Training Course
on the IAEA Safety Standards Overview

GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency

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IEC Role

Global focal point for international **preparedness, communication and response** to nuclear and radiological incidents and emergencies regardless of their cause.

Accidental

Nuclear installations, radioactive sources, and transport of radioactive material

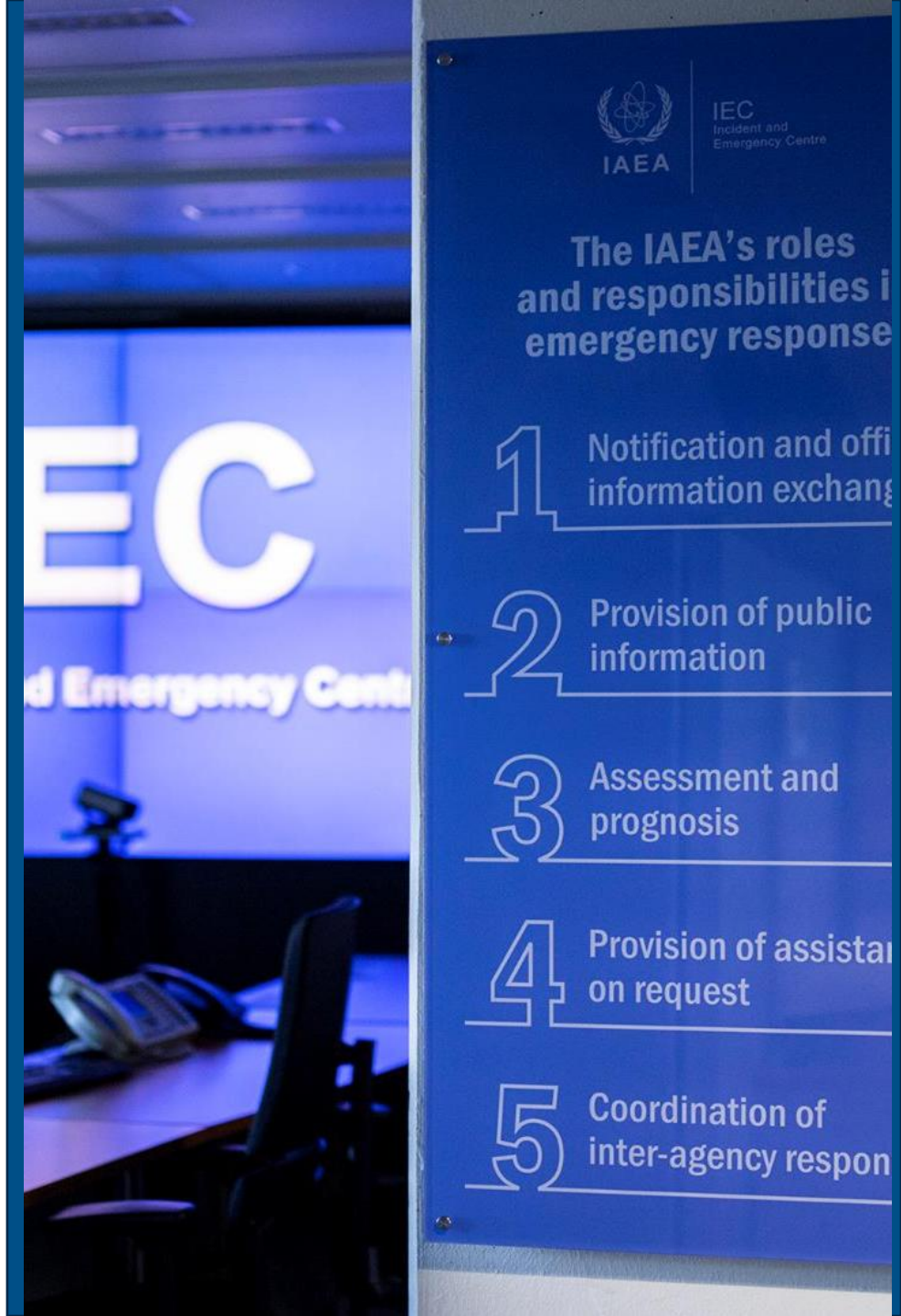
External

Earthquakes or floods affecting nuclear facilities

Security-related

Malicious or intentional acts involving radioactive material

Established after the Chornobyl accident (1986) under two international conventions



IEC Role

BEFORE

Assists Member States to build capacity for emergency preparedness and response based on IAEA Safety Standards

DURING

Gathers and verifies information Provides accurate, timely public information Conducts technical assessments Coordinates international assistance & inter-agency response

AFTER

Lessons learned
Review missions
Updated guidance for future preparedness

IEC Support to Member State Preparedness and Response

Safety Standards and Guidelines

Development of IAEA safety standards and supporting technical documents on EPR.

Capacity Building

Human resources development, specialized training courses/workshops, and information networks that facilitate knowledge sharing.

Peer Reviews and Advisory Missions

EPREV offer assessment of national EPR, providing actionable recommendations based on IAEA safety standards. Advisory missions are also conducted.

What happens when the IEC is activated?

Gather & Inform

Information collected directly from affected country through officially designated contact points

Rapid assessment

Rapid technical assessments to confirm the order of magnitude of consequences and possible progression.

Communicate

Situation updates, and the issuance of timely public information

Assist

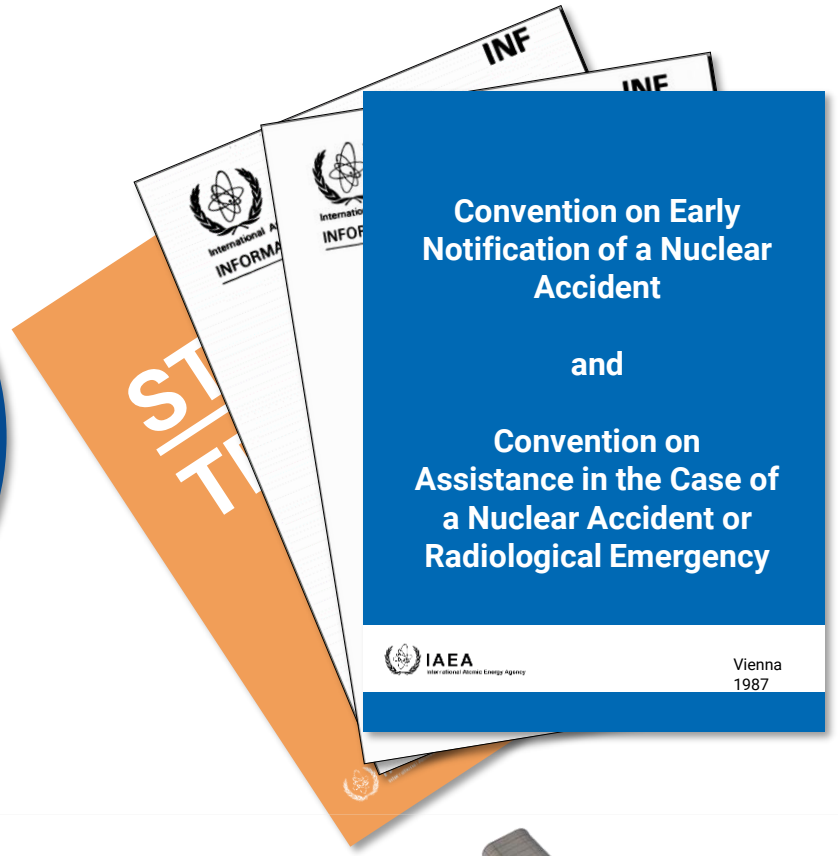
International assistance mobilized upon request

Coordinate

Coordination with international organizations

All actions are carried out by trained responders in accordance with response plans

Legal Instruments



Early Notification Convention

Notify, directly or through the IAEA, States which are or may be physically affected and IAEA about the accident

Promptly provide States, directly or through the IAEA, and the IAEA with available information relevant to minimizing radiological consequences in those States

