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Keppel, NUS, and NTU to develop utility-scale floating hybrid renewable energy system

First-of-its-kind offshore hybrid system to harness solar, wind, and tidal energy for continuous power generation.

Singapore, 27 October 2022 – Keppel Infrastructure, through its applied technology innovation arm, KepInfra Energy Transition Centre (KETC), National University of Singapore, through its Solar Energy Research Institute of Singapore (SERIS), and Nanyang Technological University (NTU), through its Energy Research Institute @ NTU (ERI@N) have signed a Memorandum of Understanding (MOU) for a joint-study on the technological and economic feasibility of developing a first-of-its-kind floating hybrid renewable energy system (RES) for operations in Singapore.

The floating hybrid RES concept comprises modular offshore floating solar platforms with the flexibility to integrate other renewable energy technologies, such as ocean wave energy conversion systems, tidal energy turbines and paddles, as well as wind turbines. The study entails exploring the deployment of the system at a particular offshore test site in Singapore waters, subject to the relevant regulatory approvals.

If successful, the parties plan to design and deploy a pilot system with at least 100 MW of renewable power generation capacity which can be scaled up over time. After implementing the novel system in Singapore, the aim is to roll-out the floating hybrid RES innovation to other regions in Asia and beyond.

An offshore floating hybrid RES harnessing complementary energy sources such as solar, wind, and waves can provide continuous 24/7 power output, higher capacity factor and a lower levelised cost of energy compared to single-source energy platforms. It also reduces the amount of marine space required and increases efficiency through the concurrent use of critical electrical infrastructures and combined operation and maintenance methodologies.

Ms Cindy Lim, CEO of Keppel Infrastructure, said, “Keppel Infrastructure is constantly pushing the envelope to accelerate energy innovations by engaging with stakeholders and partnering leading research institutes. We are pleased to embark on this joint study and co-creation of an innovative floating hybrid renewable energy system, to be deployed in suitable offshore locations around Singapore, with National University of Singapore and Nanyang Technological University. With limited land space in Singapore, moving into waters offshore presents opportunities to unlock the potential for more diversified renewable energy sources, thereby enhancing energy security and supporting Singapore’s transition to a greener energy mix. This is in line with Keppel’s Vision 2030 which puts sustainability at the core of the Group’s strategy.”

Signed at the Asia Clean Energy Summit (ACES) 2022, which is part of the Singapore International Energy Week (SIEW), the MOU brings together the complementary strengths and capabilities of the three parties.

Keppel Infrastructure will leverage its expertise in developing and operating efficient and reliable energy and environmental infrastructure, electricity retailing, as well as the development of end-to-end low-carbon solutions including renewable energy systems. Its initiatives this year include commencing the trial importation of 100 MW of hydroelectric power through the Laos PDR-Thailand-Malaysia-Singapore Power Integration Project; piloting Singapore's first membrane-based nearshore floating photovoltaic system to be deployed in Jurong Island; and it recently launched Keppel Infrastructure @ Changi, Singapore's first Positive Energy Building under the new Green Mark scheme.

SERIS and ERI@N will provide their know-how on the pontoon-based floating solar structure and its integration with other ocean renewable energy systems, as well as how to overcome the challenges of high wind and wave forces on the mooring and anchoring system; salinity on corrosion; and biofouling issues. In addition, SERIS will provide expertise in design, component selection, implementation and operation of the solar assets, while ERI@N will address tidal modelling with tidal flow conditions in the tropical belt of Singapore waters to assess power density.

Dr Thomas Reindl, Deputy CEO of the SERIS, said, "As one of the leading research institutes on Floating Solar worldwide, SERIS is very excited to provide its expertise to this novel approach of integrating Floating Solar with other renewable energy solutions. We have been moving our research focus from in-land reservoirs to offshore structures quite some time ago and, given the limited sea space in Singapore, we need to utilise the same space twofold or even multiple times. If successful, the proposed hybrid technology would also have great export potential."

