ENERGY MARKET AUTHORITY

Smart Energy, Sustainable Future

Keynote Address

IRENA Roundtable on Renewable Energy Roadmap Outlook for ASEAN – a Remap Analysis

27 October 2016

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Energy Market Authority

Agenda

- Overview of global energy outlook
- General overview of ASEAN
- What Singapore is doing: facilitating solar deployment
- Building capabilities for the future

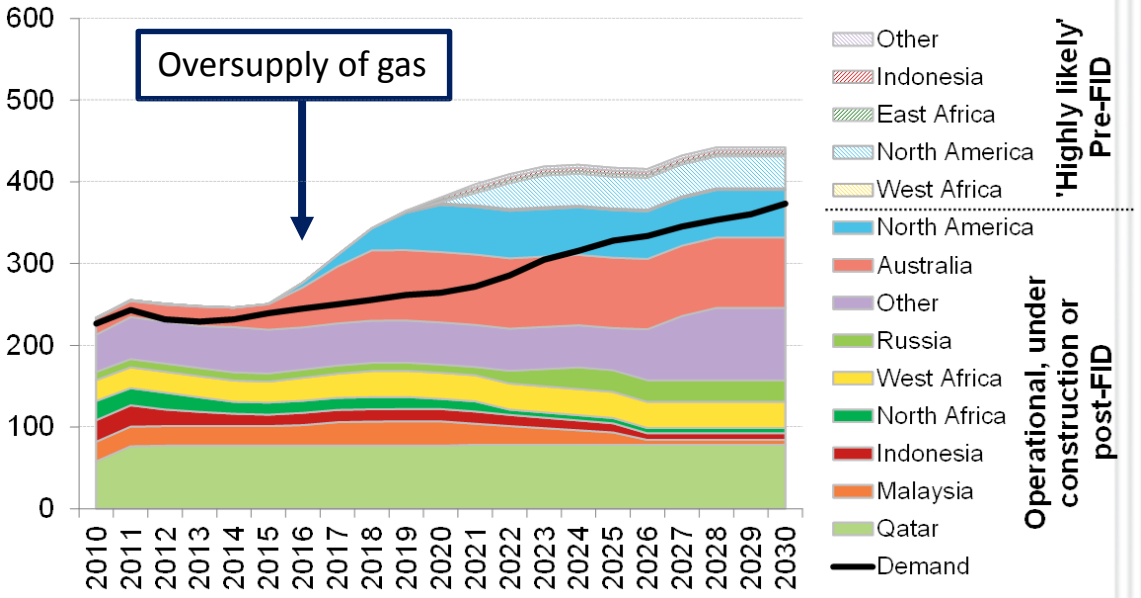
Global Energy Trend (1)

Oil prices expected to remain low for an extended period with oversupply in the global gas market

Highlights

- Limited demand growth for O&G and oversupply
- Slowdown on upstream gas projects
- Global LNG market will face persistent oversupply until 2025, with greatest oversupply in 2020

Global LNG supply and demand forecast (in MMtpa)



Source: BNEF H1 2016 Global LNG Market Outlook

Global Energy Trend (2)

Climate change remains a key priority with concerted efforts by governments

Highlights

- Paris Climate Agreement 2015 with pledges by government on mitigation and adaptation policies
- Increased collaborations between governments
- Investments in clean energy set to escalate

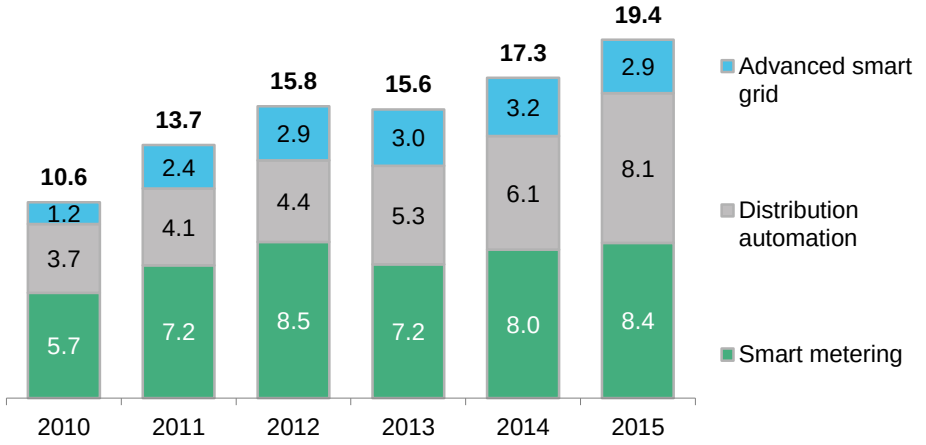
Global Energy Trend (3)

Global adoption of **digital energy products** and deployment of **renewable technologies**

