

## FINAL REPORT

**Contract :** FI4PCT950034      **Duration :** 01.01.96 to 30.06.99  
**Sector:** D31

**Title :** European ALARA Network

**1) Coordinator:**

Dr C. Lefaure	Nuclear Protection Evaluation Centre	France
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**2) Associated partner:**

M J. Croft	National Radiologic al Protection Board	United Kingdom
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**3) National contact persons**

M P. Deboodt	SCK/CEN Research Center	Belgium
Mrs S. Katajala	Loviisa Nuclear Power Plant	Finland
Mrs G. Abadia	INSERM	France
Mrs A. Schmitt-Hannig	Bundesamt für Strahlenschutz	Germany
Mr W. Pfeffer	Gesellschaft für Reaktorsicherheit	Germany
Mr A. Susanna	Agenzia Nazionale per Protezione dell'Ambiente	Italy
Mr J.C. Abrahamse	N.V. EPZ	The Netherlands
Mr. G. Saxebø	Norwegian Radiation Protection Authority	Norway
Mr J.J. Montesinos	Consejo Seguridad Nuclear	Spain
Mr I. Lund	Swedish Radiation Protection Institute	Sweden
Mr M. Furrer	Swiss Federal Nuclear Safety Inspectorate	Switzerland

## **I INTRODUCTION**

At the end of the nineties, ALARA is being implemented in European nuclear power plants as “a routine practice” as far as external exposure for workers is concerned. However its application in other aspects was far from universal. Therefore it appeared worthwhile to create a European ALARA Network (EAN) to further specific European research on topics dealing with optimisation of all types of occupational exposure, as well as to facilitate the dissemination of good ALARA practices within all sectors of the European industry and research. These considerations led to the creation of the EAN within the 1996-1999 European research programme on Nuclear Safety. CEPN was designated by the Commission as coordinator of this Concerted Action and the Network has now been in existence for three and half years. Throughout this period the Network Steering Committee Group has grown from an initial 8 countries’ representatives to 11 at present.

## II. THE CONCERTED ACTION AIMS AND OBJECTIVES

The scope and objectives were defined during the first meeting of the Network Steering Committee. They have not been modified during the reporting period and can be summarized as follows :

- \* EAN covers all industrial installations both nuclear (NPP and other installations of the fuel cycle as well as research centers) and non nuclear (gammagraphy users, industrial accelerators...) as well as medical research centres;
- \* EAN covers themes relevant to all sectors (potential exposures, internal exposure, ALARA and decommissioning...) and specific themes concerning the implementation of ALARA outside NPPs;
- \* EAN produces a regular ALARA newsletter which is widely distributed through various channels, such as the national contacts, the national radiation protection societies, the EC, etc...;
- \* EAN is responsible for initiating proposals for scientific European ALARA, Workshops, for the promotion of databases or specific research projects, as well as providing the Commission with recommendations concerning some regulatory issues.
- \* EAN should facilitate cooperation between members from all countries of the European Union and associated countries.

The main yearly goals are to provide the international community with two issues of the European ALARA Newsletter and to organise one ALARA Workshop on a specific issue in order to identify problems in that area that need further research and development or improvement of the regulations.

## III. PROGRESS AND RESULTS

### III.1 Work Package 1 - The European ALARA Newsletters

Since the beginning of this concerted action one newsletter has been issued every six months. The seventh issue was distributed at the end of August 1999.

The first issue of the ALARA Newsletter (July 1996) covered the establishment of the European ALARA Network, as well as its main goals and objectives. It also provided an opportunity to remind readers of some of the basics concerning the ALARA management of the radiation risks, to describe the regulatory perspective concerning the implementation of ALARA in Swedish nuclear power plants, and to point out that the non nuclear sector provides some ALARA challenges for the future in Germany and the UK.

The second issue (January 1997) of the ALARA Newsletter presented two tools developed with the support of the Commission of the European Union. These were, OPTI-RP (software that provides decision makers with a simple tool facilitating the selection of radiation protection options using monetary values of the collective dose unit through Cost-Benefit analyses) and IRID, (a new database in the UK that covers radiological incidents in the non nuclear sector in order to learn lessons from the past and improve ALARA implementation in these fields). This second issue also pointed out that feedback experience from many countries shows that practical implementation of ALARA relies essentially on personnel motivation and involvement: in essence ALARA is "a way of thinking", similar to the very well known "safety culture" or "total quality" approach in the industrial field.

