ENERGY MARKET AUTHORITY
Smart Energy, Sustainable Future

Overview of Singapore's Energy Market

28 November 2018

Ngiam Shih Chun
Chief Executive
Energy Market Authority (EMA)

EMA's work revolves around **market regulation**, **system operation** and **industry development and promotion**

Established on 1 Apr 2001, EMA plays a key role in market regulation, regulating the both the competitive sector and the natural monopolies to ensure system reliability and consumer safety

Regulatory Roles

Competitive Sector

(Power Generation Companies and Electricity Retailers)

- Clear and transparent regulatory regime
- Rely on market signals
- Ensure level playing field
- Low barriers of entry

Monopoly Service Providers

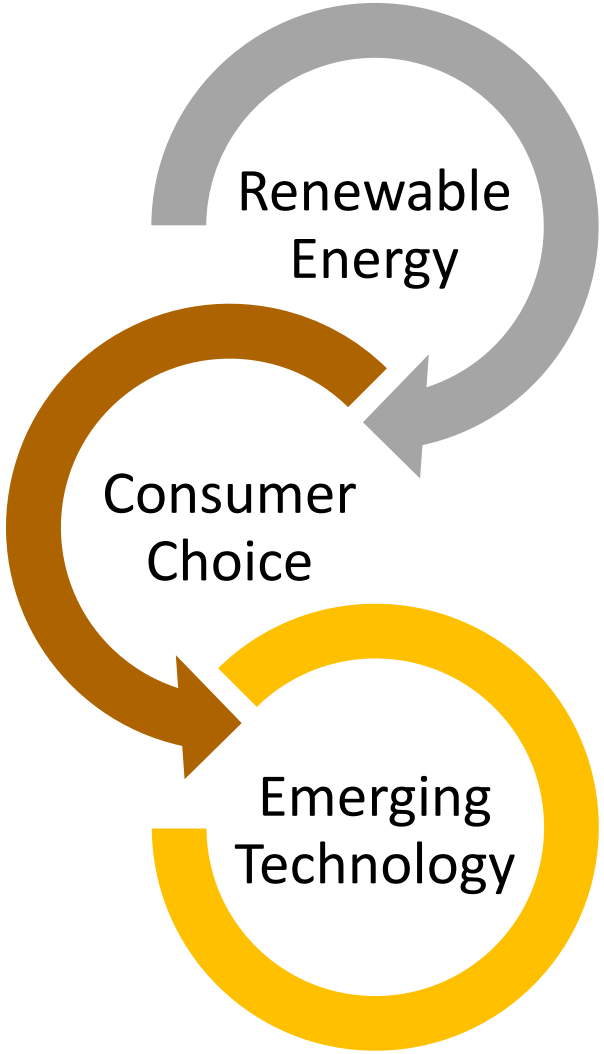
(Grid Operator, Market Support Services and Wholesale Market Operator)

- Regulate revenue of monopolies
- Incentivise efficient behaviour
- Open access

Singapore’s Energy Landscape in 2018

Installed Generation Capacity	**13,614 MW**
Fuel Mix	**Gas (95%), Petroleum Products & Coal (2%), Others (3%)**
System Peak Demand	**7,370 MW**
Electricity Consumption	**49,644 GWh**

As both the industry regulator and developer, EMA is tackling 3 important trends across the energy sector



- Under the Paris Agreement, Singapore has pledged to reduce our emissions intensity by 36% from 2005 levels by 2030. We target to raise solar capacity from 160 MWp today to 1GWp of solar beyond 2020 and are planning for 2GWp by 2030 (~20% of total generation capacity).

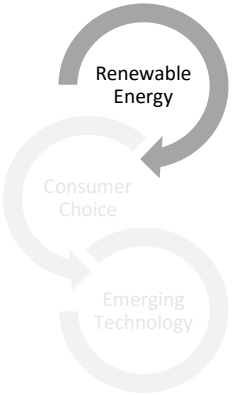
- EMA has recently fully liberalised the electricity retail market to provide consumers with choice and flexibility in their electricity purchases.

- Looking further ahead, EMA is also actively involved in RD&D to support sustained research and innovation to enhance our energy security and prepare Singapore for a future of new energy technologies.

Among the various sources, solar has emerged as the most viable form of renewable energy in Singapore

1 Solar	2 Hydro	3 Tidal	4 Wind
			
Singapore is located in the tropical sunbelt with good irradiance	Singapore's terrain is relatively flat	Tidal range in Singapore is generally low and our waters are relatively calm	Singapore has low average wind speeds

Amongst the renewable energy technologies,
solar generation is the most viable form



EMA has put in place policies and regulations to encourage the growth of solar in a sustainable way

Right Pricing Energy

- Do not subsidise. Recognise positive and negative externalities for economically sustainable outcomes. Introduced the Intermittency Pricing Mechanism (IPM) for fair cost allocation.
- Continually review the tariffs to ensure costs are paid based on causer-pay principles while accurately reflecting the cost of the infrastructure required to serve electricity consumers.

