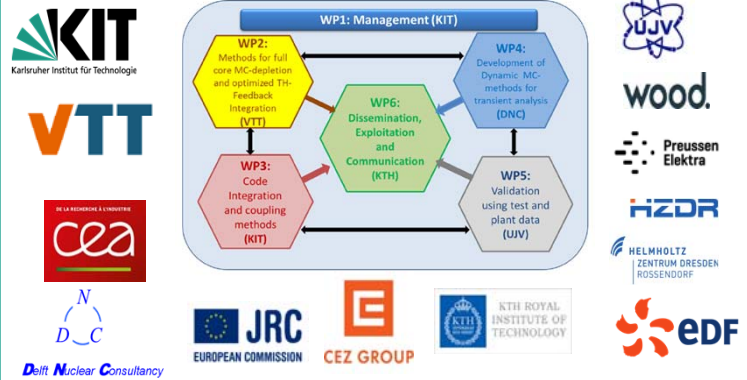# McSAFE – High Performance Monte Carlo Methods for SAFEty Demonstration

Victor Sánchez-Espinoza (KIT), L. Mercatali (KIT), D. Mancusi (CEA), P. Smith (WOOD), J. Dufek (KTH), M. Seidl (Preussen Elektra), L. Milisdorfer (CEZ), J. Leppanen (VTT), J. E. Hoogenboom (DNC), R. Vocka (NRI), S. Kliem (HZDR), P. Van Uffelen (JRC), H. Billat (EDF)
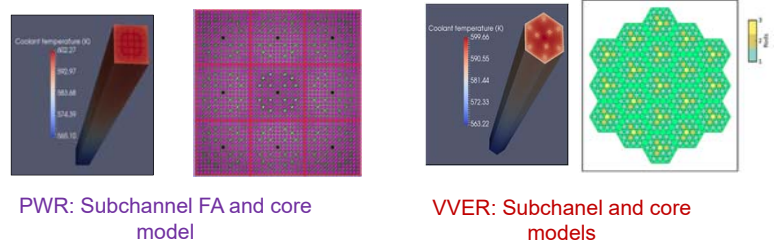
Project Goals: move MC-methods towards industrial applications

- Generalized and optimized N/TH/TM coupling

- Optimal depletion simulations (stability, CPU, memory requirements, fast convergence)

- Extension of MC-codes for transient analysis e.g. RIA (Safety) ➔ dynamic MC-codes

- Validate MC tools using experimental data

- Full core simulations at pin-level using HPC

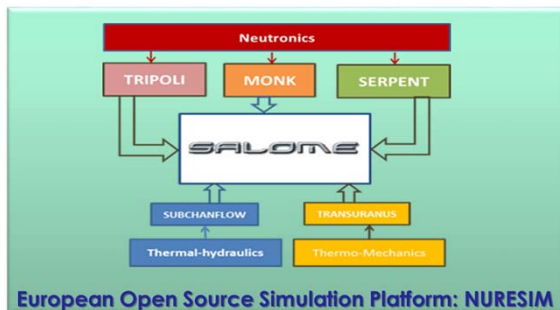- Provide reference solutions for low-order solvers
  ➔ Industry-like applications

McSAFE: MC-Based Multiphysics Tools

European Open Source Simulation Platform: NURESIM

- Two coupling approaches:
  - ICOCO-based approach
  - Internal coupling based on Multi-physics interface

OUTLOOK

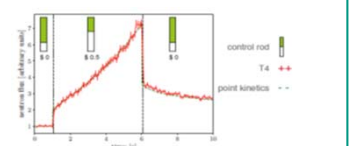- Validation using plant data and tests
- Optimization of codes/methods for HPC-simulations
- Optimizations to reduce CPU-usage for full core depletion
- Reduce statistical uncertainties of MC-codes
- Applications to PWR, VVER and SMR

- **Visit our Website: www.mcsafe-h2020.eu**

- **Any additional information needed: contact victor.sanchez@kit.edu**

McSAFE Structure & Partners

ICOCO-Coupling with flexible Preprocessor

PWR: Subchannel FA and core model

VVER: Subchanel and core models

dynSERPENT/SubChanFlow: Analysis of a REA in Minicore

PWR 3x3 Minicore

Fission power evolution and avg fuel temperature

X-Y power distribution at Time: 4.9 s

Parallel Scalability in HPC
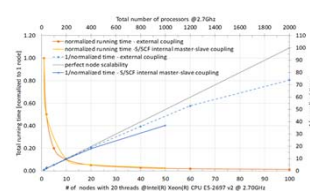
Serpent/SubChanFlow

Validation: SPERT-III REA

dynTRIPOLI Simulation

McSAFE User Group

- User Group established
- To join the UG contact: victor.sanchez@kit.edu
- Test the tools and give your feedbacks