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Development of 10 MW Micro-Nuclear Reactor as Case Study for the Kingdom of Saudi Arabia

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The Kingdom of Saudi Arabia has joined the distinguished group of nations benefiting from nuclear reactor technology. Given the unique environmental conditions of the region, the most effective strategy for nuclear reactor deployment is the development of low-power micro-nuclear plants that can be rapidly installed in remote locations [1]. The key considerations in nuclear reactor implementation include innovative design, operational safety, and economic feasibility[2,3]. Accordingly, this research focuses on the development of a low-power micro-nuclear reactor. In the initial phase, a technical and economic assessment of small modular reactors and micro-nuclear reactors is conducted to evaluate cost-effectiveness and safety performance. The second phase involves the development of passive safety features to enhance the safety performance of the selected micro-reactor. Subsequently, the conceptual design of the reactor is developed based on neutronic and thermal-hydraulic calculations. Computational tools are primarily utilized for thermal-hydraulic analysis to ensure accurate performance assessment. This study provides a comprehensive preliminary evaluation of micro-reactors, paving the way for further research and benchmark studies on advanced nuclear reactor technologies. Additionally, a key objective of this project is to train graduate students in nuclear engineering, equipping them with expertise in reactor benchmarking and the development of innovative reactor designs.

Technical Track

Nuclear Thermal-Hydraulics

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