In the north-east of Kinsarvik airborne gamma ray spectrometry showed 3 to 12 ppm. This can be looked at as apparent ground concentration from the ca. 180 m × 200 m footprint of the measurements. However, using detailed ground gamma ray spectrometry, uranium concentrations up to 41.2 ppm was found in the surrounding in granitic rocks. Furthermore, the same granite rocks are found in the open section of the deposit (figure 4). The rock matrix as well as granitic clasts exhibit increased uranium content and may be a source for increased radon concentration in the soil air. The fan-like, deposit in Kinsarvik shows several morphological and sedimentological characteristics of a rock avalanche deposit such as a hummocky surface made up of large angular boulder, an inverse grading in natural cuts and characteristic jigsaw breccia. Hence, the updated geological understanding is that the radon problem in Kinsarvik is caused by uranium bearing bedrock that is crushed down to a porous rock-avalanche deposit that emanates radon (figure 5). The rock-avalanche fell 10,900 ± 600 years ago, immediately after the local deglaciation at this part of Norway.

The geological knowledge acquired from the investigations in Kinsarvik may prove to be important in finding areas with very high radon concentrations elsewhere, both nationally and internationally. We already know about Umhausen in Austria which has observations that matches well with those observations in Kinsarvik (Ennemoser et al. 1994, Purtscheller et al. 1995) NGU will carry out investigations to see if more such areas can be found in Norway, and hopefully scientists in other regions and countries will be able to make use of the new understandings provided by the study at Kinsarvik. In short, rock avalanche deposits in bedrock terrain characterized by Uranium rich bedrock might cause high radon concentrations.

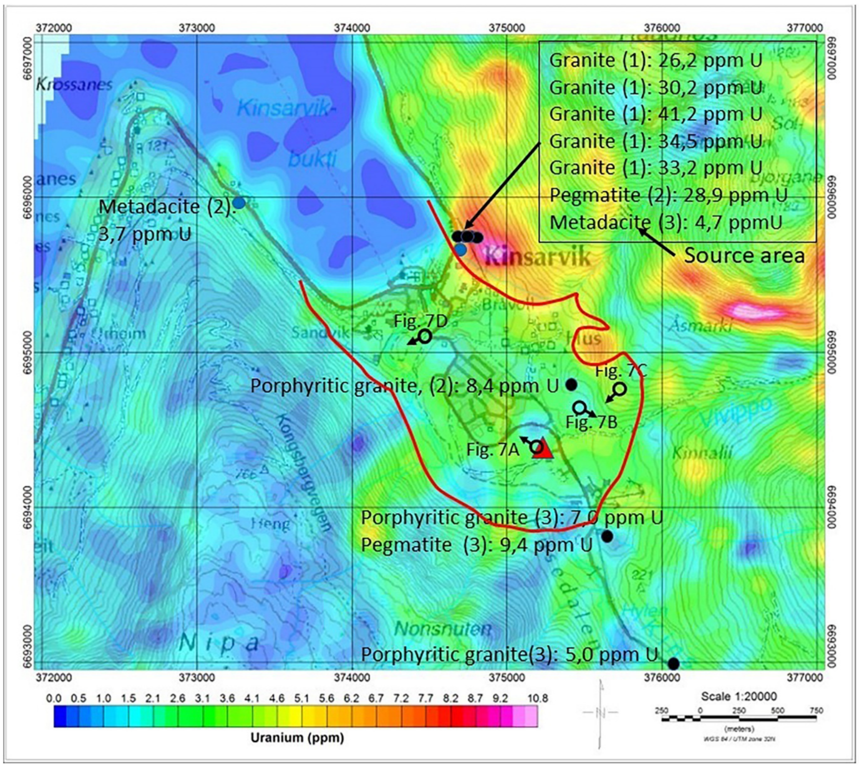

Figure 5 – Surface apparent uranium concentrations from helicopter-borne measurements and ground-based gamma-ray spectroscopy. The source area of the rock avalanche is marked with arrow "Source area", and the rock avalanche deposit is delineated with a red line. Figure is from Rønning et al. (2023).

New and effective regulations enforced by the municipality administration

In 2009 DSA published new national recommendations for radon. All buildings should have radon levels as low as reasonably achievable and within recommended limits, with an action level of 100 Bq/m³ (annual average) and a maximum level of 200 Bq/m³ (annual average). The same year, the Norwegian government adopted the national strategy for reducing radon exposure (2009-2020). The strategic goal of achieving ALARA is supplemented with legally binding limits where appropriate, such that authorities have a basis for enforcement and compliance. In 2014, as a direct result of the work with the radon strategy, new national radiation protection regulations came into force in Norway. The regulations lay down requirements for radon levels in schools, kindergartens and rental accommodations. The legally binding radon limits are in line with the recommendations, 100 Bq/m³ (action level) and 200 Bq/m³ (maximum level).

Kinsarvik is a part of Ullensvang municipality, and the local administration has in accordance with current national regulations been following up on the radon problem by measuring and mitigating the local school, homes owned by the municipality (for elderly people and others) and workplaces for municipal employees. In some cases, it has been challenging for the municipal administration to reduce the radon concentrations in accordance with the new regulations. For the kindergarten in Kinsarvik, where the high radon concentrations were initially discovered, mitigating the old premises turned out to be too complicated and expensive. It had to be replaced with a new kindergarten. The new kindergarten is built in the same area, but in accordance with new building requirements (see section on new construction below) and with special attention on radon, e.g. where to place the inlets of fresh air. The indoor radon concentrations in the new kindergarten are now according to the regulations.

