European ALARA Network

European ALARA Newsletter

25th Issue - October 2009

Editorial

A. SCHMITT-HANNIG, EAN Chairperson, P. SHAW, EAN Secretary and P. CROÜAIL, EAN Coordination

Eight years ago, when the Twin Towers of the World Trade Center collapsed, it not only left an indelible impression on the planet's collective memory, it has also led to an international awareness that strengthening security for radioactive materials and nuclear facilities worldwide was a major issue of concern. In 2006, the Litvinenko affair reinforced this awareness. As a consequence, the radiological protection and safety communities, merged into what we might now call the radiation safety community, amongst others, have developed a huge set of recommendations, measures, regulations and laws aimed at countering terrorist attacks, illicit trafficking, and other malevolent acts using or targeting radioactive sources. The aim is to prevent such events, but also to mitigate their consequences if they do occur. These aims inherently require consideration of the optimisation principle in the management - before and after - of emergency situations. There are many issues to explore: the exposures of emergency responders, security staff, supervisors and workers, operators of security-related sources, and the public must be kept as low as reasonably achievable (ALARA). It is noted that several recent ICRP recommendations (Publications No. 96, 103, 109 and 111) address these exposure situations, and with this in mind, the next 12th EAN ALARA workshop will be focussing on these issues.

The 25th ALARA Newsletter presents several papers that show that the use of radioactive sources, especially in industrial, medical and research applications (see paper Cellier & ALARA News), continues to increase worldwide. In the context of the preceding text, this further adds to the task of regulatory bodies and TSOs responsible for the control of radiation sources. The accidental or even malevolent import-export of radioactive sources (see paper Drouet & al.), and industrial and medical accidents/incidents (see paper Stritt) may never be totally prevented, but the introduction of ALARA at the preparedness stage, will certainly help in guaranteeing a better response and lower doses.

Content of the 25th Issue

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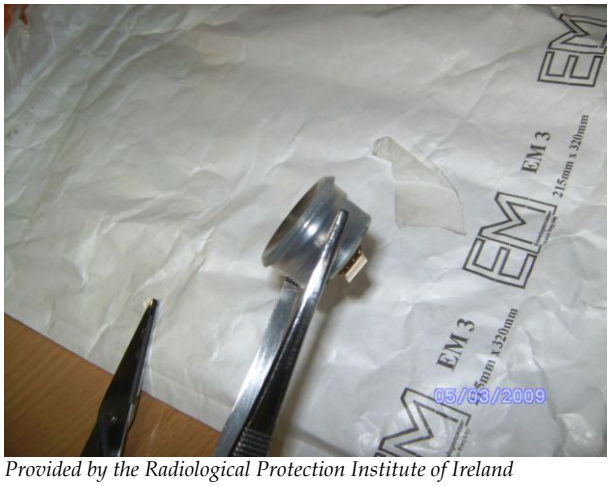
The management of the ^{60}Co contamination in lift buttons in European countries

F. Drouet, P. Croüail (CEPN, France)

Introduction

In October 2008, the French nuclear safety authority (ASN) was informed about the detection of radioactivity in lift buttons, manufactured by a French company, MAFELEC. This company manufactures lift buttons whose metal base comes from India. The detection was made on the assembled buttons and it appeared that the ^{60}Co contamination came from Indian suppliers. After investigation by the French authority, it turned out that MAFELEC has only one customer, OTIS, a lift company located in several places all over the world. As a consequence the distribution of contaminated buttons was not limited to France and measures to identify and remove buttons were taken in many countries in Europe.

At the occasion of the EAN Steering Group meeting in December 2008, discussions confirmed that many EAN countries had to deal with this issue. Then EAN decided to launch a request through its mailing list for information on the management of this event in European countries. Between January and July 2009, answers from 13 different countries were received. This article is a summary of these answers.



Provided by the Radiological Protection Institute of Ireland

The management of the contamination in France

After being informed and after an inspection of the MAFELEC site, the French nuclear safety authority asked the technical support of the Institute of radiation protection and nuclear safety (IRSN) to assess doses and dose rates for company workers and the public.

The measurements performed by IRSN revealed ambient dose rates between 1 and 20 µSv/h at the workplace at the MAFELEC site. A first dose assessment performed at the end of October 2008, based on conservative hypothesis, indicated that 22 persons might have received more than 1 mSv (up to 2.7 mSv) between August and October 2008. After receiving more detailed information from the company about the real exposure time of the workers, a new assessment was performed leading to a maximum estimated individual dose of 0.5 mSv. IRSN also performed an evaluation of the maximum dose that could be received by an individual due to exposure to the buttons in a lift. The results showed that the dose could not exceed 0.15 mSv for a person of the public.

