

Singapore

Policy & Measures towards Carbon Neutrality

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Agenda

- National Circumstances (Overview)
- Singapore Green Plan 2030
- Mitigation Efforts

National Circumstances



National Circumstances (Overview)

1. Alternative energy disadvantaged:

- Limited land area, relatively flat land, low wind speeds and lack of high-quality hydrothermal resources present challenges in pursuing alternative energy options.
- Current nuclear fission technologies are not suitable for deployment due to small land area and one of the highest population densities globally (7,485 persons per km²).
- Limited scope for solar photovoltaics (PV) deployment and for Singapore's forests to be a significant carbon sink.

(Such circumstances are recognized *under Article 4, paragraph 10 of the Convention*, which recognizes the circumstances of countries with “serious difficulties in switching to alternatives”.)

2. Open economy and dependent on the global supply chain for food and energy:

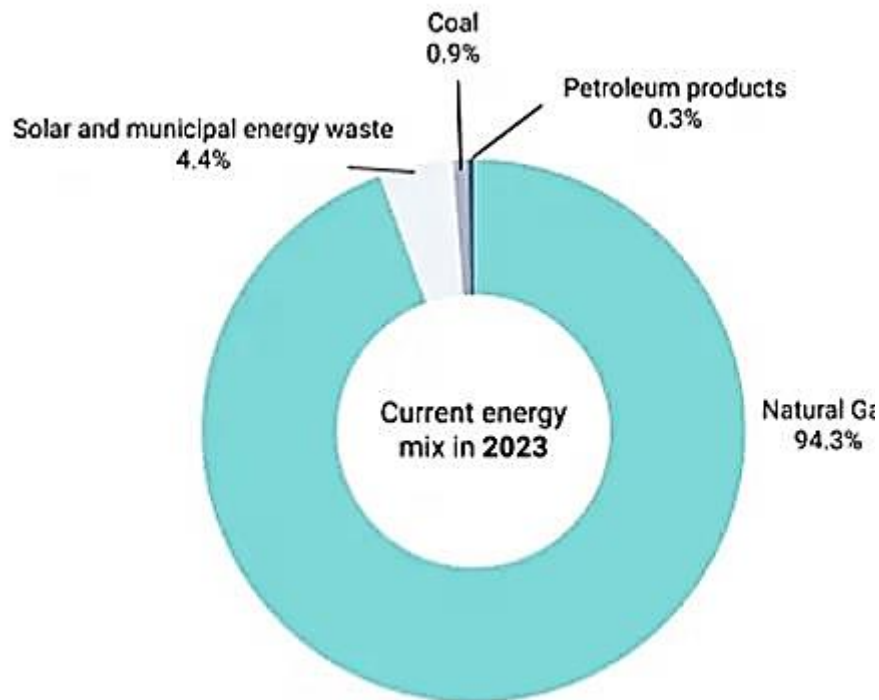
- Economic activity and emissions are highly sensitive to the volatility of regional and global developments as well as escalating climate impacts.

3. Dependent on effective international cooperation and early maturity of decarbonization technologies

- Collaboration with other countries, such as on clean energy technologies, regional power grids, clean energy trade, and carbon storage opportunities

Singapore Emissions Profile

- Major Primary Emissions: **Power (39.2%) and Industry (44.4%)**

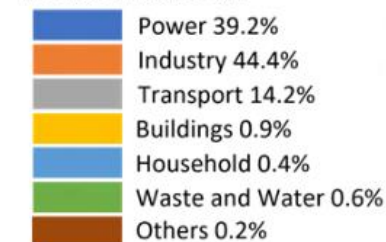


Fuel mix for Power Generation

Emissions Profile (2021)

Emissions: 53.7 MtCO₂e

PRIMARY EMISSIONS



SECONDARY EMISSIONS



The emissions profile above excludes estimated hydrofluorocarbons (HFCs) emissions of around 4.0 MtCO₂e from the Refrigeration and Air-conditioning (RAC) sector in 2021. When more robust estimates are established, the national emissions profile will be updated in accordance with the United Nations Framework Convention on Climate Change (UNFCCC) and Intergovernmental Panel on Climate Change (IPCC) guidelines on continual improvement of national GHG inventories.

