European ALARA Network
http://ean.cepn.asso.fr/

Issue 13 - August 2003

European ALARA Newsletter

Editorial

After 7 years, EAN is a mature network. Portugal and Croatia have joined in 2003; they are the fiveteenth and sixteenth participating countries to the network. Many different categories of participants have been progressively integrated into EAN. Initially (1996-2000), the participants to our activities were mainly experts in radiological protection from the regulatory bodies, research centres in radiological protection, and major utilities concerned by the use of ionising radiations. More recently (2001-2004), many other types of participants have been integrated into the network. These include professional bodies such as national and European societies for Non Destructive Testing, medical radiographers associations, manufacturers of devices using ionising radiations, manufacturers of radiation monitoring devices, international organisations, and trainers.

The scope of the EAN has been progressively enlarged, starting from occupational radiological protection in industry and research only, and now including the medical and NORM areas.

One major conclusion from this evolution is that there are general issues common to all sectors. For example, the EAN workshops have produced a number of common recommendations: to improve training and education in occupational radiological protection; to favour the emergence of a real radiological risk culture among the workers and their hierarchy; and more recently to support workers' involvement into their radiological risk management.

About 10 recommendations per workshop have been issued and many stakeholders have undertaken actions, following these recommendations, both at the international level (research project on internal exposure management, international feedback system on radiological incidents…) and national level (improvements of regulations and guidance on issues such as decommissioning and internal exposure, national systems on radiological incidents, seminars with Non Destructive Testing companies, etc).

In 2002, on average 130 individuals per day accessed the EAN website. Around 200 different documents have been downloaded from the site (mainly Newsletters and workshops presentations). Between five and ten presentations from each workshop have been downloaded more than 400 times. Most visitors come from Europe and North America, but a small percentage comes also from Asia, Oceania and Africa.

Furthermore, EAN has demonstrated that networking is an efficient modern concept. EAN is now considered as a model to be exported by international institutions such as IAEA or IRPA and by national representatives from different continents.

EAN has been consulted by the French regulatory body on a proposed "radiological event scale" that is briefly presented in this issue of the Newsletter.

For the first time in many years in Western Europe, a new Nuclear Power Plant is planned to be built (in Finland). The Finnish regulatory body describes here how it is intended to incorporate radiological protection features at the design stage of the plant.

C. LEFAURE

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Editorial Board

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Coordinated by CEPN, on behalf of the EC DG-RESEARCH
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European ALARA Newsletter ISSN 1270-9441
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Regulatory Requirements for Radiation Safety in the Design of a New Finnish NPP

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STUK (Radiation and Nuclear Safety Authority, Finland)

❑ Introduction

The project of the fifth Finnish nuclear power plant unit was formally started in May 1998 with an Environmental Impact Assessment (EIA) process. This process was completed in January 2000. In January 2002, the Finnish Government made a Decision in Principle, which concluded that constructing a new nuclear power plant unit in Finland is in line with the overall good of the society. The Finnish Parliament ratified the decision in May 2002. Based on this decision, the electricity generating company TVO is authorised to continue preparations for the construction of a new nuclear power plant unit.

According to the schedule presented by TVO, the plant type and site will be chosen by the end of 2003. The Construction Permit evaluation process takes approximately one year, and the construction works on-site could start at the earliest at the beginning of 2005. Estimated construction time is about four years, and thus, the new unit could be in operation in 2009.

❑ "FIN5 Project" at STUK

After the Decision in Principle, the Radiation and Nuclear Safety Authority (STUK) established a project group to co-ordinate the license application process of the fifth Finnish NPP unit at STUK. The project is divided into 10 subprojects, as shown in Figure 1. One subproject is radiation and environmental safety and emergency preparedness, which includes approval of siting issues, radiation safety principles of the plant and related analyses, radiation instrumentation and emergency preparedness arrangements.

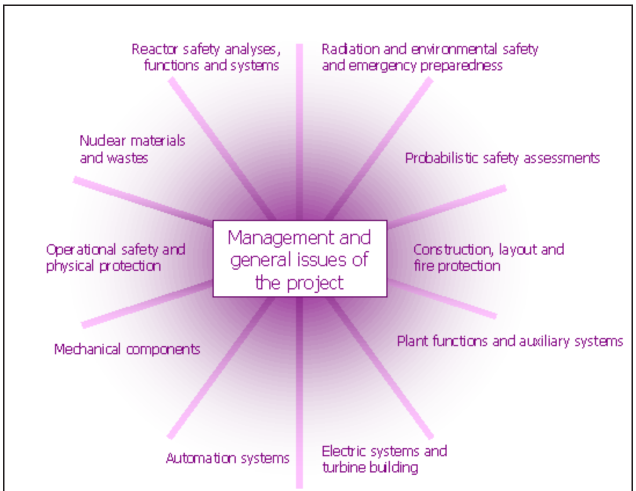

Figure 1: Different sectors of the project group, which co-ordinates the license application process of the fifth Finnish NPP unit at STUK

Regulatory Platform:

By virtue of the Nuclear Energy Act (990/87) and the Council of State Decision (395/91) on General Regulations for the Safety of Nuclear Power Plants, STUK issues detailed regulations concerning the safety of nuclear power plants. Those regulations are called YVL-guides. After the Decision in Principle, STUK made a plan in which existing YVL-guides were evaluated. It was decided that the (1996) guide concerning the radiation safety aspects in the design of NPPs would be up-dated during 2003. In the new guide, (severe) accident situations and decommissioning of the plant will be taken into account in more detail. In addition, a new design criterion for an annual personnel collective dose target of 0.5 manSv per 1 GW of net electric power (based on the statistics of the new generation nuclear power plants) will be considered. The main contents of the new guide are shown in Figure 2.

