

Innovative Floating Hybrid Renewable Energy System

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A Memorandum of Understanding (MOU) has been signed by Keppel Infrastructure through its applied technology innovation division Keplnfra Energy Transition Centre (KETC), the 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).



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The MOU has been signed for collaborative research on the technological and economic viability of creating a first-of-its-kind floating hybrid renewable energy system (RES) for operations in Singapore.

The floating hybrid RES concept consists of modular offshore floating solar platforms that can be combined with various renewable energy technologies such as ocean wave energy conversion systems, tidal energy turbines and paddles, and wind turbines. After obtaining regulatory approvals, the research will look into the system's deployment at a specific offshore test site in Singapore waters.

If the pilot project is successful, the collaborators intend to build and deploy a system with at least 100 MW of renewable power generation capacity that can be increased over time. Following the implementation of the unique system in Singapore, the goal is to expand the floating hybrid RES innovation to other parts of Asia and beyond.

Compared to single-source energy platforms, an offshore floating hybrid RES using complementing energy sources such as solar, wind, and waves can provide uninterrupted 24/7 power generation, a greater capacity factor, and a lower levelized cost. The continuous usage of vital electrical infrastructures and unified operation and maintenance procedures also decreases the amount of marine space needed and boosts efficiency.

Keppel Infrastructure is constantly pushing the envelope to accelerate energy innovations by engaging with stakeholders and partnering with 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 the National University of Singapore and Nanyang Technological University.

Ms. Cindy Lim, CEO, Keppel Infrastructure

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Ms. Cindy Lim adds, *“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.”*

The MOU was signed at the Asia Clean Energy Summit (ACES) 2022, part of the Singapore International Energy Week (SIEW). It combines the three companies’ complementary strengths and abilities.

Keppel Infrastructure will utilize its expertise in creating and operating efficient and dependable energy and environmental infrastructure, power retailing, and developing end-to-end low-carbon solutions, including renewable energy systems.

This year, it will begin the trial importation of 100 MW of hydroelectric power through the Laos PDRThailand-Malaysia-Singapore Power Integration Project; it will also pilot Singapore's first membrane-based nearshore floating solar system, which will be put in Jurong Island. It also recently debuted Keppel Infrastructure @ Changi, Singapore's first Positive Energy Building under the new Green Mark scheme.

SERIS and ERI@N will share their expertise on the pontoon-based floating solar structure and its incorporation with other ocean renewable energy systems, as well as how to resolve challenges such as high wind and wave forces on the mooring and anchoring system, salinity on corrosion, and biofouling issues.

Furthermore, SERIS will also provide experience in solar asset design, component selection, implementation, and operation, while ERI@N will handle tidal modeling with tidal flow conditions in Singapore waters to determine power density.

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.

Dr. Thomas Reindl, Deputy CEO, Solar Energy Research Institute of Singapore

Dr. Thomas Reindl continues, *"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 utilize the same space twofold or even multiple times. If successful, the proposed hybrid technology would also have great export potential."*

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.

Madhavi Srinivasan, Professor and Executive Director, Energy Research Institute@NTU

Madhavi Srinivasan concludes, *"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."*