



IAEA

International Atomic Energy Agency

Considerations on Safety and Security in Emergency Preparedness and Response

Regional Workshop on Managing the Safety Security
Interface for Research Reactors 2022

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Department of Nuclear Safety and Security
Incident and Emergency Centre

Stacey Horvitz
Associate Emergency Preparedness Officer
s.horvitz@iaea.org

EPR for Research Reactors

- Every country that operates a research reactor must be prepared for the possibility that a nuclear emergency could arise despite its efforts to ensure safe operations

**We need to be
prepared!**

Research Reactor Emergency Planning



- While research reactors are designed and operated with full attention to safety, there remains a risk that a failure or an incident gives rise to an emergency
- Emergency response may require actions by the **Operator** to mitigate the consequences of released radioactive materials both **on-site and off-site**
- The appropriate **Government Officials** and **Regulatory Body** establish in advance and maintain the arrangements for emergency preparedness and response at the **scene, local, regional, and national** and even the **international** level

Research Reactor Emergency Planning (cont.)



- The **extent** of these arrangements are commensurate with the potential magnitude and nature of hazards associated with the research reactor
 - Likelihood and possible **consequences** of the events
 - **Characteristics** of the radiation risks
 - **Location** of the installation and activities (**proximity to population centres**)
- Emergency planning for **protection of plant personnel**, emergency workers, and the **public off-site** is a necessary element of the overall plant safety and is an additional layer of **defence in depth**

IAEA's Roles in Preparedness

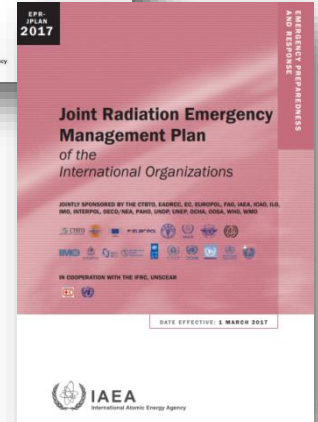
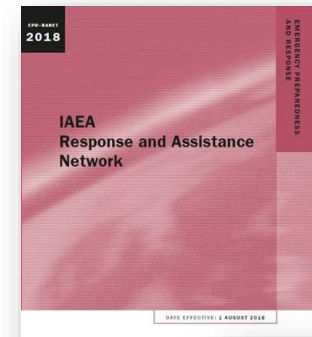
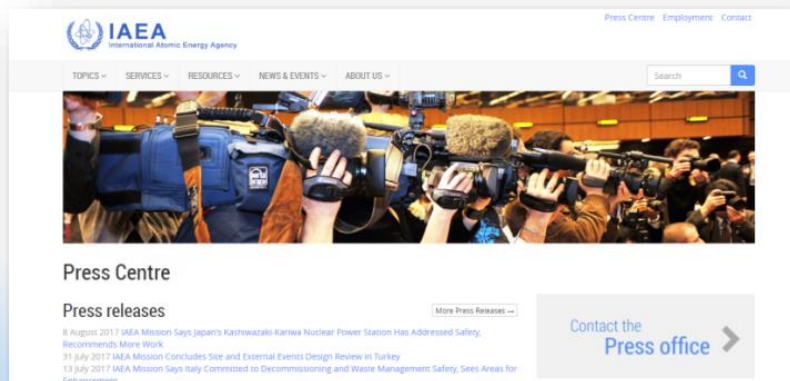


- IAEA Safety Standards, guidance and tools
- Capacity building in EPR (workshops, training courses, exercises, knowledge management...)
 - Capacity Building Centres on EPR
- Emergency Preparedness Review (EPREV)
- Protocols and operational arrangements
- Preparedness for assistance capabilities
- IAEA's in-house preparedness
- Inter-agency preparedness



IAEA's Roles in Response

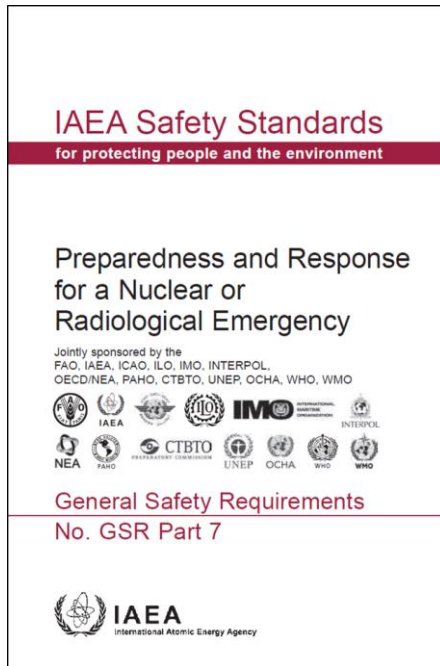
- Notification and information exchange
- Provision of public information
- Assessment of potential emergency consequences and prognosis of possible emergency progression (A&P)
- Provision of assistance on request
- Coordination of inter-agency response