Challenges in existing housing

The national regulations on radon do not apply to existing private homes. It is the owner's responsibility to measure and mitigate in private homes according to the national recommendations.

The local administration of Ullensvang offers discounted measurements to the inhabitants provided they get access to the results. In this way, the municipality administration gets a certain overview of the problem. Measurements show that there are still homes with high radon concentrations in Kinsarvik, but it can be difficult to get satisfactory results from mitigation. Most of the homes are built in the period 1970 to 1990. Typical for homes built in this period is that the foundations are not airtight. Further, many houses have poor ventilation or mechanical exhaust ventilation. The mechanical exhaust ventilation does, by expelling polluted air, create a negative pressure, which in turn forces even more soil air into the home. There are cases where, after several different mitigation measures and a reduction of e.g. 80%, the radon concentration is still above 1,000 Bq/m³. Stories like this might demotivate homeowners in the area.

However, over time, the municipal administration has built up a lot of expertise and experience with radon work, which they also share with other neighbouring municipalities.

Radon concentrations in newly built homes

Despite the major radon challenges in Kinsarvik, several new homes have recently been built in the area. In 2010, mandatory preventive measures in new buildings were introduced in the national technical building regulations. The specific radon prevention measures are usually a radon membrane over the entire base area of the building in combination with a passive sump system. The action level is 100 Bq/m³ and the upper limit value given in the regulation is 200 Bq/m³. Hence, buildings shall be constructed in a way that ensures that the flow of radon into the building is minimised, and the resulting concentration shall not exceed the upper limit (200 Bq/m³). If the radon concentration exceeds the action limit (100 Bq/m³), the pre-installed radon sump shall be activated (i.e. by an electric fan). In addition to membrane and radon sump system, a mechanically balanced ventilation system is installed in all new buildings. The balanced system ensures that the same amount of fresh air will be supplied to the building as polluted air expelled. This ensures that a negative pressure will not form in the home, which in turn prevents radon-containing soil air being drawn in from the ground.

At national level, a survey conducted in 2016 (Finne et al. 2018) showed that the new regulations has led to new homes having an average 40% lower radon concentration than new homes had before the regulations. Furthermore, the proportion of new detached houses with radon concentrations above 200 and 100 Bq/m³ have dropped from 23.9% and 7.6% to 6.4% and 2.5%, respectively. It was clear that the regulations were effective. However, it was also necessary to examine the effect of the regulations in particularly high radon areas.

In 2008 and 2020 DSA carried out a focused survey of radon concentration in new homes in areas particularly exposed to radon (Haanes et al. 2022), including Ullensvang municipality where Kinsarvik is situated. In the 2008 survey, the three participating Kinsarvik homes ranged from 110 to 420 Bq/m³, while 10 homes in the 2020 survey ranged from 30 to 190 Bq/m³. Hence, all the new homes in Kinsarvik in the 2020-survey had radon concentrations below the upper limit, as well as the rest of the participating new homes in Ullensvang municipality (10 houses).
The Ullensvang local administration has given special attention to the new built process in Kinsarvik by giving the homeowner guidance on the preventive measures and also paying attention to placement of the fresh air inlet. The local administration has also demanded radon concentration measurements before the completion certificate for the house has been issued. This is probably the reason for acceptable radon concentrations in new houses in Kinsarvik, despite the potential for very high radon concentrations being present. Nevertheless, there is reason to believe that due to the potential for very high radon concentrations in the area, the homeowner should follow up with new measurements regularly.

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Radiological protection in NORM involving industries using a graded approach: a methodology proposed from Italy

GENNARO VENOSO AND CRISTINA NUCCETELLI

Istituto Superiore di Sanità (Italian National Institute of Health), National Center for Radiation Protection and Computational Physics, Rome, ITALY

On behalf of all the partners of the Italian Research Project "Aspetti operativi e metodologici per la valutazione dell'impatto radiologico per alcuni settori industriali NORM": R. Trevisi, M. Ampollini, A. Bogi, S. Bucci, E. Caldognetto, G. La Verde, F. Leonardi, L. Luzzi, I. Peroni, F. Picciolo, G. Pratesi, F. Trotti, R. Ugolini, M. Pugliese. Project was funded by INAIL - National Institute for Insurance against Accidents at Work.*

Introduction

The implementation of the European Council Directive 59/2013/Euratom (EU BSS) in all Member States requires new obligations for NORM involving industries and extends the field of application to industrial sectors never involved before.

The "graded approach" required by EU BSS has been transposed in Italian legislation with ad hoc provisions regarding, for example, the exemption and clearance criteria and classification of NORM residues (ALARA Newsletter N.46). In order to provide tools for stakeholders to comply with these new legal requirements, a research project (Trevisi et al. 2023) was conducted addressing three main topics:

- The national NORM inventory;
- The radiological characterization of different phases of the industrial processes;
- Dose estimation for workers and members of public.

