Netherlands Enterprise Agency

Singapore: Singapore embraces hydrogen as essential part of their energy mix
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Introduction

Singapore is a relatively small and population dense city state of 720 square kilometres - which is about half the size of the province of Utrecht - and about 5.9 million inhabitants. The yearly energy consumption in 2019 was 51.7 TWh of which 41.5% was consumed by the industrial-related sector and the port.
For its energy supply the republic is largely dependent on the international energy market. More than 95% of the energy mix consists of imported natural gas; the remaining 5% is mainly generated from sun and waste & biomass. The country has few suitable alternatives for sustainable energy sources due to geographical constraints, too little wind, almost no current, no geothermal sources and the country is - just like the Netherlands - relatively flat. There is some development of solar, which is expected to grow the coming years, but due to lack of space only large floating solar parks seem to be an option. As a solution to unlock clean energy sources, the government is also looking at regional energy grids.

Long term strategies on hydrogen

In February 2021 Singapore published its Green Plan 2030. In this plan the country outlines how it wants to reduce its carbon footprint. To make sure that Singapore achieves its vision on a cleaner, more reliable and affordable energy future, it aims to focus on carbon capture, utilisation and storage (CCUS) and the use of low-carbon hydrogen. Hydrogen and CCUS take a prominent role because of the aforementioned constraints for alternative energy sources.
Singapore aims to use low-carbon hydrogen as a fuel in the maritime sector. Their port is with a 49.83 Mt sales of bunkering - five times higher compared to the Port of Rotterdam - one of the largest and most important bunkering port in the world. Singapore was also an early adopter and supporter of liquefied natural gas (LNG) for maritime, running a pilot program for LNG bunkering since 2017.
Singapore also plans to use hydrogen in the electricity sector and as a replacement for the use of grey hydrogen in the industrial cluster on Jurong Island. Singapore wants to transform the island as a model for solutions in the field of CCUS, low-carbon hydrogen and circular economy. No large scale application of hydrogen is expected in the mobility sector, except perhaps for heavy transport vehicles.
Singapore wants to play an important role as a hydrogen hub within the APAC region and export knowledge and developed technologies to neighbouring countries. To reach this, the country wants to exploit its existing grey hydrogen and natural gas infrastructure to pilot the use of hydrogen in suitable downstream applications, with a clear pathway towards the eventual use of low-carbon hydrogen.

Feasibility study on hydrogen

Important (public) parties in this field are the Agency for Science, Technology and Research (A*STAR), the Economic Development Board (EDB), the Energy Market Authority (EMA), the National Climate Change Secretariat (NCCS) and the National Research Foundation (NRF). They conducted a feasibility study on hydrogen gas. Based on this study, they are looking at different alternatives for the import and production of hydrogen, such as shipping, piping hydrogen from neighbouring countries, and the domestic production of hydrogen by steam methane reforming (SMR) with CCUS,

electrolysis of water using imported renewable electricity, biomass gasification, or through methane pyrolysis.

Investments and collaborations

Singapore has an active and highly regarded RD&D community and looks to maintain this status by investing $49 M (€30,9 M) through the Fund For Low-Carbon Energy Research. There are also different private consortia which are supported by the Singaporean government:

- MoU with Kawasaki Heavy Industries, Mitsui O.S.K. Lines, Vopak LNG, and Linde to study the commercial viability of a liquefied hydrogen supply chain
- MoU with Chiyoda, Mitsubishi, PSA, Jurong Port, City Gas, Sembcorp, SLNG (with the support of MPA and NRF) to develop a business case for the technical and commercial feasibility of hydrogen import to Singapore
- MoU with Itochu Corp, Itochu Enex, Vopak, Pavilion Energy, Mitsui OSK line, and Total on the joint development study of ammonia as a new marine fuel in Singapore

In terms of international collaboration, the country works together with Chile on low-carbon hydrogen and with Australia on low-emissions technologies. Singapore will also seek to partner other countries to advance emerging low-carbon technological solutions. Such collaborations could include joint contributions to international regulations, standards and certification on these emerging technologies, and participation in joint RD&D and test-beds. Singapore is a particularly interesting partner for association in view of its high R&D expenditure that is heavily invested in industry-driven research and well-aligned policy priorities on sustainability.

Contact

For more information on developments and opportunities in Singapore within the area of hydrogen, e-mail the Netherlands Innovation Network at the Netherlands Embassy in Singapore at sin-ia@minbuza.nl.

Sources

Information retrieved from several internet sources, such as newspaper articles and reports.