ABSTRACT

Nuclear fuel cladding is one of the important factors that influences reactor's performance and safety level. Accident tolerant fuel (ATF) is a new fuel concept developed to enhance reactor's performance and safety level under various conditions. In this study, the neutronic performance simulation of an ATF design with SiC-coated Al_2O_3 cladding in the core of a pressurized water reactor (PWR) NuScale was tested using the Monte Carlo method. The research was conducted to determine the impact of using such cladding design on neutronic characteristics, reactor performance during coolant system failure, and NuScale reactor performance under normal operating conditions. For comparative analysis, tests were also performed on the standard NuScale reactor cladding design made of M5 material and Al_2O_3 cladding without SiC coating. The reactor modeling and simulation were carried out using MCNP6.2 and VISEDX24E software. Based on the research, the use of SiC-coated Al_2O_3 cladding resulted in slower neutron population growth in the NuScale reactor compared to M5 cladding. The SiC-coated Al_2O_3 cladding showed less negative MTC and VC values compared to M5 cladding. Slower neutron population growth caused the NuScale reactor with SiC-coated Al_2O_3 cladding to reach critical and subcritical conditions in a shorter time frame than M5 cladding. Thus, this cladding design makes the reactor easier to control but less efficient in fuel usage compared to M5 cladding. The results of this study are expected to serve as a reference for the development of nuclear technology in Indonesia.

***Keywords** : ATF, PWR, NuScale, cladding, Al_2O_3, SiC.*