



# NURESAFE OPEN SEMINAR

**Brussels**  
**4-5 November 2015**



# The NURESAFE objectives

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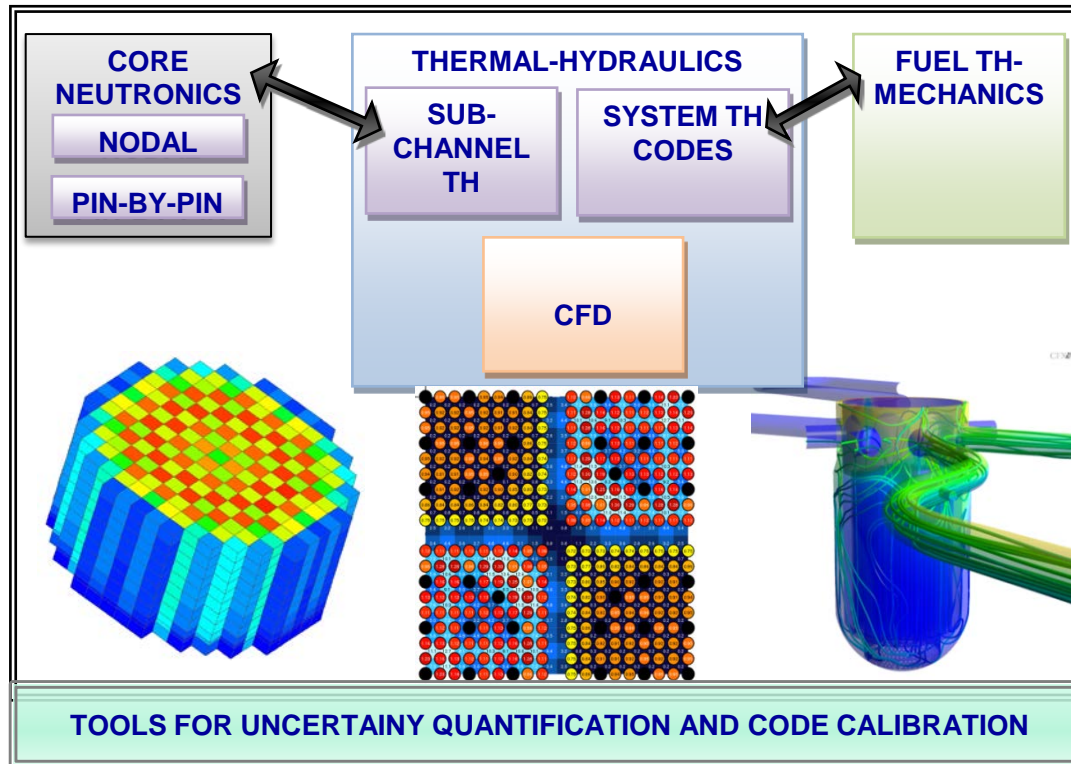
1) Develop and apply for reactor applications a novel Simulation Environment:

