European ALARA Network

Issue 3 - July 1997

European ALARA Newsletter

The European ALARA Newsletter is now on the Internet: ***http://www.cepn.asso.fr/EAN.html***

Editorial

The first two issues of the European ALARA Newsletter have reached a few thousand individuals or institutions, mainly in Europe, but also in North and South America as well as in Asia. This is much more than the initial objective of this Newsletter.

Some national radiological protection societies have either directly distributed it - by mail (Belgium) - at some meetings (France, Spain) - or advertised it in their bulletins (France, Italy and United Kingdom).

In many European countries, the EAN Network contact persons have received regularly requests from people to be placed on the mailing list.

As well as of radiological protection authorities at national and regional levels, the audience has covered health physicists from the industrial, nuclear and research sectors.

The main comments received concerning the first two issues related to the contents, the language and the distribution methods. As for the contents, the practical examples of lessons learned from incidents, extracted from the UK IRID data base, have been particularly appreciated. Therefore it is clear that there is an important need for such practical examples and readers are encouraged to send in such type of examples from their countries.

As the English language is not understood by some potential addressees of the Newsletter in most of the countries, it has been suggested it should be translated into other languages (Flemish, Spanish, French...). We are not able to do this centrally but, as the objective of the Newsletter is to facilitate as wide as possible dissemination of the ALARA culture and feed back experiences, every participating organisation may translate the Newsletter and publish it as a 'common' publication with the European ALARA Network. Moreover any journal can translate one or more articles in its own publication using its national language, just referring to the original article of the Newsletter.

In order to facilitate access to the Newsletter, it is now possible to find it on the Internet. Only the last issue will be directly accessible on the home page, but it will always be possible to download the previous issues to personal computers, to consult, print and duplicate them.

This third issue of the Newsletter tries to highlight that the success of ALARA can be achieved in very different types of installations, such as laboratories, reprocessing plants… in the nuclear industry, as well as in research centres; and can cover both repetitive operations and one-off projects. This issue also emphasises the potential for significant improvements of radiological protection in the non nuclear sector. Therefore, after the first European ALARA Network Workshop on 'ALARA & Decommissioning' (December 1997), a second workshop will be devoted to 'ALARA in the non Nuclear Industry' (November 1998). There is still time to propose some more short presentations for the first workshop; it is right time to put forward suggestions with regard to the content and organisation of the second.

Christian LEFAURE

Contents of Issue #3

Editorial Board

E-Mail: **ean@cepn.asso.fr**

Coordinated by CEPN, on behalf of the CEC DG XII
European ALARA Newsletter ISSN 1270-9441

ROUTE DU PANORAMA BP 48 F- 92263 FONTENAY-AUX-ROSES CEDEX TEL : (33-1) 46 54 74 67
FAX : (33-1) 40 84 90 34 E-MAIL : SEC@CEPN.ASSO.FR

ALARA PROCEDURE: THREE YEARS PRACTICE AT THE SCK•CEN MOL BELGIAN NUCLEAR RESEARCH CENTRE

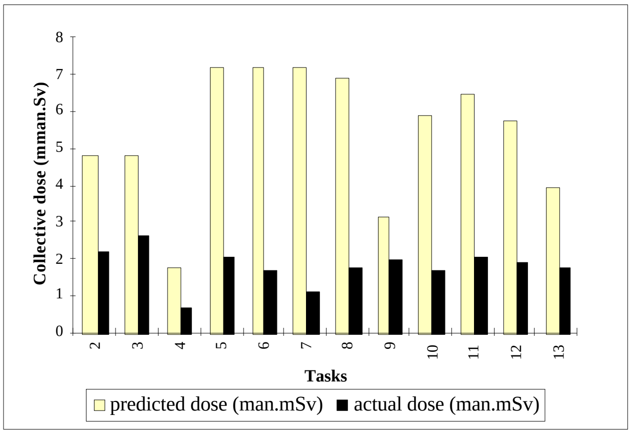
P. DEBOODT, P. ANTOINE, SCK· CEN Mol

❑ Introduction

The SCK· CEN is a federal institute located at Mol Belgium. It employs about 600 people and its missions are dealing with the peaceful uses of the nuclear energy. With its four research reactors, hot cells, technology department, Pu-radiochemistry unit, radiological protection department, and underground laboratory, the SCK· CEN performs research in many directions : radiological protection, nuclear fuel cycle, waste management issues, site restoration and decommissioning. Since the end of the 80's, and with a strong commitment of the hierarchy, the centre has developed many initiatives to put into practice the ALARA principle.

❑ The Preliminary Period

The first real attempts to develop an ALARA-procedure coincided with the starting point of the decommissioning project of the Belgian Reactor Three (BR3). In the framework of European research programmes, the BR3 was chosen, mainly, to test the techniques that could be used for the dismantling of a nuclear power plant. But, an objective of the EC was also to analyse in such circumstances the feasibility of implementing the principle of optimisation.



Graph 1.
Cutting of the Thermal Shield of the BR3 Reactor: Predicted and Actual Doses
Tasks 1-3: Horizontal Cut (three times)
Task 4: EDM Cut Preparation
Tasks 5-8: 3 Horizontal Cuts (four times)
Tasks 9-13: Preparation and Rings Cuts

In 1990, the ALARA procedure was mainly used as a support for the preparation and the follow-up of the operations. This first step provided a lot of lessons both for the managing staff of BR3 and for the people in charge of the radiological protection at SCK· CEN: the key points being the need for well trained people in the ALARA field; the development of an operational dosimetry; and the commitment of the management as well of the workers.

By the end of 1991, ten workers had been trained to become the "Local ALARA Co-ordinators". They were then put into place in each installation of the Centre and asked to examine the way to implement the ALARA principle in their daily workplaces. Simultaneously, an "ALARA and Safety Committee" was created as well as an "ALARA task force".

