FINAL TECHNICAL REPORT

CONTRACT N° : **FIR1-CT-2001_20187**

PROJECT N° : **FIS5-2001-00101**

ACRONYM : **EAN**

TITLE : **European ALARA Network**

PROJECT CO-ORDINATOR : **Centre d'études sur l'Evaluation de la Protection dans le domaine Nucléaire (CEPN) (FR) Dr C. Lefaure**

PARTNERS :

National Radiological Protection Board (NRPB) (UK), P.Shaw
Austrian Research Centers (ARCS) (Austria), C.Schmitzer
Belgian Nuclear Research Centre (SCK-CEN) (Belgium), P.Deboodt
RISØ (Denmark), H.Troen
Fortum Power and Heat Oy, Loviisa Power Plant (Finland), S.Katajala
Federal Office for Radiation Protection (Bundesamt für Strahlenschutz (BfS)(Germany), AM.Schmitt Hannig
Agenzia Nazionale per la Protezione dell'Ambiente (ANPA) (Italy), M. Paganini Fioratti
NRG (The Netherlands), J.Van der Steen
Norvegian Radiological Protection Authority (NRPA) (Norway), G Saxebol
Consejo de Securidad Nuclear (CSN) (Spain), JJ. Montesinos
Swedish Radiation Protection Authority (SSI) (Sweden), B. Ekstrom
Swiss Federal Office of Public Health (SFOPH) (Switzerland), N.Stritt
National Radiation Protection Institute (SURO) (Czech Republic), K. Petrova

REPORTING PERIOD : FROM **01.11.01** TO **30.10.04**

PROJECT START DATE : **01.11.01** DURATION : 36 Months

Date of issue of this report : **December 2004**

Project funded by the European Community under the 'FP5CA/TN' Programme (1998-2002)

TABLE OF CONTENTS

1. INTRODUCTION

The main objective of the European ALARA Network (EAN) has been since 1996, and still is, to carry on promoting the efficient and effective application of the ALARA principle through European co-operation and hence ensuring better protection of workers from ionising radiation throughout the Member States, applicant and associated countries. A Network Steering Committee Group manages the Network with representatives from eighteen European countries (Austria, Belgium, Czech Republic, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland, The Netherlands, United Kingdom) belonging to the industry, research centres or national regulatory bodies. It is noticeable that Croatia, Greece, Ireland and the Portugal have joined the network during the FP5 period.

During that period (November 2001, October 2004) three Workshops have been organised on:
"Occupational exposure optimisation in the medical field and radio-pharmaceutical industry" at Madrid, Spain in October 2002
"Decommissioning and site remediation" at Arnhem the Netherlands in October 2003, and
"Occupational radiological protection control trough inspection and self assessment" at Uppsala, Sweden in September 2004.
They have provided respectively 11, 8 and 8 recommendations published on the EAN website and in the ALARA Newsletter issue 12, 14 for the first two workshops (the recommendations of the 3rd one will be published in the issue 16 beginning of 2005).

Six issues of the newsletter have been published; they have been downloaded more than 1000 times each. Feedback from different sources indicates that the Newsletter reaches several thousand individuals or institutions.

A European ALARA Sub-network on Research reactors has been set up in April 2002 and, a working group on industrial radiography under the co-leadership of the European Federation of Non Destructive Testing (EFNDT) and EAN exists since December 2002.

The website has been regularly updated and visited. In 2001, 30 individuals per day have accessed the EAN website; since 2002, that number reached more than 130 individuals per day. Around 250 different documents have been downloaded from the site (Newsletters and workshops presentations mainly). Between five and ten presentations from each workshop have been downloaded more than 400 times and some more than 1000 times.

An evaluation of the impact of the Network has been conducted at the beginning of 2003. Its conclusion is that the Network is considered dynamic, allowing all countries and participants to benefit easily from each other. The network is not very costly and provides a lot of outputs to participating individuals or institutions (information, brain storming together, paper or electronic documents…). Many stakeholders have already implemented several recommendations from the EAN workshops both at national and international levels**.** However there are still progress to be done to reach more coherence, homogeneity and to harmonise policies and practices. In that context, the network remains very useful. All partners, both within the Steering Committee and from other origins, commit themselves to continue to work within or with EAN, when its coordination will become self-sustainable.

Looking at the format and results of the EAN, the International Atomic Energy Agency of the United Nations and the International Labour Organisation, have started a process to set up similar networks in other regions in the world. Through its participation to their action plan, the EAN will therefore help to the setting up of other regional ALARA networks in the world.

2. OBJECTIVES AND STRATEGIC ASPECTS

The main objective of the Network has been since 1996, and still is, to carry on promoting the efficient and effective application of the ALARA principle through European co-operation and hence ensuring better protection of workers from ionising radiation throughout the Member States and applicant countries.

The Network aim was to cover a range of occupational sectors: nuclear, industrial, medical and research. It should cover themes relevant to all sectors (potential exposures, internal exposure, ALARA and decommissioning…), as well as specific themes (improved tools and training in industrial radiography, monitoring, assessment and optimisation of occupational exposures to Natural Occurring Radioactive Material, ALARA in the medical sector,…).

A Network Steering Committee Group was set up for managing the Network with representatives from fourteen European countries at the beginning of the period (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Italy, Norway, Spain, Sweden, Switzerland, The Netherlands, United Kingdom), These Steering Committee Members belong to the industry, research centres or national regulatory bodies. CEPN was selected to act as co-ordinator of the network. The Network Steering Committee Group intended to identify National Contact Persons in European countries that were not yet represented in the Group.

Once a year, one Network objective was to organise a Workshop of a few days in length. The subject had to be selected to cover areas where the Network Steering Committee Group believes that significant improvements in terms of ALARA implementation may be found. Possible topics for the Workshops were defined in the proposal for the fifth PCRD:

- Occupational Exposures Management in the Medical sector
- Decommissioning of installations
- Transport of radioactive sources
- Remediation of contaminated lands after decommissioning
- The use of the Justification principle within Europe and its implications for ALARA
- Orphan sources

The participants had to be drawn from a wide spectrum of those involved in these areas. At the end of each Workshop some recommendations to the EC and other stakeholders were expected from the feedback from the sessions and work in small groups.

The EAN steering group had to perform a follow up of the impact of these recommendations both at national and international levels.

Every six months one issue of the European ALARA Newsletter was scheduled (i.e. six issues during that three years period). The Network Steering Committee Group had to decide the contents of the Newsletter. It had to concern: evolution of regulations and judicial precedents, results of research, description of existing databases, analyses of dosimetric data, ALARA programmes, available ALARA tools, need for ALARA improvements, lessons learnt from incidents, and recommendations to EC and other stakeholders arising from the panel sessions of the EAN Workshops. The contents of each issue should have included one or two feature articles, as well as experts' viewpoints and ALARA information. These newsletters should have been distributed through various channels, such as the national contacts, the national radiation protection societies, the EC, the WEB etc.…

The Network also intended to support initiatives and specific sub-networks to improve feedback, particularly in the case of radiation protection in research reactors, or concerning radiological incidents in non-nuclear field.

