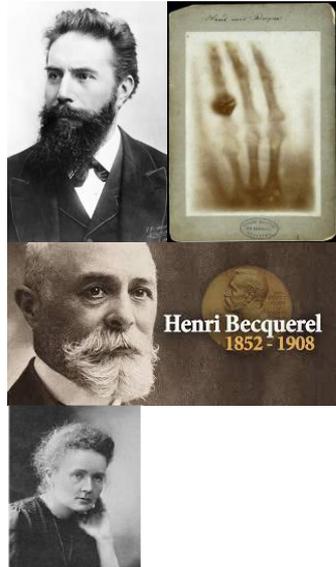
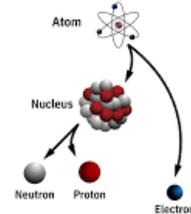
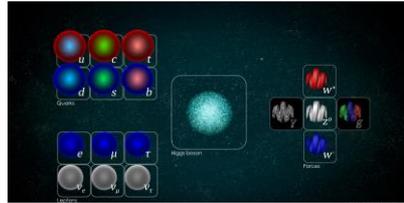


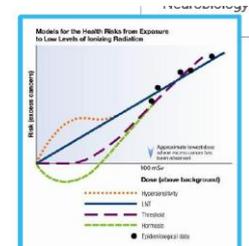
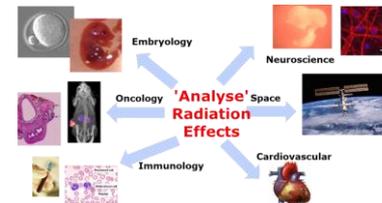
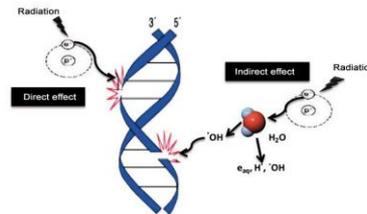
# **Le réseau ALARA européen (EAN) – trois décennies de contribution au principe d'optimisation**

Fernand Vermeersch  
Chairman of the EAN

# Rayonnements ionisantes

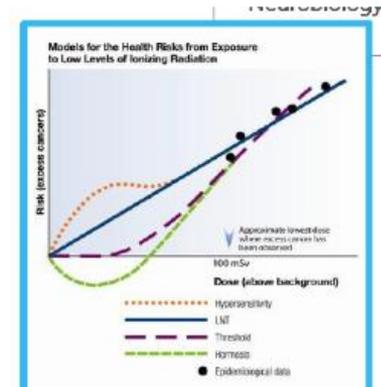


de nouvelles connaissances scientifiques et de nouvelles opportunités pour explorer et comprendre davantage la structure et la nature de la matière, améliorer les matériaux, générer de l'énergie, diagnostiquer, comprendre et traiter les maladies

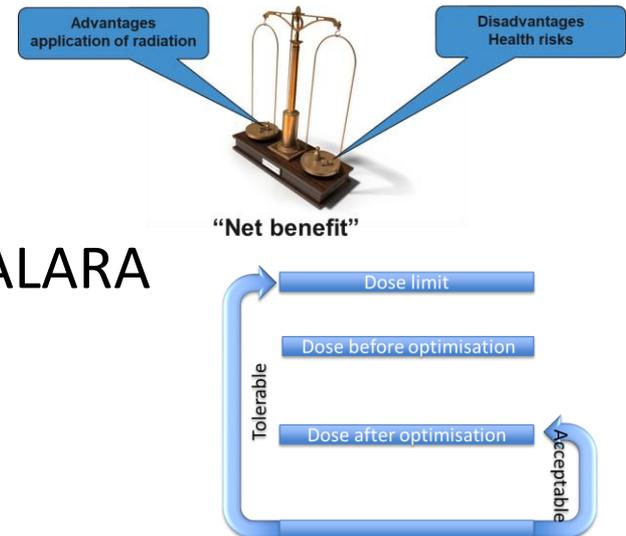


# Principes de base

- Effet dose linéaire sans seuil (effets stochastiques sur la santé)
- Principes de base de la radioprotection

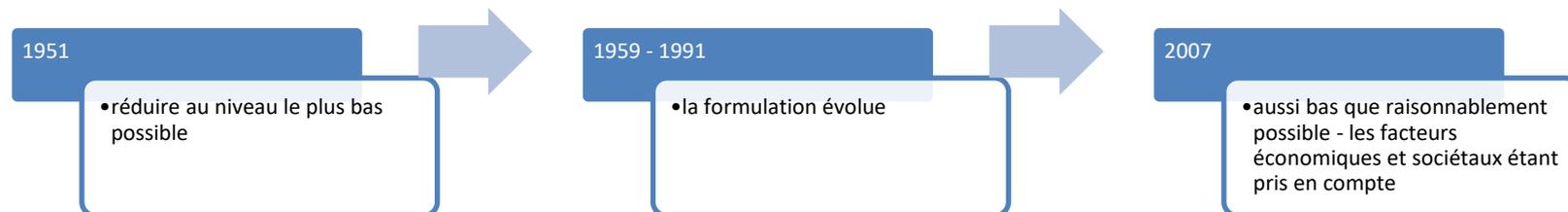


- Justification
- Optimisation → ALARA
- Limites de doses



# Évolution dans la formulation du principe d'optimisation

(ICRP, 1951)	To reduce exposures to the lowest possible level
ICRP Publ. 1 (ICRP, 1959)	To keep the exposure of large population as low as practicable
ICRP Publ. 9 (ICRP, 1966)	All doses (should) be kept as low as is readily achievable economic and social consideration being taken into account
ICRP Publ. 22 (ICRP, 1973)	All doses (should) be kept as low as reasonably achievable economic and social consideration being taken into account
ICRP Publ. 26 (ICRP, 1977)	All exposures shall be kept as low as reasonably achievable economic and social factors being taken into account
ICRP Publ. 60 (ICRP, 1991)	The magnitude of individual doses, the number of people exposed and the likelihood of incurring uncertain exposures shall all be kept as low as reasonably achievable economic and social factors being taken into account
ICRP Publ. 103 (ICRP, 2007)	The likelihood of incurring exposures, the number of people exposed, and the magnitude of individual doses should all be kept as low as reasonably achievable economic and societal factors being taken into account



