Technical Meeting on the Probabilistic Safety Assessment Framework for External Events

IAEA Headquarters
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Information Sheet
A. Introduction

The safety of nuclear installations has always been a priority for Member States utilizing nuclear power. It is an undeniable fact, as highlighted by recent experience, that severe natural hazards can at times affect the safety of nuclear installations. The need to address these rare but severe events, which have a low probability of occurrence within the life cycle of a nuclear power plant (NPP), but which can have severe consequences, especially when such events occur in tandem with other induced events, has been amply underscored by the accident at the Fukushima Daiichi NPP in March 2011. Awareness of this serious issue would in the past be undermined by screening processes based on low frequency events. It was difficult for people to convince themselves that such infrequent events with so significant potential consequences could actually happen.

Past efforts to comprehend such scenarios were often flawed by the scarcity of knowledge about such events. Events of such magnitude that had occurred, in the distant past, were often buried by the history of later less severe events or preserved in places that were not likely to be investigated when researching for such information. Thus, creating credible deterministic scenarios was not only difficult but quite incomprehensibly justifiable when created.

A more logical and systematic approach to postulating these infrequent but severe events is by the use of probabilistic models. All models have a certain advantage as they can be calibrated and validated using data gathered from events that have already occurred, but the probabilistic models allow one, in addition, to account for and integrate uncertainty as it arises in each step of the process. Such models also allow one to project this knowledge from the past into the future with its associated uncertainty.

As we reduce uncertainty using data from new observations and experience related to specific hazards, we become more certain of our predictions. Thus, a more logical approach towards predicting the consequences of future events has informed the development of external event hazard assessment methodology. It is now possible to use the past experience to predict the future expectations, with a quantified level of uncertainty or certainty as one may want to see it.

Over the past decade, this approach has been successfully used in seismic hazard assessment for NPPs. Probabilistic seismic hazard analysis (PSHA) is a technique that many experts are familiar with, and which has been used at several NPP sites around the world. The probabilistic assessment of seismic hazards has benefitted from checks against deterministic estimates based on actual occurrences and recordings of seismic activity throughout the world. This has allowed the further development of the seismic probabilistic safety assessment (SPSA) methodology. However, this methodology is not very much used for hazards such as high winds, flooding, tsunami, and others that have the potential to impact on NPPs.

The advances in the area of seismic evaluation of NPPs were not extended to other hazards as it was deemed that such hazards did not play a dominant role in the risk matrix of an NPP. This assumption was proven incorrect by the Fukushima Daiichi accident. The accident illustrated that a combination of infrequent events could impose two hazards simultaneously on the facility, thereby imposing a far greater demand on the installation than a mere summation of the individual demands. The effect of the non-seismic hazard may well have far exceeded that of the seismic shaking hazard. This realization prompted the International Atomic Energy Agency (IAEA) Member States participating in the Extrabudgetary Programme of the International Seismic Safety Centre (ISSC-EBP) to work on the development of probabilistic methodologies for the assessment of other hazards that affect NPPs. It is envisaged that, as a result of this work, a new set of tools will become available to the owners and
regulators of NPPs that can help them to perform safety assessments for hazard levels and event frequencies hitherto not practical.

This meeting affords an opportunity for Member State representatives to learn about the work carried out within the framework of the ISSC-EBP on the development of probabilistic methodologies for external events, to discuss how they can utilize this work in their national programmes, and to provide feedback on any enhancements that would be useful to the implementation of these methodologies. The meeting will serve as a forum for interaction with keynote lecturers on each of the topical areas summarizing the work accomplished and its potential use, for presentations from Member States that have already started to implement some of the methodologies, and for open discussions on related issues. Participants will have the opportunity to learn about these issues directly from the developers of the methodologies as they present their work and experience in the various areas covered by the ISSC-EBP.

This meeting is intended to benefit participants from all invited Member States. It is directed at those countries with advanced nuclear programmes (i.e. that have several operating NPPs) as well as at those that are embarking on a nuclear programme for the first time, and also at all those in between. The meeting is intended for participants from all types of organizations that are involved in the safety of NPPs, and it is hoped that it will inspire those performing probabilistic safety assessments (PSAs) for the first time to adopt the above-mentioned methodologies.