The Newsletters, material and recommendations from the Workshops, and from the feedback systems had to be made available on the EAN web site.

The Network had to be open to initiatives from its members and from the participants to the Workshops.

3. PROGRESS AND RESULTS

Since November 2001 the number of EAN countries participating to the Steering Group has been increased from 14 to 18; three Workshops have been organised and have provided recommendations; six newsletters has been issued; two sub-networks have been set up; the website has been updated regularly and is more and more consulted (see below point 5);

3.1 Workshops Organisation

The 6th Workshop preparation started in February 2002 with the first Programme Committee Meeting, followed by a second in April 2002. The Workshop took place at Madrid from the 23rd to 26th October and has been organised jointly by the CSN and CIEMAT. Its topics were occupational exposure optimisation in the medical field and radio-pharmaceutical industry. There were more than 80 participants from 12 European Countries.

The 7th Workshop preparation started in December 2002 with the first Programme Committee Meeting, followed by a second in May 2003. Its topic was "Decommissioning and site remediation". It took place in Anthem (The Netherlands) in October 2003 (29th to 31st) and has been organised by NRG. There were 60 participants from 11 European Countries.

The 8th Workshop preparation started very early in June 2003 with the first Programme Committee Meeting, followed by a second in February 2004. Its topic was "Occupational radiological protection control through inspection and self assessment". It took place in Uppsala (Sweden) in September 2004 (22nd to 24th) and has been organised by the Swedish Institute of Radiological Protection. There were 70 participants from 19 European Countries.

These three workshops have led to important sets of recommendations that have been validated by the programme committees, endorsed by the Steering Committee, made available on the website and inserted into the EAN Newsletter issues 12 (February 2003) and 14 (February 2004) for the 6th and 7th workshops conclusions and that will be inserted in the Newsletter issue N°16 in February 2005 for the 8th workshop.

Table 1. Characteristics of the annual Workshops

Subject	Location and date	Number of Participants (deliberately limited to 50-80 persons)	Number of countries
Occupational exposure optimisation in the medical and radio-pharmaceutical sectors	**Madrid, Spain, 2002**	**80**	**12**
Decommissioning and site remediation	**Arnhem, The Netherlands, 2003**	**60**	**11**
Occupational radiological protection control through inspection and self assessment	**Uppsala, Sweden 2004**	**70**	**19**

One of the major output of the Network being the recommendations from the Workshops, it appears worthwhile to develop here the findings and recommendations from the 6th, 7th and 8th Workshops.

3.2 Findings and Recommendations from the sixth EAN Workshop

The 6th Workshop has dealt, for the first time within EAN, with the medical area, allowing new types of stakeholders to be involved in the life of the Network (radiographers, medical health physicists, radiologists, nuclear medicine doctors…).

Table 2 Number of recommendations by types of addressees

Recommendations to →	Nation Regulat bodies	EC	Utilities	Rad.Prot Research Centres	Manu -fact.	Other Internat Bodies	Prof. Bodies	EAN
	6	**5**	**1**	**1**	**2**	**2**	**4**	**1**

The same recommendation may be addressed to several different stakeholders. It is therefore not appropriate to add all the numbers.

Workers exposed in the medical sector form a very significant percentage of the European workforce that is occupationally exposed to radiation. The average annual individual doses, for all monitored and measurably exposed workers (> 0.0 mSv in a year), varies from country to country by up to about a factor of 10. These differences are also evident in the numbers of people in the higher dose bands. This indicates either significantly different monitoring practices, or different types of work undertaken, or different levels of implementation of the radiological protection system.

Only limited data is available on the breakdown of the sectors of use where the doses are most significant (both in radiology and nuclear medicine). Whilst some of the higher doses are in the traditional general diagnostic area, the dose data and presentations at the Workshop indicate that the major areas of concern are in areas involving new technologies such as in interventional radiology and cardiology.

Different countries and even different medical establishments within countries have different monitoring practices. For example recorded doses may be taken from personal monitoring badges under or on top of lead protective aprons, or from an algorithm using data from both. Similarly for new techniques monitoring protocols may be poorly defined and less rigorously followed by staff who may have previously not been involved in radiological procedures.

> **Recommendation 1: In order to avoid confounding factors and provide dose data that will be useful in identifying trends and areas of concern, there would be value in harmonised guidance at a European level on personal monitoring protocols.**

The European Basic Safety Standard (BSS) are now largely implemented in the legislation of the Member States. However the Workshop identified some areas where the intent of the BSS was not being manifested in the practical implementation of radiological protection: in particular in Prior Risk Assessment, the encouragement of an appropriate Safety Culture, implementing an appropriate training programme and involvement of Qualified Experts.

The concept of Prior Risk Assessment is generally well understood with respect to general safety issues in the medical sector but it was noted that radiological protection risks are often not included. This appears to be particularly so for new procedures and new technologies.

> **Recommendation 2: Regulatory and professional bodies should influence managers and others responsible for safety to systematically include the consideration of radiological risks into prior risk assessments: particularly where new technologies or procedures are being used**.

The carrying out of appropriate Prior Risk Assessments is one manifestation of a good safety culture. The way Regulators encourage and/or enforce regulatory requirements can set the tone for safety cultures but it requires the involvement of all stakeholders to be a success.

Recommendation 3
(a): Management, whether of a large medical establishment or a smaller clinic, should actively seek the involvement of workers; in particular workers experience should be harnessed.

(b): Professional bodies have the infrastructure and mechanisms to influence practical radiological protection. They are encouraged to use them to maximum effect.

(c): When providing new equipment or supplies, manufacturers and suppliers have a golden opportunity to influence the practical implementation of radiological protection. They are encouraged to not only provide safety information but to actively engage in dialogue with customers to further this end.

Appropriate training of staff, at all levels, is a fundamental building block in the attainment of good radiological protection culture. Many mainstream professions that have involvement with well-established uses in the medical sector eg, radiologists and radiographers, include radiological protection training in their professional training curriculae. This introduction of new equipment and procedures provides challenges that require positive updating training provision. However new equipment and procedures often widen the scope beyond those that have had radiation protection training as an element in their professional training. The Workshop identified that these groups of staff are a particular area of concern, often starting to use radiation without any training – Something that an appropriate risk assessment should identify.

Recommendation 4: National Authorities, in consultation with professional bodies should

(a) periodically review the radiological protection content of professional training course to ensure it meets appropriate standards.
(b) give advice on the need for refresher training and "Continued Professional Development"(CPD); and
(c) ensuring that prior risk assessments address the training requirements for those involved in new procedures.

