

Clean Energy Country Report: Singapore

OVERVIEW

1. Energy plays an indispensable role in Singapore's economy, and is critical to our continued economic growth and development. Currently, some 80% of our Singapore's electricity is generated by natural gas, with the remainder from fuel oil, waste incineration and others. However, the use of energy is also closely linked to environmental concerns over air pollution and greenhouse gas (GHG) emissions.

2. Climate change has emerged as one of the world's biggest environmental challenges. Globally, there are observations of rising sea levels, warmer temperatures and more extreme weather events. As a relatively low-lying, small island state in the tropics, Singapore is not spared from the effects of climate change and its key vulnerabilities include coastal land loss, increased flooding, impact on water resources and the spread of diseases. However, Singapore's our domestic energy demand is small, and accounts for just 0.15 per cent of the world's CO2 emissions.

3. Much of Singapore's energy consumption is used to produce and deliver goods and services to the rest of the world. Its own efforts to mitigate emissions will not have much impact on climate change unless carried out as part of a concerted global effort. Nonetheless, as a responsible citizen of the international community, Singapore will play our part in mitigating climate change, through developing clean energy technologies and solutions and enhancing energy efficiency.

INITIATIVES IN CLEAN ENERGY

4. With Singapore's small land area and relative lack of potential for the alternative energy, there is limited scope for large scale deployment of renewable energy sources such as solar, wind, geothermal and hydro power. As such, Singapore's efforts to develop clean energy have I been focused on Research, Development and Demonstration (RD&D) for clean energy technology.

5. In March 2007, the Research, Innovation and Enterprise Council (RIEC) identified the Clean Energy industry as a key growth industry for Singapore with a total of S\$170 million dedicated by the National Research Foundation (NRF) to grow this sector.

Clean Energy Programme Office (CEPO)

6. The Clean Energy Programme Office (CEPO) was set up administratively in April 2007 under the NRF to implement and coordinate the various research and test-bedding public programmes, leveraging on the strengths of various government agencies for a comprehensive approach to develop the Clean Energy industry. Singapore's efforts to develop clean energy can be divided into 4 key areas

1) R&D and Testbedding

Island Testbeds

7. Two of Singapore's offshore islands, Pulau Semakau and Pulau Ubin have been earmarked as clean energy test sites by National Environment Agency (NEA) and the Energy Market Authority (EMA) respectively. Pulau Semakau is currently in its master-planning stage and the proposal is to test-bed various green solutions on the island. A consultancy is being undertaken on the possible technologies that can be used to fulfill the energy needs of Pulau Ubin's inhabitants. Among the potential energy types tested for the two island testbeds are solar, wind, marine, biomass, biofuel, hydrogen and fuel cells.

a. Pulau Semakau. The NEA is looking into an eco-park on Pulau Semakau to provide a test-bed for renewable and clean energy technologies. It will take up a quarter of the island's area. Created in 1999, Semakau is currently used for the disposal of ash from Singapore's incinerators. Small amounts of solar and wind energy capacity has been installed on the island, but waste-to-energy is one of the key technologies that could be demonstrated on Semakau.

b. Pulau Ubin. Currently, Pulau Ubin does not draw electricity supply from the power grid in mainland Singapore. This is because it is not economical to lay power transmission cables from the mainland to Pulau Ubin due to its modest energy demand. There is also no centralized electricity supply system on the island. Hence, all inhabitants of the island, including small businesses, run their own diesel powered generators to generate electricity. Hence, the project would not only test-bed clean energy technologies in a live environment, it would also benefit consumers in Pulau Ubin with

alternative sources of energy that are clean and potentially cost competitive.

Singapore as Living Laboratory

8. This business growth theme is a Whole-of-Government (WOG) programme launched in 2008, which encourages companies to develop their ideas, prototype, testbed and demonstrate their products and solutions in Singapore. Through collaborations with various user government agencies such as LTA, HDB, PUB and NEA, the aim is to for Singapore to become a “living laboratory” for innovative urban solutions, after which companies can use Singapore as the springboard to export such solutions globally.

Clean Energy Research Programme (CERP)

9. The CERP is a competitive funding programme allows local based entities, including companies, research institutes and even individuals, to submit proposals to bid for research funding for clean energy projects. S\$50 million has been allocated to this scheme. In the inaugural call for proposals, 8 solar-themed projects were selected, and \$10 million was awarded in grants. The second phase of CERP is under way, themed on novel roof-mounted solar-harvesting devices & systems for the tropics.

Market Development Fund (MDF)

10. A S\$5 million Market Development Fund was established under the EMA to facilitate testbedding of non-traditional generation technologies that have significant value in the electricity market and other ideas/technologies that have development potential in the electricity market. This will encourage R&D of such technologies that may otherwise not be pursued due to their current cost, lack of efficiency and economies of scale.

