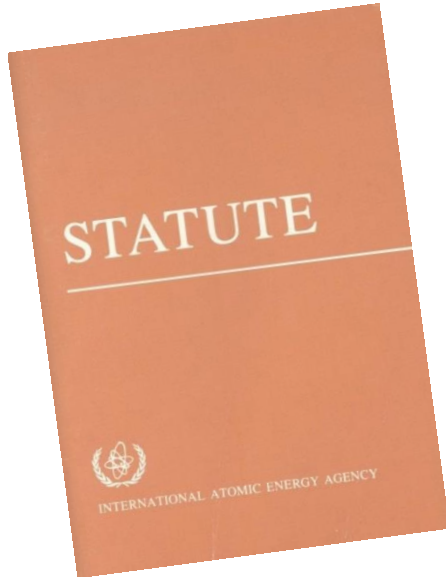


IAEA Safety Standards in the Area of Emergency Preparedness and Response: Reference Levels, Generic Criteria and Operational Criteria

International Conference on Radiation Safety
Improving Radiation Protection in Practice,
9 – 20 November 2020

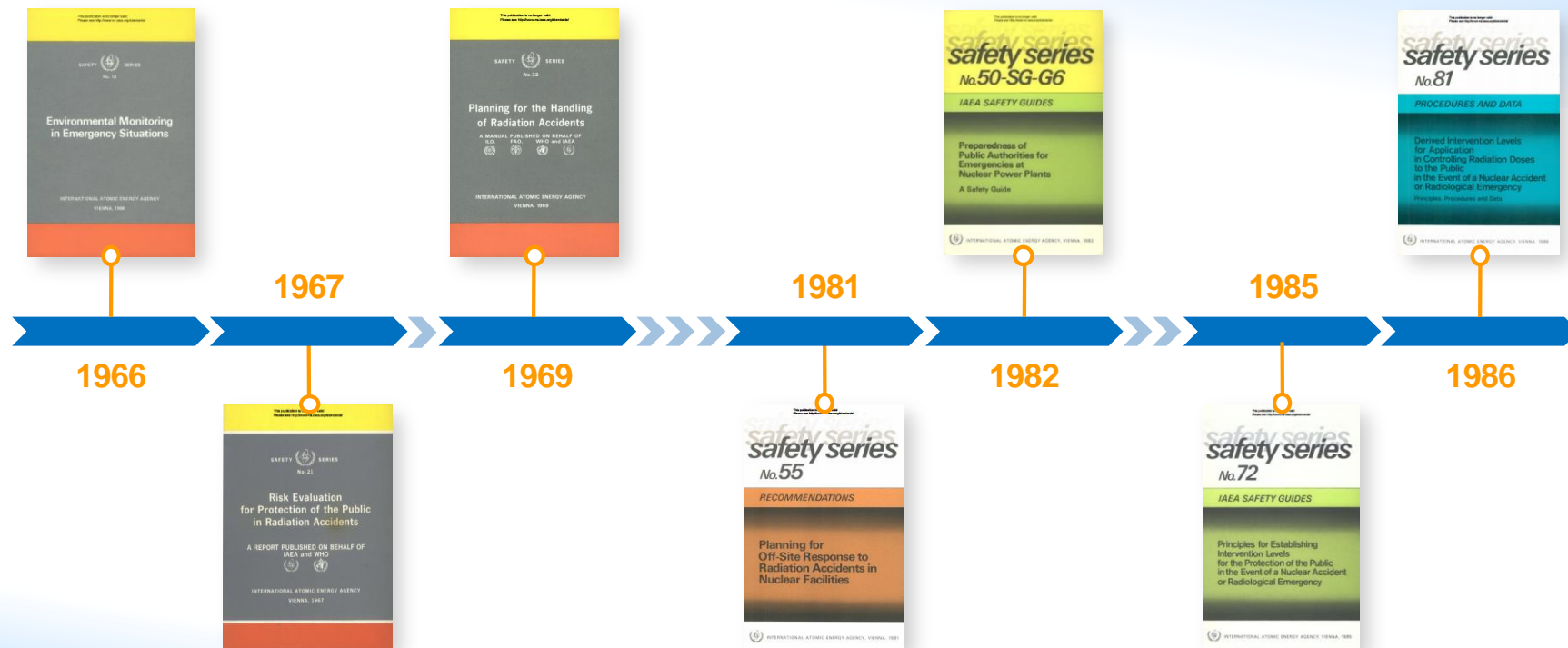
Elena Buglova
Head, IAEA's Incident and Emergency Centre

IAEA Safety Standards: Basis



- Under Article III.A.6 of its Statute, the IAEA is authorized:
 - *“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...”*