NORM inventory

In recent years, several international organizations (UNSCEAR[1] and IAEA[2]) have carried out surveys and projects focused on the public and occupational radiation exposure from ionizing radiation sources, including NORM. Moreover, in the framework of the European project RadoNorm (https://www.radonorm.eu/), which involves 57 institutions from 22 European countries, several activities have been carried out to obtain a comprehensive overview of existing NORM sites and their characteristics at the European level (Popic et al. 2023, Mrdakovic et al. 2023, Michalik et al. 2023). In this context, an Italian NORM inventory has been launched to identify active industrial sectors, and relevant secondary processes, starting from the list of industrial sectors given in the Italian regulation. With this objective, information about number of operating NORM involving industries in Italy, their characteristics and distribution at regional and national level, and basic information about the radioactivity content of raw materials and residues were collected. Preliminary results are given in Table 1. This survey updated a previous one performed in 2014 (Cappai M et al. 2014). Until now, the sectors with the higher numbers of plants have been the zircon sand industry (with a total of 207 plants) and oil and gas production (228 plants). Moreover, it was found that there are no active industries in several sectors currently present in the list of the Italian legislation, such as extraction of rare earths from monazite and extraction of tin, lead and copper.

[1] United Nations Scientific Committee on the Effects of Atomic Radiation. UNSCEAR's Global Survey of Radiation Exposure. https://www.survey.unscear.org/doku.php.

[2] IAEA ENVIRONET- IAEA Network of Environmental Management and Remediation. https://nucleus.iaea.org/sites/connect/environetpublic/SitePages/Home.aspx

Table 1. – Results of the 2022 inventory about industries involving NORM in Italy.

Industrial Sector	N. of plants
Cement production	
Integral cycle	32
Grinding	22
Geothermal energy production:	
High and medium enthalpy	34
Zircon sands industry:	
Tiles prod.	131
Refractories prod.	31
Sanitary ware prod.	30
Ceramic glazes and dyes prod.	15
Coal-fired power plants	6
Titanium dioxide production	1
Steel production:	
Integral cycle	1
Electric furnace	37
Oil & gas production:	
Oil production plants*	25
Gas production plants	193
Refinery	10
Aluminum production	1
Processing of phosphate and potassic ores	
Fertilizer production	22

*The total number of wells is 1581

Radiological characterization of the different phases of the industrial processes

For each industrial process, a methodology was developed to identify the NORM matrices of radiological concern, the radionuclides to be measured and the most suitable methods to measure them. The final goal is to verify the compliance of solid matrix activity concentrations with Exemption Levels in terms of kBq/kg (see ALARA Newsletter n°46).

For each industrial process, the methodology can be divided into four steps:

1. Identification of activities of potential radiological concern, according to the national legislation. In case the regulation indicates as a practice the entire industrial process, an in-depth study of the industrial process should be performed for identifying the most critical exposure situations.
2. Identification of the solid matrices of interest, i.e., raw materials, residues, and final products. Once identified all the matrices of interest, measurements of the relevant radionuclide activity concentration on the solid matrices are carried out (third step) using ad hoc analytical methods.
3. Radiological characterization of the matrices: in case of a raw material of natural origin, the secular equilibrium among radionuclides of the ^{238}U and ^{232}Th series can be expected. Otherwise, if the raw material has undergone previous industrial processes, the secular equilibrium of radionuclides is not guaranteed. Indeed, it is well known that the chemical/physical characteristics of the industrial processes can determine the disequilibrium of decay chains and influence the activity concentration of single radionuclides (see Table 2).
4. Finally, in the step 4, the results of measurements are compared with relevant ELs in terms of activity concentration, shown in Tables 3 and 4.

Table 2 – Solid matrices, analytical methods and radionuclides of interest for the radiological characterization of the NORM industrial sector.

	Solid matrix	Analytical method	Radionuclide
Raw material	Raw material of natural origin	Gamma spectrometry	^{40}K, series of ^{238}U and ^{232}Th
	Raw material from industrial process	Gamma spectrometry	^{40}K, segments of ^{238}U and ^{232}Th series
Residue	Dried Residue 1 (e.g from refractory industry)	Gamma spectrometry Alpha spectrometry	^{40}K, segments of ^{238}U and series ^{232}Th and ^{210}Po
	Dried Residue 2 (e.g., from cement production)	Gamma spectrometry	^{40}K, segments of ^{238}U and ^{232}Th series
	Wet residue (e.g., oil sludge)	Gamma spectrometry	^{40}K, segments of ^{238}U and ^{232}Th series

Table 3. General Exemption and Clearance Levels (ELs and CLs).

Natural radionuclides	**ELs** and **CLs**
Radionuclides from ^{238}U and ^{232}Th series in secular equilibrium - all radionuclides	1 kBq/kg
^{210}Pb and ^{210}Po (^{238}U and ^{232}Th series not in secular equilibrium)	5 kBq/kg
^{40}K	10 kBq/kg

Table 4. Specific ELs and CLs for particular material or residue destination.

Specific Situations	**Radionuclides**	**ELs**	**CLs**
Oil sludge	U-nat, ^{230}Th, ^{232}Th, ^{210}Pb, ^{210}Po	100 kBq/kg	100 kBq/kg
	^{228}Ra	10 kBq/kg	10 kBq/kg
	All radionuclides of ^{238}U/ ^{232}Th series	5 kBq/kg	5 kBq/kg
	^{40}K	50 kBq/kg	50 kBq/kg
Disposal in landfill or reuse in road construction	^{238}U/ ^{232}Th series		0.5 kBq/kg
	^{210}Pb and ^{210}Po		2.5 kBq/kg
	^{40}K		5 kBq/kg
Incineration			Dose assessment for members of the

Dose estimation for workers and members of public.