**the NURESIM Software Integrated Platform**

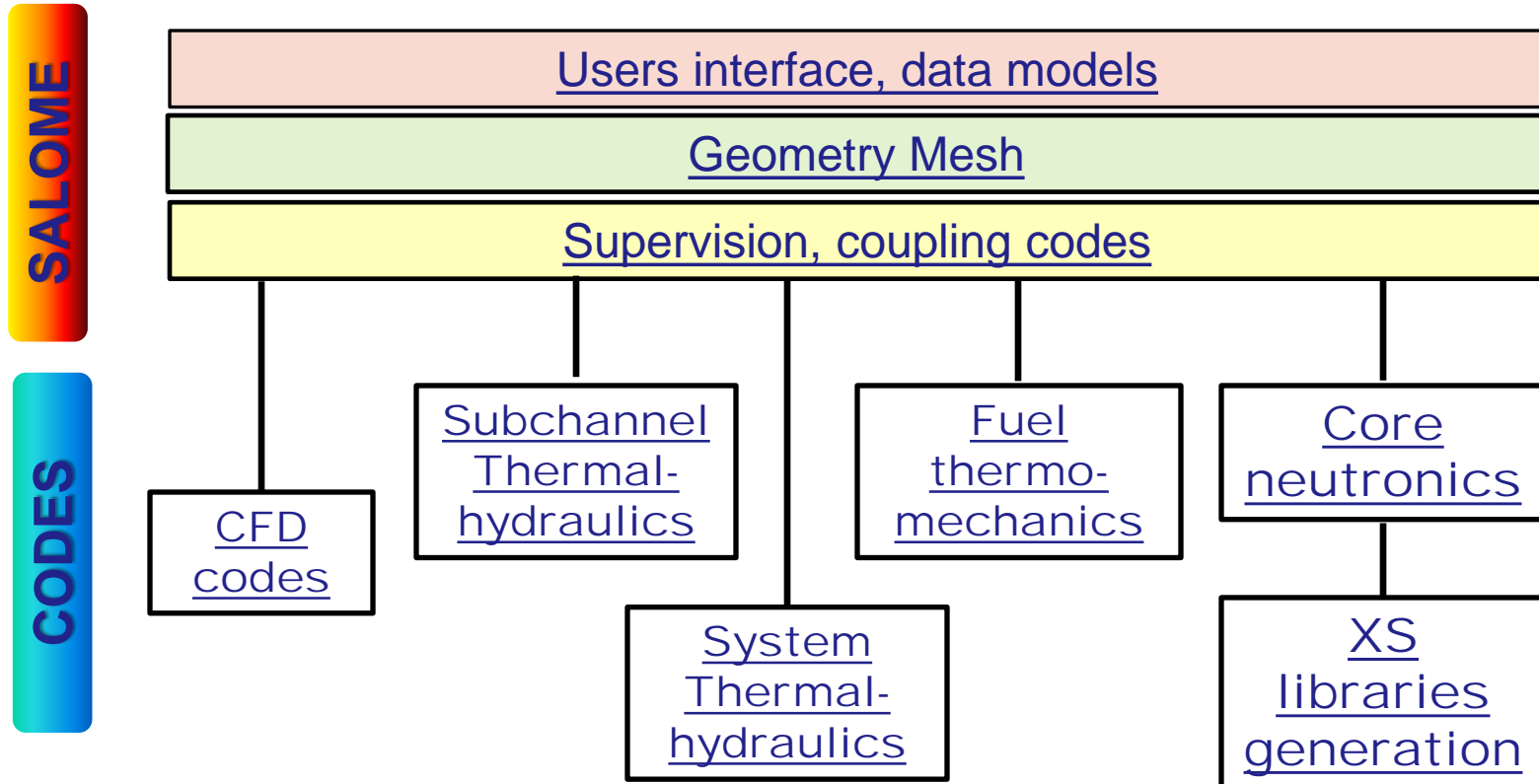
2) In order to address safety and operational issues for LWRs (normal operation and design basis accidents)

3) Create a community that brings together the European key-players and engage them in advanced simulation for LWRs

- Provide an infrastructure supporting the coupling of different physics which simultaneously influence reactor transients
- Offers a great coupling flexibility within the platform, a lot of different possibilities (→ illustrated by the following presentations)



NURESIM is based on the **generic infrastructure SALOME** which includes components for data management, coupling and users interface

