

MEDIA RELEASE

15 July 2022

Projects Awarded Under \$6 Million Grant to Test-bed and Accelerate New Clean Energy Innovations on Jurong Island

The Energy Market Authority (EMA) and JTC, with support from Enterprise Singapore (EnterpriseSG), have awarded three projects under the \$6 million grant to test-bed new clean energy innovations on Jurong Island. These projects demonstrate the shared commitment by the industry, technology partners and government agencies to advance clean energy deployment on Jurong Island.

2 The investment in clean energy technologies is part of Singapore's energy transition to decarbonise its energy supply and will support Singapore's raised climate ambition to achieve net-zero by or around mid-century. This will also support Jurong Island's vision of a more sustainable energy and chemicals park in line with Singapore's Green Plan 2030.

3 These projects, piloted for the first time on Jurong Island, cover a diverse mix of technologies. They include innovative floating solar deployment and the development of a virtual ledger system to support green hydrogen production. One of the projects will also look at using existing infrastructure to deploy energy storage systems and the electrolytes used for energy storage can be produced from recycled industrial waste, which enhances circularity on Jurong Island. The awarded projects were selected based on their innovativeness, commercialisation potential and scalability.

4 If shown to be commercially viable, the test-bed projects could be scaled up and deployed across more companies on Jurong Island as well as other industrial companies looking for cleaner energy solutions. This grant call was launched following the Jurong Island Circular Economy Study, supported by 51 energy and chemicals companies, which highlighted opportunities for greater collaboration to explore clean energy technologies on the island.

5 On the importance of investing in new energy technologies, Mr Ngiam Shih Chun, Chief Executive of EMA, said, "With Singapore's limited renewable energy options, new energy technologies and innovations are key in our decarbonisation

journey. Solar is our most viable renewable energy source and we hope to push the boundaries further to maximise the amount we can harness. We are also looking at low-carbon alternatives such as hydrogen to reduce our carbon emissions in the longer term. The partnership with industry and research community will accelerate our transition towards a more sustainable energy future.”

6 Mr Alvin Tan, JTC’s Assistant Chief Executive Officer, Industry Cluster Group, said, “Jurong Island is at the heart of our sustainable energy transition. Such collaboration with the community to devise innovative low-carbon solutions will not only quicken the pace and help us achieve breakthroughs in costs, scale, and availability of clean energy, but also bolster Jurong Island’s reputation as a living test-bed for emerging technologies.”

7 Mr Jeffrey Siow, Managing Director & Chief Operating Officer of EnterpriseSG, said, “EnterpriseSG is pleased to support EMA and JTC as part of our Open Innovation initiative to test-bed novel technologies on Jurong Island. This initiative will help our enterprises forge strong partnerships with Jurong Island companies and the research community to jointly develop sustainable solutions that contribute towards our net-zero climate ambitions.”

8 More than 30 proposals were received following the open grant call in October 2021. The grant supports the prototyping and demonstration of the awarded projects over the next two years.

Annex A: Infographic of Jurong Island as a Testbed for Clean Energy Innovations

Annex B: Details of Awarded Projects

Annex C: Factsheet on Advancing Singapore’s Energy Transition Towards a More Sustainable Future

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About the Energy Market Authority

The Energy Market Authority (EMA) is a statutory board under the Singapore Ministry of Trade and Industry. Through our work, we seek to forge a progressive energy landscape for sustained growth. We aim to ensure a reliable and secure energy supply, promote effective competition in the energy market and develop a dynamic energy sector in Singapore. Visit www.ema.gov.sg for more information.

Instagram: @EMA_Singapore | Facebook: facebook.com/EnergyMarketAuthority |
Twitter: @EMA_sg | LinkedIn: linkedin.com/company/energy-market-authority-ema/

About JTC

Since its inception in 1968, JTC has played a strategic role in ensuring Singapore stays innovative and dynamic amid global manufacturing trends.