1 General
2 Design principles
 2.1 General requirements
 2.2 Radiation sources and shields
 2.3 Materials and their corrosion resistance
 2.4 Plant layout
  2.4.1 Rooms and access routes
  2.4.2 Entering and leaving the controlled area
 2.5 Decontamination of rooms and equipment
 2.6 Decommissioning
 2.7 Accidental situations
3 Radiation safety in systems design
 3.1 Individual systems and components
 3.2 Pipelines
 3.3 Drainage and leak collection systems
 3.4 Treatment of resins and concentrates
 3.5 Limitation of the effluent release
4 Regulatory control

Figure 2: The main contents of the new guide on the radiation safety aspects in the design of NPPs

What will be different?

At present, there are two nuclear power plants in operation in Finland; two PWR units in Loviisa and two BWR units in Olkiluoto. These reactors were commissioned between 1977 and 1981. Average collective radiation doses per reactor for operating OECD country NPPs and for existing Finnish NPPs for the years 1991-2001 are shown in Figure 3. The collective dose at the Olkiluoto NPP has been clearly under the international average value of the BWR reactors. On the other hand, the comparison of the collective dose at the Loviisa NPP to the average value of the PWR reactors does not give such an excellent result. Statistics for the new generation nuclear power plants would suggest that the collective dose in the fifth Finnish NPP should be lower. This is due to the fact that ALARA aspects will be fully taken into account in the design.

In a new nuclear power plant, on-site habitability during accident situations has to be taken into account. The revised regulatory guide requires analyses of the magnitude and location of the possible radiation sources and estimates of doses received in different accident management and emergency preparedness measures. In the design process, these doses are not allowed to exceed the normal dose limits of a radiation worker. An assessment of the on-site habitability during severe accidents at the existing Finnish nuclear power plants has been recently prepared at STUK.

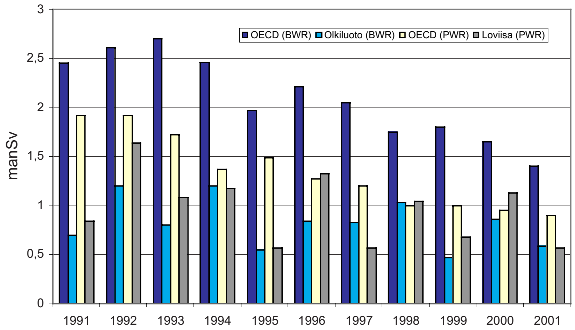

Figure 3: Average collective radiation doses per reactor for operating OECD country NPPs and for existing Finnish NPPs

❑ Conclusion

Based on a Decision in Principle, TVO continues preparations for the construction of a new nuclear power plant unit in Finland. The up-dated regulatory guide concerning the radiation safety aspects in the design of NPPs will set a new lower design criterion for an annual personnel collective dose. In addition, accident situations and aspects of decommissioning of the plant have to be taken into account. The fact that ALARA aspects are taken into account in greater detail than previously already in the design stage of the new generation NPPs is expected to ensure that the collective dose in the fifth NPP would be considerably lower than in the existing Finnish NPPs.

Internal Dosimetry — Enhancements in Application
An Overview of the EC funded IDEA Project

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❑ Introduction

New developments in internal monitoring procedures are being employed at specialized laboratories at this time, but have not found their way into routine internal monitoring programs. The sophistication of the new methods and high equipment costs are assumed to be the main reasons why they have not yet been readily accepted in the internal monitoring community. A comprehensive assessment of these techniques and the enhancements necessary to bring them to broader acceptance in the routine monitoring community is the main objective of the EC-funded IDEA project (FP5).

❑ Highlights of the Project

The two measurement techniques routinely used in internal monitoring programs to assess dose from incorporated radionuclides are in-vivo counting and bioassay analyses. The first is employed for measurements of incorporated gamma emitters; the latter for radionuclides which do not possess a sufficient gamma emission signature for in-vivo measurements to be effective. Gamma emitting radionuclides which are distributed in the whole body are measured using a whole-body counter while gamma emitters accumulated mainly in specific organs or tissues are analyzed by means of organ counting. Bioassay methods are employed for the determination of alpha or beta emitters in urine, feces, blood, or other biological samples.

The proof of compliance with existing laws and regulations required by the authorities and the necessity to provide adequate radiation protection for occupationally exposed workers are posing challenges for the currently used internal monitoring techniques. Improvements are sought in cost, accuracy, speed, detection limits, and the many contributions to the total uncertainty budget in the activity measurements as well as in the estimates on radionuclide intake and dose reconstruction.

The key elements of the IDEA project therefore are:

- validation and possible application of new measurement concepts,
- enhancement of existing (routine) measurement concepts,
- improvement of calibration techniques taking into account individual variations, and
- application of better monitoring and calibration techniques to reduce uncertainties in the evaluation of whole and partial body activity and individual intakes for dose assessment.

❑ Description of the IDEA Project

The scope of the work for the IDEA team encompasses developments in both in-vivo monitoring techniques and in bioassay measurements. Emphasis is placed on the use of low energy germanium and silicon detection systems for in-vivo organ counting and wound measurements and on calibration methods, using computer simulation and numerical phantoms, as these are expected to reduce the systematic uncertainty on in-vivo measurements.

The use of ICP-MS[1] is envisioned as the focus for the portion of the project dedicated to the investigation of bioassay measurements. The optimization of the urine sampling process, instrumental operating conditions, and measurement validation are to be studied in detail. Systematic uncertainties on the dose assessment from ICP-MS measurements are also being investigated.

Publication of guidance and the agreement on a code of practice for routine internal monitoring laboratories on the application of the newly developed monitoring techniques in in-vivo and bioassay measurements are the final objectives of the IDEA project. The use of the new systems and the methods to reduce individual measurement uncertainties will be outlined in detail.

