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Actions to Mitigate the Consequences of Radiological or Nuclear Emergencies

IAEA-KINS Workshop on the Emergency Preparedness and Response to Nuclear and Radiological Emergencies

19 - 23 June 2023, Daejeon, Republic of Korea

Introduction

- Requirement 8: “*The government shall ensure that arrangements are in place for taking mitigatory actions in a nuclear or radiological emergency*”

Definition. Mitigating Action

- Action to **reduce** the severity or seriousness of an event, generally before the implementation of urgent or early public protective actions

Image courtesy IAEA

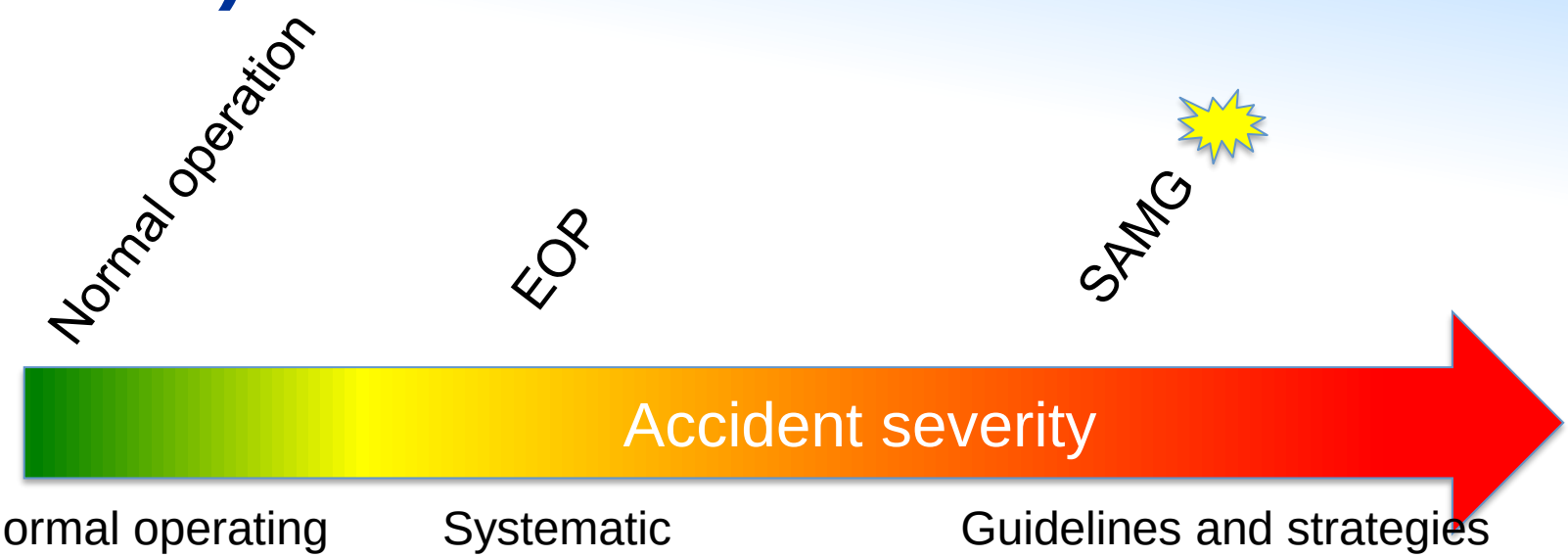
Discussion

- Can you give examples of actions that could mitigate the impact of a nuclear or radiological emergency?
- What advantages and disadvantages you see in these actions?

Mitigatory Actions for Nuclear Facilities

- Emergency operating procedures (**EOP**)
  - To control transients such as Loss of Coolant Accidents, reactivity excursions, system failures, etc.
- Severe Accident Management Guidelines (**SAMG**)
  - To prevent releases when EOPs don’t work anymore
- Firefighting
- Damage control

Severe Accident Management Guidelines (SAMG)



Normal operating procedures
Tested on simulator
Keep within safe operating envelope

Systematic procedures
Tested on simulator against anticipated accidents
Aim to prevent fuel damage and prevent releases

Guidelines and strategies
Flexible use of available equipment

Aim to limit core damage, protect the reactor vessel and reduces challenges to containment integrity

When SAMGs are triggered, the situation is serious

Challenges in Mitigation

- The facility organization is stressed to the limit
- A technical support centre is required
- External resources are required and need to integrate with the facility organization seamlessly

Image courtesy IAEA

- Special deployable equipment is required
- Communications is even more complex than usual

Storage and Research Facilities.Examples

- Fire
  - Firefighting
  - Onsite team
  - Offsite support
- Spill
  - Containment
  - Ventilation isolation
  - Drain isolation

Image courtesy IAEA

Challenges

- Facility capabilities are usually limited
- External firefighters required
  - They need to be trained
  - They need to be supported
  - They need protection and dosimetry
  - Emergency workers designation?
  - Facility support required
- What is the **procedure** outside working hours?

