

KEYNOTE ADDRESS BY MR LAWRENCE WONG, MINISTER FOR NATIONAL DEVELOPMENT & SECOND MINISTER FOR FINANCE, AT THE INTERNATIONAL UTILITY WORKING GROUP CONFERENCE 2018, 23 APRIL 2017

Mr Wong Kim Yin, Group Chief Executive Officer, SP Group

Members of the International Utility Working Group

Distinguished Guests

Ladies and gentlemen

Introduction

1. I'm very happy to join you this morning for the opening of the International Utility Working Group (IUWG) conference. As Kim Yin said, I used to be in the power sector more than ten years ago. It's good to see many familiar faces and to all our friends from overseas, a very warm welcome to Singapore.
2. Singapore is very happy to host this year's IUWG, which provides a platform for major utilities around the world to share experiences and best practices. It is especially timely given the changes and technological disruptions we have seen in the global energy landscape over the past decade.
3. The theme of this year's conference – Innovate, Secure, Sustain – is also highly appropriate. It sums up the approach that utilities have to adopt as we navigate the changing energy landscape.

The future of energy and inadequacies of our current grid

4. I remember vividly what the energy world was like ten years ago. At around this time ten years ago, oil prices were about \$150. I was scrambling to explain to consumers in Singapore why their electricity prices were going up so sharply. Everyone then was talking about peak oil, and the concern was that this would be sustained – oil prices would be kept at around that level, might go even higher and structurally, we were in a world of permanently high oil prices.
5. I think those who made those predictions then would look back and know how foolish they were. Because right after that, we had the global financial crisis. Demand fell off and we had supply side disruptions because technology enabled the US shale revolution to take off. Today, shale production has proven to be a market game changer, so America is becoming a net exporter of gas and not a net importer.
6. At the same time, renewable energy options have become more economically viable throughout this period. Solar panels in Singapore, for example, were much more expensive than what we could get from the grid ten years ago. Today, we have surpassed grid parity.
7. All these are making life for grid operators much more challenging. I have learnt from my time at the Energy Market Authority (EMA) that the most important word that grid operators think about is *balance*. If there is one word that sums

up the job of power system operators, it is *balance*. Because you have to balance supply and demand across the grid.

8. Traditionally, grid operators assume load as given and adjust the supply accordingly. You meet demand first with the most economic option, then you gradually move up the merit order until demand is fully covered. But this is becoming harder to do, because renewable energy is intermittent and availability is subject to the vagaries of weather.

9. Meanwhile, demand for power continues to rise. It is fine if it rises in such a way that it takes up the off peak slack and levels the load. But we know that is not happening. Instead, the peaks are going higher, and the grid operator has to manage – through more expensive storage or peaker plants – all of which cost money.

10. Moreover, the traditional model of centrally supplied generation and one-way electricity flow is giving way to multi-directional flows. You have more and more distributed energy resources going online; more homes, smart appliances and devices, including electric vehicles – all connected online and through the Internet of Things. Consumers can also become producers. They can optimise usage, generate and store power, and sell back to the grid.

11. The entire electricity system is undergoing changes on a scale and pace not seen since its inception. We urgently need power grids that are more robust, flexible and responsive, and the key to this is a digital grid infrastructure – one

that enables more sophisticated monitoring, diagnostics and optimisation across the entire power value chain. At the same time, one that is also robust enough to safeguard against the threat of cyber-security.

Investing in R&D to develop smarter grid architectures

12. It's an important, challenging issue and I am sure all of you, as major utilities around the world, are grappling with this. Governments and grid operators everywhere have been doing more R&D work in smarter grids and also investing in digital equipment to upgrade their existing grids.

13. Singapore is doing our part too. More generally, when we look at R&D work in Singapore, it's within the broader context of how we see research and development as a strategic emphasis for our economy. We see R&D as an investment in our future, to develop a more innovation-driven economy, and to be a Smart Nation. We want to harness technology comprehensively to create new jobs, to make our lives convenient, and to make Singapore an outstanding

city.

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14. That is why over the years, we have been stepping up public investments in R&D. We started this journey back in 2006, when we set up the National Research Foundation (NRF) and a Research, Innovation and Enterprise Council (RIEC), chaired by the Prime Minister, and we have progressively been putting in more public monies into R&D.

15. In our last five-year R&D plan, we invested \$16 billion. In the coming five-year plan, where we are part of now, we are investing \$19 billion. Within this overall national R&D plan, we have identified several strategic areas, including biomedical science, advance manufacturing, digital technologies, and one important area is urban solutions and sustainability. Energy is a key area of research focus within this domain of urban solutions.

