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Responses to Feedback and Suggestions on the Carbon Tax

S/N	Feedback/Suggestion	Response
Carbon Tax Level		
1	France, UK, Denmark and Ireland have a carbon tax that is slightly more than S$35/$tCO_2e$. Finland's, Switzerland's and Sweden's carbon tax is at S$86-93, S$123 and S$187 respectively. While the carbon tax sends the right signal to the market, S$ 10-20/tCO_2e may not be enough to impact business decisions.	The indicative carbon tax range of $$10-$20/$tCO_2e$ seeks to strike a balance between encouraging emissions reduction and maintaining cost competitiveness. The final tax rate to be decided needs to provide a sufficient price signal to incentivise behavioural change and energy efficiency improvement. Carbon prices for the European Union (EU) Emissions Trading Scheme (ETS) ranged between S$ 5.90 and S$12.60 per tCO_2e in 2016 while that in South Korea ranged between S$13.20 and S$23.60 per tCO_2e in 2016. Carbon prices across China's pilot ETS ranged between S$0.70 per tCO_2e to S$14.30 per tCO_2e in 2016.
2	Starting with a much higher tax rate could be disruptive to the market, so a better approach is to gradually increase the tax rate in phases of 5 years.	To minimise disruptions and help companies adapt, the Government will study modes of industry assistance. We also recognise the importance of a stable carbon tax level to provide certainty for businesses. Any future adjustments will take into consideration the effectiveness of the carbon tax in reducing emissions, the need to further incentivise domestic action on energy efficiency, technological improvements, international developments and prevailing economic conditions.

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Implementation Details		
3	The tax can be extended to include other pollutants as well, such as carbon monoxide, nitrogen dioxide, sulphur dioxide, particulate matter and ozone.	The six greenhouse gases that will be covered under carbon tax are those currently covered under the UNFCCC: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). There are already existing standards and targets to minimise other air pollutants.
4	Imposing the carbon tax solely on electrical power generators may cause companies to switch away from electric equipment to use equipment which are powered by fossil fuels (e.g. boilers). The tax should be applied to all activities using fossil fuels.	The tax covers direct emissions from all sources regardless of fuel type. This prevents the distortion of the carbon price signal across fuel types. Although no fuels are exempted, companies are encouraged to switch to fuels with lower emissions.
5	The carbon tax policy should take into account other existing taxes on emissions to ensure that some forms of carbon emission do not end up being taxed more heavily than others.	The carbon tax policy will take into account existing regulations and taxes affecting carbon emissions in Singapore.
6	Green electricity prices are pegged to regulated tariff rates. If regulated tariff rates are raised due to the carbon tax, green electricity prices would increase too. The Government should provide a carbon tax relief for green electricity users as they should not be penalised by the tax for using clean energy.	As renewable energy such as solar, is not affected by the carbon tax, consumers will be further incentivised to adopt solar energy compared to fossil fuels. There are a variety of business models available for consumers to adopt more solar energy. We will work with renewable energy companies to assess how these benefits may be passed on to their customers.

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Measurement, Reporting, and Verification (MRV)		
7	The cost of administering the tax may be quite expensive, reducing its efficiency. If there are material compliance costs, funds should be available to offset them.	The Government will minimise the compliance costs for companies by leveraging on existing systems, such as the Energy Conservation Act (ECA). The ECA requires all energy-intensive companies (which consume more than 54 TJ of energy annually) to measure and report energy use and greenhouse gas emissions annually. We will also consult companies on how best to introduce a verification system that ensures transparency and accountability, whilst minimising compliance cost.
8	The Government and academic/research institutions should develop a Singapore-specific life-cycle analysis database, publishing common information such as energy intensity for waste disposal, water production, and construction of infrastructure.	We will study and assess possible ways to provide companies with information to benchmark themselves against national performance and other companies.
Impact on Businesses		
9	Given that the conventional generation companies still underpin the security of electricity supply in Singapore, financial assistance should be given to power generation companies to provide greater certainty for investment decisions on existing or new assets.	The Government will study modes of assistance similar to that provided in overseas jurisdictions. As the power generation sector does not compete internationally, most overseas jurisdictions do not provide assistance to the power generation sector. They can factor the carbon price into their overall cost of fuel used when they compete to generate and sell electricity in the wholesale electricity market.
10	Low carbon strategies should be identified for small medium enterprises in energy intensive sectors, such as food manufacturing, logistics, and port operations to	For SMEs which are in energy-intensive sectors, we encourage them to embark on energy efficiency practices and adopt low carbon technologies to reduce their energy consumption. SMEs