Response to Emergencies Triggered by Nuclear Security Events



Response to emergencies triggered by any type of events, including **nuclear security events** (NSE), in GSR-Part 7 is required to be:



1. Well coordinated (5.6, 6.12)
2. Integrated with overall response at all levels (5.6)
3. Comprising a unified command and control system for emergency response (5.7)
4. Operational within safety and **security functions** (4.10 & 5.2)
5. Including an investigation, where needed, into circumstances surrounding **NSE** (6.17(c))

A national coordinating mechanism should ensure consistency among requirements for emergency arrangements, contingency plans and security plans

Definition of a Nuclear Security Event

“A ‘**nuclear security event**’ is an event that has **potential or actual implications** for **nuclear security** that must be addressed. Such events include **criminal or intentional unauthorized acts** involving or directed at nuclear material, other radioactive material, associated facilities or associated activities. A **nuclear security event**, for example, **sabotage** of a nuclear facility or **detonation of a radiological dispersal device**, may give rise to a nuclear or radiological emergency.”

Footnote 2 in (GSR Part-7-paragraph 1.16)

Definition of Emergency

“Emergency is a non-routine situation or event that necessitates prompt action, primarily to mitigate a hazard or adverse consequences for human life, health, property or the environment.

- This includes nuclear and radiological emergencies and conventional emergencies such as fires, releases of hazardous chemicals, storms or earthquakes.
- This includes situations for which prompt action is warranted to mitigate the effects of a perceived hazard.”

Goals of Emergency Response

- **Regain control** of the situation and mitigate consequences
- **Save lives**
- **Avoid** or minimize severe **deterministic effects**
- Render first aid, provide critical **medical treatment** and manage the treatment of radiation injuries
- **Reduce** the risk of **stochastic effects**
- Keep the **public informed** and to maintain public trust
- **Mitigate**, to the extent practicable, **non-radiological consequences**
- Protect, to the extent practicable, property and the environment
- Prepare, to the extent practicable, for the **resumption of normal social and economic activity**

Emergency response addresses *any adverse* (either radiological or non-radiological) *consequences* of an emergency irrespective of its cause

- Even if this is needed due to a *perceived* hazard

Integration of Nuclear Security Response into EMS



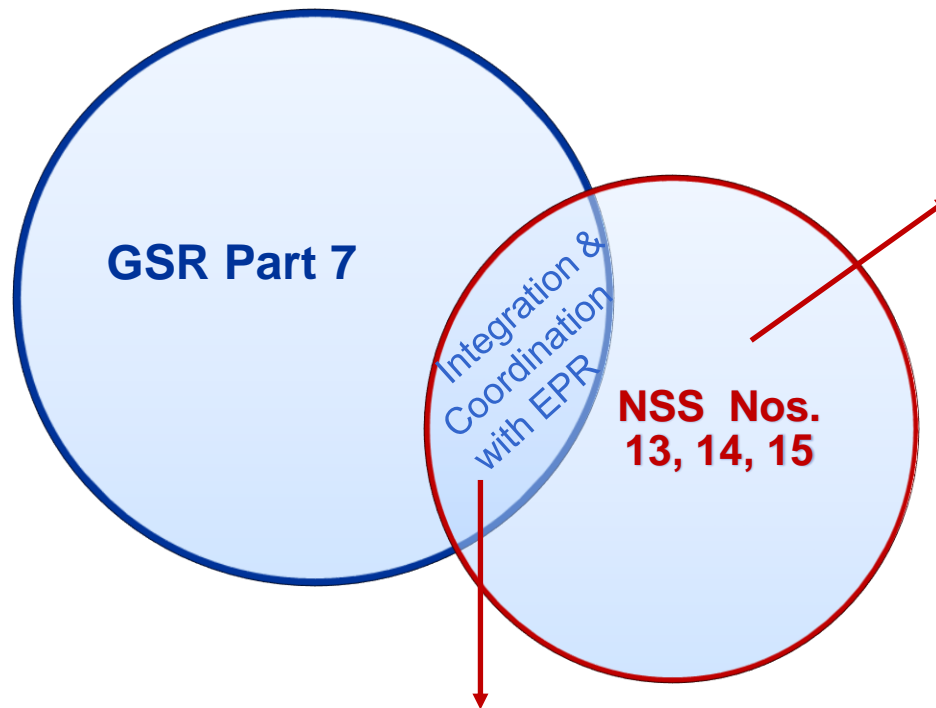
- When a **NSE** has actual or potential consequences such that it is a nuclear or radiological emergency, the **response to this NSE should be integrated into the overall national emergency management system (EMS)**
- It is expected that this emergency response will provide suitable arrangements for integrated implementation of the necessary **security response measures** and protective actions and other actions in response to the nuclear or radiological emergency, while allowing the **specific aspects relevant for security (e.g. interdiction, forensic, and radiological crime scene management)** to be properly addressed