Highlights

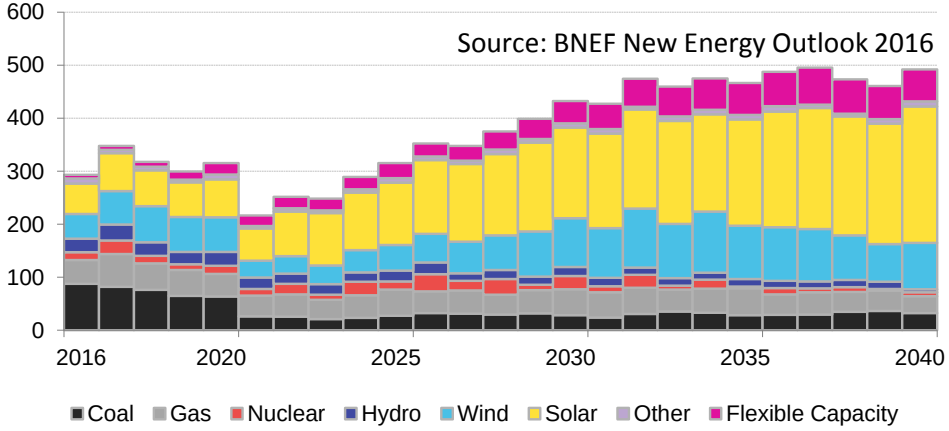
- Global smart grid investment grew by more than $2bn in 2015
- Asia and South America markets demonstrate commitment to smart metering
- Renewables will account for nearly two-thirds of new capacity installed over next 25 years
- 40% of new capacity will comprise solar

Global Smart Grid Investment by segment ($BN)



Source: BNEF Q1 2016 Digital Energy Market Outlook

Gross annual capacity additions by technology (GW)



General Overview of ASEAN

Highlights

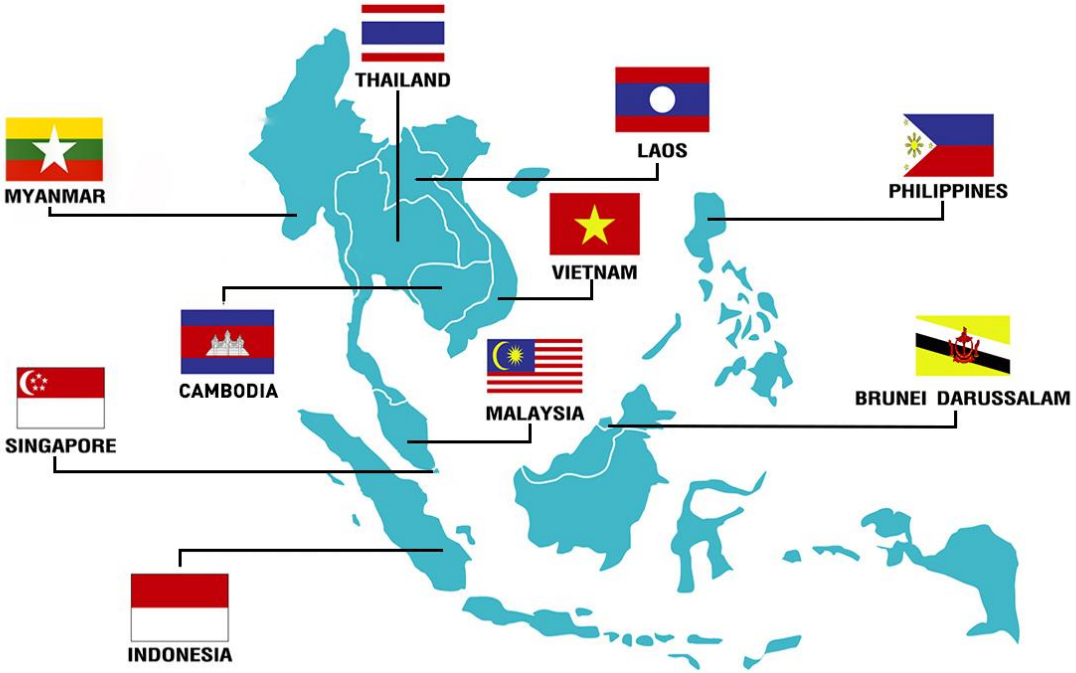
- According to the 4th ASEAN Energy Outlook, ASEAN accounted for about 8.5% of the world population, consumed about 4.5% of world's primary energy and was accountable for 5.7% of total global energy production.

- Renewable energy is expected to grow as the region diversifies its energy mix away from fossil fuels by tapping into renewable energy sources across the region

- Aims to achieve 23% renewable energy in total primary energy supply by 2025 as part of ASEAN's Plan of Action for Energy Cooperation (APAEC) 2016-2025

General Overview of ASEAN

- There is increasing development of interconnections in Southeast Asia

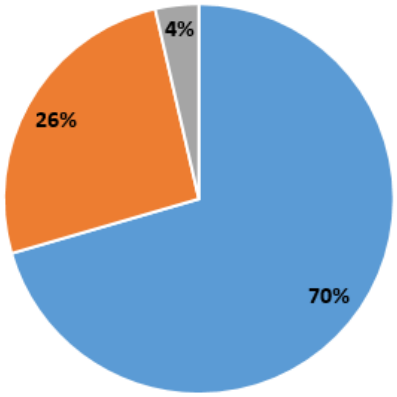


- To meet the region's energy needs, ASEAN has been working towards enhancing energy connectivity and market integration in ASEAN to achieve energy security, accessibility, affordability and sustainability for all member states.