The former meets monthly and reports to the General Manager of the SCK· CEN. This committee contains representatives of the Health Physics Dpt., the Medical Dpt., the Waste Dpt., the Safeguards Dpt. and also people involved in particular research programmes at SCK· CEN.

The task force is mainly composed of three persons who are more familiar with the "Decision making" techniques. They can provide an input on the basis of a request of the "ALARA and Safety Committee" and have to report to it. Taking into account the characteristics of a research centre, it was also decided to develop an original formal procedure for the SCK· CEN. This was done over a one and half year period, through an interactive process with health physicists, managers and technicians.

What does the procedure look like?

The ALARA-procedure has been built in such a way that it can be used by a lot of people like researchers, technicians and so on. It comprises only 3 documents :

(A) the **information** form which has to be completed before the first execution of a new set of technical operations;

(B) the **execution** form which needs to be used for the execution of a technical procedure, already approved by the Health Physics Department;

(C) the **final report** which must be completed after the first execution, after the next executions and also for the case where neither doc. A nor doc. B have been used (see below).

All these documents require information such as the identification of the operator, references to technical procedures, location of the work, estimation of dose rates, duration of the operation, number of workers. Furthermore, the production of nuclear waste is covered as well as the risks called "Conventional risks". A first approval has to be given by the Local ALARA Co-ordinator. Then, the document is transmitted for countersigning to the General ALARA Co-ordinator of the SCK· CEN (who is the Head of the Health Physics Dpt. or his deputy).

For the next implementations of procedure, only the approval of the local ALARA Co-ordinator is needed if no incident has occurred during the first execution.

In order to pursue « constraint of doses », SCK· CEN introduced in 1991 an individual dose limit of 20 mSv in a year, although the actual legal limit was 50 mSv in a year. In addition to this, three dose criteria were introduced as part of the dose control system:

- if the foreseen collective dose is lower than 0.5 man.mSv, only the form C has to be used;
- if the foreseen collective dose is between 0.5 and 5 man.mSv, forms A (or B) and C have to be completed;
- if the foreseen collective dose exceeds 5 man.mSv or if individual doses exceed 1 mSv, the technical procedure has to be considered by the "ALARA and Safety" Committee. This committee will provide his advice on the execution of the work.

All documents C are sent to the General ALARA Co-ordinator for examination. If any of the conditions have not yet been fulfilled or if incidents had occurred, the corresponding document C must be examined by the "ALARA and Safety" Committee (see Figure 1).

Following the first attempts to use this procedure, it took about 18 months to bring it into general use. Finally, during the year 1995, the goal was reached and the procedure was implemented for the whole SCK· CEN.

❑ Three Years of Practice

The lessons which now clearly appear belong to the following categories :

Status of the procedure

At the beginning, the procedure seemed to be the property of the "writers". Like many procedures there was a great risk that the procedure would be used without the real collaboration of other workers.

After three years the general feeling is that everyone now knows that there is such a procedure, everyone asks for information to be able to complete the documents and provide some recommendation for its use. The role of the local RP officer has been renewed.

To reach such an objective, the involvement of and feedback from of the workers before the publication of the final version, is required.

Role of the local ALARA co-ordinator

At the beginning, there were many contacts between the Local ALARA Co-ordinators and the General ALARA Co-ordinator. Now, the Local ALARA Co-ordinators are actually independent, and they have made very detailed proposals to modify the lay-out or the steps of the procedure to cope with the local conditions or experiences.

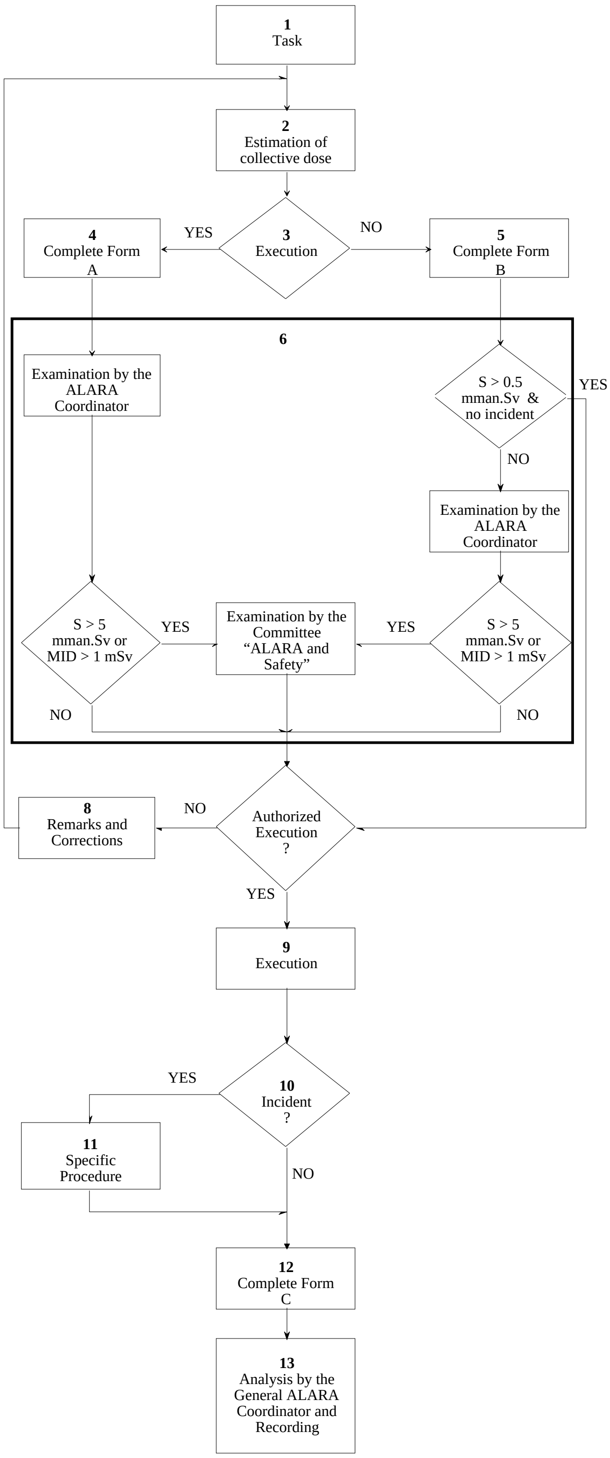


Figure 1.
General Flow-Chart of the ALARA Procedure

Health Physics Dpt. ALARA PROCEDURE	**THE INFORMATION DOCUMENT A (CEN MOL)**	Ed. 2.0 1996

