SINGAPORE

1. GOALS FOR EFFICIENCY IMPROVEMENT

1.1. Overall Energy Efficiency Improvement Goals

In 2009, Singapore pledged to reduce its emissions by 16% below business-as-usual (BAU) by 2020, should a legally binding global agreement be in place. In the meantime, Singapore aims to achieve its unconditional reduction pledge of 7%ï 11% by 2020.

Singapore supports the Paris accord achieved in the COP 21, which sets a target of limiting global warming ñwell belowò 2°C (compared with the Industrial Revolution), while aiming for a more ambitious goal of 1.5°C.

1.2. Sectoral Energy Efficiency Improvement Goals

Singapore does not have sectoral energy efficiency improvement goals.

1.3. Action Plan for Promoting Energy Efficiency

a) Objectives

As a small economy without renewable energy resources, Singapore has identified energy efficiency as a key strategy to mitigate greenhouse gas emissions. It also helps to improve competitiveness, energy security, and environmental sustainability.

To improve its energy efficiency, Singapore has increased its capabilities, raised awareness across the major energy-consuming sectors of its economy, and addressed sector-specific barriers using incentives or regulatory measures.

b) Applicable sectors

The emphasis is on the five most energy-intensive sectors: power generation, industrial, transport, buildings, and households.[1]

c) Outline

Power generation

The liberalization of Singaporeôs energy market since 2000 has promoted competition in the electricity and gas markets by encouraging investments in more efficient power generation. The implementation of a competitive electricity market has enabled greater efficiency to be achieved in the power-generation sector. Singaporeôs overall power-generation efficiency improved from 39% to 44% over the 2001ï 2012 time period.

The industry is increasingly deploying cogeneration and trigeneration technologies as part of its ongoing and future developmental plans.

Industrial

In addition to the regulatory approach, outreach programs, capability-building measures (refer to the relevant sections below), various assistance schemes, and grants have been implemented to drive energy efficiency improvements in the industrial sector. These include the following:

- The Energy Efficiency Improvement Assistance Scheme (EASe): This encourages companies to identify potential energy efficiency opportunities by funding up to 50%, (capped at SGD 200,000) of detailed assessments of buildings and industrial facilities.

[1] Ministry of National Development; Energy Market Authority.

- The Economic Development Board (EDB): This provides an energy efficiency financing program to encourage industrial and manufacturing facilities to adopt energy-efficient activities. Under this program, a third-party financier pays for the cost of energy efficiency projects and the energy savings are shared among the various stakeholders.
- The Grant for Energy Efficient Technologies (GREET): This provides up to 20% co-funding for energy efficiency retrofits (capped at SGD 4 million per project) to encourage industrial facilities to invest in energy-efficient equipment or technologies.
- The Investment Allowance (IA) Scheme: This encourages companies to invest in energy-efficient equipment by allowing an additional 30% of investment allowance to be deducted from the companiesôtaxable income.
- The Design for Efficiency (DfE) Scheme: This provides up to 50% funding (capped at SGD 600,000) to encourage investors in new facilities in Singapore to integrate energy and resource efficiency improvements into development plans early in the design stage.
- The Accelerated Depreciation Allowance Scheme: This allows capital expenditures on qualifying energy-efficient equipment to be written off in one year instead of three.

Transport

Since the transport sector accounts for a substantial and growing share of total energy use and carbon emissions, the government supports energy efficiency through various measures, including: investing in new mass rapid transit (MRT) lines, upgrading existing facilities, central bus planning, bus priority schemes, tightening quality of service standards, and enhancing commuter information. Other measures include the following:

- Managing car ownership and usage by reducing the growth of vehicle numbers through the Vehicle Quota System (VQS), refining the Electronic Road Pricing (ERP) system, improving the Off-Peak Car and Park & Ride schemes, and further developing Intelligent Transport System (ITS) solutions.
- Testing new technologies such as the Diesel Particulate Filter (DPF), diesel-hybrid buses, and electric cars.
- Developing a Green Framework for the Rapid Transit System (RTS). The Green Mark provides a systematic and structured approach in evaluating and rating the environmental performance of the RTS for existing and future lines.
- Carbon Emissions-Based Vehicle Scheme (CEVS). Since 2001, a green vehicle rebate (GVR) was offered to encourage the purchase of such vehicles. From January 1, 2013, the CEVS was adopted to provide a broader outcome-based approach that considers vehiclesôcarbon emissions and fuel efficiency.
- Fuel Economy Labeling Scheme (FELS). Since 2009, passenger and light-goods vehicles that are sold in Singapore have had to show a Fuel Economy Label. With the fuel economy information, buyers can make better-informed decisions on fuel efficiency when purchasing new cars.

