

Evaluation of Reflector Drums as an Alternative Control Mechanism in PWR-based Small Modular Reactors

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The growing interest in compact and lightweight nuclear reactors, particularly Small Modular Reactors (SMRs), calls for innovative and simplified control strategies. This study investigates the viability of using rotating annular reflector drums as a primary control mechanism in SMRs an approach not applied in Pressurized Water Reactor (PWR) technology previously. The concept involves modulating neutron economy through varying reflector materials and geometries instead of traditional control rods. A detailed 3D reactor model is being developed using advanced computational tools to perform high-fidelity neutron transport simulations. The study evaluates combinations of reflector materials, fuel types, and moderators to optimize reactivity control. Additionally, the dynamic behaviour of neutron generation density is analysed across various operational phases of drum rotation.

This control strategy not only simplifies reactor design but also inherently eliminates the risk of rod ejection accidents, offering a safer and potentially more robust control mechanism for next-generation SMRs.

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Technical Track

Student Competition

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