INFORMATION SHEET

TECHNICAL MEETING

ON

COMBINING INSIGHTS FROM DETERMINISTIC AND PROBABILISTIC SAFETY ANALYSES

Organized in cooperation with the OECD Nuclear Energy Agency (NEA)

Hosted by:
San Piero a Grado Nuclear Research Group
University of Pisa
Pisa, Italy

11–15 June 2012
1. INTRODUCTION

In 2006, the International Atomic Energy Agency (IAEA) published *Fundamental Safety Principles* (IAEA Safety Standards No. SF-1). This Safety Fundamentals publication emphasizes that “the fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation”. This is to be achieved by adherence to the fundamental principles, of which principles 5 and 8 are associated closely with probabilistic safety analysis (PSA) and deterministic safety analysis (DSA).

Principle 5 of SF-1, entitled “Optimization of protection”, states that “protection must be optimized to provide the highest level of safety that can reasonably be achieved”. In this area, PSA plays a major role. Principle 8 of SF-1, entitled “Prevention of accidents”, states that “all practical efforts must be made to prevent and mitigate nuclear or radiation accidents”. DSA has traditionally been employed to demonstrate compliance with this safety principle.

In recent years, a lot of effort has been devoted towards the harmonization of both types of analysis — deterministic and probabilistic — and towards determining their relative roles. Efforts have concentrated, in particular, on the way that the insights from the two analyses can be obtained and combined in making decisions on nuclear safety issues, and the relationship between DSA and PSA in addressing high-level requirements, such as defence in depth and safety margins.

In this context, it is essential to determine how DSA could be improved to provide better support for PSA. In general, DSA is used to support PSA in a number of areas, including:

- Determination of the set of initiating events;
- Analysis of success criteria for safety systems and accident progression following an initiating event;
- Analysis of internal and external hazards;
- Analysis of severe accident phenomena, containment performance and source term calculations for Level 2 PSA, as well as radionuclide dispersion and other topics covered by Level 3 PSA.

Conversely, it is equally important to determine how PSA results could be better used to investigate:

- The provisions for defence in depth and how PSA results could be presented to make comparison with the five levels of defence in depth easier;
- The potential for using PSA in addressing safety margins.

2. OBJECTIVE OF THE TECHNICAL MEETING

The objective of this Technical Meeting is to provide an international forum for presentations and discussion on topics relating to the integration of DSA and PSA. The meeting will consider the relative roles of DSA and PSA and the way that insights from both types of safety analyses can be obtained and combined into an integrated decision-making process. The meeting will provide an opportunity for exchanging experience, comparing national practices and discussing the way forward.
3. PROPOSED TOPICS OF THE MEETING

Participants are encouraged to make presentations on their experience in combining insights from DSA and PSA.

The following areas are regarded as important for this meeting:

- DSA in support of PSA
  - Determination of the set of initiating events;
  - Analysis of success criteria for safety systems and accident progression following an initiating event;
  - Analysis for internal and external hazards;
  - Containment performance and severe accident phenomena;
  - Requirements for the safety systems:
    - Redundancy
    - Diversity
    - Separation/segregation
    - Fail-safe actuation
    - Equipment qualification

- Limitations of DSA
  - Exclusion of accident sequences from the design basis based on engineering judgement/probabilities;
  - Need for identification of a broader set of safety threats, their ranking, identification and assessment of uncertainties.

- Insights from PSA in support of DSA
  - Quantitative risk measures and criteria for decision-making;
    - PSA for full power, low power and shutdown modes
    - Living PSA
    - Reference values (safety goals or criteria)
    - Use of PSA in decision-making

- Limitations of PSA
  - Incompleteness in the identification of a failure phenomenon and subsequent sequence development
  - Unavailability of plant-specific data
  - Inaccuracies in the modelling of human factors
  - Uncertainties
• Quality of DSA and PSA
  o Verification and validation
  o User qualification
  o Independent review
  o Modelling
  o Identification of initiating events and hazards
• Use of DSA and PSA to demonstrate compliance with safety goals
• Use of DSA and PSA to determine compliance with defence in depth
• Use of DSA and PSA for evaluation of safety margins

4. PARTICIPATION

Participation is solicited from representatives of nuclear power plants and regulatory bodies, utility organizations, as well as design and engineering consultant organizations, research centres, and international organizations engaged in activities related to operational safety and regulation. To ensure maximum effectiveness in the exchange of information, participants should be persons actively involved in the subject of the meeting.

