ABSTRACT

Small Pb-Bi Cooled No-Onsite Refueling Nuclear Reactor (SPINNOR) is one of the innovations of Small Modular Reactor (SMR), which is safe, efficient, and environmentally friendly by utilizing thorium as an alternative fuel. This study aims to analyze the neutronic parameters of the SPINNOR fast reactor fueled by thorium dioxide (ThO2) and uranium nitride (UN) with variations in fuel fractions of 50%, 55%, and 60% through Monte Carlo simulations using the Monte Carlo N-Particle (MCNP) code. Simulations were carried out with two assembly layout (TLA) configurations without refueling to determine the optimal design. The results show that the 50% fuel fraction at 590 MWth power is a more efficient design with the highest burnup level and neutron flux, while the 60% fuel fraction has the longest critical period of up to 7 years with an average excess reactivity value of 6.12%. The SPINNOR reactor, fueled by ThO2 and UN, with a capacity of 590 MWth, includes a converter and burner reactor with an initial conversion ratio (CR) of 0.35, not as a breeder reactor. This research is expected to serve as a reference and contribute to the development of thorium-fueled nuclear reactor technology in Indonesia.

Kata Kunci : *Thorium, Small Modullar Reactor (SMR), Monte Carlo, neutronic*