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Numerical simulation of hydraulics and heat transfer in the BREST-OD-300 LFR fuel assembly

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This paper presents an analysis of hydraulic and heat transfer phenomena in a lead coolant flow in a fuel assembly (FA) of the BREST-OD-300 reactor core central subzone based on CFD simulations (RANS) using the STAR-CCM+ code. Based on the simulation results, coolant pressure, velocity and temperature fields, and the fuel cladding temperature distribution have been obtained. The FA design comprises a pin bundle (p/d = 1.38) with spacer grids, and the outer shroud has been eliminated. The influence of the FA design features on the hydraulic characteristics and the cladding temperature distribution has been shown.
The CFD model was validated on experimental data on the hydraulic characteristics of a full-scale FA model. A good agreement has been shown between calculated and experimental data on the pressure drop both for the FA parts (head, pin bundle and tail) and for the FA as the whole.

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