To be filled in by the owner of the technical procedure

1 IDENTIFICATION

- Name of the procedure ....
- Installation .... Workplace ....
- Reference .... Ed. ....
- Author ....

2 EXECUTION

- Team .... persons
- Workers (CEN/SCK) ....
- External workers
- Person responsible for the supervision of the works ....
- Frequence Routine .... times/year
  Many times .... times
  Once

3 NUCLEAR DATA

- Controlled area / Supervised area
  Other area ....
- Expected collective dose .... man.mSv
  based on
  - doserate .... mSv/h
  - duration .... h
  - number of workers .... persons

  References of the calculations ....
- Highest expected individual dose .... mSv
- Highest doserate .... mSv/h
  Max. duration for evacuation .... h
- Used sources
  - Isotopes : Fuel ....
    : I-emitters ....
    : ß,K-emitters ....
  - Activity ....
  - Physical state ....
  - Shielding ....
- Risk for contamination
  no yes Max.value ....

: surface .... Bq/m^2
: air .... Bq/m^3

- Production of waste
  no standard non-standard effluent

....

4 CONVENTIONNAL RISKS

- Fire ....
- Gas ....
- Internal transport Chariot / Bridge / Other ....
- Slip / Fall Ladder / Footbridge / Other .... Electricity ....
- Machines
  ....
- Toxic products
  ....
- Work conditions
  ....
- Others
  ....

Name of the requirer	Signature	Date
Local ALARA Coordinator		

Reference of the installation
....

Consequences for operational dosimetry

To put into practice the ALARA philosophy, there is a need for more operational dosimetry devices. Operational dosimetry has its own rationality but it also appears to be a basic need to implement the ALARA principle. In this sense, more individual electronic dosimeters have been provided at the entry points of controlled areas and their management has been coupled with an appropriate software.

The feedback from this has been that during the operations, the operators have been able to modify their behaviour in such a way that for identical operations the doses were always lower, day after day.

Impact on the « safety culture »

The ALARA-procedure rapidly appeared to many people at SCK·CEN as a very useful tool to develop the level of Safety Culture.

❑ Problems Encountered

Of course, there is no ideal situation and no perfect procedure. This is also true for the ALARA-procedure as shown in the following examples:

The pre-job study

Before beginning a technical procedure, one needs to evaluate the dose rate, the duration and some others factors, but the estimation of the dose rate is not always straightforward. In a workplace, where many sources are present, it is sometimes difficult to evaluate the way the dose will be delivered to the worker. Attempts have been made to reduce the discrepancies between predictions and observations (use of dosimeters at different places, use of the results of the « mock-up » preliminary works, ...).

Filling in documents

Sometimes, project-leaders perceived a « benefit » in dividing the technical procedures into « sub-procedures » to avoid the limit of 5 man.mSv (and the time needed to proceed to an examination by the "ALARA and Safety" Committee). Fortunately, only a few examples of such a behaviour has been observed. Moreover, even in these cases, the results were generally positive, because the operations were so complex and time-consuming that the subdivision of the operations gave the opportunity for a better examination of the "sub-tasks" and have finally led to a dose reduction.

Some items have not yet been taken into account

The problems of the nuclear wastes generated during the operations and the "conventional risks" are two examples of such items.

For example, someone has to use a ladder in the controlled area. At the end of the ladder, there are some pieces of rubber to prevent it sliding the ground. But in such case, the decontamination of these pieces is very difficult and this gives rise to unneeded waste. So, people had put some plastic sheets around these extremities. This was very good to avoid contamination, but defeated the objective of putting the rubber on the ends of the ladder and as a result a worker fell and spent six weeks at home, because of a broken leg ! This very small example explains why we have to develop our attempt to solve such situations, where there are trade offs between different safety goals.

Furthermore, wastes have been taken on as « key points » for the next two years by the members of the « ALARA and Safety » Committee. It will probably lead to modifications of the design or materials in order to improve the performance of decontamination after operation.

THE APPLICATION OF ALARP IN BNFL

R. A. ATHERTON,
Nuclear and Radiological Safety, BNFL Warrington

❑ Introduction

British Nuclear Fuels plc (BNFL) has many years experience of designing, building, operating and decommissioning nuclear plant. As a company with a world class reputation for safety, we are concerned with the safe implementation and operation of plant. Central to that safe operation is the control of personnel doses to be ALARP (As Low As Reasonably Practicable). In the UK the word ‘practicable’ is used instead of ‘achievable’ for legal reasons, but it is accepted that for all practical circumstances the two words have the same meaning.

The application of the ALARP principle in design/operation has developed over the years from something which was essentially a simple cost benefit justification for designs/operations driven by dose and dose rate targets, to a central part of the design/operational decision making philosophy. To achieve this shift BNFL has acknowledged the multi-disciplinary nature of the problem and trained its workforce appropriately.

The article gives an overview of the principle as applied by BNFL and examples of the successful application over a number of BNFL projects, from new designs to decommissioning of old plant.

