ENERGY MARKET AUTHORITY

Our Clean Energy Future

SINGAPORE:
UTILISING CARBON-FREE ENERGY TECHNOLOGIES TO EXPAND CLEAN ELECTRICITY

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Presentation Outline

Introduction to:

1. Singapore
2. Energy Market Authority (EMA)
3. EMA Research & Statistics Unit

Singapore's path on utilising low carbon/carbon-free energy technologies

1. Natural Gas
2. Solar
3. Regional Power Grids
4. Low-Carbon Alternatives

Singapore is a small city-state with no indigenous resources and limited alternative energy potential.

Population[1]

6.04 million

Land Area[2]

735.6 sq km

Population Density[1]

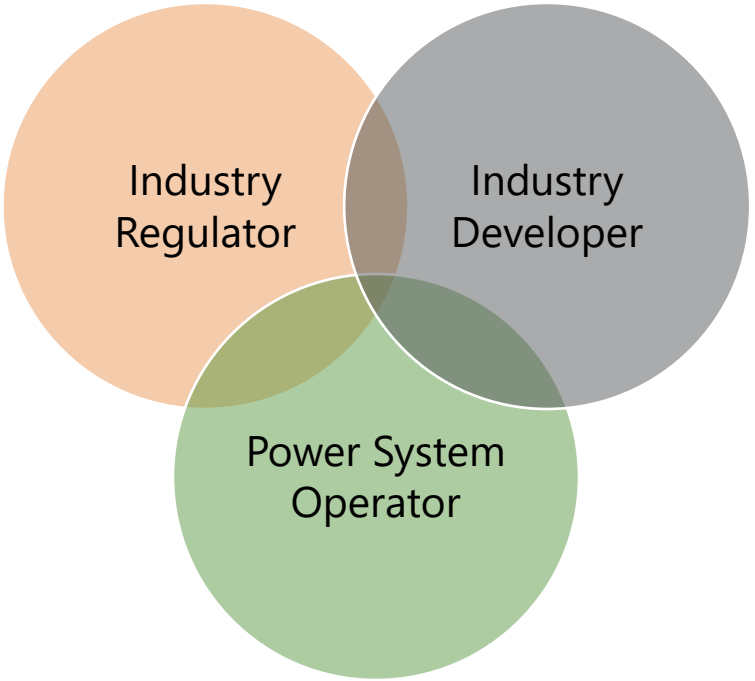
8,207 per sq km

Data sources extracted from Department of Statistic (DOS) of Singapore:

[1] DOS | SingStat Website - Population and Population Structure - Latest Data

[2] DOS | SingStat Website - Environment - Latest Data

Energy Market Authority (EMA) seeks to build a clean energy future that is resilient, sustainable, and competitive, driving Singapore's energy system into achieving our target of net-zero emissions by 2050.



Industry Regulator
We regulate Singapore's electricity, gas industries and district cooling services to ensure fair competition and protect consumers' interests.

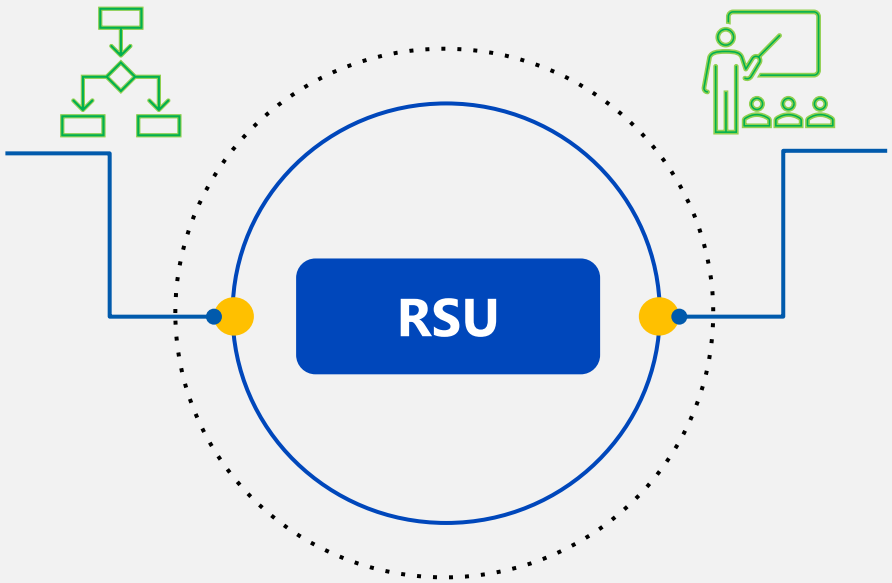
Industry Developer
We advance the energy industry by developing manpower capabilities, catalysing innovations and establishing thought leadership.

Power Systems Operator
We operate the critical delivery infrastructure used in the supply of electricity to homes, offices and industries.

As EMA's Research & Statistics Unit (RSU), we strive to be centre of excellence for energy statistics, driving data-driven decision making and planning in the energy sector, and fostering data analytics and governance capabilities.

