European ALARA Network

EAN Steering Group Meeting
5th December 2014

ALARA NEWS AND ALARA INFORMATION IN EAN MEMBERS COUNTRIES

This document summarized the main events dealing with ALARA in EAN Members countries discussed at the occasion of the 5th December 2014 Steering Group meeting.

GERMANY – Mrs A. SCHMITT-HANNIG (BFS)

Requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption – national transposition of Directive 2013/51/Euratom before Nov 2015 – in discussion

It has been decided to modify the German Drinking Water Ordinance of 2001 to comply with the Directive. Indicative doses of 0.1 mSv/a and 100 Bq/l for Radon and Tritium respectively are foreseen as well as activity concentrations, detection limits of relevant radionuclides and monitoring frequencies. In this Ordinance all requirements for drinking water will be integrated, which is reasonable for supplier and consumers. The Federal States, responsible for the implementation of the Ordinance, and other stakeholders were invited to report any concerns they might have.

Handling of radioactive substances below exemption limits

It is questioned whether the use of several ion mobility spectrometer (IMS, separating ions by shape and charge) with Ni-63 sources (each source with an activity below exemption limits, 100 MBq, but all sources together exceeding exemption levels) has to be licensed. No licensing is required, when sources are kept separately so that they cannot interrelate, this has to be insured. IMS is employed for security purposes, such as detecting drugs and explosives, the technique also has many laboratory analytical applications.

New radiopharmaceuticals: radiation protection measures for the use of Xofigo

Xofigo ($^{223}RaCl_2$), in the past also called Alpharadin, is used to treat prostate cancer that is resistant to medical or surgical treatments. The compound may contain besides ^{223}Ra also ^{227}Th (up to 0.5 %) and ^{227}Ac (up to 0.0045 %). Dose calculation procedures for incorporated radionuclides and possibilities for incorporation monitoring have to be clarified.

Partial body dosimetry in nuclear medicine

BfS has followed up radiation exposures of personnel in nuclear medicine departments, in particular with regard to partial body exposure. Measurements in the last 10 years showed partially very high local skin doses of the hands, in particular of the finger tips. Measurements during Radiosynoviorthesis (RSO) with Y-90, intra-articular injection of beta-emitting radionuclides, showed that mainly direct beta emission contributes to radiation exposure of the personnel involved and the skin dose is underestimated by a factor of 3 when using only the usual part body dosimeters (this is also true for F-18 und Tc-99m applications). It has therefore being decided some years ago that personnel involved in more than 100 RSO applications per year have to wear a second finger ring dosimeter. However, this has been handled differently in the Federal States.

BfS has elaborated a report „Radiation Exposure and Partial Body Dosimetry in Nuclear Medicine“ and issued recommendations of efficient and easy to handle criteria for implementation. Relevant nuclides are grouped together, depending on their potential hazard. This leads to activity levels for handling different radionuclides per year which require partial body dosimetry when exceeded. BfS elaborated information sheets with recommendations for radiation protection when handling beta emitters in nuclear medicine including PET, radioimmunotherapy and RSO.

Required competence in radiation protection for medical doctors working in the field of particle therapy

In Germany, 6 particle therapy facilities are already in operation or planned (Munich, Berlin, Heidelberg, Dresden, Essen, Marburg). The requirements for recognition of the relevant competence in radiation protection have to be harmonized within Germany. The following approach is proposed for competence building of medical doctors working in the field of particle therapy:

1. Verification of the required competence in radiation protection covering the whole field of radiotherapy together with 36 months practical experience.

2. Verification of 6 months practical experience in particle therapy in one or several particle therapy facilities together with verification of 100 documented applications.

3. Special course in radiation protection in particle therapy with a duration of at least 24 hours and an examination at the end. Participation in a technical discussion on particle therapy topics.

Deep geothermal technology – a new field for radiation protection

In deep geothermal technology, highly saline fluids (> 100 g/l) are used. TENORM deposits can be built above-ground in plant components, containing natural radionuclides (^{226}Ra, ^{210}Pb, ^{228}Ra und ^{228}Th) with increased specific activities of up to 3.000 Bq/g.

Experience in north Germany has shown that the Radiation Protection Ordinance has to be considered when disposing of operational wastes and radiation exposure of personnel has to be estimated. Altogether, so far 55 t radioactively contaminated materials with a total activity of 10 GBq have been accumulated.