Buildings

The Building and Construction Authority (BCA), a statutory board under the Ministry of National Development, spearheads energy efficiency improvements in the building sector. Regulatory requirements, such as the building-enveloping thermal performance standard, have been implemented since 1979 to better ensure efficiency performance in buildings. In recent years, energy-related regulations, such as minimum energy efficiency for cooling equipment and natural ventilation for all residential buildings, have been introduced.

- The Green Mark Scheme is a green building rating system launched by the BCA in 2005 to evaluate a building on the basis of its environmental impact performance. Since 2008, all new and existing buildings with a gross floor area of 2000 m^2 that are undergoing major retrofitting must meet the Green Mark Certified standard.

- The BCA has developed the Green Mark for Office Interior and Restaurants to support these businesses in promoting green initiatives. It has also worked with other agencies, such as the Ministry of Education (MOE), to develop a Green Mark for Existing Schools. In addition, the BCA introduced a Green Mark for Existing Residential Buildings to recognize the efforts by town councils and managing agents.

Table 1. List of Green Mark schemes shaping Singaporeôs building environment

Green Mark Schemes – New Buildings
Residential Buildings
Non-residential Buildings
Landed House
Green Mark Schemes – Existing Buildings
Residential Buildings
Non-residential Buildings
Schools
Green Mark Schemes – Within Buildings
Office interiors
Restaurants
Green Mark Schemes – Beyond Buildings
New parks
Existing parks
Districts
Infrastructures
Rapid Transit System

- The BCA Green Mark Incentive Scheme was launched in 2006 to encourage building developers to achieve higher Green Mark ratings. New and retrofitted buildings with a gross floor area above 5000 m^2, which have achieved ratings of Green Mark Gold and above, will be awarded monetary incentives. Due to the overwhelming response, the SGD 20 million fund was fully committed in 2010. To accelerate energy efficiency in buildings, the BCA introduced a SGD 100 million Green Mark Incentive Scheme for Existing buildings (GMIS-EB) in 2009 to help fund upgrades. A SGD 5 million Green Mark Incentive Scheme (Design Prototype) was launched in 2011 to encourage both private and public developers to go beyond the Green Mark Platinum rating and achieve 10% better energy efficiency than this level.
- A high Green Mark standard will be set as part of the land sales conditions for all new developments in selected strategic growth areas.
- In September 2015, the BCA Green Mark 2015 Scheme was introduced to push the envelope on environmental sustainability. This new Green Mark scheme places greater emphasis on health and wellbeing, smart technologies, and climatically responsive designs.
- The Public Sector Taking the Lead in Environmental Sustainability (PSTLES) initiative requires public sector agencies to implement resource management and environmental sustainability measures, such as energy and water efficiency as well as recycling. Each ministry is required to submit reduction targets and management plans to meet the targets. In addition, new public sector buildings with an air-conditioned area exceeding 5,000m^2 are required to attain the Green Mark Platinum

rating. Existing large and mid-sized public sector buildings must attain the Green Mark Gold rating by 2020.

Households

- According to the Mandatory Energy Labeling Scheme (MELS), under the Energy Conservation Act, registrable household appliances that are sold in Singapore must show the mandatory energy label. The MELS currently covers household refrigerators, air conditioners, clothes dryers, televisions, and lamps.
- The Minimum Energy Performance Standards (MEPS) for household refrigerators and air conditioners were introduced in September 2011. The MEPS were extended to clothes dryers in April 2014 and lamps in July 2015. Under the Energy Conservation Act, all registrable household refrigerators, air conditioners, clothes dryers, and lamps that are sold in Singapore must meet the minimum energy performance standards.
- A new pilot project will enable consumers with e-billing accounts to compare their electricity consumption against the average consumption of their neighbors in order to encourage improved behavior. Users can also compare their electricity consumption in the last six months against the national average and the average of neighbors in similar housing types.

