

SINGAPORE ENERGY LECTURE CUM DIALOGUE BY MR TEO CHEE HEAN, DEPUTY PRIME MINISTER AND COORDINATING MINISTER FOR NATIONAL SECURITY AT THE 10TH SINGAPORE INTERNATIONAL ENERGY WEEK 2017 ON MONDAY, 23 OCTOBER 2017, 9AM AT MARINA BAY SANDS CONVENTION CENTRE.

“Rethinking Energy, Navigating Change”

Your Excellencies,
Distinguished Guests,
Ladies and Gentlemen,
Good morning.

1 Happy to join you at the 10th Singapore International Energy Week (SIEW).

- a. Over the last nine years, SIEW has brought together global thought-leaders to discuss key energy issues and their impact on Asia, which continues to be a centre of global energy demand growth.

Rethinking Energy

2 Major changes are happening in the energy landscape. These require a rethink of how we approach energy. I will highlight some observations.

3 Globally, new capacity additions will come primarily from renewable energy.

- a. Two years ago (2015), global renewable capacity additions exceeded those of fossil fuels and nuclear for the first time.¹
- b. This trend is continuing. In 2016, nearly two-thirds of all new net capacity additions in 2016 were from renewables.² Of these, for the first time, solar photovoltaic additions alone rose faster than any other fuel, surpassing the net growth in coal.³
- c. With all these capacity additions and the retirement of older coal plants, renewables are expected to overtake coal to be the largest source of electricity globally by 2030.⁴

4 As a result of large-scale deployment and technological progress, renewable energy costs have fallen significantly, and are expected to continue to fall.

- a. Estimates show that solar is already cost-competitive without subsidies with fossil fuels in more than thirty countries,⁵ including Singapore.
- b. By 2021, Bloomberg expects solar to be cheaper than coal in China and India.⁶
- c. By 2040, each dollar can buy 2.3 times as much solar energy than it does today.⁷

¹ IEA WEO 2016 (November 16, 2016), p. 407.

² IEA (October 4, 2017). Market Report Series: Renewables 2017 – Analysis and Forecasts to 2022.

³ IEA (October 4, 2017). Market Report Series: Renewables 2017 – Analysis and Forecasts to 2022.

⁴ IEA WEO 2016, pp. 397, 418. New Policies Scenario.

⁵ WEF (December 2016). Renewable Infrastructure Investment Handbook, p. 6.

⁶ BNEF (June 15, 2017). New Energy Outlook 2017.

⁷ BNEF (June 15, 2017). New Energy Outlook 2017.

- d. Batteries and energy storage costs have fallen to about a quarter of 2010 prices.⁸ If this trend continues, energy storage can help address the issue of intermittency for renewables.

5 Disruptions are also happening in other sectors. These are a result of technological progress, favourable economics, and coordinated policy direction by many countries in addressing the global energy and climate change challenges.

- a. In the Transport sector. Forecasts show that electric cars could reach cost parity with internal combustion engine vehicles around 2025.⁹

Several countries have announced ambitious plans to phase out petrol and diesel cars.¹⁰

- i. Netherlands by 2025,
- ii. Germany and India by 2030,
- iii. UK and France by 2040,
- iv. China is also developing plans.

- b. Building sector. There are many innovation opportunities to reduce cooling loads, and for some buildings, to be a net exporter of renewable energy. Our Building and Construction Authority is striving towards “Positive energy for low-rise buildings, net zero energy for medium-rise and super-low energy for high-rise buildings”. By 2030, we are aiming for 80 % of buildings to be GreenMark certified.

- c. Industry sector. There are waste energy recovery opportunities that should be explored. Waste cold from LNG, waste gas, and waste heat can all be recovered to produce usable energy.

- d. Digitisation of our economies also means that we will see a higher degree of electrification in all sectors.

- e. Data and Info-comm sector. The average data centre requires about a hectare of land or about 4 European football fields, with energy-related costs making up half their operating expenditure.¹¹ Reducing energy and land requirements are therefore critical areas, especially for a tropical, land-scare country like Singapore.