At the request of MAFELEC senior management, IRSN also organized a meeting to inform workers about the risks associated with ionizing radiations. Moreover, the following actions were agreed with OTIS:

- Radiation measurements on OTIS sites in France,
- Actions to remove contaminated buttons from the lifts (undertaken by OTIS staff),
- Education and training of persons in charge of removing the buttons,
- Information to employees about exposures and risks.

In total, a few hundreds lifts were checked for contamination. The contaminated buttons are now considered as radioactive waste and will be managed in France accordingly. ASN classified this event at level 2 on the INES scale. This event had an important media impact in France with the dissemination of information on TV and in newspapers. Information on the evolution of the situation was mainly disseminated through ASN and IRSN websites.

The management in European countries

The buttons containing contaminated metal, produced in France by MAFELEC, were devoted to the international market. Thus the installation of contaminated buttons in lifts within Europe was highly probable. That is why, in many countries, campaigns to identify and remove potentially radioactive buttons were organized by OTIS with the support of the national safety authorities. Information of this event was spread out through

different channel: exchanges between nuclear safety authorities, between OTIS national roots, information through ECURIE system. Even exchanges within EAN favour diffusion of information.

The extent of the potential contaminated buttons differed from country to country. In Greece, OTIS asked the Greek authority to do measurements in 3 newly installed lifts. No contamination was found. In Slovenia, only few lifts were concerned and no contamination was found as well. In contrast, in Germany, the technical expert TÜV measured more than 6000 buttons, 60 of which were contaminated. Removal of all contaminated buttons was performed by OTIS, with the advisory support of TÜV. In the Czech Republic, measurements performed at OTIS' facilities revealed that, among 1050 buttons, more than 80% (859) were contaminated (maximum dose rate: 70 µGy/hr; total estimated activity: 43 MBq of ^{60}Co). However, these buttons were not installed yet and were stored in a room with low occupational factor: there was then no risk for the public and the risk for workers was minimal. Measurements were also performed in installed lifts all over the country, which resulted in OTIS staff removing 75 contaminated buttons.

Beyond the identification and removal of contaminated buttons, authorities in some countries performed more detailed radiation protection studies to assess the level of contamination and the consequences on workers, who were in charge of installing the lifts, and on the public.

In the UK, MAFELEC informed OTIS about the possible contamination. OTIS then contacted HPA for assistance. HPA performed measurements at the company's main site and in a selection of potentially affected lifts. Dose rates up to 25 µSv/h at the surface of the button and less than 1 µSv/h at 30 cm were measured. Activity measurements were performed on two buttons: the maximum activity was estimated to be 4 kBq of ^{60}Co (equivalent to about 200 Bq/g). OTIS staff members were trained by HPA to monitor and to remove contaminated buttons, which were then stored at company's facilities. A simple risk assessment indicated that the risk to workers and public was minimal. In total, 150 lifts were checked and 270 buttons were identified as contaminated. Most of the contaminated buttons were located on construction sites, where the public does not have access.

In Switzerland, following articles published in the French papers, the National Emergency Operation Centre informed SUVA (Swiss national accident insurance fund) about the possible contamination of lift buttons. OTIS Switzerland was already informed by OTIS France. The company's employees were trained by SUVA to perform measurements, using borrowed radiation protection devices, and to remove contaminated material. The company checked all potential contaminated lifts and removed the contaminated buttons: 261 lifts were checked in Switzerland containing 2918 buttons, 99 of which were contaminated. The maximum dose rate at the surface of buttons was 0.6 µSv/h. The dose to workers was evaluated to less than 10 µSv. Finally the buttons were sent back to OTIS France. In terms of information, the Swiss authority did not receive any request from the public. Only short articles about the problem in France were published.