Evolution of IAEA Safety Standards in EPR



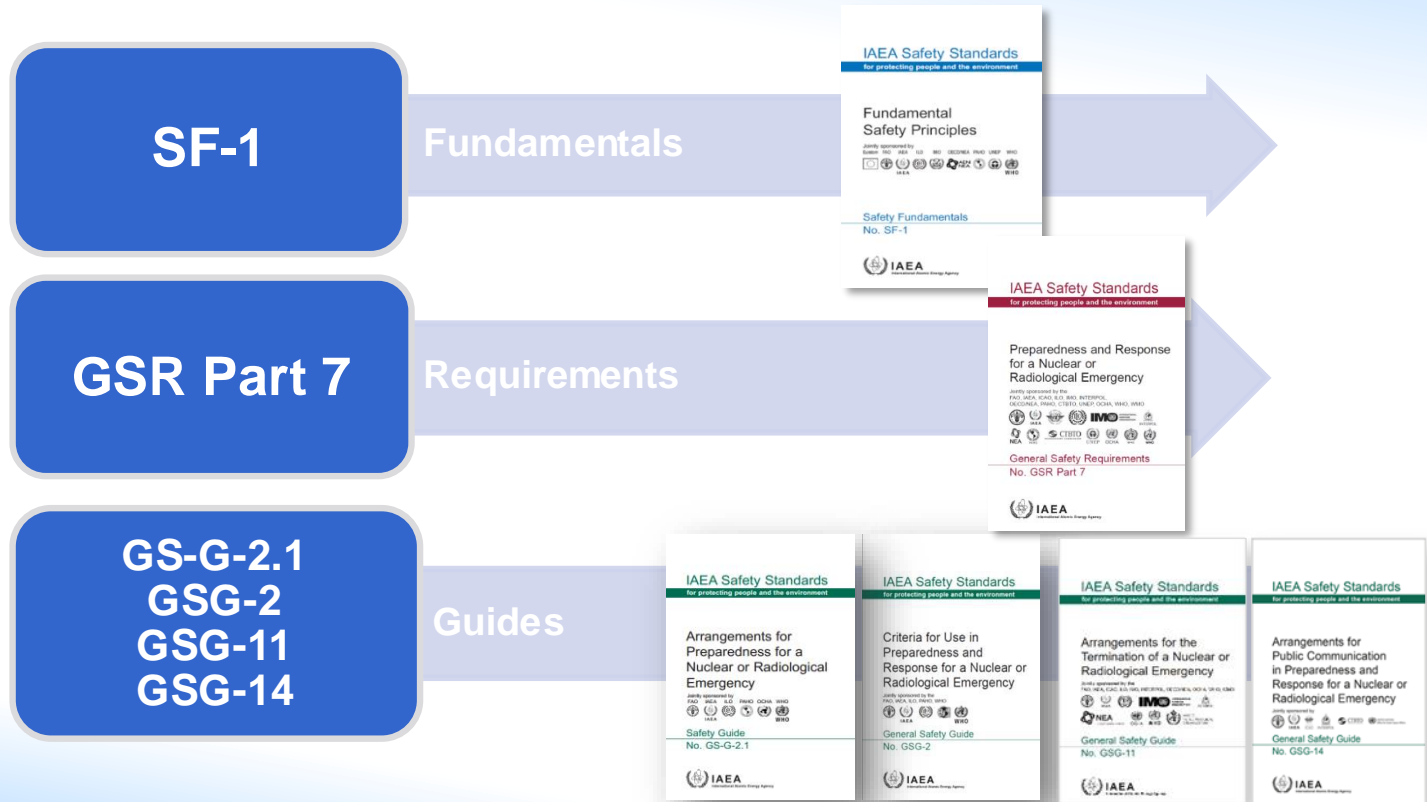
Evolution of IAEA Safety Standards in EPR (cont.)



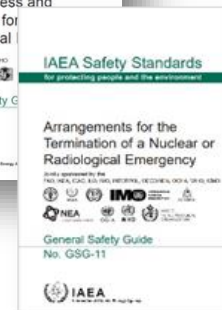
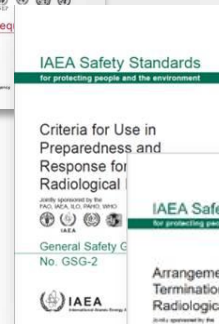
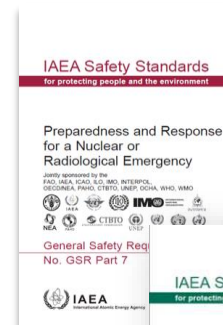
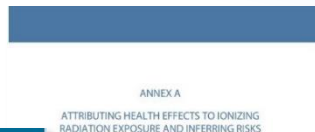
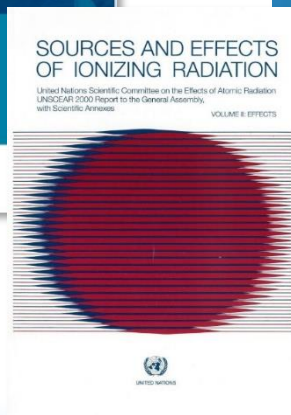
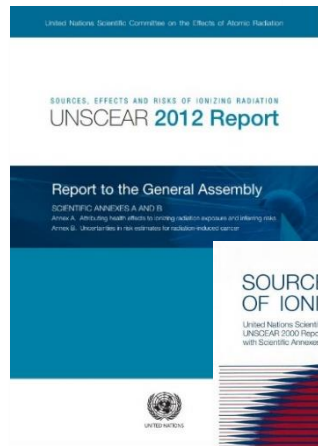
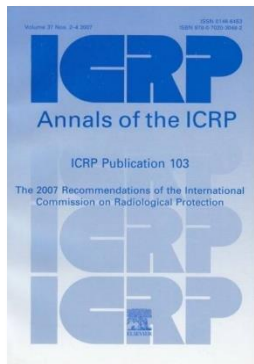
Evolution of IAEA Safety Standards in EPR (cont.)

