IAEA Assessment Tools for Nuclear and Radiological Emergencies

Potential for the Development of Assessment Tools for Emergencies during Nuclear/Radiological Decommissioning Activities

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Background on the IAEA Incident and Emergency Centre
Roles and Responsibilities in Response

- Notification and official information exchange: USIE
- Provision of public information
- Assessment of potential emergency consequences and prognosis of possible emergency progression
- Provision of assistance on request
- Coordination of inter-agency response: IACRNE
Response Structure

Director General

DDG-NS

IES Steering Group
Policy matters and oversight

Warning Point
Security Control Centre of UNSSS

On-Call System
Initial response to incoming message

IEC

On-Duty System
Call-out list

ON-CALL:
- Emergency Response Manager
- Logistics Support Officer
- Radiation Safety Specialist
- Nuclear Installation Safety Specialist
- Nuclear Security Specialist
- External Event Specialist
- Public Information Officer
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Development of Tools to Support Assessment and Prognosis during any Nuclear or Radiological Emergency
Assessment and Prognosis

• Lesson from Fukushima Daiichi accident
  Assessment of potential consequences and prognosis of likely emergency progression

IAEA Action Plan on Nuclear Safety

‘Enhance transparency and effectiveness of communication and improve dissemination of information’

• “The IAEA Secretariat to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information during a nuclear emergency on its potential consequences, including analysis of available information and prognosis of possible scenarios based on evidence, scientific knowledge and the capabilities of Member States.”
Example of Clear Public Messages

…the Mexican authorities and the IAEA believe the general public is safe and will remain safe

…[IAEA] believes the actions taken in response to the discovery of the source are appropriate and follow Agency guidance for this type of event
Challenges

• Assessment and prognosis needs to be based on IAEA Safety Standards

• Wide range of potential accident scenarios
  – Nuclear power plants emergencies (many potential technologies could be involved)
  – Radiological emergencies
  – Nuc/Rad emergencies triggered by nuclear security events

• Outputs from the IAEA Technical Team need to be consistent for each shift, scientifically accurate and high quality
Customized Assessment Tools and Procedures

- Based on experience gained during responses and exercises, IAEA has developed scenario specific assessment tools:
  - Reactor Assessment Tool
  - Protective Actions Assessment Tool
  - Internal/external Dose Assessment Tool
  - Radiological Source Assessment Tool
  - Others are actively in development
Example: IAEA Reactor Assessment Tool

Welcome to Reactor Assessment Tool

The IAEA Reactor Assessment Tool suite has been designed to assist in the process of capturing essential information during an emergency at a nuclear power or research reactor. This tool has been designed to assist an expert user to perform a high level assessment of critical safety functions during an emergency for BWR, PWR, VVER, PHWR and Research Reactor technology. This tool is intended to be used by expert users who have been trained in its applicability.

- **Pressurized Water Reactor**
  - The PWR module of the Reactor Assessment Tool is intended to be used with the most commonly available PWR technologies (except for VVER based which have their own module).
  - [PWR](#) [Instructions](#)

- **Boiling Water Reactor**
  - The BWR module of the Reactor Assessment Tool is intended to be used with the most commonly available BWR technologies.
  - [BWR](#) [Instructions](#)

- **Pressurized Heavy Water Reactor**
  - The PHWR module of the Reactor Assessment Tool is intended to be used with the most commonly available PHWR technologies including CANDU (CANada Deuterium Uranium) reactors.
  - [PHWR/CANDU](#) [Instructions](#)

- **Water-Water Energetic Reactor**
  - The VVER (WWER) module of the Reactor Assessment Tool is a modified version of the PWR module intended for use when assessing any VVER technology.
  - [VVER](#) [Instructions](#)

- **Generic Reactor**
  - The Generic Reactor module of the Reactor Assessment Tool is intended to be used for the assessment of nuclear reactor technology that is not properly covered by the other modules. If you are evaluating a reactor and are unsure which module to select, this should be chosen.
  - [Generic Reactor](#) [Instructions](#)

- **Research Reactor**
  - The Research Reactor module of the Reactor Assessment Tool is intended for use when assessing any Research Reactor. Due to the variability between the different designs, this module has been deliberately made to be generic and applicable to most designs.
  - [Research Reactor](#) [Instructions](#)
Example: Critical Safety Function Assessment

Generic Reactor Assessment

This is the IAEA Reactor Assessment Tool. Follow the step by step process and answer the questions as best you can. Press the button at the bottom to capture your results in a report.