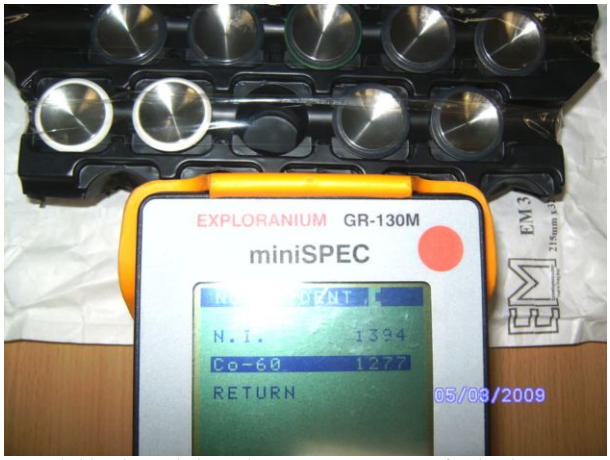
The Belgian nuclear safety authority (FANC) was informed by ASN on October 21st, 2008. OTIS France indicated that 2 lots of buttons sent to OTIS Benelux were potentially contaminated. FANC worked then with OTIS Benelux to organize measurement and to remove of all contaminated buttons. Lifts were classified in 3 categories with decreasing priority for measurements:

1) Lifts already installed and accessible for public: for this category, the measurements were performed immediately; 12 lifts were concerned and no contaminated buttons were found.
2) Lifts partly installed or in building where civil works were still ongoing (i.e. no access for the public): 58 lifts were checked; only one contained contaminated buttons (dose rate up to 4.5 µSv/hr). The contaminated buttons were removed.
3) Lift not installed: in this last category, no contamination was identified.

In total, 92 lifts and more than 450 buttons were measured; only one button was found to be contaminated. The public was informed about the contamination through FANC website.

Ireland was notified at the end of 2008 through the ECURIE System and the IAEA Illicit Trafficking Database (ITDB) programme that cobalt-60 had been detected in some elevator buttons stored in a warehouse in Italy. It was reported through EAN that these contaminated elevator buttons were also detected in the UK, which identified a sister

company in Ireland (OTIS Ltd) possibly having being supplied with similar material. The RPII followed up on this and subsequently in January 2009, OTIS Ltd in Ireland contracted the RPII to survey lifts with OTIS Ltd personnel at 24 sites throughout the country.



Provided by the Radiological Protection Institute of Ireland

Investigations by the RPII on behalf of OTIS Ltd identified 3 sites where contaminated or defective buttons were detected. A defective button (typically 3 cm diameter, 2 cm depth and 22.5 g in weight) was taken to be any button with a radiation dose rate in excess of natural background radiation of 0.15 Sv/h at the surface. The presence of cobalt-60 was confirmed in 28 buttons with individual surface doses rates between 0.3 - 30 Sv/h. Two of the buttons identified recorded the maximum surface dose rate of 30 µSv/h. Defective buttons were removed by OTIS Ltd personnel and then stored at the Company's facilities. It was determined that the levels of contamination were low and posed no risk to employees or members of the public. The buttons were returned in July 2009 to OTIS Ltd (UK) with the authorisation of the UK Environment Agency, for repatriation with the other contaminated buttons detected throughout the UK.

Import/export of contaminated metal: a current issue

The contaminated lift buttons is only one example of the issue of import/export of contaminated metal. Already in 2008, an article of the ALARA Newsletter described an incident involving contaminated imported stainless steel sheets in Italy (*Lt. Col. R. Masi,* Incident involving stainless steel sheets contaminated with Co-60 in Italy, Newsletter 23, September 2008). Moreover, a couple of weeks before the lift buttons were discovered in France, some contaminated metal flanges coming from India were discovered at a company in Sweden. This international company got first an alarm from Singapore airport and a few days later from the customs in Rotterdam. The company arranged screening for contaminated goods in Sweden, and in parallel the authority arranged contacts with radiation protection experts to perform measurements and inform the company's staff. Detailed measurement performed on one flange showed dose rate of 4-5 µSv/hr in contact. The 8 contaminated flanges were sent back to India. Some other contaminated steel issues emerged also in the UK, in Germany and Lithuania over the recent years.

In February 2009, the Spanish Nuclear Safety Authority (CSN) organized in cooperation with IAEA a conference on "Control and Management of Inadvertent Radioactive Material in Scrap Metal" to exchange international experience on that issue, to promote good practices to prevent inadvertent diversion of radioactive material and to identify needs for recommendations and guidance. The presentations and discussions showed that the problem is truly global in nature. In particular several examples of trans-border shipments associated with radioactive material found in scrap metal were presented. The fact is that there are no international legal instruments that cover this type of problem. As a conclusion, the need of establishing some form of binding international agreement between governments to unify the approach to trans-boarder shipments was unanimously identified.