The BSS requires the appointment of Qualified Experts (QE). The professional input on radiological protection that a QE can provide, can be a major factor in the implementation of many of the above issues. However it is clear from the Workshop that there were very significant differences between Member States in

(a) the perceived role of a QE in the medical sector, and
(b) the training and attributes of a QE.

The standards appeared to vary from a QE having one week's training and little power or influence, to someone having to have significant radiological protection training plus 3 years practical experience before taking on the QE function, often with the ability to directly influence senior management. A Working Group of the Article 31 Group established under the Euratom Treaty is looking at harmonising standards for Qualified Experts.

Recommendation 5: The Workshop recognised that the participation of appropriately Qualified Experts in the development and implementation of radiological protection programmes was crucial. The EC should request the Article 31 Working Group to give priority to clarifying advice on

(a) the role of QEs, and
(b) training and qualifications required.

During presentations and discussions at the Workshop it became clear that professional bodies, national authorities and international bodies had developed a range of guidance documents on different subjects, but that their existence was not widely known.

Recommendation 6: In order to provide a focus and a means of avoiding groups "re-inventing the wheel", the EAN should make arrangements to have a section of its website devoted to listing (and providing links to) existing guidance documents in the medical sector.

It is also important that when accidents and incidents occur, they are appropriately reported so that others can learn the lessons from these events.

Recommendation 7: Professional bodies, national authorities and international bodies should liase to ensure that there are appropriate mechanisms in place for the reporting of accidents and incidents, and the dissemination of lessons learned.

Several presentations covered the relatively high whole body doses associated with new techniques particularly in interventional radiology and nuclear medicine. It was also noted that these situations also result in high extremity doses, not just to the hands, but to the legs of interventional radiologist. A number of papers focussed on methods for assessing extremity doses, including electronic that can enable the pattern of exposure from individual actions to be examined and the data to be available as soon as the procedure has been completed. This immediate feedback can be used to improve specific procedures but also has a secondary but important function of raising awareness of radiation protection issues and good practice.

Recommendation 8: The EU and national authorities should support research into the development and use of electronic dosimetry systems.

Papers were presented on the expanding range of isotopes and their uses in nuclear medicine. However it appeared that the methodologies for appropriate dose assessments were not keeping pace with these developments.

Recommendation 9: The EU could provide a useful focus for developing and implementing appropriate methodologies for internal dose assessments.

It was identified that there can be strong links between the profiles of patient doses and occupational exposure. The establishment and use of Reference Doses for standard procedures have been shown to be of significant value in focussing attention on radiation protection issues and optimising both patient doses and occupational exposure.

Recommendation 10: The EU and national authorities should take measures to encourage the development of Reference Doses for new procedures.

There was considerable discussion of approaches to controlling the occupational exposure of pregnant women. Whilst national regulations are based on Article 10 of the BSS Directive there appeared to be

considerable variation in the national guidance and practices; often reflecting underlying social cultures. Whilst the issue transcends the medical sector, the scale of medical procedures and the high proportion of women in the occupationally exposed group, make the medical sector important.

Recommendation 11: There would be value in international organisations developing
- harmonised approaches to dosimetric assessment of doses to the embryo/foetus
- practical criteria for identifying work activities that pregnant women should not undertake
- **administrative procedures for the declaration of pregnancy.**

3.3 Findings and Recommendations from the seventh EAN Workshop

This was the first time that a workshop re-visited a specific topic: the 1st EAN Workshop (Saclay, 1997) was devoted to "ALARA and decommissioning", this the 7th one to "Decommissioning and site remediation". There were 20 oral presentations, mainly devoted to case studies of work undertaken in a variety of different situations (from accelerators and hot cells, to mineral wool (NORM) facilities and contaminated apartments). In addition to a scene setting session there were sessions on:
- site remediation and prevention of internal exposure
- decommissioning of installations outside the nuclear fuel cycle
- effectiveness and feedback from the use of dose and dose rates estimating factors

The opening session reviewed the progress made with the recommendations from the 1st Workshop, and identified a series of issues and questions for later consideration in the Working Group sessions. There were two such sessions where the participants were split into 6 Working Groups tasked with addressing specific issues. The reports from these groups were presented and discussed in the final two sessions in order to identify the key findings and recommendations.

Table 3 Number of recommendations by types of addressees

Recommendations to →	Nation Regulat bodies	EC	Utilities	Rad.Prot Research Centres	Manu -fact.	Other Internat Bodies	Prof. Bodies	EAN
	3	**5**	**3**			**5**		**2**

The same recommendation may be addressed to several different stakeholders. It is therefore not appropriate to add all the numbers.

3.3.1 Progress made since the 1st workshop

The implementation of the eight recommendations made at the 1st workshop was reviewed in detail in a scene-setting presentation (Deboot). In addition to this, the themes raised were also a feature of many subsequent presentations. A summary of this is given in the table below.

Table 4 Implementation of the 8 recommendations from the first workshop

Recommendations from 1st EAN Workshop	Follow-up EAN workshop/activity	Number of papers at 7th workshop[1]
External dose tools		5
Internal dose tools	Workshop 3 (1999)	2
Total risk approach	Workshop 4 (2000)	
Decision aiding (transparency)		1
ISOE	Research reactor sub-network	
Non-nuclear sector	Workshop 2 (1998)	3
Harmonised system of control		8
Clearance criteria/acceptability		2

3.3.2 Findings and recommendations

Although there were a range of subjects covered during both the presentations and the working groups, four general themes emerged from the workshop. These are discussed below.

3.3.2.1 Are we really implementing ALARA in decommissioning and remediation?

In many of the cases presented, it was clear that a diverse range of factors were involved in real decommissioning/remediation operations. The end-point, in many cases, was a decision to remove all detectable activity, irrespective of whether this constituted a significant residual risk. This raised questions about whether this approach is ALARA, or indeed whether the optimisation principle has a role. Specific conclusions and recommendations reached during the workshop were:

* The costs associated with decommissioning and remediation are complex. Although these costs can be very high, they are not all associated with dose restriction. Decision-aiding techniques, such as cost-benefit analysis, have a very limited impact in practice, and should be applied with care.
* "Social issues" are often an overriding factor, especially where public exposures are involved. These issues include public opinion and media pressure, and the overall effect is to produce a situation referred to as "ALATA" (as low as technologically achievable), a phrase introduced at the Workshop.
* Although social factors and pressures are valid and important, the Workshop expressed concerns at the establishment of "zero risk" endpoints. These are never entirely possible, are often impractical, and encourage unrealistic expectations and the disproportionate use of resources.

In comparison, the ALARA principle does appear to be well-implemented in cases where occupational, rather than public exposure, is the issue: many of the presentations confirmed the key role that optimisation now plays in planning and undertaking such operations. One possible exception to this is internal exposures, which are, in some cases avoided at the overall expense of increased external doses.