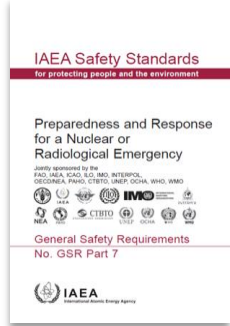


Safety Standards in EPR: Current Status



Development Process: Roles of Different Organizations





Reference Level

- Introduced by ICRP
- Level of dose:
 - Above which it is not appropriate to allow exposures to occur
 - Below which optimization of protection and safety would continue to be implemented
- Role: tool for optimization of protection
- Residual effective dose in the range 20 – 100 mSv, acute or annual, via all exposure pathways
 - Residual dose: dose expected to be incurred after protective actions have been terminated (or after decision has been taken not to take protective actions)

Reference Level

- Choosing the value for the reference level is dependent on prevailing conditions, such as:
 - Phase of the emergency
 - Practicality of reducing or preventing exposures to occur
 - Other circumstances
- Selecting lower levels for the reference level will not necessarily provide for better protection in consideration of other factors
- Consideration of the reference level alone may not be sufficient to provide for protection in an emergency response!

IAEA's Generic Criteria



- Generically justified and optimized (on radiological protection grounds) levels of projected dose, or dose that has been received, at which protective actions and other response actions are to be taken (individually or in combination)
 - Projected dose: dose that would be expected to be received if planned protective actions were not taken
 - Received dose: dose that is incurred after protective actions have been fully implemented (or decision has been taken not to implement any protective actions)
- Developed based on UNSCEAR data: current knowledge of deterministic and stochastic effects
 - low doses (less than 100-200 mGy)
 - Doses for severe deterministic effects or an observable increase in the incidence of cancer (even in a very large exposed group)

IAEA's Generic Criteria

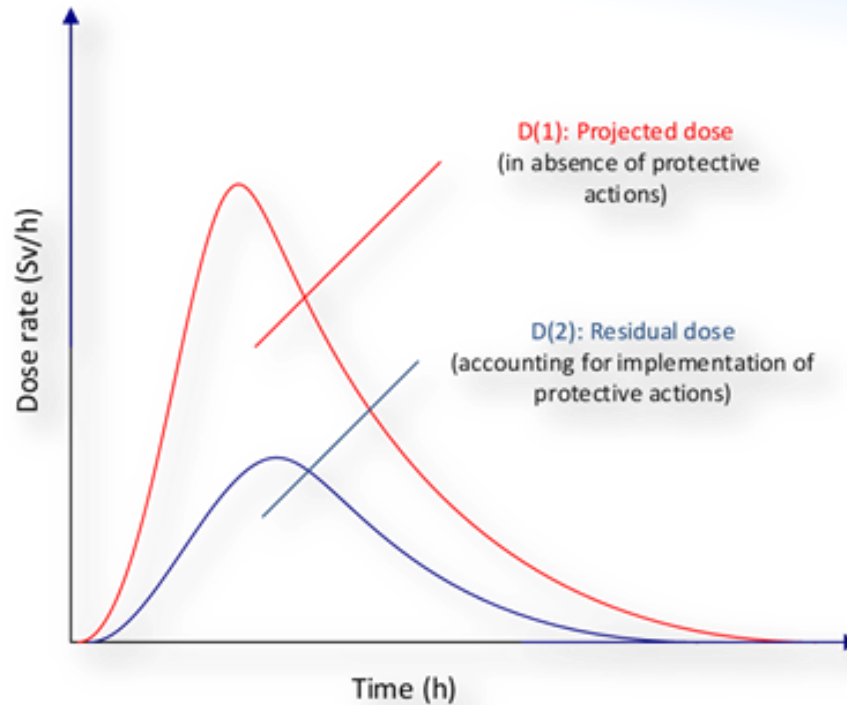


- Do not account for national / site specific circumstances
 - this needs to be considered when developing national criteria that are justified and optimized taking into account national circumstances
- Address both external and internal exposure from full range of important radionuclides
- Cover extended list of protective actions and other response actions