Navigating Change

6 Energy forms the backbone of a robust and vibrant economy that creates wealth for our society and good jobs for our people. Ensuring affordable, diverse, reliable, and resilient energy supply is thus important. Efforts from all sectors will help to accelerate the energy transition, and provide opportunities to provide clean electricity to support economic growth.

- a. For cities like Singapore, changes in the energy landscape present both challenges and opportunities.
 - i. Being sustainable is not an alternative or trade-off to economic development, but a venture into greater opportunities and green growth.

⁸ Bloomberg New Energy Finance, Lithium ion battery costs drop to US\$273/kWh in 2016 compared to US\$ 1000/kWh in 2010.

⁹ BNEF (June 23, 2017). Electric cars to reach price parity by 2025.

¹⁰ WEF (September 26, 2017). Countries are announcing plans to phase out petrol and diesel cars. Is yours on the list?

¹¹ Forrester, Global Green Data Centre Best Practices in Action, 2013.

- ii. Our companies can develop urban solutions which can also be exported to help regional countries overcome their energy and environmental challenges.

7 Governments need to think about how to facilitate this energy transition. Singapore is in the process of developing strategies to achieve its long-term clean energy deployment and energy efficiency objectives.

- a. These strategies will point the direction for long-term infrastructure planning and guide stakeholders and companies so that they can make informed decisions to maximise deployment of clean energy and energy-efficient solutions.
 - i. Given the long lifespans of energy investments, decisions taken in the next 5 to 10 years will determine our longer-term energy system in 2040-2050.
 - ii. We also want to set ambitious goals to spur R & D and innovation.
- b. Greater deployment of clean energy has the potential to significantly reduce energy costs for industry, and help Singapore compete better in a modern, digitised economy, especially when compared to countries with greater access to cheap renewable energy.

8 Managing this energy transition is important for Singapore. I will outline 3 key thrusts which should guide stakeholders in our efforts.

9 First, we must step up efforts to improve our energy efficiency. This helps to reduce the energy component in the operating cost of companies, and helps manage overall energy demand growth.

- a. In 2015, our companies achieved an industrial energy efficiency improvement of 0.6 %.
 - i. We plan to at least double this to the 1 to 2 % annual improvement achieved by leading countries such as Belgium and the Netherlands¹².
- b. We have also announced that Singapore will implement a carbon tax from 2019.
 - i. A carbon tax sends an economy-wide signal to companies on the value we place on greenhouse gases.
 - ii. This will ensure that those who emit the most greenhouse gases will fairly bear the costs to our environment, and further encourages all sectors to reduce their emissions and improve their energy efficiency.
 - iii. Revenue from the carbon tax will help to fund measures to help companies reduce their emissions.
- c. We encourage all companies, including SMEs, to tap on the Government's energy efficiency grants and incentives to invest in energy efficiency and adopt energy efficiency practices so that their business can be more competitive. Households can also switch to more energy-efficient appliances, and save on their electricity bills.

¹² NCCS (2016). Climate Action Plan: Take action today for a carbon-efficient Singapore, p. 13.

- d. Our research institutes are also working with industry, including the petrochemical and energy sectors, so that they can be best-in-class globally in energy efficiency and emit less greenhouse gases.

10 Second, we will harness renewable energy in more innovative and efficient ways.

- a. Natural gas, the cleanest form of fossil fuel, currently accounts for about 95% of electricity generation in Singapore.
- b. While natural gas will remain a key component of our energy mix, there is much scope for Singapore to harness more renewable energy.
- c. For Singapore, solar photovoltaics (PV) are presently the most technically and economically viable renewable energy option, and there is much scope for us to harness it in more innovative and efficient ways.

A study by the Sustainable Energy Association of Singapore (SEAS) study showed that solar energy, without subsidies, can contribute to 2 GWp by 2025. This is about a quarter of Singapore's projected peak electricity demand.¹³

We are also currently test-bedding floating solar panels on reservoirs, and making use of temporarily vacant land.