d) Financial resources and budget allocation

- The Sustainable Energy Fund ï SGD 28 million.
- The Green Mark Incentive Scheme for New Buildings ï SGD 20 million.
- The Green Mark Incentive Scheme for Existing Buildings ï SGD 100 million.
- The Grant for Energy Efficient Technologies (GREET) ï SGD 93.25 million.
- The Energy Efficiency Improvement Assistance Scheme (EASe) ï SGD 13.4 million.
- The Green Mark Gross Floor Area Incentive Scheme.
- The Sustainable Construction (SC) Capability Development Fund - SGD 15 million.
- The Green Mark Incentive Scheme for Design Prototype (GMIS-DP) ï SGD 5 million.
- The Building Retrofit Energy Efficiency Financing (BREEF) Scheme.
- The Smart Energy Challenge ï SGD 25 million.

(Note: Other funds in relation to R&D are stated under Section 1.6)

e) Method for monitoring and measuring the effect of the measures

Singaporeôs various energy efficiency measures include different methods to monitor and measure their impact. They are used at the discretion of their implementing government agencies.

1.4. Institutional Structure

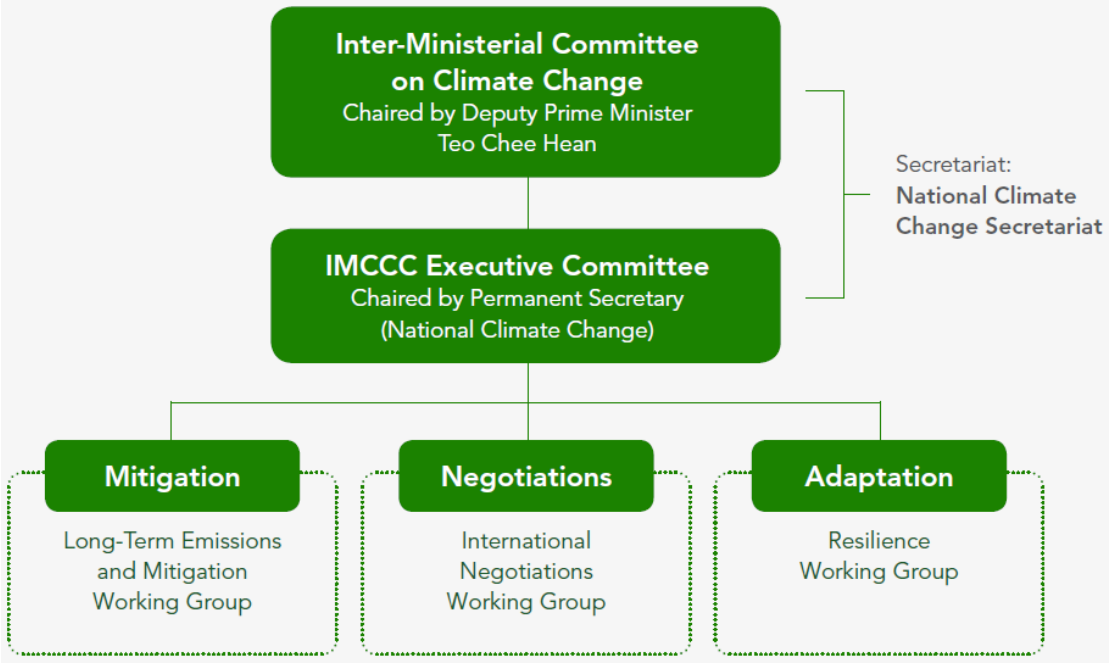
The Inter-Ministerial Committee on Climate Change (IMCCC) was set up to coordinate climate change actions across several ministries and government organizations. The IMCCC is supported by an executive committee, which oversees the work of three groups, namely:

- The International Negotiations Working Group ï in charge of the international climate change negotiations strategy under the UNFCCC.
- The Long-term Emissions and Mitigation Working Group, which studies how Singapore can stabilize its long-term emissions.

- The Resilience Working Group, which studies Singaporeôs vulnerability to the effects of climate change and recommends long-term plans for mitigation and adaptation.

In July 2010, the National Climate Change Secretariat (NCCS) was established under the Prime Ministerôs Office to coordinate Singaporeôs domestic and international policies, plans, and actions on climate change.