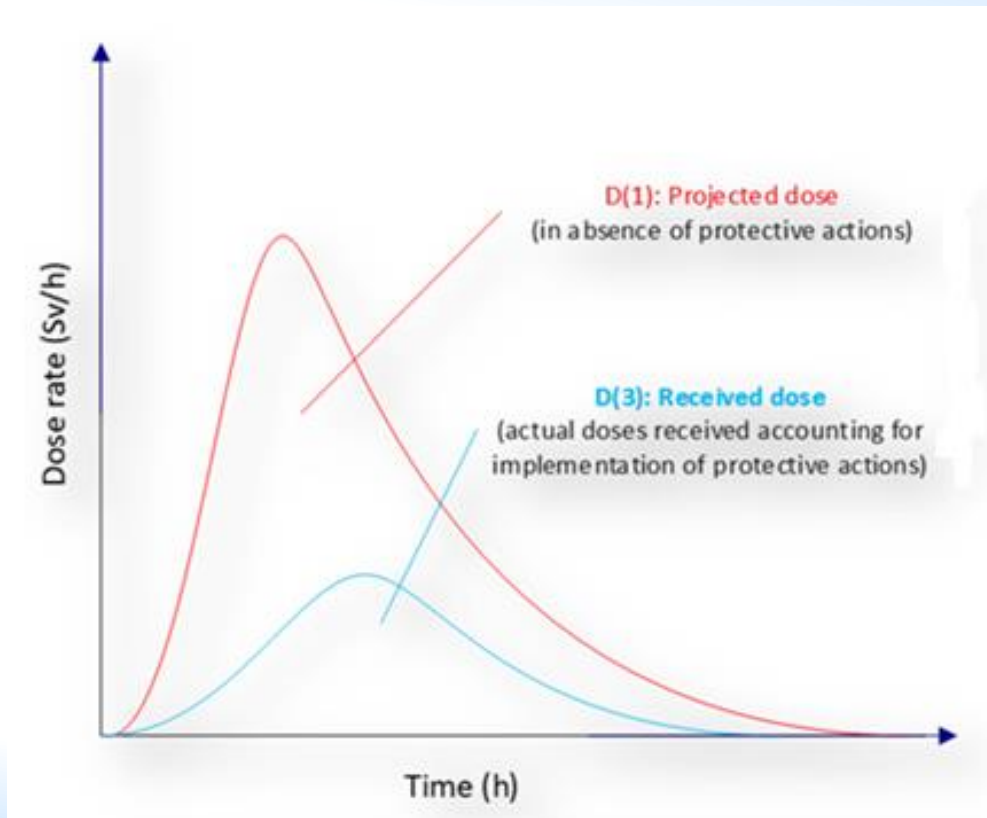
Health Effects and Other Effects

Types of possible consequences	Basis for implementation of protective actions and other response actions	
	Projected dose	Dose received
Severe deterministic effects	Precautionary urgent protective actions, even under adverse conditions, to prevent severe deterministic effects	Other response actions for treatment and management of severe deterministic effects
Increase in risk of stochastic effects	Urgent and early protective actions to reduce risk of stochastic effects as far as reasonably possible	Other response actions for early detection and effective management of stochastic effects
Adverse economic impact	Other response actions to reduce non-radiological consequences by providing basis for continuation or resumption of international trade	-