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	enable them to remain competitive against businesses in the region.	which require financial assistance to do so, may apply for the Energy Efficiency Fund* by the National Environment Agency (NEA). **More information can be found at: www.e2singapore.gov.sg.*
11	Early action by companies to reduce emissions should be recognised or rewarded in the carbon tax policy.	Companies which have reduced their emissions will directly benefit from having done so, as this reduces the amount of tax they have to pay. We encourage these companies to continue with their energy efficiency enhancement efforts.
Impact on Households		
12	As the cost of carbon will be borne by the consumer via electricity tariffs, the Government should demonstrate that the proposed tax is the most cost effective option available.	A carbon tax will enhance Singapore's existing and planned mitigation efforts under our Climate Action Plan, and stimulate clean technology and market innovation. A carbon tax will provide a price signal on GHG emissions to incentivise emitters to factor in the costs of their GHG emissions in their business decisions. It also enhances the effectiveness of other mitigation measures. As one of the more cost effective measures for Singapore, it allows companies to reduce energy consumption where and when it makes the most economic sense. In addition, the revenue collected can be used to support other mitigation measures to reduce emissions.
13	As electricity prices are also affected by other factors such as global oil prices, consumers will not be aware of the impact of the tax and will not be incentivised to	We recognise that communicating the impact of tax is important. We have taken steps to ensure that the implication of the tax is clearly outlined for businesses and households during the

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	reduce energy consumption or adopt energy efficient practices.	announcement made in March 2017. We will continue to ensure that public communications on the carbon tax is clear.
Carbon Tax Revenue		
14	The design and implementation of the schemes to be funded by the tax is an important consideration as these schemes could result in distortionary, inefficient and/or unsustainable outcomes.	We will study the planned initiatives to ensure that the design and objectives are aligned with the carbon tax to achieve sustainable outcomes.
Carbon Trading and Offsets		
15	Under the Kyoto Protocol, the process for companies to get their carbon emissions reduction certified was onerous. This is an area that can be improved.	Internationally, while negotiations are on-going, the intention is also to improve the existing rules and to enhance the process for companies.
16	Linking Singapore's carbon market with international markets will result in an outflow of funds from the economy. This will create a dynamic carbon price that may make emissions mitigation projects in Singapore less bankable and less likely to proceed.	We will study the possibility of linking Singapore's carbon market with the region and the potential implications of doing so. The benefit of a linked carbon pricing system is that emissions reductions take place where they are least costly. However, this needs to be balanced against outflow of funds and reduced incentive to undertake domestic mitigation projects. Jurisdictions that allow the use of international carbon credits usually set a limit on the amount of credits that can be used.
Others		
17	Does the Government expect our competitors to introduce some form of carbon tax in the future?	Under the Paris Agreement, other parties (which includes Singapore's key competitors) have committed to emissions reduction and will need to take action to achieve their respective pledges. We note that carbon pricing approaches are gaining