Singapore's Climate Targets

On 25 October 2022, Singapore announced that it would raise its national climate target to achieve net zero emissions by 2050. It will also reduce emissions to around 60 MtCO₂e in 2030 after peaking emissions earlier.

Despite the challenging geographical constraints faced, Singapore will continue to find innovative ways to accelerate the low-carbon transition for industry, economy and society through **four key thrusts** which are supported by a **carbon tax**, as a **key enabler** of this transition.

- Catalysing business transformation
- Investing in low-carbon technologies
- Pursuing effective international cooperation
- Adopting low-carbon practices.



Singapore Green Plan 2030



Singapore Green Plan 2030

- Launched in February 2021, the Singapore Green Plan 2030 seeks to galvanize a whole-of-nation movement and advance Singapore's national agenda on sustainable development.
- The Green Plan charts ambitious and concrete targets over the next 10 years, strengthening Singapore's commitments under the UN's 2030 Sustainable Development Agenda and Paris Agreement, and positioning us to achieve our long-term net zero emissions aspiration by 2050.

A Whole-of-Nation Sustainability Movement

The Green Plan is a multi-agency effort spearheaded by five ministries:

- Ministry of Education
- Ministry of National Development
- Ministry of Sustainability and the Environment
- Ministry of Trade and Industry
- Ministry of Transport



Ministry of Sustainability
and the Environment
— SINGAPORE —



MINISTRY OF
TRANSPORT
CONNECTING SINGAPORE



5 Pillars of Singapore Green Plan 2030



City in Nature

Create a green, liveable, and sustainable home for Singaporeans, and build up our carbon sinks by extending nature throughout our island



Sustainable Living

Make reducing carbon emissions, keeping our environment clean, and saving resources and energy a way of life in Singapore



Energy Reset

Use cleaner energy and increase our energy efficiency to lower our carbon footprint



Green Economy

Seek green growth to create new jobs, transform our industries and harness sustainability as a competitive advantage



Resilient Future

Build up Singapore's climate defences and resilience, and enhance our food security



**Green Government and Green Citizenry
as Key Enablers**



Singapore Green Plan 2030: Energy Reset

<Green Energy>

- ✓ 2025 targets:
 - ❖ 1.5 gigawatt-peak (GWp) of solar energy deployment to meet around 2% of 2025 projected electricity demands and generate enough electricity to meet the annual electricity needs of around 260,000 households – **on track, 1.17 GWp deployed**
 - ❖ Deploy 200 megawatt-hour of Energy Storage Systems to enhance grid resilience and support clean energy transitions – **completed in Feb 2023**
- ✓ 2030 targets:
 - ❖ Increase solar energy deployment to at least 2 GWp, to meet around 3% of 2030 projected electricity demand and generate enough electricity to meet the annual electricity needs of around 350,000 households
 - ❖ Best-in-class power generation technology that meets emission standards and reduces carbon emissions

<Greener Infrastructure and Buildings>

- ✓ 2025 targets:
 - ❖ Reduce energy consumption of desalination process from current 3.5kWh/m³ to 2kWh/m³ – **RFP in progress**
 - ❖ Singapore's first integrated waste and used water treatment facility to be 100% energy self-sufficient (*Tuas Nexus*) – **progressively completed from 2026**
- ✓ 2030 targets:
 - ❖ Green 80% of Singapore's buildings (by Gross Floor Area) by 2030
 - ❖ 80% of new buildings (by Gross Floor Area) to be Super Low Energy buildings from 2030
 - ❖ Best-in-class green buildings to see an 80% improvement in energy efficiency (over 2005 levels) by 2030
 - ❖ Long-term target: Reduce desalination energy further to 1kWh/m³