Supply relevant information on development of emergency situation, including its foreseeable or actual termination at appropriate intervals

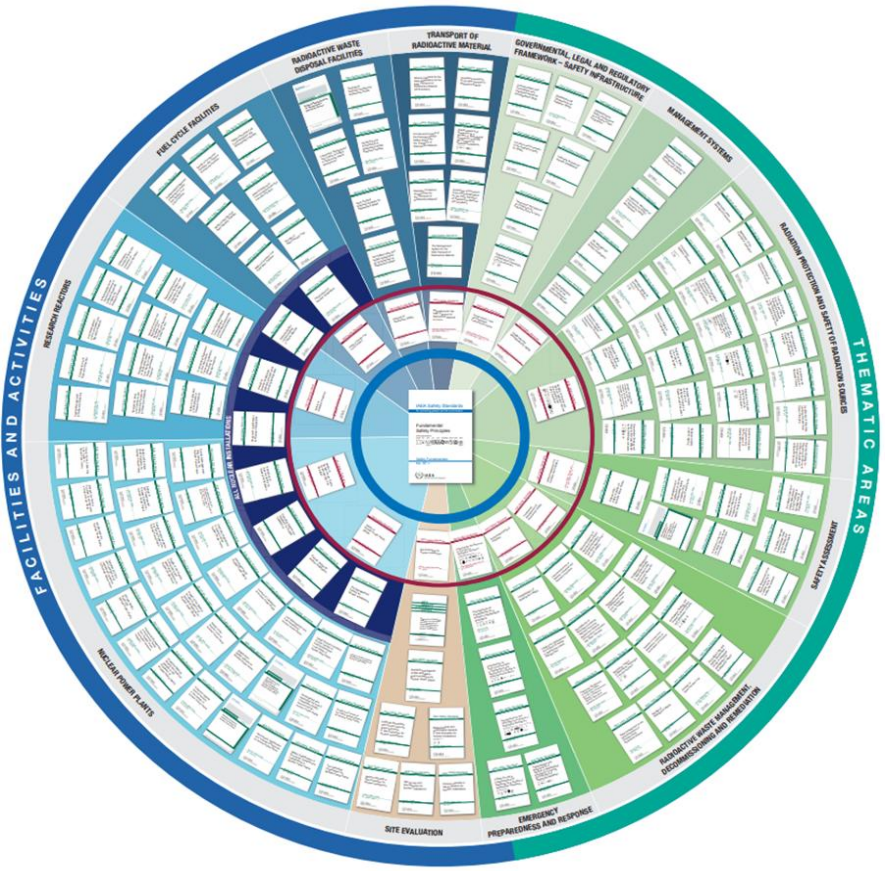
Assistance Convention

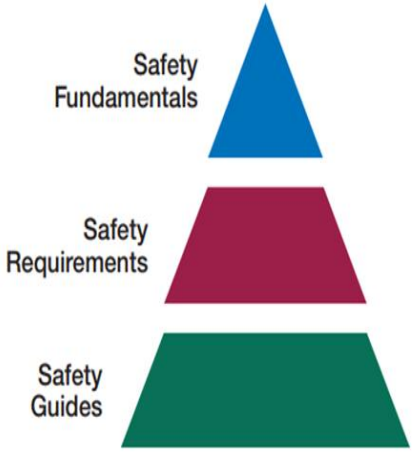
Cooperation between States and with IAEA for prompt assistance in the event of nuclear accident or radiological emergency

State needing assistance, whether or not such accident or emergency originates within its territory, jurisdiction or control, may call for such assistance from:

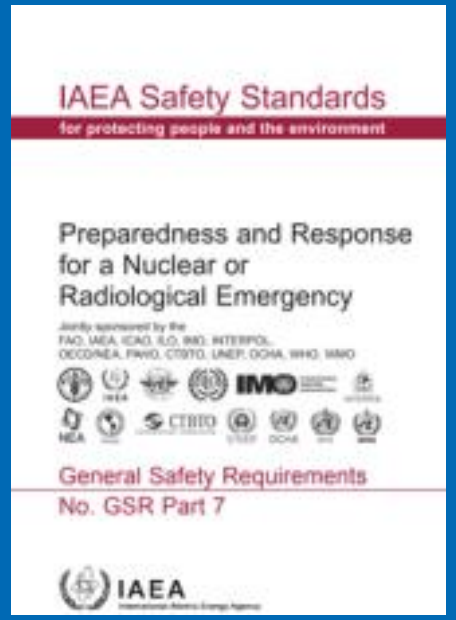
- any other State directly or through IAEA
- IAEA
- other international/intergovernmental organizations

Safety Standards



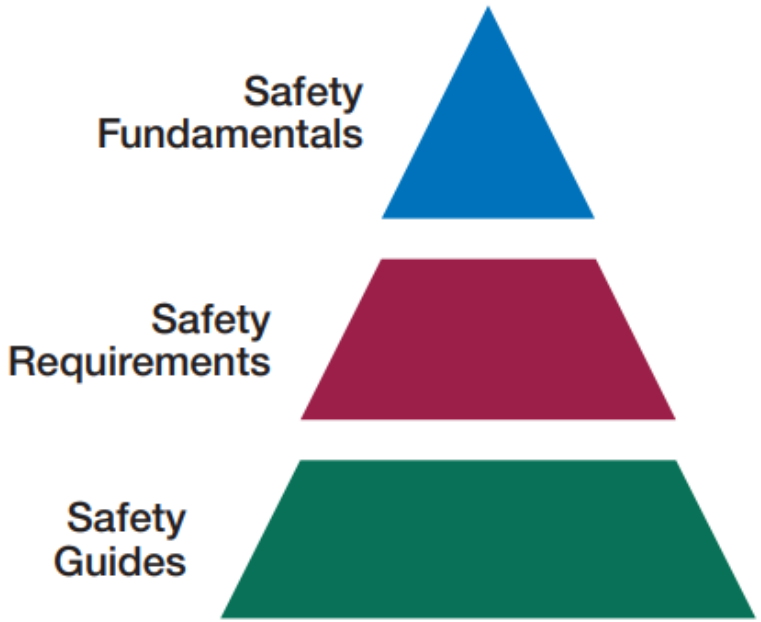


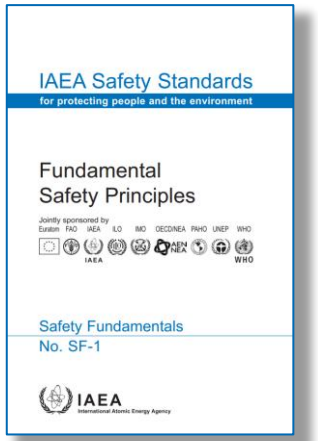
Safety standards provide the fundamental principles, requirements and recommendations to ensure nuclear safety.



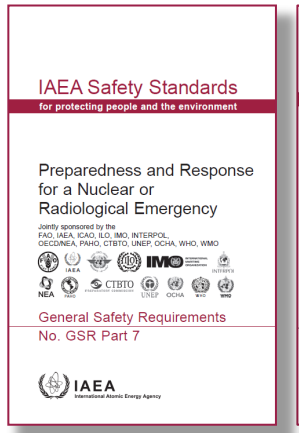
Requirements level: '**shall**'