Overview of Singapore's energy landscape

Change in **Fuel Mix** over the years

2001

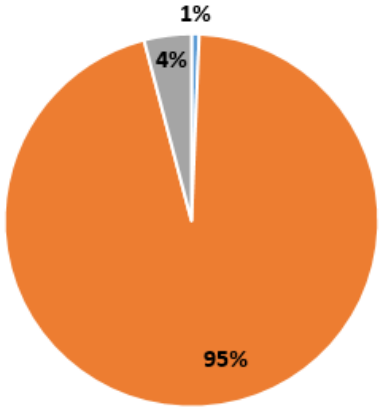


Petroleum Products

Natural Gas

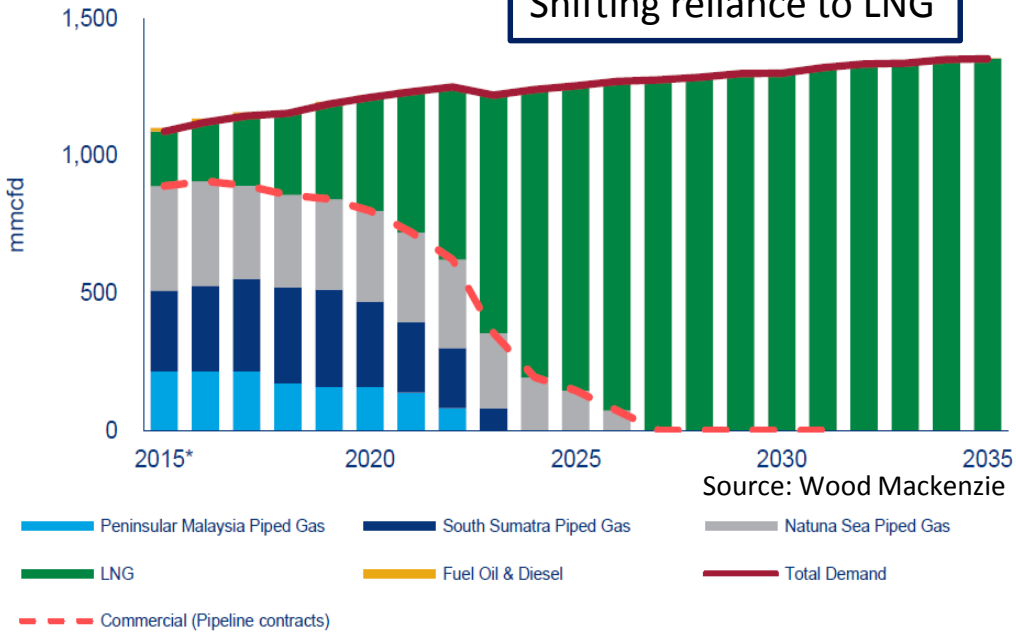
Others

2015



Singapore Gas Balance from 2015 to 2035

Shifting reliance to LNG



Source: Wood Mackenzie

Solar PV offers **greatest deployment potential** for Singapore

- Due to our physical constraints, Singapore has **limited renewable energy options** –

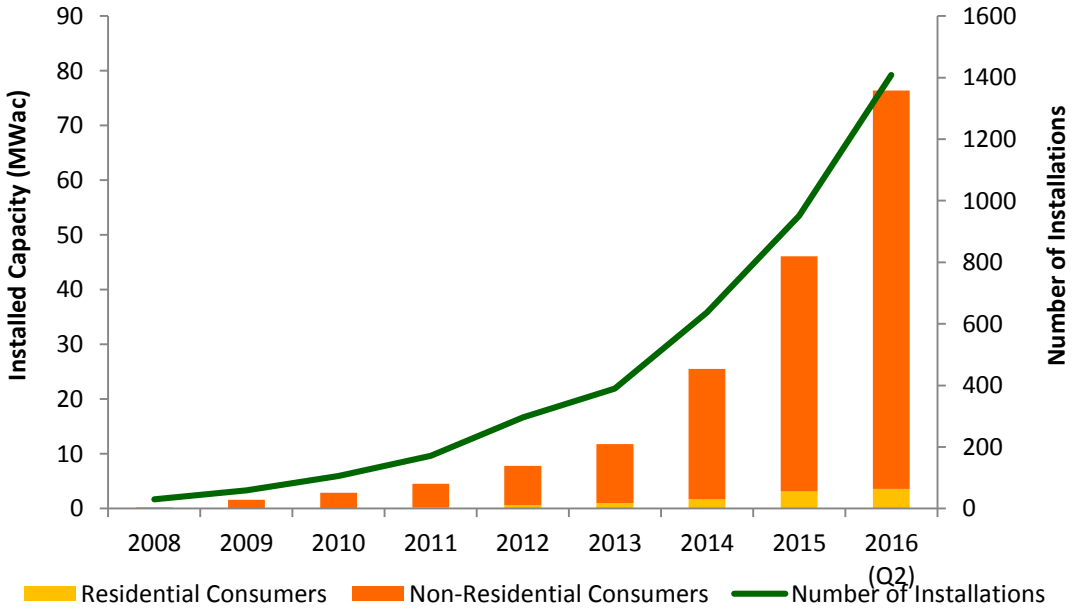
Renewable Energy	Our Constraints
Hydro	Singapore's terrain is relatively flat
Tidal	Tidal range in Singapore is generally low and our waters are relatively calm
Wind	Singapore has low average wind speeds