<Sustainable Maritime>

- ✓ 2030 targets:
 - ❖ All new harbor craft operating in port waters to be fully electric, be capable of using B100 biofuels, or be compatible with net zero fuels from 2030

Singapore Green Plan 2030: Energy Reset

<Sustainable Towns and Districts>

- ✓ 2030 targets:
 - ❖ Reduce energy consumption in existing HDB towns by 15% (from 2020 levels)

<Cleaner-energy Vehicles>

- ✓ 2025 targets:
 - ❖ New registrations of diesel cars and taxis to cease from 2025
 - ❖ All HDB towns to be Electric Vehicle (EV) ready with chargers at all HDB carparks by 2025
- ✓ 2030 targets:
 - ❖ All new car and taxi registrations to be of cleaner-energy models from 2030
 - ❖ Deploy 60,000 EV charging points nationwide by 2030
- ✓ 2040 targets:
 - ❖ All vehicles to run on cleaner energy by 2040

<Sustainable Aviation>

- ✓ 2025 targets:
 - ❖ All new airside light vehicles, forklifts and tractors at Changi Airport to be electric from 2025
- ✓ 2040 targets:
 - ❖ All airside vehicles at Changi Airport to run on cleaner energy by 2040

Mitigation Efforts

The background of the slide is a solid light green. In the bottom-left corner, there are decorative curved shapes: a large dark green shape and a smaller, lighter green shape, both curving upwards and to the right.

Mitigation Efforts: Power

[Power generation]:

- ✓ One of the major sources of Singapore's carbon emissions and accounts for about 40% of emissions today.
- ✓ Switching from fuel oil to natural gas for power generation – produces the least amount of carbon emissions per unit of electricity. In 2021, about 95% of its electricity was generated from natural gas, compared to 18% in 2000.

[Solar]

- ✓ Initiatives such as the SolarNova programme, JTC's SolarLand and SolarRoof programme and PUB's floating solar systems.
- ✓ Longer-term strategies for maximizing solar power and invest in R&D and test-bedding to increase efficiency and optimize space utilization, including through the deployment of *floating solar farms* and *vertical panel installations*.

[Regional Power Grids]:

- ✓ To import a capacity of **6** GW of low-carbon electricity by 2035, which is expected to make up around **33%** of Singapore's total projected supply.
 - ❖ As a pathfinder to ASEAN Power grid, Singapore has begun importing up to 100 MW of renewable hydropower from the Lao People's Democratic Republic (PDR) since June 2022, using existing interconnections via Thailand and Malaysia, as part of the *Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP)*.
 - ❖ To further develop and refine our technical and regulatory frameworks for large-scale electricity imports, Singapore has also announced two small-scale trial imports of electricity: *100 MW from Peninsular Malaysia and 100 MW from a solar farm in Pulau Bulan, Indonesia*.

Mitigation Efforts: Low-Carbon Alternatives

[Emerging Low-Carbon Alternatives]:

- ✓ Under the Low-Carbon Energy Research (LCER) Funding Initiative, S\$55 million has been awarded to support 12 research, development and demonstration projects on low-carbon hydrogen and CCUS, with another S\$129 million set aside for the next phase of the programme.

❖ [Low-Carbon Hydrogen]:

Although many low-carbon hydrogen technologies and supply chains are still nascent, Singapore is taking steps to prepare for hydrogen deployment. Our *National Hydrogen Strategy* is organised around five key thrusts:

- Experimenting with the use of advanced hydrogen technologies at the cusp of commercial readiness through pathfinder projects;
- Investing in research and development (R&D) to unlock key technological bottlenecks;
- Pursuing international collaboration to enable supply chains for low-carbon hydrogen;
- Undertaking long-term land and infrastructure planning; and
- Supporting workforce training and development of our broader hydrogen economy, so that Singaporeans will be ready to capture new opportunities in the global hydrogen economy.