At the European level, on 15th April 2009, the European High Level Group on Nuclear Safety and Waste Management (ENSREG) meeting raised the issue of contaminated steel products into the European Union. It decided to organise a second meeting to discuss the need for setting common actions to deal with this issue within the European Union. To prepare this meeting, the European Commission is collecting all input and ideas for a Community framework or legislative initiatives in this area.

Conclusions

Even if, finally, the radiological consequences for workers and the public were globally low, this event raises the problem of control of import/export products. The international market and the differences in the control of sources between countries make the global distribution of contaminated products possible, and make tracing this contamination quite difficult. As a

consequence, in most cases the countries using final products must ultimately deal with the problem both in terms of waste management and of economical costs.

Finally, the success of this request proves the interest of EAN participants for exchanging information on radiation protection events and that the network may also sometimes be a mean for spreading event information within Europe.

We also would like to thank the persons, who participated to the survey.
A. Avetisyan (ANRA, Armenia), S. Coenen (FANC, Belgium), J. Duffy (RPII, Ireland) B. Ekström (SSM, Sweden), M. Hammans (SUVA, Switzerland), V. Kamenopoulou (GAEC, Greece), J. Kropà ek (SUJB, Czech Republic) S. Risica (ISS, Italy), A. Schmitt-Hannig (BfS, Germany) P. Shaw (HPA, UK), J. Ziliukas (RSC, Lithuania), D. Zontar (SRPA, Slovenia).
Moreover information from France were taken from ASN information (www.asn.fr) and IRSN reports, available in French on the Institute's website (www.irsn.fr).

Pictures were provided by the Radiological Protection Institute of Ireland (RPII)

ERPAN survey about healthy volunteers exposure in biomedical research

D. Célier (ASN, France)

In March 2009, ASN was requested by the French Agency for the Safety of Health Products (AFSSAPS, the French competent authority for biomedical research), for advice about a proposed clinical trial intended to evaluate a PET tracer to diagnose Alzheimer's disease (AD). This test involves not only the participation of AD patients, but also of healthy volunteers, all aged 60 years or over. The protocol involves 2 PET-CT examinations, issuing a total effective dose of 18 mSv (F-18 + CT).

The medical experts consulted have validated the justification of the use of healthy volunteers and the optimization of doses provided. However, a dose of 18 mSv appeared quite high, especially for persons not taking any personal benefit from their exposure.
Moreover, as the French legislation on biomedical research requires the sponsor to specify an exclusion period during which the healthy volunteers cannot participate in another study. This has raised the question of setting such a period for the exposure to ionising radiation, so that people do not accumulate doses regularly when participating in research.

In the French radiation protection legislation however, following from the transposition of Council Directive 97/43/Euratom [1], exposure for purposes of biomedical research of healthy volunteers, like all medical exposures, is not subject to the principle of limitation. Only the determination of a dose constraint is imposed (Article 4 (2) (b) of the Council Directive 97/43/Euratom). The concept of exclusion period does not exist.

The European and international recommendations (ICRP 62 [2], Radiation protection 99 "Guidance on medical exposures in medical and biomedical research" [3]) specify how to evaluate the justification, by definition of levels of societal benefit and associated risk categories (effective dose ranges). However, levels of benefit (minor, intermediate, moderate, substantial) can be quite difficult to estimate. Furthermore, the concept of exclusion period does not exist, although is recommended not to repeat exposure in the highest risk category.

To make the data more complete, the ERPAN network was asked to provide an overview of regulations and practices on the subject in the different member countries. Responses were supplied by Belgium, Germany, Ireland, Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Only Switzerland and Germany have established by regulation a dose limit for healthy volunteers. In Switzerland, the limit is 5 mSv and is associated with a 5 years exclusion period. Prior to inclusion in a trial, it is verified that the volunteer has not been exposed to ionizing radiation during the previous 5 years. In Germany, the dose limit is 20 mSv for volunteers for whom no personal medical benefit is expected from their exposure.

In other countries, according to the result of the ERPAN survey, the regulation addresses the provisions of the Council Directive 97/43/Euratom. United Kingdom has defined national guideline values of maximum dose constraint, set at 10 mSv. Ireland, Norway and Sweden apply the recommendations in ICRP 62 or in Radiation Protection 99.