❑ Conclusion

Several major sources of measurement uncertainties in in-vivo and bioassay analyses have been identified. The aim of the IDEA project is to quantify these and to investigate the possibility of individual corrections to reduce the total uncertainty on the measurements or on the final dose. Verification of the proposed concepts is currently being conducted, or has been successfully completed. A comprehensive assessment of new techniques and the enhancements necessary to bring them to broader acceptance in the routine monitoring community, is in progress.
The main issues at this time are the investigation of in-vivo measurement uncertainties due to inhomogeneous distribution of radionuclides in the lung, and the uncertainties associated with aerosol diameter, chemical composition, and density. Novel detector systems, inter-laboratory uncertainties due to conventional calibration methods and the measurement systems are also being investigated. For bio-assay measurements, the use of ICP-MS systems and the interpretation of measurement results are the main focus.

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A French proposal for a classification scale of radiological incidents and accidents

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*Pascal Crouail**, Christian Lefaure***

**DGSNR: Nuclear Safety & Radiation Protection Authority, France*
***CEPN: Nuclear Protection Evaluation Centre, France*

❑ Introduction

The development of a classification scale of radiation incidents for accidents is one of the main projects started by the French Nuclear Safety and Radiological Protection Authority (DGSNR). Such a scale is intended to improve the information provided to the public, and help achieve the transparency about the severity of the events, incidents or accidents involving exposures to ionising radiations.

The DGSNR has launched a work aiming at elaborating such a classification scale for radiological incidents or accidents. This scale complements the International Nuclear Event Scale (INES) which has been used for several years to inform the public on the seriousness of incidents that occur in nuclear facilities. Like the INES[2] , the proposed scale comprises eight levels of severity and uses the same terms (anomaly, incident, - serious and major - accident) for keeping the public and media well informed. As there should be only one communication message, the proposed system consists in rating each event according to appropriate criteria, with the INES for nuclear safety aspects, and/or with the proposed new scale for radiological protection ones. The degree of severity communicated to public relates to the most severe criterion.

A complete report is available and downloadable both in French and in English. on the DGSNR web site: http://www.asn.gouv.fr/

❑ Reasons for having a severity scale for radiological incident and accident situations

Given that the public is highly sensitive to radiological protection issues, radiological incidents and accidents are given wide media coverage, regardless of their actual degree of severity. It is therefore essential that the radiological protection authorities have a simple tool whereby they can communicate with the public and put the various radiological incidents and accidents into perspective on the basis of their relative severity.

As regards the protection of human beings, the severity of an event is considered as being directly proportional to the risk run by an individual (the probability of developing fatal or non fatal health effects) following exposure to ionising radiation in an incident or accident situation.

The aim therefore is to propose a tool that will make allowance for the various aspects of this risk and to

[1] Inductively Coupled Plasma Mass Spectrometry

2 The International Nuclear Event Scale (INES), User's Manual, 2001, IAEA, Vienna, 2001.

quickly attribute to it a degree of severity that will be meaningful to the media and the wider public, using known, commonly-used qualitative terms (accident, incident, serious, major etc.).

The tool does not aim to provide a detailed explanation of radiological risks, nor does it attempt to provide perspective as regards other risks encountered in daily life (tobacco, AIDS etc.).

To be effective, a tool such as this must not only be understandable and easy to use, it must also be acceptable to all those involved. Whenever possible, there should be no vague, contradictory information.

If it is to be credible, the tool must be based on international consensus on the knowledge and assumptions associated with the health effects of ionising radiation and on the dose-effect relationships used to manage radiological risks.

To be workable, the tool must be based on a system that allows events to be classified in a simple manner using available assessment techniques (software, charts) which are based on the state-of-the-art in dose-effect relationships.

To be understandable, it should not involve terms that are too technical: the general public has great difficulty understanding the official system of dose quantities and units, which is complicated and unfamiliar, and also in grasping the difference between stochastic and deterministic effects, or assessing the severity of events on the basis of the relationships between the various types of radiation, the exposure levels and the effects.

Furthermore, the tool must also be capable of covering a wide range of "possible" events corresponding to different types of exposure (internal, external etc.) resulting in a wide range of doses (more than ten orders of magnitude!) that could be received by different types of individuals (workers, the public, patients) in very different sectors of activity (non-nuclear industry, medical, nuclear industry).

If information is to be given on events that involve several types of risk (radiological and non-radiological), it must be possible to apply the approach adopted in a general manner, not specifically to radiological risks. Thus, in the case of an event involving exposure to toxic chemicals and ionising radiation, the probability of developing health effects can be linked to either one of the two types of exposure. When exposure-risk relationships are available for toxic chemicals, a classification can be made according to other criteria and the public can be informed of all the risks on the basis, once again, of the most severe criterion.