The scheme of calculation reported in RP 122 Part 2 [8], which remains a key reference of the operational radiation protection in the NORM sectors, was followed to assess the exposure of workers and members of the public. An important result of the project was the application of new Dose Coefficient factors (DCFs) published by ICRP, in particular for intake of workers (ICRP 137) and external exposure for all age classes (ICRP 144 plus personal communication). The updated DCFs did not result very different from ones used in RP 122 Part 2, but for some radionuclides contributing little to the dose (e.g., Pb-210). The same approach of calculation was also used to extend the dose assessment to other scenarios not reported in RP 122 Part 2, e.g., the TiO_2 production and the clinker furnace maintenance. In these scenarios the external irradiation contribution was calculated using the software MicroShield.

All these results will be soon available on *Physical Agents Portal (PAF)* [9], a website developed by two of the partners of the Italian project, i.e., the USL 7 Siena "Health Agency Prevention Department" and the National Institute for Insurance against Accidents at Work (INAIL). In particular, a section ("Dose calculator") will be provided containing a *form* accepting input data (e.g., activity concentrations of radionuclides/segments, exposure scenarios) and able to estimate, using RP 122 Part 2 formulas and approach, dose for workers and populations resulting from the use of NORM in all the relevant Italian industrial sectors.

Conclusions

Results of this project will support stakeholders – NORM involving industry employers, radiation protection experts, technical figures involved in the control phases and other possible actors – to apply the Italian radiation protection regulation. This in turn will hopefully develop a radiation protection culture also in the Italian industrial sectors not used to consider among the risks also the radiological ones. Finally, an effective application of the graded approach also to NORM sectors will lead to optimize the radiation protection making more straightforward the identification of situations with the higher exposure/risks, for which regulatory efforts have to be increased.

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ALARA in interventional radiology and nuclear medicine (new radiopharmaceuticals). A synthesis of the European ALARA Network workshop n°20

SYLVAIN ANDRESZ[1], **FRANZ KABRT**[2], **JULIE MORGAN**[3], **CAROLINE SCHIEBER**[1], **ECONOMIDES SOTIRIOS**[4], **NICOLAS STRITT**[5], **FERNAND VERMEERSCH**[6]

1 Nuclear Protection Evaluation Centre (CEPN), Fontenay-Aux-Roses FRANCE
2 Ministry of Health and Food Safety (AGES), AUSTRIA
3 United Kingdom Health Security Agency (UKHSA), UNITED KINGDOM.
4 Greek Atomic Energy Commission (EEAE), GREECE
5 Swiss Federal Office of Public Health (SFOPH), SWITZERLAND
6 Research Centre on Nuclear Energy (SCK CEN), BELGIUM.

Introduction

Context

In previous issues of the *European ALARA Newsletter* (EAN, 2022; García-Cañamaque *et al.* 2023), several questions and issues regarding radiation protection and notably the application of the optimization (ALARA) principle in interventional radiology (IR) and the development of new radiopharmaceuticals in nuclear medicine (NM) were put forward.

It was noted that diagnostic and therapeutic IR bring the potential for elevated exposure for both the patients and the medical staff, notably the hands and eyes of the latter. Intensification of the usage has the prospect to increase the exposure overall. Complexification in the procedures and persisting questions about which dose monitoring to use (scope, and techniques) were also identified.

In NM, the rapid pace in the development of new radiopharmaceuticals, especially the ones used in the emerging field of theragnostics (radionuclides equally suitable for both diagnostic and therapy applications) has the potential to raise new questions surrounding radiation protection arrangements. The early stages of the development of new radiopharmaceuticals might be a blind spot for radiation protection experts and radiation protection authorities. New radionuclides might imply new challenges: in the transport, the manipulation, the assessment of the dose to the patient and require adaptation in the training of staff and the information provided to the patient. The patient 'being an unsealed and moving source', the final outcome of the waste is at stake.

One overriding issue was the lack of radiation protection training of medical professionals using IR procedures and new isotopes for NM. Some professionals don't feel part of the radiation protection "world" and an overall improvement of the radiation protection culture can be seen as necessary.

Objectives of the workshop

- To examine the challenges faced when applying the ALARA principle in interventional radiology and nuclear medicine (new radiopharmaceuticals);
- To consider how the ALARA principle can be better implemented for patient and staff exposures; for diagnostic and therapeutic uses;
- Re-visiting some topics from the 13th EAN workshop;
- To bring together relevant stakeholders to:
  - discuss emerging issues and discuss progress with existing ones;
  - exchange practical ideas and experience;
  - identify issues for further investigation and research to improve ALARA in IR and NM;
  - Provide conclusions and recommendations.

Organization

A programme committee inclusive of EAN members and non-EAN members was set up at the end of 2022 to produce a workshop programme designed to achieve the objectives. The programme was divided in four sessions:

1. Setting the scene and ALARA challenges identified in the fields of interventional radiology and new radiopharmaceuticals;
2. Tools for ALARA;
3. Focus on (new) radiopharmaceuticals;
4. Education and training, culture.

The workshop was announced in the EAN Newsletter (EAN, 2023) and announcements sent by email to the EAN mailing list in March 2023 and in July 2023; the programme was available at the time of the second announcement. Other organizations kindly helped in forwarding the workshop (BVS-ABR, 2023).

As is tradition, a significant part of the EAN Workshop was devoted to discussions in Working Groups. It was proposed to organize four working groups, driven by the following questions proposed by the programme committee:

1. The challenges for the optimization of patients and workers in interventional radiology;
2. What are the ALARA tools available in IR? Usages and usability?
3. What are the elements of a good ALARA culture in (nuclear) medicine?
4. Technical developments in nuclear medicine: how to instil RP from the outset?