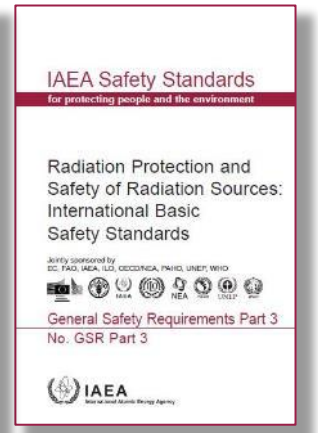
EPR, Safety Standards overview

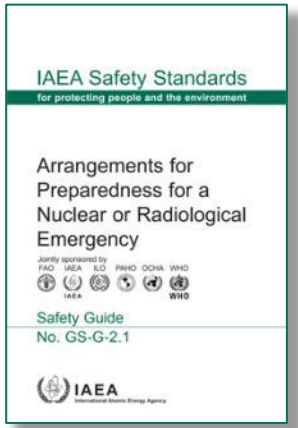


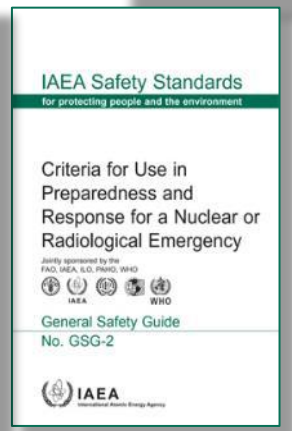


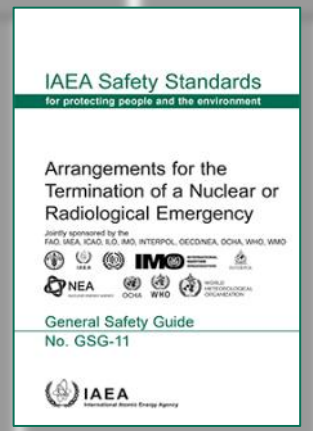
Principle 9: *"Arrangements must be made for emergency preparedness and response for nuclear or radiation incidents."*

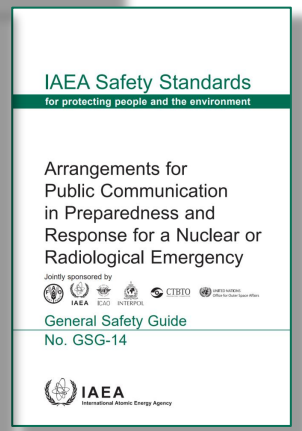


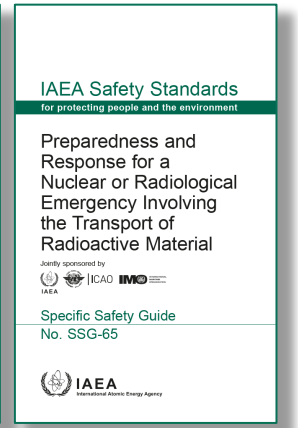








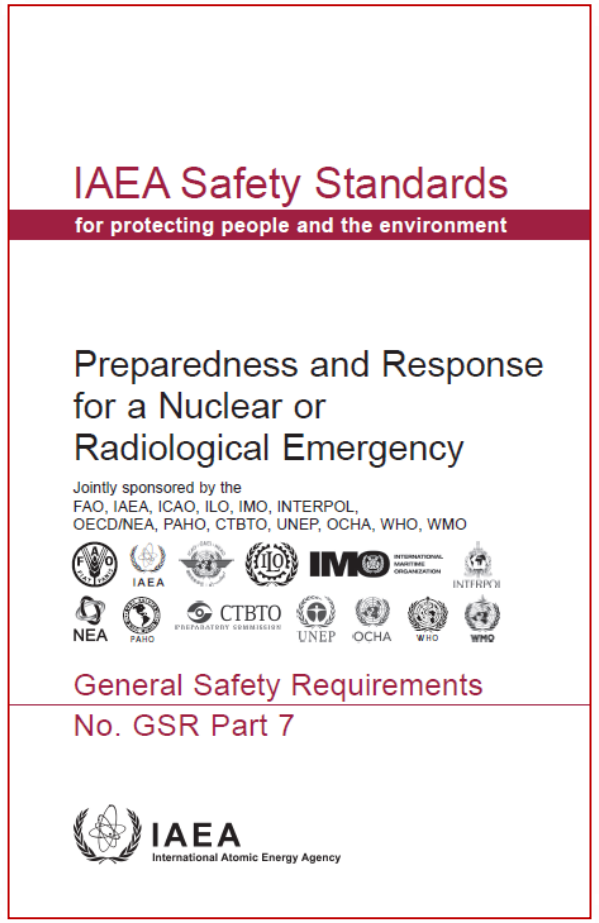




Safety Requirements No. GSR Part 7

Establishes requirements for an adequate level of preparedness and response for a nuclear or radiological emergency, irrespective of its cause

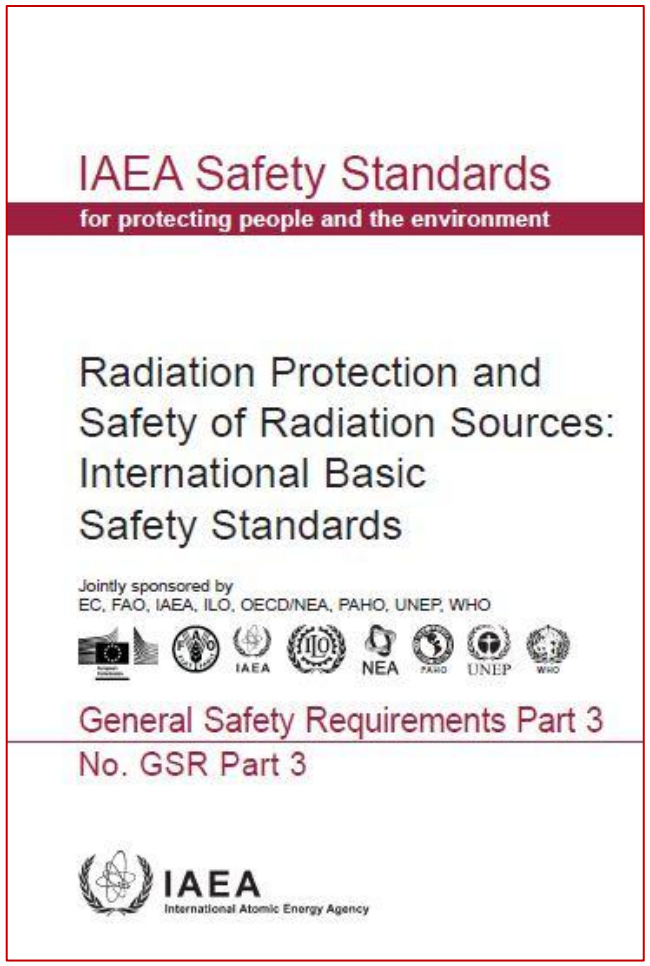
- Requirements level: **'Shall'** or 'What' to be done
- Published in 2015
- Co-sponsored by CTBTO, FAO, IAEA, ICAO, ILO, IMO, INTERPOL, OECD/NEA, PAHO, UNEP, UNOCHA, WHO, WMO
- Currently under revision



Safety Requirements No. GSR Part 3: Section 4

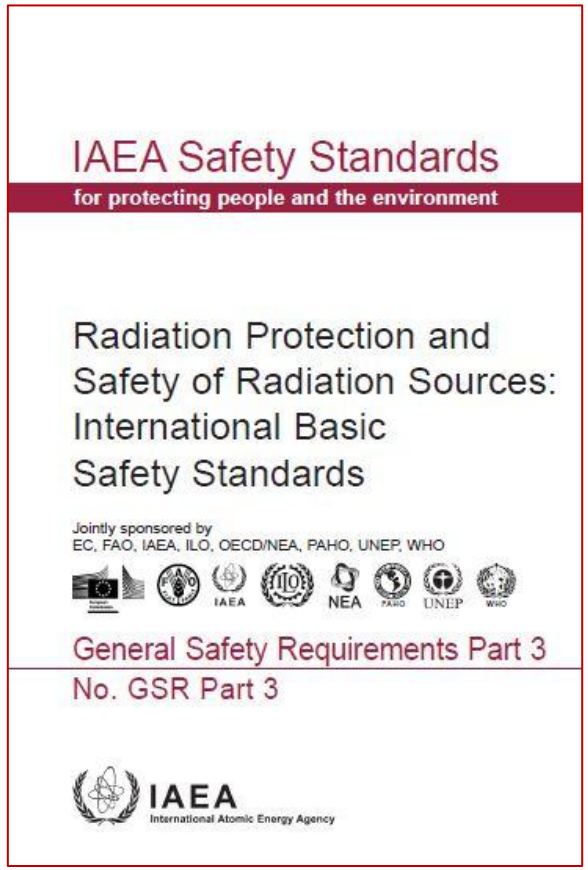
Relevant requirements in Section 4 on Emergency exposure situations