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		momentum globally. According to the latest World Bank's State and Trends of Carbon Pricing publication in 2016, the share of global emissions covered by carbon pricing initiatives has increased threefold over the past decade. Around 100 countries – accounting for 58% of global GHG emissions – have communicated in their climate pledges that they are planning or considering carbon pricing instruments.
18	There is a need to address the issue of climate change on a regional level and not just within Singapore. Singapore cannot make progress by introducing a carbon price on our own.	Singapore has been an active player in international negotiations under the UN Framework Convention on Climate Change, and were one of the first 55 Parties to ratify the Paris Agreement. For the Paris Agreement to work, we will need all countries to take their commitments seriously. We support a rigorous Measurement, Reporting and Verification (MRV) mechanism that will ensure that all parties are accountable. We also provide technical assistance and human resource capacity building in climate-related areas for developing countries, and are working on climate change issues together with ASEAN countries.
19	Instead of a carbon tax, the Government should establish an electricity Grid Emissions Factor (GEF) target for generators. Companies will pay a carbon tax if their GEF is higher than the targeted GEF and remunerated otherwise.	The benefit of an economy wide and uniform carbon tax is that it can shape energy consumption behaviour upstream and downstream. It will encourage consumers and businesses to reduce energy consumption and adopt energy efficiency practices/technologies. A GEF target can only be applied to the power sector and will not be able to cover other sectors of the economy, which accounts for a significant proportion of Singapore's emissions.

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20	Enhancing energy efficiency can be achieved by mandating minimum energy efficiency standards.	Relying primarily on energy efficiency standards is challenging as different processes and equipment are used in different sectors. Different companies will have different strategies to reduce emissions. The carbon tax will provide companies with the flexibility to implement their own strategies while reducing emissions. This will enable companies to reduce emissions in a more cost efficient manner.

Responses to Feedback and Suggestions on Singapore's Climate Change Strategy

S/N	Suggestion	Response
Enhancing Carbon Efficiency		
Industry Sector		
1	The Government can consider enhancing the collection of data for plant level operations. A lot of plants in Singapore are not monitoring their energy use at a plant level.	Under the Energy Conservation Act, companies which consume more than 54 TJ of energy per year are required to implement structured energy management systems and conduct regular energy efficiency opportunity assessments. Companies are encouraged to conduct energy assessments of their manufacturing facilities to identify and quantify areas for energy savings. Under the Energy Efficiency Fund* by the National Environment Agency, companies may receive up to 50% in funding of the costs of conducting an energy assessment, subject to a cap of $200,000. For commercial buildings, owners may apply for funding from the Building and Construction Authority's Green Mark Incentive Scheme for Existing

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		Buildings** to conduct an energy audit to determine the efficiency of air-conditioning plants. **More information can be found at www.e2singapore.gov.sg/Incentives/Energy_Efficiency_Fund.aspx* ***More information can be found at www.bca.gov.sg/greenmark/gmiseb.html*
2	Companies lack manpower capability to monitor energy use. This could be solved by building up an industry of sustainability consultants/ managers and requiring large companies to hire such roles.	The Singapore Certified Energy Manager (SCEM) programme* is available for engineering professions interested in building a career in energy management. The programme helps participants develop technical skills and competencies needed to manage and track energy use within their organisation. A SCEM training grant is available for participants which covers a portion of the SCEM training cost at the professional level. **More information on the SCEM programme can be found at www.e2singapore.gov.sg/Incentives/Singapore_Certified_Energy_Manager_Training_Grant.aspx*
		Power Sector
3	Expand the Feed-in-Tariffs system to include energy generated by biomass.	Singapore does not have Feed-in-Tariffs. We price energy at market cost, without any subsidy, to reflect resource scarcity and promote judicious usage. Steps have been taken to introduce regulatory enhancements to facilitate the entry of renewable energy when such technologies become commercially viable. The Government also provides support in the form of funding for Research & Development to develop capabilities within the renewables industry.

