



EC INSC Project MC3.01/13

EC Contract N° NSI/2014/343-969

“Training and Tutoring for experts of the NRAs and their TSOs for developing or strengthening their regulatory and technical capabilities”

Training Course

Requirements and Safety Evaluation of NPP PSA

organized by ITER-Consult and NRG

Arnhem - June 6 – 10, 2016

NRG

Utrechtseweg 310 – B50-West, 6812 AR ARNHEM

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Course Objective

The training course will present and discuss the objective, requirements and scope of a PSA for a NPP. It will cover: structure and content of PSA with related applicable safety standards and requirements, role and objective of the PSA study during the licensing and regulatory review activity.

The regulatory requirements for the PSA and its elaboration will be the subject of specific presentations, which will include among others: safety probabilistic objectives and requirements for PSA, methods, tools, initiators, safety functions, safety and non-safety systems, event tree development, fault tree, event tree quantification, data bases, consideration and modelling of common cause failures, human reliability modelling, etc. Consideration will be made for External Hazard PSA (e.g. Seismic PSA) and PSA for Low-Power and shutdown conditions.

The organization and conduct of the regulatory review of a PSA in terms of completeness and adequacy of its content will be presented.

Aspects related to effective management of regulatory review of PSA priorities and use of PSA results in the decision making process will be presented and discussed.

Experience and findings from previous regulatory review of PSA review will be presented.

Reference standards and guidelines for PSA of NPP review will be addressed.

Two Practical Applications are included in the training program.



Course Daily Program

Monday June 6 th , 2016	
08.30 - 09.00	Registration
9.00 – 12.30	Welcome, Organizational aspects
	Training objective & programme - A. Madonna (ITER)
	EU infrastructure for Nuclear & Radiation Safety – A. Madonna (ITER)
	Role, functions and responsibilities of the nuclear regulatory authority – A. Madonna (ITER)
12.30 – 13.30	Deterministic and probabilistic safety objectives and requirements for NPP – M. Gasparini, A. Madonna (ITER)
	Lunch
13.30 – 17.00	PSA Objectives and levels of risk assessment, basic concepts of PSA versus DSA – H. Brinkman (NRG)
	Fundamentals of probabilistic theory and rules (basic definitions and probability concepts) – C. Molenaar (NRG)
	Methodological requirements and references for PSA (level 1 PSA structure & content) – H. Brinkman (NRG)

Tuesday June 7 th , 2016	
9.00 – 12.30	Initiating event identification, grouping of initiating events – C. Molenaar (NRG)
	Event tree development, safety functions, frontline and support systems – H. Brinkman (NRG)
	FMEA and HAZOP – C. Molenaar (NRG)
12.30 – 13.30	Lunch
13.30 – 17.00	Systems analysis and Fault Tree development – C. Molenaar (NRG)
	Dependent failure analysis – C. Molenaar (NRG)
	Modeling of human reliability – H. Brinkman (NRG)

Wednesday June 8 th , 2016	
9.00 – 12.30	Data bases & Data analysis – H. Brinkman (NRG)
	Sequence binning, quantification and minimal cut-sets – C. Molenaar (NRG)
	Analysis of results of PSA, Importance, sensitivity and uncertainty analysis – C. Molenaar (NRG)
12.30 – 13.30	Lunch
13.30 – 17.00	Practical application on Fault tree analysis - construction examples and their analysis

Thursday June 9 th , 2016	
9.00 – 12.30	External Events / hazards PSA – general approach, internal fire, external flooding – H. Brinkman (NRG)
	Seismic PSA (Seismic Risk Assessment, Seismic Fragility Evaluation, Plant System and Sequence Analysis) – H. Brinkman (NRG)
	PSA for Low-Power and Shutdown conditions – C. Molenaar (NRG)
	Operating Experience Analysis, Configuration Risk Management (Maintenance optimization) – C. Molenaar (NRG)
12.30 – 13.30	Lunch
13.30 – 17.00	Practical application on Event tree analysis - construction examples and their analysis

Friday June 10 th , 2016	
9.00 – 12.30	International standards, references and guidance's for PSA – H. Brinkman (NRG)
	Regulatory requirements for PSA, regulatory use of PSA for decision making – H. Brinkman (NRG)
	Regulatory review of PSA – H. Brinkman (NRG)
	QA aspects for development of PSA – C. Molenaar (NRG)
12.30 – 13.30	Risk informed decision making (description with application example) – H. Brinkman (NRG)
	Lunch
13.30 – 17.00	<i>Course Summary</i> <i>Questionnaire</i> <i>Opinion from trainees</i> <i>Training Minutes</i> <i>Certificates awarding</i>