The local planning of the workshop was kindly organised by the Austrian Ministry of Public Health and Food Safety (AGES) who hosted the workshop at its Vienna premises.

Results

Attendance and contributions

A total of 40 participants from 10 countries attended the workshop; an attendance a bit lower than for the previous EAN workshops. The number of representatives per country in presented in Figure 1 and it show the good participation from United Kingdom, Austria and to a lesser extent from Belgium and France and then other European countries.

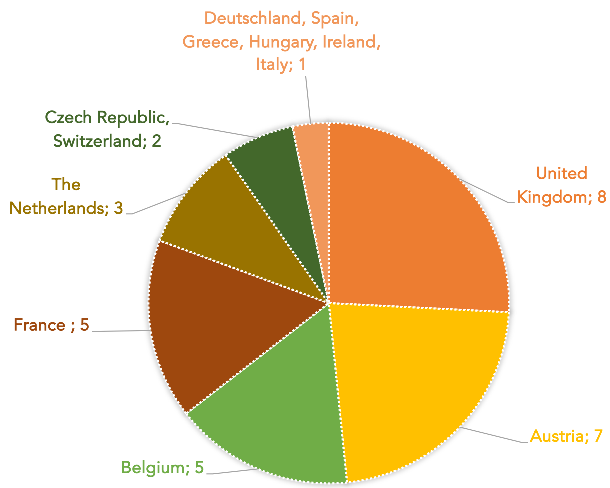

Figure 1 – Number of representatives per country in EAN workshop.

Despite some last-minute changes, 24 slideshows were presented in plenary sessions by the speakers. In addition, 3 slideshows where elaborated during the workshop by the working groups (the working group n° 2 was dismissed due to the low attendance) and presented the last days before the preliminary summary of the workshop. All the slideshows are accessible on a dedicated webpage of the EAN website.

Several organization and professional bodies were in the room; the IAEA, EFOMP, HERCA, EUTEMPE and IRPA and the workshop gathered a large array of expertise which is presented on Figure 2. However, manufacturers (of equipment and software) and practitioners (clinicians, doctors, nurses) were basically absent from the workshop.

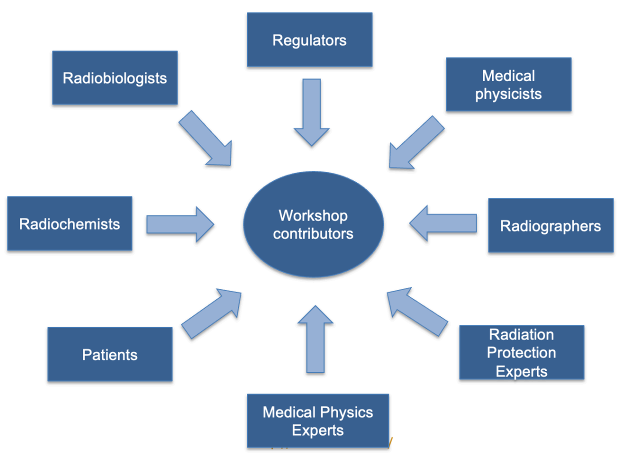

Figure 1 – The contributions to the workshop.

Recommendations

A key feature of the EAN workshops are the recommendations emanating from the working group which aimed to provide views on the improvements necessary to tackle the challenges identified and with the benefit for ALARA.

The recommendations are addressed to all the interesting parties and are meant to be shared. It should be noted that between WS19 and WS20, the EAN had set up a working group to review the implementation and dissemination of recommendations and conclusions of EAN Workshops the results of which was published last year (EAN, 2022b)

The synthesis of the recommendations as presented by the 3 working groups is reproduced below (WG1, WG2, WG3, 2023).

Working group n°1. The challenges for the optimization of patients and workers in interventional radiology *This working group did not provide recommendation explicitly. The key topics of discussion are reported below.*

- Education and training of staff by different means: MPE training, RPE training and certification, updates, monthly audit, e-learning.
- Management of radiological installations at the design and during maintenance; the whole team to be involved.
- Harmonization of interventional techniques by introducing minimum imaging parameters, standardization of nomenclature and coding for robust derived reference levels, image quality criteria for different clinical needs.
- Current challenges are:
  - Strengthening Radiation Safety Culture;
  - Shortages of MPE, RPE and RP Inspectors;
  - A definition of ‘reasonable’ in terms of ALARA
  - Optimization not being undertaken: targets for optimization are needed, and inspectors should inspect the quality of optimization.

Working group n°3. What are the elements of a good ALARA culture in (nuclear) medicine?

- Medical sector has specific challenges compared to other radiation-using sectors – for ALARA and radiation safety culture
- The speed of development of medical radiation technologies and radiopharmaceuticals requires ongoing adaptation in radiation protection
- Continuing education is required for personnel involved in medical exposures from senior management down. This should include ‘soft skills’
- Communication should be encouraged involving all stakeholders – networking opportunities should be facilitated for sharing/learning from experiences

Working group n°4. Technical developments in nuclear medicine: how to instil RP from the outset?

Radiation protection/ALARA need more consideration in the development of new radiopharmaceuticals for patient and workers: exposure risk.

