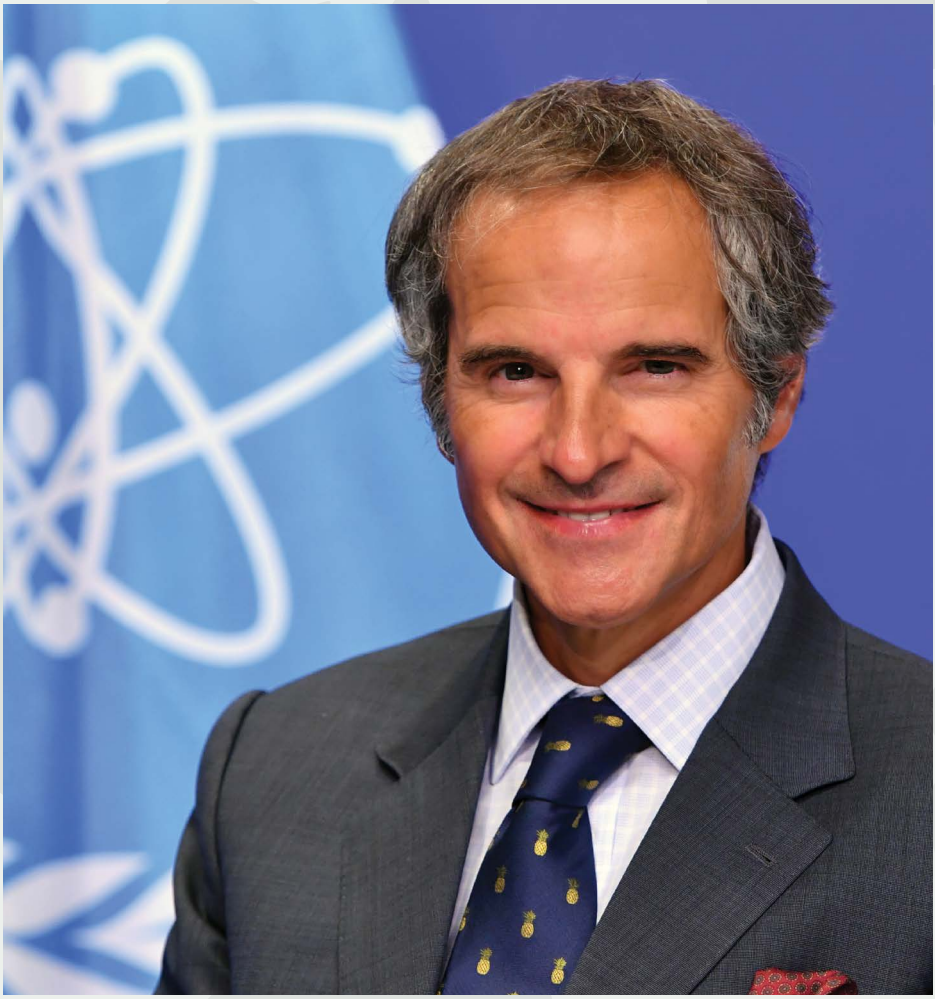
Radiation, Transport and Waste Safety

Protecting people and the environment

IAEA
International Atomic Energy Agency
Atoms for Peace and Development

MESSAGE FROM THE DIRECTOR GENERAL



“Governments, regulatory bodies and operators around the world must ensure that radiation sources are used safely and beneficially. The IAEA safety standards are designed to facilitate this. We are here to support our Member States in implementation of these standards to enhance protection of workers, patients, the public and the environment. I encourage all Member States to make use of them.”

Rafael Mariano Grossi

MESSAGE FROM THE DIRECTOR
DIVISION OF RADIATION, TRANSPORT AND WASTE SAFETY

“We’re working with Member States around the world to minimize the harmful effects of ionizing radiation without limiting its many beneficial uses. Workers, patients, the public and the environment can all be harmed by unnecessary and unintended exposures: Our Mission is to adequately protect against these harmful effects.

To fulfil our Mission, we work with Member States to develop safety standards. We assist Member States develop the necessary Regulatory Infrastructure to implement those standards. We also support international legal instruments to control use of radioactive sources and to safely manage radioactive waste and spent fuel.”

Peter Johnston

Why is radiation safety important?

The IAEA's principal safety objective is to protect people and the environment from the harmful effects of ionizing radiation. This objective needs to be achieved without unnecessarily restricting the many beneficial uses of radiation enjoyed by society.

We live in a world that is naturally radioactive. Uranium, thorium and potassium have been present in the earth's crust since it was formed and the radiation emitted by these radioactive elements expose all of us, all the time. The amount of radiation to which we are exposed is highly variable, depending very much on local geology and other factors.