The practice of deep geothermal energy is not yet explicitly regulated in the radiation Protection Ordinance. How this will be done when implementing Directive 2013/59/ Euratom, is still under discussion. In the Directive, it is mentioned that geothermal energy production is one of the industrial sectors to be taken into account when applying Article 23 (Identification of practices involving naturally-occurring radioactive material).

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GREECE – MR. E. SOTIRIOS & MRS E. CARINOU (GAEC)

Amendment of the Community framework for nuclear safety (2009/71/EURATOM)

EEAE welcomes the agreement on the text amending the Community framework for nuclear safety (2009/71/EURATOM) reached under the Greek Presidency. This file was set as the priority of the Greek Presidency in the field of EURATOM.
The new Directive provides that member states implement a regulatory framework that aims to prevent any type of accident, no matter how much unlikely or extreme may be considered, and should an accident occur, to limit the consequences of radioactive releases. At the same time, the Directive reinforces crucial components of the nuclear safety system, such as the independent role and functions of the regulatory authorities, the safety peer reviews mechanism, the safety culture, the transparency and the public information.
EEAE chaired the Council's Working Party on Atomic Questions, where the negotiation took place. Within a short time period and through difficult negotiations, the Greek Presidency managed to achieve a commonly accepted agreement by using a variety of working methods (e.g. working groups, side events, word by word text editing, technical contribution of the European Nuclear Safety Regulators Group-ENSREG). The task was supported by EEAE experts.

Information event on the new European BSS Directive

EEAE organised on 10th of October 2014 an information event on: "The Developments in the radiation protection regulatory framework: the new European Directive 59/2013/EURATOM".
Aim of this event was to present the Directive to the stakeholders involved in the national radiation protection system, since it will be the base for the new national regulatory framework regarding safety against ionizing radiation.
The regulatory framework for the use of ionising radiations concerns a wide range of workers, professionals in health, industry and research sectors as well as bodies responsible for public health, environmental protection, civil protection, etc. The event agenda included the following presentations:

- Evolutions in the regulatory framework for radiation protection - the new Euratom Basic Safety Standards Directive (Stefan Mundigl, DG Energy, EC)
- Overview of the main technical changes in the new Euratom BSS Directive (Tom Ryan, Environmental Protection Agency, Ireland)
- Actions and action plan for the revision of the national radiation protection regulatory framework (Vassiliki Kamenopoulou, Head of Licensing & Inspections Division, EEAE).

Establishment of Dose Reference Levels (DRLs) for pediatric diagnostic examinations and interventional procedures

The national pediatric DRLs will be determined using the 3rd Quantrile methodology on data that will be collected for selected radiology examinations/procedures. The major pediatric public hospitals and more than 15 radiology departments undertaking pediatrics examinations (private and public) countrywide will be included in the study. The collection of data will be carried out at each radiology system of the hospital/clinic, for at least 15 children for each age/weight group.
For radiographic examinations, special forms will be prepared by EEAE and will be sent to the participating radiology departments. The information to be collected concerns patient data (age, sex, weight, height, etc), radiological exposure (kV, mAs, FSD, field size, tube filtration, grid, etc) and dosimetric data (air kerma, tube output, skin dose, etc). Respective forms will be prepared for CT examinations and interventional procedures, in order the required dosimetric data to be collected

from the dose reports of the systems or the respective files. The procedure for the establishment of the DRLs is expected to be complete in 2015.

EEAE's Integrated Management System

Having put safety as a priority at all levels of operation and at the heart of decision making, EEAE implements an integrated management system. Our policy is to serve the public interest and in accordance with our vision, mission and values, to provide high-quality services and regulatory work. The integrated management system is certified since December 2013 in accordance with the requirements of ISO 9001:2008 standard and incorporates all functions and accreditations of EEAE. The list of EEAE accreditations/certifications includes:

- Accreditation according to ISO/IEC 17025 standard for:
  - non-ionizing radiation measurements,
  - individual monitoring by the use of whole body dosemeters and extremity dosemeters,
  - gamma spectrometry measurements,
  - radon measurements,
  - calibrations in radiotherapy, diagnostic radiology, radiation protection, individual monitoring.
- Accreditation as an "inspection body", type A, according to ISO/IEC 17020 standard, in order to perform inspections in radiation facilities and applications (radiology, nuclear medicine, radiotherapy, radiography and industry).
- Certification according to ISO 29990 standard, regarding the scope "Design, development and provision of non-formal education and training in radiation protection and nuclear safety".