Regulation Reduction

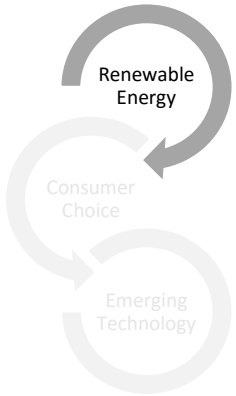
- Simplified rules for lower compliance costs & streamlined registration requirements. For e.g. Enhanced Central Intermediary Scheme, Solar Generation Profile.

Research & Development

- Partner the industry and research community to test-bed solutions. For e.g. awarded grant call to develop solar forecasting solutions to better manage intermittency.

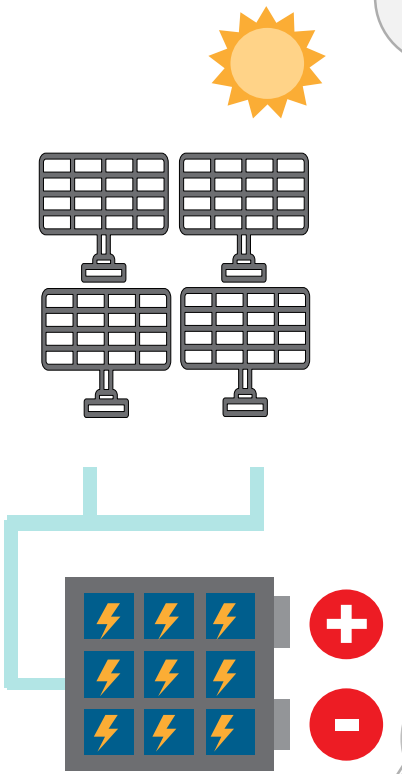
Raising Demand With Government Taking Lead

- The SolarNova Programme aggregates public sector demand for solar PV.
- Singapore's goal is to raise solar adoption from today's 162 MWp to 1 GWp beyond 2020.



To enable even higher levels of solar penetration, Singapore is facilitating the development and entry of energy storage systems (ESS)

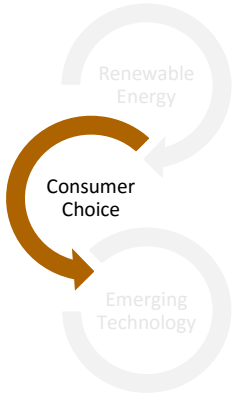
ESS is a game-changing technology that can enable higher levels of solar adoption, as well as increase system efficiency through peak-shaving of electricity demand.



In Oct 2018, EMA rolled out the ACCESS (ACCelerating Energy Storage for Singapore) programme to facilitate the deployment of Energy Storage Systems in Singapore. ACCESS partners can work with EMA to **pilot use cases and design business models** to operate ESS in Singapore.

In Oct 2018, EMA published a **policy paper on ESS** to provide regulatory clarity for the industry. The existing framework allows ESS to participate in the energy, regulation and reserves markets.

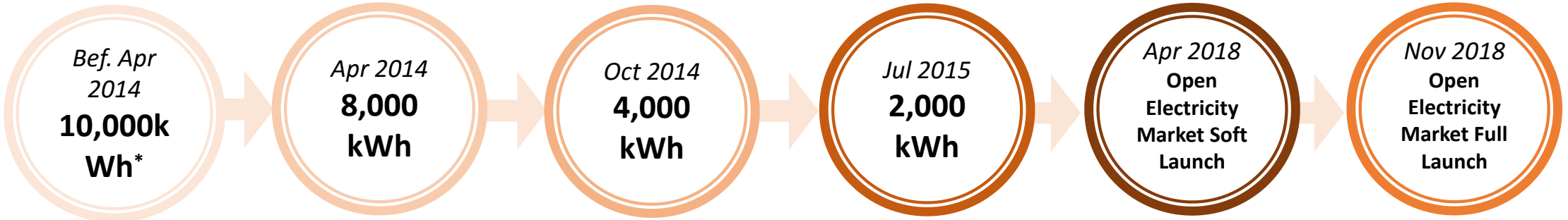
EMA's first **Regulatory Sandbox** will test the grid operator's (SP PowerAssets) use of ESS at a substation at a residential areas. Findings will guide our regulatory approach for the grid operator.