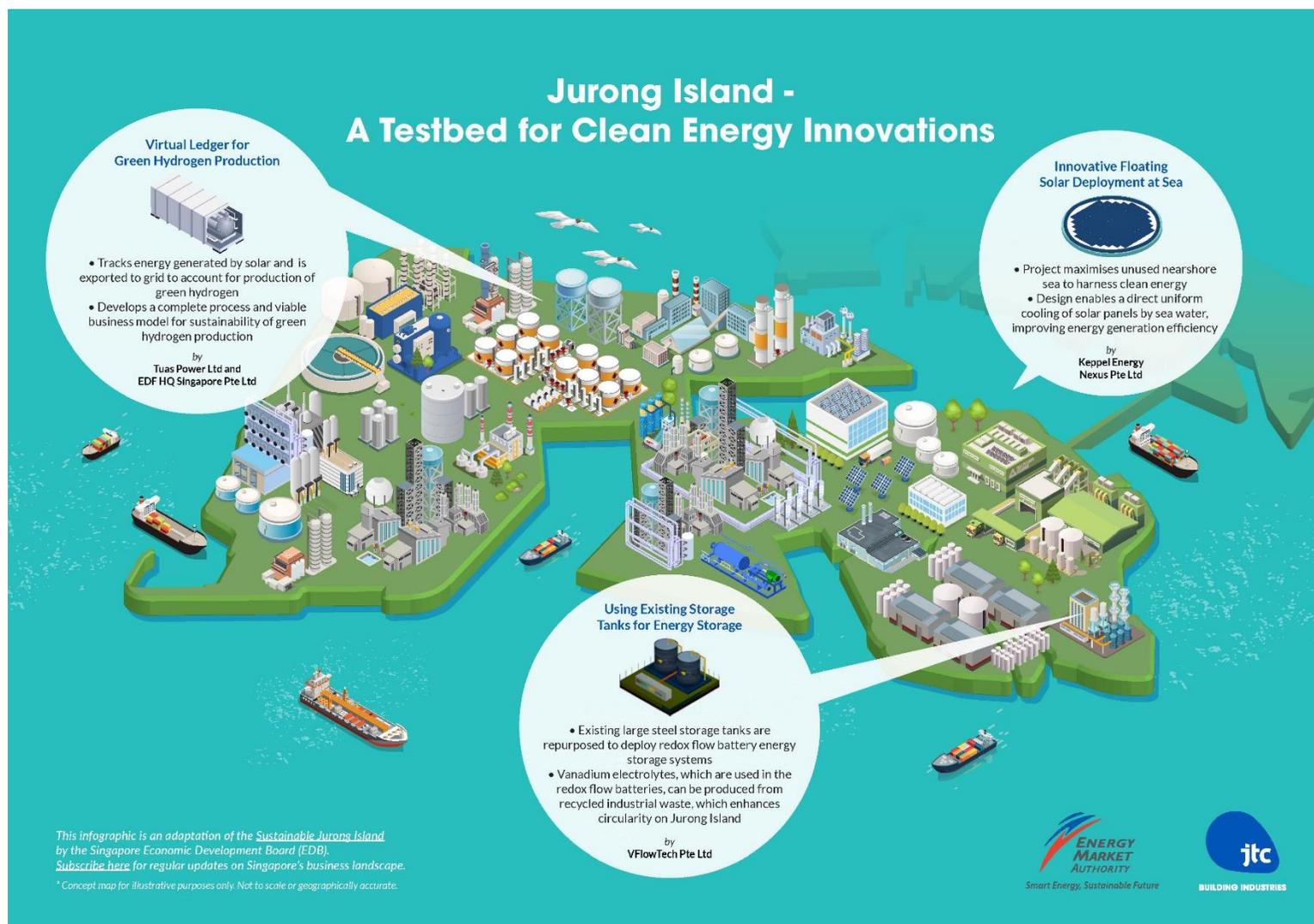
As a government agency under Singapore's Ministry of Trade and Industry, JTC is paving the way forward for Singapore's industrial landscape with clean, green and smart estate masterplans such as one-north, Seletar Aerospace Park, Jurong Innovation District, and Punggol Digital District. Our estates attract new investment and foster collaborative ecosystems that strengthen Singapore's position as an advanced manufacturing hub. We also drive innovation in the Built Environment sector by piloting new construction technologies.

