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Performance Optimization Analysis of PeLUIt-40 using HTGR Code Package (HCP)

The PeLUIt-40 (*Pembangkit Listrik dan Uap untuk Industri*) reactor, a pebble-bed High-Temperature Gas-Cooled Reactor (HTGR) with a power of 40 MWt designed for electricity and co-generation applications, holds promise as a solution for clean energy. A thorough examination of neutronic and thermal-hydraulic aspects is essential to assess the resilience of the PeLUIt-40 design and ensure compliance with safety standards. This study focuses on evaluating the reactor's resilience and safety through comprehensive analyses of neutronic and thermal-hydraulic aspects. Leveraging the HTGR Code Package (HCP), we aim to optimize its operational dynamics, enhancing efficiency and sustainability. The research integrates various simulations enabled by the HCP to provide detailed insights into PeLUIt-40 behavior. Neutronics simulations offer an understanding of neutron flux distributions, criticality, fuel depletion, guiding control strategies, and fuel management. Thermal-hydraulic analyses elucidate coolant flow characteristics and temperature profiles critical for maintaining safety margins. Safety analyses assess accident scenarios, i.e., Depressurized Loss of Forced Cooling (DLOFC), ensuring the reactor's resilience against unforeseen contingencies. Integration of these analyses aims to enhance reactor performance and highlight PeLUIt-40 potential for electricity and co-generation applications. This research will contribute to ongoing discussions on advanced reactor technologies and inform future HTGR design and operation advancements.

Country OR International Organization

Indonesia

Email address

nuri012@brin.go.id

Confirm that the work is original and has not been published anywhere else

YES

Author: TRIANTI, Nuri (National Research and Innovation Agency of Republic of Indonesia (BRIN))

Co-authors: WULANDARI, Cici (Institut Teknologi Bandung); IRWANTO, Dwi (Institut Teknologi Bandung); MIFTASANI, Fitria (National Research and Innovation Agency (BRIN), Indonesia); WIDIAWATI, Nina (National Research and Innovation Agency (BRIN), Indonesia); SETIADIPURA, Topan (BRIN); SUUD, Zaki (Institut Teknologi Bandung)

Presenter: TRIANTI, Nuri (National Research and Innovation Agency of Republic of Indonesia (BRIN))

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