- More (radio)biological data is required to understand the way radiopharmaceutical works
- MPE should be involved from the point of radiopharmaceutical development through to production and use.
- Accurate measurements of activity as well as personalised dosimetry are needed.
- Requires the development of specialised dosimetry software.
- Use a Holistic approach: taking into account the whole chain from development to production, application in the patients and finally to waste. A social debate is required.
- Be aware of waste problem: long-lived contaminants in radiopharmaceuticals (like 177m-Lu) in environment.
- Promote provision/exchange of information including RP throughout development of new radiopharmaceuticals.
- Adequate RP training at all stages of radiopharmaceutical development and use, for all individuals, including the patients needs to be addressed.

Perspective

The EAN intends to publish a more detailed synthesis of the workshop based on the plenary session, the working groups discussion and dialogue in a peer-review journal. These elements will be available there for any interested audience and will be reported to the ICRP by the EAN, as Special Liaison Organization.

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Asia and the Pacific Regional ALARA Network (ARAN)

QINJIAN CAO, On behalf of ARAN

1 Department of Health Physics, China Institute for Radiation Protection

History

The Asia and the Pacific Regional ALARA Network (ARAN) was initiated by the International Atomic Energy Agency (IAEA) in December 2007, to support the development of a sustainable regional network, which facilitates information, findings and data exchange and practical and cost-effective implementation of the principle of optimization of radiation protection in participating countries. In July 2014, it entered into a suspension period without actual activities implementation. In consideration of its significance, the IAEA helped with the reactivation process of ARAN together with the China Institute for Radiation Protection (CIRP). On 6th May 2021, ARAN was successfully reactivated through a virtual meeting with the participation of countries in the region. On 10th November 2021, the first ARAN Management Board Meeting since its reactivation was held, where the Steering Committee was elected and the Terms and Conditions were approved.

Objectives

- To share and exchange information, experience and expertise for promoting the implementation of the as low as reasonably achievable (ALARA) principle (optimization of protection and safety) for the management of occupational exposure in all situations, in the participating countries.
- To enhance and develop skill and competence in occupational radiation protection for the different stakeholders concerned, in particular through the proposals for appropriate training programmes.
- To contribute to the harmonisation of radiation protection policies and practices, particularly concerning ALARA, both at regulatory and operational levels across the region.
- To identify and investigate topical issues of common interest within the countries to further improve the implementation of ALARA.
- Establishment of the following Working Groups covering different areas of Radiation Protection:
  - Working Group 1: External monitoring
  - Working Group 2: Internal monitoring
  - Working Group 3: Workplace monitoring
  - Working Group 4: Protection of staff in the medical field
  - Working Group 5: Protection of workers in industrial radiography and industrial irradiators
  - Working Group 6: Exposure of workers to naturally occurring radioactive material
  - Working Group 7: Exposure of workers in a nuclear and radiological emergency

Management

ARAN is coordinated by an Executive Committee, called the Steering Committee, comprising the network chairpersons, the two vice chairpersons, the former chairperson, as well as an IAEA representative. The IAEA and Regional Cooperative Agreement (RCA) established this network comprised of representatives from 21 countries: Australia, Bahrain, Bangladesh, China, Indonesia, Iraq, The Islamic Republic of Iran, Jordan, Kuwait, Lebanon, Malaysia, Nepal, Oman, Pakistan, Philippines, Republic of Korea, Sri Lanka, Syria, T.T.U.T.J of T. Palestininian A., Thailand, and Qatar.

Members of ARAN Steering Committee are:

- **Chairperson**: Dr. Liu Liye (Chinese representative, China Institute for Radiation Protection)
- **Vice-chairpersons**: Ms. Chadia Rizk (Lebanese representative, Lebanese Atomic Energy Commission) and Ms. Kristine Marie Romallosa (Philippine representative, Philippine Nuclear Research Institute)
- **IAEA representative**: Mr. Burçin Okyar
- **Secretariat**: China Institute for Radiation Protection (CIRP)
- **Secretary**: Mr. Cao Qinjian (CIRP)

Recent Activity

An Intercomparison (IC) exercise will be organized jointly by the International Atomic Energy Agency (IAEA) and China Institute for Radiation Protection (CIRP) in collaboration with the Asia and the Pacific ALARA Network (ARAN). The IC exercise is one of the outputs of RAS/9/093 Regional Project for the harmonization of practices, exchange of knowledge on external dosimetry and achieve a common understanding among authorized or approved dosimetry service providers that operate under a quality management system.

The aim of the IC Exercise is to assess the capabilities of the technical dosimetry services in the region and improve the performance for Hp (10) and Hp (0.07) in photon (gamma and X ray) fields, thus supporting participating Member States (MSs) to achieve a more accurate dosimetry service in line with the project milestones of RAS/9/093 project. The IC exercise will be announced by IAEA, CIRP and ARAN in January 2024 and finished in November 2024 according to draft agenda.

EUTERP workshop short summary

WITH THE KIND CONTRIBUTION FROM EUTERP REPRESENTATIVES

Background

The 9th EUTERP Workshop was held in Groningen 26-27 June 2023. The theme for this workshop was "The Development of competence standards for Radiation Protection Trainers". With participants working in groups, the objective of the workshop to try to draft a skeleton guidance document/reference standard for the competences necessary for those who aspire to deliver radiation protection training.

The background to this was in the previous workshop (Malta, 2018) which had the theme of "optimisation of radiation protection training". A question put to participants at that workshop was, that given that those who wish to provide advice on radiation protection matters (QEs, RPEs, MPEs) are required to have their competence to do so formally recognised by Competent Authorities, should it be a requirement for trainers – who are "influencers" – to also have their ability/competence formally recognised? After considerable discussion the answer to the question was "no" but it was concluded that development of expected best-practice standards/guidance would be of value.

