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RENEWABLE ENERGY

Singapore marks progress in renewable-energy test beds

Solar panel systems being tested, first microgrid deployed; S'pore eyes leadership role in renewable-energy space

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SINGAPORE has completed the first stages of its renewable-energy test beds as it continues to develop clean-technology know-how that can one day be exported.

Ten different photovoltaic (PV) systems have been installed in western Tengeh Reservoir, making this the world's largest collection of floating solar panel systems being tested.

Over on Pulau Semakau south of mainland Singapore, the first micro grid has been deployed. Already, the infrastructure on the island – a landfill created by using incinerated waste to reclaim land from the sea – is powered by solar energy instead of diesel.

Minister for the Environment and Water Resources Masagos Zulkifli offered these updates on Tuesday at the Asia Clean Energy Summit, which is part of the annual Singapore International Energy Week.

The Economic Development Board (EDB) says both floating PV and microgrid technologies are areas in which Singapore can develop its strength.

The Tengeh reservoir pilot aims to test a variety of flotation systems and PV modules installed by various companies around the world, such as Italy's Enel Green Power and Singapore companies Sunseap and SolarGy. The S$11 million project is led by EDB and national water agency PUB.

The agencies will study the performance of the solar installations relative to each other, and to a reference installation on land, as well as the environmental impact these panels have on the water quality and biodiversity of the reservoir.

Mr Masagos said: "This pilot project is the first of its kind worldwide because of the sheer variety of flotation systems and PV modules tested, and the rigour involved in studying the environmental impact of floating PV systems.

"If this pilot successfully establishes the economic viability and environmental sustainability of floating solar PV systems, Singapore will explore the large-scale deployment of these systems."

Singapore had pitched its plan to study floating PV systems as a solution to its land constraints in 2011. The project was to be operational by 2013, but the challenge of coordinating the work among various government agencies delayed its take-off, PUB told reporters during a tour of the site.

Floating PV systems also have other benefits; for example, they reduce loss of water from reservoirs through evaporation and produce more electricity due to the cooling effect of water, said the Solar Energy Research Institute of Singapore (Seris), which is managing the project.

The first phase of the project involves the 10 floating PV systems of 100 kilowatt-peak each, making up a total capacity of about one megawatt-peak. These will be connected to Singapore's power grid in December.

Under the second phase next year, the best two performing systems will be scaled up to one megawatt-peak each.

Seris deputy chief executive Thomas Reindl noted that floating PV systems are not new; systems of several megawatts have been installed in Japan and UK. However, not enough studies have been done to assess the technical implications and economic and environmental viability of deploying such technologies on a larger scale, he said.

"Eventually, we plan to develop technical references for floating PV installations, together with the relevant international standard-setting bodies, to allow the global solar community to benefit from this test bed."

At the event, Mr Masagos also said that the Renewable Energy Integration Demonstrator Singapore (Reids) on Pulau Semakau will build three other microgrids to test how various microgrids interact with each other. These will be helmed by General Electric, South Korean electrical component manufacturer LSIS, and French energy companies Engie and Schneider Electric in a partnership.

Reids' work has attracted companies keen to adopt such technologies. A luxury resort on the remote Indonesian island of Bawah plans to deploy, by next year, a renewable-energy microgrid, which will be developed by Engie and Schneider Electric through the Reids platform.

Meralco, the largest electric distribution company in the Philippines, hopes to provide power to numerous remote communities across the archipelago. It will partner Reids for microgrid projects and joint research work.

Mr Masagos said: "The Reids platform will therefore pave the way for similar solutions to be developed and exported to serve the fast-growing microgrids market in South-east Asia and beyond.

"Such clean-energy test beds in Singapore underscore the importance of innovation and close partnership between the government and industry in developing environmental sustainability. They allow Singapore to develop a leadership role in renewable-energy development in the region."

This year, Singapore has attracted new investments across the fields of solar, microgrids, smart grids and energy management from cleantech companies which have committed to spending S$50 million in Singapore over the next five years. They include General Electric Grid Solutions business, solar project developer Conergy and France's Ijenko which provides a cloud-based analytics platform for utilities, said EDB.

Snapshot on renewable energy test-beds

Floating solar photovoltaic (PV) systems at Tengeh Reservoir

- S$11 million project to test economic and technological feasibility of large scale PV systems
- Led by EDB and PUB, with Solar Energy Research Institute of Singapore (Seris) as project manager
- **First phase:** 10 different PV systems (100 kilowatt-peak each), started in May 2016
- **Second phase:** Two different PV systems (1 megawatt-peak each), to start in 2017
- Involves companies such as SolarGy, Phoenix Solar, Sunseap, REC, Sharp Solar and Enel Green Power
- **Why it matters for Singapore:** Can help overcome land constraints and turn Singapore into a leader for urban solar capabilities

Renewable Energy Integration Demonstrator Singapore (Reids) at Semakau Landfill

- Initial investment of S$10 million for infrastructure
- Expected to draw S$20 million in investments over next five years to test integration of multiple renewable energy sources
- Led by Energy Research Institute @ NTU (Erion), supported by EDB and NEA
- **First phase:** Installation of a micro-grid facility with over 3,000 sq m of PV panels and a large-scale energy storage system already completed
- **Second phase:** Building three more micro-grids, which can be either operated separately or integrated as a single facility, over 64,000 sq m (size of eight soccer fields) by end-2018
- Four micro-grids to have a total system size of 1 megawatt-peak, which will produce power for fish hatcheries and nurseries located in Semakau
- Involves 13 companies such as Accenture, Engie, LSIS, Sembcorp Industries, Trina Solar and Vestas
- **Why it matters for Singapore:** Can tap Singapore's strength in systems engineering to build new capabilities in advanced power engineering and energy management technologies

Source: Seris, Erion, EDB; Photos: ST