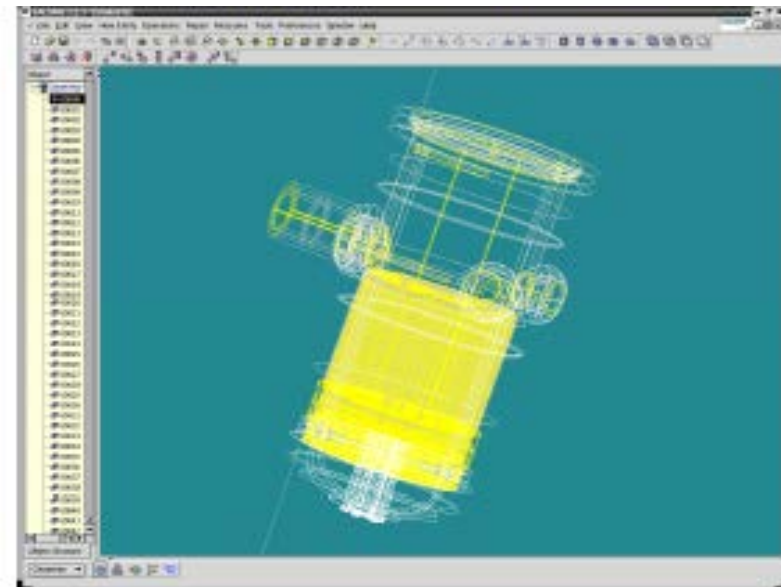
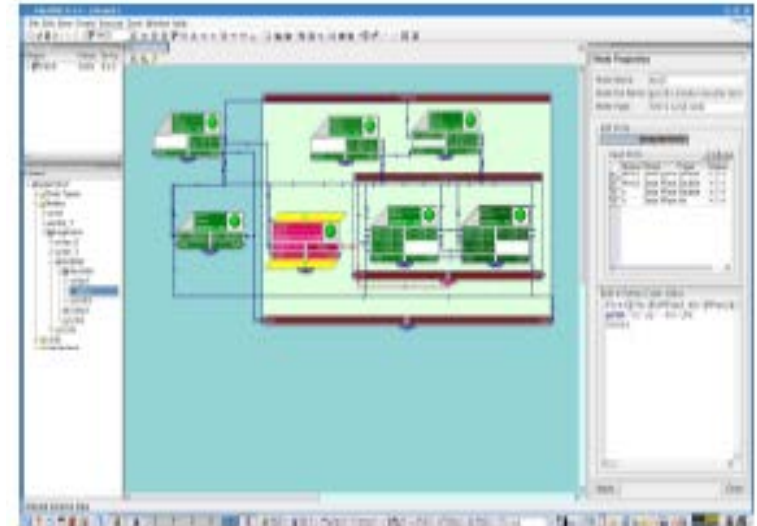


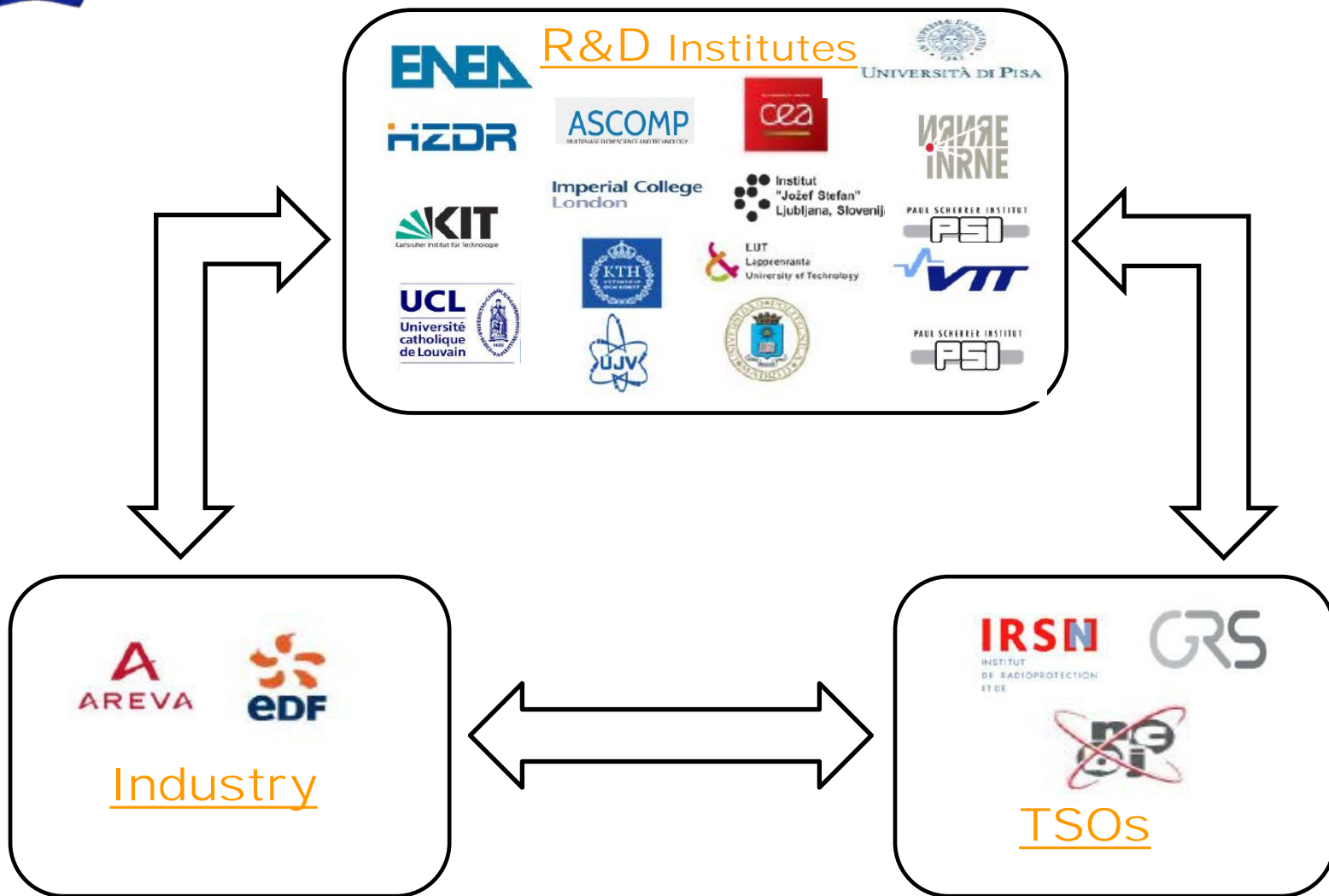
- Facilitate coupling implementation between codes in an heterogeneous environment
- Promote the use of software standards
- Provide a generic user interface, user friendly and efficient
- Provide HPC functionalities
- Offer interface between CAD models and codes