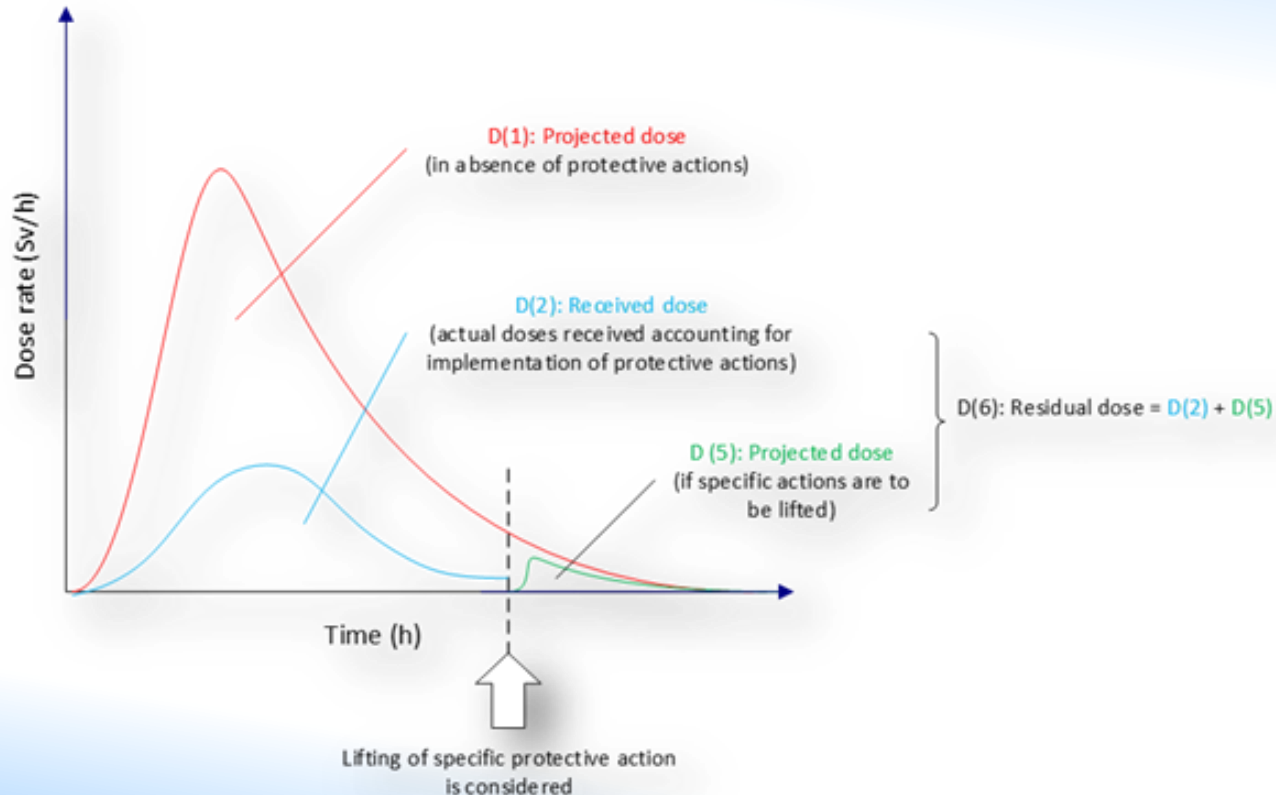
Preparedness stage



Response stage

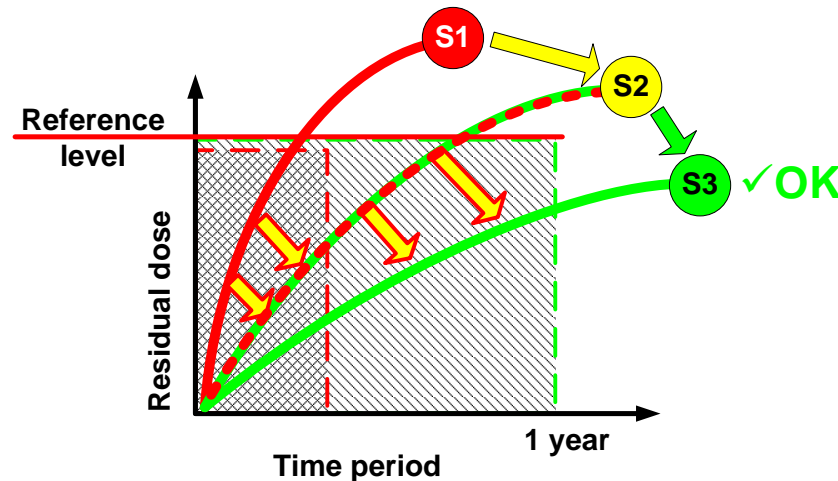


Response stage (cont.)

