

## The Future of Singapore's Energy Story

*Our Energy Story will harness "4 Switches", energy efficiency and the power of co-creation to create a sustainable energy future for Singapore.*

Singapore's energy sector has come a long way since its early days. Over the last 50 years, we have moved from oil to natural gas for cleaner power generation. We are also starting to see more solar energy on rooftops and reservoirs. We have improved the reliability of the energy system, while keeping costs affordable.

2. Looking ahead, climate change is a challenge that requires us to change the way we use and produce energy, especially if energy demand continues to rise with economic growth. Singapore's energy sector will need to evolve in order to achieve our vision of a clean and efficient energy future.

### The "4 Switches"

3. Minister for Trade & Industry Chan Chun Sing at the Singapore International Energy Week (SIEW) 2019 today spoke about the need to create our Energy Story together. The Energy Story will harness "4 Switches" to guide and transform our energy supply. This will be supported by greater efforts in energy efficiency to reduce energy demand. The "4 Switches" will comprise:

- 1<sup>st</sup> Switch: Natural Gas – About 95% of Singapore's electricity is generated using natural gas, the cleanest fossil fuel today. Natural gas will continue to be a dominant fuel for Singapore in the near future as we scale up our other switches. Government will help generation companies improve the efficiency of their power plants.
- 2<sup>nd</sup> Switch: Solar – This remains Singapore's most promising renewable energy source. We are on track to reach our solar target of 350 megawatt-peak (MWp) by 2020. The Government is working towards achieving a new solar target of at least 2 gigawatt-peak (GWp) by 2030, and an energy storage deployment target of 200 MW beyond 2025.
- 3<sup>rd</sup> Switch: Regional Power Grids – Singapore will also explore ways to tap on regional power grids to access energy that is cost-competitive. This could be realised through bilateral cooperation or regional initiatives.

- 4<sup>th</sup> Switch: Emerging Low-Carbon Alternatives – We will also look into emerging low-carbon solutions that have the potential to help reduce Singapore's carbon footprint. These could include carbon capture, utilisation or storage technologies and hydrogen.

### **New Solar Target of at least 2 GWp by 2030**

4. The Government will work with companies, researchers and the public to deploy at least 2 GWp of solar by 2030 – enough to meet the annual power needs of around 350,000 households in Singapore<sup>1</sup>. This would increase solar adoption in Singapore by about 8 times from today's installed capacity. To facilitate greater solar adoption, Singapore will deploy and maximise solar panels over available spaces. These could include rooftops, reservoirs and offshore spaces. Besides increasing our clean energy supply, solar will improve energy security by tapping on alternative energy sources.

### **More Energy Storage for More Solar**

5. Energy storage can address solar intermittency and enhance grid resilience by managing mismatches between electricity supply and demand. The Energy Market Authority (EMA) will support a large-scale, nationwide deployment of Energy Storage Systems (ESS), with a target of 200 MW beyond 2025. To do so, EMA will work closely with the industry and agencies to build test-beds and standards to support the deployment of ESS in Singapore.

6. Among the collaborations will be a research grant awarded under EMA's partnership with the Korea Institute of Energy Technology Evaluation and Planning (KETEP). This will help promising Singaporean and Korean firms to co-develop innovative solutions towards the management and safety of ESS. Project details can be found in [Annex B](#) below.

### **Co-creating our Energy Story**

7. Our Energy Story is a long-term effort, and everyone has a role to play in creating this story. To make this vision a reality, the Government will work hand-in-hand with all stakeholders, including businesses, research communities, youths and young scientists, the Union of Power and Gas Employees and the public.

[An infographic on the Energy Story is in [Annex A](#)]

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<sup>1</sup> This assumes (a) a DC-to-AC conversion ratio of 0.77; (b) a solar PV load factor of 14%, which is the average percentage of solar output expected in a year; and (c) an average monthly household electricity consumption of 444.3kWh (based on 2017 data).

