MODELLING OF NATURAL CIRCULATION IN PMK-2 EXPERIMENTS USING RELAP5 CODE

TADAS KALIATKA^{1,*}, ALGIRDAS KALIATKA¹, ARON HEGEDUS², ATTILA GUBA²

¹Lithuanian Energy Institute, Breslaujos g. 3, LT-44403, Kaunas, Lithuania ²HUN-REN Centre for Energy Research, 1121 Budapest, Konkoly-Thege Miklós út 29-33, Hungary

* Corresponding author email: Tadas.Kaliatka@lei.lt

Systems, utilizing natural coolant circulation, are valued for not needing human intervention and being able to operate without external power supply systems. Such systems are widely used in different passive safety systems of current nuclear reactors and is the main distinctive feature of Small Modular Reactors. SMRs introduction is planned in several EU countries – Lithuania and Hungary included.

The Lithuanian Energy Institute (LEI) and the Hungarian Centre for Energy Research (HUN-REN EK) are working together in the bilateral project issued by Lithuanian and Hungarian Academies of Science in 2022. The joint project titled "Contribution to the Development of Small Modular Reactor Concepts for the European Union" was accepted by both academies. During this three-year length project, the most promising SMR concepts, the main safety challenges related to employing passive safety systems for nuclear reactor cooling during accidents, investigation of critical heat transfer, and other issues are analysed.

This paper deals with the investigation of natural circulation of coolant performed in both institutions – HUN-REN EK and LEI. HUN-REN EK has the PMK-2 experimental facility where several experiments were conducted related to natural circulation. These experiments may be utilized to better understand the behavior of passive safety systems. LEI colleagues using the thermal hydraulic code RELAP5 are modeling the natural circulation phenomena observed in these PMK-2 experiments and using the calculation results to validate the numerical code. RELAP5 code calculation results against experimental data will be presented and discussed in the presentation. The performed investigation of natural circulation will contribute to the development of passive safety cooling system of SMRs.

079_abstract_FISA2025