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Simulation of the Egyptian 2nd Testing Research Reactor (ETRR-2) experimental benchmark in aid of verification and validation of the OSCAR-4 system.

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Abstract content
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Recently, the IAEA published a set of experimental benchmarks for research reactors. Previously, such results had only been published for power reactors, which limited the benchmark tests to code-to-code comparisons, for research reactors. Since these results are now available, it is possible to validate reactor codes against experimental data. The published benchmarks include neutronics and thermal-hydraulic benchmarks for the ETRR-2 reactor. For the purpose of this work, ETRR-2 was of particular interest since some of its components are similar in design as compared to the research reactor operated by Necsa and the focus was on the neutronics benchmark. Most importantly, ETRR-2 was chosen as a test case on the strength of the proven capabilities of the Overall System for the CAlculation of Reactors, generation 4 (OSCAR-4) to simulate the research reactor at Necsa. OSCAR-4 is a nodal diffusion based code which is used to perform day-to-day reactor calculations in support of the research reactor at Necsa. As a means of improving the capabilities of the OSCAR-4, there is a need to solve more benchmark problems in aid of verifying and validating the code system for research reactor applications. From the experimental benchmarks of ETRR-2, Core SU-29 was chosen as the basic core configuration. As a starting point, an OSCAR-4 model was built to model the aforementioned core. As a reference model, a more accurate Monte Carlo code, Serpent, was used to model the same core. Relative errors were calculated for the core power distributions generated from these two independent models, with a maximum error of 6.36%. To further analyze the accuracy of the OSCAR-4 model, a comparison was done between the models by calculating the effective multiplication factor for cases where control rods were fully inserted, half-way inserted and fully extracted from the core. After establishing the correct model, control rod worth experiments were simulated and the results were compared with the experimentally measured results.

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and his / her institution

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