B. Objectives

The purpose of this meeting is to present the probabilistic framework related to risk assessment for external hazards developed by the IAEA’s International Seismic Safety Centre (ISSC) and to share the knowledge and experience gained by Member States with respect to this framework. The framework aims to provide a complete probabilistic based scheme for the safety assessment of NPPs against external events. This will be achieved through the improvement of probabilistic hazard assessment methodologies, in conjunction with modifications to the PSA methods in order to account for the simultaneous effect of more than one hazard and for multi-unit sites subjected to common cause effects.

Furthermore, the IAEA/ISSC is seeking feedback from Member States to be used for further improvements to the current technical framework and to initiate the revision process for existing IAEA publications in order to bring them in line with current international practice and experience related to risk evaluation for external hazards.

C. Proposed Topics

The meeting will feature discussions on the following technical areas:

- Probabilistic methodologies to assess natural hazards other than seismic hazards;
- Probabilistic methodology to combine the effect of more than one hazard acting concurrently;
- Treatment of uncertainty in probabilistic methodology;
• Update and upkeep of the probabilistic hazard assessment and maintenance of the plant PSA; and

• Risk metrics for multi-unit safety assessment considering non-reactor facilities at a site.

The plenary session of the meeting will open with a presentation on the IAEA safety standards, followed by presentations given by the selected keynote speakers and the representatives of various countries and organizations on their experience related to above technical areas.

D. Participation

The meeting is open to representatives of all Member States with an active nuclear programme, including those that are building their first NPP or expanding an existing nuclear power programme. Participants should be intimately familiar with the details of their country’s national practice in relation to external hazard assessment and the protection of nuclear installations against external hazards.

The meeting is targeted at decision-makers and senior managers engaged in the implementation of a national nuclear programme. Senior managers and/or experts from design and operating organizations in Member States are invited to share their experience on issues related to national and/or international practices concerning site safety related aspects such as hazard characterization, development of site specific design parameters and probabilistic risk assessment for nuclear installations. Senior managers from Member States’ regulatory bodies and/or technical support organizations, as well as from authorities involved in the licensing and review processes, are also invited to give presentations on their experience and to explain what expectations they have of the IAEA safety standards and supporting publications. Potential vendors of NPPs (or other nuclear installations) are also invited to share their views and experience.

Participants should complete the attached Participation Form (Form A) as soon as possible and send it to the competent official authority (Ministry of Foreign Affairs or National Atomic Energy Authority) for transmission to the IAEA Secretariat (see Section K), to arrive no later than 15 June 2015. The nomination of a participant will be accepted only if forwarded by the Government of an IAEA Member State or by an organization invited to participate.

The meeting is, in principle, open to all officially nominated persons. The IAEA, however, reserves the right to limit participation in case this becomes necessary due to limitations imposed by the available seating capacity. It is, therefore, recommended that interested persons take the necessary steps for obtaining their official nomination as early as possible.

E. Visas

Nominated participants who require a visa to enter Austria should submit the necessary application to the nearest diplomatic or consular representative of Austria as soon as possible.
F. Expenditures

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 meeting. The IAEA has, however, limited funds at its disposal to help meet the cost of attendance of certain participants. Such assistance may be offered upon specific request to normally one participant per country provided that, in the IAEA’s view, the participant on whose behalf assistance is requested will make an important contribution to the meeting. The application for financial support should be made at the time of nominating the participant.

G. Presentations

A completed Participation Form (Form A), indicating whether the prospective participant intends to present a paper or not, must be sent to the IAEA through the competent official authority by 15 June 2015, together with two copies of an abstract (400 words). The abstract will be used to select papers/presentations for the meeting and to establish the final programme. Papers and/or presentations on topics relevant to the provisional programme detailed in Section C above should be submitted through the appropriate governmental channels. The submission of a paper implies that the author intends to participate in the meeting if it is accepted. The presentations should not exceed 20 slides. Examples of the topics to be addressed in the presentations are given in Section C.

Thirty copies of the full paper should be brought by the author for distribution during the meeting.

H. Working Language

The working language of the meeting will be English. No simultaneous interpretation will be provided.

I. Outputs

The proceedings of the meeting will be made available in electronic format.

J. Local Arrangements

The meeting will be held at the IAEA’s Headquarters in Vienna, Austria, specifically in the Press Room (Building M) at the Vienna International Centre (VIC), and will start on Monday, 3 August 2015, at 10.00 a.m. and end at 12 p.m. on Thursday, 6 August 2015.
All the material for the meeting, including the agenda and information on local arrangements, will be sent to nominated participants once the completed Participation Forms have been received. The final agenda, in particular, will be adjusted based on the number of presentations by Member States.

K. Organization

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