IAEA
International Atomic Energy Agency

Workshop on the Application of the Concept of Defence in Depth and Practical Elimination

IAEA Headquarters, Vienna, Austria

and virtual participation via MS Teams

15-18 July 2025

Ref. No.: EVT2404119

Hybrid event

Information Sheet

Introduction

Defence in depth is a fundamental concept in nuclear safety that involves creating multiple, independent layers of protection to prevent accidents and mitigate their consequences if they occur. This aims to ensure that if one layer fails, others will still be in place to achieve the fundamental safety objective of protecting people and society from harmful effects of ionising radiation, and the fundamental safety principle (number 8) of making all practical efforts to prevent and mitigate nuclear or radiation accidents (IAEA Safety Standards, Safety Fundamentals No. SF-1). One of the key aspects of defence in depth is the independence among the layers, in particular between the third layer, focused on control of accidents within the severity level of design basis accidents, and the fourth, focused on prevention and mitigation of the progression of accidents with severe consequences. With the aim to fulfil the independence between these two layers, the IAEA Specific Safety Requirements for Nuclear Power Plants: Design (SSR-2/1) introduced the concept of 'design extension conditions' and the associated additional safety features to be required in the design, together with the acknowledgment of the concept of 'practical elimination' (of plant event sequences that could lead to an early radioactive release or a large radioactive release).

The concept of practical elimination in nuclear safety has evolved since it was first introduced. The idea of 'practical elimination' was suggested in the 1996 report INSAG-10, concerning the elimination of possible weaknesses in defence in depth. In this context, INSAG-10 discussed strengthening the containment function for advanced reactors; it indicates that by using probabilistic and deterministic means certain severe accident scenarios that could lead to large radioactive releases due to early containment failure would be demonstrated to be essentially eliminated with a high degree of confidence. The term later became 'practical elimination'.

Following INSAG-10, the concepts of practical elimination and design extension conditions were further developed and refined through various international safety standards and guidelines. The International Atomic Energy Agency (IAEA) played a crucial role in this process by publishing SSR-2/1 (Rev.1) in 2016 that provided detailed requirements on achieving practical elimination and implementing additional safety features for design extension conditions in nuclear power plant designs. This publication aims to enhance the understanding of the interconnections between the defence-in-depth concept, design extension conditions, and practical elimination, which are key components of the overall safety approach for nuclear power plants. IAEA's Specific Safety Guide No. SSG-88, published in 2024, marked a significant milestone in achieving consensus on the guidance related to practical elimination and design extension conditions. SSG-88 outlines the necessary steps to demonstrate that certain accident scenarios have been practically eliminated, including the use of advanced safety features, thorough safety assessments, and continuous improvement of safety measures, thereby enhancing global nuclear safety.

Objectives

The purpose of the event is to disseminate Design Extension Conditions and the Concept of Practical Elimination in the Design of Nuclear Power Plants (IAEA Safety Standards Series No. SSG-88) on the implementation of the concepts of defence in depth and the practical elimination of plant event sequences that could lead to an early or large radioactive release from nuclear power plants.

The event will provide a forum for nuclear power plant designers, operators, technical support organizations, and regulators to become familiar with the concepts of defence in depth, practical elimination and design extension conditions and their interrelations. Additionally, the event will cover the methodology to demonstrate the implementation of practical elimination in the design of nuclear power plants for those plant event sequences that could lead to large or early radioactive releases.

Target Audience

The event is open to representatives of nuclear power organizations from Member States with an active nuclear power programme, from embarking countries that have undertaken activities to implement their first nuclear power plant, and from Member States with active programmes for the design of advanced nuclear reactors. It includes government organizations (policymakers, analysts, regulatory bodies and research and development agencies), and industry (vendors, engineering companies, plant operators and technology developers).

Working Language(s)

English.

Expected Outputs

The expected output of this event is enhanced knowledge in participating Member States in the understanding of the concepts of defence in depth, practical elimination and design extension conditions, their interrelationships, and the methodology for implementing practical elimination in the design of nuclear power plants, including the use of deterministic and probabilistic approaches and engineering judgement for that purpose.

Topics

The event will address aspects related to the implementation and substantiation of design solutions to achieve practical elimination of nuclear power plant event sequences that could lead to an early radioactive release or a large radioactive release, such as:

- Interrelations among design extension conditions, practical elimination and defence in depth.
- Methods, challenges and solutions for identifying plant event sequences that could lead to early radioactive releases or large radioactive releases:
    - Use of phenomenological (top-down) and of sequence oriented (bottom-up) approaches;
    - Use of advanced simulation tools;
    - Consideration of operating experience feedback.
- Design implementation of additional safety features to prevent and mitigate plant event sequences that could lead to early radioactive releases or large radioactive releases:
    - The role of research activities to support the definition of design basis for additional safety features;
    - Application of design basis for additional safety features, such as single failure criterion, fail safe, protection against common cause failures, design limits and adequate safety margins.
- Use of engineering judgement, and deterministic and probabilistic safety approaches to substantiate the effective implementation of additional safety features to achieve practical elimination:
    - The role of engineering judgement, and of deterministic and probabilistic approaches;
    - Determining reasonably practicable safety provisions to achieve practical elimination;
    - The use of cut-off probabilistic values.
- Member State experiences in, and regulatory perspectives on, the implementation of ‘practical elimination’.

