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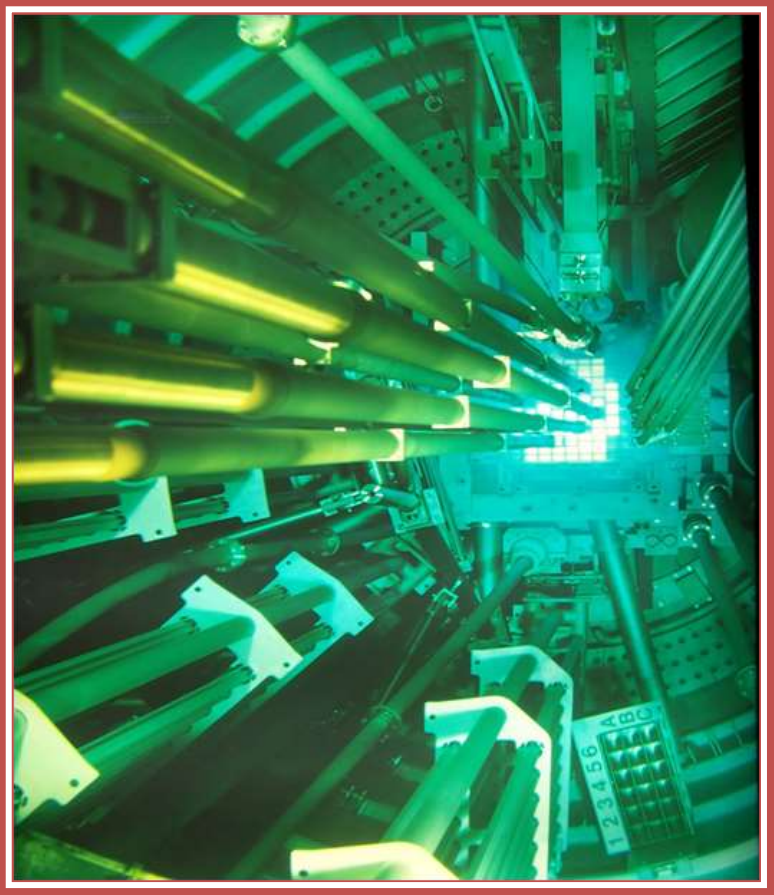

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PREFACE

Dear readers,

With great pleasure, we provide you with the second issue of the Journal of Nuclear Reactor Technology (Jurnal Teknologi Reaktor Nuklir), Tri Dasa Mega, in 2025 – Vol. 27 No. 2 (June 2025). This issue contains five articles discussing various applications of nuclear technologies and sciences.

The first article, "A Probabilistic Approach to Assess Sediment Ejecta Hazard for Nuclear Power Plant Siting: Insights from the Serpong Case Study", was written by Akhmad Muktaf Haifani, Hadi Suntoko, Topan Setiadipura, and Widjojo A. Prakoso, from the Faculty of Engineering, Department of Civil Engineering, University of Indonesia, Depok, West Java, Indonesia. They study liquefaction-induced sediment ejecta endangering the safety of nuclear power plant (NPP) sites, yet traditional indices like LPI and LSN ignore important underlying mechanisms. This paper introduces the Probabilistic Ejecta Potential Index Analysis (Prob_EPI), a physics-based alternative that takes into consideration pore pressure dynamics, interlayer effects, and hydraulic gradients. When normalized against a Hydro-Mechanical Boundary (HMB) and confirmed with six statistical measures, the 80% artesian gradient is found as the essential threshold. When applied to two boreholes (DH11 and DH17) at the proposed Serpong NPP site under 250-5000-year seismic scenarios, Prob_EPI increases with seismic strength and reveals vulnerable sand layers at depths of 5-22 m. The approach strengthens the basis for evaluating ejecta hazards and increases confidence in nuclear site selection.

The second article, "Thermal Hydraulic Performance Asymmetric Aero Foil Fin in Printed Circuit Heat Exchanger," was studied by Donny Nurmayady, Mita Konstantin, Khairul Handono, Arief Tris Yulianto, Erwin Nashrullah, Nurlaila, Devita Nitiamijaya, Jentik Meikayani, and Muhammad Zulham Kentji from the Research Center for Nuclear Reactor Technology, National Research and Innovation Agency of Indonesia, Kawasan Sains dan Teknologi, BJ Habibie, Office Building. 720, Tangerang Selatan, Banten, Indonesia. In this research, about aligning with the development of an advanced reactor in SMR design, a compact heat exchanger was considered important. Printed Circuit Heat Exchanger (PCHE) is a compact heat exchanger with the smallest dimensions among industrial heat exchangers. Many innovative designs have been published regarding thermal-hydraulic performance as well as architecture or structure in PCHE. This paper shows a comparison of airfoil fin shapes. The purpose of this study is to compare thermal hydraulic performance between symmetric and asymmetric airfoil fins in the Printed Circuit Heat Exchanger (PCHE) using three different gases, i.e., Nitrogen, Carbon dioxide, and Hydrogen. One row of 3-D airfoils has been analyzed with the Nusselt number, pressure drop, and heat transfer coefficient compared. The simulation has been done on the finite element method using COMSOL software to demonstrate the structures, the heat transfer profile, as well as thermal-hydraulic numbers. The result of this research when the asymmetrical aerofoil has about 23.38% higher heat transfer rate and 19.67% lower pressure drop compared to the Air Foil Fin (symmetrical aerofoil). The conclusion that an asymmetric aerofoil using carbon dioxide would provide the smallest physical dimension, followed by the lowest pressure drop.