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4	Open up more reservoirs and sea space to install floating solar projects.	In October 2016, EDB and PUB launched Singapore's first floating solar photovoltaic cell test-bed at Tengeh Reservoir in Tuas, testing 10 different solar PV systems of 100kWp each. The test-bed will be used to study the performance and cost-effectiveness of the various systems, including their impact on water quality and evaporation. EDB and PUB will also explore the potential for larger solar deployment on reservoirs and potentially, on the waters surrounding Singapore, taking into consideration the results of the test-bed.
5	Encourage more R&D into energy storage from off-grid renewable energy sources so as to create a sustainable energy ecosystem.	The Energy Market Authority (EMA) has established a $25 million Energy Storage Programme to develop technologies that will enhance the overall stability and resilience of Singapore's power system. Under the programme, EMA and Singapore Power are running a 6MW test-bed (enough to power 500 four-room HDB flats for a day) to study the deployment of grid-level energy storage technologies in Singapore. The test-bed will evaluate the performance of different storage technologies, establish the standards and guidelines associated with the deployment of an energy storage system, and establish the policy and regulation framework required.
6	Is Singapore planning to invest in carbon capture and storage /utilisation?	In order to assess the potential and steps required to further carbon capture and storage/utilisation (CCS/U) in Singapore, a technology roadmap was developed in 2014. The roadmap found that CCS/U from major stationary sources is a potential technology that could help Singapore to reduce carbon emissions from its power and industry sectors in the longer term. While several technology options are possible for CCS/U, most are nascent and require further R&D.

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		Besides the common challenges of high energy requirements, high cost of carbon utilisation as well as potentially limited international demand for CCU products, Singapore would need to address considerations such as low CO_2 concentration streams, lack of local storage sites and high cost of long distance transport of CO_2. Research work in CCS/U is currently conducted in Singapore in institutes such as the A*STAR Institute of Chemical and Engineering Science and through programmes like the Cambridge Centre for Carbon Reduction in Chemical Technology (C4T), which is funded by the National Research Foundation (NRF). We will continue to monitor developments in CCS/U and explore innovative solutions which can help to reduce emissions in a practical and effective manner. **The CCS/U Roadmap can be found at www.nccs.gov.sg/sites/nccs/files/Roadmap_CCSU_20140729.pdf*
Buildings Sector		
7	Explore and encourage zero/low energy ways to dehumidify, ventilate, and cool buildings.	BCA's Green Mark Scheme includes an assessment of thermal comfort in buildings. All new and existing buildings are required to meet minimum Green Mark standards. In addition, under BCA's Green Buildings Innovation Cluster, grants have been given to support research and development in buildings energy efficiency technologies. The research projects awarded include projects which seek to improve thermal comfort and energy performance of cooling systems.

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8	Construction sites, especially mega-projects like the construction of Changi T5, should use power from the grid instead of on-site fuel generators, and maximise solar power harnessing.	Depending on the location of the construction site, on-site fuel generators may be required. In addition, certain construction machinery have their own internal combustion engines and cannot be connected to the grid. The use of solar power is encouraged where possible.
Transport Sector		
9	There remain many unexplored opportunities to improve energy efficiency in the movement of goods.	In 2015, the Government announced a $20 million pilot project to develop an integrated delivery system for malls. The ongoing pilot aims to consolidate the movement of goods, reduce congestion and enhance efficiency at malls. This will be done by partnering existing malls and logistics companies to improve the process of loading and unloading of goods at malls and streamlining distribution schedules. The trial is expected to continue until next year. In addition, the Government is also assessing the possibility of optimising logistics using off-site consolidation centres. For fleet-based operations, there are ongoing trials to test the viability of electric taxis and buses in Singapore. For light/heavy goods vehicles, the electric mobility roadmap* (produced by NCCS and NRF) found that while there were opportunities for emissions reduction, further intensive analysis would be required before we can consider electrification for all fleet-based operations. Nonetheless, we welcome feedback and suggestions on possible solutions the logistics sector may employ to enhance energy efficiency. **More information on the roadmap can be found here:* www.nccs.gov.sg/sites/nccs/files/Roadmap_E-M_1.pdf

