In-Depth Discussion on
UNCERTAINTY ANALYSIS IN MODELING

Prof. José M. Aragonés (Poli. University of Madrid, Spain)

- *Introduction/Presentation of the subject and experts*

Drs. Eric Royer and Jean-Marc Martinez (CEA-Saclay, France)

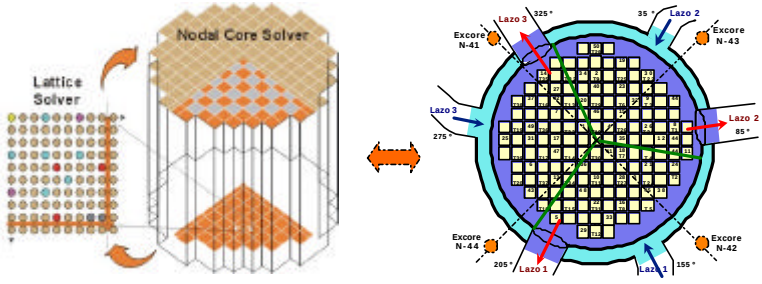
- *Proposal to combine experience in multiphysics and uncertainty analysis in international benchmarks*

Prof. Francesco D'Auria (University of Pisa, Italy)

- *In-Depth Uncertainty Analysis Methods for coupled neutronics-thermal-hydraulics transient analysis: state-of-the-art, critical issues and needs*

Nuclear Science Committee NEA-OCDE Paris, 9 June 2005

- **Nuclear Reactor Transient Analysis requires Coupled *Multi-Physics*:**
  - **3D Core Neutron Kinetics Þ Power distribution + Detector responses**
    Multi-Scales (space-time): nodes, fuel pins and within-pellet (power ⇔ isotopics)
    Multi-Levels (orders of methods): diffusion and transport (incl. MonteCarlo)
  - **3D Core + in-Vessel + System Thermal-Hydraulics Þ r + Temp's**
    Multi-Scales: channels, sub-channels and within-pellet (Temp. ⇔ mat.prop.)
    Multi-Levels: Two-phase flows, CFD, DNS (+ fuel-clad Thermo-Mechanics)



- **Key Issues** (not yet solved) **in Coupled *Multi-Physics* Transient Analysis:**
  - **Physical data, numerical solutions, coupling schemes** (convergence, etc.)
  - **Models and meshes, parallel computing platforms** (efficiency)
  - **Uncertainty analysis of non-linearly coupled *Multi-Physics* methods**

¡¡¡ Subject of this In-Depth discussion !!!

- **The need of Uncertainty Analysis in *Multi-Physics* Reactor Modeling**

3-D Reactor core + vessel + system *Multi-Physics* for:

- ✓ **Best-Estimate safety analysis**
- ✓ **Operation surveillance, planning and training**
- ✓ **Design of advanced and Gen-IV reactors**

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- **NURESIM** Integrated RTD Project of the 6th Euratom Framework Program

European Platform for Nuclear Reactor Simulations

18 Partners from 13 Countries + User's Group ; 7.6 M€ in 3 years (2005-07)