## **About the Energy Market Authority**

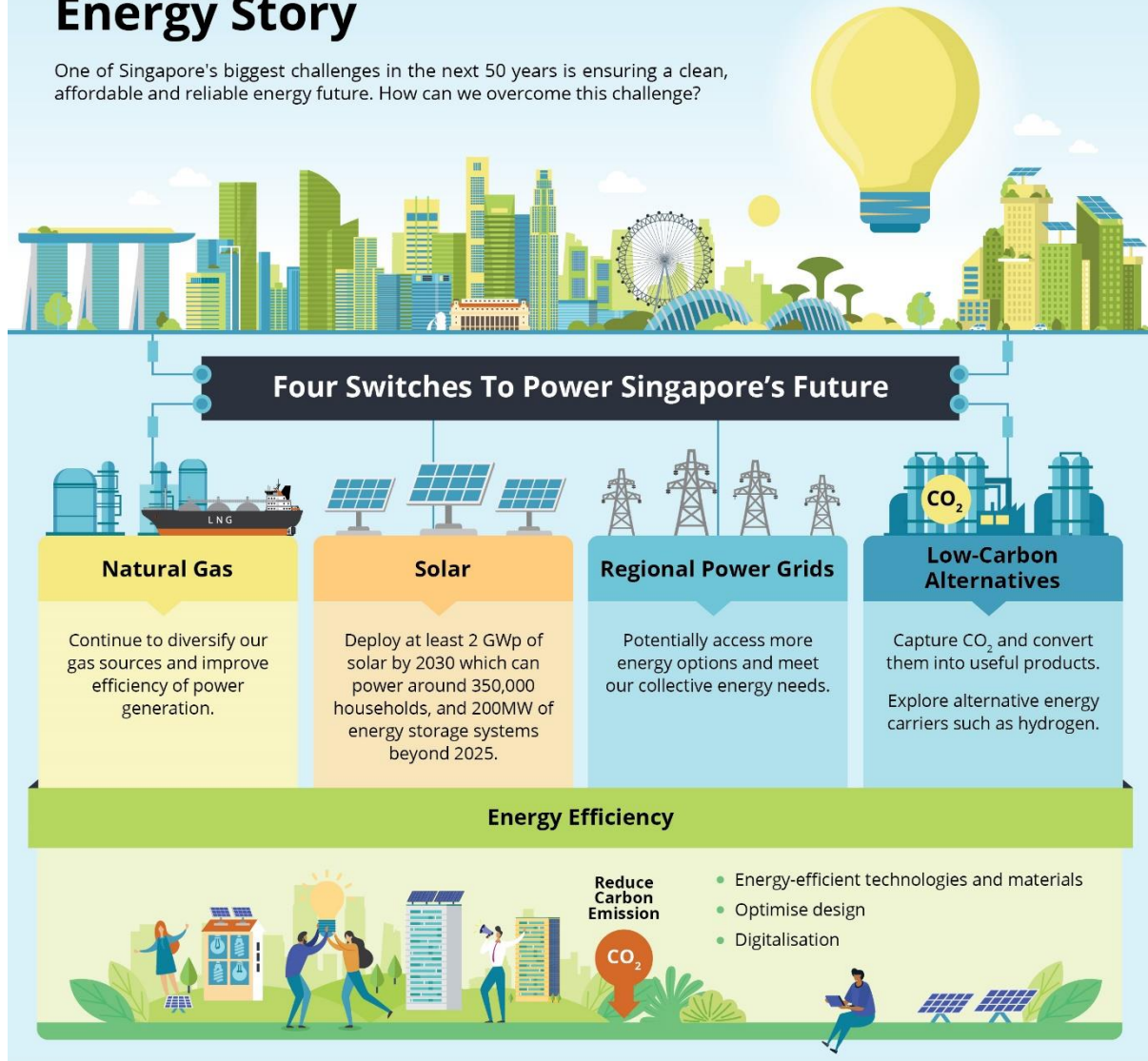
The Energy Market Authority (EMA) is a statutory board under the Ministry of Trade and Industry. Our main goals are to ensure a reliable and secure energy supply, promote effective competition in the energy market and develop a dynamic energy sector in Singapore. Through our work, EMA seeks to forge a progressive energy landscape for sustained growth.

Website: [www.ema.gov.sg](http://www.ema.gov.sg) | Follow us: [facebook.com/EnergyMarketAuthority](https://facebook.com/EnergyMarketAuthority) or [twitter.com/EMA\\_sg](https://twitter.com/EMA_sg)

Infographic to be attributed to "Ministry of Trade and Industry, Singapore".

# The Future of Singapore's Energy Story

One of Singapore's biggest challenges in the next 50 years is ensuring a clean, affordable and reliable energy future. How can we overcome this challenge?



## Co-creating our Energy Story

The Government will work hand-in-hand with our workforce, researchers, industries and consumers to co-create our Energy Story.



**FACTSHEET ON ENERGY MARKET AUTHORITY - KOREA INSTITUTE OF ENERGY TECHNOLOGY EVALUATION AND PLANNING PARTNERSHIP**

**Project Objective**

Safer, Denser Energy Storage Systems for the Tropics

**Current situation**

Solar energy is the most viable source of renewable energy for Singapore. However, it is intermittent in nature as solar output can be affected by weather conditions such as cloud cover. Energy Storage Systems (ESS) can be used to store solar energy and overcome its intermittent nature.

Some ESS today use lithium iron phosphate (LFP) and lithium iron manganese phosphate (LMFP) batteries. They are safer to deploy as they do not produce oxygen when overheated which could lead to fire incidents. However, they tend to take up more space compared to other lithium-ion batteries for the same amount of energy stored.

**Aim**

The project aims to develop a novel hybrid ESS by coupling the LFP and LMFP batteries with lithium-ion capacitors<sup>2</sup> to store and despatch more energy within the same amount of space required for deployment. The project will also develop a Smart Distributed ESS Management System (SDEMS) designed for Singapore's hot and humid climate, as such conditions can degrade battery performance.

The SDEMS will come with an artificial intelligence correction model to optimise ESS charging for better battery stability and fire safety. If successful, the project will produce a new ESS that is safer and more suited for hot and humid conditions. The SDEMS can also be customised by the industry to work with different types of lithium-ion batteries used for their ESS.

**Project Team:**

**Principal Investigator:** Mr Yong Ping Quen, Building System & Diagnostics Pte Ltd

**Co-Investigators:** Regentech Pte Ltd, Singapore Institute of Technology

**Korean Collaborators:** On-Test Co Ltd, Korea University

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<sup>2</sup> Capacitors are used to store energy and electric charge.