The third issue (July 1997) of the Newsletter tried to highlight that ALARA can be successfully pursued 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 emphasised the potential for significant improvements of radiological protection in the non nuclear sector.

The fourth issue (January 1998) of the Newsletter provided a report back on the first Workshop organised by the European ALARA Network. The topic of the workshop was 'ALARA and Decommissioning'. This issue provide a mechanism to widely disseminate the lessons learnt from the Workshop and particularly to develop, as an outcome from the Workshop, a set of recommendations to the European Commission to facilitate, within Member States, the implementation of ALARA in decommissioning strategies and operations (see below Work Package on EAN Workshops).

The fifth issue (July 1998) of the Newsletter presented some reviews of occupational exposure data from France and Spain. Comparison of such reviews provides valuable feedback experience to identify priorities. This issue also covered some matters addressed during meetings in Washington and Dublin on exposure of aircraft crew to cosmic radiation: namely doses are not trivial, protection options are limited, and therefore there are a number of scientific and policy issues that need developing.

The sixth issue (February 1999) of the Newsletter provided a report back on the second Workshop organised by the European ALARA Network. The topic of the workshop was 'Good Radiation Practices in Industry and Research'. As well as a summary of the Workshop, this issue included recommendations to the European Commission (see below Work Package on EAN Workshops). In this issue the Secretary of the International Commission of Radiological Protection also presented the recent work of the Commission.

The seventh issue (August 1999) of the Newsletter described a new software, the VISIPLAN ALARA planning tool. This facilitates the calculation of dose profiles for different work scenario's taking into account worker position, work duration and subsequent geometry and source distribution changes. A new Spanish Safety Guide, concerning the practical implementation of the optimisation of radiation protection, was also presented. It describes the distribution of ALARA responsibilities within the utilities and contractors firms.

The main comments received concerning the Newsletter 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 database, have been particularly appreciated. Therefore it is clear that there is an important need for such practical examples and readers have been encouraged to send in examples from their countries.

As in many countries the English language is not understood by some of the potential addressees of the Newsletter, it has been suggested it should be translated into other languages (Flemish, Spanish, French...). The Network is 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, 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, providing the original article in the Newsletter is referenced.

### III.2 Work Package 2 - The European ALARA Workshops

**The first Workshop** organised by the European ALARA Network took place 1-3 December 1997, at the Institut National des Sciences et Techniques Nucléaires, Saclay, France. The topic of the workshop was ‘**ALARA and Decommissioning**’

The first lesson learnt from this Workshop was that the format was successful and that there is scope in Europe for such ALARA Workshops; which are neither a big congress nor a collection of working groups with lots of different meetings, but which over a few days provide a forum for a few dozen experts to exchange feedback experience and to identify problems that need further research or development.

The participants covered a wide spectrum of those involved in decommissioning; eg, site managements responsible for decommissioning programmes, international and national advisory bodies who recommend standards such as clearance level criteria, regulators who enforce the legislation and site operators and contractors who undertake the decommissioning and have to implement clearance levels. During the Workshop, 26 invited papers were presented covering both the nuclear fuel cycle (from mining through hot cells to research and power reactors) and non-nuclear situations eg, accelerators and historic uses of radium and thorium. The number of invited papers was considered to be the maximum that could be accommodated in the 3 days and retain sufficient discussion time. The Workshop format provided great flexibility; for example one of the most appreciated items was the late inclusion of the presentation of ALARA software and tools. The participants who were not presenting invited papers were encouraged in the pre-Workshop literature to prepare short papers to contribute to the discussion. About a third produced papers; all were distributed and a few were presented. Undoubtedly a key feature of the Workshop was the ‘passionate discussions’ both after each presentation and in a final panel session. Some elements of these discussions are presented in the Newsletter in Pascal Crouail’s article and are illustrated with some inserts covering relevant sections or tables from some of the papers.

The Workshop was able to identify **a set of recommendations** (see below) **to the European Commission** in order to facilitate, within Member States, the implementation of ALARA in decommissioning strategies and operations. These recommendations were:

1. To develop tools to estimate dose rate levels in complex and evolving environments.
2. To develop techniques, models and software to realistically predict internal exposures.
3. To support the implementation of ALARA in quite complex situations there is a need to take into account various trade offs such as radiological and conventional risks, public and occupational exposure, imposed or voluntary risks, human health and environmental hazards.
4. To develop decision aiding tools to introduce transparency and coherence in the trade-offs identified in 3.
5. To enlarge the International System on Occupational Exposure (ISOE) to plants being decommissioned in order to have available an international database providing feedback from experience.
6. To create an ALARA culture in the non-nuclear sector where there are significant opportunities to improve ALARA implementation.
7. To elaborate clear criteria to be applied in the radiological aspects of the remediation of contaminated sites and for protocols covering means of demonstrating compliance.