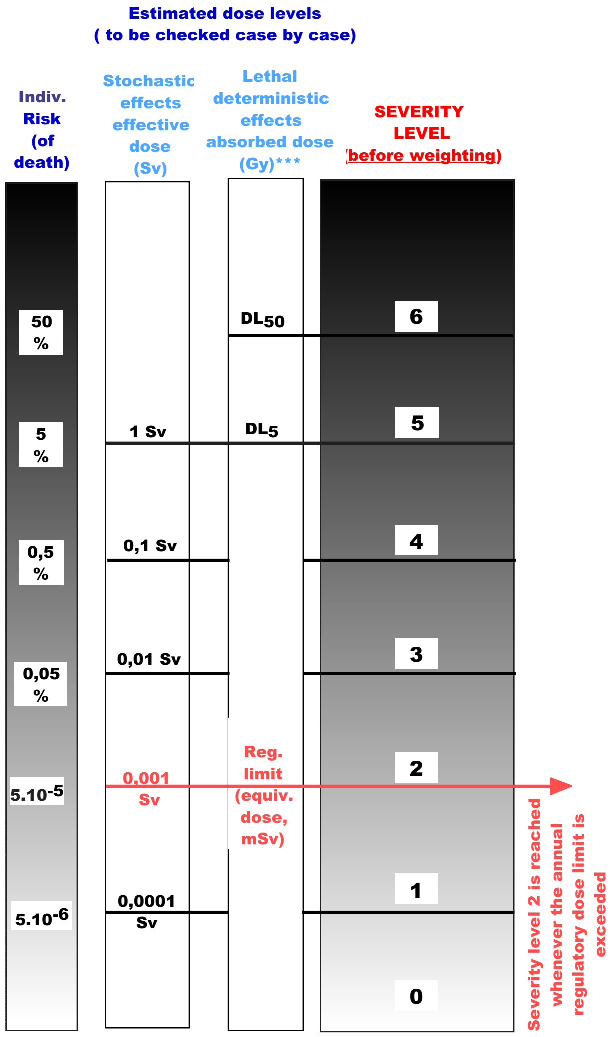
French proposal deals only with the assessment of radiological protection of individuals: protection of the environment against radioactive, toxic substances or other pollutants for example are not covered.

Lastly, the tool has three further objectives:

- To make allowance for the number of individuals exposed during the incident or accident.

- To highlight events that reflect shortcomings in the radiological protection system and those that are due to non-compliance with the regulatory rules in force.

- To estimate the severity of a potential risk, i.e. a risk corresponding to the exposure to which individuals could have been subjected if they had been present or present for longer at the scene of the event.



(*) DL50 and DL5 are dose/doserates/organs related (the report provides abacuses which give corresponding ranges of value in Gy)

(Remark) In most cases, the severity level for an event involving workers can be deduced using this chart and reducing the severity level obtained by 1.

Figure 4. The proposed scale for rating radiological events leading to public exposures

❑ Exposure situations not covered by the proposed scale

Most situations involving exposure to naturally-occurring radiations are, by nature, of the non-incident type (exposure to cosmic radiation, internally deposited natural radionuclides etc.) and do not fall into the category of exposure events covered by the scale. It would also appear that other types of exposure to naturally-occurring radiation should be excluded in the light of current practices and regulations: examples are exposure to radon in dwellings or exposure to enhanced levels of naturally-occurring radionuclides, but future changes in the regulations could mean that some situations could be classified as incidents.

"Normal" occupational exposure, "normal" medical exposure (i.e. that which is justified, planned and optimised) and controlled exposure (in the case of so called "interventions" for example) are not covered by the scale.

Past events (fallout from nuclear weapons testing, the Chernobyl accident etc.) should be classified with the proposed severity scale. However, the corresponding long-term residual exposures are not supposed to be assessed using the proposed scale (as it does not constitute a "new" event).

❑ Exposure situations covered by the proposed scale

Contrary to the examples given above, all events leading to accidental exposures that are combined with normal or controlled exposures could be assessed using the scale proposed.

Radiological incidents and accidents leading to patient exposures are situations that will eventually be covered by the proposed scale. First, however, it is intended to consult with professionals in medical field to determine exactly which events can be considered as incidents or accidents.

❑ The proposed scale

This article will not describe in detail how the proposed scale can be used when radiological events occur. However, as an illustration, Figure 4 hereabove shows the risk/dose vs. severity levels given in the scale as far as public exposures are concerned.

The downloadable report provides the detailed rules that have to be applied in case of occupational exposures but, in most cases, the severity level for an event involving only workers can be deduced using the chart corresponding to public exposures, and reducing the severity level obtained by 1.

In the case of events leading to both public and workers exposures, the maximum severity level obtained by the two classification systems (relating to the public and workers) shall be used for communication purposes.

After this initial classification of the event, weighting factors have then to be applied in some cases for example (see the report for details):

- In case of an obvious lack of radiation safety culture.
- Where regulatory limits are breached (other than individual annual doses) for example a doserate limit for transport of material.
- If several people are exposed during the event (for example, if they are more than 10, or more than 100 exposed at doses higher than the regulatory annual dose limits, the severity rating is increased by +1, and +2, respectively).
- If observed or expected deterministic effects are not lethal: if a lethal deterministic effect occurs in the population, it will lead to a severity level of 6 - if a non-lethal deterministic effect occurs, it will lead to a severity level of 5 (for permanent disabling) or 4 (for non disabling or reversible effects).

Potential exposures (eg. lost sources) are also in the scope of the proposed scale; the report gives a first proposal for communicating this type of events (often, they are "non-events"), but this point is still in discussion in France.

Once the weighting factors have been applied, the event is classified on the severity scale which has 8 levels (from 0 to 7) and, the communication wording used will be the same as INES:

• Events finally rated at level zero are known as **"deviations"**; they can be considered as being of no concern as regards radiological protection.

• Events finally rated as levels 1 to 3 are **"incidents"**.
  - events classified at Level 1 are known as "anomalies".
  - events classified as Level 2 are known as "incidents".
  - events classified as Level 3 are known as "serious incidents"

• Events finally rated at levels 4 to 7 are **"accidents"**.
  - events classified as Level 4 are known as "Level 4 accidents".
  - events classified as Level 5 are known as "Level 5 accidents".
  - events classified as Level 6 are known as "serious accidents".
  - events classified as Level 7 are known as "major accidents".

❑ Status of the work

The DGSNR now wants this work to be critically reviewed by the stakeholders concerned by radiation protection. The DGSNR is therefore in the process of organising a large consultation of French stakeholders (professional societies in the medical and radiological protection fields, RELIR group, representatives of trade unions, representatives of environmental associations, major nuclear utilities, association of NDT firms…).