As a part of its continuous improvement, EEAE aims at the full harmonization of its integrated system management with the internationally established requirements governing regulatory authorities and radiation facilities (IAEA Safety Standards, The Management System for Facilities and Activities, GS-R-3). EEAE's main objective is to incorporate safety culture characteristics into management system.

Implementation of an RN emergency system in Eastern Mediterranean (IMAGES), 2012-2015

Aim of project IMAGES is to investigate the use of RODOS software in urban areas and in the interior of buildings in case of a terrorist attack with dirty bombs. In this framework software codes will be developed for the calculation of the dispersion of radioisotopes in urban environment. The simulations will take in to account available data as well as information from the existing emergency response plans. The realization of the project is based on the following steps:

- Installation of RODOS software in Greece and its adaptation to the local conditions for urban areas.
- Development of models for the calculation of the dispersion of radioisotopes at the street level.
- Development of scenarios concerning a possible terrorist attack with dirty bombs.
- Simulation of possible countermeasures and evaluation of their effectiveness.
- Dissemination of programme results: Demonstration of RODOS software and training of the emergency response personnel on its use.

Project IMAGES is funded by the programme HOME/2011/AG/CBRN of the European Commission. □

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IRELAND – MR. H. SYNNOTT (EPA)

ADR Derogation

The RPII as Competent Authority for Class 7 has issued an MLA under Chapter 1.5 of the ADR 2013 for the purposes of exempting drivers of vehicles transporting radioactive substances of UN Nos. 2915 and UN3332 (Type A packages for the carriage of radiopharmaceutical and Nuclear Moisture Density Gauges (NMDG)/some non-destructive testing (NDT) sources respectively) from ADR basic training within the limits and the conditions stipulated under additional requirement S12 (2013). This derogation addresses the unintended consequences of an amendment made to the 2013 ADR and is valid until the 1 January 2015. This MLA (M-265) has also been signed by other Contracting parties to the ADR (see http://www.unece.org/trans/danger/multi/multi.html). Following meetings of the United Nations Economic Commission for Europe (UNECE) Inland Transport Committee, Working Party on Dangerous Goods last November in Geneva, and taking cognisance of the current derogations with respect to S12, the UNECE has agreed a modified text for the 2015 ADR reverting back to a text very similar to the 2011 ADR.

In summary, the radiation awareness training undertaken for the carriage of UN2915 and UN3332 where the number of packages containing radioactive material carried does not exceed 10 and the sum of the transport indices does not exceed 3, is now satisfactory and in compliance with the ADR, with the introduction of the MLA 265 that Ireland has signed.

Radiation Doses to the Irish population

In June 2014 the RPII published its report on Radiation Doses to the Irish Population. This report is an update of a population dose assessment undertaken in 2008 and includes the most recent data available on the principal radiation exposure pathways.

The average annual dose to a person in Ireland from all sources of radiation is now estimated as 4037 microsievert (μSv) which is consistent with the value, 3950 μSv, estimated in 2008. Natural sources of radioactivity account for 86 % of all radiation exposures in Ireland. Artificial sources contribute approximately 14% and are dominated by the beneficial use of radiation in medicine. Doses from other artificial sources such as Sellafield, Chernobyl, occupational exposure, etc., account for less than 1%.

Radon is the principal source of radiation exposure in Ireland, representing just over 55% of the average radiation dose. Most of this dose is received in people's homes although radon exposure at work accounts for the largest contribution to occupational exposure. For the individual, exposure to radon is extremely variable with a measured range of exposure in Irish homes of between 250 μSv and 1,225,000 μSv per annum.

The report can be downloaded by clicking on the following link;
http://www.epa.ie/pubs/reports/radiation/radiationdosebyirishpopulation.html

National Radon Control Strategy

In February 2014 a national strategy to tackle the 250 lung cancer cases linked to exposure to radon was launched by Minister for the Environment, Mr Phil Hogan, T.D. at the Radiological Protection Institute of Ireland's (RPII) annual National Radon Forum in Kilkenny. The National Radon Forum brings together a broad range of stakeholders focussed on addressing the radon problem in Ireland.