# Objectifs du réseau ALARA

- Promouvoir une mise en œuvre plus large et plus uniforme du principe ALARA (principe d'optimisation) pour la gestion des expositions des travailleurs, du public et des patients dans toutes les situations exposition aux rayons ionisantes,
- Fournir un point central et un mécanisme pour l'échange et la diffusion d'informations issues des expériences pratiques ALARA
- Identifier et étudier les questions d'actualité d'intérêt commun pour améliorer davantage la mise en œuvre du principe de l'optimisation

# Histoire et évolution

- **1996**
  - coopération d'experts de diverses organisations Européennes à travers la formation européenne ALARA
  - Soutien Européen de 1996 à 2004
  - Soutien de la CE à trois ateliers
  - Des individus passionnés, soutenus par leurs institutions
- Evolution vers un réseau autonome
- **2005**
  - EAN organisation à but non lucratif de droit français
  - Coordination CEPN, UK Health Security Agency et un groupe d'experts Européens
  - Conseil d'administration (bureau) de l'EAN
    - Président, vice-président, trésorier, secrétaire
    - Groupe de pilotage EAN (activités)
- EAN en 2016-2019 :
  - 18 membres (organisations) en Europe
    - + groupes de travail
    - + sous-réseaux actifs (ERPAN, EANNORM, ...) + en relation avec d'autres organismes... Organisation en relation formelle avec la CIPR
- **EAN aujourd'hui 21 membres (organisations)**

# Participation de l'EAN

- Coopération volontaire
- Un large éventail
  - d'experts autorités de radioprotection et autorités de sûreté
  - entreprises et services industriels
  - instituts de recherche
  - hôpitaux
  - ....
- Un soutien financier à travers des contributions de différentes institutions, entreprises, autorités de régulation, ...organisées par pays (un représentant ou une personne de contact par pays)

# Les membres actuels



**Austria,**  
Franz KABRT



**Belgium**  
Fernand Vermeersch



**Croatia**  
Mladen NOVAKOVIC



**Czech**  
Irena Petrova



**Denmark**  
Jens Peter Bangsgaard



**Finland**  
Maaret LEHTINEN



**France**  
Gwenaëlle Lorient,  
Pascal Crouail



**Germany**  
Ulrike KULKA



**Greece**  
Sotirios ECONOMIDES



**Iceland**  
Jónína Guðjónsdóttir



**Ireland**  
Barry O'Connor



**Italy**  
Cristina NUCCETELLI  
Gennaro Venoso



**The Netherlands**  
Folkert DRAAISMA



**Norway**  
Sneve Malgorzata



**Portugal**



**Slovenia**  
Selma Fijuljanin



**Spain**  
Arturo PEREZ MULAS



**Sweden**  
Petra HANSSON



**Switzerland**  
Patrick Vonlanthen  
Nicolas Stritt



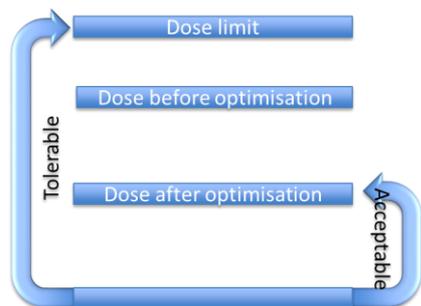
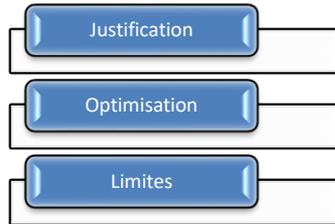
**United Kingdom**  
Julie Morgan



