

RBEC Neutronics Benchmark: Path Forward

Solutions have been received from most participants with two further solutions expected in the near future.

Discrepancies among solutions are seen both for BOL eigenvalue and for the evolution of eigenvalue versus depletion. The Kurchatov Institute has analyzed these discrepancies and has found that a significant fraction of both discrepancies may be due to variations in the U^{238} basic nuclear data in the several nuclear data sets used by different participants.

To nail down the source of discrepancies, the participants agreed to provide additional edits and descriptions of methodology as follows:

(1) Describe in detail the sequence of steps in depleting the number densities in all regions including:

- How finely the region is subdivided;
- How the flux is normalized;
- Whether the isotopes are depleted by group fluxes or by a one-group flux;

(2) At BOL:

- Produce a neutron balance for the zero buckling (infinite medium) Core 1 composition with capture, fission, neutron generation reported by heavy isotope and for the sum of structure isotopes and for the sum of coolant isotopes. Normalize the balance to 1000 fissions in the region;
- Report Σ -transport and Σ -removal cross-sections for the sum of Pb isotopes by energy group used for Core 1 – if a deterministic solution was used. Additionally, Mr. A. Dudnikov will collapse the continuous energy Monte Carlo reaction rates for Pb Σ_{tr} and Σ_f from basic nuclear data libraries JENDL, JEF and ENDF into a group structure of 10 to 0.821MeV; 0.821 to 0.1111MeV; 111.1keV to 9.118keV and 9.118 keV to 0.0eV

(3) At the mid point and the end of cycle for Mode 1:

- Report number densities for Pu^{239} , Pu^{240} , Pu^{241} , U^{238} ;
- Report fission product capture cross-section Σ_a ;
- Produce a neutron balance (as at BOL) for an infinite medium solution of the composition generated in the original (non-infinite medium depletion).

Mr. A. Dudnikov volunteered to assemble and analyze the supplemental edits. In June 2007, he will distribute a format to be filled. Submittals are due to Mr. A. Dudnikov by August 31, 2007.

On a related topic, Mr. Toshinsky announced that a (U-fuelled) critical experiment is in planning to support SVBR-75/100 design and construction. He volunteered that IPPE and Gidropress could in the future produce a calculation benchmark for comparison against the critical assembly measurements. This was greeted with enthusiasm by the participants. The release of the critical assembly results would require a monetary compensation of a magnitude for later discussion.