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10	Reduce the usage of lights or light intensity at night.	Lighting is necessary to ensure safety for all road users. LTA had conducted trials on the use of Light Emitting Diodes (LED) for our street lights since 2013, and will now extend this technology to all street lights in Singapore. LED street lights are about 25% more energy efficient than current street lighting. In addition, LED lighting is more reliable and requires less frequent replacement. This helps to conserve energy, and reduce maintenance and manpower costs. LTA will also replace the existing timer-based street lighting system with a Remote Control and Monitoring System (RCMS), which will allow the system to be more responsive to weather changes. This enables LTA to remotely switch street lights on and off in response to varying street lighting needs, and to have a more responsive and efficient maintenance regime as the RCMS features automated fault detection and alert capabilities.
Household Sector		
11	Encourage households to adopt smart technologies such as IOT (Internet of Things) or automation/sensor technologies.	The Government is conducting a trial in Yuhua testing the use of Utilities Management System. The trial has been extended to cover over 3,000 households. The system will can help households monitor energy and water use through a mobile application. It will also send alerts to alert users whenever usage levels are high. This could help households conserve electricity and save money.
12	Households may not wish to purchase more energy efficient appliances as these appliances have high upfront cost. For example, a 5-tick energy saving air-condition system cost an average of $600 more than a 2-tick system. An	A 5-tick air-conditioner model will save households about $270 in electricity bills a year* as compared to a 2-tick model. Assuming a 5-tick air-conditioner costs $600 more, the energy savings would recover the additional cost in just over 2 years. Given that the average lifespan of an air-conditioner is 7 years, the household will

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	average household will need 7 years before the cost of savings is justifiable.	continue to enjoy cost savings of around $1,290 for the remaining lifespan of the 5-tick model. NEA has developed a life cycle cost calculator** for different air-conditioner models, refrigerators, clothes dryers and televisions to help households make well-informed purchasing decisions. **Based on electricity cost of $0.27/kWh of electricity, assuming a multi-split 7.5kW cooling capacity air-conditioner used 8 hours daily.* *** More information on the life cycle cost calculator can be found at www.e2singapore.gov.sg/Life_Cycle_Cost.aspx or in the myENV mobile application.*
Waste and Water Sectors		
13	The Government should encourage all companies to reduce the use of plastic bags and sell products with more sustainable packaging.	NEA encourages the use of reusable bags to reduce waste. While households may use plastic bags to contain their waste, shoppers are encouraged to decline plastic bags that they do not need and use reusable shopping bags as often as possible. NEA welcomes the efforts of retailers and environmental groups who promote reusable bags to reduce plastic-bag waste. For example, NTUC FairPrice offers customers a $0.10 rebate when they bring their own bags, with a minimum spending of $10. For plastic bags which are thrown away, these are incinerated safely at our waste-to-energy plants, to produce electricity. This is in contrast to other countries where waste is directly landfilled. In these countries, plastic bags, which are not biodegradable, may remain in landfills for a long time or find their way into the sea. In June 2017, the National Environment Agency (NEA) announced that all companies would be required to provide information on the

		type and amount of packaging on their products, and their plans to reduce materials used. Products with reduced packaging will carry the Logo for Products with Reduced Packaging label. This will help consumers make informed purchasing choices in an effort to reduce waste.
14	The concept of a circular economy is a good way to reduce carbon emissions.	Some of our existing initiatives include incinerating waste to generate electricity, and purifying treated used water to produce NEWater, a high-grade quality water that is safe to drink. We are also looking into new initiatives. Last year, we launched a two-year onsite food waste recycling pilot at 2 hawker centres in Ang Mo Kio and Tiong Bahru. We also introduced two eco-digesters at Our Tampines Hub to convert food waste into fertiliser and non-potable water. The project has reduced the amount of waste produced by two-thirds and has generated around $40,000 in savings annually.
Harnessing Green Growth Opportunities		
15	What are the opportunities which will arise from the carbon tax?	The carbon tax will create demand for, and drive opportunities in energy efficiency and energy management solutions within the industry, buildings, transport, and power generation sectors, as well as the renewable energy sector. Another opportunity is in the area of carbon markets. Singapore has the potential to develop as a carbon trading hub, leveraging our strong financial sector.
16	Invest in green industries in Singapore and the region.	To support clean tech companies in Singapore, our living laboratories provide a platform for businesses to collaborate with research institutions and government agencies to test-bed low carbon solutions under real world conditions. We also support technology