- Requirements level: '**Shall**' or 'What' to be done
- Published 2014
- Co-sponsored by EC, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP, WHO



Safety Requirements in EPR:

Overview of the IAEA Safety Standards No. GSR Part 7



- 26 requirements
- 3 main sections:
  - General requirements
  - Functional requirements
  - Requirements for infrastructure

Goals of Emergency Preparedness

To have:

- An adequate capability in place at the operating organization and local, regional, national and international (where appropriate) levels, for the effective response to a nuclear or radiological emergency

- Integrated set of infrastructural elements that include, but are not limited to:

  - *authority and responsibilities*
  - *organization and staffing*
  - *coordination*
  - *plans and procedures*
  - *tools, equipment and facilities*
  - *training, drills and exercises*
  - *management system*

Goals of Emergency Response

- To regain control of the situation and to mitigate consequences
- To save lives
- To avoid or minimize severe deterministic effects
- To render first aid, to provide critical medical treatment and to manage the treatment of radiation injuries
- To reduce the risk of stochastic effects
- To keep the public informed and to maintain public trust
- To mitigate, to the extent practicable, the non-radiological consequences
- To protect, to the extent practicable, property and the environment
- To prepare, to the extent practicable, for the resumption of normal social and economic activity

Safety Requirements in EPR

- **General requirements:** *to be fulfilled before any emergency planning can start*
- **Functional requirements:** *functions to be performed for response to be effective and goals of emergency response to be met*
- **Requirements for infrastructure**: *for infrastructural elements essential for performing response functions*

General Requirements

#1. Emergency Management System

- Commensurate with hazard assessment
- Effective response to reasonably foreseeable events (including very low probability events)
- Integrated under an all-hazards approach
- Coordination and consistency between national and international emergency arrangements

General Requirements

#2. Roles and Responsibilities

- Clear allocation of roles and responsibilities in EPR:
  - Government
  - Regulatory body
  - Operating organizations
  - Response organizations

- National Coordinating Mechanism to ensure, at all levels:
  - Roles and responsibilities are well understood
  - Coordination and consistency among emergency arrangements
  - Coordination of hazard assessment, emergency analysis, exercise, and effective communication with the public

General Requirements

#4. Hazard Assessment (1/2)

"Assessment of hazards associated with facilities, activities or sources within or beyond the borders of a State in order to identify:

- *Those events and the associated areas for which protective actions and other response actions may be required within the State;*
- *The actions that would be effective in mitigating the consequences of such events."*

- The result of hazard assessment is a basis for establishing arrangements for preparedness and response.
- According to the level and characteristics of hazard (Table 1 in GSR Part 7), five emergency preparedness categories (EPCs) are established the basis for graded approach.

General Requirements

#4. Hazard Assessment (2/2)

EPC	Description
I	Facilities, for which postulated on site events could give rise to **severe deterministic effects off the site** that would warrant **precautionary urgent protective actions, urgent protective actions or early protective actions, and other response actions** to achieve the goals of emergency response
II	Facilities, for which postulated on site events could give rise to **doses to people off the site** that would warrant **urgent protective actions or early protective actions and other response actions** to achieve the goals of emergency response *** No consideration given to events giving rise to severe deterministic effects off the site**
III	Facilities, for which postulated on-site events could warrant **protective actions and other response actions on the site** to achieve the goals of emergency response *** No consideration given to events warranting urgent protective actions or early protective actions off the site**
IV	**Activities and acts** that could give rise to a nuclear or radiological emergency that could warrant **protective actions and other response actions** to achieve the goals of emergency response in an unforeseen location
V	**Areas within emergency planning zones and emergency planning distances** in a State for a facility in category I or II located in another State

General Requirements

Emergency Response Action: to mitigate the consequences of an emergency for human life and health, property and the *environment*.

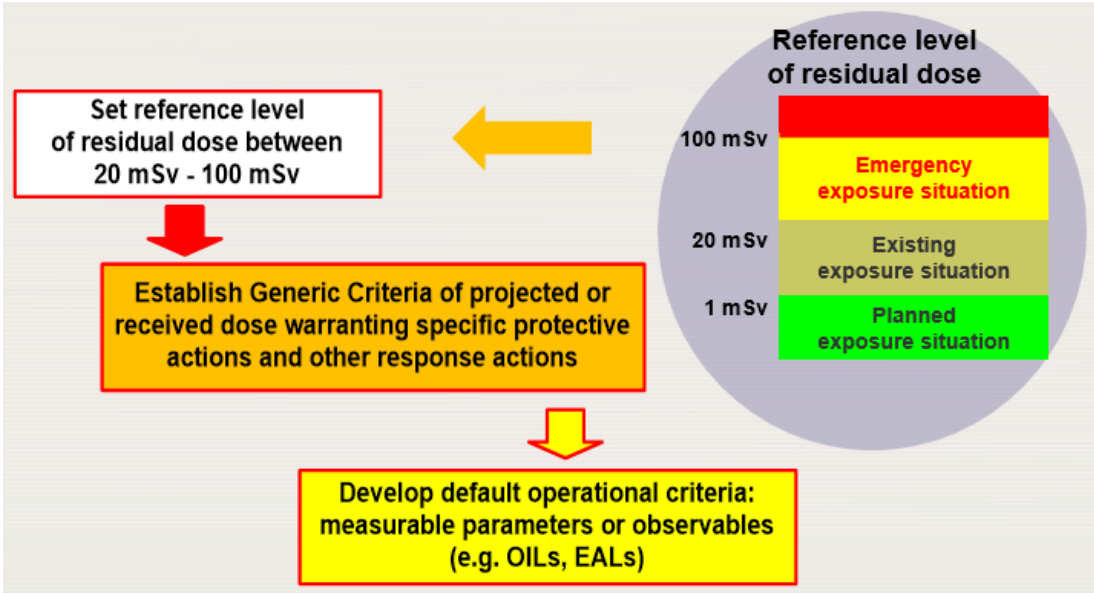
- **Protective Action:** for the purposes of avoiding or **reducing *doses***
  - **Precautionary Urgent Protective Action:** taken **before or shortly after a *release*** of *radioactive material*, or an *exposure* to avoid or to minimize ***severe deterministic effects***.
  - **Urgent Protective Action:** must be taken promptly (usually **within hours to a day**) to be effective
  - **Early Protective Action:** can be implemented **within days to weeks** and can still be effective
- **Other Response Action:** An *emergency response action* other than a *protective action*
  e.g. long-term medical follow-up, psychological counselling, other actions for mitigating *non-radiological consequences* and for public reassurance

(IAEA Nuclear Safety and Security Glossary https://vocabulary.iaea.org/iaea-safety-glossary.html)

General Requirements

#5. Protection Strategy

- **Justified and optimized set of protective actions and other response actions** meet the goals of emergency response
- To be developed **at the preparedness stage**
  - Based on the results of **hazard assessment** and the potential consequences of an emergency
  - Involving all interested parties



- To be implemented **safely** and effectively in response to an emergency

Functional Requirements (1)

#6. Managing emergency response operations

- Effective transition from normal to emergency operations in facilities
- Clearly specified and unified **command and control system** for emergency response under the all-hazards approach
- Coordination at any level including across border where appropriate

#7. Identifying, notifying and activating

- Emergency classification for facilities
  - **Emergency Action Levels**
  - **General emergency, Site area emergency, Facility emergency, Alert**
- Notification and activation of pre-planned response
  - On-site and off-site (including across border) as appropriate

Functional Requirements (2)

#8. Taking mitigatory actions

- Actions to reduce the potential for conditions to develop that would result in exposure or a release of radioactive material
- Provision of off-site emergency services to support on-site response