We are bringing the benefits of competition to small consumers

- The Energy Market Authority (EMA) has progressively opened up the electricity market to provide consumers with more choices and flexibility in their electricity purchases since 2001.

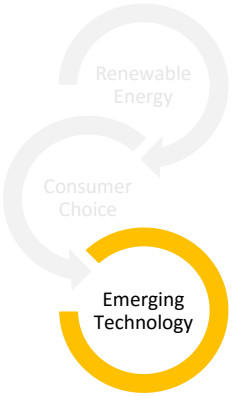
Journey Towards Open Electricity Market



* *Refers to consumption eligibility threshold based on average monthly electricity consumption*

Starting from 1 November 2018, about 1.4 million consumers, mostly households, will get to enjoy more choices and competitive pricing in electricity price plans while continuing to receive the same reliable electricity supply from the national power grid.

To maintain a vibrant and competitive energy sector in the long run, EMA must also catalyse R&D innovation and nurture enterprises



- A 3-pronged "RIED" approach to meet Singapore's economic and national needs:

(a) Research. Push innovation boundaries in new growth areas to enable solar integration, reduce energy demand and strengthen grid resilience.

(b) Innovation. Catalyse new business models, refine our R&D bets, and engage industry to develop industry-specific problem statements.

(c) Enterprise Development. Strengthen market translation/commercialisation of our R&D efforts and grow our local enterprises.

'Energy security vital to Singapore's survival'

JOSEHONG

Singaporeans may know how crucial water security is to the Republic's survival, but they also need to keep an eye on its energy security.

After all, the country's water facilities such as Newater and desalination plants require large amounts of energy to operate, Senior Parliamentary Secretary for Trade and Industry and Foreign Affairs Tan Wu Meng said yesterday.

Energy security was thrust further into the limelight after Tuesday's power outage, he said at the Energy Innovation event organised by the Energy Market Authority (EMA).

Energy security was thrust further into the limelight after Tuesday's power outage.
PHOTO: LIANHE ZAOBAO

Singapore International Energy Week

Millions to be invested to boost energy sector

Projects include research on cooling tech and to prepare for future with multiple power grids

SINGAPORE INTERNATIONAL ENERGY WEEK

Singapore beefs up muscle in solar and energy storage

The Energy Market Authority is also making it easier for consumers to sell excess solar energy back into the grid

By Andrea Soh
sandrea@sph.com.sg
@AndreaSohBT

SINGAPORE is taking its new energy ambitions a step further by developing its solar forecasting capabilities, enhancing a scheme for selling excess solar energy and installing an energy storage testbed on the grid.

This comes as Deputy Prime Minister Teo Chee Hean estimated at an industry event on Monday that solar energy could eventually reach up to 20 per cent of Singapore's energy mix.

Singapore also hopes to deploy solar panels on vertical building surfaces in future.

A study by the Sustainable Energy Association of Singapore has showed that solar energy can contribute up to two gigawatt-peak by 2020 – a quarter of Singapore's projected peak electricity demand, he added.

Separately, the Energy Market Authority (EMA) announced on Monday that it is awarding a S$6.2 million research grant to a consortium led by the National University of Singapore (NUS) to develop solar forecasting capabilities.

Despite Singapore's sunny cli-

sensing, machine learning and grid modelling to improve the accuracy of solar output forecasts and grid management.

Besides the NUS, the consortium comprises Solar Energy Research Institute of Singapore (Seris), the Centre for Remote Imaging, Sensing and Processing (CRISP) at NUS, A*Star's Experimental Power Grid Centre (EPGC), and the Singapore-MIT Alliance for Research and Technology's Centre for Environmental Sensing and Modelling (Censam).

The EMA is also enhancing its Central Intermediary Scheme, under which consumers sell excess solar output into the wholesale energy market. While consumers generating over

to build the two systems which use lithium ion and vanadium redox flow technologies respectively. The two were selected out of more than 10 international consortiums from the US, Europe and Asia that submitted competitive bids.

CW Group, a wholly-owned subsidiary of Hong Kong-listed CW Group Holdings Limited, will be working with Nanyang Technological University, while Red Dot Power is working with National University of Singapore, ST Kinetics' subsidiary Singapore Test Services, and German-American technology company Younicos.

The test bed is expected to be operational for three years at two substation locations in the north and north-eastern part of Singapore. They

New consortium to build customised forecasting model that is key to stable national power grid

$6.2m grant to better predict solar power needs

JOSE HONG, THE STRAITS TIMES

The Energy Market Authority (EMA) has awarded a $6.2 million research grant to a consortium to improve Singapore's abilities to forecast the amount of solar power it generates.