Since the discovery of X-rays and radioactivity more than 100 years ago, we have developed a wide variety of safe and beneficial uses of radiation in medicine, industry, agriculture and research. The many uses of nuclear technology include improving food production and preservation, diagnosing and treating disease and electricity production.

UNDERSTANDING THE PROBLEM

While natural sources of radiation dominate the exposure received by most people, man-made sources tend to be more controllable. Even though we cannot entirely avoid radiation exposure, in situations where some control is possible, we may need to consider actions to protect people and the environment.

Radiation safety is about the management of radiation exposure to ensure that an appropriate balance is maintained between the risks posed and the benefits derived by both individuals and by society in general.

Our work has evolved over the years from an initial focus on safety at nuclear power plants to encompass safety at all types of facilities and in all types of activities in which radiation and radioactive sources are used.

The uses of radiation and radiation sources continue to increase worldwide. Safety can never be taken for granted and complacency must be avoided at all costs. The IAEA offers a range of services to evaluate the national infrastructure for radiation safety in Member States. These services ensure that adequate safety provisions are in place to address the uses of radiation and radiation sources in the State.

How does radiation affect us?

WORKERS

High levels of radiation of either natural or artificial radiation may be present in some working environments. The IAEA's programme on occupational radiation protection is designed to ensure an appropriate control of radiation doses received by workers in various industries.

PATIENTS

Avoiding unnecessary and unintended radiation exposure of patients without reducing the beneficial use of radiation sources for medical diagnosis and treatment is the goal of the IAEA's work on radiation protection of patients.

PUBLIC

Protection of the public is an integral part of the Agency's activities. For example, the criteria for managing radioactive waste take into account the impact on the public. In addition, the IAEA has an extensive programme of work to protect the public from natural sources of radiation, such as radon in homes.

… AND THE ENVIRONMENT

An exposure may arise from the release and subsequent dispersal of radioactive materials in the environment and from the direct emission of radiation from facilities. In order to ensure the well-being of present and future generations and for equitable and sustainable development, discharges of radioactive materials to the environment have to be closely monitored and strictly controlled.

Why are safety standards important?

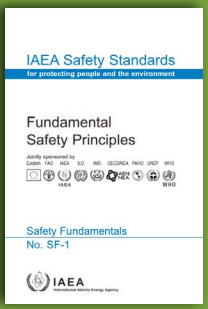
Regulating and assuring safety is a national responsibility.

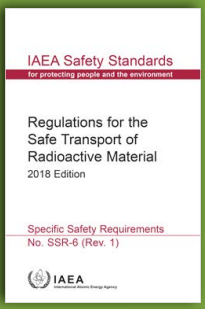
The IAEA helps Member States meet this responsibility by establishing international safety standards and by providing for their application. These standards are developed through an open, transparent and consensus-driven process by teams comprising experts from Member States and the IAEA Secretariat.

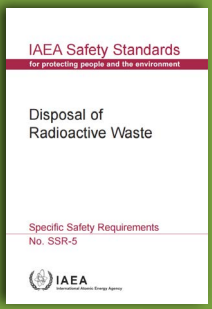
These teams are gathered from around the world to assemble, synthesize and integrate their knowledge and experience into the standards being developed or revised in order to assist all Member States in using nuclear and radiation related technologies soundly, sustainably, safely and consistently.

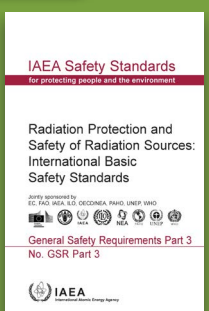
The IAEA develops and maintains safety standards for nuclear safety, radiation protection, transport of radioactive material and the safe disposal of radioactive waste.

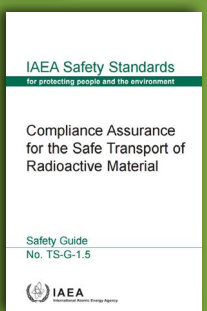
The IAEA Safety Standards system comprises safety fundamentals, safety requirements and safety guides with the aim of protecting people and the environment from the harmful effects of ionizing radiation.