The proposed scale then enters a test phase in France. Moreover the French regulatory body has officially sent the "draft" report to all European regulatory bodies, to the European Commission, and to IAEA for information and comments. CEPN is also consulting European partners, through the European ALARA Network.

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Summary of the SRP Scientific Meeting ALARP: Principles and Practices Oxford, April 2003

The 40th Anniversary of the UK Society for Radiological Protection (SRP) provided the opportunity for a 3 days scientific meeting, on the topic of ALARP (As Low As Reasonably Practicable), the UK equivalent to ALARA. The meeting was attended by some 200 people and was split into 4 sessions with accompanying poster displays, an industry exhibition and an Open Forum session.

The first session covered “ALARP past, present and futures; its uses and abuses”. Geoff Webb reviewed the history of ALARA as a structured approach to thinking about dose control. He concluded that whilst “the inclusion of a large number of ridiculously low individual doses should be avoided in collective dose”, it still provides a useful parameter in decision aiding tools such as cost benefit analysis that can provide inputs to decisions on ALARA.

Jack Valentin (ICRP Secretary) next considered the future of the ALARA concept in the context of the fact that ICRP is reviewing its basic recommendations. Recent developments in the understanding of cell bystander effects call into question the simple Linear No Threshold (LNT) approach, but the overall philosophy is likely to remain; the avoidance of deterministic effects and the minimisation of stochastic harm taking into account other factors. There is an increasing awareness of the need to overtly include the ethical basis of decision making. The equity of dose distribution, waste production and disposal, the basis of optimisation and constraints, the impact of radiation exposure on biota other than man and lower dose cut-offs all need to be considered within the Dose Limitation philosophy. At the same time simplification of dose constraints may be desirable, with a greater emphasis on individual dose limitation. For collective dose a more limited role, identifying blocks of exposure over time and area, is likely to be retained.

Mick Bacon, Nuclear Installations Inspectorate (NII) and Bob Smith, Environment Agency (EA), presented a joint regulatory view of ALARP and Best Practical Means (BPM): concepts that have some similarities but also differences. Whilst current regulations call for the application of ALARP in the workplace, its actual application continues to cause debate. Although ultimately it is for the courts to decide whether or not their has been compliance with the law, NII has developed guidance on what is required by ALARP and BPM from the duty holder. An interesting point is that from a legal standpoint ALARP only applies to risks under the licensee’s control - on that basis a small increase of dose at site A to produce much larger dose reductions in the nuclear cycle at site B may not be ALARP in the eyes of the law but would be within radiological protection circles. Similar guidance in defining and applying BPM and Best Practical Environmental Option (BPEO) is being prepared by EA and the Scottish Environmental Protection Agency (SEPA).

There was then several papers putting forward a series of challenges to the application of the ALARA /ALARP principle. Ian Jackson (Jackson Consulting) suggested that in the future, technology based standards such as Best Available Technology (BAT) are likely to become the dominant driving forces in protecting the environment. For example high level policy objectives like OSPAR tend to emphasise BAT. David Copplestone considered the challenge of adapting the philosophy to non-human biota. It was suggested that this was possible, however, the development of dose frameworks, and identification of end-points of concern for the huge diversity of species and like cycle stages potentially of interest, presents a considerable challenge. Greg Butler (Sustainable Environment Policy Unit, Manchester University) challenged the current balance between social and economic factors in dose optimisation. Decision making can appear inconsistent. For example, individual doses of up to a few 10s of mSv per year from natural gas, with an annual collective dose of 200 to 300 man.Sv to the UK population is considered to be “no danger”, yet comparable dose arising from nuclear power plant operations are considered to require massive investments to achieve dose reductions. The talk illustrated the need to address social and economic factors in a quantitative, explicit and rigorous fashion.

A presentation by John Croft looked at the differences between the application of ALARP in the nuclear and non-nuclear sectors. He looked at the key drivers in developing safety culture (essentially the collective knowledge and value sets of an organisation). Regulatory presence was seen as “setting the tone”, with a need for clear signals from the regulators of their expectations and then firm but fair enforcement. In the nuclear sector the limited number of major employers, the availability of in house RP Experts and extensive professional networks have been factors that have supported strategic decisions about a coherent approach to and implementation of an ALARA culture; which is now well embedded. In the medical sector the mature uses of radiation and the historically influential position of medical physicists has led to a healthy ALARA culture for both occupational and patient exposures – but with some issues over emerging technology uses. In research and teaching the presence and influence of the professional health physicist was more varied and together with clashes over an academic freedom culture, a high turnover of staff and transient populations, there was a variable level of ALARA culture. Industry was the most disparate of all the sectors. Many of the uses were peripheral to organisations’ core functions and in house professional health Physics expertise was rare. Here it was concluded that, although there had been some improvement in ALARA culture, there was still some way to go, particularly in respect of industrial radiography.

A second session covered ALARP in operational, remediation and disposal activities. The nature of the talks varied widely: Jim Bishop (BNFL) talked about the application of ALARP in an active Magnox reprocessing plant, Bob Major (NNC) discussed dose optimisation at

Kursk NPP and Dave Stone (Enviros) presented general aspects of BPEO and ALARP in decommissioning. These involved a wide range of radiation levels form Sv/h to mSv/h, but similar issues were raised in identifying best practice. Thus, ALARP has aspects of both physical protection measures and work practice or culture. Where possible, ALARP should be designed into plant and especially for older plant, incorporated into any refurbishment programme. The work force also requires appropriate training. This should not be simply prescriptive but should encourage a continuous improvement to work practices.

Simon Robenshaw (NNC), Kevin Lee (BNFL), Simon Goodwin (BNFL) and Iona MacDonald (UKAEA) illustrated decommissioning in various facilities at Harwell, Greenwich, Sellafield and Dounrey. Specific instances of best practices were presented, again emphasising the need for strategic overviews, options comparison for specific projects and workforce training. With respect to decommissioning very few operations are routine and each programme requires individual consideration.