Paragraph 1.16 in GSR Part 7

“1.16 The requirements apply for preparedness and response for a nuclear or radiological emergency irrespective of the initiator of the emergency, whether the emergency follows a natural event, a human error, a mechanical or other failure, or a **nuclear security event**. The requirements do not cover preparedness for, or response measures that are specific to, **nuclear security events**, for which recommendations are provided in Refs [9–11]. **Such response measures include activities for the identification, collection, packaging and transport of evidence contaminated with radionuclides, nuclear forensics and related actions in the context of investigation into the circumstances surrounding a nuclear security event.** The requirements established here do provide for a coordinated and integrated approach to preparedness and response for a nuclear or radiological emergency arising from a **nuclear security event** that necessitates protective actions and other response actions to be taken for protection of members of the public, workers and emergency workers, helpers in an emergency and patients.”

Ref [9-11]: IAEA Nuclear Security Series No. 13, 14, 15

Nuclear Security Response Measures Coordination and Integration with EPR



GSR Part 7: Para. 1.16, 5.6, 5.7, 6.17

Response measures in the context of **investigation** into the circumstances surrounding a **nuclear security event**

- **Identification**
- **Collection**
- **Packaging**
- **Transport of evidence contaminated with radionuclides**
- **Interdicting and countering the perpetrators**
- **Nuclear forensics and related actions**



- **Evidence Management:**
 - Collection and handling of evidence within a nuclear security event section (*NSS 15 para. 6.13-6.15,...*)
- **Nuclear Forensics:**
 - Nuclear forensics sections (*NSS 15 para. 6.16, 7.14-7.16,...*)
- **Other related actions:**
 - Contingency Plans for securing the location and protecting emergency equipment and personnel (*NSS 13 para. 5.44*)
 - The regulatory body should establish requirements to ensure there are security measures to detect nuclear security events and to report any such event (*NSS 14 para. 3.35*)

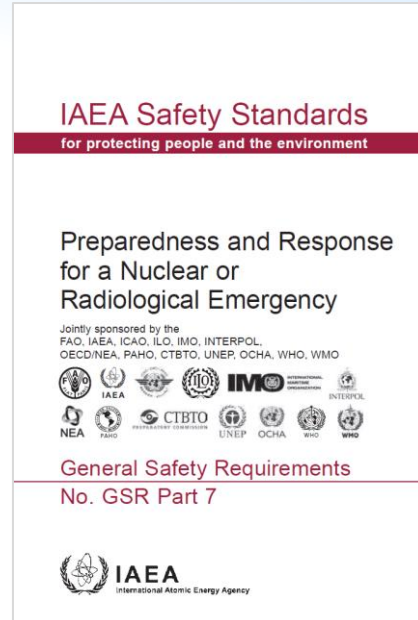
Relevant Requirements in GSR Part 7



Requirement 2:

Roles and responsibilities in EP&R

“To coordinate and ensure consistency between the emergency arrangements of the various response organizations, operating organizations and the regulatory body at local, regional and national levels under the all-hazards approach, including those arrangements for response to relevant nuclear security events, and, as appropriate, those arrangements of other States and of international organizations”

