Households will now be able to buy electricity from their chosen retailer

Singapore revs up renewables push amidst solar and carbon tax uncertainties

The city-state has trialed the Open Electricity Market and announced a carbon tax, but operational doubts persist.

When Singapore held the soft launch of the Open Electricity Market in Jurong, it enabled households and firms to buy electricity from their chosen retailer, and in a way represented the promising direction the country was taking in renewables as the initiative is expected to bolster solar power developers that can now reach a wider base of consumers to purchase their green electricity. OEM is expected to be rolled out to the rest of the country from the Q4 of 2018, but programme implementation has seen its share of challenges.

In April, **Soh Sai Bor**, assistant chief executive of the Singapore Energy Market Authority's economic regulation division, said the agency has banned door-to-door sales or marketing activities at or near residential premises in order to protect consumers from aggressive marketing tactics.

"We will not hesitate to act against retailers if they engage in dishonest marketing practices," he said, in response to a public letter claiming the EMA had adopted a "hands-off approach" towards the OEM as retailers begin to jockey for a slice of the electricity market.

Retailers pull marketing gimmicks

"Some retailers have resorted to gimmicks, like free electricity and cash rebates. This may not benefit customers in the long run, and serve to confuse and encourage wasteful habits. In addition, the retailer who gets the most business may not be the cheapest or the most eco-friendly; just the one with the most marketing savvy," the public letter read.

The OEM hiccups—when taken together with what analysts have cited as larger uncertainties surrounding the country's focus on large-scale solar systems despite the lack of physical space and the long-term impact of the looming carbon tax scheme—serve to illustrate Singapore's growing pains in its drive to become a renewables leader in Southeast Asia.

After 2020, the pace of installation is expected to be even faster; given the target to reach 1GWp capacity beyond 2020.

"With the OEM to be implemented across Singapore by the end of this year, solar power developers will be able to tap the residential consumer market to offer green electricity. After 2020, the pace of installation is expected to be even faster; given the target to reach 1GWp capacity 'beyond 2020,'" said **Gautam Jindal,** research associate at Energy Studies Institute at the National University of Singapore.

The OEM is one of the key projects meant to propel solar power development in Singapore and enable the country to meet its target of 350MW installed capacity, and it has a lot more ground to cover. "Singapore has two years remaining to reach its target," said Jindal. "As of the first quarter of 2018, less than half of the target has been accomplished."

SolarNova programme

However, Jindal noted that the SolarNova programme has already awarded three tenders for a combined 190MWp PV capacity, and will come out with a fourth tender in 2019. The third tender was awarded in June to Sembcorp Solar Singapore, a subsidiary of Sembcorp Industries, which entails building, owning, operating and maintaining rooftop solar systems across 848 HDB blocks and 27 government sites. The project involves a total capacity of 50MWp and covers blocks in the West Coast and Choa Chu Kang town councils.

The Singapore Housing and Development Board, which runs the programme with the Singapore Economic Development Board, said the tender was also the largest so far under the SolarNova programme. Sembcorp Solar Singapore expects the construction of the rooftop solar systems to start in the third


Are Singapore's energy targets enough for the city?

quarter of 2018 and aims to complete it by Q2 of 2020.

As of the first quarter of 2018, the number of grid-connected solar PV installations in the country stood at 2,155, almost double from 1,138 in the year-ago period, EMA data showed. Of these, 734 or one-third were residential installations, up from 374 in the prior year, and the rest were non-residential.

Still, **Zhi Xin Chong**, associate director at PGCR Research, IHS Markit, reckons Singapore's ability to deploy large-scale solar systems will be constrained by the lack of space. "I think the concept of Singapore moving largely to renewables is wishful thinking. But Singapore can contribute to other parts of the renewable ecosystem."

Chong said Singapore is the financial hub for Asia and renewable energy developments in the region requiring capital raising, legal structuring, urban planning, efficient management of utility infrastructure, all of which are expertise that can be found in Singapore. "Whilst we are unable to physically develop renewables in a large way in Singapore, we can assist in the developments in the region," he noted.

In July, Singapore's Minister for the Environment and Water Resources Masagos Zulkifli announced that the country would launch a Climate Action Package, which aims to develop capacity in the 10-member Association of Southeast Asian Nations. The capacity-building programme will cover disaster risk reduction, climate science, climate finance, flood management, and long-term mitigation strategies.

Sufficient emissions target?

Singapore's level of commitment to reduce emissions has also come under scrutiny, even as some analysts have argued that it remains appropriate given the country's geographical constraints and integrated industries.

Earlier in April, The Economist Intelligence Unit said that Singapore is "well placed" to reach its commitment under the Paris Accord to lower its greenhouse gas emissions by 36% per unit of GDP by 2030 compared with the 2005 level as well as stabilise them in absolute terms by around that year. The assessment cited long-term plans to promote efficient energy use and the passage of a Carbon Pricing Bill, the latter likely to "go a long way" towards creating industrial incentives in clean energy.