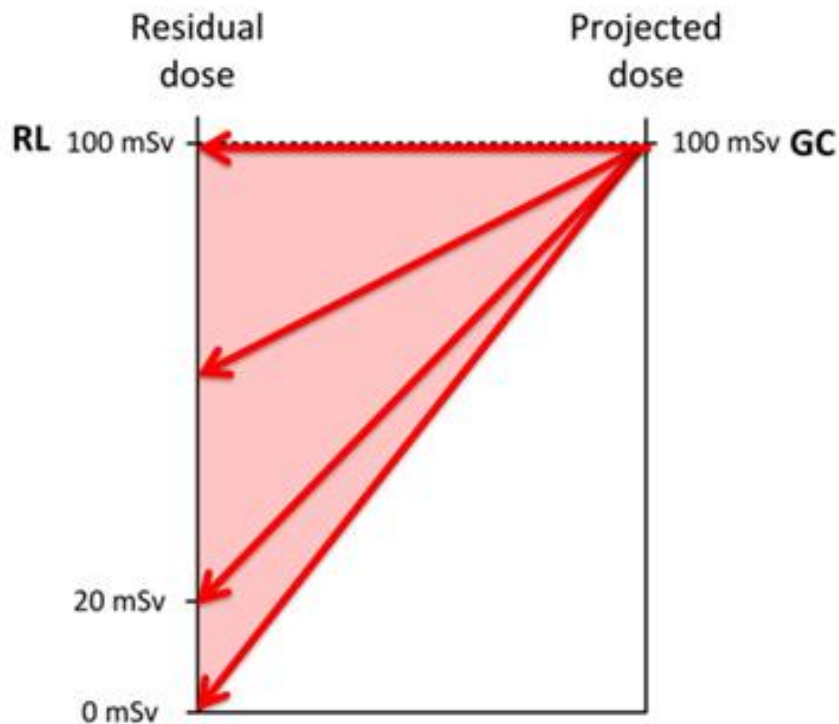


Optimization by using RL

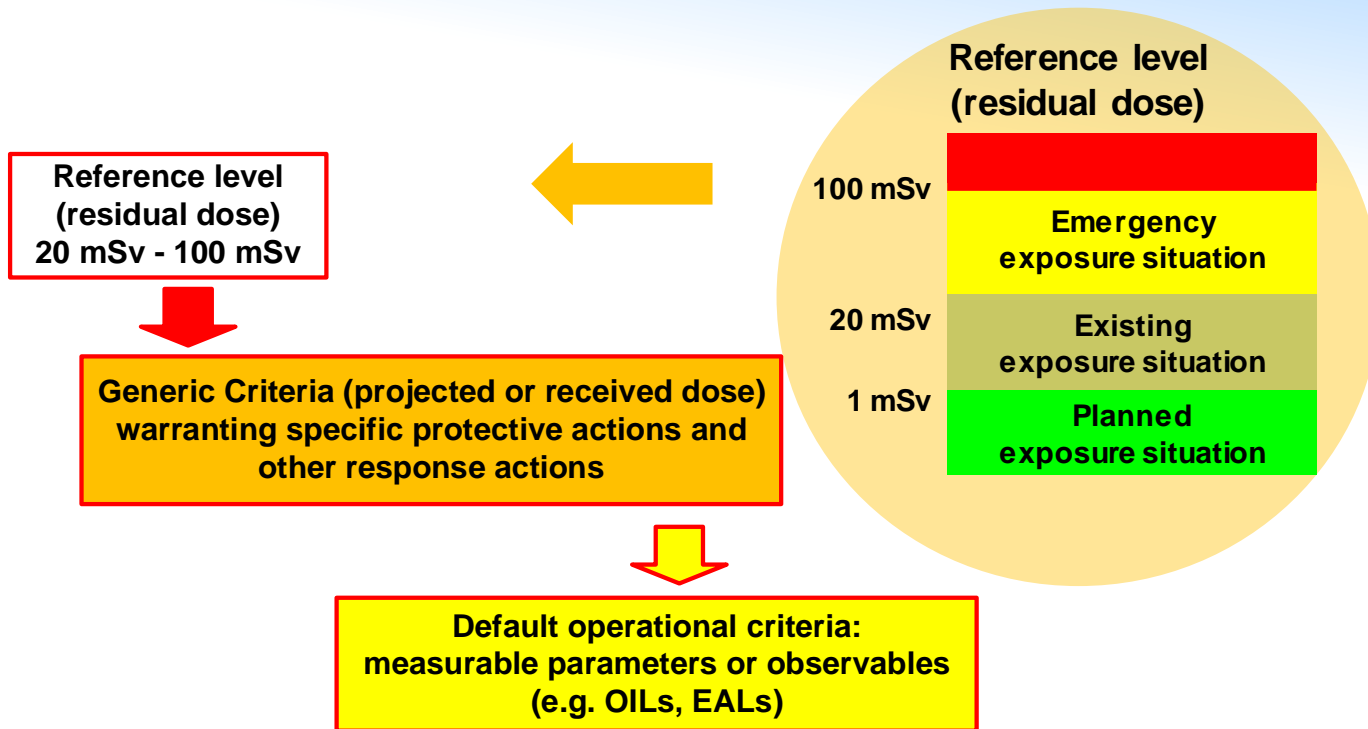
- RL during response used as benchmark for assessment of effectiveness of actions and strategy taken
- Priority is given to address exposures above RL with possibility for optimization of protection to continue to be implemented below RL as long as this is justified, i.e. does more good than harm