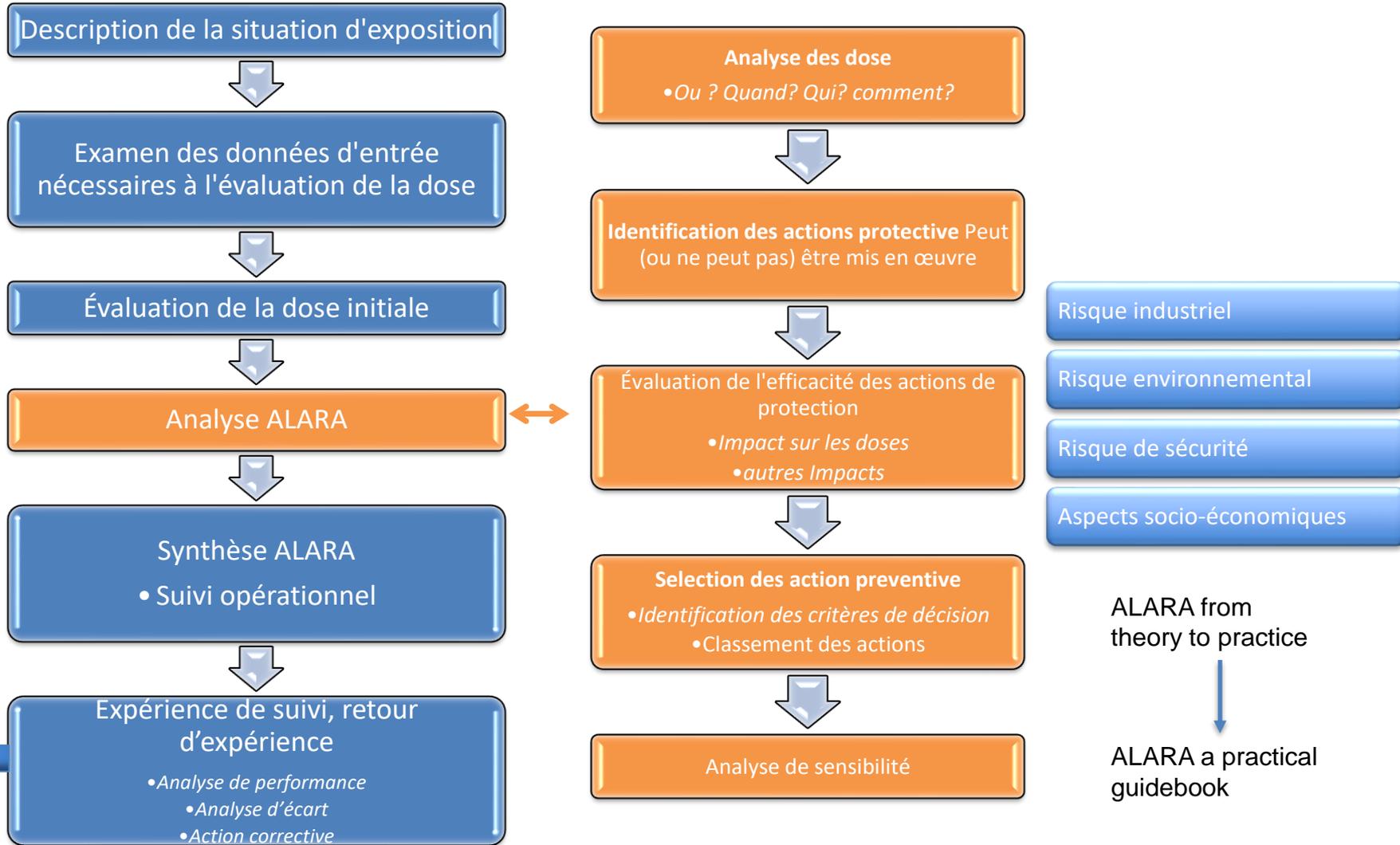
**CERN**  
Stefan ROESLER

Representant dans le  
steering group

# Niveau de risque acceptable

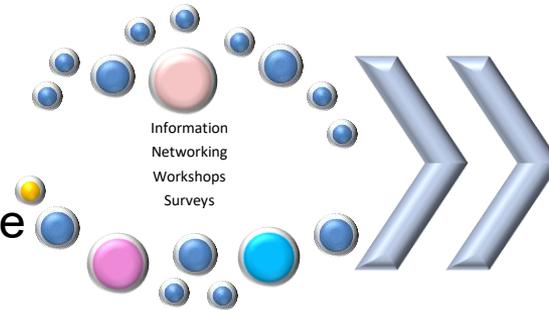


# Process d'optimisation (process ALARA)



# Activités et résultats de l'EAN

Collecte de données sur  
l'application du principe  