- Nonetheless, Singapore is located in the tropical sunbelt with good irradiance. Hence, amongst the renewable energy technologies, **solar generation offers the greatest deployment potential.**

Steady growth in solar PV deployment in Singapore

- **Market interest in solar has been growing in Singapore**. Since 2008 to Q2 2016:
  - ✓ The number of installations has increased from **30 to 1,409**;
  - ✓ The installed capacity has increased from **0.3 MWac to 76.5 MWac.**

- The take-up is expected to accelerate over the next few years, as prices fall and technology continues to improve.

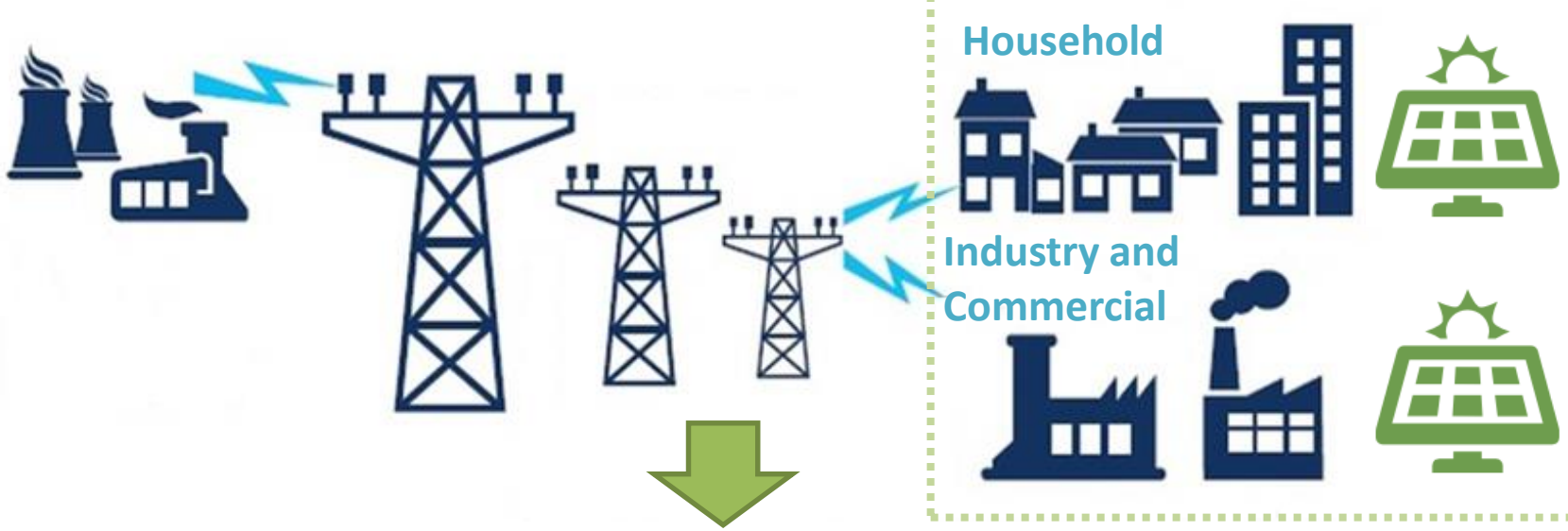


Emerging Paradigm of **"Prosumers"**

Power Generation

Transmission and Distribution

Consumption and Production



- Previous status quo: either a producer or consumer, where electricity and revenue flow in single directions
- New paradigm: emergence of "prosumers", where electricity and revenue can flow in both directions