* Another clear factor to emerge is that both decommissioning and site remediation involve other (non-radiological) hazards, and an integrated or "holistic" approach to risk management is desirable. Adoption of this approach throughout the lifetime of operations would be especially beneficial to the final decommissioning/remediation operation.

Recommendation 1: Management of occupational internal exposure.

[1] Represents the number of papers that addressed the particular subject. Some papers covered more than one subject, and many papers focused on new issues entirely.

In some cases, too much emphasis is placed on avoiding occupational internal radiation exposures, to the detriment of external radiation control. This approach is sometimes necessary, for example because the internal radiation hazard is unpredictable. In other cases, In other cases, operators should aim to ensure an overall balance between internal and external radiation doses to workers.

Recommendation 2: Integrated risk approach.
An integrated (or "holistic") approach to risk management in decommissioning and site remediation should be encouraged by international bodies such as IAEA, ILO, NEA and EC. This should be supported by regulators and implemented by operators, and should aim to include: a simultaneous consideration of non-radiological hazards and risks, so as to provide the best overall protection of persons and the environment; and greater emphasis on life-cycle planning of facilities, where the issues of decommissioning and remediation are considered throughout

3.3.2.2 What is the role of the stakeholders in decision-making?
Examples were presented in which increased stakeholder involvement, especially from members of the public and their representatives, had been actively pursued. These involved more proactive ways of providing information (telephone "help-lines", open days, etc), as well as encouraging participation in the actual decision-making process. The evidence suggests that this has helped raise wider public awareness and acceptance, which in turn has been beneficial to the overall operation. The workshop concluded that wider application of this approach should be encouraged.

Recommendation 3: Stakeholder involvement.
Experiences presented in the workshop have shown the importance of involving all interested parties (stakeholders) in the decision making process dealing with site remediation. To encourage this, it is recommended that:
- EC and other international organisations provide guidance and spread feedback experiences;
- national authorities provide suitable regulatory frameworks; and
- decision makers make arrangements to invite views from different stakeholders, and set up forums in which each may make a relevant contribution. These arrangements should normally be the responsibility of operators, where they exist, in consultation with the relevant authorities.

3.3.2.3 Are there specificities in the non-nuclear sector?
It was very clear during the workshop that this sector can be defined in different ways, and covers a broad range of situations, for example:
* low level contamination, e.g. in research laboratories;
* very high contamination levels in source production facilities; and
* NORM sites with large volumes of waste.

Many differences with nuclear sites were noted, for example in terms of the historical use of sites, their location, etc. Overall, however, it was felt that appropriate decommissioning/remediation techniques exist but need to be adequately selected, in many cases using lessons learned from the nuclear industry. At this stage, although there appears to be no need for new tools/techniques to be specially developed for this sector, the decommissioning industry is far from being mature. It was moreover suggested that an inventory of relevant sites to be decommissioned/remediated would help encourage the sharing of experience and good practice.

Recommendation 4: Inventory of non-nuclear sites.
The workshop identified a need for national and international inventories of non-nuclear sites to be decommissioned and/or remediated. This should include past operations as well as sites still in operation. In the first instance, national authorities are encouraged to assemble such an inventory, and to make it available to interested parties to encourage the sharing of experience and feedback, and to ensure transparency

For NORM-contaminated sites, it was noted that historical processes were often undertaken with no knowledge of the associated radiation hazard - this may still be the case with some existing processing plants. This can result in large-scale decommissioning/remediation problems for operators, many of which lack relevant knowledge of the radiological issues that need to be addressed.

Recommendation 5 Guidance for NORM sites
In the case of NORM-contaminated sites, there is often less awareness of radiological problems and hazards. Guidance should be developed by international bodies to help those responsible for such sites to:
- **identify likely sources of contamination;**
- **assess the radiation hazards; and**
- **select suitable techniques for decommissioning and site remediation.**

3.3.2.4 Are they still further needs for external dose prediction tools?
The session devoted to these tools indicated that they continue to be developed and are increasingly sophisticated. One major development has been in the graphical interfaces used to display the results in 3D. These tools clearly have a role in ALARA planning, especially for work in high dose rate areas, and are also a useful training aid. With the increasing number of available tools, it was suggested that a means of benchmarking and comparing different systems was a priority. It was also noted that the Workshop had provided a useful forum for communications between different organisations using different tools, and that this should be encouraged further.

Recommendation 6: External Dose Prediction Tools network
The EAN (with the support of the EC) should establish a European "sub-network on dose prediction tools", involving users, developers, and other stakeholders to share experiences, develop common standards and identify future needs for decommissioning and site remediation operations.
The workshop noted that the current sophistication of dose prediction tools needs to be matched by the training of users.

Recommendation 7: Training for users of dose prediction tools
Training for users of prediction codes and tools is necessary to help ensure that the results obtained are both consistent and reliable, and that they are interpreted correctly. IAEA have already developed training material on this topic. One of the functions of the recommended sub-network on dose prediction tools should be to review and comment on existing training

material. These comments should be disseminated to users and suppliers of dose prediction tools, and also fed back to IAEA.

One of the working groups on dose prediction tools also considered the protocols for obtaining radiological data prior to site remediation, and concluded that this was an area of concern. IAEA have produced guidance on the radiological characterisation of sites prior to remediation operations. However, the Workshop noted evidence that site characterisation costs were becoming increasingly significant. This was often due to uncertainty about the amount of radiological monitoring and sampling required. The demands of different national regulatory systems were also noted.

Recommendation 8. Site characterisation tools
Further guidance from international bodies on site characterisation protocols (sampling requirements, etc.) is recommended at the beginning and end of the remediation/decommissioning process. This guidance should aim to provide a common framework for decision-making within the context of different national regulatory systems.

3.3.3 Conclusion

Many improvements have been achieved since the first Workshop on "ALARA and decommissioning", both in practice (as shown during the exchanges on case studies) and in the methodological area (recommendations from national and international bodies on management strategies, methodology and tools for estimating doses to public and the workers…). The role of a network, such as EAN, to widely spread information to interested parties appears to be very efficient and will help in promoting further progress.

3.4 Findings and Recommendations from the eigth EAN Workshop

The 8th Workshop has dealt, for the first time within EAN, with "Occupational Radiation Protection through Inspection and Self-assessment". Respectively half and one third of the audience were from the regulatory bodies and utilities from medical and industry sectors. The objective of the Workshop was "to assess how regulatory authorisation and inspection, and internal controls (peer reviews, self assessment, etc.) contribute to achieving ALARA for occupational exposure".
Half the programme time was devoted to Group discussions and report backs.In total, there were 14 oral presentations, and 10 poster presentations, organised under the following titles:

- Setting the Scene;
- Regulatory Bodies and Control Organisations;
- Licensees; and
- Workers.