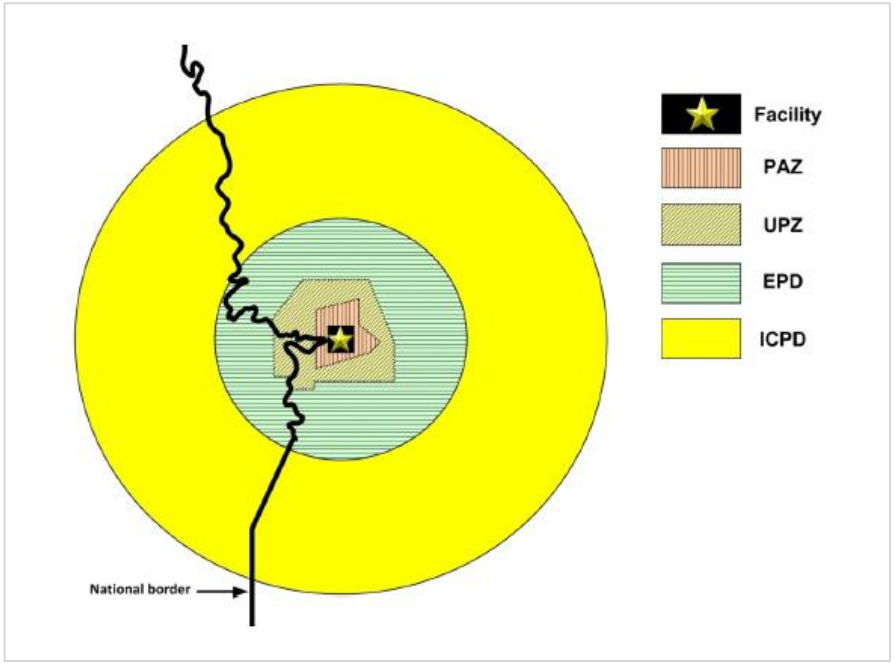
#9. Taking urgent protective actions and other response actions

- To avoid severe deterministic effects and to reduce the risk for stochastic effects (e.g. through sheltering, evacuation, ITB, restrictions on food and comodities, preventing inadvertent ingestion)
- Within the first few hours that follow a release to be effective; effectiveness is significantly reduced by delay

Functional Requirements (3)

#9. Taking urgent protective actions and other response actions

- Off-site **emergency planning zones and distances** for facilities in Category I&II:
  - Precautionary action zone (PAZ)
  - Urgent protective action planning zone (UPZ)
  - Extended planning distance (EPD)
  - Ingestion and commodities planning distance (ICPD)



Arrangements to be ensured at the preparedness stage

Functional Requirements (3)

#9. Taking urgent protective actions and other response actions

Precautionary Action Zone (PAZ)

- for **EPC I**
- Arrangements **for taking urgent protective actions** and other response actions
- Taking actions **before any significant release** of radioactive material occurs
- based on conditions at the facility
- to avoid or to minimize severe deterministic effects

Suggested EPZ sizes
for EPC I & II facilities

Power	PAZ	UPZ
EPC I Reactors		
≥1000 MW_{th}	3-5 km	15-30 km
100-1000 MW_{th}		
EPC II Reactors		
10-100 MW_{th}	None	0.5-5 km
2-10 MW_{th}		0.5 km

Functional Requirements (3)

#9. Taking urgent protective actions and other response actions

Urgent protective action Planning Zone (UPZ)

- For **EPCs I and II**
- arrangements to initiate urgent protective actions and other response actions
- if possible, actions implemented **before** any significant release of radioactive material occurs, based on **conditions at the facility**,
- **after** a release occurs, actions implemented based on monitoring and assessment of the radiological **situation off the site**
- to reduce the risk of stochastic effects

Suggested EPZ sizes
for EPC I & II facilities

Power	PAZ	UPZ
EPC I Reactors		
≥1000 MW_{th}	3-5 km	15-30 km
100-1000 MW_{th}		
EPC II Reactors		
10-100 MW_{th}	None	0.5-5 km
2-10 MW_{th}		0.5 km

Functional Requirements (3)

#9. Taking urgent protective actions and other response actions

Extended Planning Distance (EPD)

- for EPC I and II (beyond the UPZ)
- arrangements **to conduct monitoring and assessment** to identify areas
- **To reduce the risk of stochastic effects effectively in the areas** by taking protective actions and other response actions within a day to a week or to a few weeks following a significant radioactive release

Suggested EPD sizes
for EPC I & II facilities

Power	EPD	ICPD
EPC I Reactors		
≥1000 MW_{th}	100 km	300 km
100-1000 MW_{th}	50 km	100 km
EPC II Reactors		
Under development		

Functional Requirements (3)

#9. Taking urgent protective actions and other response actions

Ingestion and Commodities Planning Distance (ICPD)

- for EPC I or II (beyond the EPD)
- for which arrangements shall be made to take response actions
- for **protecting the public from the ingestion of food, milk and drinking water and from the use of commodities other than food** with possible contamination following a significant radioactive release

Suggested EPD sizes for EPC I & II facilities

Power	EPD	ICPD
EPC I Reactors		
≥1000 MW_{th}	100 km	300 km
100-1000 MW_{th}	50 km	100 km
EPC II Reactors		
Under development		

Functional Requirements (4)

#10. Providing instructions, warnings and associated information

EPC I, II & V

- ✓ Arrangement for **actually or potentially affected public**
  - In normal operations & at preparedness stage:
    - Identify target population groups
    - Inform in understandable language:
      - Potential for an emergency and hazards associated
      - Arrangements in place to protect them (warning, actions to take)
  - In an emergency
    - Warn them and instruct them what to do

EPC III & IV

- ✓ Arrangement to provide information and instructions to identify people who may have been affected by an emergency and may need response actions

Functional Requirements (5)

#11. Protecting emergency workers and helpers

- **Emergency worker:** Worker with a duty in emergency response
  - operating personnel, directly or indirectly employed
  - first responders, drivers & crews of evacuation vehicles
- **Helper in an emergency:** Volunteers from the public

Provisions for protection:

- Trained in advance (if designated) / 'just in time' training (if not designated)
- Dose received is managed, controlled and recorded
- Necessary protective and monitoring equipment is provided;
- ITB is provided, if it is needed
- Informed consent (when appropriate)
- Arrangements for medical examination, longer term medical actions, psychological counselling

Functional Requirements (5)

#11. Protecting emergency workers and helpers

- Exposure of Emergency Workers: not in excess of 50 mSv other than:
  (1) For the purposes of saving human life or preventing serious injury;
  (< 500 mSv)
  (2) When taking actions to prevent severe deterministic effects or actions to prevent the development of catastrophic conditions that could significantly affect people and the environment; (< 500 mSv)
  (3) When taking actions to avert a large collective dose.” (< 100 mSv)

- Exposure of Helpers: not in excess of 50 mSv

Functional Requirements (6)

#12. Managing the medical response

- **Notifications** by medical personnel
  - Presentation of medical symptoms of radiation exposure
  - Other effects indicating possible radiological emergency

- Arrangement of **Medical actions** for those affected in the emergency
  - Provision of first aid, dose estimation, transportation
  - Medical screening and triage for areas within emergency planning zones
  - Specialized treatment of overexposed resulting in severe deterministic effects
  - Longer term medical actions for early detection and treatment of radiation induced health effects among the exposed population groups

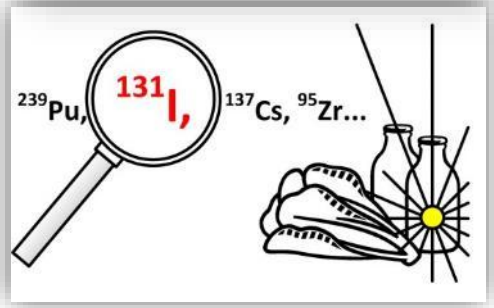
Functional Requirements (7)

#13. Communicate with the public throughout the emergency

- Provide **timely, clear, factually correct information**
  - Arrangement for loss of usual communication
  - Protect sensitive information
- **Develop a system for putting health hazards:**
  - To address public concerns regarding health consequences (“Am I safe?”)
- Monitor and address misleading information and actions taken beyond emergency response actions that are warranted
- Respond to enquiries from the public and news media