Christian Lefaure noted that in France the traditional culture had been one of setting prescribed limits. ALARA was not introduced until 1986 and then only for external exposure of the workforce. Since 1991 the application of ALARA has become more widespread, through the initiatives of EDF, and stringent individual and collective dose targets have become adopted. In 2001, the ALARA principle was extended to public and medical exposures. However, it appears that ALARA is still commonly misunderstood and misapplied in decision making processes. Across Europe more generally the ALARA network was established in 1996 to promote best practices. With this, more precise wording on the weighting to be attached to social and economic factors have evolved, and the implementation of ALARA has become a more rigorous regulatory requirement. Challenges for the future include better determination of neutron doses, application of ALARA to the non-nuclear sector and the greater involvement of stakeholders.

Session 3 covered ALARP in the context of small users and non-routine exposures. There were presentations on dose limitation in the context of a research reactor, emergency surveillance situations and the dissemination of emergency response arrangements. Among the more unusual talks was one on the practical and ethical issues arising from a person undergoing radio iodine therapy wanting to take a long haul flight.. Although the potential doses to fellow travellers was relatively small (worst case estimate 0.06 mSv) perceptions of risk can be highly subjective. Presenting the issues to six audiences (totalling 183 people) attracted responses indicating that technically the trip should not be limited, but the majority felt that it might not be reasonable for fellow passengers.

Arwell Barrett (Health and Safety Executive) discussed the potential application of the ALARA concept to non-ionising radiations, particularly electro-magnetic field exposure and optical radiations. There is a large variation in how different parts of the electromagnetic fields affect people ranging from driver distraction from mobile phones to the generation of projectiles in high electromagnetic fields. Many effects are deterministic in nature and the question is whether it is reasonable to apply ALARP. Controls are being set using a precautionary approach by having levels at a fraction of the required exposure to develop the effect in question. In addition, wearing appropriate personal protection can be enforced to reduce the risk of injuries.

Session 4 covered ALARP or close to zero? Within this Duncan Jackson (Enviros) looked at the issue of valuing risk reduction measures through he application of a visible valuation of saving a statistical life. The primary message was that risk and spend decisions should be linked in a clear fashion, with the acceptance of pragmatic lower risk thresholds. This may be a contentious issue since in discussion it was made clear that there are currently no regulatory cut-off dose below which ALARP need not be applied, but the effort involved in the decision making should be commensurate with the doses involved. Nonetheless it is for the courts to determine on issues of ALARP and here there may be a need for guidance to Magistrates.

Acknowledgement is given to the SRP, as this article is an adaptation of its summary of the Meeting.

Radiological Incident in Macedonia and Italy

Mario Paganini-Fiorati

❑ The event and its radiological consequences

On June 2001, a foundry in Skopje (Macedonia) sent 32 steel slabs of different sizes (total amount about 65 tons) to three shipyards in Italy, as follows:
a) 12 slabs were sent to the harbour of Ancona;
b) 19 slabs were sent to the harbour of Palermo;
c) 1 slab was sent to the harbour of Livorno.

All the slabs were contaminated with detectable quantities of cobalt-60.

Surveys carried out with a portable multichannel analyser showed that the contamination was due to cobalt 60, with a concentration of about 1 Bq/g. Direct measurements gave 3 μSv/h at maximum at a distance of a few cm; at a distance of 1 m, 1 μSv/h; at a distance of 3 m, the equivalent of the background was measured.

The contamination was detected because of the following events:
1. the Ancona shipyard used 12 slabs to build two fishing boats;
2. on October 2001 the shipyard sent its metal scraps to a firm that usually gathers scraps to be sent to a foundry;
3. this firm monitored these scraps, according to Italian law procedures, and detected some radioactive contamination;
4. the firm notified the local Police Body.

The contaminated slabs were traced and found to be produced in Skopje (Macedonia) and traded in Italy through a trading firm to the shipyards referred above.

The slabs sent to the harbour of Palermo were simply stored; the slab sent to the shipyard of Livorno was used in the same period. Surveys were performed in all three harbours according to criteria and procedures agreed among the involved surveyors.

Information about the contamination was obtained by the foundry in Skopje:
a) in two castings, of about 100 tons each, cobalt-60 contamination was detected with activity concentrations of 0.831 Bq/g and of 0.609 Bq/g, respectively;
b) the preceding five castings were reported free of contamination. No information could be obtained concerning the five following castings. The total production of contaminated steel amounted to 200 tons, of which 35 tons were sent to Italy. No information is available concerning where the other 135 tons were sent.

The trading firm considered the detected contamination in perfect compliance with the Italian legislation. However, the Italian laws for radiation protection state that the exemption level of 1 Bq/g is not valid for recycling and waste management. For components with a contamination lower than 1 Bq/g, their use is allowed only if the annual dose to any member of the public is less than 10 μSv/y and the collective dose is less than 1 Sv/y.

At Ancona, surveys and measurements were performed by the relevant Regional Authorities for Environmental Protection (ARPA) in co-operation with the police and a surveyor from ANPA (the National Agency for Environmental Protection). At Livorno, surveys and measurements were performed by the relevant Regional Authorities for Environmental Protection (ARPA) in co-operation with the police. At Palermo, the local laboratory for Hygiene and Public Health co-operated with the police body.

At the harbour of Ancona:

1. Almost all the slabs had already been used to build two fishing boats; the contaminated components of the two boats were readily identified; the affected areas were identified and declared “restricted areas”;

2. Powders and scraps produced during the building of the boats were identified, collected and removed from the areas normally occupied by workers, in a sealed container. No removable contamination was left in these last areas;

3. The remaining slabs were put in the same containers;

4. The relevant workers were likely to have been exposed to doses less than 1 mSv, but in any case their exposures are to be considered as not justified;

5. As for internal contamination, carpenters and welders (25 workers) immediately underwent whole body monitoring at the ENEA Centre of Bologna. No internal radioactive contamination was detected.