This will allow the authorities to better plan for the demand and supply of electricity in the national grid.

The launch of the consortium, led by the National University of Singapore, was announced by Ms Sim Ann, Senior Parliamentary Secretary for Trade and Industry and Foreign Affairs, at the Singapore International Energy Week.

Ms Sim also announced the launch of $17.8 million in grants to build a test bed to develop energy storage capabilities. Two consortiums led by CW Group and Red Dot Power will set up the Energy Storage System.

EMA, which awarded the grants with SP Group, said en-

more reliant on solar power, said EMA. This form of energy fluctuates on a daily basis, much like wind power.

At the event held at the Sands Expo and Convention Centre, Ms Sim also announced the launch of $17.8 million in grants to build a test bed to develop energy storage capabilities. Two consortiums led by CW Group and Red Dot Power will set up the Energy Storage System.

EMA, which awarded the grants with SP Group, said en-

an installed capacity of up to 10MW of their own energy will be able to sell the excess directly back into the grid without having to register as a market participant.

Currently, consumers with an installed capacity of more than 1MW have to register as a market participant.

The first residents to benefit from this will be in Jurong, as they will have access to the Open Electricity Market, which allows them to pick from multi-

nate inter-ministerial efforts towards the country's long-term energy goals.

He said Singapore needs to focus on solar energy because its geography prevents it from effectively using other forms of renewable energy such as wind and water.

Nanyang Technological University's Energy Research Institute executive director, Professor Subodh Mhaisalkar, said the energy storage and solar forecasting initiatives are essential

Helping it build the grid is SP Group, which manages the national grid.

The micro-grid will use multiple types of renewable energy and will eventually make the entire campus emission-free, said Mr Brandon Chia, head of SP Group's centre of excellence.

Aside from being able to disconnect from the national grid, the micro-grid could also provide energy to it if needed, Mr Chia said.

SIT engineering professor

After water success story, next challenge is energy: Chun Sing

Goal is to ensure S'pore is never dependent on single energy source, says minister

Jose Hong

If the past 50 years have been about how Singapore has overcome water scarcity, the next 50 will be about how the country overcomes its energy challenges.

"Just like how Singapore has successfully diversified our supply of water over the years, our next ambitious goal is to enhance our energy resilience to ensure that we are never dependent on any single source of supply," Minister for Trade and Industry Chan Chun Sing said yesterday at the opening of the Singapore International Energy Week at Marina Bay Sands.

To this end, the country is investing in infrastructure, tapping green energy and acting as a test bed for innovative solutions here and abroad.

He announced new projects and initiatives ranging from ramped-up solar production to greater support for the energy storage systems – essentially gigantic rechargeable batteries – that will enable Singapore to better use solar production.

The Energy Market Authority (EMA) will drive the development of energy storage systems, which is crucial for Singapore's success in harnessing renewable energy.

Solar power is the most promising renewable source for the country, but a major drawback lies in unpredictable sunshine due to cloud cover.

Despite this, the Republic hopes that by 2025, solar power could support about a quarter of national projected peak electricity demand.

Today, solar energy accounts for about 2 per cent of the country's power supply.

EMA therefore announced yesterday two partnerships with PSA Corporation and Sembcorp Industries to help roll out energy storage systems on a commercial scale.

The authority also launched a policy paper that it said would continuously evolve as the local energy storage systems landscape develops.

This will support the $17.8 million in grants announced at the 2017 energy week that went into testing which storage solutions would work best in Singapore's hot and humid climate.

An EMA spokesman said: "We see energy storage systems as an essential technology to enabling higher levels of solar power adoption in Singapore.

"We encourage industry to invest in these solutions to optimise their energy use and provide new solutions and business models to our market."

Leading the push for solar energy, ITC will expand its solar generation capacity by 800 times through its SolarRoof and SolarLand initiatives.

From a total installed capacity of 1 megawatt-peak (MWp) today –

enough power for 250 four-room Housing Board flats for a year – the government agency aims to achieve 800MWp by 2030.

ITC's SolarRoof programme allows power to be pumped into the national grid from solar panels on the rooftops of the agency's buildings. It lets consumers buy this electricity even if the buildings they occupy are not equipped with solar panels.

SolarLand installs solar panels on vacant land as an interim use.

Mr Chan said: "Overcoming the energy challenge will be our next big audacious goal for the next 50 years."

He added: "As the energy sector undergoes transformation, all of us – consumers, companies and countries – stand to gain from the deployment of new technologies.

"With better production, management and consumption of energy, we can ensure a high quality of life and a vibrant economy for our people through greater access to cleaner, more affordable and more reliable energy."

josehong@sph.com.sg

SEE MORE B7

Thank You