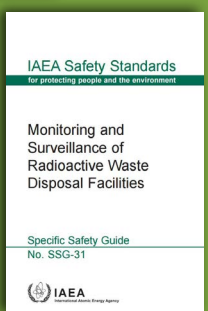








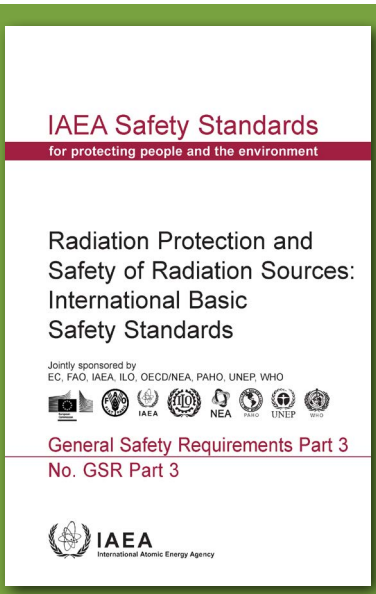




What are the International Basic Safety Standards?

The International Basic Safety Standards establish the requirements for the protection of people and the environment from the harmful effects of ionizing radiation and for the safety of radioactive sources. They apply to exposures due to man-made and natural sources of radiation.

These standards are intended for use by governmental authorities and regulatory bodies responsible for licensing facilities and activities; by organizations operating nuclear and other facilities where radioactive sources are used; by medical professionals using radiation for the diagnosis and treatment of patients; and by technical support organizations, among others.



Examples of published safety guides:

- **Justification of Practices, Including Non-Medical Human Imaging (GSG-5)**
- **Protection of the Public against Exposure Indoors due to Radon and Other Natural Sources of Radiation (SSG-32)**
- **Radiation Safety for Consumer Products (SSG-36)**

How does the IAEA support Member States?

The IAEA supports Member States in establishing and maintaining a proper safety framework for the management and control of radioactive material and other sources of radiation, including radioactive waste and spent fuel.

The IAEA facilitates the development of regional networks, for example for transport safety, in order to encourage collaboration and cooperation among Member States.

The IAEA works closely with Member States, national regulatory bodies and international organizations in establishing and implementing its programmes.

The IAEA facilitates the implementation of international legal instruments on safety, for example the Code of Conduct on the Safety and Security of Radioactive Sources.

Through cooperation with other international organizations, the IAEA ensures that consistent advice and support is provided to all government agencies worldwide.

To improve their worldwide use, many IAEA Safety Standards are co-sponsored by other international organisations. These include the European Commission (EC); the Food and Agriculture Organization of the United Nations (FAO); the International Labour Organization (ILO); the Nuclear Energy Agency of the OECD (OECD/NEA); the Pan American Health Organization (PAHO); the United Nations Environment Programme (UNEP); and the World Health Organization (WHO), among others.

What IAEA services and tools are available in radiation protection?

The IAEA assists Member States in the application of safety standards by providing peer reviews, advisory services and information tools such as:

EDUCATION AND TRAINING

Education and Training Appraisal (EduTA) provides a review of the provisions for education and training in radiation protection, including the identification of national education and training needs:
www.iaea.org/services/review-missions/education-and-training-appraisal-eduta

Postgraduate Education Course on Radiation Protection and the Safety of Radioactive Sources:
www.iaea.org/services/training/pgec

RADIATION PROTECTION OF WORKERS

ORPAS provides Member States with an objective assessment of the provisions for occupational radiation protection, identifies areas for improvements and makes recommendations on actions to be taken.

Occupational Radiation Protection Networks (ORPNET):
www.iaea.org/services/networks/orpnet-new

The Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR):
https://nucleus.iaea.org/isemir

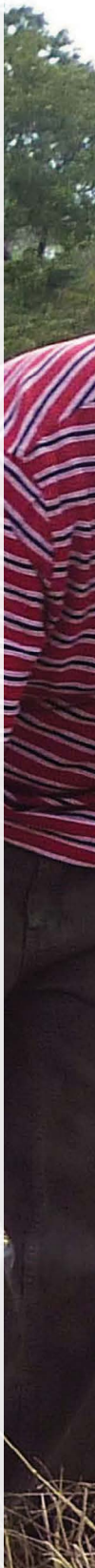
RADIATION SAFETY TECHNICAL SERVICES

The in-house accredited laboratory and operational programmes support IAEA activities around the world including dose assessment, workplace monitoring and radiation safety guidance:
www.iaea.org/topics/workers/radiation-safety-technical-services

RADIATION PROTECTION OF PATIENTS

Capacity building is provided by the IAEA to its Member States through training of health professionals on radiation protection in medical uses of radiation, and by providing information resources through the Radiation Protection of Patients Website:
https://rpop.iaea.org

What other IAEA services and tools are available?