Supporting Solar "Prosumers" through **Public-Private Collaboration**

PUBLIC

PRIVATE

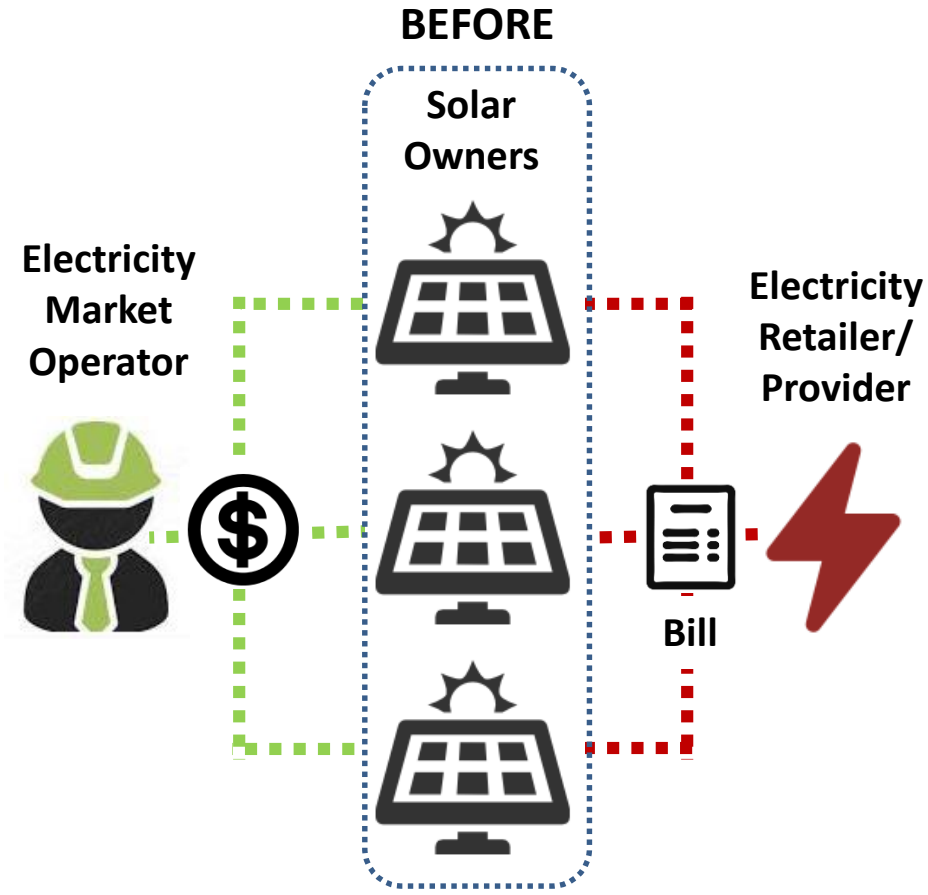
1. **Enhancing the regulatory framework for solar**

2. **Programme to aggregate solar lead demand in government buildings**

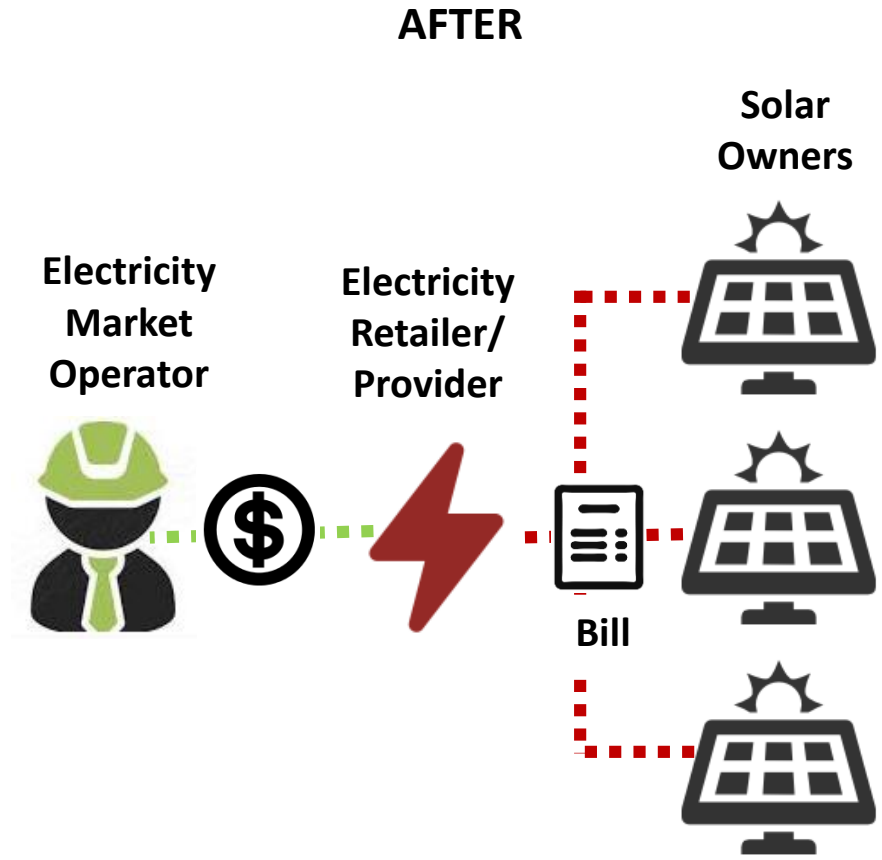
3. **Fostering a pro-business environment by facilitating new solar business models**

Enhancing Regulatory Framework:

Allowing Solar "Prosumers" to Receive Payment in an Expedient and Least Effort Manner