➔ **Contributes to reduce the costs and facilitates sharing models and software**

**Produced in freeware – LGPL licence**  
<http://www.salome-platform.org>

(➔ see SALOME presentation)







**Expectation: a well balanced relation between the NURESAFE partners and the UG members  
→ a Win-Win relation**

## NURESAFE offers to the NUG

- Delivery of codes in order to run benchmarks
- Participation to NURESAFE meetings
- Information on methods and results

## NURESAFE expectations from the NUG

- Feedback on Nuresafe methods, codes and results  
OR
- Production of benchmarks results  
OR
- Delivery of reactor or experimental results



- 1) Develop higher fidelity simulation tools for reactor applications
  - ✓ multi-physics / multi-scale tools
  
- 2) Apply these simulation tools to challenging reactor problems:  
« **Situation Targets** »
  
- 3) Implement a methodology for verification and validation including:
  - ✓ Validation against experiments
  - ✓ Uncertainty quantification and code calibration
  - ✓ Benchmark the NURESAFE tools with other simulation tools



## Two Categories of Situation targets

1/ Multi-physics applications involving core physics and thermal-hydraulics

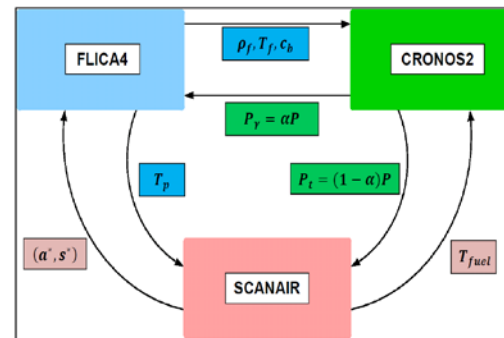
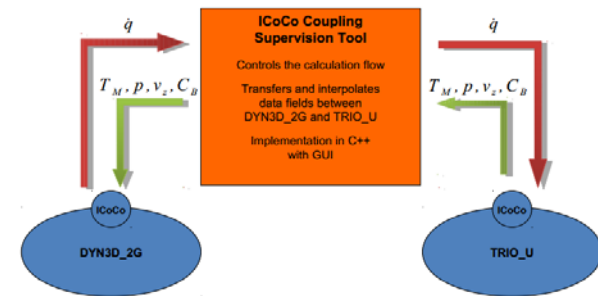
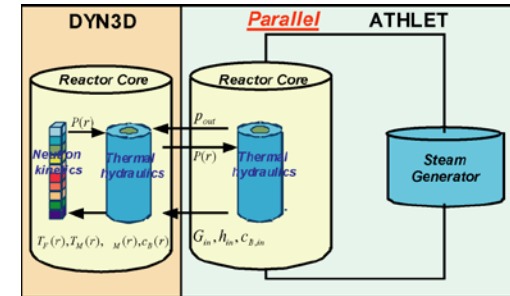
2/ Thermal-hydraulics multi-scale / multiphysics applications

