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MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

NMB'S HYDROGEN HyPEReactor DELIVERS RELIABLE, ZERO-EMISSION POWER TO ORANG ASLI VILLAGE

PERAK, 18 JULY 2025 – NMB (NanoMalaysia Berhad), an agency under the Ministry of Science, Technology and Innovation (MOSTI), today marked the first public operation and real-world deployment of its solid-state hydrogen-based off-grid power system, the HyPEReactor, at Perkampungan Orang Asli Tibang, Perak. This milestone marks a significant step in validating the system's ability to deliver clean and reliable electricity to underserved rural communities, replacing unstable and carbon-emitting diesel generators with a sustainable power source.

Developed in collaboration with NanoCommerce Sdn Bhd and HyPERTech Industries Sdn Bhd, the HyPEReactor uses a cutting-edge nanotechnology enhanced material mixture for high-capacity hydrogen generation. The generated hydrogen is converted into electricity through a fuel cell device, providing uninterrupted power with zero carbon emissions and ensuring villagers have access to clean and safe energy that supports their daily lives and essential services. During the development of this technology, the Fuel Cell Institute at Universiti Kebangsaan Malaysia (UKM) played a key role as a technical and research advisor, particularly in the areas of fuel cell performance and system integration. Meanwhile, Limpahan Engineering Sdn Bhd played a role in technology development, leveraging its expertise in engineering design and system fabrication. The company oversees the full process from concept design and manufacturing to assembly, automation, and testing, ensuring high-quality, reliable, and market-ready solutions.

Perkampungan Orang Asli Tibang was selected as the pilot site due to its limited access to stable grid electricity and frequent power outages seen at neighbouring villages, which have impacted essential services such as communication, education, and healthcare. With the installation of the HyPEReactor under the Ekonomi MADANI Programme by MOSTI, the villagers now benefit from a stable, quiet, and clean power supply, which improves their quality of life and enables better opportunities for the community.

MALAYSIA MADANI

The demonstration was officiated by the Minister of Science, Technology and Innovation, YB Tuan Chang Lih Kang, and NMB Group's Chief Executive Officer, Dr Rezal Khairi Ahmad.

YB Tuan Chang Lih Kang said, "The field deployment of the HyPEReactor is a manifestation of the MADANI government and our national commitment to equitable energy access and sustainable innovation. This initiative brings clean power to communities that need it the most and accelerates and democratises the adoption of hydrogen technologies under Malaysia's Hydrogen Economy and Technology Roadmap (HETR)."

The HyPEReactor offers significant advantages over conventional systems. It provides a more cost-effective alternative, utilising recyclable sodium borohydride ($NaBH_4$) as a hydrogen carrier. This compound can be regenerated, offering potential cost savings of up to 40%, associated with green hydrogen production, depending on the energy source and scale of deployment. It is also safer as it operates at low pressures (below 10 bar), significantly reducing the risks associated with high-pressure hydrogen systems (350 to 700 bar). Additionally, its simpler and lightweight design eliminates the costly need for heavy compressors and high-pressure hydrogen tanks, making it also practical for mobility applications.

This deployment serves as a validation milestone for NMB's hydrogen innovation, paving the way for potential scale-up across rural Malaysia and bringing hope to many more underserved communities that will gain access to sustainable energy. It also offers additional opportunities in telecommunications infrastructure and portable or mobile clean power solutions.

NMB Group's Chief Executive Officer, Dr Rezal Khairi Ahmad, said: "This milestone reaffirms NMB's position at the forefront of green hydrogen innovation in Malaysia. The government's strong commitment to clean energy transition has translated into continued support for NMB for investments in hydrogen technology development and commercialisation. The Perkampungan Orang Asli Tibang demonstration project is positioned as an investment awareness platform to create a conducive environment for the widespread adoption of this innovative solid-state hydrogen generator."

Globally, the market for solid-state hydrogen systems is projected to grow to USD 1.6 billion by 2030, driven by increasing demand for safe and compact hydrogen storage and generation solutions, coupled with rising adoption across key sectors and strong policy support in Europe and APAC to meet carbon neutrality goals. The Asia-Pacific market, particularly in the context of rural electrification, is expected to play a significant role in this growth, with households constituting the largest end-user segment.

In 2024, the Asia-Pacific (APAC) market for solid-state hydrogen generators was valued at USD 570 million, and it is anticipated to reach USD 1.2 billion by 2032. This upward trajectory reflects the region's commitment to sustainable energy solutions and its response to the challenges of rural energy.

The HyPEReactor was developed under the Hydrogen EcoNanoMY programme, led by NMB, with contributions from local technology partners, SMEs, government agencies, including Jabatan Kemajuan Orang Asli (JAKOA), academic institutions, and industrial partners. The project is being implemented as part of the MADANI Economy: Empowering the People initiative, which aims to bridge the gap between rural and urban areas by improving basic facilities. It aligns with the National Science, Technology and Innovation Policy (NSTIP) 2021–2030, which envisions the creation of a sustainable, inclusive, and scientifically advanced society moving towards becoming a high-tech nation.

The project also reflects key MADANI values such as Sustainability (Kelestarian), by providing clean, zero-emission energy to reduce environmental impact, and promotes well-being (Kesejahteraan) through improved access to reliable & sustainable electricity in rural communities. The development and deployment of the HyPEReactor highlight Innovation (Daya Cipta), showcasing Malaysia's capabilities in advanced clean energy technologies.

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