Market registration required for payments for excess solar energy



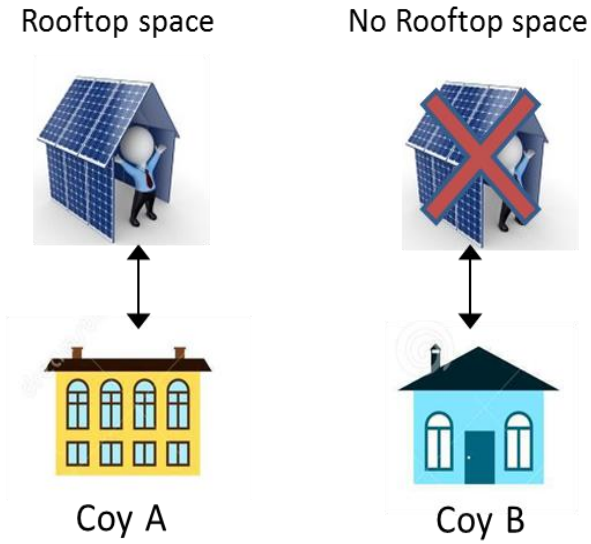
Payments for excess solar energy **through Central Intermediary** without onerous market registration

Enhancing Regulatory Framework:

Supporting Smart Business Models

Before

Solar energy is only limited to customers with rooftop space

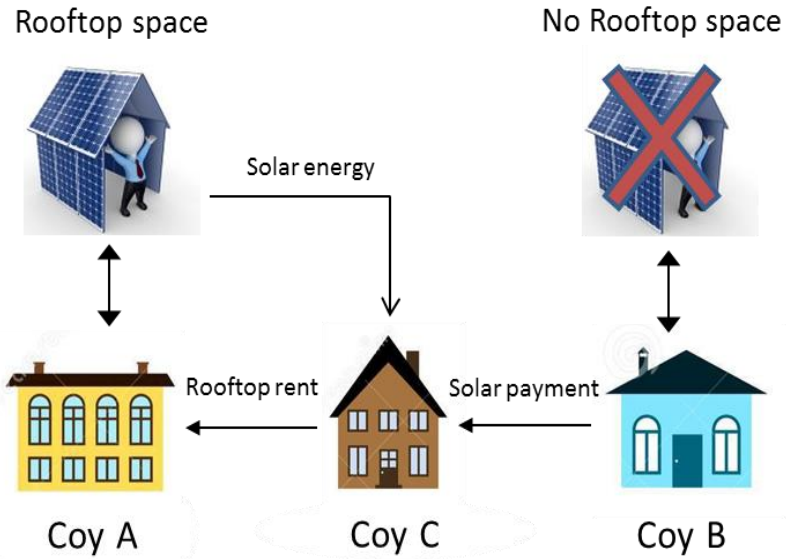


Company A has rooftop space but does not want solar energy

Company B does not have rooftop space but wants to use solar energy

After

Companies without rooftop space to buy solar energy from intermediaries who lease rooftop space for solar panels



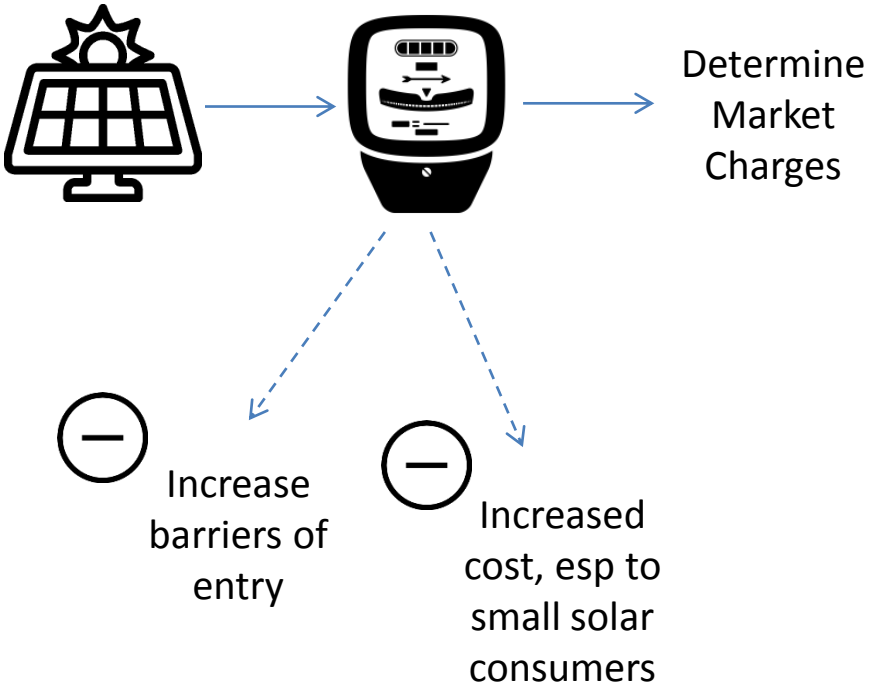
Company C can sell the solar energy to Company B

Furthermore, with the **Electricity Futures Market**, solar independent retailers could offer a blend of green retail contracts to suit consumers' needs.