The National Radon Control Strategy aims to tackle this serious public health problem by reducing the number of lung cancer cases caused by the radioactive gas radon. The aim of this Strategy is to minimise the exposure to radon gas for people in Ireland and to reduce, to the greatest extent practicable, the incidence of radon related lung cancers

The inter-agency group that worked to develop the Strategy comprised members from the following: Department of Environment, Community and Local Government (Chair), Radiological Protection Institute of Ireland, Health Service Executive, Health and Safety Authority, Department of Jobs, Enterprise and Innovation, Geological Survey of Ireland, Sustainable Energy Authority of Ireland, County and City Managers' Association and Department of Health.

An overriding consideration in developing the strategy was to ensure it was cost effective and practical. Recommendations were developed using health economics tools and the measures proposed were put out for public consultation. It sets out some 48 recommendations under the following general headings:

- **Prevention**
  Preventing the problem in new buildings through better building standards and training of building professionals

- **Reduction**
  Reducing levels of radon in existing properties through initiatives such as exchanging information at the time of selling properties, compliance with housing standards regulations and continuing the programme of radon testing in social housing.

- **Awareness**
  Raising awareness of the health hazard, in order to encourage the public to take action, through: information campaigns, education and a dedicated website with information for householders, employers, builders and radon service providers.

- **Regulation**
  Ensure the implementation of effective regulations relating to radon. These include regulations covering protection from radon in the workplace and regulations concerning the incorporation of radon prevention into new buildings.

A copy of this document can be downloaded by clicking on the following link, http://www.environ.ie/en/Publications/Environment/EnvironmentalRadiation/FileDownLoad,35484,en.pdf.

Video on radon testing in the home

The RPII has produced a short animated video which shows how easy it is to measure radon in the home

The public are sometimes discouraged from carrying out a radon measurement as they mistakenly think that it is difficult or expensive. The video goes through the steps involved in performing a radon measurement and aims to show the viewer that radon is a very easy thing to measure in the home

See the video here [Link to http://www.youtube.com/watch?v=z75znh9SDus]. □

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SWITZERLAND – MR. N. STRITT (OFSP)

Swiss radiation protection legislation

The current Swiss radiation protection legislation is based on the recommendations ICRP 60 which have been replaced in 2007 by ICRP 103 [1]. These recommendations are implemented in basic safety standards by IAEA [2] and EURATOM [3]. Switzerland plans to translate as far as possible the new version of the EURATOM BSS into its national law. Ten radiation protection ordinances are being revised. The consultations of the office have just started and the revised legislation should come into force in 2016. The main changes concern the following points:

- The **exposure situations and categories** introduced by ICRP 103 together with the system of dose limits, dose constraints and reference levels will be adopted.
- The **clearance levels** introduced by IAEA BSS will be adopted. Clearance levels for another 500 nuclides have been calculated with the same scenarios and will be introduced.
- The philosophy of a **graded approach**, which is already applied in the current system of authorisation and enforcement, will be introduced in the legislation.
- For **occupational exposure** the main changes will be the introduction of A- and B-workers, regulation of NORM-industries, radon at workplace and dosimetry for aircrew. Also the concept of controlled area and supervised area will be introduced.
- Regulations for **high activity sealed sources** and for **orphan sources** will be introduced in accordance with international standards.
- For **medical exposure**, dose constraints will be introduced for carers and comforters and for volunteers. Also a legal framework for the introduction of clinical audits will be established
- As recommended by international standards and WHO a lower **radon** reference-level will be introduced. The radon action plan has already been established.
- For **emergency exposure situations** reference levels will be introduced.
- For the **protection of the environment** and as a substitute for tolerance levels in food, immission-limits will be introduced.
- The **radiation protection education** will be updated and an obligation for continuous education will be introduced.
- There will still remain some Swiss concepts of radioprotection since it was not possible to harmonise every aspect of the IAEA or EURATOME BSS.

Incident, Ines 3 in Switzerland

While repairing a biplane cardiovascular X-ray system in a hospital, a service technician accidentally activated the system's floor pedal. Moving a mobile lead shield, he did not realize that the shield was jamming the pedal. He continued his work under unnoticed X-ray exposure for about 5 minutes until the system alarm was automatically activated. Most of the time, the upper part of his body was very close to the lateral x-ray tube. He wore a lead apron during the exposure but he forgot to wear his dosimeter that day.

About two hours after the exposure, the technician developed an erythema on the parts of his body that were not protected by the apron, mainly his face and neck. The next day, he reported his accident to the competent authorities and was immediately hospitalized in a unit specialized in treating heavily irradiated patients. After three days, he could leave the hospital and is now treated on an outpatient basis. Considering the erythematous reaction and first information available, the

local skin dose was roughly estimated to be around 5 Gray. The investigation of this accident is still ongoing but it appears to be that the dose received is much less than estimated.