On the other hand, the Climate Action Tracker—a consortium of research organisations tracking climate change action—has criticised Singapore's commitment to lower emissions as "highly insufficient" given the country's high economic capacity. "Whilst it has considerably expanded its renewable energy capacity, Singapore's main focus for climate mitigation is now on energy efficiency programmes. However, this will not compensate for the increasing energy demand from the industry and buildings sectors, which will result in rising emissions," said CAT, expecting its reduction target to lead to emissions in 2030 rising 123% above 1994 levels.


Gautam Jindal


Zhi Xin Chong

In a press query, the National Climate Change Secretariat (NCCS) of the Prime Minister's Office (PMO) noted that CAT's methodology on assessing the sufficiency of a country's climate targets is largely based on various indicators relating to historical emissions, capabilities and development status.

"For Singapore, in addition to these factors, our climate targets need to take into account our challenges as a small city state with limited access to alternative energy. We are a low-lying city-state of around 720 km² with no natural resources. We have limited alternative energy options such as geothermal, wind or hydropower. Where feasible, we have taken various steps to reduce emissions from energy production," it responded.

NCCS noted that Singapore now generates over 95% of electricity from natural gas, up from 26% in 2001. "These early policy decisions to switch to natural gas, the cleanest form of fossil fuel, have led to a 4 MT abatement in greenhouse gas emissions. We also price energy at market rates and do not have fossil fuel subsidies, so as to allow market prices to drive energy efficiency," it added.

Jindal concurred and said that Singapore's targets for emissions and renewables are "sufficient given its national circumstances," noting the country's shift to natural gas, the cleanest possible fossil fuel, and waste incineration. "Singapore has limited technical potential for most renewable energy sources and solar PV is constrained by land scarcity and intermittency concerns," he said, adding that the country's main industries, such as petrochemicals and pharmaceuticals, are highly integrated. "It's difficult to introduce energy efficiency measures that may alter tried and tested processes."

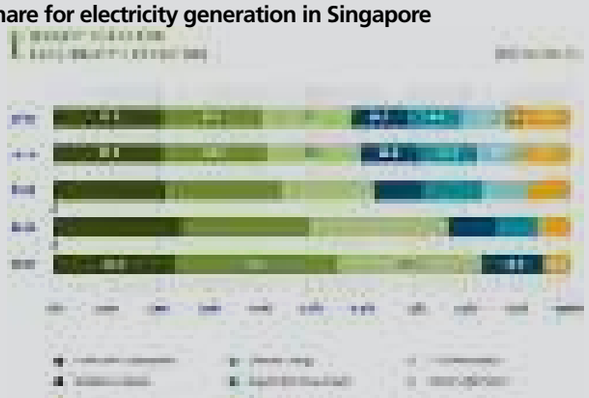
Fulfilling a pledge

The NCCS has also indicated that Singapore, in order to meet its targets, has progressively rolled out various measures aimed at reducing emissions. Firstly, it enhanced its Energy Conservation Act 2017 for three reasons, "(a) strengthen the measurement and reporting requirements for greenhouse gas emissions; (b) require companies to undertake regular energy efficiency opportunity assessments; and (c) introduce minimum energy performance standards for common industrial equipment and systems," it said.

It has also announced an economy-wide carbon tax without exemption from 2019 to incentivise emissions reductions and adoption of low-carbon technologies. "The carbon tax will apply to facilities emitting 25ktCO_2e or more in greenhouse gas emissions a year, across all sectors without exemptions. This is expected to cover around 80% of Singapore's emissions," it added.

Moreover, the tax will be reviewed by 2023, with an intention of increasing it S$10-15/t$CO_2$e ($7.4-11) by 2030. "In doing so, we will consider international developments, the progress of our emissions mitigation efforts, and our economic competitiveness. The implementation of carbon tax will help to accelerate innovation and energy efficiency, shifting our economy and

Market share for electricity generation in Singapore



Source: Energy Market Authority, Singapore

COUNTRY REPORT 2: SINGAPORE

Singapore encourages innovation through floating PV systems

society towards a sustainable, low-carbon future," NCCS said.

Aside from the carbon tax, Singapore is also aiming to improve the energy efficiency of its buildings through the Green Mark Scheme which mandates a minimum level of energy efficiency for new buildings and existing buildings undergoing major retrofitting works. "We are also investing in green building technologies such as more efficient air-conditioning, solar deployment and smart energy management systems. Our aspiration is to have positive energy low rise buildings, zero energy medium-rise buildings, and super-low energy high-rise buildings for the Tropics," it said.

Green marks, green mobility

Its aim is to achieve Green Mark standards for 80% of its buildings by 2030, compared to more than one-third now. Since 2013, commercial buildings, healthcare facilities, and educational institutions have been required to submit energyconsumption data annually. Starting this year, information are publicly disclosed to encourage buildings to consciously adopt measures to reduce their energy footprint, NCCS noted.

