

# The international system of Radiation Protection

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# International organizations involved in Radiation Protection

# ICRP: International Commission on Radiological Protection

## Founded in 1928

- Work was initiated by the effects following applications of radiation (e.g. x-rays) in medicine

## Study effects of radiation on human health in dependence on

- Exposure levels (total doses and dose rates)
- Age and gender
- Pathway (external/internal exposure)
- Elaborate a system to convert exposure to radiation dose
  - Activity intake [Bq] → Dose [Sv]

## • Providing recommendations for radiation protection

- E.g. dose limits, reference levels
- Basis for developing radiological protection standards world-wide



ENEP

# UNSCEAR: United Nations Scientific Committee on the Effects of Atomic Radiation

## Founded in 1957

– Study the systematically effects of ionizing radiation

- **Systematic study all sources of exposure to radiation**

- Natural radiation

- Medical exposure

- Applications in science and industry

- Estimate levels and trends of radiation doses

- **Analysis of studies on ionizing radiation**

- Effects on human health

- Effects on wildlife

- **UNSCEAR reports directly to the United Nations General Assembly**

- Represent a consensus of the UN Member States on effects of ionizing radiation

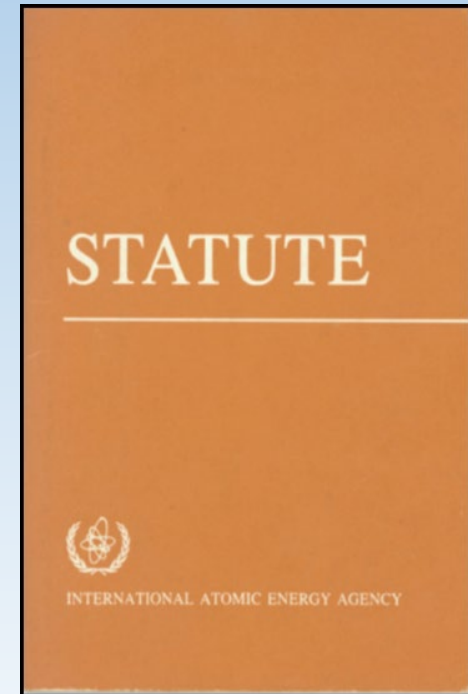
Founded in 1957 by the United Nations

## Article III, *Functions* Paragraph A.6.

“ To **establish** or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned,

**standards of safety for protection of health** and minimization of danger to life and property (including such standards for labour conditions), and

to provide for **the application of these standards** to its own operation as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency ...; “



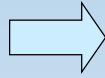
Statute 1957

# Development of International Standards

## UNSCEAR

United Nations  
Scientific Committee on  
the Effects of Atomic  
Radiation

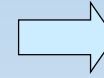
Scientific Reports on  
Radiation Effects



## ICRP

International  
Commission on  
Radiological  
Protection

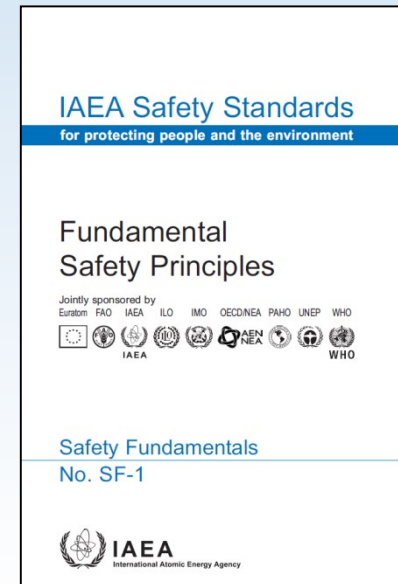
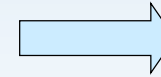
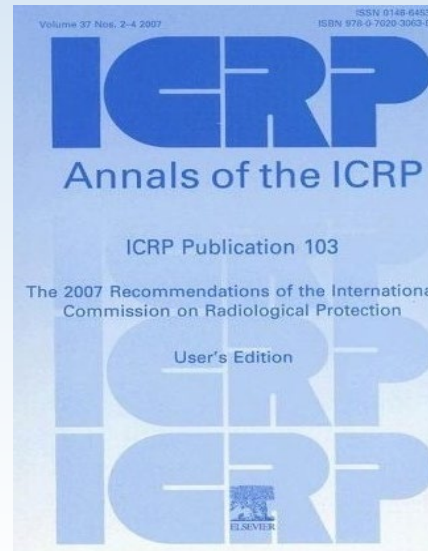
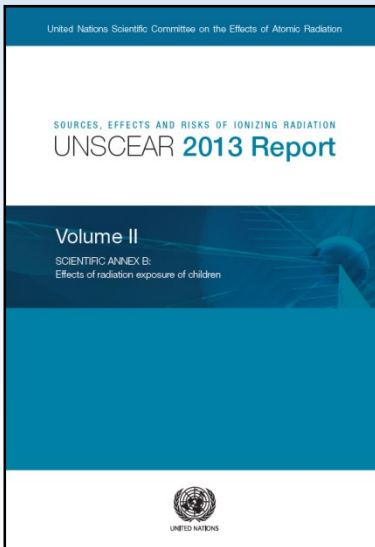
Recommendations on  
Dose limits, reference  
levels



