Modelling Thermo Mechanical Reactivity Feedback in Fast Reactors

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Fast spectrum reactors are characterized by positive reactivity addition upon heat-up of the coolant. This positive reactivity is compensated by multiple negative feedback mechanisms, among them thermal expansion of the fuel and other structures in the core. Precise knowledge of the magnitude and time evolution of this thermal expansion effect is essential for making the safety case of fast reactors. Currently, a simplified description of such structural feedbacks is used to evaluate the core reactivity response to various transients. In this project, an accurate thermo-mechanical model of a fast reactor core will be developed in OpenFOAM multi-physics platform and coupled to Serpent Monte Carlo neutron transport code. The model will be subsequently used to study transient behaviour of the core and assess the accuracy of the existing models.