❑ Why Consider ALARP?

There is a regulatory requirement that the ALARP principle is applied to all design and operational decisions which impact on radiological safety.

❑ How Do We Implement ALARP?

Much of the challenge associated with the practical application of ALARP is ensuring that everyone involved with radiological safety (Mechanical Engineers, Electrical Engineers, Nuclear, Radiological and Operational Safety Specialists, Operators, Health Physicists, etc…) understands the principles of ALARP and applies them in a consistent, comprehensive and practical way. This is achieved in part by ensuring that there is a team approach with regular and ongoing communication between all the team members, which helps to ensure that all disciplines are considered during the decision process. Hence, ALARP is being addressed from all angles as the decision process progresses in order to arrive at a true optimum solution (i.e. one that considers all variables).

Code of practice

In order to arrive at a common understanding across the disciplines, BNFL has produced a Code of Practice (CoP). The aim of this CoP is also to give guidance on the application of the principle. The CoP covers the following areas:

- ALARP and Management
- Hierarchy of Protection
- Cost Benefit Analysis and Collective Dose
- Application of ALARP to deterministic effects
- Practical Applications
  - ALARP in Design
  - ALARP in Routine Operations
  - ALARP for Projects
  - ALARP and Public Exposure

Figure 2 illustrates the generic decision process that is used. It highlights the qualitative and quantitative nature of the process and also the need to consider a range of safety and non-safety related factors.

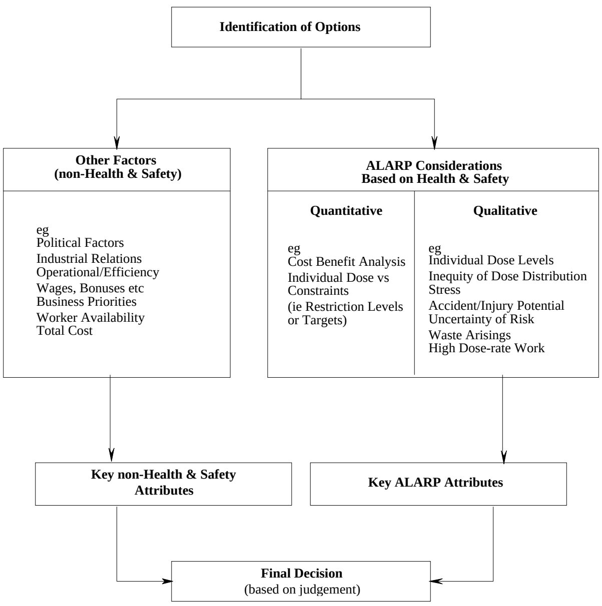


Figure 2.
The ALARP Decision Process

The CoP also gives guidance on the level of consideration expected as designs develop (and hence uncertainties reduce) and how the level of justification depends on the magnitude of doses under consideration.

As a project progresses, the CoP requires that ALARP is continually reviewed and regular presentations made to the project management and regulatory authorities. At key stages of a project, (eg before the Design Safety Reports are issued) explicit ALARP reviews are performed involving relevant disciplines. Such reviews provide a forum for major decisions, which may impact on ALARP, to be discussed. They also help in producing an auditable record of the consideration of ALARP issues, major and minor, which have been made as a project has progressed.

Further guidance

Many specialist areas within the Company have produced further guidance on the detailed application in their particular areas. For example, the Nuclear and Radiological Safety Section (NRS) has developed an ALARP training module for use primarily by those involved in ALARP at the design and decommissioning stages of a project. The module is hands on, enabling users to consider options, propose solutions and make decisions regarding a series of practical problems, based on actual experience. The module can be updated as more good examples become available. Aspects of ALARP considered include dose, conventional hazards, costs and practicability of alternative design options. Making use of experience from existing plants/ projects, theoretical modelling and analysis may all form part of the process.

The ALARP experience database

The ALARP Experience Database is being developed by NRS as a program which contains knowledge, can infer decisions from the knowledge and allows the knowledge to be maintained independently from the rest of the program. The system aims to capture expertise in the specialised area of ALARP, so that future decisions can be appropriately based on historic precedents and agreed principles. Its attraction is that it reduces the need for, and time taken up by, laborious, possibly unproductive searches through vast amounts of historic data files, by having a user-friendly electronic system. The user is essentially led step-by-step through the key aspects of a project that are important in classifying ALARP decisions in order to find an historic example that matches the user's current project. Where no historic data are available, the user is informed and can further refine their search if desired. When a match is found the user is given access to an overview description of the example directly. The user can also propose the addition of further examples to the system by providing key information which will be centrally reviewed.

General ALARP guidance is also available within the program based on the CoP.

It is the intention to demonstrate this database at the forthcoming ALARA Seminar in December 1997.

❑ Examples of the Application of the ALARP Principle

New engineering project - early phase

The biggest benefits to be gained from the application of the ALARP principle during the design stage of the project are often at the start. It is at this stage that major decisions are being made regarding the siting of a plant, its layout (including classification into radiation zones) and how its process will function, including decisions on whether operations will be manual or automated. The decisions follow the general pattern shown in figure 2 and because they can have major dose implications they often involve both justification and optimisation.

New engineering project - detailed design phase

As a project progresses, the emphasis on the application of ALARP tends to move to the more detailed designs of individual cells and plant items. For example within the Sellafield MOX Plant (SMP), which is currently being commissioned, many operations take place in a glove box environment. Detailed consideration of ALARP by various disciplines has led to significant improvements in glove box design, which will ultimately lead to significantly lower doses over the plant lifetime. As well as optimisation of shield design (by using the most practicable thicknesses of appropriate material), operator occupancy times have been reduced by using easily maintainable items, mounted external to the glove box where practicable, and use of CCTV cameras. Human factors considerations have led to visibility being improved by using combinations of transparent shielding materials and positioning glove ports for ease of operation. The potential for the spread of contamination or spillage of material has been reduced by good ventilation design and the use of specific collection devices (eg. for spilled pellets).

