Karlsruhe Institute of Technology

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Datum: Samstag, 21. Februar 2015
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Unser Zeichen: LM

Assessment of computational methods in support to the decommissioning of nuclear power plants (NPPs)

Within the framework of the radiological characterization in support to the decommissioning of NPPs, efficient computational methods are required in order to provide a reliable estimation of the radionuclide inventory and its distribution within the facility. The correct theoretical prediction of the activation and of the isotopic inventory of nuclear components is important since it can directly affect the whole approach to decommissioning, including the choice of the time to start decommissioning and the desirability of delay between stages. In addition, such an estimate will be a great asset in the planning phase to ensure that the facility is decommissioned in a safe, economic and timely manner. This information will assist the planners in determining factors such as the need for decontamination, shielding or remotely operated equipment, waste management and disposal, and potential radiation exposures to the work force.

Different computational methodologies can be applied, these being either Monte Carlo (MC), deterministic, or a combination of these (hybrid techniques).

Some of the following issues will be addressed in the context of this thesis:

- The suitability, effectiveness and efficiency of MC, deterministic and hybrid neutron transport methods for NPP activation studies.
- The development of 3D MC NPP- models for specific nuclear components.
- The performance of different variance reduction (VR) methods for accelerating the MC calculations.

The suitability of state-of-the-art activation codes for reactor ex-core activation calculations.

- Pre-requisites: Mechanical Engineering, Physics, Reactor Physics, interest on numerical simulations.
- Duration: 4-6 Months
- Location: KIT Campus North, Institute for Neutron Physics and Reactor Technolgy (INR), Building 521
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