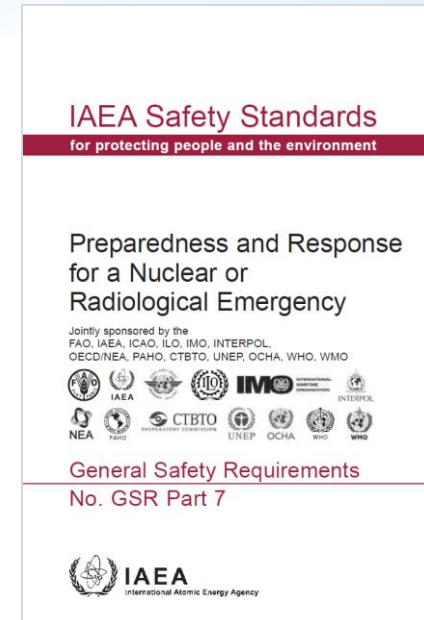


Relevant Requirements in GSR Part 7 (cont'd)



Requirement 2: Roles and responsibilities in EP&R

“To ensure consistency among requirements for emergency arrangements, contingency plans and security plans of operating organizations specified by the regulatory body and by other competent authorities with responsibilities for regulating nuclear security, as relevant, and to ensure that these arrangements and plans are integrated”



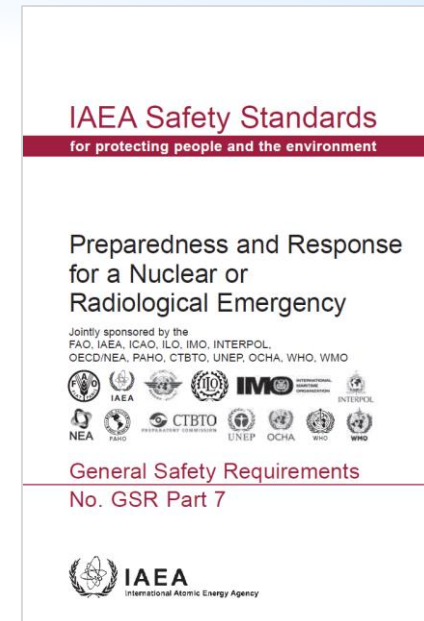
Relevant Requirements in GSR Part 7 (cont'd)



Requirement 4: Hazard assessment

“The government shall ensure that the hazard assessment include consideration of the results of threat assessments made for nuclear security purposes”

“The government shall ensure that a review of the hazard assessment is performed periodically with the aims of: [...] taking into account any changes in the hazards within the State and beyond its borders, any changes in assessments of threats for nuclear security purposes, the experience and lessons from research, operation and emergency exercises, and technological developments”



Consideration of Threat Assessment in Hazard Assessment per GSR Part 7

- An **emergency** can be caused by a **malicious act**, such as sabotage at a nuclear facility or explosion of RDD at a strategic location



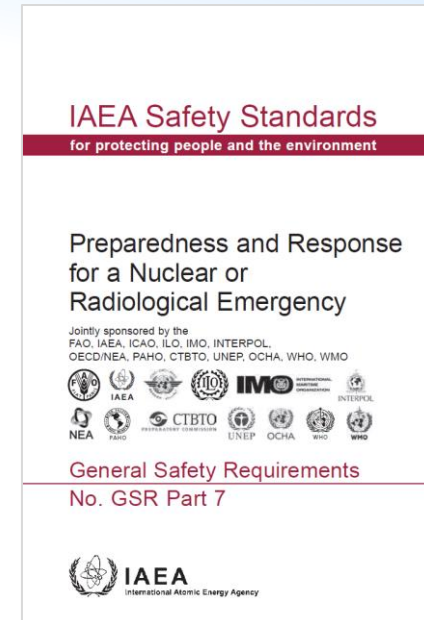
- **Results of the Threat Assessment** can be used to inform hazard assessment and emergency response planning
 - What may happen
 - Where it may happen
 - How it may happen
- Results of the threat assessment will enable to better characterize postulated emergency scenarios in which a nuclear security event is triggered and associated consequences

Relevant Requirements in GSR Part 7 (cont'd)



Requirement 6: Managing operations in an emergency response

“For facilities in categories I, II and III, arrangements shall be made for the on-site emergency response to be promptly executed and managed without impairing the performance of the continuing operational safety and security functions both at the facility and at any other facilities on the same site”