d'optimisation en pratique



Input

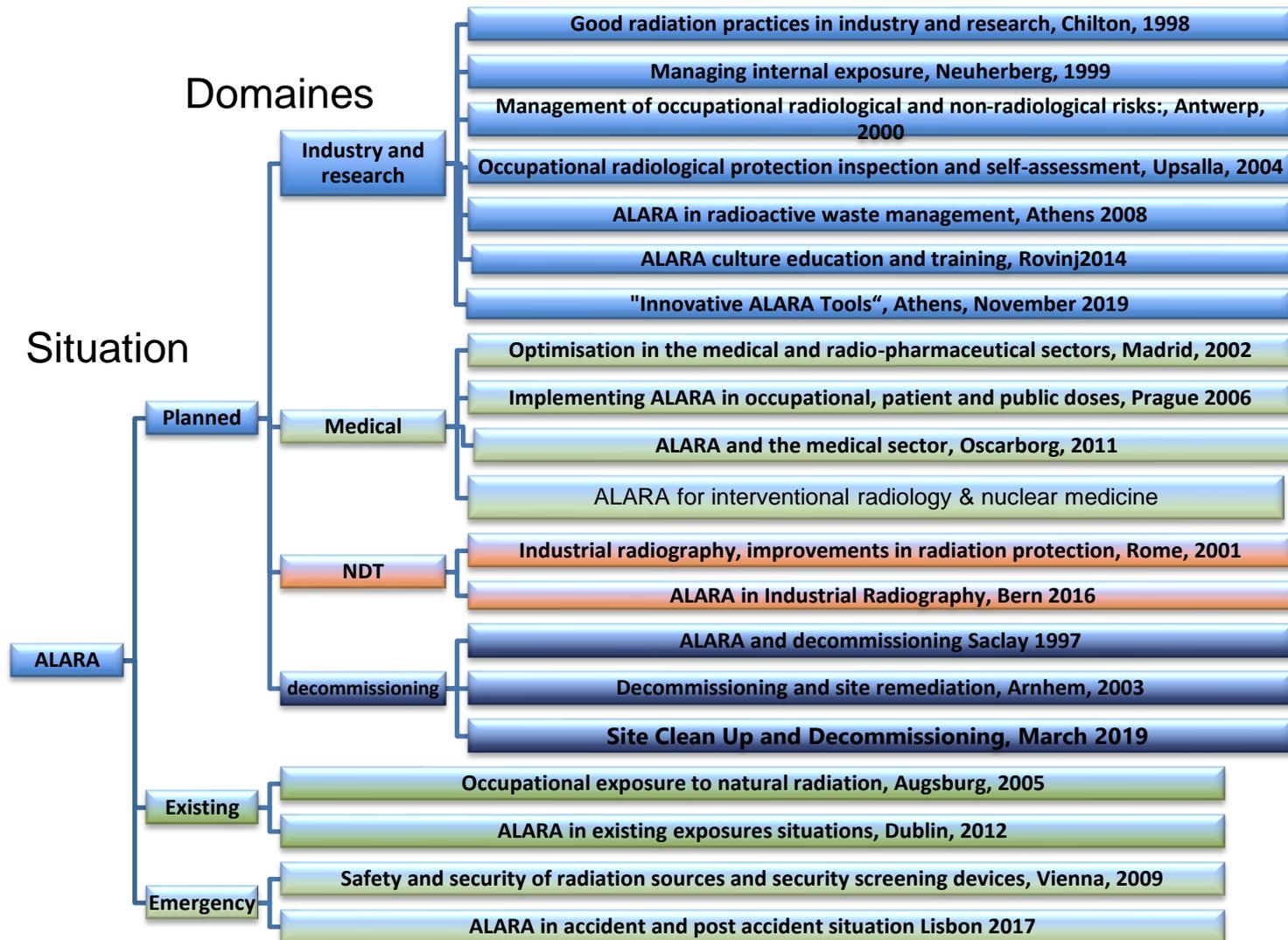


output

Recommandation  
guidance  
Retour d'expérience

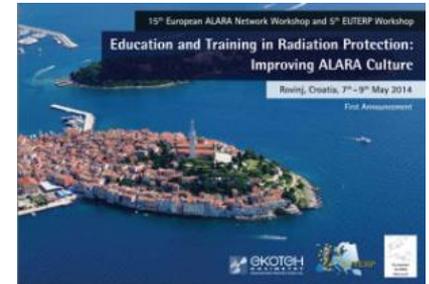
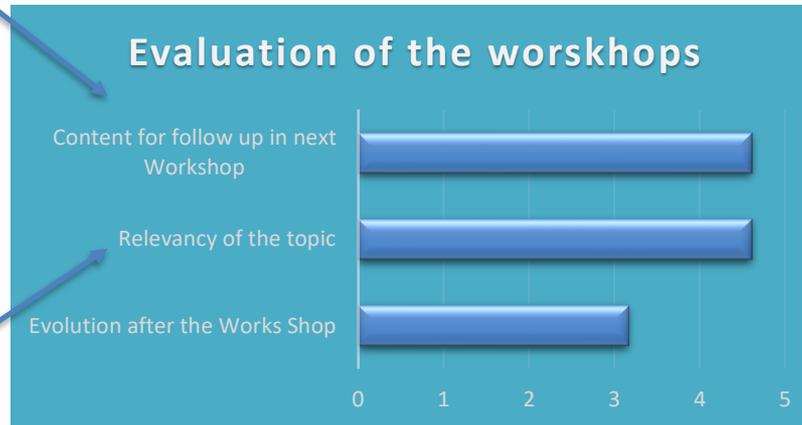
- Workshop EAN
- enquêtes et soutien aux enquêtes européennes
- Sous-réseaux
- EAN Bulletin ALARA
- Site Web de l'EAN