Subsequently, the above mentioned research

protocol was approved in France, after the trial sponsor added a specification in the protocol for a 5 years exclusion period for volunteers.

In order to improve radiation protection in biomedical research and harmonise practices in Europe, guidelines such as the ICRP 62 could be added to European and national legislations. They could be complemented by implementation of an exclusion period, which would prevent volunteers from accumulating exposure by participating in too many research studies involving exposure to radiation.

References

[1] Council of the European Union. Council Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionising radiation in relation to medical exposures. O.J. L-180, 22-27, 1997

[2] International Commission on Radiological Protection. Radiological Protection in Biomedical Research. ICRP Publication 62. Annals of ICRP. Oxford: Permagon Press, 1992.

[3] European commission. Radiation protection 99 "Guidance on medical exposures in medical and biomedical research". 1998.

Analyse of a reference dosimetry error in electron therapy in Switzerland

N. Stritt, M. Dorthe (SFOPH, Switzerland)

Legal provisions

The use of ionising radiation in medicine in Switzerland is regulated by several ordinances. The Radiological Protection Ordinance provides a general framework and more detailed requirements are specified in technical Ordinances, such as the "Use of unsealed sources", the "Use of sealed sources in medicine" and the "X-ray" Ordinances. In radiation therapy, requirements regarding Quality Assurance, such as dosimetry checks, are specified in the Ordinance on Medical Accelerators, with full details for the application given in the Swiss Society of Radiobiology and Medical Physics (SSRMP) Recommendation 11.

Incident summary

Extensive dosimetry checks have to be undertaken every year in order to comply with the above-mentioned ordinances. While such a dosimetry check was performed after installing a new accelerator, an error in the reference dose measurement for electron beams was identified in a radiotherapy centre. It was found to be caused by an incorrect calibration of temperature and pressure.

When investigating the origin of the error, it appeared that a new dosimeter had been introduced the previous year. Local pressure and temperature data were entered directly in the old dosimeter, yielding results corrected for pressure and temperature. When switching to the new dosimeter, pressure and temperature were no longer entered in the dosimeter, and the corresponding correction factor had to be subsequently computed with an excel spreadsheet, provided by the external institute in charge of the dosimetry. However, whilst both sets of data as well as the correction factor were displayed in the excel spreadsheet, they were not actually used to calculate the resulting dose. The erroneous calibration factor was then used throughout the dosimetry (calibration of monitor units) and the mistake went unnoticed in spite of other quality assurance checks (daily and weekly checks). This error led to a dose excess of 4.6% at the reference point.

Actual doses delivered to patients were investigated. The dose delivered to each patient (110 in total) during the period of time when the reference dose was not correct was reconstructed. The discrepancy between the planned and applied dose was analysed for each patient; a small number of patients (< 10) had been exposed to an excess dose of 4.6%, with the vast majority receiving no more than 1% excess dose. No abnormal skin reaction was noticed during or after the course of the treatment.

The incident was reported to the Federal Office of Public Health (SFOPH) and a full investigation was requested. The radiation therapy centre then suggested the corrective measures outlined below, which were approved by the SFOPH.

Lessons learned / Measures taken

When commissioning a new accelerator, care must be taken to ensure that two separate dosimetry systems are used (e.g. with a second dosimetry chain or TLD).

The local physicist, rather then an external institute, must be in charge of the whole dosimetry calibration process (as according to the SSRPM

recommendations 8 et 9) and perform measurements with an ionisation chamber calibrated by METAS (national metrology institute).

Daily and weekly checks relying solely on relative values are not sufficient and can lead to systematic errors being missed. The best way to ensure the accuracy of the reference dose is to use a calibrated reference ionisation chamber.

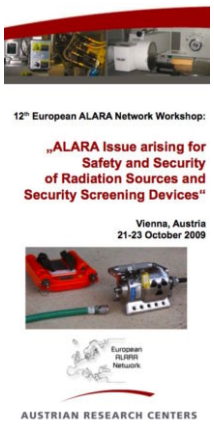
Dosimetry measurements should be given priority of over other tasks and half a day should be set aside for those measurements, so that they can be performed without time pressure.

Night measurements must be prohibited. The person doing these measurements must not do them after the usual work day. He/she must be able to fully focus on the operations necessary to the measurements.

