

## SINGAPORE



### Country at a glance

- Population: 5.09 million (2010) [1]
- Total area: 697 sq. km [2]
- Carbon emissions per capita: 12.37 metric tons (2010) [3]
- Energy consumption per capita: 74.9 MWh (2010) [4]
- Percentage of global carbon emissions: 0.21% (2010) [3]



### Power Plant Conversion to Gas-fired Combined Cycle Technology in Singapore

Singapore's largest power generation company, Senoko Energy, inaugurated its Stage 2 repowering project in February 2013. The project involved converting three oil-fired 250 MW steam plants into two technologically advanced and environmentally-friendly gas-fired combined cycle plants (CCPs) to produce 862 MW. The S\$ 1 billion investment will result in an estimated reduction in CO<sub>2</sub> emissions of up to 1 million tons per year.

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**Table 1 Breakdown of energy use, electricity and heat generation, 2010**

	Primary energy sourced within country		Energy imports minus exports	Primary energy used within the country <sup>(a)</sup>		Electricity Generation <sup>(b)</sup>		Heat Generation <sup>(c)</sup>	
	unit	ktoe		%	ktoe	GWh	%	GWh	%
Coal, including brown coal & peat		0	0	7	86	0	0	0	0
Oil fuels		0	0	70,562	292,666	77	8,490	0	0
Natural gas		0	0	7,198	83,712	22	35,705	19	0
Nuclear		0	0	0	0	0	0	0	0
Hydroelectric		0	0	0	0	0	0	0	0
Biofuels and waste		404	100	0	4,695	1	1,174	3	0
Solar photovoltaics		0	0	0	0	0	0	0	0
Solar thermal		0	0	0	0	0	0	0	0
Tide, wave and ocean		0	0	0	0	0	0	0	0
Wind		0	0	0	0	0	0	0	0
Geothermal		0	0	0	0	0	0	0	0
Electricity (imported)		0	0	0	0	0	0	0	0
Sub total Renewables		404	100	0	4,695	1	1,174	3	0
<b>Totals</b>		<b>404</b>	<b>100</b>	<b>77,767</b>	<b>381,159</b>	<b>100</b>	<b>45,369</b>	<b>100</b>	<b>0</b>

Source: Based on World Energy Statistics and Balances Database 2012, "World Energy Balances." © OECD/IEA, 2012.

Notes:

Standard conversion used is 1 ktoe = 11.63 GWh

(a) Sum of energy sourced within country, energy imports minus exports, international marine and aviation bunkers and stock change flows.

(b) Includes all electricity generation, including any exported.

(c) Does not include electrical heating. Includes waste heat recovery from electricity generation plants.

**Table 2 Breakdown of transport fuel use, 2010**

	Total transport mix	%	Domestic aviation	Road	Rail	Pipeline transport	Domestic navigation	Non-specified (transport)
Oil products	2,665	94	0	2,665	0	0	0	0
Natural gas	13	0	0	0	0	0	0	13
Electricity	151	5	0	0	151	0	0	0
Sub total	0	0	0	0	0	0	0	0
Renewables								
<b>Total</b>	<b>2,829</b>	<b>100</b>	<b>0</b>	<b>2,665</b>	<b>151</b>	<b>0</b>	<b>0</b>	<b>13</b>

Source: Based on World Energy Statistics and Balances Database 2012, "World Energy Balances." © OECD/IEA, 2012.

## Stand on climate change

Singapore signed the UNFCCC on 29 May 1997 and later ratified it on 27 August that same year. Singapore signed the Kyoto Protocol on 12 April 2006 and ratified it on 11 July 2006.

The Singapore government set relatively ambitious energy and carbon targets, including a 35% improvement in energy intensity from 2005 levels by 2030, and a 25 percent improvement of carbon intensity from 1990 levels by 2012.

Prior to the 2009 Copenhagen Climate Change Conference, Singapore pledged to reduce its emissions by 16 percent from the 2020 business-as-usual (BAU) level, contingent on a legally binding global agreement in which all countries implemented their commitments in good faith. Although a legally binding agreement has yet to be reached, Singapore has nonetheless started to implement mitigation and energy efficiency measures which should reduce emissions unconditionally by 7 to 11 percent from the 2020 BAU level.

## National climate change programmes

In 2001, fuel oil was the dominant source for generation of electricity in Singapore but the share of natural gas increased rapidly from 28 percent in 2001 to 81 percent in 2009. Electricity generated by diesel, syngas and refuse incineration remain at around 4 percent[5].

The National Climate Change Secretariat (NCCS) became a dedicated unit in July 2010 under the Prime Minister's Office to provide coordination at the highest level for Singapore's domestic and international policies, plans and actions on climate change. The NCCS also supports the work of the Inter-Ministerial Committee on Climate Change. The National Climate Change Strategy was released in June 2012, detailing Singapore's efforts to become a climate resilient global city[6]. Singapore also implemented an Energy Conservation Act in 2013 which mandates large energy users (> 12GW annual consumption) to develop energy efficiency improvement plans.