Choosing RL and GC



Protection Strategy



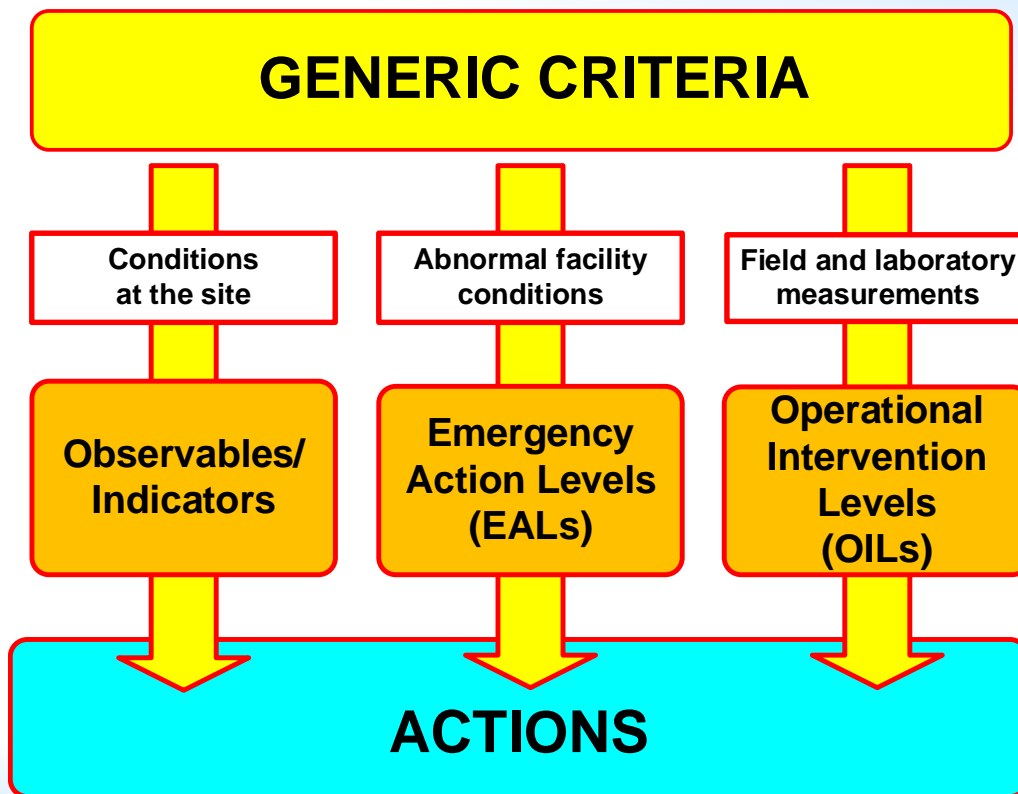
Operational Criteria

- Generic criteria cannot be used directly in response
 - They are based on projected or received dose which need to be calculated taking into account large number of considerations and uncertainties



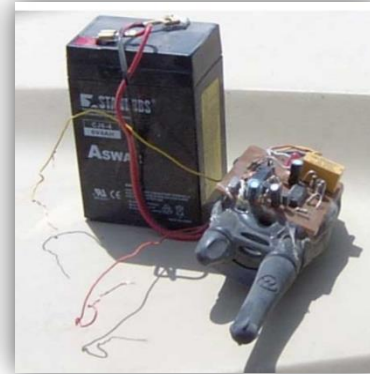
- Hence need to develop, at preparedness stage, derivations from generic criteria (i.e. operational criteria) that can be used directly in response

Operational Criteria (cont.)