Enhancing Regulatory Framework:

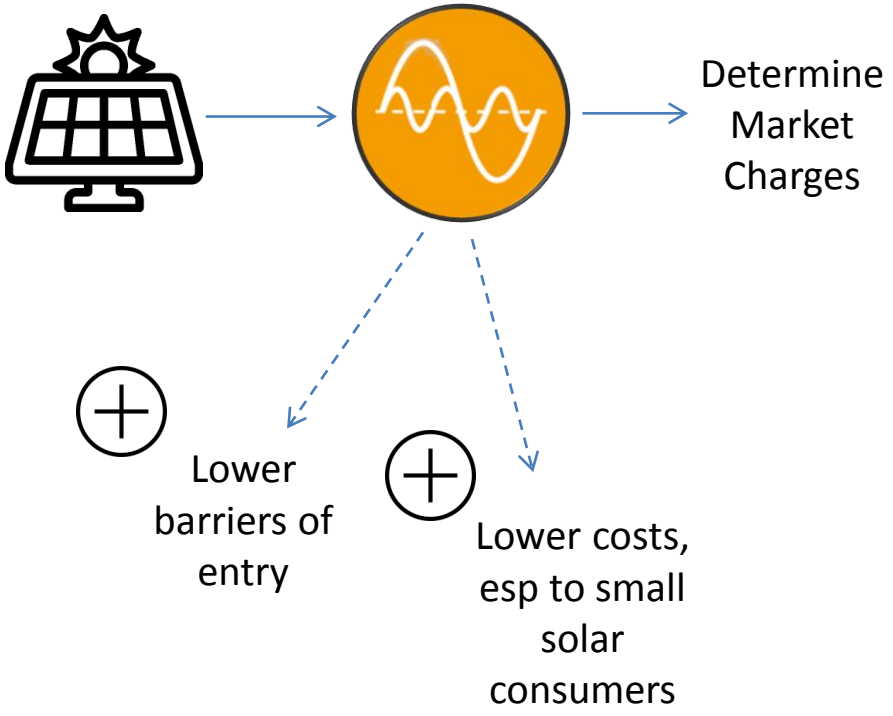
Streamlining Metering Requirements

BEFORE



Having requirements such as the installation of standard generation meters to determine market charges seen as too costly.

AFTER



Eligible consumers can use an alternative arrangement (e.g. estimated IGS profile) for settlement of relevant market charges

Government Taking the Lead to Accelerate Solar Deployment

- The **SolarNova Programme** is an initiative led by Economic Development Board that aims to accelerate solar deployment in Singapore through promoting and **aggregating solar demand across government agencies**.
- Through government-led demand, it aims to contribute 350 MWp of solar PV to Singapore's energy supply by 2020.


FUTURE READY singapore

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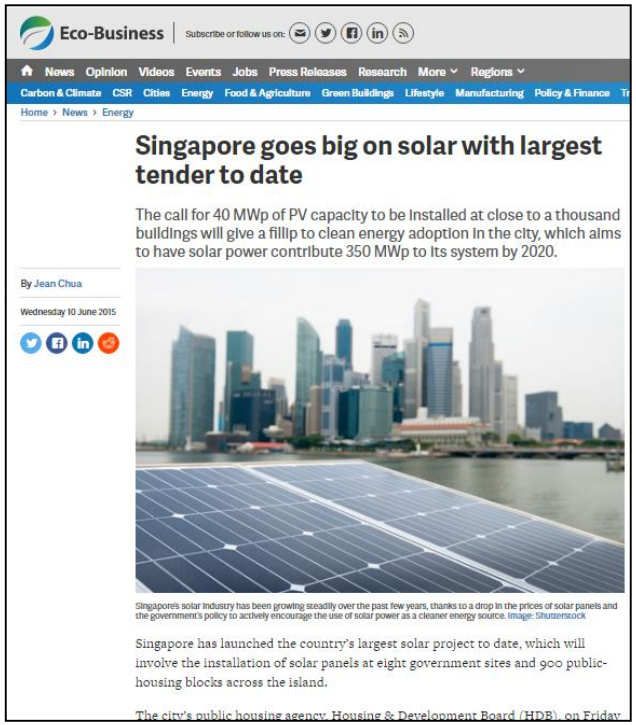
HDB launches first tender under EDB-led programme, SolarNova

05 June 2015

On 5 June 2015, HDB called the first multi-agency solar leasing tender for a total capacity of 40 MWp, making it the largest to date in both the public and private sectors in Singapore. It was also the first tender that was launched under the programme, SolarNova, which is spearheaded by EDB.

Under the programme, EDB encourages government agencies to come together to use solar power, so as to spur the growth of the solar industry in Singapore.

SolarNova aims to contribute towards Singapore's projection for solar power to contribute 350 MWp to Singapore's energy supply by 2020, and more tenders under the programme are called over the next four to five years.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Singapore goes big on solar with largest tender to date

The call for 40 MWp of PV capacity to be installed at close to a thousand buildings will give a fillip to clean energy adoption in the city, which aims to have solar power contribute 350 MWp to its system by 2020.