Functional Requirements (8)

#14. Taking early protective actions and other response actions



- To reduce the risk of stochastic effects (e.g., through restrictions on food and commodities, relocation etc.)
- Develop monitoring strategy and use Operational Intervention Levels (OILs)

  OILs are measurable quantity and corresponds to a generic criteria. They are used immediately and directly to determine the appropriate protective actions on the basis of an environmental measurement.
- Specific to emergency planning distances (EPD, ICPD)
- **Access control** and **restriction control** for areas in which evacuations and relocations are carried out

Functional Requirements (9)

#15. Managing radioactive waste during an emergency

- Arrangement to ensure safe and effective management of radioactive waste
  - Do not compromise protection strategy
  - Consider, at preparedness stage, its impact on waste production
  - Minimize the amount of material declared as radioactive waste
  - Method of identifying appropriate storage options and sites
  - Consider management of contaminated human and animal remains

Image reproduced from 'The Radiological Accident in Goiânia', IAEA , Vienna (1988)

Functional Requirements (10)

#16. Mitigating the non-radiological consequences

- Adverse psychological, social and economic consequences
- May arise from emergency itself or from actions taken

✓ Consider them in the context of protection strategy

✓ Provide the public with:

  - Information and place the health hazard in perspective
  - Medical and psychological support
  - Social support

✓ Protect international trade

✓ Identify and address inappropriate actions

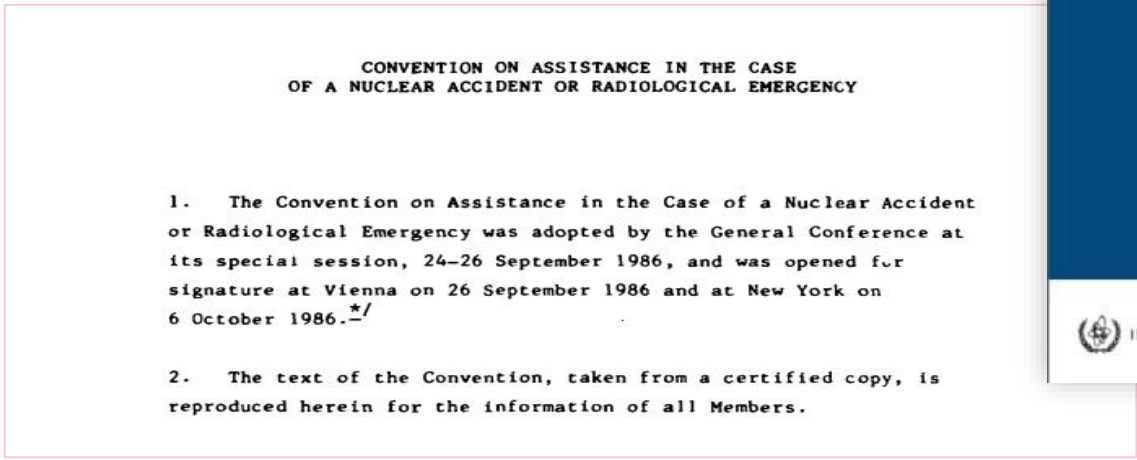
Functional Requirements (11)

#17. Requesting, providing and receiving international assistance

- On the basis of multilateral instruments (e.g., Assistance Convention) or bilateral arrangements

To:

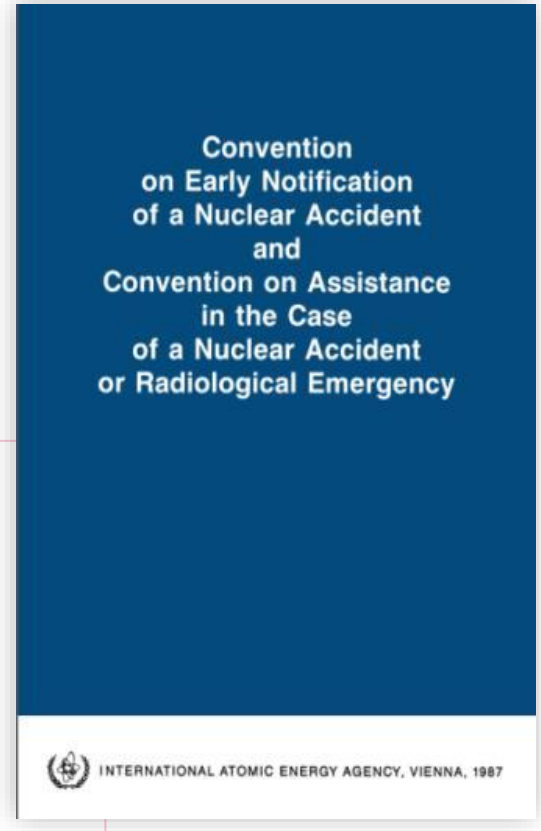
- Request international assistance when needed
- Receive assistance requested
- Timely respond to request for assistance



CONVENTION ON ASSISTANCE IN THE CASE
OF A NUCLEAR ACCIDENT OR RADIOLOGICAL EMERGENCY

1. The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency was adopted by the General Conference at its special session, 24-26 September 1986, and was opened for signature at Vienna on 26 September 1986 and at New York on 6 October 1986.*/

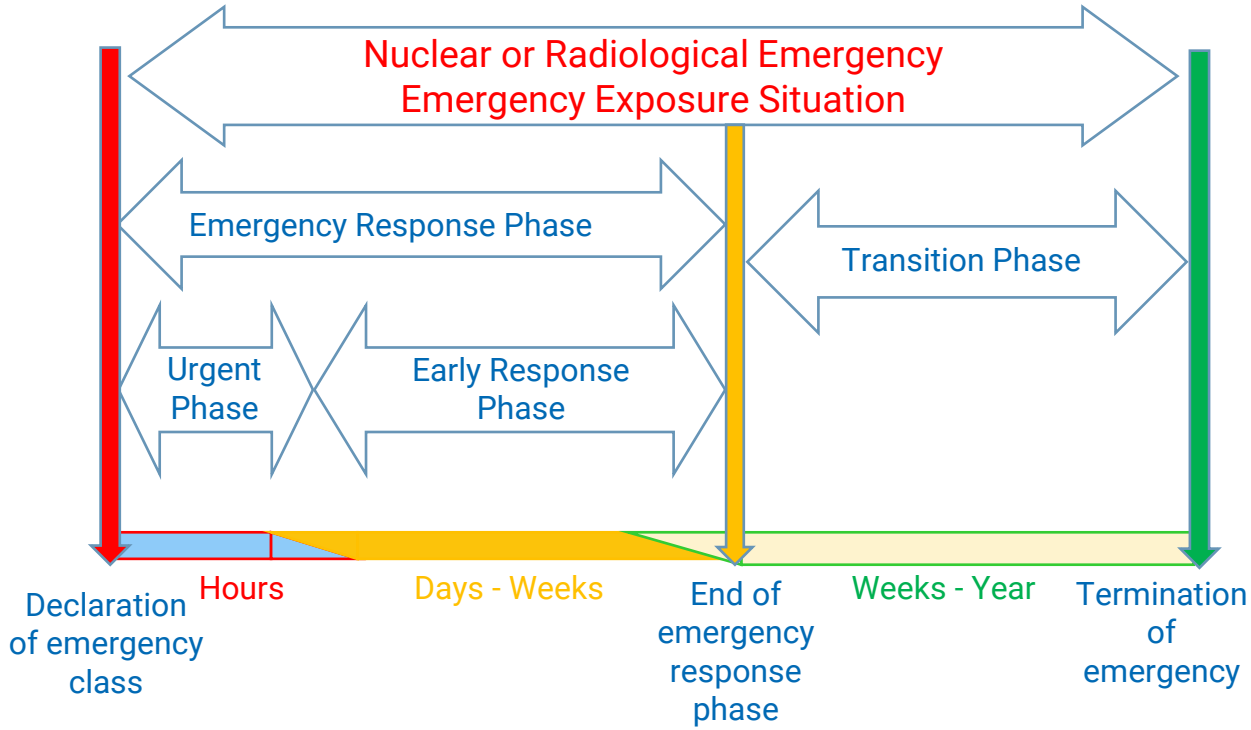
2. The text of the Convention, taken from a certified copy, is reproduced herein for the information of all Members.