Observables / Indicators

- e.g. fire, earthquake, loss of control,
- unshielded source, RTG, RDD

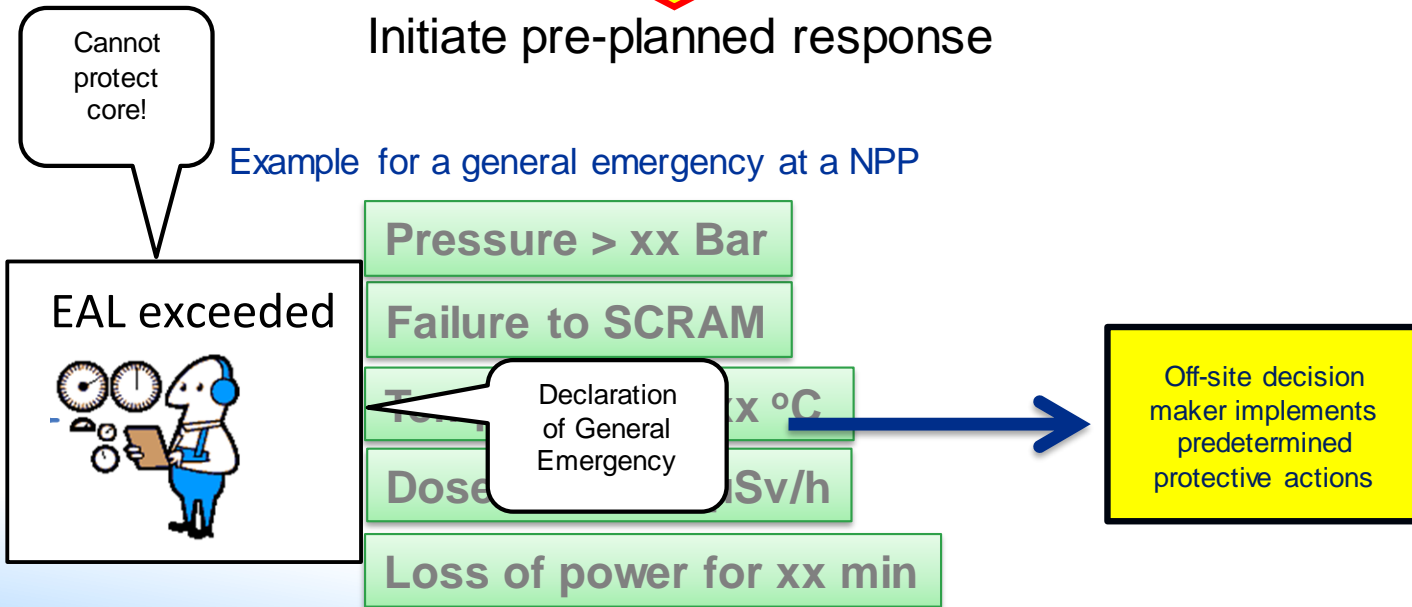


Emergency Action Levels

EALs are specific, predetermined and observable criteria to detect, recognize and determine the emergency class



Initiate pre-planned response



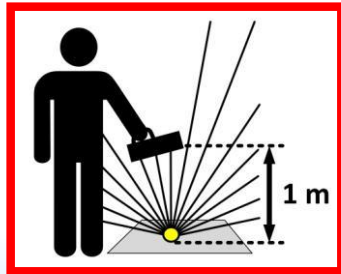
Operational Intervention Levels

OILs – predetermined default operational triggers for quantities that are measured by a field monitoring instrument or determined by laboratory analysis

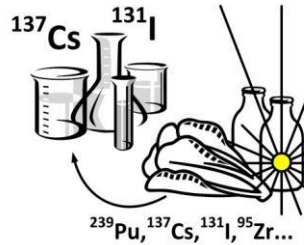


Protective and other response actions

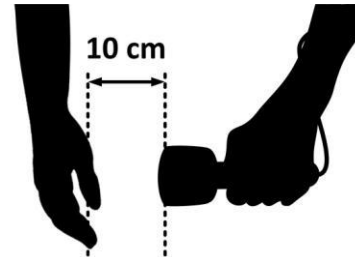
Dose rate above
the ground



Food and water
concentrations

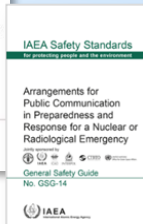
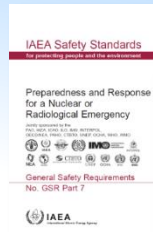
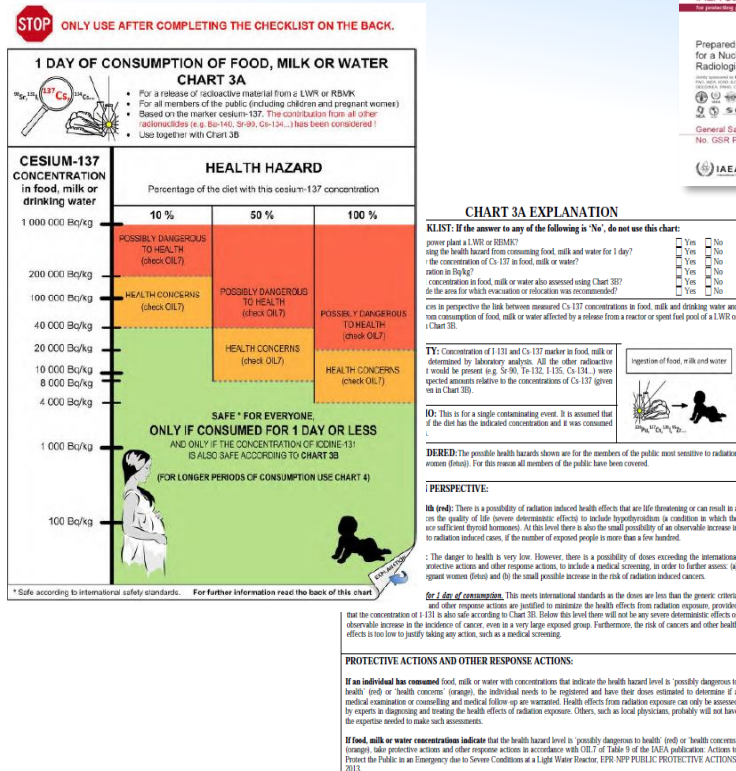


Dose rate from skin
contamination



Example Communication Tool

- Generic and Operational Criteria can be used to develop perspective charts to communicate health hazard to the public in an emergency



To conclude

- Importance of understanding concepts
 - Reference Level – Generic Criteria – Operational Criteria
- Use of appropriate concept for specific action
 - Inappropriate use will lead to inefficient response
- IAEA Safety Standards in EPR provide comprehensive ground and explain practical application



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Thank you!