Plant commissioning and operation

During commissioning the emphasis changes to checking that the design provisions are performing as expected and that there have been no omission in protection. It is therefore routine to do radiological checks to demonstrate the integrity of shielding and containment. All equipment is checked for proper functioning of safety mechanisms and safety related equipment. At this stage any problems with maintenance and operability are also addressed. There is an important emphasis on personnel training, and good operational practice, both during commissioning and plant operation.

Once the plant becomes active, periodic reviews of the doses received by the operators are performed (based on dose measurements). These reviews form the basis for decision making on how to further optimise/reduce the major doses on the plant. Additionally there are regular formal updates to the safety documentation which supports the operation of the plant which consider the acceptability of all operator doses (both internal and external).

Decommissioning project

Decommissioning can be regarded as either an "intervention" to minimise any risk to the public or a "practice" that costs operator doses - for both cases the benefit from decommissioning needs to be optimised. Delaying operations can reduce doses to the workforce since some isotopes will have decayed. Decommissioning maintenance doses in the intervening period, however, need to be considered, together with the potential loss of knowledge of plant conditions several years after the plant was last operated which may increase the time and dose taken to complete the decommissioning.

BNFL is committed to decommission a number of existing facilities. An example of this is the emptying of corroded fuel cladding from a silo storage facility. Structural considerations have placed weight restrictions on the facility which leads to limits on the amount of shielding which can be used. Additionally, the operating areas on top of the silos are in high background dose rate fields due to significant amounts of contamination from the 1960's and 1970's.

An integrated team of designers, plant operators and radiological safety personnel undertook:

- Detailed ALARP reviews to examine options for constructing the silo emptying machine either in-situ or outside the building. The solution resulted with minimal dose uptake and also lowest overall cost by bringing the machine into the building in a modular form, and constructed on the silo top.

- Complex computer modelling, in association with the same integrated ALARP review approach, has been used to optimise the effectiveness of shielding on the machine in terms of positioning, thicknesses and use of different materials, within weight constraints.

- Dose surveys were performed in the existing building to identify contamination sources leading to high dose rates. Subsequently, methods of dose reduction were considered, including removal of redundant or contaminated equipment, the use of local shielding and decontamination of the building floor. All these resulted in reducing lifetime doses and hence identifying when it is most practicable to undertake each task.

The BNFL Code of Practice 20 « Application of ALARP to the Routine Exposure of Workers and the Public » is available, contacting Mr Rafiq Pazeer:
Fax: +44 1925 832161 E-Mail: ajc.nrs@dial.pipex.com

EXAMPLES TAKEN FROM IRID

J. CROFT, NRPB, UK.

In issue #2 of the ALARA Newsletter, two examples of incidents, taken from the Ionising Radiations Incident Database (IRID) operated by NRPB/HSE/EA, were presented with their corresponding lessons learnt. Two further examples are presented here. ***The Editorial Board would be pleased to receive examples of radiological incidents from your country.***

❑ *IRID Case No 3*

A university department had, for quite a number of years, a stock of caesium-137, in the form of caesium chloride solution. This was originally obtained for use in a teaching experiment, but this was discontinued many years ago and the solution retained for other possible uses. During a programme of disposing of old sources an incident occurred which gave rise to a significant intake. At the time of the accident the activity of the solution was 150 MBq.

The solution was kept in a standard multidose vial with a rubber septum cap. The work was being undertaken on a shelf bench behind lead bricks. This was contrary to the local rules which required the work to be done in a fume cupboard. The user reported that when a pressure relief needle was used, the force necessary to push through the age hardened rubber system was such that when it penetrated it went further and entered the solution. This gave rise to an unexpected spurt of liquid from the vial, which contaminated the face of the user. It is possible that through ageing or being left in the sun the vial had become slightly pressurised. The user decontaminated himself and the laboratory, but did not report the incident to the University authorities until several days later.

Subsequently whole body monitoring measured the intake to be 10 MBq and the committed effective dose equivalent was estimated to be 140 mSv. It was thought that ingestion was the main intake route, but inhalation or absorption through the skin would not have altered the assessed dose. The intake amounted to a remarkably high 7% of the original activity, which suggests the users face was close to the vial or other things also went wrong.

Lessons learnt

1. *The retention of radioactive solutions beyond their useful life provides an ongoing potential for accidents, especially where ageing of the containment is relevant.*
2. *The incident provides a classic example of why manipulations of this type and using this amount of activity were required to be, and should have been, carried out in a fume cupboard.*
3. *All incidents should be reported as soon as possible so that appropriate measures can be taken. Although it did not occur here, poor monitoring after the decontamination could have left a situation where the contamination was allowed to spread.*

❑ *IRID Case No 4*

One type of industrial radiography exposure equipment uses a pneumatic system to transfer the radioactive source from the shielded container to the exposure position. These systems are installed in purpose built radiography facilities with interlocks on the access doors that are linked to installed gamma alarm monitors.

Over a two year period two very similar incidents occurred in the same facility. They involved an iridium-192 source of about 7 TBq giving a dose rate of approximately 0.9 Sv h^{-1} at 1 m. In both incidents the source became stuck in the pneumatic exposure tube.