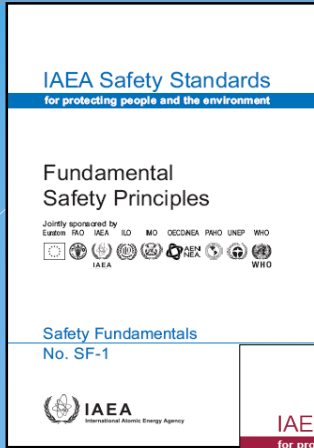
## IAEA

International Atomic  
Energy Agency

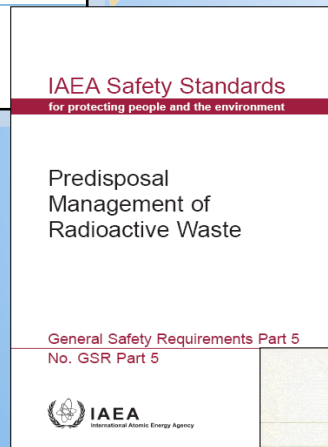
Safety Standards for  
Protecting People  
and the Environment



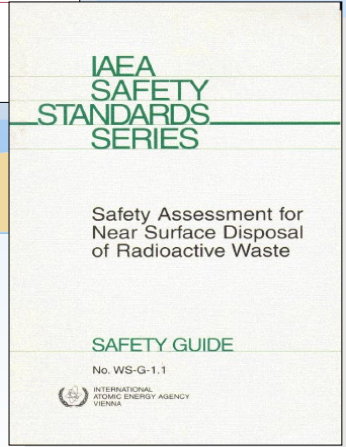
# IAEA Safety Standards Categories



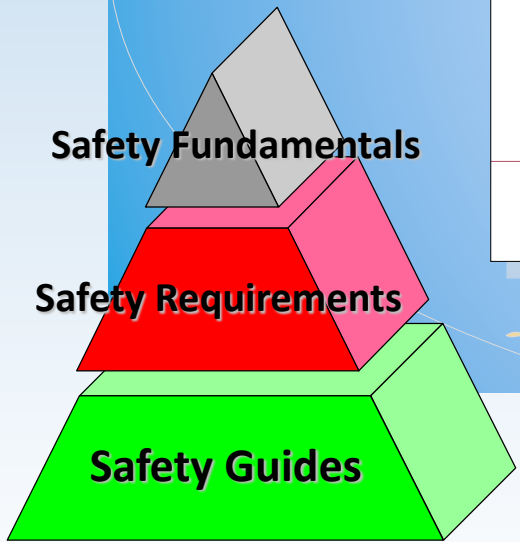
**Fundamental Safety Principles**



**Requirements: What to do?**



**Best Practice to meet Requirements: How to do?**



# Safety Fundamentals: 10 Safety Principles

## IAEA Safety Standards

for protecting people and the environment

### Fundamental Safety Principles

Jointly sponsored by



Safety Fundamentals

No. SF-1



- 1 **Responsibility** for safety
- 2 Role of **government**
- 3 Leadership and **management** for safety
- 4 **Justification** of facilities and activities
- 5 **Optimization** of protection
- 6 **Limitation** of risks to individuals
- 7 Protection of present and **future generations**
- 8 **Prevention of accidents**
- 9 **Emergency preparedness and response**
- 10 Protective actions to **reduce existing or unregulated** radiation risks



