Contribution ID: **397** Type: **ORAL**

Verification of the neutron diffusion code AZNHEX by means of the Serpent-DYN3D and Serpent-PARCS solution of the OECD/NEA SFR Benchmark

Tuesday, June 27, 2017 11:20 AM (20 minutes)

AZNHEX is a neutron diffusion code for hexagonal-z geometry currently under development as part of the AZTLAN project in which a Mexican platform for nuclear core simulations is being developed. The diffusion solver is based on the RTN0 (Raviart-Thomas-Nédélec of index 0) nodal finite element method together with the Gordon-Hall transfinite interpolation which is used to convert, in the radial plane, each one of the four trapezoids in a hexagon to squares. The main objective of this work is to test the AZNHEX code capabilities against two well-known diffusion codes DYN3D and PARCS. In a previous work, the Serpent Monte Carlo code was used as a tool for preparation of homogenized group constants for the nodal diffusion analysis of a large U-Pu MOX fueled Sodium-cooled Fast Reactor (SFR) core specified in the OECD/WPRS neutronic SFR benchmark. The group constants generated by Serpent were employed by DYN3D and PARCS nodal diffusion codes in 3D full core calculations. A good agreement between the reference Monte Carlo and nodal diffusion results was reported demonstrating the feasibility of using Serpent as a group constant generator for the deterministic SFR analysis. In order to verify the under development solver inside AZNHEX, the same Serpent generated cross sections sets for each material were exported to AZNHEX format for four different states (as in DYN3D and PARCS): a) a reference case in which the multiplication factor (keff) is the compared value, b) the Doppler constant (KD), c) the sodium void worth, and d) the total control rod worth. Additionally, the radial power distribution was also calculated. The results calculated with AZNHEX showed also a quite good agreement in the direct comparison with DYN3D (-66 pcm in keff) and PARCS (-109 pcm in keff) and therefore against the Serpent reference solution (-194 pcm in keff). As AZNHEX is still under development further improvements will be implemented and new tests will be carried out, but so far the results presented here give confidence in the development.

Country/Int. Organization

Mexico/ININ,IPN
Germany/HZDR

Primary author: Dr GOMEZ TORRES, Armando Miguel (Instituto Nacional de Investigaciones Nucleares)

Co-authors: Dr DEL VALLE GALLEGOS, Edmundo (Instituto Politecnico Nacional); Dr FRIDMAN, Emil (Helmholtz-Zentrum Dresden-Rossendorf); Dr PUENTE ESPEL, Federico (Instituto Nacional de Investigaciones Nucleares); Ms ARRIAGA RAMIREZ, Lucero (Instituto Politecnico Nacional); Dr LOPEZ SOLIS, Roberto Carlos (Instituto Nacional de Investigaciones Nucleares); Dr KLIEM, Sören (HZDR)

Presenter: Dr GOMEZ TORRES, Armando Miguel (Instituto Nacional de Investigaciones Nucleares)

Session Classification: 6.3 Neutronics - 1

Track Classification: Track 6. Test Reactors, Experiments and Modeling and Simulations