Singapore has also been active in its green mobility options, espcially in the areas of public transport, walking, and cycling, by improving and promoting public transport, managing the use of vehicles, and encouraging fuel and carbon efficiency for vehicles. A 360km rail network, 120 trains, and seven transport hubs are expected to boost the city's energy needs.

"We have a comprehensive suite of measures which collectively aim to increase the use of public transport during morning peak hours from 67% in 2016 to 75% by 2030. By 2050, the aim is to further increase this share to 85%," NCCS said.

Research investments

Singapore is also investing in the research and development focused on urban solutions and sustainability sector, which includes supporting the piloting, test-bedding, and accelerating the adoption of new technologies. "Although the scale of solar energy deployment in Singapore is limited by space constraints and issues with intermittency, we are making progress in having solar panels on more HDB rooftops, and increasing our solar PV deployment to 350MWp by 2020, and further to 1GWp beyond 2020," it added.

Singapore is conducting engineering and environmental studies into the deployment of floating solar systems to be extended to other reservoirs. "To push boundaries beyond the reservoirs, we are also studying the development of offshore solar panels that can withstand harsher conditions in the sea, such as stronger winds and wave action," NCCS said.

The carbon tax was then announced in February, when the Singapore government said that heavy emitters in the country will be charged S$5 per tonne of greenhouse gas emissions under its carbon tax scheme to be implemented in 2019, reduced from the previously announced range of between S$10 to S$20 to allow companies more time to adjust and initiate energy efficiency projects. Facilities that produce more than 25,000 tonnes of greenhouse gas emissions or more annually, which is equivalent of emissions produced by the annual electricity consumption of 12,500 HDB four-room households, will have to pay the carbon tax.

"With Singapore set to impose a carbon tax of S$5 per tonne of CO_2 emissions on large polluters including power generators, it will be interesting to see how the situation unfolds," said Jindal. "All but one of the generation companies made losses in 2017; and whilst the carbon tax is meant to be passed down to the consumer, generators and their retail arms may look to absorb the costs in order to maintain their market share."

Finance Minister Heng Swee Keat has argued that the carbon tax will push businesses to take measures to reduce carbon emissions, noting that large emitters account for about 80% of Singapore's emissions. The government will provide support to help enhance energy efficiency and reduce emissions and is prepared to spend over the expected S$1b in carbon tax revenue in the first five years to support energy efficiency projects.

Is the tax a burden?

Large emitters have pushed back at the carbon tax, viewing it as an additional burden that would lower their global competitiveness. Some firms have also asked for the carbon tax to be based on emissions performance benchmarks rather than a flat rate, claiming that it will result in a fairer system.

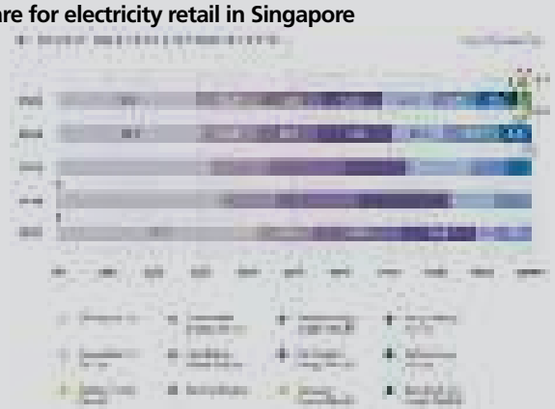
Despite these concerns, Heng has insisted that a credits-based carbon tax system is the "economically efficient way to maintain a transparent, fair and consistent carbon price across the economy to incentivise emissions reduction." The Singapore government said that by 2023, the carbon tax rate will be reviewed and is envisioned to be raised to S$10 and S$15 per tonne by 2030.

"Singapore is trying to contribute and do its part to reduce carbon emissions. It has established the NCCS that has been pushing a number of initiatives, most recently, the proposed carbon price. Singapore's renewable targets are aspirational but there has also been a drive from the government to realise this. Such as HDB deploying solar systems on its rooftops or PUB piloting a floating solar farm in Tengah reservoir," said Chong.

In October 2016, the Singapore government launched the floating Tengah test bed, the world's largest. Then in April, PUB called a tender to conduct engineering studies for the deployment of a 1MWp floating solar PV system at Lower Seletar Reservoir and a 1.5MWp floating solar PV system at Bedok Reservoir. Both systems will help power the national water agency's operations and are estimated to cut down its carbon footprint by about 1.3kt CO_2 annually, similar to removing about 270 cars off the road per year.

The carbon tax will push businesses to take measures to reduce carbon emissions, noting that large emitters account for about 80% of Singapore's emissions.

Market share for electricity retail in Singapore



Source: Energy Market Authority, Singapore