8. In addition to the planned second European ALARA Network Workshop (see below) there was support for :
- (i) a Workshop on the optimisation of internal exposure and potential risk management, and
  - (ii) a second Workshop on decommissioning within 3 to 5 years to check the progress of concepts, tools and practices.

**The second Workshop** organised by the European ALARA Network on “**Good Radiation Practices in Industry and Research**”, took place 23-25 November 1998 in the UK at NRPB, Chilton. The Workshop gave rise to 36 presentations that prompted very fruitful discussions. It was clear for all participants that as demonstrated by several presentations, industrial and research sectors are prominent in terms of radiological accidents and feature prominently in the high dose distributions. The Workshop achieved its objective of providing a focus for feedback on the application of ALARA in Industry and Research. The format of the Workshop again fostered discussion and the **identification of what** it is hoped will be useful **recommendations to the Commission**. These recommendations were:

1. To encourage the establishment of compatible accident databases in all Member States.
2. To support the establishment and operation of feedback mechanisms to ensure at the European level widespread dissemination of case studies and lessons to be learned from accidents
3. To encourage an improved and coherent standard of training and refresher training in industrial radiography.
4. To support work to improve the design of radiography equipment in respect of the robustness of source control mechanisms and to investigate the viability of fail-safe source return sensors/detectors.
5. To encourage National and European exposure data to be structured to help identify trends, areas that are not well monitored and overall to help to prioritise allocation of resources in order to reduce exposures.
6. To encourage a more uniform approach to the assessment of dose from exposures to naturally occurring radioactive material (NORM) and from internal exposure.
7. To explore improvements in the disposal of low activity waste arising from NORM.
8. To support the proposal by EAN to the Commission for the Third Workshop to address internal exposures assessment and management (see also recommendation number 8 from the first Workshop).
9. To pursue actions which will improve radiological safety awareness as part of an overall approach to safety, in cooperation with professional bodies and industry group organisations.
10. To support easily understood information being made available to various audiences on comparisons of risks.
11. To collaborate with IAEA, World Customs Organisation and Interpol (as evidenced by the Dijon meeting) in order to address the high priority matter sources security.

**After the success of these two first Workshops**, and as recommended during both, the European ALARA Network will organise **a third Workshop on “Managing Internal Exposure” at Munich in November 1999.**

Finally several other topics have already been envisaged by the Network Steering Group for future Workshops, namely :

- “comparison of occupational risks management: input for radiological protection” in 2000.
- “ALARA and industrial radiography”, in 2001.

### III.3 Other Actions

The Network has proposed to the Commission (DGXI) to introduce a call for tender to study the level of radiological protection actually achieved for workers in the research sector and non nuclear industry.

Another proposal has been made by members of the Network to DGXI after the second Workshop to support the establishment and operation of feedback mechanisms to ensure widespread dissemination of case studies and lessons to be learned from radiological accidents. The first contacts are positive. It is then envisaged to create a specific group of representatives from different countries in order to select case studies and to use the EAN Web site for this dissemination.

## IV. SUMMARY OF MAIN ACHIEVEMENTS

After three and half years the European ALARA Network is a live and effective network and the concerted action should be considered as quite successful :

- As far as the Newsletters are concerned the issues 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 target of two hundred. 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 regularly received requests from people to be placed on the mailing list. As well as radiological protection authorities at national and regional levels, the audience has covered health physicists from the industrial, nuclear and research sectors.

- In order to facilitate access to the Newsletter, it has been possible since September 1997 to find it on the Internet ( <http://www.cepn.asso.fr/EAN.html> ). Only the last issue is directly accessible on the home page, but it is possible to download the previous issues to personal computers, to consult, print and duplicate them. The European ALARA Network Internet site is "visited" monthly by about 20 individuals ; some of them asking to receive the Newsletter.

- The value of practical examples of lessons learned from incidents, as described in the first issues of the Newsletter using the UK IRID data base, has led other countries to propose such examples: i.e. Germany (issue number 3), Sweden (issues number 4 and 7), Spain (issue number 4), France (issue number 5 and 7), Italy (issue number 6).