Residential Sector:

- Minimum Energy Performance Standards (MEPS) for household air-conditioners and refrigerators in 2013 and onwards will extend to lighting and other appliances in 2014

Building Sector:

- Green Mark Certification
  - For all new buildings
  - For existing buildings when retrofitted from 2013 onwards
- Audit of building cooking systems every three years in new and existing buildings that have undergone retrofitting from 2013 onwards
- Submit energy consumption and energy-related building data under the Energy Conservation Act (2013)

#### Industrial Sector:

- **Help companies identify commercially viable energy efficiency improvements and help defray** upfront costs through co-funding
  - Design for Efficiency Scheme (DfE)
  - Energy Efficiency Improvement Assistance Scheme (EASe) co-funds cost of engaging accredited energy services companies (ESCOs) to conduct energy audits and identify energy efficiency improvement measures
  - Grant for Energy Efficient Technologies (GREET) provides tax incentives for energy efficiency investments and provides up to 50 % of project cost, with a cap at S\$2 million.
  - Investment Allowance (IA)
  - Energy Performance Contracting (EPC) model, in which a third party bears the upfront cost of energy efficiency investments and shares the expected energy savings over time with the consumer (businesses or households)
- Extend Grant for Energy Efficient Technologies (GREET) scheme beyond 2012
- Develop and support energy efficiency by financing pilot schemes
- Encourage new co-generation plants in energy intensive sectors
- Grow technical and professional capabilities for carrying out energy efficiency improvements
  - ESCO Accreditation Scheme
  - Singapore Certified Energy Manager (SCEM) Programme

#### Transport Sector:

- Achieve 70:30 modal split between public and private transport [7].
- Implement Carbon Emissions-based Vehicle (CEV) Scheme to encourage purchase of low carbon emission cars from 2013

#### Waste and Water:

- Incineration
  - Waste water sludge dehydration and incineration by Sumitomo Mitsui Banking Corporation and ECO-Special Waste Management (ECO-SWM) that will result in a 129,000 CO<sub>2</sub>t-eq reduction
- Water Efficiency
  - Reduce total domestic water consumption from 156 litres per capita per day in 2008 to 140 litres per capita per day by 2030
- Desalination
  - By 2060, Public Utilities Board (PUB) aims to expand Singapore's desalination capacity by almost 10 times to meet 30% of the long-term water needs
  - Improve energy efficiency of the desalination process
- Recycling
  - Improve recycling rate from 56 percent in 2008 to 70 percent

#### Energy Sector:

- Power Generation
  - Continue fuel mix switch from fuel oil to natural gas
  - Build liquefied natural gas (LNG) terminal and import LNG from global gas markets
- Energy Grants to support up and downstream commercially relevant R&D
  - Clean Energy Research Programme (S\$50 million)
  - Energy Market Authority (EMA) Market Development Fund (S\$5 million)
- Solar test-bedding and research
  - Economic Development Board (EDB) Solar Capability Scheme (SCS) (S\$20 million)
  - Economic Development Board (EDB) Clean Energy Research Test-Bedding (CERT) (S\$17 million)
  - Housing & Development Board (HDB) conducting solar test beds in 30 HDB precincts over a five-year period
  - Solar leasing model tested in Punggol

## Ministries involved in climate change/energy policy making:

Ministries involved	Web links
Ministry of Environment and Water Resources	<a href="http://mewr.gov.sg">mewr.gov.sg</a>
Ministry of Finance	<a href="http://mof.gov.sg">mof.gov.sg</a>
Ministry of Foreign Affairs	<a href="http://mfa.gov.sg">mfa.gov.sg</a>
Ministry of Trade and Industry	<a href="http://mti.gov.sg">mti.gov.sg</a>
Ministry of Transport	<a href="http://www.mot.gov.sg">www.mot.gov.sg</a>
Ministry of Home Affairs	<a href="http://www.mha.gov.sg">www.mha.gov.sg</a>
Ministry of Law	<a href="http://www.mlaw.gov.sg">www.mlaw.gov.sg</a>
Ministry of Manpower	<a href="http://www.mom.gov.sg">www.mom.gov.sg</a>
Ministry of National Development	<a href="http://www.mnd.gov.sg">www.mnd.gov.sg</a>
Energy Market Authority	<a href="http://www.ema.gov.sg">www.ema.gov.sg</a>
National Environment Agency	<a href="http://www.nea.gov.sg">www.nea.gov.sg</a>
National Climate Change Secretariat	<a href="http://www.nccs.gov.sg">www.nccs.gov.sg</a>
Urban Redevelopment Authority	<a href="http://www.ura.gov.sg">www.ura.gov.sg</a>

## Education institutes involved in climate change/energy policy making:

Education Institutes involved	Web links
Energy Studies Institute	<a href="http://www.esi.nus.edu.sg">www.esi.nus.edu.sg</a>
National University of Singapore	<a href="http://www.nus.edu.sg">www.nus.edu.sg</a>
Solar Research Institute of Singapore	<a href="http://www.seris.nus.edu.sg">www.seris.nus.edu.sg</a>
Energy Research Institute @ NTU	<a href="http://erian.ntu.edu.sg/">erian.ntu.edu.sg/</a>

## References

- [1] "World Population Prospects: The 2010 Revision." Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.
- [2] "CIA - The World Factbook." Available: <https://www.cia.gov/library/publications/the-world-factbook/geos/fr.html>. [Accessed: 28-Mar-2013].
- [3] CO<sub>2</sub> Emissions from Fuel Combustion Statistics database 2012, "Indicators for CO<sub>2</sub> emissions." © OECD/IEA, 2012.
- [4] World Energy Statistics and Balances database 2012, "World Energy Balances." © OECD/IEA, 2012.
- [5] "Statement of Opportunities 2010." Energy Market Authority, 2010.
- [6] "National Climate Change Strategy." National Climate Change Secretariat, 2012.
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