NURESIM: a European Software Platform for Nuclear Reactor Simulation

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Since 2005, Europe is developing the NURESIM Reference Simulation Platform for Nuclear Reactors within the framework of the EURATOM R&D Program. This development follows a roadmap which is consistent with the European SRA (Strategic Research Agenda) of the SNE-TP (Sustainable Nuclear Energy Technology Platform). After delivery of a first version at the end of 2008, the platform is presently being developed in the frame of the NURISP European Collaborative Project, which includes 22 organizations from 14 European countries.

NURESIM intends to be a reference platform providing high quality software tools, physical models, generic functions and assessment results.

The NURESIM platform aims at developing a more accurate representation of the physical phenomena by promoting and incorporating the latest advances in Core Physics, two-phase Thermal-Hydraulics and fuel modelling. It includes multi-scale and multi-physics features, especially for coupling Core Physics and Thermal-Hydraulics models for reactor safety. Easy coupling of the different codes and solvers is provided through the use of a common data structure and generic functions (e.g., for interpolation between nonconforming meshes).

More generally, the platform aims at providing generic pre-processing, post-processing and supervision functions through the open-source SALOME software, in order to make the codes more user-friendly.

The platform also provides the informatics environment for testing and comparing different codes. For this purpose, it is essential to permit connection of the codes in a standardized way. The standards are being progressively built, concurrently with the process of developing the platform.

The NURESIM-Platform and the individual models, solvers and codes are being validated through challenging applications corresponding to nuclear reactor situations, and including reference calculations, experiments and plant data. Quantitative deterministic and statistical sensitivity and uncertainty analyses tools are also developed and provided through the platform.

A Users' Group of European and non-European countries, including vendors, utilities, TSO, and additional research organisations (beyond the current partners) has also been established in order to enhance the role of the platform in meeting the needs of the nuclear industry, as applied to current and future nuclear reactors.

This presentation will summarize the achievements and ongoing developments of the platform in Core Physics, Thermal-Hydraulics, Multi-Physics, Uncertainties and Code Integration.