- The first Workshop was attended by 70 experts from 9 European countries and was described by them as a “very useful exchange meeting characterized by open discussions” and “a new helpful forum”. On the basis of the presentations and discussions a set of recommendations to the Commission was identified.

- The second Workshop was attended by 60 participants from 11 countries with a good mix of operators, health physics experts and regulators; all with interests in the industrial and research sectors. It was able to identify a set of important recommendations to the Commission.

- Finally it should be noted that eleven countries are represented in the European ALARA Network Steering Group which provide guidance on the work programme of the European ALARA Network. The original eight, from Belgium, UK, France, Germany, Sweden, Switzerland, Spain, Italy, were joined at the end of 1997 by a representative of the Netherlands, at the end of 1998 by a representative of Norway and at the beginning of 1999 by a representative of Finland. All these countries have sent representatives to Programme Committees and Workshops. Ongoing positive discussions with representatives of other European countries, allow us to expect further countries to be represented in the near future.

## V. PUBLICATIONS

LEFAURE C, **Alara in Europe: recent evolutions and the European ALARA Network.** 1997 International ALARA Symposium, Orlando, USA, March 16-19, 1997.

LEFAURE C., CROUAIL P., CROFT J., ABADIA G., **Le réseau ALARA Européen : un outil de progrès pour ALARA en Europe.** Poster, SFRP, Congrès National de Radioprotection, Avignon, 18-20 June 1997.

LEFAURE C., CROUAIL P., **Les expositions professionnelles dans l'industrie non nucléaire et la recherche en France et en Europe : situation actuelle et recommandations du Réseau ALARA Européen en vue d'améliorer la radioprotection.** SFRP, Congrès National de Radioprotection, Angers, 2-3 June 1999.

LEFAURE C., CROUAIL P., CROFT J., **The European ALARA Network.** IRPA 10, Hiroshima, May 2000 (proposed poster).

### CONTENTS OF EUROPEAN ALARA NEWSLETTERS

#### *\*Issue 1 - July 1996*

CROFT J., SCHMITT-HANNIG A., **Dose distribution in Germany and the United-Kingdom.**

GODAS T., **ALARA in practice: a regulatory perspective from Sweden.**

LOCHARD J., LEFAURE C., **Managing the radiation risk: ALARA a principle, an obligation, a state of Mind.**

#### *\*Issue 2 - January 1997*

CROFT J., **IRID: Ionising Radiations Incidents Database.**

O'DONNELL P., AMOR I., BUTRAGUEÑO JL., **ALARA Organisation in operating Spanish NPPs.**

C. SCHIEBER, **OPTI-RP: A Software to Evaluate, Compare and Select Radiation Protection Options.**

#### *\*Issue 3 - July 1997*

ATHERTON R. A., **The Application of ALARP in British Nuclear Fuels.**

CROFT J., **Examples Taken From the Ionising Radiations Incident Database.**

DEBOODT P., ANTOINE P., **ALARA Procedure: Three Years of Practice at the SCK/CEN Mol Belgian Research Centre.**

LIEBERZ W., SCHMITT-HANNIG A., **Study on Reducing Doses in Mobile Industrial Radiography in Germany.**

*\*Issue 4 - January 1998*

LEFAURE C., CROUAIL P., CROFT J., **Observations and Recommendations from the 1st EAN Workshop to improve ALARA Implementation during decommissioning.**

*\*Issue 5 - July 1998*

BARTLETT D. T., CROFT J., **Exposures of Aircrews.**

HERNANDEZ A., MARTIN A., VILLANUEVA I., in Spain, CHAMPION M. et al in France, **Occupational Dose Distributions**

CROFT J., **Prosecution following a contamination Incident in the UK.**

*\*Issue 6 - January 1999*

THOMAS G., LEFAURE C., CROUAIL P., CROFT J., **Observations and Recommendations from the 2nd EAN Workshop: "Good Radiation Practices in Industry and Research".**

VALENTIN J., **What's happening within ICRP?**

*\*Issue 7 - August 1999*

VERMEESCH F., VAN BOSSTRAETEN C., **The use of the VISIPLAN ALARA planning tool in ALARA studies at the SCK\*-CEN Mol.**

MONTESINOS J.J., O'DONNELL P., AMOR I., BUTRAGENO J.L., **New Safety Guide: Practical Implementation of the Optimisation on Radiation Protection in Spanish Nuclear Power Plants.**