Figure 1. Relationship diagram of the IMCCC



Source: Energy Market Authority.

1.5. Outreach and Capacity Building

a) Outreach programs

Awareness is promoted through several programs, including:

- The Home Energy Auditor (HEA) and the Life Cycle Cost Calculator (LCCC), which are mobile applications developed to improve information on high energy-consuming appliances and their lifetime costs.
- The Energy Efficiency National Partnership (EENP) is a voluntary program launched in April 2010 to promote energy efficiency in the industry. It includes:
  a) Encouraging participants to implement an energy management system.
  b) Develop a learning network to provide opportunities to learn and share energy efficiency ideas, technologies, practices, standards, and case studies.
  c) The EENP Awards to recognize companies and individuals who excel in the areas of energy management. The Fifth EENP Awards Ceremony was held on October 6, 2015, in conjunction with the National Energy Efficiency Conference (NEEC).
- The BCA has implemented outreach programs, including: a public online portal; roving green building exhibitions; and new social media (Facebook). The BCA has also partnered with the Green Mark Champion, CDL, to hold the BCA-CDL Green Sparks Competition 2010 in order to stimulate innovation among the youth on retrofitting existing buildings.

- The BCA also implemented the International Green Building Conference (IGBC) 2015, which was held in September 2015.

b) Capacity Building

- The Singapore Certified Energy Manager (SCEM) program offers formal training and certification in the area of energy management. A grant covering approximately 70% of the cost is available to participants.
- As part of the EENP learning network activities (refer to Section 1.5 (a)), the National Energy Efficiency Conference (NEEC) brings together experts and professionals to provide leadership, share the best practices, and discuss case studies. The event is organized by the National Environment Agency (NEA), in partnership with the EDB and the EMA.
- The Energy Services Companies (ESCOs) Accreditation Scheme was introduced to enhance the professionalism and quality of energy services offered. Currently, there are 20 accredited ESCOs operating in Singapore and 27 qualified energy services specialists.
- Green Mark Specialist Certification Programs aimed at equipping professionals with new skills and deepening their professional abilities in environmental sustainability. These include the certification courses for Green Mark Managers (GMM), Green Mark Facilities Managers, and Green Mark Professionals (GMP).
- The BCA introduced a certification course on Measurement & Verification of Central Chilled-Water Plant Efficiency to increase capacity in this area.
- Executive Development and Degree Programs on Sustainable Design and Operations.
- The BCA Academy partnered with the University of Nottingham to implement a Master of Science in Sustainable Building Design program in 2009. The two-year, part-time program is the first of its kind in Singapore, and it focuses on developing cross-disciplinary professional skills as well as analysis and decision-making skills.
- The BCA Academy partnered with the University College London (UCL) to launch the Master of Science Degree in Facility and Environment Management in 2015. This is also a two-year, part-time degree program.
- Apart from postgraduate degrees, the BCA has signed an agreement with UniSIM and Singapore Polytechnic to jointly offer the Bachelor of Science in Facility and Events Management program.

Short but intensive executive development programs are also in place for continual education. One example is the six-day, Carnegie Mellon University-BCA Executive Development Program on Leadership in Environmental Sustainability. To date, approximately 540 executives have been trained through this program.

In addition, since 2010, the BCA Academy has collaborated with the Stuttgart University of Applied Sciences in Germany for the HFT Stuttgart-BCA Executive Development Program on Innovations in Sustainable Design and Technology. This program provides a strategic platform for fostering building professionals in the area of green building design and technology.

1.6. Research and Development in Energy Efficiency and Conservation

In 2007, the Ministry of National Development (MND) Research Fund established a SGD 50 million research fund to support R&D efforts in green building technologies and energy efficiency.

To further harness multi-disciplinary research and development capabilities, Singapore has launched a SGD 1 billion National Innovation Challenge as a major new R&D thrust over the

next five years. The first area for the challenge is Energy Resilience for Sustainable Growth, which aims to develop cost-competitive energy solutions for deployment within 20 years in order to help Singapore improve energy efficiency, reduce carbon emissions, and increase energy options.

As part of the inaugural Smart Energy Challenge (SEC),[2] launched in November 2009, the EMA awarded Singapore-based companies a total of SGD 10 million in order to support the development of new energy technologies and solutions in power generation, energy for transportation, and energy efficiency for the industry.

