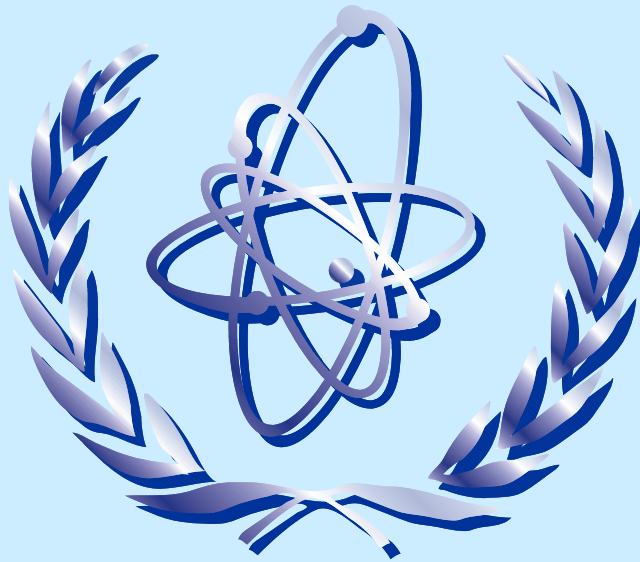


IAEA Training in level 1 PSA and PSA applications

PSA Project



IAEA Guidelines for PSA



Introduction

The following slides present the IAEA documents that deal with procedures, guidance and good practices for the performance of PSA and PSA tasks



IAEA Guidelines for PSA

IAEA-Safety Series 50-P-4 Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 1) (1992)

- Provides guidance for conducting a level 1 PSA
- Internal initiating events (excluding internal hazards)
- Emphasis is provided on the procedural steps of the PSA rather than on details of corresponding methods
- It promotes a standardised framework, terminology and form of documentation for PSA so as to facilitate the review of such studies



IAEA-TECDOC-719 Defining initiating events for the purposes of probabilistic safety assessment (1993)

- **It provides information on different approaches for defining Initiating Events**
- **It includes a generic initiating event database that contains about 300 records taken from 30 plant specific PSAs**
- **It includes IEs for PWR, BWR and WWER reactors**
- **It includes an introduction to the treatment of internal and external hazards**



IAEA-TECDOC-749 Generic initiating events for PSA for WWER reactors (1994)

- **This report presents a generic list of initiators for both WWER reactor types (440 and 1000)**
- **It presents the frequencies of more frequent initiators (transients) based on collected operating experience**
- **It also presents frequencies of LOCAs as used in several PSA projects on-going at the time of the preparation of this report**



IAEA-TECDOC-648 Procedures for conducting common cause failure analysis in probabilistic safety assessment (1992)

- **The objective of this report is to provide explicit guidance for a practical approach to CCF analysis**
- **A four step analysis framework is proposed:**
 - **System logic model development**
 - **Identification of groups of components subject to common cause failure (qualitative and quantitative screening)**
 - **Common cause modelling and data analysis**
 - **System quantification and interpretation of results**



IAEA-TECDOC-648 Procedures for conducting common cause failure analysis in probabilistic safety assessment (cont.)

This TECDOC gives the following additional guidelines:

- **Recommended parametric CCF models**
- **Parameter estimates and data analysis**
 - **Plant specific estimates**
 - **Construction of pseudo specific data base**
 - **Generic parameter estimates**
- **Analysis of results**
- **Practical considerations**
 - **modelling of high redundant systems**
 - **breaking the symmetry**



IAEA Guidelines for PSA

IAEA-Safety Series No. 50-P-10 Human Reliability Analysis in Probabilistic Safety Assessment for Nuclear Power Plants (1995)

- **This document presents a practical approach and terminology for HRA in PSA**
- **It describes methods and data sources for analysing the human actions**



IAEA Guidelines for PSA

IAEA-TECDOC-478 Component reliability data for use in probabilistic safety assessment (1988)

- This report is a compilation of component reliability data from the publicly available literature
- It consists of about 1000 records from 21 data sources
- Includes data for NPP components usually modelled in PSA
- It provides detail description and definition of major generic failure modes considered when compiling the database



IAEA Guidelines for PSA

IAEA-TECDOC-508 Survey of ranges of Component reliability data for use in probabilistic safety assessment (1989)

- This document presents the ranges of rates or probabilities of component failure for selected components that are usually considered in PSA
- It could be used to compare particular data with the bulk of data found in the literature