At the harbour of Livorno, 1 slab was used in the building of a boat; this boat was seized and measurements were carried out on scraps and powders. The same criteria as for Ancona were adopted.

At Palermo, the 19 slabs have not been used yet. All the slabs were seized and set away from any unauthorised access.

On March 2002, the judge in Ancona responsible for the case stated that all the remaining slabs in Palermo, powders and scraps gathered in Ancona and Livorno should be sent back to the foundry in Skopje. Components of relevant sizes were cut into smaller parts in restricted areas; all the areas were covered with plastic sheets; air samplers were used to monitor air contamination during all the procedures. All the involved areas were left free of radioactive contamination. The work was completed and all contaminated materials were sent to Skopje by October 2002.

❑ **Conclusion**

In conclusion, this event is not thought to have resulted in significant radiation exposures to either workers or members of the public. Nevertheless it should be stressed that small doses could be delivered to a large number of members of the public, if metal tools or consumer goods with a very low contamination are distributed among the population. In this case the missing 135 tons of contaminated steel surely will cause some exposure to some people somewhere in the world.

A further consideration is that EC Directives and the national legislations focus on the problem of contaminated scrap metal. Il this case, the contamination was associated with freshly manufactured material. In order to avoid such events, newly manufactured materials should be controlled in the same way as scrap metal, when crossing every checkpoint at any European border.

The classification of the event with the French scale project

This event would be classified level 1 on the French radiological scale: there was no significant public or workers exposures (ie. The severity level before weighting equal to 0); actions ans decisions taken during the event have not shown a real lack of radiological protection culture; there was no breached regulatory limit, but some people could receive low doses from the lost slabs.

Then, using the French proposed classification scale of radiological incidents and accidents, the rating of this event, would be:
0+1 (weighting for potential exposures) = 1 (= **anomaly**).

ALARA NEWS

Implementation of the 96/29 EURATOM Directive: 3 new French Decrees

Three decrees which have been recently adopted, ensure the transcription into French law of the 96/29/EURATOM Directive (available in French, only):

- *Décret n° 2003-270 du 24 mars 2003 relatif à la protection des personnes exposées à des rayonnements ionisants à des fins médicales et médico-légales et modifiant le code de la santé publique*
- *Décret n° 2003-295 du 31 mars 2003 relatif aux interventions en situation d'urgence radiologique et en cas d'exposition durable et modifiant le code de la santé publique*
- *Décret n° 2003-296 du 31 mars 2003 relatif à la protection des travailleurs contre les dangers des rayonnements ionisant.*

The values of the regulatory dose limits in France are:

- For the members of the public: 1 mSv/year
- For the workers: 20 mSv/12 months
- For students under 18 years old: 6 mSv/12 months

For pregnant women and foetus: 1 mSv for the foetus during the remainder of the pregnancy period.

For more information, please contact:
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Dose limits for stochastic effects in Lithuania

By the Central and Eastern European ALARA Network

The CEEAN informs us on the values of the regulatory dose limits in Lithuania:

- For the members of the public: 1 mSv/year and 5msv/5 years or, 5 mSv/year in specific circumstances,
- For workers (category A): 100 mSv/5 years with a maximum of 50 mSv/year
- For workers (category B) and students under 18 years old: 6 mSv/year
- For pregnant women and foetus: 1 mSv for the foetus during the remainder of the pregnancy period

In very specific circumstances (eg. interventions after accidents), the Ministry of Health can exceptionally approve case by case exceedings of the above values.

Fore more information, please contact Mr. Gendrutis MORKUNAS
Email: genmo@takas.lt

4th ICRM Conference on Low-Level Radiioactivity Measurements Techniques

Vienna, Austria, 13-17 October 2003

The conference follows on from earlier events (Monaco 1991, Seville 1995 and Mol 1999). The measurement of low levels of radioactivity in a wide variety of matrices has been of interest to the scientific community since the beginning of the 'nuclear age' and techniques have continued to be developed to enable the detection of ever lower amounts of radioactivity in smaller samples. This conference will look at the latest developments in this area with reference to and emphasis on the metrology and quality of measurements.

Online booking and programme are available via the ICRM web site http://www.icrm-llrmt.at/icrm_ct.html
For more information, please contact
BEV - Bundesamt für Eich- und Vermessungswesen
Section: Ionizing Radiation, Radioactivity, Altgasse 35, 1160 Vienna, Austria (www.metrologie.at)
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Or ARC Seibersdorf Research GmbH, Health Physics
2444 Seibersdorf, Austria (www.arcs.ac.at)

Proceedings of the International Conference (Geneva, 26-30 August 2002)

Hosted by the Governement of Switzerland, organized by the IAEA and convened jointly with the ILO, the Geneva Conference on "**Occupational Radiation Protection: Protecting Workers against Exposure to Ionizing Radiation**", was the first international conference to cover the whole area of occupational radiation protection, including infrastructure development, radiation monitoring, stakeholder involvement, and the probability of causation of occupational harm attributable to radiation exposure.

The IAEA published the proceedings of the whole conference. They include all contributed papers, topical session presentations, and round table discussions. An executive summary includes the findings and recommendations of the Conference.