2. MEASURES FOR ENERGY EFFICIENCY IMPROVEMENTS

2.1. Government Laws, Decrees, and Acts

Energy efficiency is governed through a number of regulatory measures.

2.2. Regulatory Measures

Energy Labeling and Standards:

- The Energy Conservation Act (ECA) sets energy efficiency requirements and energy management practices.
- Mandatory energy labeling for household air conditioners and refrigerators in January 2008; fuel economy labeling for passenger and light-goods vehicles in April 2009; clothes dryers in April 2009; televisions in July 2014; and lamps in July 2015.
- MEPS for household air conditioners and refrigerators in September 2011, and clothes dryers in July 2014.

Vehicles:

- The Vehicle Quota System (VQS) (see Section 1.3 for details).
- The Off-Peak Car scheme.
- Electronic Road Pricing (ERP).
- The Carbon Emissions-Based Vehicle Scheme (CEVS).
- Building a Green Framework for the Rapid Transit System (RTS), which specifically addresses and evaluates energy concerns and sustainable design efforts.

Buildings:

- Building Control (Environmental Sustainability) Regulations 2008.
- Code for Environmental Sustainability of Buildings 2nd Edition.
- BCA Green Mark Scheme ï New Buildings.
- Code on Envelope Thermal Performance for Buildings 2008.
- Mandatory Higher Green Mark Standard for Government Land Sales Sites in Key Strategic Areas.

Industrial:

- Mandatory energy management practices came into effect under the Energy Conservation Act in April 2013.

[2] The SGD 25 million Energy Research Development Fund (ERDF) provides financial support for the implementation of new and innovative energy solutions that are close to deployment and have the potential to provide tangible results.

2.3. Voluntary Measures

Voluntary measures to drive energy efficiency improvements in Singapore include: the EENP program; the BCA Green Mark Scheme; the Green Label Scheme (SEC); the Singapore Carbon Label (SEC); the Green Building Product Certification Scheme (SGBC); the Green Office Label (SEC); the public sector energy audits and others (see Section 1.3 for details).

2.4. Financial Measures Taken by the Government

2.4.1. Tax Scheme

Investment Allowance (IA) Scheme and Accelerated Depreciation Allowance Scheme (see Section 1.3 for details)

2.4.2. Low-Interest Loans

N/A

2.4.3. Subsidies and Budgetary Measures

Subsidies available include the following: the Energy Efficiency Improvement Assistance Scheme (EASe); the Grant for Energy Efficient Technologies (GREET); the Design for Efficiency (DfE) Scheme; the Green Vehicle Rebate; the Innovation for Environmental Sustainability (IES) Fund; and the Green Vehicle Rebate. (Note: The respective information was provided in earlier sections.)

2.5. Energy Pricing

Since Singapore imports most of its energy, energy prices in Singapore are not subsidized and subject to volatility in regional and global energy prices. Fuels are also subject to excise duties and a goods and services tax (GST). Taxes and duties make up approximately 30% of retail fuel prices at the pump.

2.6. Other Efforts for Energy Efficiency Improvements

2.6.1. Cooperation with Non-Governmental Organizations

- Sustainable Energy Association of Singapore (SEAS) and the Institution of Engineers Singapore (IES) for the Singapore Certified Energy Manager Program.
- The NEA for the Renewable Energy and Energy Efficiency Partnership (REEEP).
- Cooperation with the Singapore Green Building Council (SGDC): SGBC-BCA Green Individual Award recognizes the contributions of professionals and individuals who have been leading the green building movement in Singapore.

2.6.2. Cooperation through Bilateral, Regional, and Multilateral Schemes

Singapore actively participates in multilateral forums on energy such as the APEC Energy Working Group, ASEAN, and the East Asia Summit (EAS) Energy Cooperation Task Force (ECTF).

2.6.3. Other Cooperation/Efforts for Energy Efficiency Improvements

Cooperation with the International Energy Agency (IEA), the Asian Development Bank (ADB), and the United Nations Environment Program (UNEP): Sustainable Building and Climate Initiative (SBCI) have been initiated to facilitate the transfer of technologies, policies, and exchange of the best practices in energy efficiency as well as other aspects of sustainable development.

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