At the workshop

At the Groningen workshop the groups considered 4 core themes that around which to structure such a document –

1. Profiling the trainee categories: understanding who is being trained;
2. Profiling the trainer;
3. Detailed competences (necessary knowledge and skills);
4. Approach to developing appropriate training;

\- and in the short time available started to identify more precisely the scope of the guidance, the level of detail appropriate for inclusion, aspects that need to be included within each theme and appropriate reference material. There was lively discussion within the groups !

Results and perspective

The conclusion at the end of the workshop was that the development of such a standard/guidance remains a worthwhile objective and is feasible, ideally in a format that can be readily adapted for national circumstances. It was agreed that, using the workshop output as a basis, EUTERP should take the project forward possibly through the establishment of a task group comprised of interested and willing volunteers and, ideally, representation from some of the main RP networks.

Check the programme, book of abstracts and proceedings at: https://www.etrap.net/etrap-2023

The next step is to establish Terms of Reference for the work and to identify interested contributors. If interested please contact EUTERP at secretary@euterp.eu!

Pictures from the conference website
© EUTERP ■■

Stakeholder involvement in generating science after nuclear emergencies.

Did you hear about the SHAMISEN-SINGS (2017-2020) project?

The historical nuclear accidents of the last decades, in particular those of Chernobyl and Fukushima, have shown the importance of the commitment of all stakeholders, including the population itself, in the actions implemented for the protection people living in the affected territories to allow a return to dignified living conditions.

The establishment of a dialogue between local experts and the population has been essential to understand the needs of the affected people, to improve real-time feedback on local radiological conditions, to support radiation protection and remediation actions in the affected areas, and to enable health assessment and long-term surveillance. It is also this commitment to recovery that has helped to restore the confidence of residents displaced or left behind after the Fukushima accident. In particular, the use of personal dosimeters (such as the D-Shuttle) or other devices that allow people to make their own dose measurements has also proved crucial in enabling them to regain calm control over everyday actions (eating, moving, working, etc.).

Another important lesson is the need to increase, in peacetime, their commitment to accident preparedness and response, and to improve the practical radiation protection culture of the largest number of citizens for a more disaster resilient society.

The SHAMISEN-SINGS project, builds on the recommendations of the EC-OPERRA funded SHAMISEN project, aimed specifically to enhance the citizen participation in preparedness for and recovery from a radiation accident through novel tools and apps to support data collection on radiation measurements, health and well-being indicators.

In that respect, the Shamisen-Sings project published a booklet that contains a set of recommendations on the development and use of apps for measuring radiation doses and health/wellbeing indicators, particularly in the aftermath of a nuclear accident.
It is available here in several languages (English, French, Italian, Japanese, Russian, Spanish, and Ukrainian versions): https://radiation.isglobal.org/shamisen-sings/booklets/

This infographic presents recommendations of how to measure external gamma radiation with help of a mobile app (for citizen science use and general public) developed during the SHAMISEN SINGS project (EU-funded). Designer: Maria Beltran

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Image: The Broken Vase 1913, Ludwig Strimpl (1880-1937)

Lorem Ipsum

Trenz Pruca

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Life of EAN and ALARA events

December 15 2023 is the Administrative Board and Steering Group meeting of the EAN. The meeting is planned at CEPN, France.

15-17 May 2024 Third workshop of the European NORM Association (ENA) It will be hosted by the Italian National Institute of Health with the support of the Italian Radiation Protection Association, at Rome, Italy.

The EAN has been invited by ENA to plan a specific session on the application of ALARA for NORM. **This will constitute the next EAN (mini)workshop.** The Administrative Board and the Steering Group meeting of the EAN will take during the ENA workshop.

The EAN has set up an **Task Group on ALARA for NORM** with Representative from Norway (DSA), Belgium (SCK CEN), Slovenia (Health Ministry), Ireland (EPA) and France (CEPN). The tentative objectives of the TG are to build a session for the ENA workshop and disseminate the results.

Other events in sight

- **ICRP 7th symposium**, 6–9 November 2023, Tokyo, Japan, Registration is possible until 5 November. https://icrp2023.jp

- **Challenges in Your Early Radiation Protection Career**, This event will focus on the obstacles and challenges faced in the early part of an RP career. 15 November, Birmingham, United Kingdom
https://srp-uk.org/event/352/challenges-in-your-early-radiation-protection-career

- **Practical Radiation Protection**. The Scottish Committee of the Society for Radiation Protection has organised this one-day meeting which covers a range of Practical Radiation Protection topics. 12 December 2023, University of Strathclyde, Glasgow, Ireland
https://srp-uk.org/event/353/practical-radiation-protection-and-learning-from-experience-radioactive-materials-transport

- **ISOE European Symposium**, organized by the European Technical Centre of the in collaboration with EPZ and ANVS. Call for abstract until 5 January 2024. 4–6 June 2024, Rotterdam, The Netherlands

- **The ALARA Days,** organized by the French Society for Radiation Protection, 18–19 June 2024, Saint Malo, France.