Event details

In this section you will enter basic information about the event details. This information will be automatically filled into the Reactor Assessment Report which is generated at the end of this process.

Country: Germany
Name of facility: Essenbach
Reactor unit being assessed: Unit 1

IAEA Reactor Assessment Tool Summary

Emergency Classification Alert
IAEA Emergency Classification Site Area Emergency

This report was generated at (UTC):

![Diagram of reactor components and status indicators]
Example: Communication of Emergency Monitoring Data
Example: Communication of Emergency Monitoring Data
Example: Communication of Measurement Scenario
Example: Communication of Measurement Scenario

Communicating the geometry of a measurement scenario

- 50 cm from the bar
- 100 cm from the bar
- 200 cm from the bar

- 50 cm from the bar
- 100 cm from the bar
- 200 cm from the bar
Example: Communication of Dose Calculation Scenario

Mid-chest

Hand/fingers
Future Direction

• Improve public communication capabilities
• Enhanced event timeline tracking
  – 3d reactor modelling and communication
• Simplified Gaussian based modelling for short field dispersions (e.g. RDD)
• Database of release terms
• Development of unique scenario assessment tools (e.g. decommissioning, UF6)
Example: 3d Communication

Material can be prepared in preparedness phase to explain technology
Example: 3d Communication

This same material can be used to support emergency evolution communication.
Example: 3d Communication

07:05 UTC
Diesel generator failure
Example: 3d Communication

10:15 UTC
Onsite monitoring indicates readings > 10 mSv/h

10:15 UTC
Offsite monitoring indicates readings > 1 mSv/h
Decommissioning Accident Scenarios?

• Scenarios during decommissioning operations can be unique compared to routine operations. For discussion:
  – What types of scenarios are possible?
  – Which scenarios are considered highest consequence?
  – Which scenarios are considered most likely?
  – Is there a potential to develop (or use existing) tools in this area?
Thank you!

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Additional images
Example: 3d Communication
Example: Flowcharts

- Process Overview
- Event Classification Process during an Emergency at a Nuclear Power Plant
- Critical Safety Function Assessment and Prognosis for a Severe Accident at a Nuclear Power Plant
- Nuclear Installations Specialist Assessment Process for an Emergency at a Nuclear Power Plant
- Supporting Technical Material

**TECDOC-955: LWR Procedure A2 - Assessment of core or spent fuel damage**

**Supporting Material for Nuclear Installations Specialist Assessment Process for an Emergency at a Nuclear Power Plant**
Example: Critical Safety Function Assessment

Event details

In this section you will enter basic information about the event details. This information will be automatically filled into the Reactor Assessment Report which is generated at the end of this process.

Country
Select Country

Name of facility

Reactor unit being assessed

EMERGENCY CLASSIFICATION ASSESSMENT

CRITICAL SAFETY FUNCTIONS AND KEY BARRIERS

RELEASE

SAFETY AND AUXILIARY SYSTEM STATUS

The purpose of this section is to focus the Technical Team to consider the current status of safety and auxiliary systems. The evaluation of the technical team in this section should support and complement the evaluation of the critical safety functions. Once this section is complete, the Technical Team should consider if their answers support the answers provided in the next section and the previous section.

Is there power available?

Justification (Optional)

ELECTRIC POWER

Spent fuel conditions

Justification (Optional)

Radiological release conditioning and monitoring

Justification (Optional)

SITUATION PROGNOSIS

Download Word Report  Download PDF Report
Example: Visual Outputs
Example of Clear Public Messages

Based on these reports and the information that has been made available, the IAEA considers the public is safe and sees no reason why this should not continue to be the case in the future.

...[IAEA] considers that the food supply chain is safely under control. The food supply in Japan remains safe.
Incident and Emergency Centre (IEC)

Global focal point for emergency preparedness and response for nuclear and radiological safety or security related emergencies, threats or events of media interest and world’s centre for coordination of international emergency preparedness and response assistance
Example: Communication of Emergency Monitoring Data
Example: Communication of Emergency Monitoring Data

Former display and assessment system called EMIDS
Example: Automatic Report Generation Leads to Consistent Quality Output