# EAN a organisé 20 workshops depuis 1996

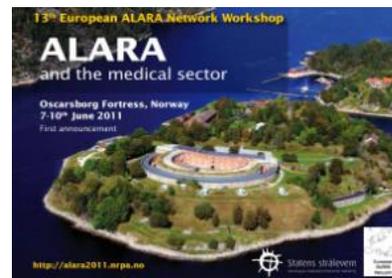


# Évaluation des workshops

contenu



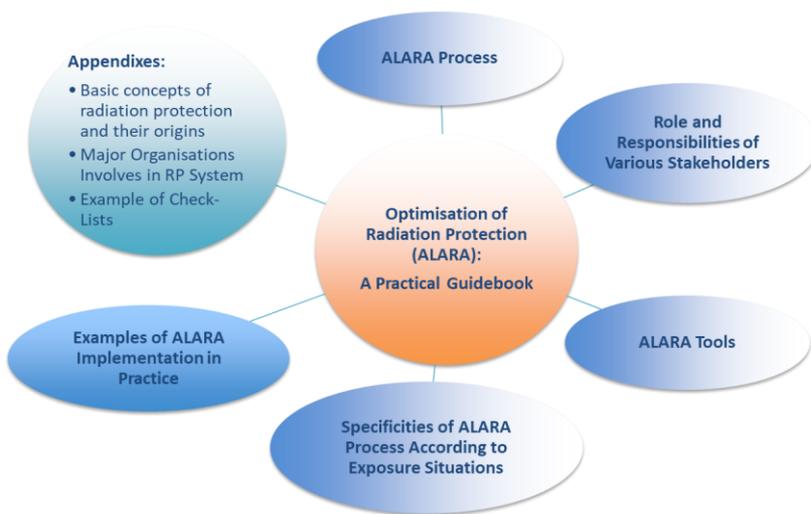
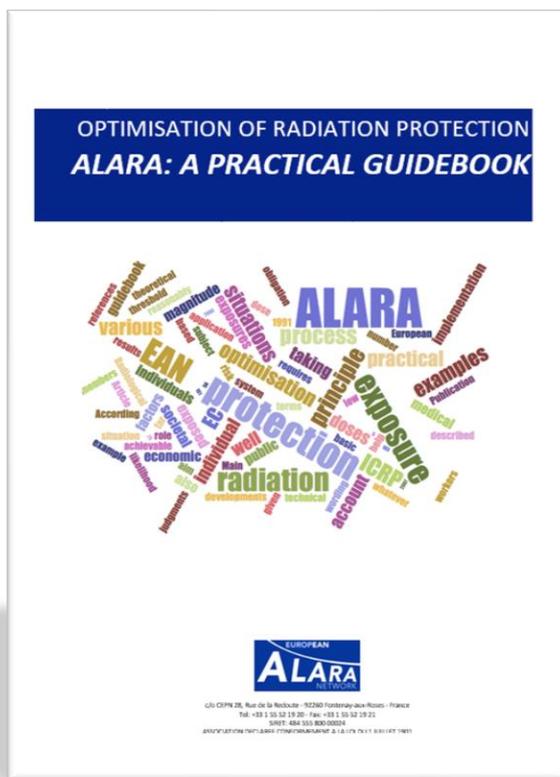
pertinence



# Un livret pratique

## Finalisation of the book

Publication as a downloadable pdf file



### TARGET AUDIENCE



- Competent authorities
- Manufacturers, suppliers and designers
- Licensees
- Radiation protection professionals
- Professional associations
- Exposed workers
- Public
- Patients

# Examples

- Illustration dans toutes les situations d'exposition
- Tous les exemples sont rassemblés à partir de présentations/publications lors de divers Congrès/workshops
- Présenté de manière structurée
  - Quel est l'exemple illustrant
  - Contexte
  - Méthodologie
  - Résultats
  - Leçons apprises

Optimization of Radiation Protection - ALARA - A Practical Guidebook  
ALARA IN PRACTICE FOR PLANNED EXPOSURE SITUATIONS 11



Figure 7. TLD prepared operator hands

For the series of measurements the use of long gripping tools, a lead container and a 10mm aryl glass syringe shielding was compared to the newly developed Application Support Kit (including accessories).

The calculated estimation of the exposure of the original treatment (without improvement) indicated a maximal local skin dose of approx. 30mSv per treatment on the physician's and physician's hands. Based on these numbers, the overall annual skin dose would, on the assumption of 75 interventions per year, have greatly exceeded the annual limit of 500mSv.

**Methodology:**  
To optimize protection during the application processes, a special application device was developed as well as a waste box.



Figure 8. Application device

**Main results:**  
Through the optimized handling and the consequent use of long gripping tools the maximal local skin dose could be reduced to <math>< 0.1\text{mSv}</math> during the preparation and to 3mSv and 1mSv during the application for the physician and for the operator, respectively (see Figure 1). Through the use of the Application Support Kit and a redesign of the waste container, the radiation exposure of the personnel was significantly reduced by a factor of more than 10.

Optimization of Radiation Protection - ALARA - A Practical Guidebook  
ALARA IN PRACTICE FOR PLANNED EXPOSURE SITUATIONS 12

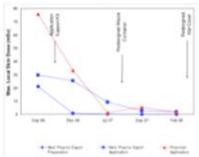


Figure 1. Results of Optimization

**Physical Properties of Rhenium-188:**  
Half-life: 17.0 hours  
Decay energy: Beta decay,  $E_{\beta, \text{max}} = 2.12\text{MeV}$   
Chemical form:  $\text{ReO}_4^-$  in isotonic saline solution

*This case study has been contributed by J. Kopp and H. Wiseman at University Hospital Aachen and J. Barth, IIG*

**References:**  
Endovascular Brachytherapy with Rhenium-188, Jürgen Kopp, Hermann Wiseman, Gisbert Leisner, Insa Barth, Arndt Sippig, 13th EAN Workshop on "Age in the Medical Sector", Oslo, Norway, June 2011. (www.eu-alaro.net)  
ALARA in Handling of Beta Emitters - Measurement, Techniques and Optimization, Insa Barth, Arndt Sippig, EAN Newsletter Issue 29, October 2011. (www.eu-alaro.net)