Jalan Bahar Cleantech Park

11. Singapore is developing a Cleantech Park at Jalan Bahar for clean technology R&D, prototyping and light manufacturing. The site is located in the Northwest of Singapore next to the Nanyang Technological University (NTU) to maximise synergies. It will allow test-bedding of products and solutions for the tropics, including ideas that are replicable for global markets. It will also achieve a low resource consumption, low waste, and low emissions footprint through green buildings, renewable

energy and clean technologies. The first building is targeted for completion in 2011. These initiatives will facilitate the commercialisation of promising new technologies that can meet urban energy needs in a sustainable manner.

Clean Energy Research and Testbedding Programme (CERT)

12. This programme provides opportunities for companies to develop applications and solutions and testbed their Clean Energy technologies in Singapore, using government buildings and facilities. \$17 million has been ceded to this programme. Projects include National Parks Board's Gardens by the Bay, PUB's Marina Barrage, Singapore Polytechnic's campus, BCA's Zero-Energy Building and HDB's Eco-Precinct@Punggol.

R&D Centres for Clean Energy

13. CEPO is in the process of establishing Clean Energy R&D Centres. An example is the Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore. Centres such as SERIS will build up Singapore's R&D capabilities and train skilled manpower to support the industry.

Singapore Initiatives in New Energy Technologies (SINERGY)

14. With an initial grant of S\$38.5 million, the Agency for Science, Technology and Research (A*STAR) has set up a national R&D and testbedding centre for evaluation of sustainable energy solutions (Singapore Initiatives in New Energy Technologies, SINERGY). The Centre will enable researchers and companies to testbed the infrastructure that will allow potential adoption of alternative energy solution systems.

2) Industry Manpower and Capability Development

Clean Energy Scholarships

15. S\$25 million has been invested in local and overseas scholarships to groom talent. The prestigious Clean Energy Scholarships will train the next generation leaders for Clean Energy research in Singapore, as well as to support the growth of the industry. The scholarships range from elective courses in polytechnics, through to specialist undergraduate and postgraduate/ research oriented courses. Over the next five years, the

scholarships aim to sponsor more than 100 students to take up postgraduate degrees relevant to the clean energy sector.

Solar Capability Scheme (SCS)

16. This S\$20 million incentive programme was launched in May 2008 and seeks to encourage innovative design and integration of solar panels into buildings. SCS aims to build up the capabilities of designers, architects and system integrators in solar energy companies through increased implementation by lead users in Singapore.

3) Financing

Quickstart

17. Quickstart is a repayable grant programme that seeks to nurture Singapore-based cleantech startups under the guidance of approved incubators. The aim is to ensure that there is a conducive local landscape in which startup companies can thrive and become global players in the cleantech industry;

Energy Research Development Fund (ERDF)

18. This \$25 million fund, to be spent over the next 5 years, will provide financial support and is aimed at developing capabilities and knowledge, including the creation of suitable market mechanisms and infrastructure to enable the implementation of new energy solutions. The ERDF will fund projects on a smaller scale initially, to pave the way for larger scale adoption once the energy solutions have proven feasible. For instance, the ERDF could potentially fund work on developing and optimising infrastructure to support the operation of electric vehicles, a new technology source that could fundamentally change how Singaporeans commute in the near future.

4) Facilitation of Installation

Solar Handbooks

19. EMA and Building Construction Authority (BCA) have published handbooks on the basics of solar PV systems. This is aimed at educating the general public on safety issues, grid connection and regulatory requirements.

INITIATIVES IN ENERGY EFFICIENCY

Energy Efficiency Programme Office (E2PO)

20. Apart from the development of clean energy, a second key pillar for Singapore's response to the challenge of sustainable development is energy efficiency. A mutli-agency committee, the Energy Efficiency Programme Office (E2PO) was established to drive energy efficiency in Singapore. Some of the key initiatives under the E2PO to encourage energy efficiency are:

- a. Energy Efficiency Improvement Assistance Scheme (EASe). This is a co-funding scheme that encourages companies in the building and manufacturing sectors to carried out detailed assessments on their energy consumption and identify areas of improvement. The government would co-fund up to 50% of the costs of the assessment.
- b. Grant for Energy Efficient Technologies (GREET). This scheme encourages industrial facilities to invest in energy efficient equipment and technologies by co-funding up to 50%, capped at \$2 million, of the qualifying costs per project.

Energy Conservation Act

21. In addition, the Government is introducing minimum energy management standards for large energy users in the industry sector from FY2013. This includes i)the appointment of energy managers, ii) reporting of energy use and iii) submission of energy efficiency improvement plans for large energy users. Energy Efficiency-related legislation across various sectors will be consolidated in an Energy Conservation Act that will be introduced in FY2013.

22. The Energy Conservation Act aims to be to help Singapore achieve the target of a 35% improvement in energy intensity by 2030, from 2005 levels and to ensure co-ordinated approach to standards setting for energy efficiency across all sectors. Under the Act, the proposed mandatory energy management practices will affect companies that consume more than 15 GWh of energy annually, or 1.29 ktoe of energy

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