ALARA NEWS

For more news, please visit regularly EAN Website www.eu-alara.net

❑ 12th European ALARA Network Workshop (October 2009, Vienna)



The 12th EAN Workshop will deal with "ALARA issues arising for Safety and Security of Radiation Sources and Security Screening Devices". It will be held in Vienna (Austria) from 21st to 23rd October 2009. The aim of the workshop will be to consider how the implementation of ALARA, in terms of planned and emergency exposure situations, involving worker and public doses, is affected by the introduction of these new security-related measures. In the case of new equipment and procedures, there is also the question of whether exposures arising from security screening devices can be justified. In addressing these issues, the workshop aims to consider how an optimum balance between protection, safety and security can be achieved.

More information and registration on the Workshop's website: www.alara2009.at.

❑ Recommendations of the French COFREND/ASN/SFRP working group on industrial radiography

This publication ended a long process which begun in May 2005 when ASN urged professionals of industrial radiography to define, on a national level, rules of good practice for preparing and setting up sites.

To guarantee the relevance of this work, the French Committee of Non-Destructive Testings (COFREND) committed itself to this process, with the help of experts from the French Society for Radiation Protection (SFRP). Given the scale of the project, nine working groups were formed, each one responsible for a particular theme (*regulation, experience feedback, training, equipment, dosimetry, job analysis, self-assessment guide, division of responsibilities, transport).*

A special edition of the French journal "Radioprotection" (Vol. 43, No. 7, 2008), including the results of that work was published in late 2008. The documents can be freely consulted on the journal's website: **www.radioprotection.org**

❑ Conclusions of the workshop on *Depleted uranium research: an update* (Italy, 2008)

On 17th December 2008, the Istituto Superiore di Sanità (ISS, National Institute of Health, advisory body for the Minister of Health) organised the international workshop *Depleted uranium research: an update,* the sequel to a first workshop on the subject held in October 2004. The ISS's interest in this issue is due to the request made by the Minister to continue the research into the potential association between cancer incidence and exposure to DU. Indeed, in 2002 a statistically significant excess of Hodgkin's lymphoma was observed among the Italian peacekeeping forces who had been deployed in the Balkans. The Workshop was an opportunity to share new scientific research results and research prospects, as well as future activity programs. Key issues were epidemiological studies on exposed personnel, studies of the biological effects of DU, and environmental and biological monitoring. The programme of the workshop, the abstracts and the slides of the presentations can be found at the following web address:

http://www.iss.it/tesa/even/cont.php?id=197&lang=1&tipo=8.

The workshop summary is only available in

Italian, in compliance with a request of the Health Minister to keep Italian population updated about the DU issue, but abstracts and slides are in English.

❑ New radiation protection regulation in Norway

Work in connection with revision of the basic regulation for radiation protection and use of radiations has been going on for a several years, and drafts are now being circulated for comments. The former basic regulations have been split into two regulations: one for radiation protection and one for environmental protection. The environmental regulation contains a number of nuclide-specific tables, defining various exemption and clearance levels. The revised radiation protection regulations are tightened on several points. Stricter requirements for medical screening programs are introduced, and the issue of self-referral has been addressed. Also stricter requirements for radon concentrations in schools and kindergartens are suggested. Concerning non-ionising radiation, the most dramatic change refers to the introduction of 18-year limit and staffing requirements for tanning studios. Both regulations are planned to come into force from January 1st 2010.

❑ Atlas of radon in homes in Scotland

In April 2009, HPA published an atlas of radon in homes in Scotland (HPA-RPD-051). The report brings together all the data held in the UK national radon database on radon levels in Scottish dwellings. It updates previous reports and presents the first complete radon probability map for the whole of Scotland including the inhabited off-shore islands.

Data from radon measurements in over 19,000 Scottish dwellings are presented in tabular format by local authority and by various divisions of the postcode system. A number of Radon Affected Areas are identified on the maps. It is recommended that a phased programme should be undertaken in the higher probability areas with the twin objectives of identifying homes with high radon levels and encouraging owners and landlords to reduce such levels. The full report can be downloaded from:

http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1240386976401?p=1197637096018

❑ EC Scientific Seminar on "Emerging evidence for radiation induced circulatory diseases"

In 2008, the European Commission organised its Scientific Seminar on "Emerging evidence for radiation induced circulatory diseases". Five lectures on new data from epidemiological and radiobiological studies were given by scientists actively working in the field of radiation induced circulatory diseases. More information can be found on the following Webpage:

http://ec.europa.eu/energy/nuclear/radiation_protection/scientific_seminar_en.htm

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