Mitigation Efforts: Low-Carbon Alternatives

❖ [Carbon Capture, Utilization and Storage (CCUS)]:

- Singapore is exploring possible CCUS deployment pathways, e.g., Carbon dioxide captured could be sequestered in suitable sub-surface geological formations, utilized as feedstock for synthetic fuels or as building materials through mineralization.
- Singapore will continue to monitor technological and market developments and scale up deployment as pathways become technoeconomically viable.
- For Jurong Island, the aim is to realize at least 2 MtCO_{2e} of carbon capture potential per annum by 2030 and achieve more than 6 MtCO_{2e} of carbon abatement per annum by 2050.
- In Dec 2023, S-Hub and EDB signed a MOU to coordinate the planning and development of a CCS project, capable of capturing and permanently storing at least 2.5 million tons of CO₂ a year, by 2030.
- In Feb 2024, Singapore signed a letter of intent (LOI) with Indonesia on cross-border collaboration on CCUS following a new Indonesian law to allow it. The countries will form a working group to seek a legally binding bilateral agreement on the cross-border transport and storage of CO₂ between the neighbouring countries.

❖ [Biofuel]:

- Singapore is studying the potential for wider adoption of biofuels and sustainable bioresources in carbon-intensive sectors such as electricity generation, transport and heavy industry.
- More than 70,000 tonnes of biofuels have been supplied to ocean-going vessels as at end-2022, and Singapore Airlines is using blended sustainable aviation fuel – made from used cooking oil and animal fats – for all its flights.
- Flights departing from Singapore will be required to use sustainable aviation fuel (SAF) from 2026. The goal will then be raised to between 3 and 5% by 2030, subject to global developments and the wider availability and adoption of SAF.

Transforming the Energy & Chemicals Sector

- ✓ The Sustainable Jurong Island report details plans to transform Jurong Island into a Sustainable Energy & Chemicals (E&C) Park that operates sustainably and exports sustainable chemicals globally.
- ✓ By 2030, Singapore aims to increase output of sustainable products by 1.5 times from 2019 levels and realize at least 2 MtCO_{2e} of carbon capture potential.
- ✓ By 2050, we aspire to increase the output of sustainable products by four times from 2019 levels and achieve more than 6 MtCO_{2e} of carbon abatement per annum from low-carbon solutions.

□ To support the industry in its efforts to transform Jurong Island, the Government is putting in place infrastructure and support measures:

- ✓ Incorporating sustainability into the planning of greenfield sites and investments;
- ✓ Building specialized or shared infrastructure;
- ✓ Conceptualizing the CCU Translational Testbed to accelerate the development of CCU technologies in Singapore;
- ✓ Introducing incentives to support the adoption of decarbonization measures; and
- ✓ Supporting R&D in low-carbon solutions

Regulations: Energy Conservation Act

❑ Energy Conservation Act (ECA) & Energy Conservation (Energy Management Practices)

Regulations:

- ✓ Appointing a certified energy manager;
- ✓ Monitoring and reporting energy use and greenhouse gas emissions annually;
- ✓ Submitting energy efficiency improvement plans annually;
- ✓ Strengthening measurement and reporting requirements for greenhouse gas emissions;
- ✓ Requiring companies to implement energy management systems, undertake regular energy efficiency opportunity assessments or implement energy performance monitoring;
- ✓ Introducing minimum energy efficiency standards for common energy consuming industrial equipment and systems; and
- ✓ Requiring companies which are building new energy-intensive facilities to review the facility design of such new ventures for energy efficiency opportunities, and to monitor and report their energy use and performance indicators based on measured data

Regulations: Carbon Pricing Act

❑ Carbon Pricing Act (CPA):

