

# The Incredible Green Hydro Hub

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There has never been a better time for disruptive climate technologies as the urgency to take meaningful action to fight climate change has never been greater. Prime Minister Narendra Modi demonstrated climate leadership at COP26 in Glasgow and put forth India's "Panchamirth" vision to achieve net zero by 2070, in addition to achieving aggressive near-term targets such as 500 GW of renewables capacity, 50 percent of electricity capacity to be met with renewables, one billion tonne reduction in cumulative emissions by 2030, and 45 percent lower emissions intensity of gross domestic product (GDP) by 2030.

The International Energy Agency's clean energy innovation report warns that just 25% of the emission cuts needed to meet net-zero between 2050 and 2070 are likely to result from mature technologies such as wind generation, nuclear power, solar power and energy-efficiency measures. The IEA believes that most of the remaining emissions (41%) will need to be addressed using technologies currently in the early adoption phase, while technologies in the prototype and demonstration stages could tackle the final 32% of emissions.

In LED lighting, India demonstrated that India can push a disruptive technology from the early adoption phase to ubiquitous deployment in record time. It has recently aggregated demands for 5450 E-buses from five Indian cities and brought down prices of electric buses below combustion vehicles. Similarly, India has the opportunity now to accelerate innovation and scale-up deployment of green hydrogen production technology. This is critical as electricity accounts for less than quarter of India's energy economy. There is an urgent need to prepare the rest of the energy economy fuelled by \$160 billion of imported hydrocarbons for deep decarbonisation.

Indian has a huge potential to become the global hub for production and export of green hydrogen. This is necessary to make India energy independent before the country completes 100 years of its independence in 2047. Currently, India spends over \$160 billion of foreign exchange every year for energy imports. These imports are likely to double in the next 15 years without remedial action. India should aim to be world's biggest green hydrogen technology and production hub. There are three factors that positions India well to covert this ambition to reality.

Firstly, a proactive and pragmatic policy. Unlike solar and battery technologies, Indian policy action in green hydrogen has not lagged the global momentum. In addition, the Indian policy unambiguously focuses on reducing the cost of green hydrogen by addressing the delivered cost of green power and creating giga-scale demand via existing hydrogen consuming industrial sectors.

Indian green hydrogen demand creation focuses on refining and fertiliser sector in the short-term and city-gas blending in medium term. Indian strategy focuses on transport and steel as a long-term play. This pragmatic strategy helps the Indian government to create giga-scale demand certainty while reducing the subsidy required to affordable levels.

India's exclusive focus on green hydrogen for Industrial applications is distinctly different from global strategies that support many colours of hydrogen for multiple applications.

Secondly, India Inc. rallying behind the green molecule. A clear and proactive policy signals inspired the Indian industry to draw-up ambitious plans and forge critical global partnerships in green hydrogen. Even before the roll-out of the green hydrogen policy on demand, illustrious industrial houses such as RIL, L&T, Adani and NTPC have announced multibillion dollar investment plans in green hydrogen. All renewable energy players such as Greenko, Renew and Acme have announced giga-scale green hydrogen production targets. India's largest hydrogen consumer Indian Oil Corporation has formed a green hydrogen JV with L&T and Oil India has signed a pact with HomiHydrogen. This industrial momentum in Indian green hydrogen sector should be leveraged to propel India towards becoming a global green hydrogen hub.

Thirdly, India's suitability as hydrogen and electrolyser production destination. Electrolyser is a device that splits water to produce green hydrogen. India's abundant wind, solar and pumped storage resources provide India with one of the least cost for clean electricity. Unlike many other technologies that require pristine manufacturing conditions, electrolyser manufacturing suits the Indian strengths in competitive and precision metal fabrication and assembly. Though some technologies employ high-tech production processes, these can be quickly indigenised. Despite

the relative simplicity of technology compared to batteries and solar panels, India currently relies on a very small number of foreign technology providers. This is resulting in high royalties and reduces strategic flexibility to use indigenous materials. India must commercialise the next-generation hydrogen technologies.

The above three factors highlight the unique ecosystem advantages India has and how the stage is set for the country to become a global champion in green hydrogen. The Harnessing Green Hydrogen report recently released by NITI Aayog lays out five key actions that are required to construct a high-tech and low-carbon Indian brand in green hydrogen.

Firstly, the world's largest electrolysis (green hydrogen generation) capacity of over 60 GW/5 million tonnes by 2030 for domestic consumption. This will help India meet the 500 GW renewable energy target. Secondly, the world's largest production capacity of green steel at 15-20million tonnes by 2030 — a pioneering effort to make green steel mainstream for the world. Thirdly, the world's largest electrolyser annual manufacturing capacity of 25 GW by 2028 delivering affordable ones for India and the world. Fourthly, the world's largest production of green ammonia for exports by 2030 helping India's allies to decarbonise. This may require up to 100 GW of green hydrogen and fifthly, a \$1 billion investment into industry led hydrogen research and development to enable breakthrough technologies for the world at scale and the speed that is required.

With proactive collaboration among innovators, entrepreneurs and government, green hydrogen has the potential to drastically reduce CO2 emissions, fight climate change, and put India on a path towards net-zero energy imports. It will also help India export high-value green products making it the first major economy to industrialise without the need to 'carbonise'.

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