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Verification and validation of the CEFR Serpent model for the generation of reference solutions and Cross Sections database for the deterministic code AZNHEX

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The National Institute for Nuclear Research (ININ) of Mexico, participates in the IAEA-CRP on Neutronics Benchmark of the Chinese Experimental Fast Reactor (CEFR) Start-Up Tests, which was proposed by China Institute of Atomic Energy (CIAE). The Mexican participation in this Benchmark is focused in two main goals: the first one, the use of SERPENT code for the generation of reference solutions and a Macroscopic Cross Sections (XS) database and,the second one, the use of the previously generated XS to verify and validate AZNHEX, a deterministic domestic code, nowunder-development, devoted to Fast Reactors calculations, that is part of the Mexican platform for nuclear reactor analysis: AZTLAN platform.
The Benchmark exercises include the following tests: fuel loading and approach to criticality, control rod worth measurements, sodium void reactivity, temperature reactivity, reactivity due to fuel subassembly position swap, foil activation and reactivity due to thermal expansion. In this paper, a complete Verification and Validation (V&V) process is described for each one of the exercises mentioned above by comparing the numerical results using SERPENT with the experimental data available. Temperature and thermal expansion effects in all the materials are considered for an accurate representation of the model. Several scripts were created, and are briefly described, to simplify and automate input generation considering the control rods position and for the generation of the XS database. The V&V of AZNHEX code with the XS generated with SERPENT is presented in another dedicated paper.

Country/Int. organization

Mexico

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