

**PSA and PSA Applications**

**WORKSHOP MANUAL**

**IAEA**

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# INTRODUCTION

## Objectives of the Workshop

Probabilistic Safety Assessment (PSA) is an effective tool to enhance plant safety, and to operate nuclear facilities in the most efficient manner. However, a PSA that is to be used as a day to day tool for decision making at NPPs has to reflect the actual design and operational features of the plant as accurately as possible, it must be of high quality and has to be subject to strict QA processes.

Since the early 80s the IAEA has made a considerable effort to support the development of technical capabilities for PSA in Member States, to write technical procedures for carrying out PSA, and to assist the Member States in reviewing PSA through its IPSART Service (International PSA Review Team). Additionally, current efforts are being devoted to support and promote the appropriate use of PSA methods and results in decision making at the nuclear power plants.

The purpose of this workshop is to provide the participants with basic training on key issues in PSA level 1. The second part of this workshop is dedicated to presentations on low power level PSA and some PSA applications in the design and operational areas.

## Target Group

This workshop is designed for staff members of utilities, nuclear power plants, regulatory authorities, and support organizations with practically no or little experience in PSA development, however some of the PSA application subjects might be interesting even for those that have already basic PSA knowledge.

## Duration

1 week

## Language

English

# COURSE PLAN

The workshop is divided into Modules, which are further divided into sessions. Each module is characterized by its objectives that are generally met by more than one session. Session is a generic term to describe the training activity e.g. a lecture, work session, video presentation, briefing, exercise, drill, discussion or any combination of these activities.

## Course structure

<b>Module</b>	<b>Objectives</b>	<b>Duration [hrs]</b>
<b>M0</b> Opening	To register for the workshop To be comfortable with the workshop, its aims and arrangements	1
<b>M1</b> Introduction to PSA	Introduce a historical background Present the role of PSA in Safety Management	1.5
<b>M2</b> Quality Assurance for PSA	Present the IAEA guidelines for PSA Present QA for PSA and associated documentation	4.5
<b>M3</b> PSA Level 1 – Main Methodological Tasks	Present the methodology and main tasks to be performed in the development of a PSA	14
<b>M4</b> Other PSAs - Examples	Present PSA for low power and shutdown conditions Present PSA for flood, fire and external events	4
<b>M5</b> Basic PSA Applications	Present of the different uses of PSA to enhance the safety of nuclear installations	6
<b>M6</b> Evaluation and Closing of the Workshop	To be able to evaluate the benefits, limitations and effectiveness of the course To give suggestions for future improvements of the course	1
<b>SUM</b>		<b>32</b>

# COURSE PROGRAMME

workshop programme:

## Suggested

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8 <sup>00</sup> – 9 <sup>00</sup>	Registration Opening and Training admin.  <i>Local organisers</i>	Initiating Event Analysis  <a href="#">Lesson: III1_1_A</a>	Reliability Data Analysis (use of generic/or plant-specific data)  <a href="#">Lesson: III_3_1</a>	Low Power and Shutdown PSA  <a href="#">Lesson: IV1_1</a>	Use of PSA to Support Design and Design Modifications  <a href="#">Lesson: V2_1</a>
9 <sup>00</sup> – 10 <sup>00</sup>	Basic PSA Introduction  <a href="#">Lesson: II_0</a>	Accident Sequence Modelling  <a href="#">Lesson: III1_2_A</a>	Reliability Data Analysis (specific aspects)  <a href="#">Lesson: III_3_2</a>	Low Power and Shutdown PSA (continue)  <a href="#">Lesson: IV1_1</a>	PSA based Evaluation and Rating of Operational Events  <a href="#">Lesson: V2_2</a>
10 <sup>00</sup> – 10 <sup>30</sup>	<b>Coffee break</b>				
10 <sup>30</sup> – 11 <sup>30</sup>	The Role of PSA in Safety Management  <a href="#">Lesson: II_1</a> IAEA Guidelines for PSA  <a href="#">Lesson: III_1</a>	Key Elements of the Documentation for IE Definition  <a href="#">Lesson: III1_3</a>	Human Reliability Analysis  <a href="#">Lesson: III4_1</a>	Hazards Analysis for PSA  <a href="#">Lesson: IV2_1</a>	Development and Use of Probabilistic Safety Criteria  <a href="#">Lesson: V2_3</a>
11 <sup>30</sup> – 12 <sup>30</sup>	QA for PSA  <a href="#">Lesson: III_2</a>	Boolean Algebra and PSA Quantification  <a href="#">Lesson: III_2_1_A</a>	Human Reliability Analysis (continue)  <a href="#">Lesson: III4_1</a>	Hazards Analysis for PSA (continue)  <a href="#">Lesson: IV2_1</a>	Evaluation of training  Closing
12 <sup>30</sup> – 14 <sup>00</sup>	<b>Lunch break</b>				
14 <sup>00</sup> – 15 <sup>00</sup>	Documents Generated in a PSA Project  <a href="#">Lesson: III_3</a>	System Analysis in a PSA (part 1)  <a href="#">Lesson: III2_1_B</a>	Dependent Failure Modelling  <a href="#">Lesson: III5_1</a>	Living Probabilistic Safety Assessment  <a href="#">Lesson: VI_1</a>	
15 <sup>00</sup> – 16 <sup>00</sup>	Regulatory Review of Level 1 PSA  <a href="#">Lesson: III_4</a>	System Analysis in a PSA (part 2)  <a href="#">Lesson: III2_1_B</a>	Dependent Failure Modelling (continue)  <a href="#">Lesson: III5_1</a>	Risk/Safety Monitors  <a href="#">Lesson: VI_2</a>	
16 <sup>00</sup> – 16 <sup>30</sup>	<b>Break</b>				
16 <sup>30</sup> – 17 <sup>30</sup>	Discussions	System Analysis (Example)  <a href="#">III2_2_A</a>	PSA Quantification  <a href="#">Lesson: III6_1</a>	Risk/Safety Monitors (continue)  <a href="#">Lesson: VI_2</a>	