Contribution ID: **364**   Type: **Poster Presentation**

Pressurized Water Reactor MOX/UO₂ Core Transient Benchmark Steady State Calculations with OSCAR-4

Thursday, 12 July 2012 17:30 (2 hours)

Abstract content
   (Max 300 words)

In the design of new reactors and optimization of cycle load in existing nuclear reactors, the use of computer models has become integral to the nuclear industry. Recently, a need has risen to examine the extent to which these codes can be used to analyze reactors that use mixed-oxide (MOX) fuel, due to the international weapons plutonium disposition programme. For this purpose, the OECD/NEA Working Party on Scientific Issues in Reactor Systems proposed a benchmark to analyze the significant changes to the kinetic response of a four-loop Westinghouse PWR reactor core, partially loaded with MOX fuel, as a result of the different neutronic characteristics of plutonium to uranium.

In this work, an OSCAR-4 full core model is created for the steady state benchmark problem (part I), using the provided two-group cross-section library. The Overall System for the Calculation of Reactors (OSCAR-4) is a multi-group nodal diffusion code developed jointly by Necsa, South Africa and CompuSim AB, Sweden. Calculations are performed to determine the core multiplication factor, total rod worth and power density distribution for all rods in and all rods out states. The results obtained compare well with those of other nodal diffusion codes that participated in the benchmark. Also, the results are in good agreement with those of heterogeneous solutions obtained using different cross-section libraries.

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Session Classification: Poster Session

Track Classification: Track B - Nuclear, Particle and Radiation Physics