- Represents **international consensus** on Radiation Protection
  - Based on ICRP 103 (2007)
- Defines responsibilities
  - Government and regulatory body
  - Operator
- Defines exposure situations
- Radiation protection principles
  - Justification, Optimization, Limitation
- Radiological criteria
  - Public in all exposure situations
  - Workers

## IAEA Safety Standards

for protecting people and the environment

### Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards

Jointly sponsored by  
EC, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP, WHO



General Safety Requirements Part 3  
No. GSR Part 3



# The System of Radiation Protection is complex

- ***Three Exposed Groups***

- Workers
- Patients
- General public

- ***Three Exposure Situations***

- Planned exposures
- Emergency
- Existing exposures

- ***Three Radiation Protection Principles***

- Justification
- Limitation
- Optimization

# Categories of exposure



## Occupational exposure

- Exposure of workers during their work



## Public exposure

- Exposure to members of the public due to
- **Sources in planned, emergency and existing exposure situations,**
- Excluding any occupational exposure or medical exposure



## Medical exposure

Exposure incurred by

- Patients undergoing medical or dental diagnosis or treatment
- Carers and comforters of patients undergoing radiological procedures
- Volunteers subject to exposure as part of a programme of biomedical research

# Types of Exposure Situations



## Planned exposure situations

Situations involving the **planned introduction and operation of sources**

- *(including decommissioning, disposal of radioactive waste, rehabilitation)*



## Emergency exposure situations

Unexpected situations

- May occur during of a planned situation,
- **Or from a malicious act**, requiring urgent attention



## Existing exposure situations

Situations that already exist when a decision on control has to be taken

- Natural background radiation
- Residues from past practices operated outside the system
- **Residues from incidents and accidents**



# Radiation Protection Principles

**Justification**

**Actions should be adequate to the risk**

**Do more good than harm**

**Optimization**

**Exposure levels  
Number of people exposed  
Economic and social implications**

**As Low As Reasonably Achievable, economic and social factors being taken into account (ALARA)**

**Limitation**

**Limitation of doses and associated risks**

**Dose limits  
Reference levels**

# Limitation of exposures

## Dose limits

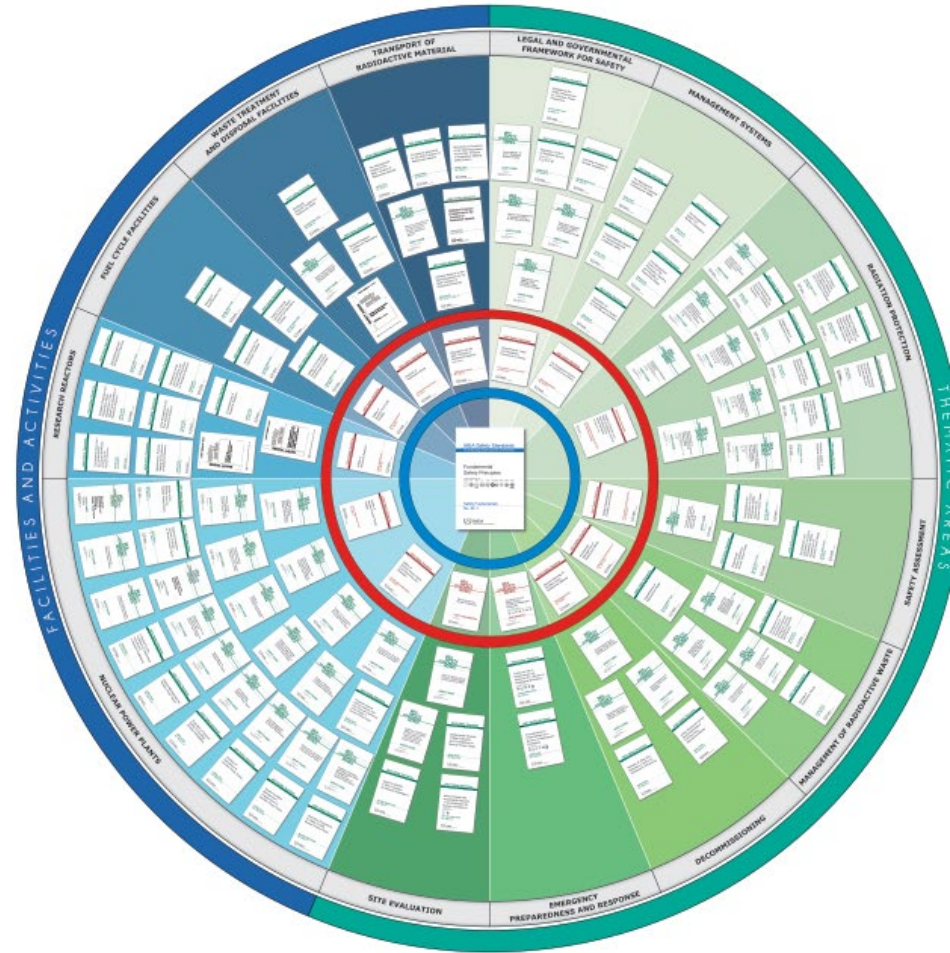
- **Planned** exposures
- Exposure from all planned activities must not exceed an effective dose of 1 mSv/a