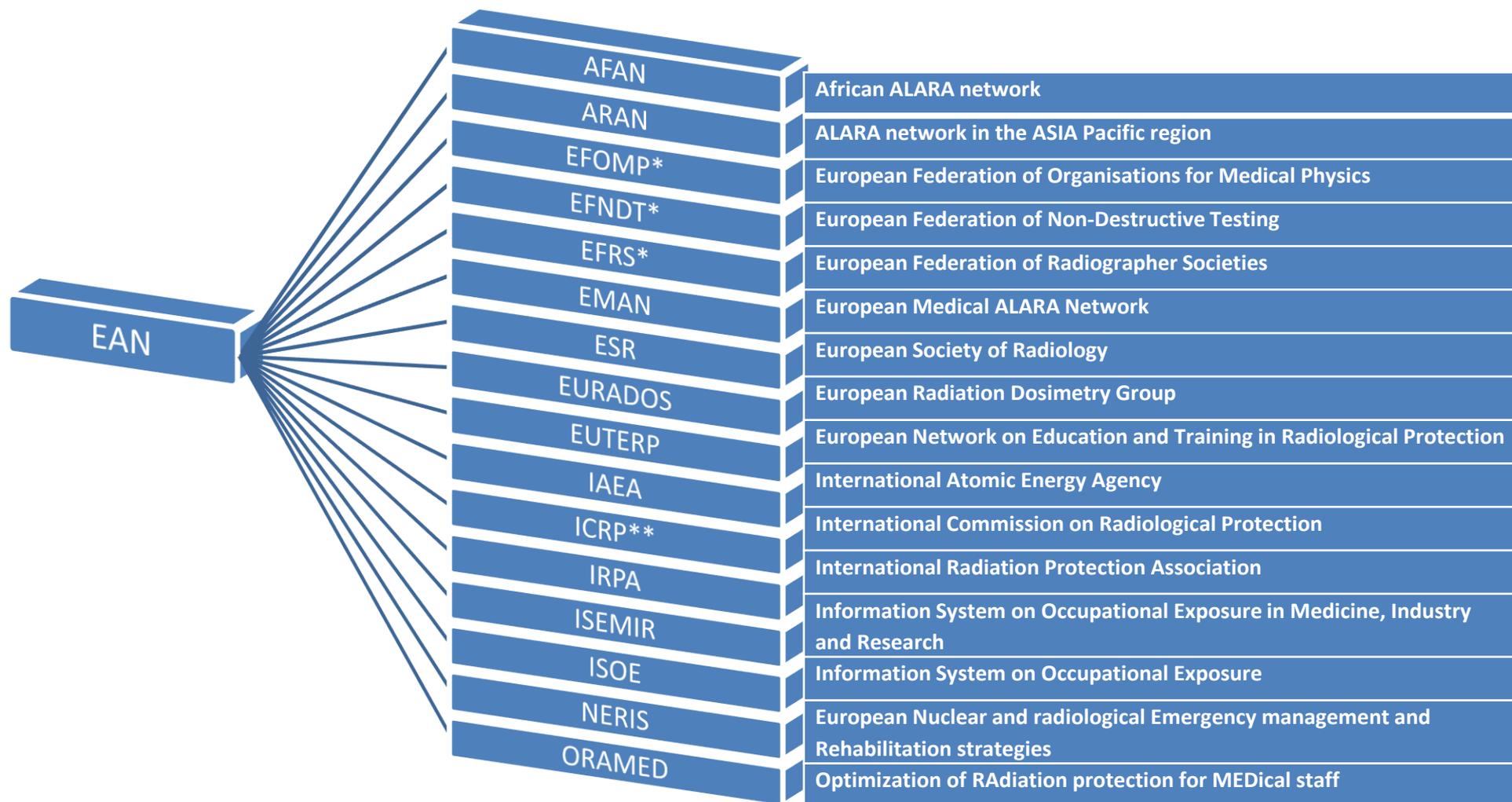
## EAN est aussi...

- Une newsletter semestrielle, largement diffusée :



- Un site internet avec lien vers les conclusions et les recommandation des ateliers

## EAN est un réseau...



# Networking in general

Home / Services / Networks / Occupational Radiation Protection Network (ORPNET)



**IAEA**  
International Atomic Energy Agency

## Occupational Radiation Protection Network (ORPNET)

Networks

The Occupational Radiation Protection Network (ORPNET) is a web-based network that promotes the optimization of occupational radiation protection. It provides comprehensive information about worldwide, regional and national networks and systems related to the radiation protection of workers, and it enables participating networks to cooperate with each other. Information about upcoming meetings, new publications, joint projects, posters and other related news is also featured.

Through ORPNET, participants share good practices and facilitate the implementation of radiation protection measures that make exposure as low as reasonably achievable – a principle known by its abbreviation ALARA. The network also supports experience exchange and aims to enable users to ensure that activities at the national and international level complement each other.

Exposure of workers to radiation can occur as a result of various human activities, including work associated with the nuclear fuel cycle, the use of radioactive sources and X-ray machines in medicine, scientific research, agriculture and industry. Workers who handle materials containing enhanced concentrations of naturally occurring radionuclides also can be exposed. Adequate radiation protection of workers is essential.

ORPNET was established in 2010, as a result of an IAEA and International Labour Organization Action Plan that had been created following a request in a resolution adopted at the 2002 IAEA General Conference. The resolution took into account the findings and recommendations from the first International Conference on Occupational Radiation Protection, held in 2002.

Two worldwide networks, the International System on Occupational Exposures (ISOCIE) the Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR) are part of ORPNET, as are regional networks including the European ALARA Network (EAN), the European ALARA Network for Naturally Occurring Radioactive Materials (EAN NORM) and the European Medical ALARA Network (EMAN).

Other participants include regional networks originally set up by the IAEA, including Regional European and Central Asian ALARA Networks, the Asian ALARA Network (ARAN) and the Network to Optimize Occupational Radiological Protection in Latin American (REPROPLAN).

ORPNET was further developed and adapted in line with discussions at the 2012 and 2014 International and Regional ALARA Networks Coordination Meetings, and at a side-event of the second International Conference on Occupational Radiation Protection, held in 2014.