The opening session included a presentation of the results of an EAN questionnaire on the size and structure of national regulatory authorities. It also identified a series of issues and questions for later consideration by the Working Groups. There were two such sessions where the participants were split into 6 Working Groups tasked with addressing specific issues. The four main topic areas were:

- inspection;
- self assessment;
- workers' involvement; and
- communication between stakeholders.

The reports from these groups were presented and discussed on the final day, from which the key findings and recommendations from the workshop were derived.

Table 5 Number of recommendations by types of addressees

Recommendations to →	Nation Regulat bodies	EC	Utilities	Rad.Prot Research Centres	Manu -fact.	Other Internat Bodies	Trainers	EAN
	8	**3**	**5**			**2**	**1**	

The same recommendation may be addressed to several different stakeholders. It is therefore not appropriate to add all the numbers.

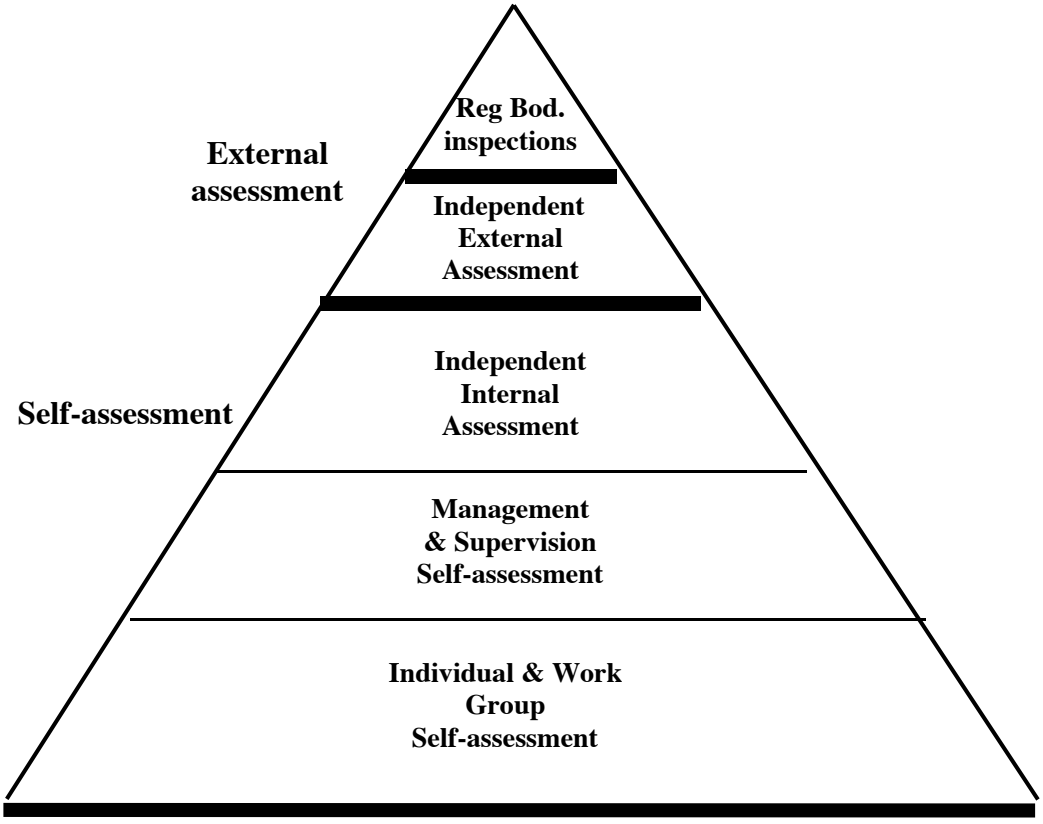
3.4.1 Issues arising

One of the main objectives of the EAN is to encourage optimisation through the sharing of information and experience. About half the participants were from national regulatory bodies, and the Workshop provided a valuable opportunity for exchanging information and ideas between these bodies. In addition, there was a general willingness from regulators and other stakeholders to openly discuss problem issues. In this respect alone, the workshop was considered to be of significant benefit. In addition to this, many issues were raised, from both the presentations and the working groups, and from these a number of common themes emerged.

3.4.1.1 The assessment layers

The full scope of the assessment is illustrated in Figure 1. It comprises five layers, of which two correspond to external assessment, and three to self-assessment.

FIG. 1.Triangle of the assessment process



The role of the different stake holders in these different types of assessment, as well as their frequencies and pre-requisites have been discussed during the workshop. The main points that have been addressed are summarised below.

3.4.1.2 Regulatory bodies and regulatory inspections

All the participating countries have one or more national bodies that are responsible for inspecting practices with a view to enforcing regulatory requirements. The resources devoted to inspection/enforcement vary, but are generally quite limited when compared against the number of practices. Consequently, priorities need to be set, and resources need to be appropriately targeted, to ensure effective regulatory control.

Inspection and enforcement regimes vary between countries, but in all cases are regarded as an essential component of the control system. Such activities are not, however, sufficient by themselves, and Regulatory Body advice and guidance for users can reach a larger audience, and thus lead to a better level of compliance overall. Having said this, the Workshop acknowledged that a balance was necessary to ensure that Regulatory Bodies do not encroach onto the responsibilities of (radiation) employers and Qualified Experts.

The training of inspectors (from Regulatory Bodies or other external organisations) was raised several times. The view was that, as well as knowledge-based training in radiation protection, inspectors needed interpersonal skills to effectively undertake their work. In addition, training should include familiarisation with the approach to radiation protection within the different types of practice under their control. For example, it was suggested that inspectors in the medical sector should have received "on the job" training and experience in hospitals and other medical establishments.

3.4.1.3 Licensees/Employers

It was agreed that self-assessment was central to maintaining regulatory compliance, and would usually aim to exceed regulatory requirements. Quality Management Systems are now an integral part of most businesses, and (radiation protection) self-assessment readily forms a component of such systems, as demonstrated in a number of presentations.

The amount of communication between regulatory bodies and employers varies considerably between countries. It was agreed that such communication should be encouraged, for example through consultation on draft regulatory changes, and through on-going liaison between the regulators and the regulated on issues/problems of common interest.

3.4.1.4 Workers

The overriding impression was that more could be done to involve workers in both the drafting and enforcement of regulations. It seems that special initiatives, such as the creation of national bodies with formal liaison functions, or establishing stakeholder panels or workshops, are needed to make real progress in this respect.

It was agreed that Trade Unions, Professional bodies and other worker/safety representatives have a key role to play, and their involvement should be encouraged. They should be consulted on the drafting of regulations, and also be regarded as one of the main stakeholders in terms of regulatory inspections. As such, they should be notified of inspections, be consulted during inspections, and directly notified of the findings of the inspection.