Mitigation for Transport Accidents

- Main mitigation actions are:
  - Firefighting
  - Containment of spills
  - Isolation of radioactive sources
  - Isolation of potentially contaminated bystanders

Image courtesy IAEA

Identification of Challenges

- Transporter is first to take action… if not incapacitated
- Witnesses and bystanders are first at the scene, but their mitigating capabilities are limited
  - They may worsen the situation and create (more) contamination
- First responders are first qualified responders at the scene
  - But can they identify the presence of radioactivity?
  - Do they know how to respond?
  - Will they respond if they know the scene is radioactive?

Challenges.What is Needed?

- Adequate **arrangements** for the transporter and the consignor to take prompt response actions at the scene
- Familiarization **program** and adequate **equipment** for all first responders
  - To recognize the presence of radiation
  - To take appropriate actions to contain the hazard

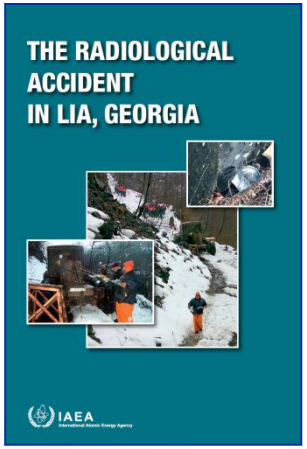
Other Emergencies Include

- Lost or stolen sources
- Found sources or contamination
- Security events involving radioactive material

Images courtesy IAEA

Mitigation Includes:

- Prompt **plans** to find the source
  - Integrated and coordinated response
  - Public information strategy
- **Shielding** and **isolation** when the source is found



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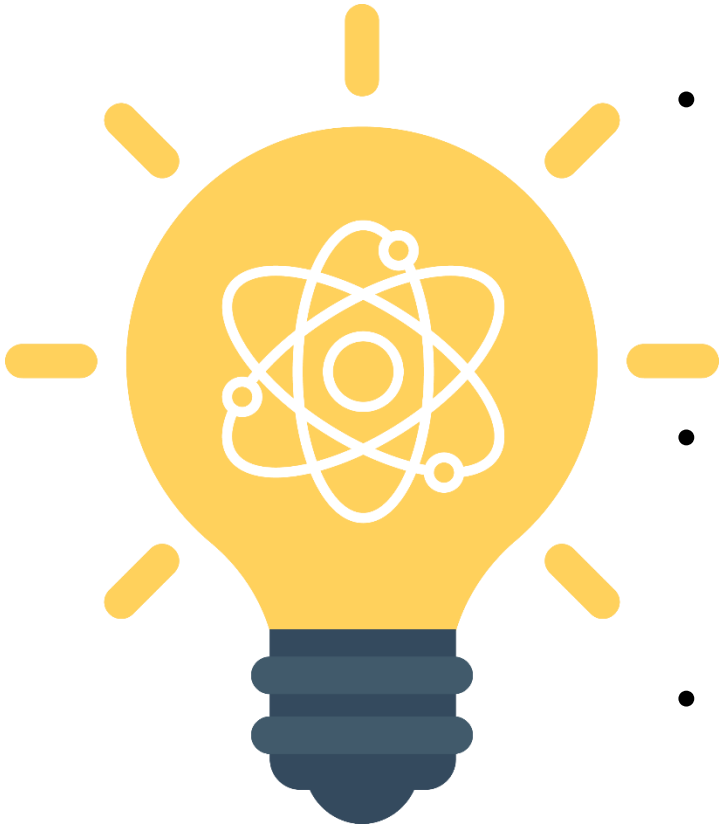
Key Points



- For nuclear facilities, mitigatory actions include EOP, SAMGs and firefighting
- For all facilities, arrangements with external resources must be in place
- For transport and other EPC IV events, external organizations must all have a basic knowledge of what to do when radioactivity is encountered

Where to Get More Information

- IAEA GSR Part 7 (2015)
- IAEA GS-G-2.1 (2007)
- IAEA EPR-Method (2003)
- IAEA NS-G-2.15 (2009)
- IAEA WS-G-6.1 (2006)

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Thank you!

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