Participants should complete the Participation Form (see Attachment A) as soon as possible and send it to the competent official authorities (Ministry of Foreign Affairs or National Atomic Energy Authority) for transmission to the IAEA Secretariat (see Section 11 below), to arrive no later than 1 June 2012. The designation 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 designated persons. The IAEA, however, reserves the right to limit participation due to limitations imposed by the available facilities. It is, therefore, recommended that interested persons take the necessary steps for obtaining an official designation as early as possible.

5. VISAS

Designated participants who require a visa to enter Italy should submit the necessary application to the nearest diplomatic or consular representative of Italy as soon as possible.

Similarly, the necessary arrangements for the shipment of hardware/software to be used in presentations should also be made as soon as possible.
6. EXPENDITURE

The costs of the meeting are borne by the IAEA; no registration fee is charged to participants.

Travel and subsistence expenses of participants will not be borne by the IAEA. Limited funds are, however, available to help cover the cost of participants from countries eligible to receive technical assistance under the IAEA’s technical cooperation programme. Such assistance can be offered, upon specific request, to one participant per country provided that, in the IAEA’s view, this participant will make an important contribution to the meeting. The application for financial support should be made at the time of designation of the participant.

7. PAPERS

Papers on topics covered by the programme of the meeting (see Section 3 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. Papers should not exceed 3000 words and should contain an abstract of about 400 words. Papers should be prepared according to the guidelines provided in Attachment B.

A completed Participation Form (see Attachment A), with an indication of the intention to present a paper must be sent to the IAEA through a competent official authority by 1 June 2012, together with two copies of an abstract (400 words). The abstract will be used to select papers for the meeting and to establish the final programme (see Sample A).

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

8. WORKING LANGUAGE

The working language of the meeting will be English.

9. PROCEEDINGS

The results of the meeting will be published in a technical report as soon as possible after the meeting (possibly only in electronic form).

10. LOCAL ARRANGEMENTS

The meeting will be held at the University of Pisa in Pisa, Italy. It will start on Monday, 11 June 2012, at 9.00 a.m. and end in the afternoon on Friday, 15 June 2012.
The meeting agenda and local details, together with information on local arrangements, will be sent to designated participants when the completed participation forms have been received.

11. SECRETARIAT

The Scientific Secretary for the meeting is Mr Javier Yllera of the Division of Nuclear Installation Safety.

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           Vienna International Centre
           PO Box 100
           1400 Vienna
           AUSTRIA

           Fax: +43 1 2600 7 26109
           Tel.: +43 1 2600 26109
           Email: J.Yllera@iaea.org
ATTACHMENT A: PARTICIPATION FORM

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ATTACHMENT B: INSTRUCTIONS FOR THE PREPARATION OF PAPERS

Length

Papers should not exceed 3000 words.

Copyright

Authors are responsible for ensuring that nothing in their papers infringes any existing copyright. If previously copyrighted material is included, authors must provide evidence that the copyright holder has given permission for its use.

Manuscript

The original manuscript should be printed on one side of the paper only. The desired layout is shown in Sample A below. An electronic copy should be supplied with the original.

Margins: Top 2 cm. Bottom 2.7, right and left 2.5 cm.

Font: Times New Roman 12 or 11.

The paper must begin with an abstract. The abstract should be typed as one paragraph not exceeding 400 words and should not contain references or footnotes.

References and bibliography for background reading should be numbered in Arabic numerals in square brackets, and listed at the end of the paper. Please refer to the following examples:


Figures and tables should be clear and reproducible. All figures and tables should be placed as near as possible to the place where they are first mentioned, but do not wrap text around them.
TITLE OF THE PAPER IN BOLD CAPITAL LETTERS

N. SURNAME 1, N. SURNAME 2
Organization 1
City, Country

N. SURNAME 3
Organization 2
City, Country

Abstract

This abstract should present a brief outline of the contents of the paper. It should not exceed four hundred (400) words.

1. INTRODUCTION

It is suggested that a brief introduction of the topic(s) discussed further in the following Sections of this paper be included.

2. SECTION TWO

2.1. Section two point one

2.1.1. Section two point one point one

2.1.1.1. Section two point one point one point one