

SEIZING OPPORTUNITIES IN A NEW ENERGY LANDSCAPE

We have come a long way in our energy story over the last 50 years. To tackle climate change concerns, Singapore has been changing the way we consume and produce energy. The Singapore Energy Story sets the vision for how Singapore can power our future through four switches (Natural Gas, Solar, Regional Power Grids and Emerging Low-Carbon Alternatives), supported by efforts to improve energy efficiency across all sectors. Click [here](#) to find out more about the four switches.

Read on to find out about some of the things we are doing to support Singapore's Energy Story.

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WHAT WE ARE DOING TO SUPPORT THE FOUR SWITCHES

As we explore new fuels and energy options, we should also make our power system more efficient. To this end, we will further enhance energy efficiency in power generation through the advanced Combined Cycle Gas Turbine or CCGT scheme. This will encourage generation companies to adopt new technologies to reduce carbon emissions.

We will complement our CCGTs with smaller and more flexible generation units which are better designed to provide back-up power. When CCGTs do not need to set aside capacity for back-up, they can run more efficiently, thereby reducing their carbon output.

Additionally, we have worked with NUS to develop a new method of storing natural gas – in an ice-like-crystalline compound (i.e. gas hydrates) - that is more stable and cheaper to maintain as compared to Liquefied Natural Gas. The Solidified Natural Gas Technology project, awarded under the Energy Storage Grant Call, led to the formation of a spin-off company, NewGen Gas, which is in discussions with companies to test-bed and scale-up the technology.

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Grid-wide Intermittent Energy Management by Aggregation of Distributed Energy Storage Systems



Distributed ESS deployed within a switchroom in Punggol
[Photo Credits: Sunseap Group]

Funded under EMA's Energy Storage Grant Call in 2016, a project team was formed by Nanyang Technological University (NTU), Sunseap Leasing and Panasonic Asia Pacific formed a project team to develop a centralised control system to manage distributed lithium-ion batteries across several sites.

Insights gained from this project will demonstrate how distributed Energy Storage Systems (DESS) can potentially be applied for future deployments in Singapore. For example, the following recommendations for the safe and reliable operation of DESS in Singapore were proposed from experience gained in the test-bed:

- Provision of high-level protection for the local energy management system (EMS). While each DESS is equipped with a battery management system to prevent the battery from overheating, it is important to have a local EMS to prevent the battery from overcharging/discharging, which could damage the battery permanently.
- Introduction of a safety protocol to cater for loss in communications between the centralised control system and the local EMS. In an event of communications loss between the centralised control system and EMS, the DESS operator will not be able to monitor the system parameters and verify if the DESS is working in safe conditions. The EMS should set the DESS into standby mode if there is a loss in communications for more than five minutes to prevent the unsafe operation of the DESS.

Singapore's First Floating Energy Storage System



Singapore's First Floating Energy Storage System

EMA and Keppel Offshore & Marine (O&M) jointly awarded a research grant to a consortium led by Envision Digital International Pte Ltd to pilot Singapore's first floating Energy Storage System (ESS). The team will deploy a 7.5MW/7.5MWh lithium-ion battery ESS on Keppel O&M's Floating Living Lab (FLL). This will be Singapore's largest ESS deployment to date, with sufficient capacity to power more than 600 four-room HDB flats a day. The ESS will also explore a first-of-its-kind battery stacking solution in Singapore, which could potentially reduce the footprint required for deployment by up to 40%. Findings from the project are expected to be applied to ESS on mainland Singapore. This would help support power grid stability and resilience, and facilitate the adoption of more renewable energy such as solar.

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Tapping on regional power grids for cleaner energy resources is one strategy to further diversify Singapore's energy supply. We will be embarking on a two-year trial for 100 megawatts (MW) of electricity imports from Peninsular Malaysia to Singapore. The trial aims to assess and refine the technical and regulatory frameworks for importing electricity into Singapore. This would help to facilitate larger-scale imports from the region in future.

We also intend to be a part of the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP). This will be a pathfinder towards the broader ASEAN Power Grid vision and underlines our commitment to advance regional power grids as a solution to decarbonisation in the region.

To reduce Singapore's carbon footprint in the longer term, the Government has announced a \$49 million Low-Carbon Energy Research Funding Initiative. It will support research, development and demonstration projects in low-carbon energy technologies such as hydrogen and carbon capture, utilisation and storage (CCUS) over the next five years. One of these projects will look at blending of low-carbon hydrogen with natural gas in combined cycle gas turbines, which can help us make the switch to hydrogen in future.

Beyond efforts to decarbonise our power system, we are also looking to increase productivity, enhance efficiency and reduce costs. Go over to the [SIEW Virtual Platform](#) and click on the "Youth Exhibition" tab to find out more about decarbonisation and digitalisation through a series of curated school projects!

Find out more about how EMA is co-creating tomorrow's energy future with the industry and research community, by developing innovative solutions through R&D [here](#)!

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