In the first incident the end cap of the tube had been slightly deformed due to repeated impact from the source and it eventually jammed the source when it was exposed. It was noted that there was a lack of routine maintenance. In the second incident a piece of metal swarf in the tube jammed the source. In both incidents the safety systems worked and prevented uncontrolled access. At this point it is worth comparing how the sources were actually recovered and the safety culture that would have been applied in the nuclear industry. In the latter case there would have been detailed planning, written procedures would have been produced, portable shielding used and probably some sophisticated handling equipment made available. In reality the source recoveries were treated as simple engineering problems that needed to be resolved quickly but with only limited consideration of radiation protection aspects. Long handling tongs were used to ensure the hand doses were not excessive, but control of the whole body doses was less successful; the doses being 29 and 40 mSv from the first incident and 16 and 52 mSv from the second incident.

Lessons learnt

1. *Routine inspections of equipment before use and a programme of routine maintenance can significantly reduce the probability of sources becoming stuck in an exposed position.*
2. *The incidents display the value of installed safety systems, including a gamma alarm monitor interlocked to access routes. Without these, such incidents would have probably resulted in radiation burns and possibly fatalities.*
3. *The design of the facility and equipment should have taken into account means for the recovery of a source that is stuck or cannot be returned by the normal means. For example after the second incident a mechanical means of pushing the source back to the shielded position, that could be operated from outside the facility, was installed.*
4. *The planning of source recoveries is essential to implementing ALARA. Industrial radiography could benefit from learning from the safety culture of the nuclear industry.*

STUDY ON REDUCING DOSES IN MOBILE INDUSTRIAL RADIOGRAPHY

W. LIEBERZ, A. SCHMITT-HANNIG,
Bundesamt für Strahlenschutz, Germany

The exposure of workers to ionising radiation has been reduced substantially over the past several years. However, in some areas (i.e. workers using mobile radiography equipment), doses are still relatively high. Since one of the principles of radiation protection is keeping doses as low as reasonably achievable, the Staatliche Arbeitsschutzverwaltung des Landes Nordrhein-Westfalen decided to conduct a study.

In order to achieve the objective of reducing the dose to industrial radiography workers, the following steps were taken:

- workers' doses were estimated (according to the current technical and organisational rules);
- measures for reducing radiation exposures were identified;
- companies and institutions concerned were informed of means for improving the situation together with various professional organisations.

In close co-operation with some radiography companies, dose and dose rate measurements were carried out over 17 working days. These measurements were geared towards estimating personal doses to radiographers during their daily routine when all operational measures and technical equipment were in accordance with the rules layed down in German ordinances, guidelines and licenses. The following areas of mobile radiography were covered:

Work area	Radionuclides employed
Petrochemistry I (5 days)	Ir-192 and Co-60
Energy supply (3 days)	Ir-192
Pipelines (3 days)	Ir-192
Petrochemistry II (3 days)	Ir-192
Various mobile work areas (3 days)	Ir-192 and some x-ray equipment

The operational duty teams are always comprised of two workers. The exposures of both workers were followed and the operational procedure as well as technical equipment were reviewed and found to be satisfactory. The calculated annual doses were in the range of 0.8 to 4.1 mSv, with the higher dose values being due to the use of Co-60. It was found that, in general, the measured doses were dependent on the number and duration of exposures as well as on spatial factors.

Surprisingly, all annual doses were below 5 mSv. It can be concluded from these measurements that working does not lead to annual doses of more than 5 mSv, a figure in the order of the average annual exposure of the German population (ca. 4 mSv). Taking into account that difficult working conditions or radiological incidents may lead to higher exposures, 5 mSv per year serves only as a reference value under routine working conditions.

About 240 of 700 radiographers working with mobile equipment in NRW receive annual doses higher than 5 mSv. Excluding the 60 radiographers working mainly in nuclear power plants, reasons for the remaining 180 radiographers receiving doses higher than necessary are:

- difficult working conditions;
- not following operational procedures set up according to protection regulations;
- employing old equipment.

In cases where these reasons could be ruled out, a reduction of dose can only be achieved by changing the thinking pattern and the working habits of workers involved. In order to achieve this, those concerned must fully understand that it is not only possible but advantageous to reduce the dose. At the same time, it is the responsibility of the radiation protection officer (« das Strahlenshutzbeauftragter » in German, « la personne compétente » in French) in charge to change the organisational framework in such a way that the reduction of dose is possible. This can be achieved by regular instructions of-, personal discussions with-, and suitable radiation protection courses for-, radiographers. These measures should raise worker awareness, enabling them, in their own best interest, to strive for dose reduction and to accept, as well as follow, radiation protection regulations and procedures.

To this end, the Staatliche Arbeitsschutzverwaltung des Landes Nordrhein-Westfalen notified all companies involved of the results of the study, of possible consequences and gave them proposals for reducing dose. They also made visits to the companies so as to discuss implementation of the proposals. Examples of improper procedure were discussed and it was agreed that a representative of the competent authority would participate in the next instruction sequence. The operational radiation protection procedures of the company should include worker instructions (for proper procedure) as well as a user manual for all technical equipment being used, to be updated from time to time.

In addition to this, revisions at construction sites were carried out in order to ascertain to what extent radiation protection regulations and procedures were being followed. These results were also included in the discussion with the companies.

A report is also available on this subject in German. You can contact Mrs Schmitt-Hannig to get it (E-mail: schmitt@bfs.de). (ref. "Hohe Strahlenbelastung nicht Schicksal", Jahresbericht 1995, Staatl. Arbeitsschutzverwaltung des Landes NRW, Herausgeber: Ministerium fuer Arbeit, Gesundheit und Soziales, p. 40-43).

....

ALARA NEWS

ALARA Training for the French Occupational Physicians

Since 13th February 1997, a new regulation requires that French occupational physicians receive a specific training about radiation protection if they watch over contractors' personnel working in nuclear installations. In June 1997, the content of this training was specified by a ministerial order: optimisation of radiological protection as well as knowledge of working conditions are two items which are explicitly mentioned among the required « practical basis ».