For more information on JTC, visit www.jtc.gov.sg

About Enterprise Singapore

Enterprise Singapore (EnterpriseSG) is the government agency championing enterprise development. We work with committed companies to build capabilities, innovate and internationalise. We also support the growth of Singapore as a hub for global trading and startups and build trust in Singapore's products and services through quality and standards. Visit www.enterprisesg.gov.sg for more information.

ANNEX A: INFOGRAPHIC OF JURONG ISLAND AS A TESTBED FOR CLEAN ENERGY INNOVATIONS

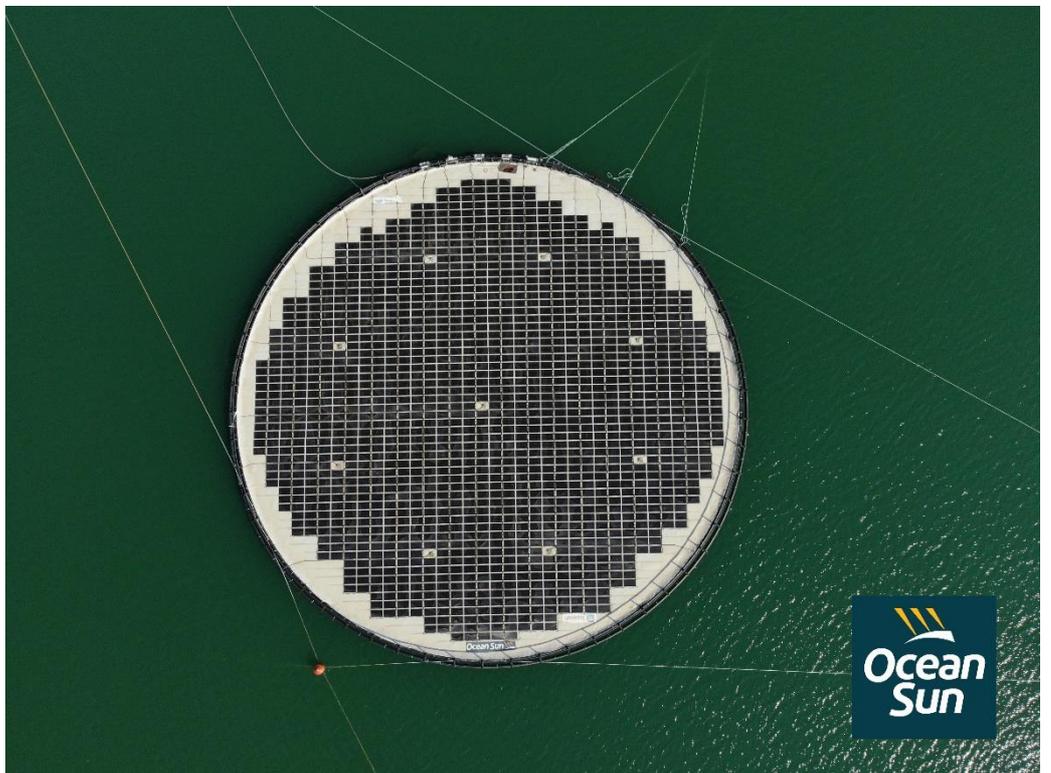
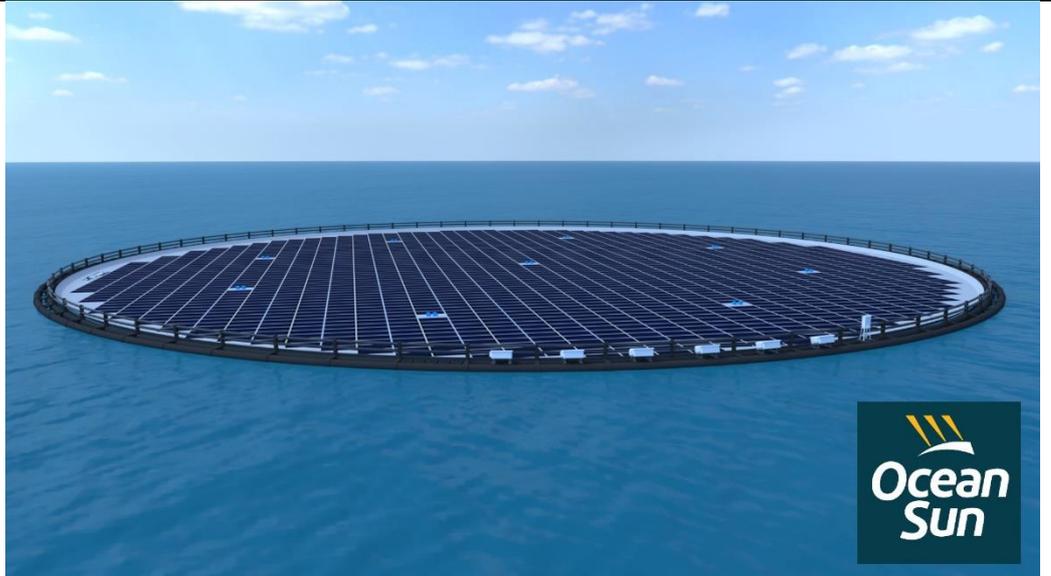