Worker training is required to encourage their involvement. This should provide them with the required knowledge base to understand and critically review the precautions provided by employers for their own protection and to participate actively into the self assessment processes, as they are they are the only one who should do it on a day to day basis. It should also be confidence-building, and help develop a "no fault" culture where workers are encouraged to question the status quo.

3.4.2 Recommendations

Each working group produced conclusions and recommendations, and gave a report back on the final day of the workshop. The output of the Working Groups was collated by the EAN co-ordinators, to produce the formal recommendations of the Workshop, as listed below.

RECOMMENDATION 1: Inspector training

Regulatory Authorities should develop and implement training programmes for regulatory inspectors. The aim is to ensure that inspectors have the necessary competence and experience to effectively undertake their duties. Training programmes should include:

- **an initial training programme, including a scientific core of knowledge, and a code of conduct for undertaking inspections;**

familiarisation with how work is undertaken in the different work sectors they will inspect; and

- **a system for Continuous Professional Development.**

Regulatory Authorities are encouraged to make use of standardised training material for inspections, such as provided by the IAEA.
International Organisations should be encouraged to provide guidance to Regulatory Authorities on training programmes and their provision.

The European Commission should be encouraged to develop competence criteria for inspectors for mutual recognition within the European Union.

RECOMMENDATION 2: Self-assessment
Regulatory Authorities should ensure that self-assessment is an explicit requirement of the regulatory system, particularly through authorisations. Regulatory inspections should pay attention to how employers implement this requirement in practice.

Regulatory Authorities and International Organisations should develop guidance on the self-assessment principles, methods and tools appropriate for different practices. It is recognised that IAEA has already produced a number of documents that refer to the self-assessment procedures, and a review of these should be undertaken before any new guidance documents are produced.

Employers and training providers should ensure that self-assessment tools and methods are included in education and training programs for Qualified Experts, managers and supervisors, and workers.

RECOMMENDATION 3: Internal regulation (large utilities)
The concept of an internal regulatory, or quality assurance, department is considered to be a helpful bridge between external regulatory inspections and self-assessment. This concept should be encouraged across the EU, especially for larger organizations, and with a special emphasize on new member states and applicant countries. The aim of this "internal regulator" is:

- **to play an active role in ensuring that a satisfactory radiation protection system is in place;**
- **to critically review the system with a degree of impartiality; and**
- **to assist and complement the existing external regulatory inspection regime.**

RECOMMENDATION 4: Involvement of Trade Unions and other social partners
Regulatory Authorities should ensure that Trade Union and other worker/safety representatives are consulted on the drafting of requirements

for inspection and self-assessment. They should also be informed of planned regulatory inspections, involved in the inspection process, and directly informed of the results.

In turn, Employers should ensure that such representatives are consulted on self-assessment procedures and are involved in the implementation and review of such procedures in practice.

RECOMMENDATION 5 : Communication between Regulators and other stakeholders
In order to make efficient use of resources, Regulatory Authorities should develop systems for two-way communication with:
(groups of) workers in different sectors; Qualified Experts; employers' representatives such as professional bodies/associations, from different work sectors; and institutions providing radiological protection training
Topics should include consultation on new regulations, expectations of the different stakeholders, examples of good practice, and the emergence of new applications and protection methods. Formalised systems of communication could be an effective means for increasing the role of inspectorates and should, where practicable, be open and transparent.

RECOMMENDATION 6 : Worker involvement
Employers should encourage and facilitate worker involvement in both external and internal assessments by:
- ensuring a management commitment to worker involvement;
providing appropriate training to empower workers and encourage questions; and by
- clearly communicating results of inspections and self-assessments to workers.

RECOMMENDATION 7 : Communication between Regulatory Authorities
National Authorities should promote communication between different National Regulatory Authorities. This should include the exchange of information on the licensing and inspection methods employed in different countries. Joint inspections, i.e. involving two or more Regulatory Bodies from different countries, should also be encouraged as a means of sharing information and experience. The creation of a network of contacts through which such information can be exchanged, is also recommended.

RECOMMENDATION 8 : Self-assessment and accident prevention
The investigation of accidents often reveals a number of contributing factors that place workers under additional stress, and hence make accidents more likely. Employers are encouraged to consider such factors when developing self-assessment procedures, so as to help minimise the probability of accidents occurring in future.

3.5 EAN Newsletters

As expected six newsletters have been published during that period.

The Newsletter issue 10 has been issued in January 2002; that issue number 10 should have been issued in September 2001, before the FP 5 contract, therefore all subsequent issues will be postponed by six months. The newsletter 11 has been issued in August 2002. The Newsletter issue 12 has been issued in February 2003. The newsletter issue 13 has been issued in August 2003. The issue 14 have been issued in march 2004. The issue 15 have been issued in October 2004. The issues 10, 12 and 14have provided the recommendations namely of the 5th workshop on "industrial radiography improvements in radiological protection", of the 6th workshop on "occupational exposure optimisation in the medical field and radio-pharmaceutical industry" and of the 7th workshop on "Decommissioning and site remediation". The Newsletters have also continued describing incidents or accidents and lessons learned to avoiding them.

The newsletter is distributed through various channels, including national contacts, national radiation protection societies and the EC. All the newsletters are downloadable from the EAN website: http://ean.cepn.asso.fr/ these six last issues have been downloaded more than 1000 times each. Feedback from different sources indicates that the Newsletter reaches several thousand individuals or institutions, mainly in Europe.

3.6 EAN website

The EAN website has been updated very regularly during the whole period. All newsletters have been made available on it; as well the advertisement for the workshops, the papers presented at the workshops, the conclusions and recommendations from the workshops are available on the website. Links are also provided with other website of interest for radiological protection

3.7 The European ALARA Sub-networks and Working Groups

3.7.1 The sub-network on Research reactors

The European ALARA Sub-network on Research (EASN) reactors has been set up and started to exchange information on occupational doses and possible improvements in radiological protection. Its first meeting was held in April 2002 at CEPN (France). Its second meeting was held in September 2002 at SCK CEN Mol (Belgium). The third meeting, has been hosted by RISØ in Roskilde, Denmark on June 16-17, 2003, attention was paid to the handling/treatment of radioactive waste. The fourth meeting took place at CEA in Grenoble, France on February 2-3, 2004.The number of participants to that sub-network is increasing (five countries in 2002, seven countries in 2003).

Table 6 : Topics covered by the EASN meetings

Topics	meeting 1	meeting 2	meeting 3	meeting 4
Decommissioning		X	X	X
Status of the regulations		X		X
Management of liquid waste			X	
Training				
Practical implementation ALARA		X		X
Integrated approach of risks		X		X
Clearance level		X	X	X

Data from seven countries are now available. The participants also use the sub-network to promote a process of peer review when visiting each other's facilities.