Mrs. G. ABADIA, INRS/EAM, 30 rue O. Noyer, F-75685 PARIS, Cedex 14, FRANCE .
Tel: +33 1 40 44 31 05; Fax: +33 1 40 44 30 99

« ALARA Course » Saclay (Paris), 17th-19th March 1998

A 3-days ALARA training course will be held at the National Institute for Nuclear Sciences and Technologies (INSTN). This course - in French - will present both theoretical and practical examples with the participation of representatives of the French utilities and research centres.

Contact : Mrs M.-R. LEBOURG
INSTN, CEN-Saclay, 91191 Gif sur Yvette, FRANCE.
Tel: +33 1 69 08 31 04 ; Fax: +33 1 69 08 97 77

Regulations Concerning Final Management of Spent Nuclear Fuel or Nuclear Waste in Sweden

The Swedish Radiation Protection Institute (SSI) has published proposed regulations concerning health and environmental protection criteria for disposal of spent fuel and high level waste in the report SSI-rapport 97:07, Health , Environment and High Level Waste.
The main captions of the regulations are: Holistic Approach and Optimization of Radiation Protection; Environmental Protection; Dose to critical group; Time periods, and Intrusion.

The radiation protection background to the proposed regulations is given in the report. The proposed regulations are presently being circulated to international organisations for comments. The report can be ordered from SSI, free of charge.

Contact persons:
Mr I. LUND, Fax: +46 8 729 71 08
Mr M. WESTERLIND, Fax: +46 8 729 71 64,
E-mail: magnus.westerlind@ssi.se

Transcription of the European Directive on Patient Doses in the Italian Legislation

On the 14th and 21st February 1997, five decrees have been published on the Official Journal of the Italian Republic by the Ministry of Health. They are all about the radiation protection of persons undergoing medical examination or treatment, in application with the European Council Directive 84/466 and in accordance with the optimisation of radiological protection principle.

Contact: Mr. A. SUSANNA, ANPA, Via Vitaliana Brancati 48; I-00144 Roma, ITALY.
Tel: + 39 6 500 728 60; Fax: +39 6 500 728 56

European Workshop on Reference Doses and Quality in Medical Imaging

A training workshop on "Reference doses and quality in medical imaging" will be held in Luxembourg on 23-25 October 1997. The workshop is being organized by the European Commission, in cooperation with the German Federal Office for Radiation Protection and its Institute of Radiation Hygiene (BfS).

The objective of the workshop is to present, in a didactic form, the concept and implications of quality criteria and reference doses. This will include the mechanisms for the establishment and selection of reference dose values, methods for dose measurements, and dose assessments. The implementation of quality criteria and reference dose values will be discussed, as will their relevance to optimization strategies. In particular, the practical role of reference doses in establishing clinical audit programmes will be highlighted.

The working language of the workshop will be English.

Contact persons:
Dr. H. Schibilla, DG XII/F-6, 200 rue de la Loi, B-1049 Brussels, BELGIUM.
Fax +32-2-2966256; E-mail: hannelore.schibilla@dg12.cec.be

Institute of Radiation Hygiene, Prof. Dr. F. E. Stieve
Ingolstdter Landstrasse 1, D-85764 Oberschleissheim/Neuherberg, GERMANY.
Tel. +49-89-31603260; Fax +49-89-31603111; E-mail: fstieve@bfs.de

ICRP Publication 75

The latest publication of the International Commission on Radiological Protection is devoted to the « General Principles for the Radiation Protection of Workers ». It deals in some details with the management of occupational exposures, both in normal and emergency situations, the monitoring of workers and the workplace, health surveillance of workers, and the management of overexposed workers. An underlying theme is the optimisation of the radiation protection.

Contact: Mr. A.D. WRIXON, NRPB Chilton,
DIDCOT OX11 ORQ, UNITED KINGDOM.
Tel: +44 123 582 2634; Fax: +44 123 582 2630
E-mail: tony.wrixon@nrpb.org.uk

EUROPEAN ALARA NETWORK Contact Persons

- **BELGIUM**

Mr. P. DEBOODT, SCK/CEN, Boeretang 200,
B-2400 MOL
Tel: +32 14332853; Fax: +32 14321624
E-mail: pdeboodt@sckcen.be

- **FRANCE**

Mrs. G. ABADIA, INRS/EAM, 30 rue O. Noyer,
F-75685 PARIS CEDEX 14
Tel: +33 1 40 44 31 05; Fax: +33 1 40 44 30 99

Mr. C. LEFAURE, CEPN, BP 48,
F-92263 FONTENAY-AUX-ROSES CEDEX
Tel: +33 1 46 54 74 67; Fax: +33 1 40 84 90 34
E-mail: lefaure@cepn.asso.fr

- **GERMANY**

Mrs. A. SCHMITT-HANNIG, BfS, Inst. für Strahlenhygiene,
Ingolstädter Landstrasse 1,
D-85764 OBERSCHLEISSHEIM
Tel: +49 89 31603 101; Fax: +49 89 31603 140
E-mail: schmitt@bfs.de

Mr. W. PFEFFER, GRS/mbH, Schwertnergasse 1,
D-50667 KÖLN,
Tel: +49 22 12068 773; Fax: +49 22 12068 888
E-mail: pff@mhsgw.grs.de

- **ITALY**

Mr. A. SUSANNA, ANPA, Via Vitaliana Brancati 48;
I-00144 ROMA,
Tel: + 39 6 500 728 60; Fax: +39 6 500 728 56

- **SPAIN**

Mr. P. O'DONNELL, CSN, Justo Dorado 11,
E-28040 MADRID
Tel: +34 1 346 05 61; Fax: +34 1 346 05 88
E-mail: pot@csn.es

- **SWEDEN**

Mr. I. LUND, SSI, Box 60204,
S-17116 STOCKHOLM
Tel: +46 8 729 7157; Fax: +46 8 729 7108
E-mail: ingemar.lund@ssi.se