- **16th International Congress of the IRPA: Radiation Harmonization: Standing United for Protection**, 7–12 July 2024, Orlando, Florida
http://irpa2024.com

Contacts

European ALARA Network Contact Persons

AUSTRIA
Franz KABRT
Osterreichische Agentur fur Gesundheit und Ernahrungssicherheit GmbH
Spargelfeldstraße 191, 1220 WIEN
Tel.: +43 (0)5 0555-32922 |
E-mail: franz.kabrt@ages.at

BELGIUM
Fernand VERMEERSCH
SCK•CEN
Boeretang 200, 2400 MOL
Tel: +32 14 33 28 53; Fax: +32 14 32 16 24
E-mail: fvermeer@sckcen.be

CROATIA
Mladen NOVAKOVIC
Radiation Protection Authority – EKOTEH Dosimetry
Vladimira Ruzdjaka 21, 10000 ZAGREB
Tel: +385 1 604 3882; Fax: +385 1 604 3866
E-mail: mlnovako@inet.hr

CZECH REPUBLIC
Jan KROPACEK
State Office for Nuclear Safety,
Syllabova 21, 730 00 OSTRAVA
Tel: +420 596 782 935; Fax: +420 596 782 934
E-mail: jan.kropacek@sujb.cz

DENMARK
Kresten BREDDAM
National Institute for Radiation Protection
Knapholm 7, 2730 HERLEV
Tel: +45 44 54 34 63
E-mail: krb@sis.dk

FINLAND
Maaret LEHTINEN
Säteilyturvakeskus – Radiation Practices Regulation
Laippatie 4, 00880 HELSINKI
Tel: +358 9 75988244 Fax: +358 9 75988248
E-mail: maaret.lehtinen@stuk.fi

EDITORIAL BOARD

European ALARA Newsletter
Coordinated by CEPN and UK HSA

ISSN 1270-9441
c/o CEPN
28, rue de la Redoute
F-92260 Fontenay-aux-Roses
http://www.eu-alara.net

France
Gwenaëlle LORIOT
Institut National des Sciences et Techniques Nucléaire, Commissariat à l'Energie Atomique (CEA/INSTN),
17 rue des Martyrs 38054 GRENOBLE Cedex 9
Tel: 01 69 08 25 82
E-mail: gwenaelle.loriot@cea.fr

FRANCE
Pascal CROÜAIL
Nuclear Protection Evaluation Centre),
28 rue de la Redoute 92260 FONTENAY-AUX-ROSES
E-mail: pascal.crouail@cepn.asso.fr

GERMANY
Ulrike Kulka
Bundesamt für Strahlenschutz,
Ingolstädter Landstrasse 1, 85764 OBERSCHLEISSHEIM
E-mail: UKulka@bfs.de

GREECE
Sotirios ECONOMIDES
Greek Atomic Energy Commission
P.O. Box 60228, 15310 AG-PARASKEVI
Tel: +30 210 6506767; Fax: +30 210 6506748
E-mail: sikonom@eeae.gr

ICELAND
Jónína GUÐJÓNSDÓTTIR
Rauðararstigur 10, 105 REYKJAVIK
Tel: +354 552 8200; Fax: +345 552 8202
E-mail: Jonina.Gudjonsdottir@gr.is

ITALY
Cristina NUCCETELLI, Gennaro VENOSO
Istuto Superiore di Sanità – Technology and Health Department
Viale Regina Elena 299, 00161 ROME
Tel: + 39 06 4990 2203; Fax: +39 06 4990 2137
E-mail: cristina.nuccetelli@iss.it

IRELAND
Hugh SYNNOTT
Environmental Protection Agency,
Office of Radiological Protection
3 Clonskeagh Square, Clonskeagh Road, DUBLIN 14
Tel: +353 1 206 69 46; Fax: +353 1 260 57 97
E-mail: h.synnott@epa.ie

NORWAY
Malgorzata SNEVE
Norwegian Radiation and Nuclear Safety Authority
Regulatory Cooperation Programme,
Grini næringspark 13, 1361 Østerås, P.O. Box 329, 0213 OSLO
Tel: +47 95 171 14 49
E-mail: Malgorzata.sneve@dsa.no

SLOVENIA
Selma FIJULJANIN
Slovenian Radiation Protection Administration
Langusova 4, 1000 LJUBLJANA
E-mail: Selma.Fijuljanin@gov.si

SPAIN
Arturo PEREZ MULAS
Consejo de Seguridad Nuclear
Justo Dorado 11, 28040 MADRID
Tel: +34 91 346 02 62; Fax: +34 91 346 03 16
E-mail: apm@csn.es

SWEDEN
Petra Hansson
Stralsäkerhetsmyndigheten,
17116 STOCKHOLM
Tel: +46 8 799 44 38
E-mail: Petra.Hansson@ssm.se

SWITZERLAND
Stefan ROESLER
Centre Européen de Recherche Nucléaire (CERN)
Groupe Radioprotection, Unité Santé, Sécurité et Environnement
Esplanade des Particules, P.O. Box 1211 GENEVA 23
E-mail: Stefan.Roesler@cern.ch

SWITZERLAND
Nicolas STRITT
Swiss Federal Office of Public Health,
Radiation Protection Division,
3003 BERN
Tel: +41 31 324 05 88; Fax: +41 31 322 83 83
E-mail: nicolas.stritt@bag.admin.ch

THE NETHERLANDS
Folkert DRAAISMA
NRG
Utrechseweg 310 B50-West,
6812 ARNHEM
E-mail: draaisma@nrg.eu

UNITED KINGDOM
Julie MORGAN
UK Health Security Agency, Chilton
DIDCOT – OX11 0RQ
Tel: +44 113 267 9041
E-mail: julie.morgan@ukhsa.gov.uk