- Multi-physics applications involving core physics and thermal-hydraulics

- ✓ Main Steam Line Break (MSLB)

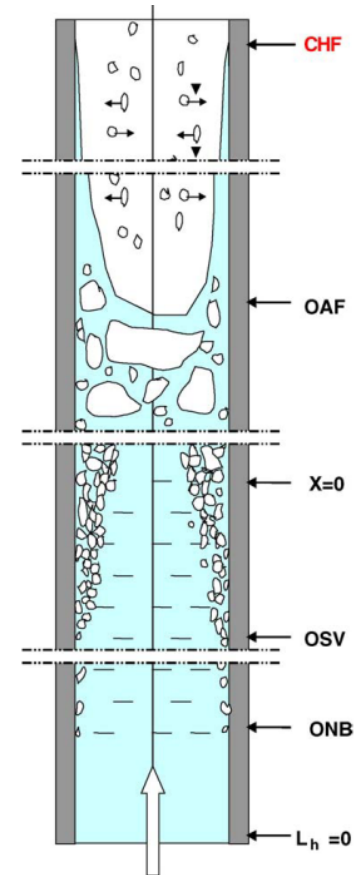
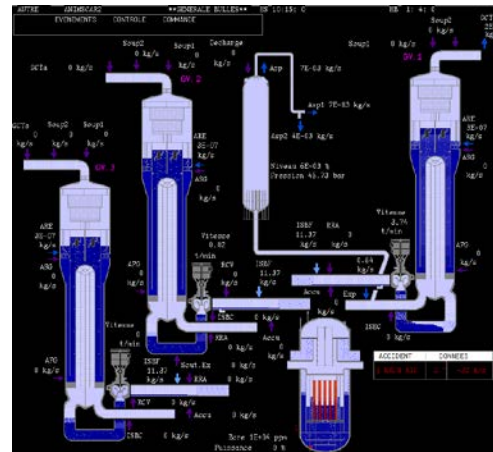
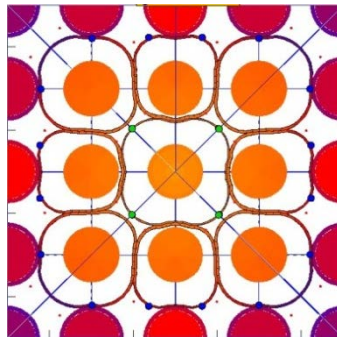
- Square lattice PWR
- VVER

- ✓ A BWR application: PB turbine trip



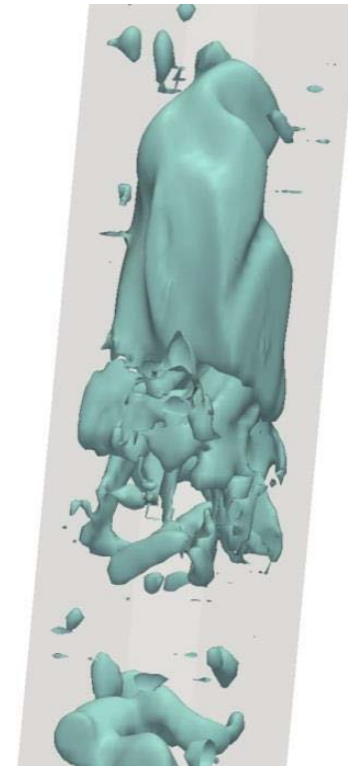
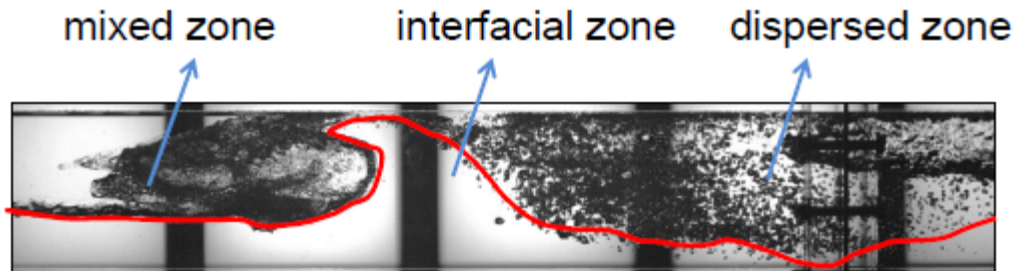
- **Thermal-hydraulics multi-scale / multiphysics applications**