Functional Requirements (12)

#18. Terminating a nuclear or radiological emergency

- Prepare to **terminate** the emergency
  - **Recovery**
  - **Transition to existing or planned exposure situation**
- Radiological and non-radiological consequences shall be considered
- Ensure **consultation with interested parties**
- **Adjust protective actions and other response actions**
- **Inform the public**
- Ensure clear roles and functions of organizations



Functional Requirements (13)

#19. Analysis of emergency and emergency response

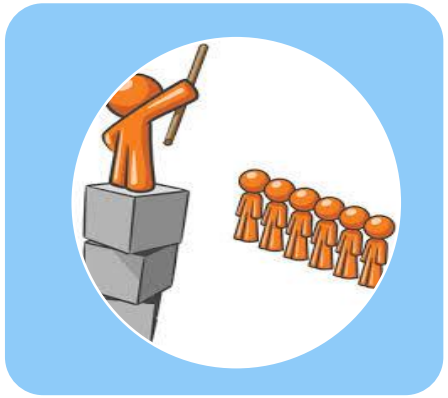
- Preserve data and information during response to the extent practicable for analysis
- Consider following points in analysis:
  - **root causes**
  - **improvements needed** in emergency arrangements
  - general implications to safety and security
- Take actions promptly on the basis of an analysis **to avoid other emergencies**

Members of the IAEA fact-finding team in Japan in the technical support center of the Fukushima Daini Nuclear Power Plant on 26 May 2011.

Requirements for infrastructure (1)

#20. Authorities for EPR

Functions assigned to appropriate organizations



#21. Organization and staffing

- Preparedness staffing in routine organizational structure
- Appropriate number and qualified staff for response

#22. Coordination of EPR

- Coordination between relevant organizations
- Consistency of assessment not to give rise to confusion

#23. Plans and procedures for response

Coordination with national emergency response and security plans

Requirements for infrastructure (2)

#24. Logistical support and facilities

- Adequate tools, instruments, communication systems and documentation
- Compatible with other procedures and equipment

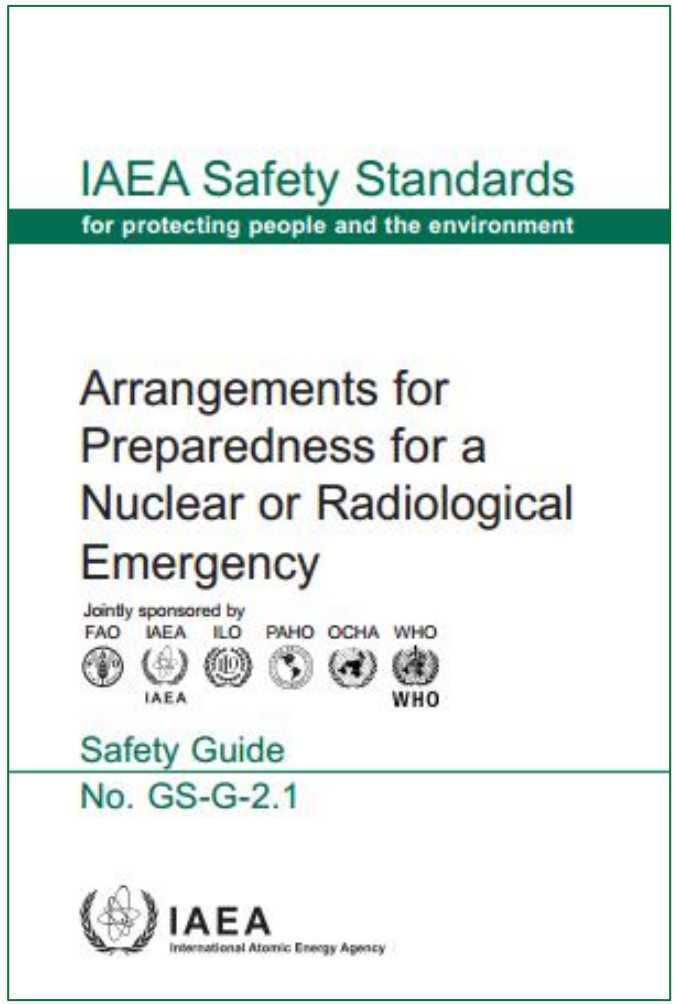
#25. Training, drills and exercises

- Trainings for response personnel to have requisite knowledge, skills, and ability
- Some exercise with participation of concerned organization, people who are potentially affected, and mews media
- Systematic evaluation of exercises

#26. Quality management program

- Ensure availability and reliability of all supplies, equipment, plans, and procedure
- Review and update emergency plans
- Incorporate lessons from research, experience and exercises

Safety Guides: No. GS-G-2.1



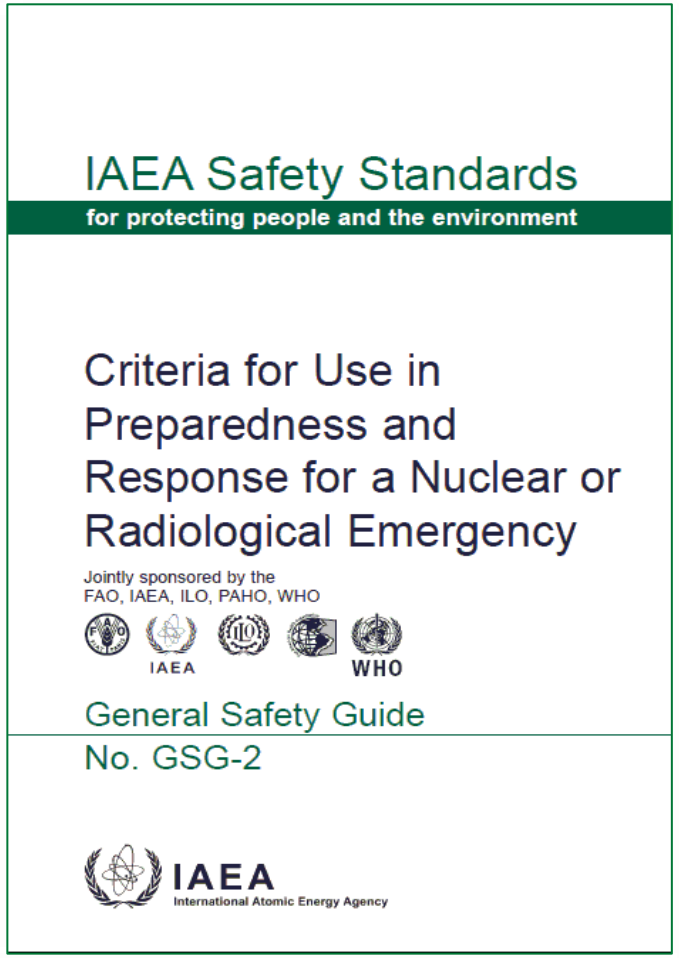
Provides recommendations on implementation of specific safety requirements that were established in GS-R-2 (predecessor of GSR Part 7)

- Recommendations level: '**Should**' or 'How' to be done
- Published in 2007
- Currently under revision

