International Conference on Fast Reactors and Related Fuel Cycles FR22: Sustainable Clean Energy for the Future (CN-291)

Contribution ID: **438** Type: **POSTER**

CRITICALITY SENSITIVITY ANALYSIS IN RELATION TO EMPTIES OF A FAST REGENERATOR NUCLEAR REACTOR

Friday, April 22, 2022 10:30 AM (2 hours)

The current energy production, resulting from the concepts related to the fission of fissile nuclides, nuclear energy, is of the order of 397,650 MWe produced by the 449 nuclear plants in operation and another 54,364 MWe to be supplied by another 54 under construction on the planet [2], data that demonstrate the growth in installed capacity and the installation of electrical energy from nuclear fission. Thus, nowadays, the projection of an increase in the share of nuclear energy in energy production and supply is notorious, with the need for annual availability of approximately 62.825 thousand tons of mineral resources of its fundamental item, natural uranium, for the which is estimated at approximately 7.988 million tons of world reserves [3]. This work, applying spherical coordinates, presents the modeling of the FBR core considering the approximation of diffusion equation to one and two energy groups for conditions without void and also with the insertion of 5.87% of void in the coolant. Taking as reference the analytical approach developed, programs were elaborated in FORTRAN language that allowed the calculation of the flow distribution, the absorption, the leakage, the kef f, and the reactivity coefficient. The detailed results allowed showing the behavior of FBR and the sensitivity of the kef f and the reactivity coefficient to the presence of void, which presented the same trend of the results obtained through the SCALE software. Therefore, the exposed modeling proved to be a powerful tool in the initial phases of the nuclear reactor core design.

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Session Classification: Poster Session

Track Classification: Track 6. Modelling, Simulations, and Digitilization