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		development and commercialisation through various initiatives, such as TechBridge Ventures. Steps are also being taken to encourage green financing in Singapore. MAS has recently introduced a Green Bond Grant Scheme to incentivise the issuance of green bonds in Singapore. Under the scheme, qualifying issuances can offset 100% of expenses attributable to obtaining an external review for green bonds, up to a cap of S$100,000 per issuance. If successful, we may witness the development of a green bond market in Singapore.
17	The public sector could take the lead in generating jobs to support monitoring, reporting and verification of energy use, and sustainability reporting.	The public sector is taking the lead in environmental sustainability through our efforts to monitor our resource use and introduce environmental sustainability measures. We hope that such efforts will encourage companies to adopt sustainable practices and incorporate sustainability solutions into their company's agenda.
Other Feedback and Suggestions		
18	It should be mandatory for the public and private sector to publish sustainability reports.	The Singapore Exchange (SGX) introduced sustainability reporting on a "comply or explain" basis in 2016. This requires Singapore-listed companies to publish a sustainability report at least once a year, including information on environmental, social and governance factors; policies, practices, and performance; targets; sustainability reporting framework; and their board statement. SGX has organised training workshops to help firms meet the new requirement. The Government recently released the Public Sector Sustainability Plan* which outlines the Government's efforts to enhance our environmental sustainability, particularly in the areas of reducing electricity and water consumption, and greening our buildings. Some

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		of our targets include achieving electricity savings of 15% and water savings of 5.1% by 2020 from 2013 baseline consumption levels, and for all our new buildings to attain the BCA Green Mark Platinum award. Updates on our progress to meet our 2020 targets will be provided when available. **The Public Sector Sustainability Plan can be found at: www.mewr.gov.sg/docs/default-source/grab-our-research/Public_Sector_Sustainability_Plan_2017-2020.pdf*
19	Climate change efforts should become one of the key national KPIs, in line with GDP figures.	Singapore's climate change efforts are tracked closely under the Inter-Ministerial Committee on Climate Change, chaired by Deputy Prime Minister Teo Chee Hean. To ensure transparency and accountability, details of our emissions and energy consumption are tracked in annual publications such as the Key Environmental Statistics (KES)* report, and Singapore Energy Statistics (SES)*. In addition, we also publish our Biennial Update Report (BUR)* every two years, which provides information on our emissions and mitigation efforts. **The following reports can be found at:* *- KES: https://www.mewr.gov.sg/docs/default-source/default-document-library/grab-our-research/KES_2016.pdf* *- SES: http://www.nea.gov.sg/docs/default-source/energy-waste/climate-change/second-biennial-update-report-(16-dec-2016).pdfhttps://www.ema.gov.sg/cmsmedia/Publications_and_Statistics/Publications/SES/2016/Singapore%20Energy%20Statistics%202016.pdf* *- BUR: http://www.nea.gov.sg/docs/default-source/energy-waste/climate-change/second-biennial-update-report-(16-dec-2016).pdf*

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20	Promote urban farming (in residential areas) and eating of less meat (especially beef) to reduce our food emissions.	To facilitate vegetable cultivation, HDB, National Parks (NParks) and various Residents' Committees started an initiative, Community in Bloom in the heartlands, to promote greening and strengthen community bonding through gardening. To reduce food waste (from meat, fruits, or vegetables), several outreach campaigns have been launched to encourage individuals to adopt smart food purchase (e.g. choosing the right food portions), storage and preparation. NEA and Agri-food and Veterinary Authority (AVA) have also worked with industry stakeholders to develop a food waste minimisation guide for retail food establishments.
21	It would be useful to quantify and state the emissions intensity "gap" between business-as-usual (BAU) policy settings and the targeted outcomes.	Our target is to reduce emissions intensity by 36% from the 2005 levels. To achieve this target, we have assessed possible options from our technology roadmaps*, independent studies, and through consultations with businesses and the general public. This has helped us to understand what would be required above business-as-usual efforts, as well as the most appropriate policies and schemes to achieve our target. We will continue to review this to take into account advancements in technology and other developments. * *The technology roadmaps can be found at:* *www.nccs.gov.sg/resources/technology-roadmaps*