Radium action plan

Radium (226) luminescent painting was used in Switzerland between 1920 and 1960 in the watch industry for clock hands and frames. This work was done before the radiation protection law entered into force. After the 70s the use of radium was prohibited in the watch industry and replaced by tritium or by other non-radioactive agents.

After the 70s the watch industry was quite carefully controlled and the regulatory body issued licenses for the use of radioactive substances. Remediation of polluted sites were also performed. However, before the 60s some work with radium was also performed in private homes. At that time radium was not an issue and there was no need to search and remediate systematically these homes.
In the beginning of 2014, the discovery of radioactively contaminated soil on a construction site of a new road changed the perception of the population and the media about its risk. The media dug deep into federal archives in order to determine the origin of the discovered radium. They found addresses of private homes listing the places and names of workers where radium luminescent painting was used in handcraft.

The media published all the addresses online and in newspapers resulting the population to ask a lot of questions. The federal authorities were obliged to perform measurements on site to reassure the population. Some traces of contamination were found in several houses (~10% of the listed homes so far). However, so far these traces presented no sanitary risks for the inhabitants. Nevertheless some remediation are necessary in order to fulfil the dose limit of 1 mSv per year if a person is assumed to live 24h/7d in the contaminated rooms. As a result of a concerned population, the politics asked the regulatory body (Swiss federal office of public health and the SUVA) to react and solve this problem.

Hence, a radium action plan was launched by the SFOPH in summer in order to systematically search, find, measure and remediate sites where contamination is still present. This action plan is supposed to last from 2015 to 2020 until all potentially contaminated locations are found and remediated if necessary. The financing of this action plan needs yet an approval by the Swiss confederation. □

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UNITED KINGDOM – P. SHAW (PHE)

Note that CRCE reports have been migrated to the PHE website. They can now be found at: https://www.gov.uk/government/collections/radiation-phe-crce-report-series.

Also, previously published HPA reports can be found at:

http://webarchive.nationalarchives.gov.uk/20140722091854/http://www.hpa.org.uk/Publications/Environment/PHECRCEReportSeries/

PHE has reported on the 3rd UK CT survey, which provides a snapshot of patient doses in 2011. Scan details for 47,000 individual patients (rather than standard protocols as studied in previous surveys) relating to 13 types of CT examination on adults, and also head examinations on children, were submitted by CT centres. This represented nearly a third of all UK scanners, all of which now include multi-detector-row (MDCT) technology.

Wide variations are still apparent between CT centres for similar procedures, highlighting the need for continuing attention to the optimisation of protection and the use of specific scanning protocols for each patient group. The report also recommends national reference doses for examination of adults and children, and can be downloaded at: https://www.gov.uk/government/publications/doses-from-computed-tomography-ct-examinations-in-the-uk

PHE has issued a report (PHE-CRCE-011) on the 2013 inter-comparison of passive radon detectors. A total of 25 laboratories from 12 countries submitted 31 sets of detectors. Analysis of the results allows each exposure group in each set to be classified from A (best) to F (worst). There was an improvement in the percentage of results in category A; however, all types of detector (etched track or electret) appear in each class, demonstrating that stringent quality assurance is vital irrespective of the measurement technique.

The report can be downloaded at: https://www.gov.uk/government/publications/2013-intercomparison-of-passive-radon-detectors-results

An industrial radiography company was prosecuted for an accident with an X-ray set, in which a radiographer suffered tissue damage to the middle, ring and little fingers of his right hand. The estimated finger dose was 23 Sv. This was the result of unsafe working practices involving the disconnection of the safety and warning systems installed in a radiography enclosure. The company were fined approximately €40,000 (including legal costs). The report of the incident (including a photograph of the injured fingers) will shortly be posted on OTHEA.

A different Company was prosecuted for the temporary loss of an industrial gamma radiography (ytterbium-169) source. The source had become disconnected from the gamma radiography equipment, but this was not immediately detected. As a result, the source was handled by several workers, all of whom are estimated to have received significant doses to the hand: up to 16 Sv in some cases. The prosecution resulted in a very large fine - equivalent to almost 0.5 million Euros (including legal costs). A more detailed description of the incident can be found at: http://press.hse.gov.uk/2014/rolls-royce-fined-for-loss-of-radioactive-source/ ■

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