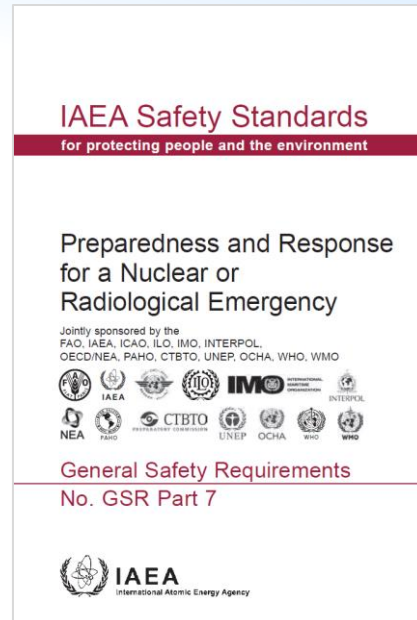


Relevant Requirements in GSR Part 7 (cont'd)



Requirement 6: Managing operations in an emergency response

“Arrangements for response to a nuclear or radiological emergency shall be **coordinated and integrated** with arrangements at the local, regional and national levels for response to a conventional emergency and to a nuclear security event. These arrangements shall take into consideration the fact that the initiator of the nuclear or radiological emergency may not be known early in the response”



Relevant Requirements in GSR Part 7 (cont'd)



Requirement 23:

Plans and procedures for emergency response

“Plans, procedures and other arrangements for effective emergency response, [...] shall be made for coordinating a national emergency response. The arrangements for a coordinated national emergency response:

- [...]
- Shall describe the coordination effected between these arrangements and the arrangements for response to a conventional emergency and to a nuclear security event”

IAEA Safety Standards

for protecting people and the environment

Preparedness and Response for a Nuclear or Radiological Emergency

Jointly sponsored by the
FAO, IAEA, ICAO, ILO, IMO, INTERPOL,
OECD/NEA, PAHO, CTBTO, UNEP, OCHA, WHO, WMO



General Safety Requirements

No. GSR Part 7



Nuclear Security Events Triggering Nuclear or Radiological Emergencies



- Loss, theft or found dangerous radioactive source
- Identifying presence of radiological dispersal device or its explosion
- Use of radiological exposure device in public domain
- Intentional contamination of food, drinking water or other products
- Sabotage or accident during transport of radioactive materials
- Severe overexposures during use of radiation related technologies

Emergencies Triggered by Nuclear Security Events: What may change?



- Emergency responders
 - Regularly responding to various types of emergency and used to means under which they are expected to work together
- Some priorities, for example
 - Preserving evidence vs removing hazardous material
- Public communications priorities and information that can be shared
 - Sensitive information should be timely identified and not disclosed

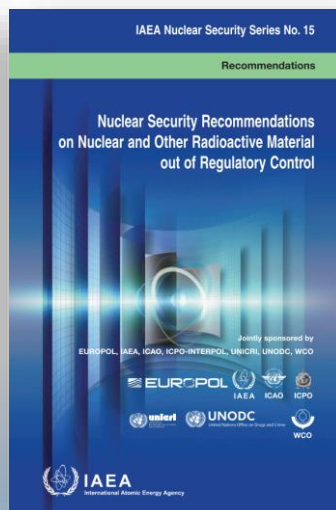
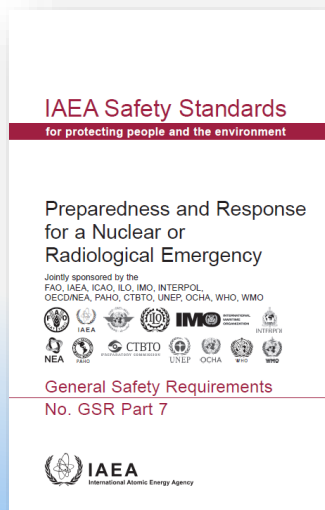
Other Considerations

- Emergency arrangements may be affected by nuclear security systems
 - e.g. access to vital areas might be restricted
- Functionality of nuclear security system may be affected in emergency response by emergency or by emergency arrangements
- Threat assessment may inform the hazard assessment and associated emergency planning
- Protection may need to be afforded to some EPR related sensitive information for nuclear security purposes

Where to Get More Information?



- Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015)
- Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 13, IAEA, Vienna (2011)
- Nuclear Security Recommendations on Radioactive Material and Associated Facilities, IAEA Nuclear Security Series No. 14, IAEA, Vienna (2011)
- Nuclear Security Recommendations on Nuclear and Other Radioactive Material out of Regulatory Control, IAEA Nuclear Security Series No. 15, IAEA, Vienna (2011)



iec.iaea.org
iec-information@iaea.org
@IAEAIEC



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Thank you!