(1) **Provide quality energy statistics and facilitate evidence-based decision making**

e.g., conduct investigative studies via data analytics and advanced modelling techniques (e.g., AI/ML) through cross-departmental and cross-agency collaborations.



(2) **Uplifting officers' data management and analytics capabilities**

Through:

- *deepening data governance-related knowledge through Hub-and-Spoke model to better safeguard data.*
- *empowering them (e.g., AI/ML, visualisation) to improve work efficiencies, identify innovation opportunities, and prepare them to be a future-ready and data-centric workforce.*

The power sector accounts for ~40% of Singapore's carbon emissions. EMA is actively driving towards net-zero energy system while ensuring energy security through the Four Switches:

Natural Gas

- Encourage upgrading to more energy efficient power generation plants with grants and incentives.
- Impose standards and development of new generation units compatible with natural gas and hydrogen.

Solar

- Achieve at least 2 gigawatt-peak (GWp) of installed solar capacity by 2030, meeting the annual electricity needs of ~350,000 households.

Regional Power Grids

- Target to import up to 6 gigawatts (GW) of low-carbon electricity by 2035, equivalent to ~30% of Singapore's electricity supply then.

Low-Carbon Alternatives

- Exploring emerging low-carbon energy technologies in preparation to harness them when they become technically and commercially viable.

Visit Energy Supply | EMA for more info.

Singapore is ***driving power sector's efficiency*** through equipment grants and incentives and ensuring hydrogen-compatible standards for new generation units.

- Improve power generation companies' efficiency and reliability by launching:
  a. *Genco Energy Efficiency Grant Call* – encourage use of energy efficient equipment and technologies.
  b. *Incentive scheme for advanced Combined Cycle Gas Turbines* (CCGTs) – encourage adoption of new and more efficient CCGTs.
- New standards for generation units: New and repowered generation units must be at least 30% hydrogen-ready by volume, with the ability to be upgraded to 100% hydrogen-ready in future.
- New generation capacity: Construction of two new Open Cycle Gas Turbines (OCGT) units, capable of using up to 30% hydrogen alongside natural gas by Jun 2025.

Visit Natural Gas | EMA for more info.

Singapore has achieved our 2025 target of deploying 1.5 GWp of ***solar energy*** at end-2024. We are on track to meeting at least 2 GWp by 2030, equivalent to the annual electricity needs off ~350,000 households.

- Ideal clean energy source: Singapore enjoys high solar irradiance of about 1,580 kWh/m^2/year, making it ideal to tap on solar energy as a clean energy source to generate electricity.
- Driving solar deployment: EMA collaborates with other government agencies and the industry to maximise solar deployment on:
  a. Rooftops
  b. Reservoirs and offshore spaces
  c. Temporary vacant land
  d. Buildings

Visit Solar | EMA for more info.

Singapore targets to import around 6 GW of low-carbon electricity through the ***regional power grids*** by 2035, equivalent to ~30% of our energy supply then.

- Diversify clean energy sources: Enhances Singapore's energy resilience by diversifying beyond borders to cleaner energy sources, reducing reliance on natural gas.
- Import trials:
  a. *Phase 1*: Up to 100 MW of renewable hydropower imports from Lao PDR to Singapore.[1]
  b. *Phase 2*: Increased to 200 MW of electricity trading whereby additional supply will come from Malaysia.[2]
- Large scale electricity imports (e.g., solar, hydro, wind): To date, EMA has issued Conditional Approvals to import low-carbon electricity from:

a.	Australia:	1.75 GW	7.35 GW
b.	Cambodia:	1 GW	
c.	Indonesia:	3.4 GW	
d.	Vietnam:	1.2 GW	

[1] Through the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP) in Jun 2022.
[2] Facilitated by the introduction of multidirectional power trade.
Visit Regional Power Grids | EMA for more info.

We are exploring the feasibility of harnessing ***emerging low-carbon energy technologies*** when they become technically and commercially viable.

1. **Hydrogen**:
   - Singapore's National Hydrogen Strategy: Aims to supply up to 50% of Singapore's power needs by 2050 through use of low-carbon hydrogen.
   - Low-carbon technologies: Developing low- or zero-carbon ammonia power generation and bunkering solutions for the power sector.
2. **Advanced geothermal systems**:
   - Geophysical investigation project: Researchers identified areas in Singapore with temperatures up to 200ºC suitable for power generation.
   - Nationwide study: To assess Singapore's geothermal potential and suitable locations for building geothermal power plants.
3. **Carbon capture, utilization, and storage (CCUS)**:[1]
   - Feasibility assessment/study: To better understand the potential for CCUS pathways, identify suitable storage for carbon dioxide and assess economic feasibility.

[1] CCUS involves capturing carbon dioxide from sources like power plants and transforms it into useful products or stores it to prevent atmospheric release.
Visit EMA | Low-Carbon Alternatives and New study will assess Singapore's geothermal energy potential, sites for power plants: EMA | The Straits Times for more info.

Q&A