3.7.2 The working group on industrial radiography

Following the 5th Workshop, a group has been set up under the co-leadership of the European Federation of Non Destructive Testing (EFNDT) and NRPB from the UK as EAN representative. This sub-network, in connection with EC DGTREN, aims to develop and maintain Codes of Practice for NDT Operators, and for NDT clients. The Group intends to promote good radiation protection practice and the achievement of ALARA, as well as to develop initiatives to improve and support appropriate radiation protection training, particularly in respect of learning the lessons from accidents and incidents. This group met for the first time in December 2002.

3.8 Comparison of achieved objectives and stated objectives

All expected actions have been implemented both in qualitative terms (see 3.1 to 3.4) as well as in terms of milestones and deliverables (see next section 4 and final management report). Some actions started even earlier than scheduled, as for example the preparation of the 8th Workshop. As well the costs corresponds to what was expected with a general increase of the in kind contribution (see management report). Finally the impact of the Network appears much more important when looking at (see section 5):

- the number of individuals and institutions reached;
- the influence of the recommendations both at national and international levels;
- the influence of the network as a model for other regional networks in the world.

4. LIST OF DELIVERABLES

The following table compare the expected and actual delivery dates.

Deliverable No	Deliverable title	Planned Delivery date (T_0 + Months)	Actual Date	Dissemination level
D1	Minutes of EAN Steering Group meeting 1	$T_0 + 1$	16 Janv 2002	CO
D2	Minutes of EAN Steering Group meeting 2	$T_0 + 7$	12 July 2002	CO
D3	Minutes of EAN Steering Group meeting 3	$T_0 + 13$	18 February 2003	CO
D4	Minutes of EAN Steering Group meeting 4	$T_0 + 19$	September 2003	CO
D5	Minutes of EAN Steering Group meeting 5	$T_0 + 25$	18 February 2004	CO
D6	Minutes of EAN Steering Group meeting 6	$T_0 + 31$	17 September 2004	CO
D7	Minutes of the 1st Program Committee. Meeting of the 6th EAN Workshop	$T_0 + 3$	March 2002	CO
D8	First announcement. & Call for paper 6th EAN Workshop	$T_0 + 4$	April 2002	PU
D9	Minutes of the 2d Program Committee. Meeting of the 6th EAN Workshop	$T_0 + 6$	May 2002	CO
D10	Minutes of the 3rd Program Committee. Meeting of the 6th EAN Workshop	$T_0 + 9$	No need of a third meeting	CO
D11	Second announcement of the 6th EAN Workshop	$T_0 + 9$	July 2002	PU
D12	6th EAN Workshop	$T_0 + 12$	October 2002	RE
D13	Recommendations from the 6th EAN Workshop	$T_0 + 14$	November 2002	PU
D14	Minutes of the 1st Program Committee. Meeting of the 7th EAN Workshop	$T_0 + 15$	15th January 2003	CO
D15	First announcement. & Call for paper 7th EAN Workshop	$T_0 + 16$	14th February 2003	PU
D16	Minutes of the 2d Program Committee. Meeting of the 7th EAN Workshop	$T_0 + 18$	1st June 2003	CO
D17	Minutes of the 3rd Program Committee. Meeting of the 7th EAN Workshop	$T_0 + 21$	No third meeting is necessary	CO
D18	Second announcement of the 7th EAN Workshop with programme	$T_0 + 21$	15th June 2003	PU
D19	7th EAN Workshop	$T_0 + 24$	October 2003	RE
D20	Recommendations from the 7th EAN Workshop	$T_0 + 26$	October 2003	PU
D21	Minutes of the 1st Program Committee. Meeting of the 8th EAN Workshop	$T_0 + 27$	16th July 2003	CO

D22	First announcement. & Call for paper 8th EAN Workshop	T_0 + 28	25th August 2003	PU
D23	Minutes of the 2d Program Committee. Meeting of the 8th EAN Workshop	T_0 + 30	11 February 2004	CO
D24	Minutes of the 3rd Program Committee. Meeting of the 8th EAN Workshop	T_0 + 33	No need for a 3rd meeting	CO
D25	Second announcement of the 8th EAN Workshop	T_0 + 34	27th march 2004	PU
D26	8th EAN Workshop	T_0 + 36	22nd to 24th September 2004	RE
D27	Recommendations from the 8th EAN Workshop	T_0 + 38	13 December 2004	PU
	Publication of EAN Newsletter issue No 10	Was delayed from previous contract	January 2002	PU
D28	Publication of EAN Newsletter issue No 10	T_0 + 3	February 2002	PU
D29	Publication of EAN Newsletter issue No 11	T_0 + 9	August 2002	PU
D30	Publication of EAN Newsletter issue No 12	T_0 + 15	February 2003	PU
D31	Publication of EAN Newsletter issue No 13	T_0 + 21	August 2003	PU
D32	Publication of EAN Newsletter issue No 14	T_0 + 27	March 2004	PU
D33	Publication of EAN Newsletter issue No 15	T_0 + 33	October 2004	PU
D34	EAN Web site maintenance (monthly)	*	Regularly done	PU
D35	Minutes of the First meeting of the sub-network on research Reactors	T_0 + 6	June 2002	CO
	Minutes of a second non planned meeting of the sub-network	Not planed	December 2002	CO
D36	Report 1 from the EAN Research Reactors sub-network	T_0 + 12	December 2002	PU
D37	Minutes of the third meeting of the sub-network on research Reactors	T_0 + 18	November 2003	CO
D38	Report 2 from the EAN Research Reactors sub-network	T_0 + 24	December 2003	PU
D39	Minutes of the fourth meeting of the sub-network on research Reactors	T_0 + 30	April 2004	CO
	Minutes of a fifth non planned meeting of the sub-network	Not planed	December 2004	CO
D40	Final Report from the EAN Research Reactors sub-network	T_0 + 36	December 2004	PU
D41	Minutes of first meeting of the Working Group EAN/EFNDT	Not planed	March 2003	RE
D42	Minutes of second meeting of the Working Group EAN/EFNDT	Not planed	November 2003	RE

D43	Document on EAN results, evolution and needs	Not planed	June 2003	PU

(*) The maintenance of the WEB site will be a permanent monthly process from T_o to T_o + 36

5. DISCUSSION, DISSEMINATION AND USE OF THE RESULTS

5.1 Participation to EAN activities

Representatives of the first fourteen member countries of the Steering Committee regularly participate in all EAN activities. During the last workshops, representatives from the US, Israel, Syria, Lithuania, Croatia, Slovenia, Canada, Sudan, Iran have also participated actively.

During the last two months of the second year, four new countries have joined the EAN, namely three of the last four EU member states (namely Ireland, Greece and Portugal) and one applicant country (Croatia). Representatives of these countries are now members of the EAN Steering Group.