**Publications**

7 April 2020  
Occupational Radiation Protection in the Uranium Mining and Processing Industry

12 October 2018  
Radiation Protection and Safety in Medical Uses of Ionizing Radiation

Access  
ORPNET

News

IAEA Promotes Radiation Protection Standards at Global Conference

Key Radiation Safety Areas for the Next Decade Identified at the International Conference on Radiation Safety

Events

13 - 17 Sep 2021  
Vienna, Austria  
Technical Meeting on the Assessment and Evaluation of the Occupational Radiation Protection Appraisal Service

Related resources

International Conference on Occupational Radiation Protection: Enhancing the Protection of Workers – Gaps, Challenges and Developments, 3-5 December 2014

International Conference on Occupational Radiation Protection – Protecting Workers Against Exposure to Ionizing Radiation, 26-30 August 2002

Radiation protection

Webinars on occupational radiation protection

Contact

Send an email



More than 300 users worldwide have already signed up to two new e-learning courses on radiation protection of workers, recently launched by the IAEA. Occupational Radiation Protection based on General Safety Guide No. GSG-7 and Management and Control of Naturally Occurring Radioactive Material (NORM). The material focuses on how to further strengthen worker protection and occupational exposure control, and provides guidance on monitoring and recording methodologies.

"The courses contain practical examples drawn from occupational radiation protection related requirements of IAEA General Safety Requirements GSR Part 3 and are tailored to the needs of employers, licensees and registrars; management bodies and their specialist advisers and health and safety committees concerned with the radiation protection of workers," said Buron Okyar, IAEA Radiation Safety Specialist and the Technical Officer responsible for the development of courses.

[Read more >>](#)

**European ALARA Network: Article on the graded approach for workplaces**

The concept of a 'graded approach' is commonly found in regulations and standards, e.g. in IAEA Safety Guides 2, GSR Publications 3 etc. The definition of a graded approach may vary across organisations but the broad principle is that the requirements to manage an activity or practice are commensurate with the level of risk and potential hazards of the activity/practice ...

This article on the Graded Approach for Workplaces in the Context of the Implementation of Directive Euratom 2013/59 is the synthesis of an EAN and ORPNET brainstorming meeting and survey. It is published in the European ALARA Network newsletter.

[Read more >>](#)

**IAEA launches second online training course in occupational radiation protection**

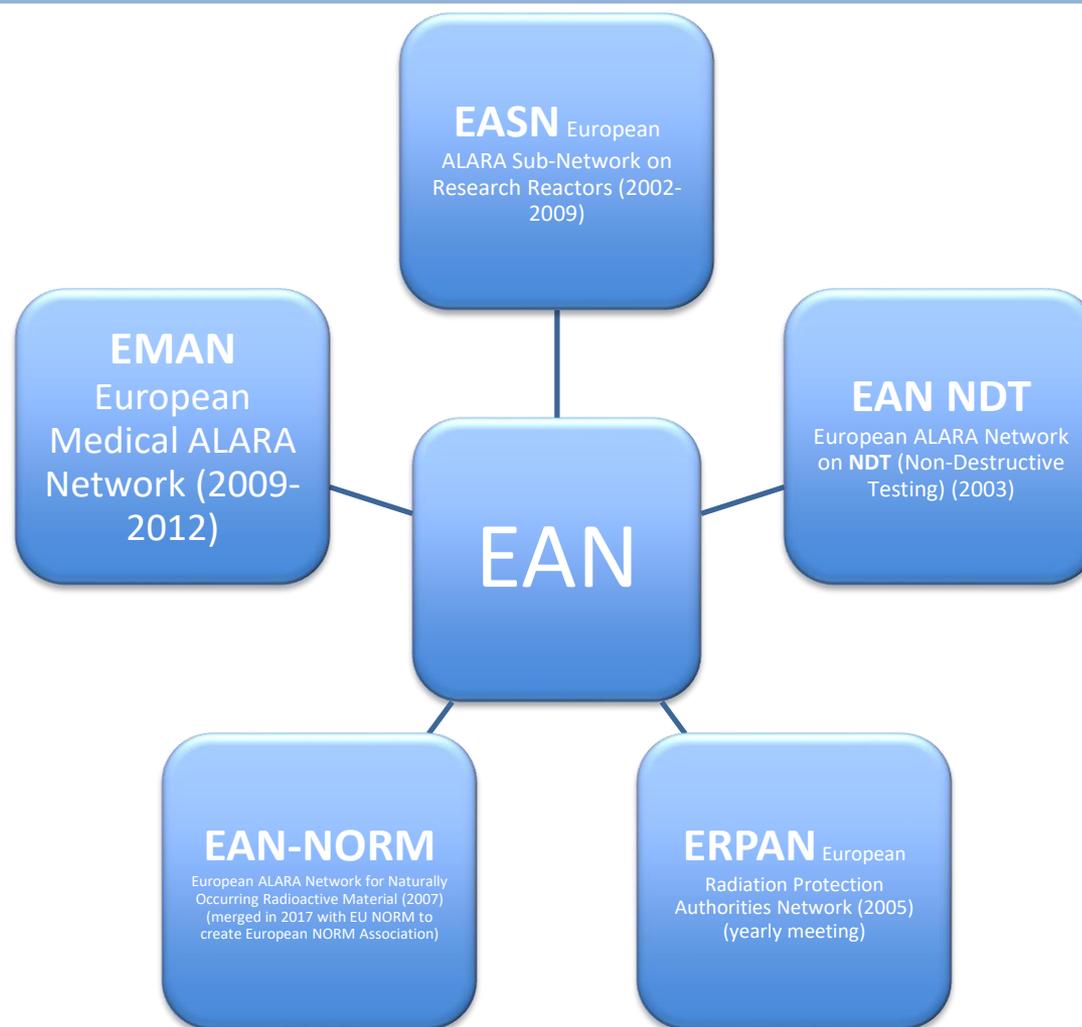
The course entitled Management and Control of Naturally Occurring Radioactive Material (NORM) provides guidance based on GSG-7 on fulfilling the requirements of GSR Part 3 with respect to worker protection in industrial processes/operations involving NORM. The course includes 13 modules, takes around 7 hours to complete and offers guidance on regulatory control (focusing on the application of a graded approach); the characterization of NORM and the assessment of exposures; and the transport of NORM.