Credit: JTC

ANNEX B: DETAILS OF AWARDED PROJECTS

Project Title	Project Circularity
Awarded Company	Keppel Energy Nexus Pte Ltd (Keppel)
Partners	- Ocean Sun AS
Description	<p>Project Aim: Keppel will pilot an innovative nearshore photovoltaic (PV) system based on Ocean Sun’s patented technology that is designed to withstand stronger waves and rough sea conditions in a nearshore marine environment to harness solar energy reliably.</p> <p>The conventional floating solar PV systems used in Singapore are generally kept afloat with multiple floating units and are deployed in calmer water bodies such as reservoirs.</p> <p>For the innovative floating PV systems, the solar panels are placed directly on a single circular reinforced membrane; and are buoyed and protected by a high-density polyethylene pipe structure surrounding the membrane. It is safer, more stable and can withstand stronger waves and rough sea conditions.</p> <p>The nearshore floating PV systems will be piloted at the seawater near JTC’s Oasis Building or any other appropriate site as identified on Jurong Island.</p> <p>Potential benefit: If successful, this would be Singapore’s first membrane-based nearshore floating PV system to reach 1.5 MWp and serve as a proven model for future scaling and replication in rougher nearshore waterbodies in Singapore and the region.</p>

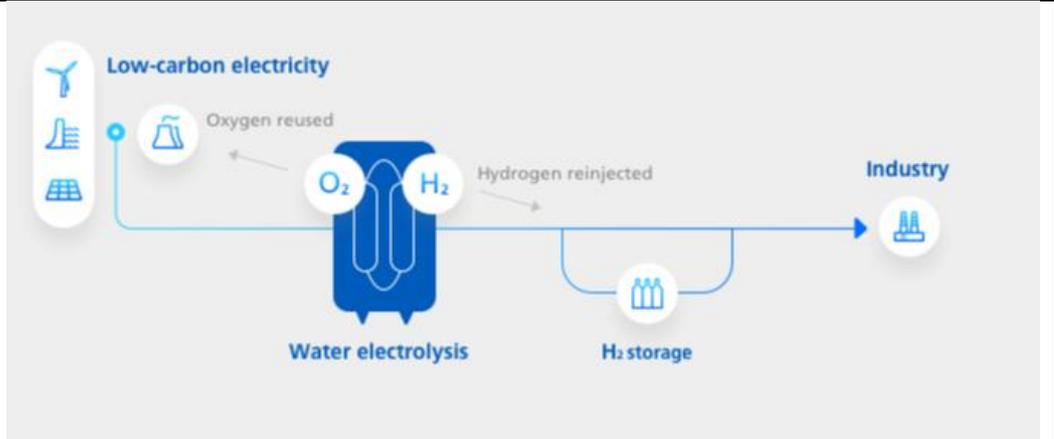
Photos



*Caption: An example of the innovative floating solar photovoltaic system
Photo credit: Ocean Sun AS*

