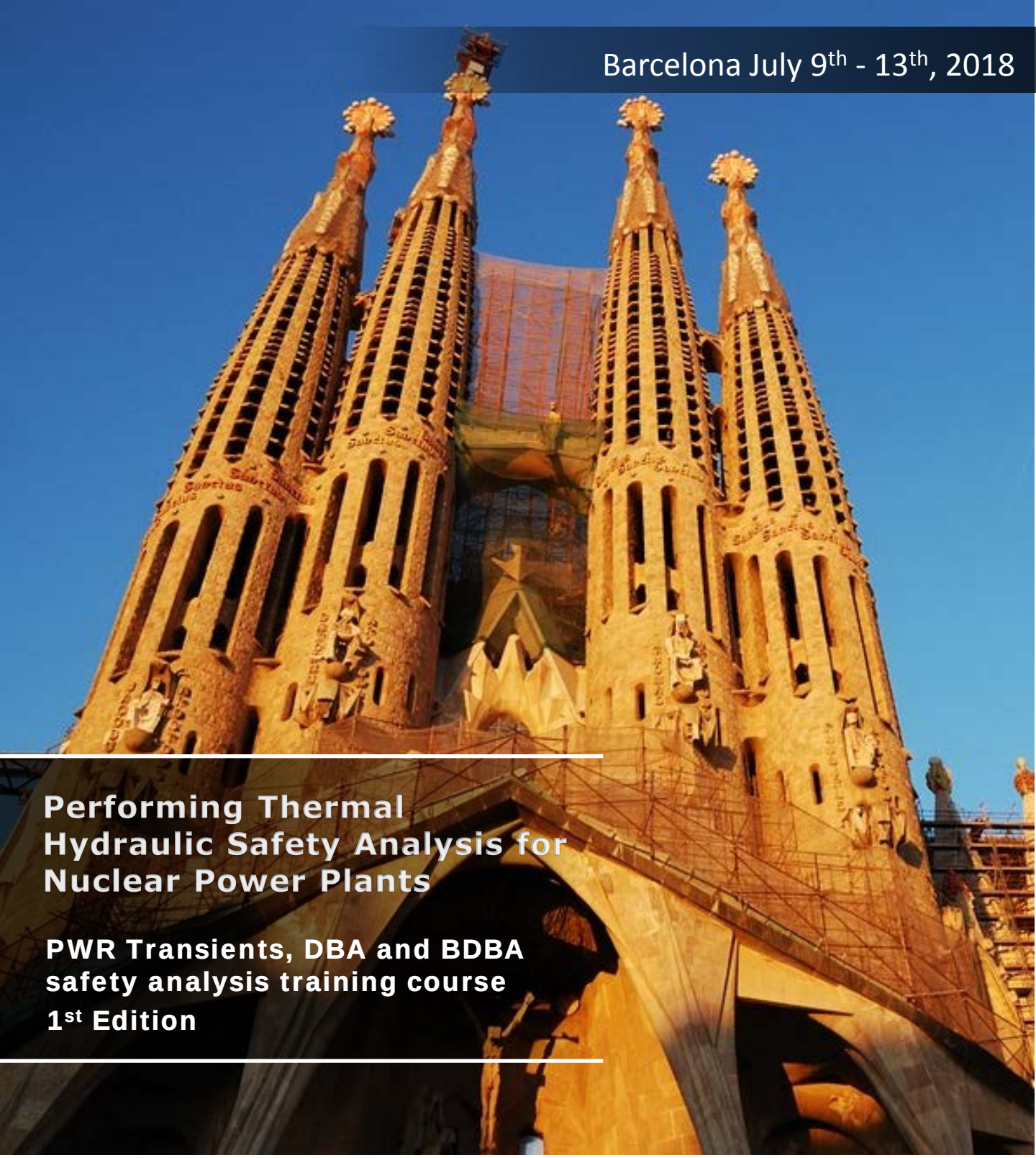


Barcelona July 9th - 13th, 2018

Performing Thermal Hydraulic Safety Analysis for Nuclear Power Plants

PWR Transients, DBA and BDBA safety analysis training course

1st Edition

ANNETTE

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

ANT

Advanced Nuclear Technologies

The course focuses on the knowledge and capabilities to perform Safety Analysis within the field of PWR nuclear power plants operations and safety