- ✓ Provides an effective policy to motivate emitters to take action to reduce their emissions;
- ✓ Supported by a robust measurement, reporting and verification (MRV) framework;
- ✓ Applicable to all industrial facilities with an annual direct GHG emissions of 25,000 tonne of carbon dioxide equivalent (tCO₂e);
- ✓ Proposed carbon price was set after careful balancing of the environmental, economic and social needs of our Singapore
- ✓ The initial carbon tax rate was set at \$5 per tonne for 2019 to 2023, to provide a transition period for businesses to adjust. The carbon tax rates will be raised to:
 - \$25 per tonne in 2024 and 2025
 - \$45 per tonne in 2026 and 2027
 - with a view of reaching \$50 to \$80 per tonne by 2030
- ✓ The carbon tax revenue collected are used to support decarbonisation efforts, the transition to a green economy, and to cushion the impact on businesses and households.
- ❖ International carbon credits
 - From 2024, taxable facilities will be allowed to use high quality international carbon credits (ICC) to offset up to 5% of their taxable emissions. **Eligible ICCs used under the carbon tax regime will need to comply with rules under Article 6 of the Paris Agreement, and meet seven principles to demonstrate high environmental integrity.**
 - **Currently, Singapore has signed MOU's with 16 countries*. It has signed IAs with Ghana and Papua New Guinea.**

* Chile, Colombia, Costa Rica, Dominican Republic, Peru, Bhutan, Cambodia, Fiji, Lao PDR, Mongolia, Sri Lanka, Vietnam, Kenya, Morocco, Rwanda and Senegal

Mitigation Efforts: Financial Support

- To support businesses in their decarbonization journeys, Singapore Government has introduced a suite of measures to help companies improve energy efficiency, reduce emissions, and seize opportunities in the green economy:
- ❑ **Energy Efficiency Measures**: Provide the economic benefits of lowering energy costs to individuals and businesses while reducing carbon emissions.
 - ✓ The **Energy Efficiency Grant**, **Resource Efficiency Grant for Emissions** and the **Investment Allowance for Emissions Reduction** support businesses in improving the energy efficiency and other forms of emissions reduction (such as reduction in non-CO₂ greenhouse gas emissions and flare gas recovery) in their industrial facilities.
 - ✓ Support local enterprises, particularly Small and Medium Enterprises (SMEs), in building long-term capabilities in sustainability and capturing green growth opportunities through the **Enterprise Sustainability Programme**.
 - ✓ **Transition Framework**: From 2024, a transition framework introduced to provide support for existing emissions-intensive trade-exposed (EITE) companies as they work to reduce emissions and invest in cleaner technologies, while managing near-term impact on business competitiveness. It will also help to mitigate the risk of carbon leakage. The amount of allowances awarded to each facility is determined based on its performance on internationally-recognised efficiency benchmarks where available, and the facility's decarbonisation plans.

Mitigation Efforts: Capability Building

❑ Initiatives to improve industrial energy efficiency, which include:

- ✓ The Energy Services Company (ESCO) Accreditation Scheme and Singapore Certified Energy Manager (SCEM) Programme
- ✓ Energy Efficiency Technology Centre (EETC)
 - In collaboration with the National Environment Agency (NEA), the Energy Efficiency Technology Centre (EETC) aims to be the leading technology innovation centre that supports local Small & Medium Enterprises (SMEs) in energy efficiency initiatives.
- ✓ Energy Efficiency Opportunities (EEO) Assessor Certification Scheme
 - The National Environment Agency (NEA) and The Institution of Engineers, Singapore (IES) have jointly launched a new scheme to certify engineers for their technical expertise and experience in improving the energy performance of industrial processes, systems and equipment, and to qualify them to conduct Energy Efficiency Opportunities Assessments (EEOAs) for energy-intensive industrial facilities.
- ✓ The Energy Efficiency National Partnership Programme, a voluntary programme launched by NEA, EDB and EMA in 2010, which aims to foster a culture of sustained energy efficiency improvement in industry.

Thank you!

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