Before taking this course, participants are advised to complete the training on Occupational Radiation Protection based on General Safety Guide No. GSG-7.

The course is publicly available in English within the IAEA's learning management system and offers a certificate of completion.

[View the course >>](#)

# Subnetworks



# Activités récentes et prévues



Workshop on reasonableness IRPA



Liaison ICRP, TG 104 mobile sources



Working group on ALARA for Radon at Work

- Publication and presentation, IRPA conference



Workshop on workplace monitoring, Cyprus

- Co-organisation IAEA and EAN
- Invitation to central European and Asian countries
- June 2022



Webinar “the application of the justification principle, the choice of the exposure situation and the categories of exposure in the context of NORM and radon”

8<sup>th</sup>, December 2022

# Activités récentes



Development of ALARA in interventional radiology and in the use of novel radio-pharmaceuticals , 20<sup>th</sup> EAN Workshop

**ALARA for interventional radiology & nuclear medicine**

2-4 October 2023

ENA European NORM Association

With the participation of



3<sup>rd</sup> ENA workshop 15<sup>th</sup>-17<sup>th</sup> may 2024 Session III European ALARA Network Session



Next workshop “RP and optimization in Transport” (working title)



SMR ? The next one?

# Strategic agenda



25<sup>th</sup> Anniversary

Strategic agenda 2021-2026

2025

Preparing the new strategic agenda

# 2021-2026 strategic agenda

- **Secteur médical**

- des améliorations importantes ont été identifiées
- ALARA doit suivre le rythme des développements récents dans l'utilisation de nouvelles techniques d'imagerie et de produits radiopharmaceutiques.



Development of ALARA in interventional radiology and in the use of novel radiopharmaceuticals , 20<sup>th</sup> EAN Workshop

**ALARA for interventional radiology & nuclear medicine**

2-4 October 2023

- **Installations nucléaires**

- vieillissement des installations existantes, démantèlement
- De nouvelles installations nucléaires (centrales nucléaires, stockage de déchets nucléaires, installations de production d'isotopes, réacteurs de recherche, nouveaux modèles de réacteurs, etc.) sont en cours de développement ou seront développées dans un avenir proche.



Workshop on workplace monitoring, Cyprus

- Co-organisation IAEA and EAN
- Invitation to central European and Asian countries
- June 2022



Next workshop "RP and optimization in Transport" (working title)



SMR ? The next one?

- Tous deux ont besoin des connaissances et des compétences de la communauté de la radioprotection
- permanence sur le maintien et le développement des aptitudes et des compétences

# 2021-2026 strategic agenda

- **Situations d'exposition existantes**
  - l'application du principe ALARA dans les circonstances actuelles reste un défi
- Harmonisation des pratiques en favorisant le partage d'expériences



3<sup>rd</sup> ENA workshop 15<sup>th</sup>-17<sup>th</sup> may 2024 Session III European ALARA Network Session



Webinar "the application of the justification principle, the choice of the exposure situation and the categories of exposure in the context of NORM and radon"  
8<sup>th</sup>, December 2022



Working group on ALARA for Radon at Work  
•Publication and presentation, IRPA conference



Workshop on reasonableness IRPA

# Invitation

- L'EAN lance également une invitation ouverte à d'autres pays (organisations) pour qu'ils rejoignent le réseau afin de promouvoir davantage une mise en œuvre plus large et plus uniforme du principe ALARA et d'échanger et de diffuser des informations issues des expériences pratiques ALARA.



Austria, Franz KABRT	Belgium Fernand Vermeersch	Croatia Mladen NOVAKOVIC	Czech Irena Petrova
Denmark Jens Peter Banggaard	Finland Maaret LEHTINEN	France Gwenaelle Loriot, Pascal Crouail	Germany Ulrike KULKA
Greece Sotirios ECONOMIDES	Iceland Jónína Guðjónsdóttir	Ireland Barry O'Connor	Italy Cristina NUCCETELLI Gennaro Venoso
The Netherlands Folkert DRAAISMA	Norway Sneve Malgorzata	Portugal	Slovenia Selma Fijulanin
Spain Arturo PEREZ MULAS	Sweden Petra HANSSON	Switzerland Patrick Vonlanthen Nicolas Stritt	United Kingdom Julie Morgan
CERN Stefan ROESLER			



# Conclusion

- Avons-nous bénéficié de l'utilisation de l'approche d'optimisation ?
  - Des réductions de dose sont obtenues dans différents domaines appliquant des rayonnements ionisants
  - Favorise la sensibilisation aux risques qui soutient la sécurité, la culture de la sécurité et la participation des parties prenantes
  - Favorise la bonne gouvernance, un jugement équilibré et permet une utilisation optimale des ressources
- Bénéficiions-nous du réseau EAN
  - Retour d'expérience sur l'optimisation pratique
  - Mécanisme pour l'échange et la diffusion d'informations issues des expériences pratiques ALARA

**Gaining interest in the EAN  
and its activities?**

**[www.eu-alara.net](http://www.eu-alara.net)**

**And remember that EAN is an  
open network!**