IAEA Guidelines for PSA

IAEA-Safety Report Series No.10. Treatment of Internal Fires in Probabilistic Safety Assessment for Nuclear Power Plants (1998)

- **This report provides information and good practices in conducting internal fire PSA**
- **It concentrates on procedural steps of fire PSA rather than on specific details**



IAEA-Safety Series 50-P-7 Treatment of External Hazards in Probabilistic Safety Assessment for Nuclear Power Plants (1995)

- **Provides guidance for conducting PSA for external hazards in Nuclear Power Plants**
- **Emphasis is provided on the procedural steps of the PSA rather than on details of corresponding methods**
- **It promotes a standardised framework, terminology and form of documentation for external hazards so as to facilitate the review of such studies**



IAEA-TECDOC-724 Probabilistic safety assessment for seismic events (1993)

- This document is associated with IAEA-Safety Series 50-P-7 Treatment of External Hazards in Probabilistic Safety Assessment for Nuclear Power Plants, and discusses in detail a specific external hazard, i.e., earthquakes



IAEA-Safety Series 50-P-8 Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 2)

- **This document presents procedures for conducting PSAs concerned with accident progression and phenomena leading to potential containment failure**
- **It emphasises the procedural steps rather than specific details**
- **Methods for determining the likelihood of containment failure and the release of radionuclides to the atmosphere are also given**



IAEA-Safety Series 50-P-12 Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 3)

- This document presents procedures for conducting PSAs concerned with the release of radionuclides and their transfer through the environment , and with the assessment of the public health and economic consequences of an accident
- It emphasises the procedural steps rather than specific details



IAEA-TECDOC-1101 Framework for a quality assurance programme for probabilistic safety assessment

- This report describes the framework for developing an adequate QA programme for PSA
- The framework is based on and is in accordance with the related QA guidelines of the IAEA for safety in nuclear power plants and other related installations
- The report identifies the key areas that are recommended to be addressed by a QA programme for PSA



IAEA-TECDOC-832 IPERS guidelines for the international peer review service

**IPERS (IPSART): International Peer Review Service
(International PSA Review Team)**

- **This TECDOC is intended to give guidance on how an IPERS (IPSART) review is organised and conducted**
- **It describes the steps needed to prepare the review**
- **It highlights the PSA aspects which should be covered in detail**



IPSART

- **GENERAL OBJECTIVES**

- **Assess the adequacy of the treatment of important technological and methodological issues in the PSA**
- **Assess whether specific conclusions and applications of the PSA are adequately supported by the underlying technical basis**
- **IPSART does not replace internal, independent reviews and it does not perform a validation of the PSA nor does it replace quality assurance**



IPSART (cont.)

- **The IPERS reviews are conducted in the most profitable way for the PSA team by:**
 - **assuring that the comments of the reviewers are fully understood**
 - **promoting discussion to allow for a transfer of knowledge and experience**



IAEA-TECDOC-1106 Living probabilistic safety assessment (LPSA)

- **This report presents a definition for Living PSA**
- **It discusses the planning and documentation requirements necessary to ensure that a completed PSA is a Living PSA**
- **It also discusses aspects related to the PSA updating process**



IAEA Guidelines for PSA

IAEA-TECDOC-1144 Probabilistic safety assessments of nuclear power plants for low power and shutdown modes

- Provides guidance for conducting a level 1 low power and shutdown PSA (SPSA)
- Emphasis is provided on the procedural steps of the PSA rather than on details of corresponding methods
- Provides examples of plant operating states (POS) being analysed for different plant designs



IAEA Guidelines for PSA

IAEA-TECDOC-1135 Regulatory review of probabilistic safety assessment (PSA) Level 1

- Provide guidance to regulatory authorities on how to review the PSA
- Emphasis on Level 1 full power PSA studies
- Discusses all the review tasks in details



IAEA Guidelines for PSA

IAEA-TECDOC-1200 Applications of probabilistic safety assessment (PSA) for nuclear power plants

- **Compiles information on a comprehensive set of PSA applications**
- **Discusses the basis for PSA applications**
- **Both the utility and regulatory use of the PSA are discussed in details**



IAEA Guidelines for PSA

IAEA-TECDOC-1267 Procedures for conducting probabilistic safety assessments for non-reactor nuclear facilities

- **A new area of application of PSA methods**
- **Provides guidance for conducting PSA for non-reactor facilities**
- **Emphasis on the general procedural steps specific for non-nuclear facilities rather than on methodological details**