Project Title	Smart H2 Green Virtual Ledger
Awarded Company	Tuas Power Ltd (TPL), EDF HQ Singapore Pte Ltd (EDF)
Partners	<ul style="list-style-type: none"> - EDF HQ Singapore Pte Ltd (EDF) - TRECS.ai Pte Ltd - Air Liquide Singapore Pte Ltd - Energy Research Institute @ NTU (ERI@N)
Description	<p>Project Aim: The project aims to demonstrate an innovative concept of using a virtual ledger to support 24/7 production of green hydrogen powered with offsite solar energy generation.</p> <p>Up to 1.5 megawatt peak (MWp) of solar photovoltaic systems will be deployed at Tuas Power facilities at Tuas South and Jurong Island. The Renewable Energy Certificates (RECs) generated by the export of solar energy to the grid will be tracked via a virtual ledger. The RECs will in turn enable the electrolyser to draw green electricity from the grid to generate a consistent stream of green hydrogen.</p> <p>The electrolyser will be installed at Tuas Power's Multi-Utilities Complex in Jurong Island in close proximity to a potential buyer to minimise the transportation cost of green hydrogen.</p> <p>Potential benefit: If successful, the solution will develop a complete process and business model to produce green hydrogen locally. It addresses the intermittency of renewable energy so that production of green hydrogen will not be reliant on when the renewable energy is available.</p> <p>The Green Virtual Ledger also integrates the energy management system and the REC platform to optimise the forecast between power generation and demand.</p>

Photos



*Caption: Schematics of Electrolyser
Image credit: EDF HQ Singapore Pte Ltd*



*Caption: Electrolyser
Photo credit: EDF HQ Singapore Pte Ltd*

Project Title	Scalable Vanadium Redox Flow Battery for Round-the-clock Renewable Solution
Awarded Company	VFlowTech Pte Ltd
Partners	<ul style="list-style-type: none"> - Advario Singapore Chemical Pte. Ltd - CBE Eco-Solutions Pte Ltd - Infosys Limited - Rolls-Royce Singapore Pte Ltd - Nanyang Technological University (NTU)
Description	<p>Project Aim: The project aims to demonstrate the innovative deployment of Vanadium Redox Flow Battery energy storage systems (VRFB-ESS) by leveraging existing storage tank infrastructure on Jurong Island.</p> <p>The project seeks to store the ESS electrolyte in steel storage tanks which can be scaled up to raise the ESS capacity from MWh to GWh scale.</p> <p>The solution will also be 100% recyclable, and the electrolyte will be synthesised using recycled vanadium ions from industrial waste on Jurong Island.</p> <p>The ESS solution will be deployed at a 460 square metres site on Jurong Island and will be powered using solar photovoltaic systems deployed on Advario’s facilities on Jurong Island.</p> <p>Potential benefit: The innovative ESS design demonstrates strong synergy with Jurong Island companies who owns storage tanks that can potentially be used for energy storage.</p> <p>The structure of this innovative VRFB-ESS is also about five times more space-efficient than that of a typical containerised redox flow battery ESS due to the size of the storage tanks available and comes with cloud-based smart energy management to optimise the operation of ESS for different applications. The VRFB-ESS can accelerate the development and adoption of renewable energy as well as reduce the environmental impact of industrial waste in Jurong Island.</p>

ANNEX C: FACTSHEET ON ADVANCING SINGAPORE'S ENERGY TRANSITION TOWARDS A MORE SUSTAINABLE FUTURE

Climate change is a global existential threat and Singapore is doing its part to reduce emissions for a more sustainable future. Our Long-Term Low-Emissions Development Strategy (LEDS) aspires to halve emissions from its peak to 33 MtCO_{2e} (metric tonnes of carbon dioxide equivalent) by 2050, with a view to achieving net zero as soon as viable in the second half of the century.