## Reference levels

- **Emergency** situation: 20 - 100 mSv
- **Existing** exposures: 1 - 20 mSv/a
  - **Reference level is not a limit, but a target**
  - Situation-dependent: feasibility and experience

## The “wheel” of IAEA safety standards

- The Safety Standards approved by the IAEA Board of Governors.
- The series has about 130 to 140 standards.
- Safety Guides are evaluated every 5 years.
- Safety Requirements are evaluated every 10 years.



Status as of June 2012



The International Atomic Energy Agency (IAEA) is a United Nations system organization with its headquarters in Vienna, Austria. The IAEA's mission is guided by the interests and needs of Member States and activities undertaken include supporting the peaceful uses of nuclear science and technology, promoting high levels of nuclear safety and security, and verifying compliance with non-proliferation agreements.

Further information on the activities undertaken by the IAEA can be found at [www.iaea.org](http://www.iaea.org)

To provide high levels of nuclear safety, the IAEA publishes Safety Standards for use in the nuclear industry. The hierarchy of the Safety Standards begins with the Fundamental Safety Principles, then the Safety Requirements and finally the Safety Guides. In addition, numerous more specific technical reports are produced to support the Safety Standards. The Safety Standards are produced with the involvement and agreement of all Member States and provide a global reference for nuclear safety. All nuclear organizations in all Member States are encouraged to adopt and implement the principles, requirements and guidance given in the Safety Standards in order to maintain and improve global nuclear safety.

The Safety Standards can be downloaded or ordered from [www.iaea.org/safety](http://www.iaea.org/safety) under 'List of all valid Safety Standards'.

Note: The priority of Safety Standards over the standards, not technical and advisory texts in the diagram which have been elaborated for the convenience of the different user groups in the context of safety and technical standards. The standards are produced by the IAEA Safety Standards Group in cooperation with the national authorities of the Member States. A complete list of the Safety Standards is available on the IAEA website at [www.iaea.org/safety](http://www.iaea.org/safety).

# International Conventions for Safety of nuclear applications

- **Agreement between states** for regulation of matters affecting all of them
- Agreements **about basic principles** or procedures
- Define common goals
- Duties of the participating Member States
- System of exchange of information



- **Conventions coordinated by the IAEA**

- Joint Convention for Nuclear Safety
- Joint Convention for Management of Spent Fuel and Radioactive Waste
- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency

- **ESPOO Convention**

- Convention on Environmental Impact Assessment in a Trans-boundary Context

- **London Convention**

- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter

- **OSPAR Conventions**

- Convention for the Protection of the Marine Environment of the North-East Atlantic

# Summary

- **Radiation Protection System**
  - Internationally agreed
  - Based on science
  - Includes all relevant exposure situations
- **IAEA Safety Standards are established by IAEA in consensus with all Member States**
- **Implementation within National Responsibilities**
  - Guidance provides by IAEA Safety Standards
- **Complemented in International Conventions**