Overview

This 2018 course is the 1st edition of the training "Performing Thermal Hydraulic Safety Analysis for Nuclear Power Plants". It is held at the Technical University of Catalonia (Barcelona).
The target of the course is to enhance the comprehension of Safety Analysis for workers in the industry, young professionals, analysts from regulatory bodies and individuals interested in the field of Safety Analysis.
The course is divided in two blocks:

I. Safety Analysis Report (SAR) Chapter 15: Design Basis Accidents (DBA).
II. Safety Analysis performed in the field of Beyond Design Basis Accidents (BDBA).

In the first block, an introduction on regulations, plant design and relevant plant documentation is performed. The block is focused on the relationship between DBA and the plant design, the acceptance criteria and the Technical Specifications .

In the second block, several approaches to BDBA Safety Analysis are introduced. Specific cases will be studied related to SBLOCA and SBO scenarios. In addition, special focus will be given to the plant response and the design of FLEX systems within BDBA scenarios.

In this course the plant response during accident scenarios will be related to Safety Analysis Report, Regulations and Technical Specifications

Objective of the course:

The course objective is to enhance the understanding of complex systems behavior taking place in accidental scenarios in nuclear power plants. Also to understand the link between the plant behavior results and the work performed by analysts or engineering support companies at the power plant. The course will focus on relating the previous knowledge on PWR plant systems with the following topics: (1) Transient and Accident Analyses (Chapter 15) required at plant's Final Safety Analysis Report and (2) Beyond Design Basis Accidents, that might be part of required studies from the regulatory bodies.

Target of the course:

The seminar is open to vendors, utilities, regulatory bodies, national laboratories, consulting companies and universities. A maximum of 30 participants will be accepted from which 15 may come from ENEN organizations free of charge.

Requested Background:

The participants are assumed to have basic knowledge on PWR nuclear systems and fundamental basics on reactor theory.
Please note that this is not a course on any particular thermal hydraulics code, neither an introductory course on PWR systems. A software adapted for the course which is based on RELAP5 will be used as a learning tool, but no previous experience with system codes is required. The plant model will be configured in a way that the participants will be able to operate the system components and obtain quality results.

Schedule:

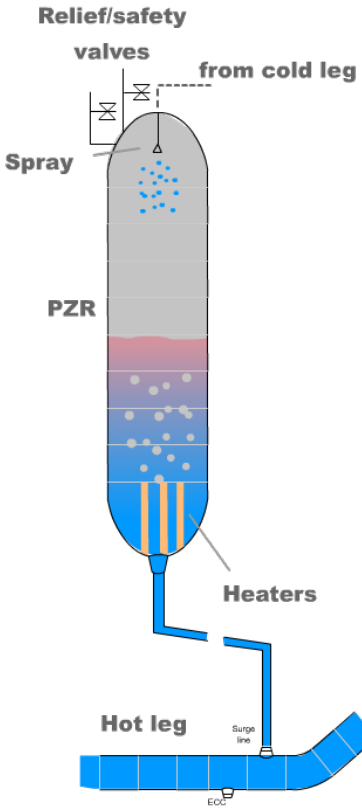
Date	Contents
July 9th (Mon)	- Registration - Introduction to the course - Regulations and safety - Exercici 1(Max)
July 10th (Tue)	- Fundamentals of thermal hydraulics - Phenomenology in PWR transients and accidents - Exercise on SBLOCA events
July 11th (Wed)	- Experimental databases - Exercise on RHR failure during shutdown conditions
July 12th (Thu)	- ETF - Phenomenology during SBO sequences - The FLEX system - Exercise on SBO sequences
July 13th (Fri)	- Exercise on SBO sequences - Wrap-up