By Jean Chua

Wednesday 10 June 2015

Singapore's solar industry has been growing steadily over the past few years, thanks to a drop in the prices of solar panels and the government's policy to actively encourage the use of solar power as a cleaner energy source. Image: Shutterstock

Singapore has launched the country's largest solar project to date, which will involve the installation of solar panels at eight government sites and 900 public-housing blocks across the island.

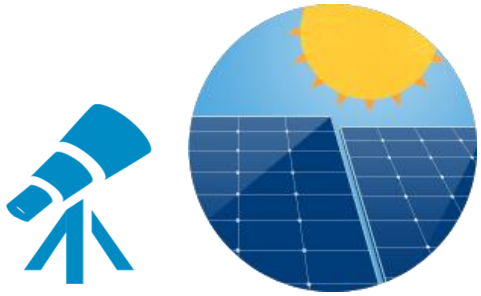
The city's public housing agency, Housing & Development Board (HDB), on Friday

Preparing for Future Power Generation Investments in Singapore

Highlights

- For the electricity market to work well, it is important that there should be adequate and quality information for investors to make their investment decisions
- In Oct 2015, EMA conducted a public consultation exercise to seek feedback to prepare for future power generation investments in Singapore
- This led to the launch of the Singapore Electricity Market Outlook (SEMO) to facilitate investment decisions through providing relevant information
- This includes the projected demand and supply conditions and a special solar outlook section

Greater Visibility into the Solar Horizon

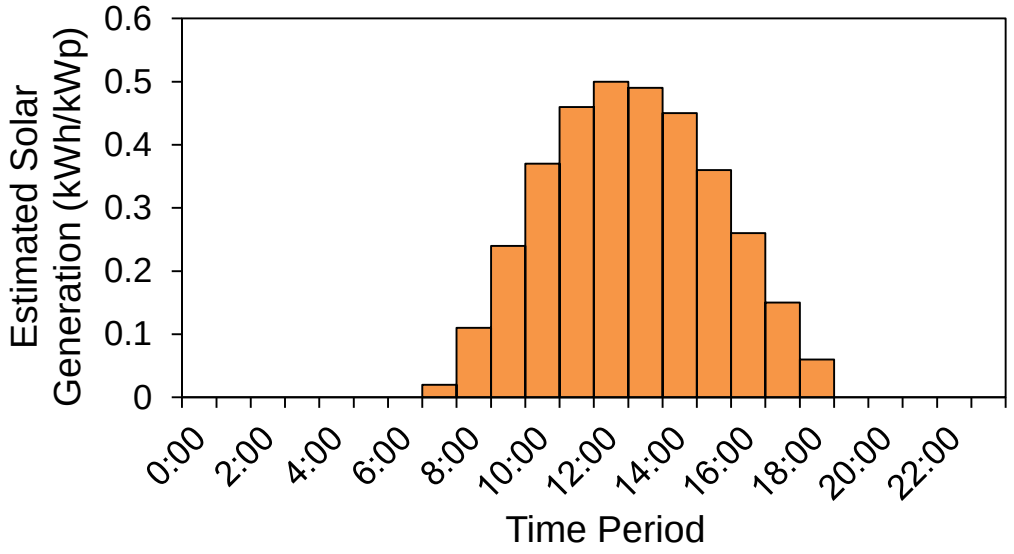


- Recognising the growing interest in solar PV development in Singapore, EMA has worked with Solar Energy Research Institute (SERIS) to share more information on solar.
- This is to enable the industry to better understand its characteristics and growing share in the electricity market.
- EMA welcomes feedback on information which may be useful for the solar industry.

SEMO Insights

- In the SEMO, EMA has also shared the solar irradiance data and estimated total solar generation profile in hourly periods for Singapore.

- These information may enable investors to make informed decisions on power generation investments including solar PV technologies, as well as provide stakeholders with a better understanding on the potential impact of solar PV on the electricity system and market.



Building Capabilities to Manage Intermittency

- Looking ahead, EMA will be building system-level capabilities solutions to ensure that the power system is ready to manage the increased intermittency as solar deployment accelerates.

Solar Forecasting

- Solar forecasting will be important tool for managing intermittency and determining the reserves requirements to cater for real-time weather fluctuations and solar output.
- EMA is working with the Meteorological Service Singapore to bring together knowledge in weather science and grid modeling.

Energy Storage

- EMA has launched the Energy Storage Programme to build capabilities and solutions in grid-scale energy storage, suited for Singapore's weather condition, to deal with intermittency and to facilitate the deployment of solar energy.
- EMA has published a consultation paper to seek feedback on possible enhancements to the policy framework for energy storage.

Meeting New Energy Realities

- We are facing new energy realities amidst the current oversupply of oil and gas, meeting global climate change commitments and increasing deployment of renewable energy technologies.

- With increasing regional interconnectedness, there are opportunities for ASEAN collaboration to meet the challenges.

- Singapore will continue to develop our energy landscape to foster industry innovation, enable greater competition in the energy market and create greater choices for consumers.

THANK YOU