2 The power sector has a key part to play as it accounts for about 40% of Singapore's carbon emissions¹. We need to significantly reduce the power sector's emissions, while ensuring that the power system remains secure, reliable and sustainable. Singapore is therefore harnessing four Switches—natural gas, solar, regional power grids and low-carbon alternatives—to transform its energy supply, while promoting energy efficiency to reduce demand.

Four Supply Switches for Power Sector Decarbonisation

A. Natural Gas

3 As Singapore transitions towards cleaner energy sources, reliable and sufficient energy sources are needed to ensure supply reliability. Natural gas will continue to be a dominant fuel for Singapore's electricity generation even as we scale up the other 3 Switches. EMA will continue to diversify our natural gas sources and work with the power generation companies to improve the efficiency of their power plants.

B. Solar

4 Solar remains the most promising renewable energy source in the near term for Singapore. Today, over 630 megawatt-peak (MWp) of solar has been installed² and we are on track to achieving our solar panel deployment target of at least 2 gigawatt-peak (GWp) by 2030 (equivalent to powering 350,000 households a year). Conventional rooftop solar has been complemented with innovative ways of deploying solar photovoltaic systems on spaces such as water bodies, temporary vacant land or sheltered walkways, making Singapore one of the most solar dense cities in the world. To manage the intermittent nature of solar and ensure grid resilience, we are planning to deploy at least 200 megawatts (MW) of energy storage systems (ESS) beyond 2025.

5 Nonetheless, there are still limitations to the amount of solar energy that we can harness due to Singapore's limited land area. Even as we work towards achieving

¹ Source: National Climate Change Secretariat

² Figure accurate as of Q4 2021

our 2030 solar target of 2GWp, it will constitute only around 3% of the country's total electricity demand in 2030.

C. Regional Power Grids

6 To overcome our land constraints, Singapore is tapping on regional power grids to access cleaner energy sources beyond its borders. Regional power grids can help accelerate the development of renewable energy projects in the region, bringing economic growth and increasing access to renewable energy. Electricity imports will also help us to diversify our energy sources away from natural gas and improve our energy resilience.

7 Singapore is planning to import up to 4 gigawatts (GW) of low-carbon electricity by 2035, which is expected to make up around 30% of Singapore's electricity supply in 2035. This will be done through a competitive Request for Proposal (RFP) process. Steps will also be taken to maintain our energy security, such as diversifying our import sources and ensuring back-up supply is in place to mitigate supply disruptions.

8 To pave the way for these electricity imports, EMA has been working with various partners on electricity import trials. These trials will allow us to assess and refine the technical and regulatory frameworks for importing electricity. They include a trial to import 100MW of electricity from Peninsular Malaysia, as well as a pilot to import 100MW of solar-generated electricity from Pulau Bulan, Indonesia. Singapore is also a part of the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP), which facilitates cross-border power trade among the four countries.

D. Emerging Low-Carbon Technologies

9 Singapore is exploring emerging low-carbon technologies such as hydrogen and carbon capture, utilisation and storage (CCUS) that can help reduce Singapore's carbon footprint in the longer term. While such technologies are nascent, EMA is taking active steps including investing in R&D through the Low-Carbon Energy Research (LCER) Funding Initiative to improve the technical and economic viability of implementing low-carbon technologies such as hydrogen and CCUS.

10 Advances in geothermal technology have also opened up the opportunity for us to consider the prospect of tapping on this energy source for power generation. For instance, EMA is working closely with Nanyang Technological University, and various ministries and agencies including the Ministry of Trade and Industry and the National Climate Change Secretariat to conduct studies to determine the geothermal resource potential in Singapore.

Promoting Energy Efficiency to Manage Demand

11 Besides transforming the way we produce energy, managing our energy demand is also key to achieving a more sustainable future. With the economy recovering from the pandemic and as energy demand grows with increasing electrification, demand management will be a key pillar in supporting the energy transition. EMA will continue to encourage energy efficiency in the industry and households, and is concurrently developing other demand management initiatives. Together, everyone will have to play their part by conserving energy and supporting the greener energy transition for a more sustainable future.