Orders and requests for information may be addresses to:
Sales and Promotion Unit, IAEA, Wargramer Strasse 5, P.O. Box 100, A-1400 VIENNA, AUSTRIA.
E-mail: sales.publications@iaea.org
Website: http:://www.iaea.org/worldatom/Books

8th EAN Workshop on "Occupational Radiological Protection Control through Inspection and Self-assessment"

Photo: Uppsala kommun

Uppsala, Sweden
22-24 September 2004

FIRST ANNOUNCEMENT

Photo: Uppsala kommun

OBJECTIVE OF THE WORKSHOP

The objective of the workshop is to assess how regulatory authorisation and inspection, and internal controls (peer reviews, self assessment…) contribute to achieving ALARA for occupational exposure.

The Workshop will encourage views from regulatory bodies, licensees, workers and their representatives and promote communication between these and all other interested parties.

The main output from the Workshop will be recommendations to the different stakeholders on good practices and effective tools of control through regulatory authorisation and inspection, and internal control.

SCOPE OF THE WORKSHOP

The Workshop will be in four sessions half the time and in four working groups the rest of the time.
The four sessions will cover the following topics:

- Setting the scene
- Regulatory bodies & control organisations
- Licensees
- Workers

Themes for the working groups:

- Inspections
- Self assessment
- Involvement of workers
- Communication between stakeholders

The programme committee reserves the possibility of limiting the attendance to 100 participants.

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Last Announcement

Objectives

The main objectives of the seventh European ALARA Network (EAN) Workshop are to review the recommendations of the first EAN Workshop (held in Saclay in December 1997), to identify progress made in the application of ALARA in decommissioning and to discuss what still needs to be done, both in the nuclear and non nuclear sectors.

Scope of the Workshop

The Workshop will cover the following topics (See the provisionnal Programme below).

- Site remediation including occupational exposures, the impacts on population and environment, and risk perception;
- Operational aspects of decommissioning outside the nuclear fuel cycle such as accelerators, medical installations, NORM and consumer product facilities;
- Effectiveness and feedback on the use of dose and dose rate estimating tools;

In order to pursue the objectives, there will be oral and poster presentations. Each of the four topics will be discussed in a separate session. To gather the views of interested parties, some of the workshop will be devoted to small, facilitated, discussion groups (once again each of the four topics will be covered separately). The number of participants will, therefore, be restricted to 80.

The Workshop will take place in the NRG facility in Arnhem, the Netherlands, from the 29th to 31st of October 2003.

Posters

Authors wishing to provide poster presentations (in English) are invited to submit an abstract of 15-20 lines (A4) typed single-spaced in Times 12 pt (Word format) to Mr. F. VAN GEMERT, (NRG), by 30st September 2003 by email : vangemert@nrg-nl.com

Fees

350 € (lunches & coffee pauses included)

7th EAN WORKSHOP - PROGRAMME

Wednesday 29 October 2003

SESSION A Setting the scene

• Welcome	*J. van der Steen*
• Introduction and setting the scene	*C. Lefaure /P. V. Shaw*
• Follow up of former recommendations to be announced	*P. Deboodt*

SESSION B Site remediation
(Chair: Mr. Gendrutis Morkunas)

• The role of ALARA in management decisions	*J.A.M.M. Kops*
• Applications of multi-attribute utility analysis to issues in uranium mining in Central Europe	*M.C. Thorne, M. Kelly*
• Methodology for the management of industrial sites contaminated with radionuclides in France	*A. Oudiz et.al.*
• Methodology for estimating the doses to members of the public from contaminated land	*S.F. Mobbs, W.B. Oatway*
• Site remediation of the decommissioned uranium mines and treatment f actories in Czech Republic	*J. Smetana, R. Smetana*

SESSION C Site remediation and prevention of internal exposure
(Chair: Mr. Pascal Deboodt)

• Restoration of the former site of the institute for nuclear physics research in Amsterdam	*P.W.F. Louwrier*
• Occupational exposure during site remediation at Wismut	*Peter Schmidt et.al.*
• Clean-up of a GBq-Pu contamination of two apartments, contaminated by the Pu theft at the • WAK (Pilot Reprocessing Plant) Karlsruhe	*H. Höfer*
• The Olen radium facility: environmental contamination, impact on the population and site remediation	*H. Vanmarcke et.al.*
• The role of personal protective equipment in reducing occupational exposure	*T. Bain*

Discussion in Working Groups no 1

Thursday 30 October 2003

SESSION D Decommissioning of installations outside the nuclear fuel cycle
(Chair: Mrs. Hanne Troen)

• Dismantling of the Amsterdam 700 MeV linear electron accelerator MEA, electron storage ring AmPS and the experimental halls	*P.W.F. Louwrier*
• Melting of 137Cs and 57Co sources in a steel plant: remediation and environmental monitoring	*V. Berna et.al.*
• Radiological survey of the active central laboratory (ACL) in Studsvik, Sweden	*H. Efraimsson*
• Operational; aspects of decommissioning if installations containing mineral wool	*E.I.M. Meijne*
• Dose reduction techniques employed during cell line decommissioning	*J. Horsley*

SESSION E Effectiveness and feedback on the use of dose and dose rate estimating tools
(Chair: Mr. Vincent Massaut)

• Dismantling of the hot-cell nr. 41 at the SCK/CEN, using the ALARA planning tool VISIPLAN	P. Antoine et.al.
• Applications of calculation codes in the field of decommissioning	C. Le Goaller
• The EDR gamma scanner	J.M. Pérez et.al.
• Gamma imaging as a complementary technique to health physics monitoring	K. Hughes, G. Mottershead
• The use of a waste conversion index as a long term performance indicator for civil nuclear liabilities	P. Fawcett
• Dose rate field and dose uptake modelling for the clean-up of spent fuel ponds at the site of UKAEA-Dounreay	J.M. Brossard et.al.

Discussion in Working Groups no 2 & Plenary reporting of Working Groups

Friday 31 October 2003

• Plenary synthesis of conclusions and recommendations	C. Lefaure / P.V. Shaw

Optional Visit to the Dodewaard power plant preparing for deferred dismantling