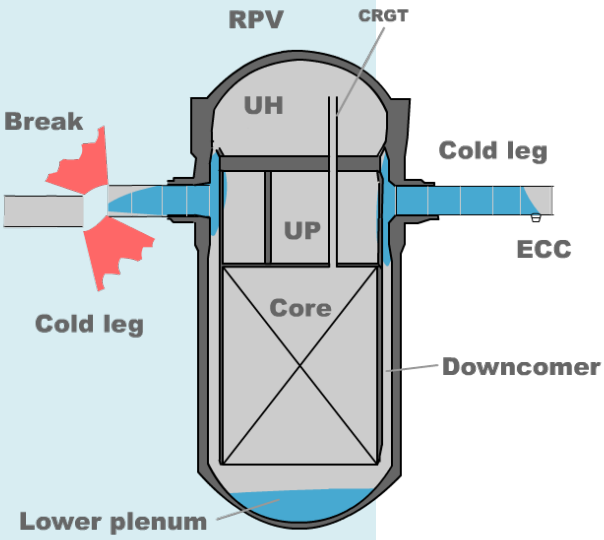
The method of delivery combines theoretical explanations, observation of plant/experimental results, group discussions and exercises using real thermal hydraulic codes

Methodology:

The approach in the practical exercises will be:

- Introductory theory on systems related to the transient and the expected evolution of the main parameters. The acceptance criteria to be fulfilled by the design will be introduced as well.
- Searching and understanding experimental or plant results directly related to the selected transient/accident.
- A simulation of the particular transient will be performed allowing the participants to plot several variables in order to analyze the thermal hydraulic plant response.
- A discussion on the adequacy of the current design to meet with the acceptance criteria will be done.





The course will cover the following topics:

- PWR hydraulic systems related to transients.
- Expected phenomenology in the transient.
- PWR protection system and engineered safety features actuation signals.
- Expected operators actuation during the transient according to their procedures.
- Analysis of thermal-hydraulic code results.
- NUREG-0800 standard review plan for Safety Analysis Report.

The course will be held at The Barcelona School of Industrial Engineering (ETSEIB) which is part of the Universitat Politècnica de Catalunya BarcelonaTech, a public institution dedicated to higher education and research, specialized in the fields of engineering, architecture and science.

The School is located in Barcelona and is well connected with the airport and the city center.

The course is organized by the Advanced Nuclear Technologies group (ANT) from UPC. ANT has a long experience in R&D and teaching in Nuclear Engineering, nuclear reactors technology, thermal-hydraulic analysis and safety for fission and fusion reactors.

For more information, please visit our website:

https://ant.upc.edu

The seminar is open to vendors, utilities, regulatory bodies, national laboratories, consulting companies and universities.

UPC Barcelona School of Industrial Engineering
Av. Diagonal, 647. 08028 Barcelona