- **SWITZERLAND**

Mr. M. FURRER, HSK/RAS,
CH-5232 VILLIGEN
Tel: +41 563 103 811; Fax: +41 563 103 907
E-mail: furrer@hsk.psi.ch

- **UNITED KINGDOM**

Mr. J. CROFT, NRPB Chilton,
DIDCOT OX11 ORQ
Tel: +44 123 582 2680; Fax: +44 123 582 2650
E-mail: john.croft@nrpb.org.uk

The European Commission « Radiation Protection » cepn, INSTN and NRPB organise the

1st EUROPEAN ALARA NETWORK WORKSHOP on ALARA and DECOMMISSIONING

at INSTN-Saclay, FRANCE
December 1-3, 1997

PROGRAMME

December 1, 1997

- **Fuel Cycle Experiences**
- **Reactors Experiences**
- **Hot Cells Experiences**

December 2, 1997

- **Decision Aiding Studies and Tools**
- **Public vs Workers Trade offs**

December 3, 1997

- **Clearance Levels Aspects**
- **Decommissioning and Regulatory Policies**
- **Discussion Panel**

All papers are invited presentations. The attendance is limited to a maximum of sixty experts. If you are interested in participating to the workshop, please complete the application form on the back and send it to the Organising Committee. The latest date for receipt of applications is the first of October 1997. You will be notified of the outcome by the end of October 1997. All non lecturing participants are asked to prepare a short paper (about three pages). As an input to the workshop, these will be distributed to participants. They would help in providing a focus for the discussion panel, and participants providing particularly pertinent short papers may be asked to briefly summarize their paper to the meeting.

The application form and the list of the provisional lectures are available on the back of this page.

For further information, please contact the Organising Committee:
Mr. P. Croüail (CEPN) ; Fax: +33 1 40 84 90 34
E-Mail: crouail@cepn.asso.fr
Mrs. M.-C. Pajadon (INSTN) ; Fax: +33 1 69 08 97 77

The European Commission
« Radiation Protection »
CEPN, INSTN and NRPB
organise the

1st EUROPEAN ALARA NETWORK WORKSHOP on ALARA and DECOMMISSIONING

at INSTN-Saclay, FRANCE
December 1-3, 1997

Provisional Lectures:

Opening (INSTN, EC, CEPN)
1- Optimisation and Decommissioning: Challenge and Limits (CEN/SCK Mol-Belgium)
2- ALARP Experiences in BNFL Installations (British National Fuels-UK)
3- ALARA during the Major Refurbishment of a Reprocessing Plant (British National Fuels-UK)
4- The ALARP Process as a Method of Dose Control in Decommissioning Operations at Sellafield (British National Fuels-UK)
5- ALARA in Decommissioning of the Andujar Uranium Mill (ENRESA-Spain)
6- The Lessons Learnt and Issues Arising from the Decommissioning of a SPV Magnox NPP (Magnox Electric-UK)
7- Cutting and Disposal of Reactor Internals, Oskarshamn 1 (OKG Aktiebolag-Sweden)
8- Experience by the Decommissioning of VVER Reactors in Greifswald and Rheinsberg (Energiewerke Nord-Germany)
9- Health Physics Aspects of Decommissioning at AWE (AWE-UK)
10-ALARA in the Decommissioning of IN-04 Facility in CIEMAT (CIEMAT-Spain)
11-Application of the ALARA Principle in the Decommissioning at CEA Facilities (Commissariat à l’Energie Atomique-France)
12-Decision Aiding in Nuclear Site Decommissioning (CEN/SCK Mol-Belgium)
13-Decommissioning a French PWR NPP: Dose Assessment and Optimisation (Electricité de France-France)
14-Optimisation Opportunities in the Dismantling of Accelerators (VUB-Belgium)
15-Optimised Reclamation Strategies for Uranium Mining Sites (BfS/Brenk Systemplanung-Germany)
16-Decommissioning of Historic Sites (NRPB-UK)
17-Criteria for Land Releases (NRPB-UK)
18-Different Policy Option for the Recycling of Contaminated Scrapped Metal (European Commission)
19-Recycling of Metal Scrap from Nuclear Installations (OECD/NEA)
20-Experiences with Release Measurement during Decommissioning of NPP (NIS Ingenieur-Germany)
21-Clearance: History and Outlook (NIRAS/ONDRAF Belgium)
22-Regulatory Experience of ALARA and Decommissioning at UK Nuclear Sites (HSE/NII-UK)
23-Radiation Protection Issues in Connection with the Decommissioning of Nuclear Facilities (SSI-Sweden)
24-Impact of New Regulatory Approaches on the Decommissioning of Vandellos 1 NPP (CSN-Spain)
25-The BfS Guide for the Decommissioning of Nuclear Facilities (BfS-Germany)
26-ALARA Principles in Licensing Procedures for Decommissioning Operations (TÜV Hannover-Germany)
27-Experiences from Licensing and Supervising the Decommissioning of Nuclear Installations (Bavarian State-Germany)
28-A Methodology for the Occupational Exposure Feedback in the Dismantling Field (IPSN-France)
Discussion Panel

____

THIS IS AN APPLICATION FORM (PHOTOCOPY IT AND SEND IT TO US)

Family name ____
First name ____
Mailing address ____
Postal code ______________ City____________________________ Country__________________
Business Phone __________________ Fax _________________ E-Mail ___________________________
Area of Expertise ____
____
____

Date: Signature:

The attendance fee is **FF 2000. Do not pay now**.

For further details please contact :
Mr. P. Croüail (CEPN) ; Fax: +33 1 40 84 90 34; E-Mail: crouail@cepn.asso.fr **or,** Mrs. M.-C. Pajadon (INSTN) ; Fax: +33 1 69 08 97 77