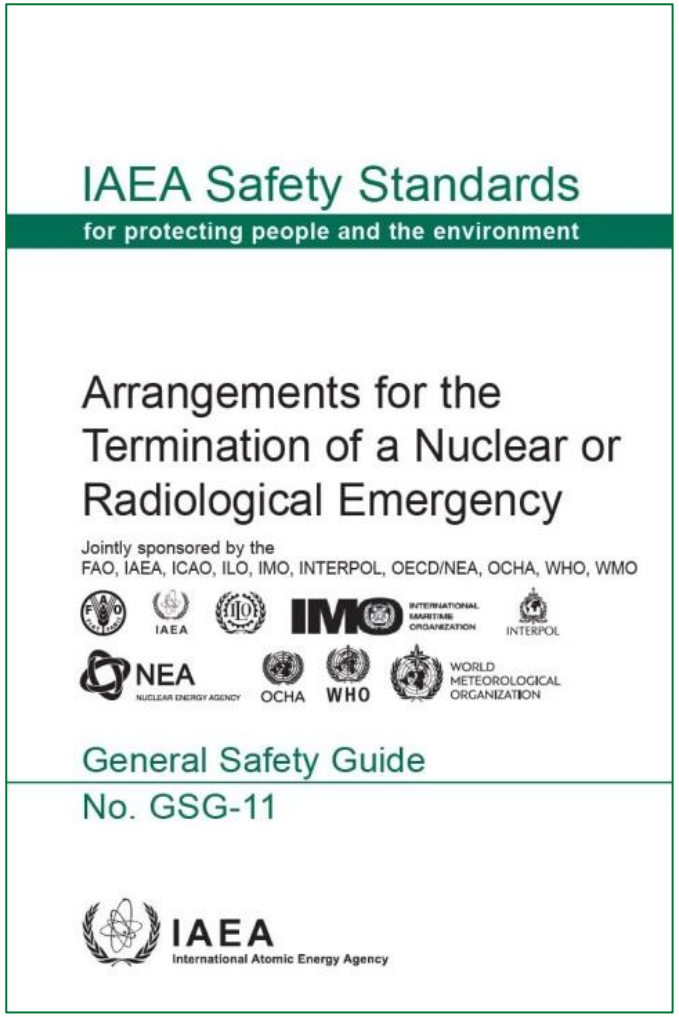
Safety Guides: No. GSG-2

Provides guidance on criteria for taking protective actions and other response actions in a nuclear or radiological emergency

- Recommendations level: '**Should**' or 'How' to be done
- Published in 2011
- Currently under revision

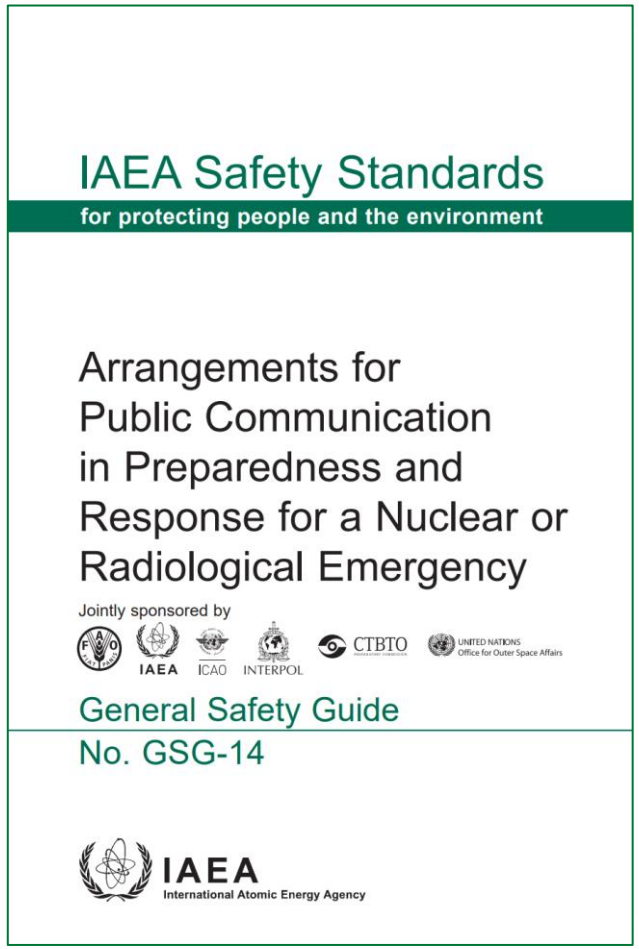


Safety Guides: No. GSG-11



- Provides guidance and recommendations on:
  - Developing arrangements, as part of overall emergency preparedness efforts, for transition to either an existing exposure situation or a planned exposure situation, as appropriate, and for the termination of the emergency
  - The primary objective and prerequisites for enabling the emergency to be terminated
- Published in March 2018

Safety Guides: No. GSG-14



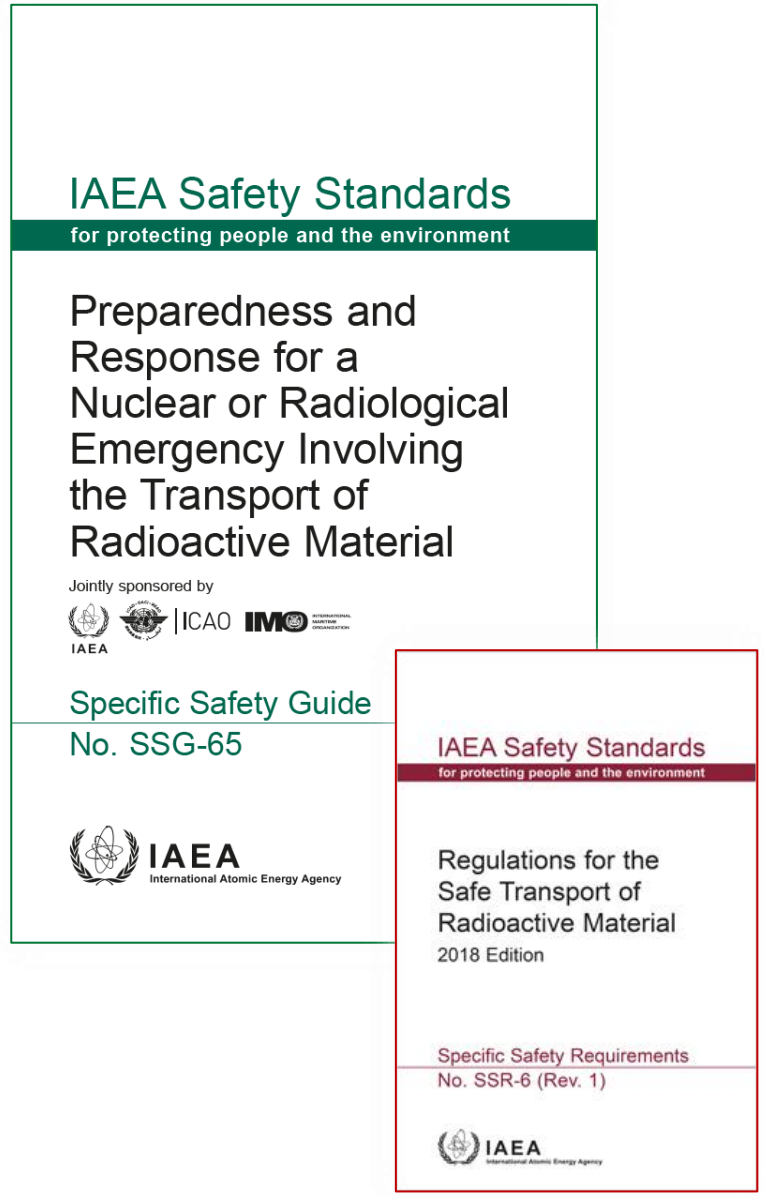
Provides guidance on applying requirements 10 and 13 in GSR Part 7, and developing and implementing effective communication plans to communicate with the public in preparedness and response to a nuclear or radiological emergency

- Recommendations level: '**Should**' or 'How' to be done
- Published in 2020

Safety Guides: No. SSG-65

Provides guidance and recommendations on the implementation of the requirements established primarily in GSR Part 7 and SSR-6 (Rev. 1) in order to prepare for, and respond to, emergencies during the transport of radioactive material

- Recommendations level: '**Should**' or 'How' to be done
- Published in 2022



Thank you!

Safety-Standards.Contact-Point@iaea.org