16. Over the years, we have looked at several aspects of the energy system. We have done R&D on solar panels, electric vehicles, smarter buildings within the tropics – all of these research have paid off. We are seeing more solar panels deployed in Singapore; our buildings are getting greener; and we also see a faster take-up of electric vehicles as we electrify our transport fleet.

17. This year, we are embarking on **Energy Grid 2.0**. It is a timely investment because we have done quite a bit of work over the years and now, to pull together all of these different components, we need a smart grid – one that can help us optimise the entire power system.

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18. Under Grid 2.0, we will be exploring research and development in several areas. First is to integrate multiple sources including renewables, across electrical, gas and thermal networks, as a single intelligent, reliable and resilient system. Second, we are looking at key component technologies, such as new cooling technologies and solid-state transformers.

19. Solid-state transformers are potentially a key building block in the smart grid concept. Today's transformers, as all of you know, still work on analogue technology. There is a lot of potential to move into digital solid-state transformers to completely change the way substations are designed.

20. We already know that individual solid-state transformers can work, but the question is how they might operate in the context of a larger grid. In the Singapore context, if this takes off, another potential benefit is that it offers tremendous potential to save valuable land space, because today's substations are quite big and takes up a lot of space in land scarce Singapore. If you have solid-state transformers the size of a suitcase, potentially, imagine the kind of changes that can happen to the design of future substations and how much land can be freed up for more valuable usage.

21. Besides undertaking upstream research, we envisage that Grid 2.0 will be a platform for industry players to partner with researchers. We are not just doing research in the universities. We want research to be applicable and to be deployable. We envisage that this will be a platform where industry players can partner with researchers to demonstrate innovative energy solutions in test-beds within Singapore, prove the concept, and then scale up the technologies to the district and even to the national level.

22. I am happy to hear that our grid operator, the Singapore Power (SP) Group, and one of our local universities, the Singapore Institute of Technology (SIT), will be working together to build a micro-grid which will be housed at SIT's future

campus. This micro-grid, which can be connected and disconnected from the main grid as required, will provide a platform for new technologies and solutions to be tested in a controlled environment. I don't think you will want to put something experimental in the main grid and risk potential disruptions to the entire electricity system. With a micro-grid, it is a useful platform where innovation and experimentation can be done.

23. Later this morning, SP and SIT will be signing a Research Collaboration Agreement (RCA) to develop innovative, cost-effective solutions for Singapore's future needs. I look forward to fruitful outcomes from this collaboration.

Other efforts to support the development of smarter grids

24. Besides researching and test-bedding next generation grid architectures, we are also exploring innovative solutions in different areas. For example, EMA, together with the Meteorological Service Singapore (MSS) and a consortium led by the National University of Singapore (NUS), is working to develop a solar forecasting model suited to the tropics, in particular to Singapore's tropical weather conditions. It is particularly important for us because while we may be in the tropics with lots of sun, we also have weather changes, cloud cover, all of which can cause solar power to be highly intermittent and difficult to predict. This forecasting model will help us to better manage solar intermittency.

25. SP Group and EMA will also be test-bedding different Energy Storage System (ESS) technologies. Again, we see storage as a potential way to manage intermittency and the technology here is getting better, cost is coming down, so we would like to gather insights on the standards and policies required to facilitate the deployment of large scale storage solutions in Singapore, tailored to our weather context and operating environment.

26. On the demand side, we are working towards enabling remote metering of electricity, water and town gas meters so that consumer can have more timely information on their utilities consumption and can optimise demand. We are rolling out full retail competition for households so that even at the household level, they can choose their retailers, optimise their consumption, and we are scaling up more demand response schemes. Not so easy to do – it will be interesting to hear from grid operators elsewhere how demand response has taken up or has taken off if at all, but we know it's difficult. Consumers are still not embracing this enthusiastically, be it individuals or companies, so we are doing our best to scale up as well.

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IUWG is a good platform for mutual exchange

27. I have touched briefly on Singapore's approach. There are quite a number of things that we are doing. We believe we still have much to learn from other countries, especially all of you who are here today. We can all benefit from the sharing of our own experiences, best practices, learn from one another and see

how we formulate better policies and schemes together in order to improve our power system worldwide.

28. Platforms like the IUWG will continue to be key for the exchange of information and ideas, as well as to facilitate co-creation of solutions at a regional and global level.

29. On that note, I would like to encourage everyone to share your knowledge and insights over the next few days. I wish all of you a fruitful and enjoyable conference.

30. Thank you very much.

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