ISAS Brief
No. 1175 – 24 October 2024

The Green Hydrogen Landscape in South Asia

Saeeduddin Faridi and Puspa Sharma

Summary

South Asia is not isolated from the rapidly growing global interest in green hydrogen. The pursuit of decarbonisation and energy security has drawn countries like India, Nepal, Pakistan and Sri Lanka to design policy roadmaps and undertake projects to develop green hydrogen ecosystems and assess their feasibility. In moving forward, it is crucial to understand the potential challenges developing countries in South Asia may face.

Green hydrogen, often dubbed as the clean fuel of the future, is hydrogen produced via electrolysis using renewable energy. With its versatile nature, it can help in the decarbonisation of carbon-intensive sectors like petrochemical refining, cement and fertilisers, many of which currently use grey hydrogen, that is hydrogen produced using natural gas. It is also likely to play a critical role in the region's clean energy goals with its potential as an energy storage solution and its use as a fuel.

With the growing interest and investments in developing green hydrogen ecosystems across the world, it is poised to become an important clean energy carrier in the coming years. Countries such as Japan and South Korea have large-scale plans of adopting green hydrogen. With that, opportunities of green hydrogen export are also likely to become lucrative.

So, how are South Asian countries looking at the opportunity presented by green hydrogen?

Green Hydrogen Projects and Policies

In 2023, India launched the ambitious National Green Hydrogen Mission which aims at developing a green hydrogen ecosystem and enabling the production, usage and export of green hydrogen. The mission outlines how renewable energy, policy mechanisms and strategic interventions will be leveraged to produce five million metric tonnes (MT) of green hydrogen by 2030, alongside the installation of 60 to 100 gigawatts (GW) electrolyser capacity.

To this effect, the Indian government has announced an outlay of ₹19,744 crore (S$3.26 billion) until 2029-30 for the manufacturing of electrolysers and the production of green hydrogen. Private participation is also being leveraged. Major players such as Reliance Group and Tata Projects are likely to bid for pilot projects announced under the hydrogen mission. Some projects have already taken off. GAIL India commissioned its 10 megawatts (MW) green hydrogen plant in May 2024.

To offset the lack of domestic demand currently, many projects are looking towards exports. India recently signed its first export agreement with Japan for the supply of 200,000 metric tonnes of green ammonia. Green ammonia is a derivative of green hydrogen. Converting

hydrogen to ammonia also enables its transport. India is also discussing green hydrogen supply agreements with Singapore and the European Union.

Other South Asian countries have also shown interests in leveraging their renewable energy to produce green hydrogen. In 2021, Pakistan announced its first green hydrogen project. Led by Oracle Power and Kaheel Energy, this project will see the development of a 1.3 GW renewable energy hub which will produce 55,000 tonnes of green hydrogen using 400 MW electrolysers. This project is also geared towards the export of green hydrogen.

In 2023, Sri Lanka also announced its Green Hydrogen Roadmap to address challenges of energy security, energy affordability and environmental sustainability. The roadmap describes the approach Sri Lanka will take to develop its green hydrogen ecosystem, enabled by its renewable energy potential. The initial phase looks towards developing a domestic market for green hydrogen technologies, exploring long-term export markets, and undertaking research and development.

In Nepal, several studies on prospects of green hydrogen development have been undertaken since 2008, and the Kathmandu University has been running a Green Hydrogen Lab. The country has recently developed its Green Hydrogen Policy, particularly with the aim of reducing imports of fossil fuels and chemical fertilisers, ensuring energy storage and energy security. The policy also lists seven strategies and working policies to implement those strategies. The identification of risks associated with green hydrogen and measures to address them are also part of the policy.

Challenges

Deploying green hydrogen for decarbonisation remains an expensive alternative. For the steel industry in India to decarbonise using green hydrogen, the cost has to come down to US$1-2/kilogramme (kg) [S$1.36-S$2.7/kg] from the US$4.10-7/kg (S$5.20-S$9.17/kg) today. According to the report by the Institute for Energy Economics and Financial Analysis, the steel industry will replace 80 per cent of grey hydrogen with green hydrogen by 2050, provided costs decline and a carbon pricing mechanism is deployed. This will make the economics favourable for green hydrogen to compete with grey hydrogen.

Additionally, given the global interest in green hydrogen, the cost of hydrogen will also depend on government support and subsidies. This can trigger competition among countries to capture greater shares of the sector in the global economy. The United States' (US) Inflation Reduction Act, for instance, deploys financial mechanisms like subsidies and tax breaks for green hydrogen producers. Estimates suggest the cost of green hydrogen could fall to US$1/kg (S$1.31/kg) in some regions of the US. This can have important implications for the growth of green hydrogen sectors of growing economies in South Asia.

Logistics and infrastructure also pose a challenge for green hydrogen's adoption. Hydrogen requires advanced storage and transportation systems. While pipelines offer the most efficient method, transport over land or sea involve pressurised tanks or cryogenic tankers which maintain temperatures as low as -253 degree Celsius.

The availability of freshwater, used to produce green hydrogen, is also a challenge in water stressed South Asia. The shutdown of thermal power operations due to water shortages is not unheard of in India. Between 2013 and 2016, water shortages forced 14 of the 20 largest thermal utilities to stop operation at least once. Therefore, managing freshwater resources will be a crucial challenge in South Asia's aim of green hydrogen development.

. . . . .

Mr Saeeduddin Faridi is a Research Analyst at the Institute of South Asian Studies (ISAS), an autonomous research institute at the National University of Singapore (NUS). He can be contacted at saeedf@nus.edu.sg. Dr Puspa Sharma is a Visiting Senior Research Fellow at the same institute. He can be contacted at puspa.sh@nus.edu.sg. The authors bear full responsibility for the facts cited and opinions expressed in this paper.