Participation and Registration

All persons wishing to participate in the event have to be designated by an IAEA Member State or should be members of organizations that have been invited to attend.

In order to be designated by an IAEA Member State or invited organization, participants are requested to submit their application via the InTouch+ platform (https://intouchplus.iaea.org) to the competent national authority (Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or organization for onward transmission to the IAEA by **30 April 2025**, following the registration procedure in InTouch+:

1. Access the InTouch+ platform (https://intouchplus.iaea.org):
    - Persons with an existing NUCLEUS account can sign in to the platform with their username and password;
    - Persons without an existing NUCLEUS account can register here.
2. Once signed in, prospective participants can use the InTouch+ platform to:
    - Complete or update their personal details under 'Complete Profile' and upload the relevant supporting documents;
    - Search for the relevant event under the 'My Eligible Events' tab;
    - Select the Member State or invited organization they want to represent from the drop-down menu entitled 'Designating Authority' (if an invited organization is not listed, please contact InTouchPlus.Contact-Point@iaea.org);
    - If applicable, indicate whether financial support is requested and complete the relevant information (this is not applicable to participants from invited organizations);
    - Based on the data input, the InTouch+ platform will automatically generate the Participation Form (Form A) and/or the Grant Application Form (Form C);
    - Submit their application.

Once submitted through the InTouch+ platform, the application, together with the auto-generated form(s), will be transmitted automatically to the required authority for approval. If approved, the application, together with the applicable form(s), will automatically be sent to the IAEA through the online platform.

NOTE: The application for financial support should be made, together with the submission of the application, by **30 April 2025**.
For additional information on how to apply for an event, please refer to the InTouch+ Help page. Any other issues or queries related to InTouch+ can be sent to InTouchPlus.Contact-Point@iaea.org.
Selected participants will be informed in due course of the procedures to be followed with regard to administrative and financial matters.

Participants are hereby informed that the personal data they submit will be processed in line with the Agency's Personal Data and Privacy Policy and are collected solely for the purpose(s) of reviewing and assessing the application and to complete logistical arrangements where required. The IAEA may also use the contact details of Applicants to inform them of the IAEA's scientific and technical publications, or the latest employment opportunities and current open vacancies at the IAEA. These secondary purposes are consistent with the IAEA's mandate. Further information can be found in the Data Processing Notice concerning IAEA InTouch+ platform.

Papers and Presentations

The IAEA encourages participants to give presentations on the work of their respective institutions that falls under the topics listed above.

Participants who wish to give presentations are requested to submit an abstract of their work. The abstract will be reviewed as part of the selection process for presentations. The abstract should be in A4 page format, should extend to no more than 2 pages (including figures and tables) and should not exceed 500 words. It should be sent electronically to Mr Jorge Luis Hernández the Scientific Secretary of the event (see contact details below), not later than **30 April 2025**. Authors will be notified of the acceptance of their proposed presentations by **30 May 2025**.

In addition to the registration already submitted through the InTouch+ platform, participants have to submit the abstract together with the Participation Form (Form A) to their competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or their organization for onward transmission to the IAEA not later than **30 April 2025**.

Expenditures and Grants

No registration fee is charged to participants.

The IAEA is generally not in a position to bear the travel and other costs of participants in the event. The IAEA has, however, limited funds at its disposal to help meet the cost of attendance of certain participants. Upon specific request, such assistance may be offered to normally one participant per country, provided that, in the IAEA's view, the participant will make an important contribution to the event.

The application for financial support should be made, together with the submission of the application, by **30 April 2025**.

Venue

The event will be held at the Vienna International Centre (VIC), where the IAEA's Headquarters are located. Participants must make their own travel and accommodation arrangements. General information on the VIC and other practical details, such as a list of hotels offering a reduced rate for IAEA participants, are listed on the following IAEA web page: www.iaea.org/events.

Participants are advised to arrive at Checkpoint 1/Gate 1 of the VIC one hour before the start of the event on the first day in order to allow for timely registration. Participants will need to present an official photo identification document in order to be admitted to the VIC premises.

Visas

Participants who require a visa to enter Austria should submit the necessary application to the nearest diplomatic or consular representative of Austria at least four weeks before they travel to Austria. Since Austria is a Schengen State, persons requiring a visa will have to apply for a Schengen visa. In States where Austria has no diplomatic mission, visas can be obtained from the consular authority of a Schengen Partner State representing Austria in the country in question.

IAEA Contacts

Scientific Secretary:

Mr Jorge Luis Hernandez
Division of Nuclear Installation Safety
Department of Nuclear Safety and Security
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA
Tel.: +43 1 2600 24568
Email: J.Luis-Hernandez@iaea.org

Administrative Secretary:

Ms Michaela Milanovic Bujnova
Division of Nuclear Installation Safety
Department of Nuclear Safety and Security
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA
Tel.: +43 1 2600 22519
Email: m.milanovic-bujnova@iaea.org

Subsequent correspondence on scientific matters should be sent to the Scientific Secretary and correspondence on other matters related to the event to the Administrative Secretary.

Event Web Page

Please visit the following IAEA web page regularly for new information regarding this event:

https://www.iaea.org/events/EVT2404119