The third article, "Boron Neutron Capture Therapy (BNCT) Dose Optimization for Oesophageal Cancer Using Particle and Heavy Ion Transport Code System (PHITS) Ver. 3.35," was explored by Putri Nur Cahyani, Mokhamad Tirono, Yohannes Sardjono, Isman Mulyadi Triatmoko, Gede Sutrisna, Fendinugroho, Nunung Nuraeni, and Heru Prasetio from the Department of Physics, Faculty of Science and Technology, Maulana Malik Ibrahim State Islamic University of Malang, Indonesia. Their research is about Esophageal cancer, which is a type of cancer that has a globally high incidence

and mortality rate. Boron Neutron Capture Therapy (BNCT) is a promising radiation therapy method in esophageal cancer treatment due to its ability to deliver high doses selectively to tumor tissue with minimal impact on surrounding healthy tissue. This study aims to optimize BNCT dose distribution, evaluate the irradiation time, and determine the most effective irradiation direction in esophageal cancer. Simulations in this study were carried out using PHITS version 3.35 to model the geometry of esophageal cancer, surrounding organs, and radiation sources used. The phantom represented an ORNL adult male with a 24,69 cm^2 tumor. The neutron source came from an accelerator with a 30 MeV proton beam. The boron concentrations analyzed in the cancer tissue were 110, 125, and 140 µg/g. Irradiation from the posterior (PA) direction with a boron concentration of 140 µg/g showed the most optimal BNCT therapy results, with an irradiation time of 15.78 minutes. This technique is capable of delivering an effective dose to the cancerous tissue without exceeding the tolerance limits of the surrounding healthy organs, making it safe for use.

The fourth article, "Boron Neutron Capture Therapy (BNCT) Dose Optimization for Varian Cancer Oligometastatic Using Particle and Heavy Ion Transport Code System (PHITS) v3.35," was studied by Al Fiyatuz Zuhroh, Mokhamad Tirono, Yohannes Sardjono, Gede Sutresna Wijaya, Isman Mulyadi Riatmoko, and Fendi Nugroho, from the Department of Physics, Faculty of Science and Technology, Maulana Malik Ibrahim State Islamic University, Malang, Indonesia. The paper presents that in Indonesia, ovarian cancer ranks third among cancer-related deaths, with a poor prognosis largely due to late-stage diagnosis and limited treatment efficacy. Boron Neutron Capture Therapy (BNCT) has emerged as a promising alternative, offering selective tumor cell destruction hrough boron-10–mediated nuclear reactions. This study employed HITS v3.35 to simulate BNCT in a case of oligometastatic ovarian cancer with para-aortic lymph node involvement (FIGO IIIC). The neutron source was a 30 MeV cyclotron. Simulations were conducted with two irradiation directions, posterior–anterior (PA) and left lateral LLAT), and three boron concentrations of 100, 120, and 145 µg/g. The A direction provided a more focused dose distribution to the tumor target nd a shorter irradiation time compared to LLAT. The results indicated that the posterior–anterior (PA) beam configuration provided a more favorable balance between tumor dose coverage, irradiation time, and organ-at-risk (OAR) sparing compared to the lateral approach. These findings suggest that PA irradiation with 120 µg/g boron concentration may represent a promising option in BNCT planning for ovarian cancer. However, as this work is based on simulation in an idealized phantom, further experimental and clinical validation is required before clinical application can be considered.

The fifth article, "Validation of the Batan-3DIFF Code against Fission Chamber Measurements for In-Core Thermal Neutron Flux in the RSG-GAS Reactor," was investigated by Ranji Gusman, Alexander Agung, Mohammad Subekti, Fitri Susanti, and Surian Pinem from the Department of Nuclear Engineering and Engineering Physics – Universitas Gadjah Mada, Yogyakarta, Indonesia. This paper presents that the accurate determination of neutron flux distribution is essential for reactor physics analysis and supports various applications, including material irradiation and radioisotope production. This study presents a comparative analysis of the axial thermal neutron flux distribution, evaluating results from the deterministic diffusion code Batan-3DIFF against experimental measurements obtained using a fission chamber detector. Measurements were performed at three irradiation positions—D-7, E-7, and G-7—within the RSG-GAS reactor core. At position D-7, the Batan-3DIFF calculation yielded a maximum thermal neutron flux of approximately 1.34×10^{14} $n\cdot cm^{-2}\cdot s^{-1}$, while the fission chamber measurement recorded a slightly lower value of 1.26×10^{14} $n\cdot cm^{-2}\cdot s^{-1}$, corresponding to a relative deviation of 6.0%. Similar levels of discrepancy were observed at positions E-7 (6.7%) and G-7 (6.8%), with the computational results consistently overestimating the measured flux. The systematic deviations are primarily attributed to the geometric and material homogenization approximations inherent in the diffusion model, as well as differences in the neutron energy response of the fission chamber compared to the modeled spectrum. Despite these minor discrepancies, the overall agreement between the calculated and experimental flux profiles confirms that Batan-3DIFF is capable of reliably representing axial neutron flux distributions in the RSG-GAS reactor

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On behalf of the Jurnal Teknologi Reaktor Nuklir (Journal of Nuclear Reactor Technology), Tri Dasa Mega, I would like to thank all Editors, Reviewers, Managements, Authors, and Readers for your endless support.

Editor in Chief