
Contribution ID: **411**

Type: **ORAL**

# Solution of the OECD/NEA SFR Benchmark with the Mexican neutron diffusion code AZNHEX

*Tuesday, June 27, 2017 2:50 PM (20 minutes)*

The AZTLAN Platform project is a Mexican national initiative led by the National Institute for Nuclear Research of Mexico, which brings together nuclear institutions of higher education in Mexico: the National Polytechnic Institute, the National Autonomous University of Mexico and the Autonomous Metropolitan University, in an effort to take a significant step towards positioning Mexico, in the medium term, in a competitive international level on nuclear reactors analysis and modeling software. The project is funded by the Sectorial Fund for Energy Sustainability CONACYT-SENER and one of its main goals is to build up as well as strengthen the national development of specialized nuclear knowledge and human resources. The AZTLAN platform consists of several neutronics and thermal-hydraulics modules. Among the neutronics tools, the AZNHEX code has been developed. AZNHEX is a 3D diffusion code that solves numerically the time dependent neutron diffusion equations in hexagonal-z geometry. 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. In order to support and provide reliability to the platform, a stringent verification and validation (V&V) process in which the use of international Benchmarks and Monte Carlo reference solutions has been started. As a part of this V&V activities, results obtained with AZNHEX for the full-core simulations of the two nuclear cores of the OECD/NEA SFR Benchmark (a 1000 MW metallic-fueled and a 3600 MW MOX-fueled) are shown and compared with the ones obtained with the reference Monte Carlo code Serpent. The cross sections sets used in AZNHEX were also generated in a previous step with the Serpent code to maintain consistency between calculations. The obtained Results for keff, sodium void worth and control rods worth are within reasonable agreement; in the order of tens of pcms. The results presented are not only useful for the verification of AZNHEX, but also these ones help to define a well-tested methodology in order to generate cross section sets for future dynamic calculations with AZNHEX. Based on the results, the strengths and limitations of the AZNHEX code are discussed in the conclusions and a series of improvements have been identified and planned to be implemented.

## Country/Int. Organization

MEXICO/INSTITUTO NACIONAL DE INVESTIGACIONES NUCLEARES

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**Session Classification:** 6.4 Neutronics −2

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