Previously the participants to EAN 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. This reflected the composition of the Steering Committee itself. However it was then noted that many problems needed the participation of other types of participants. Consequently now many other types of participants were invited and most of them have actually been integrated into the network. This is the case mainly since 2001 of:

- representatives of professional bodies such as Medical Radiographers Associations, Medical Physicians Associations, Medical Physicists Associations…
- representatives of manufacturers of devices using ionising radiations
- representatives of manufacturers of radiation monitoring devices
- representatives of international organisations such as ILO, IAEA
- representatives of trainers in radiological protection

5.2 The Website

The **website** has been regularly updated and visited. In 2001, 30 individuals per day have accessed the EAN website; since 2002 that number reached more than 130 individuals per day. Around 200 different documents have been downloaded from the site (Newsletters and workshops presentations mainly). Between five and ten presentations from each workshop have been downloaded more than 400 times and some more than 1000 times. Most visitors come from Europe and North America, but a small percentage comes also from Asia, Oceania and even Africa.

All the 6 issues of the Newsletter, most of the presentations from the $6^{th, 7th}$ and 8^{th} Workshop as well as the conclusions and recommendations from these Workshops are available on the Web site.

5.3 Evaluation of EAN outputs effectiveness

It is too early to analyse precisely all impacts of the most recent EAN activities. However in 2003 the Steering Committee has conducted an evaluation concerning EAN activities. The following paragraphs will mainly refer to that evaluation and also to more recent events or tendencies.

5.3.1 In Europe

Different stakeholders have implemented several recommendations from the EAN workshops. For example, these include:

5.3.1.1 International level

- The European Commission (DG RESEARCH) has supported and financed a new research project dealing with the management of internal exposure, the SMOPIE project(Strategies and Methods for Optimisation of Internal Exposure of workers from industrial natural sources) within the fifth PCRD. This project, co-ordinated by NRG from the Netherlands reached its end in June 2004 and the results

have been discussed at the EAN Steering Group. It dealt with a totally new area for the Network: the NORM sector (naturally occurring radioactive materials).

- European Commission (DGENV) has decided to support EURAIDE (European Accident and Incident Data Exchange.) This project, co-ordinated by NRPB from UK, reached its end in December 2003 and the results have been discussed at the EAN Steering Group,). This pilot study has proposed a management scheme for a radiation accident and incident data exchange system at the European level. A European workshop is expected on that topic in 2005.
- European Commission radiation protection has supported financially the third, fourth and fifth workshops after recommendations from the first and second workshops.

5.3.1.2 National levels

- After the first Workshop (ALARA and Decommissioning), a working group (of university representatives) for decommissioning of accelerators has been set up in Belgium to follow up the recommendations made. In Sweden several ideas from that Workshop were used when writing "Regulations on Planning for and during Decommissioning of Nuclear Facilities."
- After the second Workshop (Good Radiation Practices in Industry and Research), the French society of Radiological Protection has set up a network to provide lessons learned from occupational radiological incidents (RELIR), a new regulatory system to follow up incidents have been set up in Norway. Since then, the regulatory bodies in Austria, Switzerland and the Netherlands, as well as AVN in Belgium, are investigating solutions to create such systems. The Workshop also provided the impetus for the continuation of the IRID system in the UK, and the wider dissemination of the lessons learned from accidents via the NRPB website. A number of other issues raised at the second workshop, relating to good radiation practices, were taken into account in the subsequent revision of UK regulations. It is also noticeable that the French regulatory body has asked the new RELIR network to provide comments and advices on its new communication scale on radiological incidents and accidents.
- After the third Workshop (management of internal exposure), in Germany parts of the recommendations from the third Workshop have been introduced into regulatory guidelines (for example, the Draft guideline on the "Physical radiation protection control-incorporation monitoring"). The improvement of the management of internal exposure is also considered as an issue in the Netherlands since that Workshop. In the UK, the regulatory authorities have commissioned further studies into the dosimetric data applied to intakes of NORM, with the eventual aim of incorporating this into regulatory guidance.
- The fifth and sixth Workshops (respectively on Industrial Radiography and on Medical occupational exposure) have had an impact on many stakeholders behaviour in several countries. The regulatory body in Czech Republic organises now seminars with Non Destructive Testing companies, using the material from the fifth Workshop, this has led to an improvement of co-operation between these partners. That Workshop has also influenced the discussion of the authorities with the Dutch radiographers. The regulatory body in the Netherlands intends to integrate some recommendations from both workshops into guidance. In Italy, the medical health physicists often refer to the sixth Workshop and in Sweden an analysis of the doses taken by personnel in the medical field is scheduled following that Workshop. In Germany, the Rome Workshop has intensified the co-operation between the German Society of Non-destructive Testing and the ALARA Network; this is considered as very important for harmonisation concerning safety of equipment and development of practical requirements; it is expected to lead sooner or later to the development of specific German guideline on "Safety in Technical Radiography".
- Furthermore, the new regulations in Norway now address more clearly the need for competence in radiological protection, following recommendations from several workshops.
- Following the 8th EAN Workshop (inspection and self assessment), Ireland is currently revising its licensing conditions to implement several of the workshop recommendations, in particular those relating to self-assessment and internal regulation.

5.3.2 Outside Western Europe

- Following the IAEA Geneva Symposium in August 2002, where the EAN has been mentioned by the participants and a recommendation from that international symposium stating that: "International mechanisms for facilitating optimisation of occupational radiation protection – for example, ALARA

Networks- should be encouraged", an Action Plan on occupational exposure management has been set up by the Agency and endorsed by the IAEA board of Governors last September. Within that Action Plan a special mention is done to elaborating regional ALARA Networks in most other regions of the world. The EAN co-ordinator has been appointed as a member of this Action Plan Steering Committee; its first meeting took place at Vienna in February 2004.

- Another IAEA symposium took place at Rabat in September 2003 and the IRPA meeting has been held in Madrid last May. Several representatives of the EAN Steering Group were present in these two conferences. The experience of the EAN has been highlighted several times (as oral presentations and during a specific session on networking) during these conference.
- Looking at the format and results of the EAN, the International Atomic Energy Agency of the United Nations, has started a process to set up similar networks in other regions in the world. It is therefore expected that the EAN will help to the setting up of other regional ALARA networks in the world.

5.4 Conclusions

The Network is considered dynamic, allowing all countries and participants to benefit easily from each other. The network is not very costly and provides a lot of outputs to participating individuals or institutions (information, brain storming together, paper or electronic documents…). Some countries have developed training standards, monitoring systems or techniques, schemes for control and inspection, feedback systems on incidents, research projects on ALARA implementation, while some others do not. Therefore there are still progress to be done to reach more coherence, homogeneity and to harmonise policies and practices. In that context, the network remains very useful.

All partners, both within the Steering Committee and from other origins, commit themselves to continue to work within or with EAN in a self-sustainable manner. This is for example the case of the European Association of Medical Radiographers that has recently (February 2003) written in its journal "as a conclusion it is of interest for us to continue to work with the European ALARA Network**".**