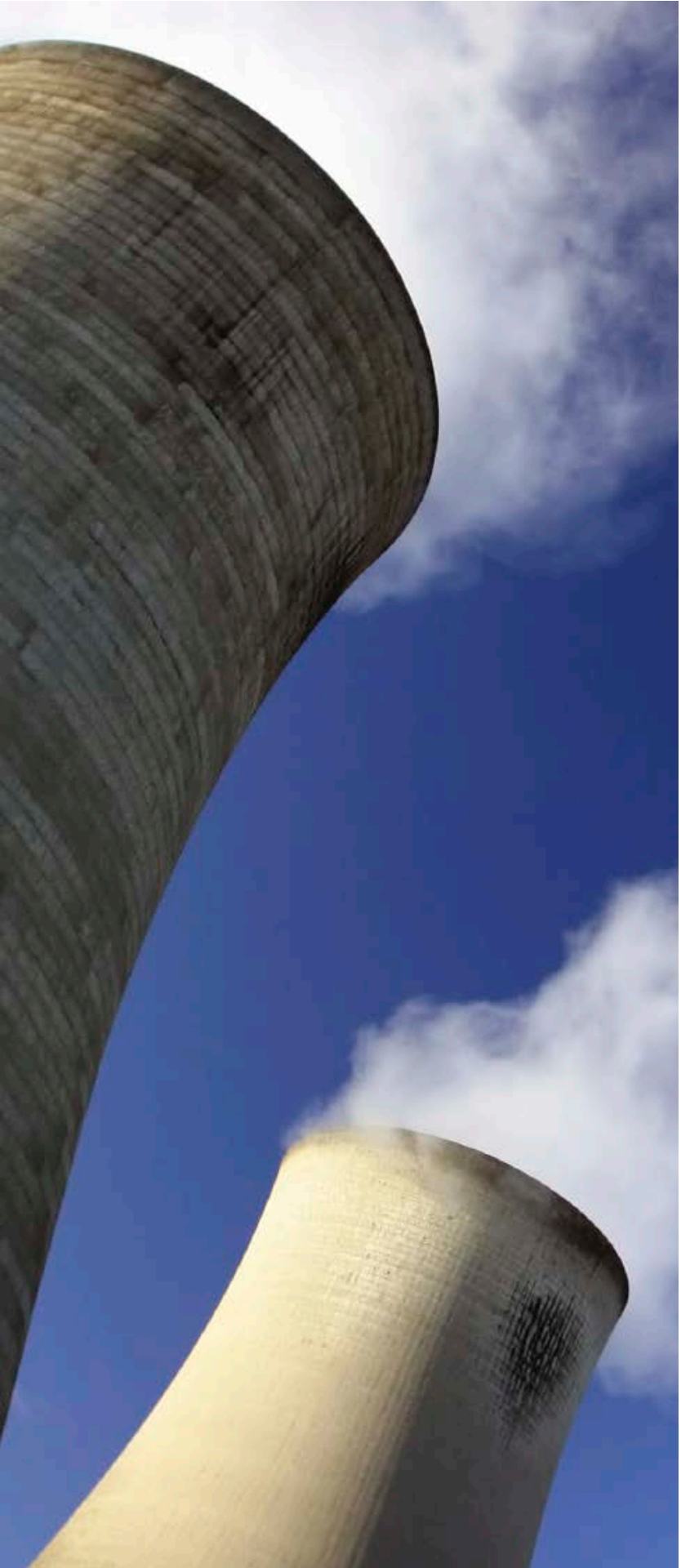
Lecturers:

Dr. Jordi Freixa has about 15 years of experience in the use of TH system codes. During this time, he has developed or worked with more than 10 full plant models. His main areas of research are the validation and application of best estimate thermal hydraulic codes for LWRs.

Daniel Suàrez has an experience of 7 years training NPP operators including full scope control room simulators at Tecnatom S.A. During this time, he has studied operators responses to DBA and BDBA in actual power plant condition. At this time he also works as assistant professor and is also finishing his PhD in nuclear fusion related technology.

Max Casamor has an experience of 6 years in training NPP operators including full scope control room simulators at Tecnatom S.A. He is now a granted full time PhD student finishing his thesis on coupling CTF subchannel code and RELAP5 system code.

Prof. Reventós was Responsible of Plant Dynamic Analysis in the utility organization operating Ascó and Vandellòs NPPs (1985-2001). He has more than 30 years of experience in the preparation and qualification of TH models for NPPs as well as its use in fields like operation support, PSA, training, licensing and fuel management.



Organizing committee

Dr. Jordi Freixa
Mr. Daniel Suàrez
Mr. Max Casamor
Prof. Francesc Reventós

Registration page:

https://ant.upc.edu/en/activities/

Registration Fee:

ENEN assistants: **FREE OF CHARGE**
Registration deadline: June 30th

Non-ENEN assistants:
Before June 30th: **1250€/participant**
After June 30th : **1500€/participant**

Contact:

Feel free to contact us at:

jordi.freixa-terradas@upc.edu
daniel.suarez.cambra@upc.edu
max.casamor@upc.edu

Website:
https://ant.upc.edu

ANT Advanced Nuclear Technologies

UPC UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

ANNETTE