CONTROL OF SOURCES OF RADIATION

Advisory Missions on Regulatory Infrastructure for Radiation Safety provide Member States with advice and support to strengthen and enhance national regulatory infrastructure for radiation safety and the control of sources of radiation:
www.iaea.org/topics/regulatory-infrastructure

REGULATORY INFRASTRUCTURE

Integrated Review Service (IRRS) is a peer review, by an international team of senior safety regulators, of the status of the national regulatory infrastructure for nuclear and radiation safety, in relation to IAEA safety standards. Information about regulatory infrastructure:
www.iaea.org/topics/regulatory-infrastructure

eSARIS is an IAEA-developed web-based tool for internal review of regulatory body processes and performance:
www.iaea.org/resources/software/e-saris

RAIS is a software application developed by the IAEA to assist Member States in managing their regulatory control programmes:
www.iaea.org/resources/software/rais

TRANSPORT SAFETY

Safe Transport of Radioactive Material e-learning provides training for regulators, operators and anyone interested in the regulatory requirements for the safe transport of radioactive material by sea, air, and land modes of transport:
https://elearning.iaea.org/m2/course/index.php?categoryid=83

WASTE MANAGEMENT

ARTEMIS missions provide peer review services to Member States to review practices in radioactive waste safety, spent fuel management, decommissioning and remediation safety:
www.iaea.org/topics/radioactive-waste-and-spent-fuel-management

ENVIRONMENTAL ASSESSMENT

The IAEA's Programme MEREIA is a forum for scientists, regulators and operators to exchange knowledge and experience in the field of assessing radiation doses to humans and the environment arising from radionuclides in the environment:
www.iaea.org/about/waste-and-environmental-safety-section

AN INSIGHT INTO SERVICES

The IAEA assists Member States in building competence and transferring knowledge in radiation safety. This is essential for the establishment of a comprehensive and sustainable national infrastructure for radiation safety. The IAEA provides peer reviews, advisory missions, review services, and training courses.

SERVICES TO ASSIST MEMBER STATES IN THE AREA OF RADIATION, TRANSPORT AND WASTE SAFETY:

- ADVISORY MISSIONS ON REGULATORY INFRASTRUCTURE FOR RADIATION SAFETY INCLUDING SECURITY
- EDUCATION AND TRAINING APPRAISAL (EduTA)
- INTEGRATED REGULATORY REVIEW SERVICE (IRRS)
- OCCUPATIONAL RADIATION PROTECTION APPRAISAL SERVICE (ORPAS)
- PROTECTION OF PATIENTS TRAINING COURSES
- TRANSPORT SAFETY TRAINING COURSES
- WASTE AND ENVIRONMENTAL SAFETY ACTIVITIES
- INTERNATIONAL BASIC SAFETY STANDARDS WORKSHOPS

FACTS & FIGURES

IAEA PEER REVIEWS AND ADVISORY MISSIONS FROM 2014 TO 2021:

183	TOTAL NUMBER OF PEER REVIEW AND ADVISORY MISSIONS IN RADIATION, TRANSPORT AND WASTE SAFETY
66	INTEGRATED REGULATORY REVIEW SERVICES (IRRS)
20	OCCUPATIONAL RADIATION PROTECTION APPRAISALS SERVICE (ORPAS)
15	EDUCATION AND TRAINING APPRAISALS (EDUTA)
11	INTEGRATED REVIEW SERVICES FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT, DECOMMISSIONING AND REMEDIATION (ARTEMIS)

Top 10 by the numbers

>1300 participants at 90 IAEA workshops and training courses on decommissioning

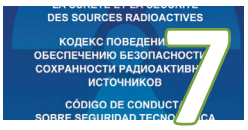
>900 000 visits to the IAEA Radiation Protection of Patients website each year

500 Participants from 72 Member States at the International Conference on Occupational Radiation Protection

>1700 radiotherapy incidents entered into the SAFRON incident learning and reporting system

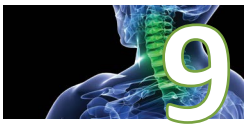
8 International Organizations support the publication of the International Basic Safety Standards GSR Part 3

90 Member States attended 25 regional workshops on National Strategy for Education and Training



140 States support the Code of Conduct on the Safety and Security of Radioactive Sources

800 000 occupationally exposed workers in nuclear industry



4 billion medical radiation procedures annually

20 million packages of nuclear materials safely transported each year

How to obtain key IAEA radiation protection publications

The IAEA is a leading publisher in the nuclear field. Its scientific and technical publications include international safety standards, technical guides, conference proceedings and scientific reports. Publications of a more general interest include the IAEA Bulletin, factsheets and topical booklets.

For information obtaining this and other publications, see:

http://www-pub.iaea.org/books/howtoorder.aspx

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