- ✓ LOCA
- ✓ Pressurized Thermal Shock (PTS)
- ✓ BWR applications



## Objectives:

- Deliver the next generation of TH core simulation tools to the NURESIM software platform
- Couplable with other physics
- Multi-scale and 2-phase Computational fluid Dynamics
- Implemented in the platform codes
- Provide verified and validated tools





# The Agenda – Today November 4th

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Start at	End at		Speaker
8:45	9:15	<i>Registration</i>	
9:15	9:35	Introduction – The NURES SAFE project	B. Chanaron (CEA)
		<b>Multi-physics activities</b>	<b>Chair S. Kliem</b>
9:35	10:05	Introduction to the multi-physics activities	S. Kliem (HZDR)
10:05	10:25	SALOME: recent developments and HPC capacities	N. Crouzet (CEA)
		<i>coffee break</i>	
10:45	11:15	Capacities and achievements of the COBAYA4 code after the NURES SAFE project	C. Ahnert (UPM)
11:15	11:45	Advanced simulation of the PWR MSLB using the TRIO_U/DYN3D coupled code	Alexander Grahn (HZDR)
11:45	12:15	PB Turbine Trip without SCRAM advanced simulation	Y. Perin (GRS)
12:15	12:45	Developments and results for VVER	N. Kolev (INRNE)
12:45	14:00	<i>lunch</i>	



# The Agenda – Today November 4th

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14:00	14:15	Information from the European Commission	P. Manolatos
		<b>Multi-physics and multi-scale thermal-hydraulics applications</b>	<b>Chair D. Bestion</b>
14:15	14:40	Overview of thermal-hydraulics activities from NURESIM to NURESAFE	D. Bestion (CEA)
14:40	15:05	Advanced modeling of Reflooding	N. Trégourès (IRSN)
		<i>coffee break</i>	
15:20	15:50	Other developments for LOCA	Contributors
15:50	16:05	Uncertainty quantification of system codes	E. Nouy (CEA)
16:05	16:20	Towards a more general CFD modeling for all flow regimes	S. Mimouni (EDF)
16:20	16:55	Multi-scale simulation of Pressurized Thermal Shock (PTS)	(HZDR, UCL)
16:55	17:05	Uncertainty quantification of CFD for PTS simulation	(CEA)
17:05	17:40	BWR advanced thermal-hydraulics	H. Anglart (KTH)



# The Agenda – Tomorrow November 5th

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Start at	End at		Speaker
9 :00	9 :30	<b>The NURESAFE users group activity</b>	T. Toppila (FORTUM)
		<b>Core multiscale thermal-hydraulics</b>	<b>Chair - D. Lakehal</b>
9:30	10:00	Introduction to core multi-scale activities	D. Lakehal (ASCOMP)
		<i>coffee break</i>	
10:15	10:45	Coupling interface tracking Method with phase-averaged models	(ASCOMP)
10:45	11:15	DNS of pool and turbulent convective boiling	(PSI or ASCOMP)
11:15	11:45	DNS of turbulent bubbly flow in a channel	(CEA or ASCOMP)
11:45	12:15	Implementation in the platform codes and validation	L. Vyskocil (UJV)
12:15	12:30	Conclusions of the Seminar - discussion	Nuresafe Excom