Professor Madhavi Srinivasan, Executive Director of ERI@N said, "Sustainability is one of the key pillars under the NTU 2025 strategic plan and ERI@N is at the forefront of green solutions for the whole energy value chain. The deployment of a renewable energy system in tropical offshore conditions will face challenges such as oceanic environmental loads, biofouling and corrosion. We have a unique expertise in designs and concepts, as well the necessary deployment experience that will be critical in resolving such issues, gained from our test bedding experience in Singapore. Through this tripartite partnership, we hope to contribute our experience and to advance this cutting-edge technology together with our partners."

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About Keppel Infrastructure Holdings Pte Ltd
Keppel Infrastructure (KI) is a wholly-owned subsidiary of Keppel Corporation, a Singapore flagship multinational company providing solutions for sustainable urbanisation. KI provides solutions for some of the world's most pressing challenges through its power & gas, environment and new energy businesses by leveraging its proprietary technology, strong technical expertise and proven operating capabilities.

KI has a track record of developing energy and environmental infrastructure end-to-end, including power generation assets, waste-to-energy (WTE) facilities, large-scale district cooling systems, as well as NEWater and desalination plants. In Singapore, it operates a 1,300-megawatt high efficiency gas-fired combined cycle power plant and a utility pipe rack and pipe line network in Jurong Island. It is also Singapore's leading electricity retailer, and the first and largest district cooling systems developer and service provider. Globally, through Keppel Seghers, it is one of the leading WTE technology providers with more than 100 project references in 20 countries.

KI is expanding its presence, in Singapore and overseas, in areas such as power generation, waste management, district cooling, renewables and energy storage, electric vehicle charging infrastructure and other clean energy opportunities.

The newly established KETC aims to harness technological foresight, drive collaboration both within KI and across the Keppel Group, as well as provide a platform for the test-bedding, development and commercialisation of new technologies and solutions through partnerships with external parties such as institutes of higher learning, technology developers, and funding agencies.

For more information, please visit www.kepinfra.com

About the Solar Energy Research Institute of Singapore (SERIS) at NUS
The Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore is the city-state's national institute for applied solar energy research. SERIS is supported by the National University of Singapore (NUS), the National Research Foundation Singapore (NRF), the Energy Market Authority of Singapore (EMA) and the Singapore Economic Development Board (EDB). It has the stature of a NUS University-level Research Institute and is endowed with considerable autonomy and flexibility, including an industry-friendly IP policy.

SERIS collaborates closely with universities, research organisations, government agencies and industry, both locally and globally. The collaborations with companies from the global solar sector span from small start-ups to industry leading heavyweights. SERIS is globally active but focuses on technologies and services for tropical regions, in particular for Singapore and South-East Asia. Visit www.seris.nus.edu.sg for more information.

Facebook: facebook.com/SERIS.Singapore
LinkedIn: linkedin.com/company/solar-energy-research-institute-of-singapore-seris

About Nanyang Technological University, Singapore
A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the Engineering, Business, Science, Medicine, Humanities, Arts, & Social Sciences, and Graduate colleges.

NTU is also home to world-renowned autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies, Earth Observatory of Singapore, and Singapore

Centre for Environmental Life Sciences Engineering – and various leading research centres such as the Nanyang Environment & Water Research Institute (NEWRI) and Energy Research Institute @ NTU (ERI@N).

Under the NTU Smart Campus vision, the University harnesses the power of digital technology and tech-enabled solutions to support better learning and living experiences, the discovery of new knowledge, and the sustainability of resources.

Ranked amongst the world's top universities, the University's main campus is also frequently listed among the world's most beautiful. Known for its sustainability, over 95% of its building projects are certified Green Mark Platinum. Apart from its main campus, NTU also has a medical campus in Novena, Singapore's healthcare district.

For more information, visit www.ntu.edu.sg

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