- i. Early results in the testbed at Tengeh Reservoir show that the floating solar panels have better performance than typical rooftop solar systems. We plan to deploy floating systems at other reservoirs as well.¹⁴
- ii. On Jurong Island which houses major petrochemical complexes, we are exploring how to make greater use of vacant land by installing moveable solar panels as an interim use.¹⁵
- iii. In the future, the deployment of solar panels on vertical building surfaces also offers opportunities. We have limited horizontal surface area in Singapore, but we have a lot more vertical surfaces on our buildings.

11 Third, we will continue to invest in energy Research, Development & Demonstration (RD&D).

- a. Under the Research, Innovation and Enterprise (RIE) 2020 plan, US\$ 660 mil (S\$900 mil) is set aside for the urban solutions and sustainability domain, of which energy is a key focus area.
 - i. This supports piloting and test-bedding of new technologies in areas such as power systems, smart grids, energy storage, green buildings, and green data centres, with the aim of accelerating the commercialisation and adoption of these technologies.
- b. Our scientific and research community are already partnering companies to undertake cutting-edge research.

¹³ SEAS (Jan 20, 2014). A case of sustainability: Accelerating the adoption of renewable energy in Singapore [White paper].

¹⁴ PUB (September 29, 2017). PUB studying clean energy solutions from blue spaces [Press release].

¹⁵ Channel NewsAsia (September 4, 2017). JTC calls tender to install movable solar panels on Jurong Island.

- i. This supports companies pursuing green growth opportunities in clean energy and energy efficiency.
- ii. Our companies such as Keppel, Singtel are capitalising on cloud computing, the Internet of Things, Big Data and advances in energy efficiency to develop next-generation, high-rise data centres for instance.

These innovations in building design, rack design, intelligent controls, and new approaches to meet cooling needs, will help optimise land use and further reduce energy and carbon emissions by up to 15 % from the current best-in-class service provider data centres in Singapore.¹⁶

12 With all the disruptive changes to the energy landscape, the Government will need to look at energy more holistically.

- a. We will set up a National Energy Transformation Office (NETO) within the Energy Market Authority (EMA) to better synergise our efforts across agencies and steer Singapore's efforts towards our long-term energy objectives.
 - i. NETO will adopt a whole-of-government perspective in planning and coordinating energy Research, Development and Demonstration (RD&D) funding and initiatives, and enabling policies for the adoption of transformational energy solutions.

13 We will also build up a strong core of power engineering professionals who are able to take us into the transformed energy landscape.

- a. Power systems form the backbone of critical infrastructure such as transportation, utilities and buildings.
- b. The public sector itself will need 250 more power engineers to join us.
- c. EMA will lead the development of our manpower needs and capabilities for the Power sector.

14 Beyond addressing our own energy challenges, we will continue to play an active role in the global energy architecture.

- a. International cooperation is increasingly important in ensuring effective action on environmental sustainability and energy security.
- b. Singapore has been participating actively in regional and international forums such as ASEAN, APEC and the G20, to learn from and contribute to the international discourse on energy. For our ASEAN Chairmanship next year, we will work with ASEAN members, Dialogue Partners and international organisations to deepen energy collaboration in clean energy, natural gas and LNG, and the financing of energy investments.
- c. We joined the IEA as an Associate Member in October 2016, to help build a more inclusive global energy architecture and contribute towards the region's efforts for a more sustainable energy future.

¹⁶ The Power Usage Effectiveness indicates the ratio between energy consumed by a data centre (inclusive of the facility itself and its IT equipment) against how much is utilised by the equipment. A PUE of 1 is the ideal.

- d. The annual SIEW is also part of our efforts to further international energy cooperation.

Conclusion

15 It is in our collective interest to accelerate this energy transition into a low-carbon world.

- a. Singapore may be physically limited by our small size and the lack of resources. But this has provided the impetus for us to find innovative solutions to overcome the challenges we face.
- b. We hope that we can share experiences with other countries and cities to arrive at better solutions for all of us.

16 As the global energy landscape evolves, the energy dialogues that SIEW seeks to foster become ever more important.

- a. SIEW brings together global energy leaders to discuss how to innovate and translate energy solutions that could benefit all of us.

17 Congratulations on SIEW's 10th anniversary. I hope you will continue to be part of the energy conversation at SIEW in the years to come. Thank you.