

Proper policy support will drive green hydrogen proliferation in India

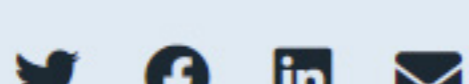
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Charith Konda

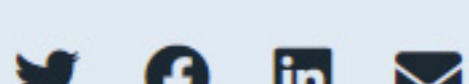


Key Findings

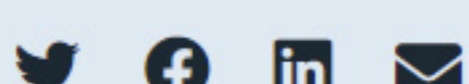
Although the use of hydrogen in industrial applications is not new, producing green hydrogen and increasing its applications across industries require new policies and infrastructure.



India's green hydrogen strategy needs to provide an end-use obligation on the current and potential green hydrogen users to offer investors the confidence to set up manufacturing units.



India should develop a robust green hydrogen certification that is internationally aligned and accepted to build the green hydrogen industry.



Green hydrogen is emerging as the fuel of the future, with the world expecting it to play a key role in the efforts to decarbonise the global economy. The fuel holds promise due to its versatility in applications that range from agriculture, industry and energy (transportation and electricity).

India's import dependency on oil and gas and high renewable energy potential make green hydrogen a promising solution. This has prompted the Indian government to adopt a [green hydrogen production target of 5 Million Metric Tonnes \(MMT\)](#) per annum, and possibly 10MMT per annum considering the export potential, by 2030.

However, as with any new industry, the green hydrogen industry also faces some early-stage challenges that could slow its progress. With the union government and states developing policies for green hydrogen, it is imperative that these help in the cost reduction of the fuel as well as generate demand. Crafting the right policies for green hydrogen from the outset will help overcome the pains of correcting it later.

Preparing the ground for the green hydrogen revolution

Apart from the union government, states like Gujarat, Rajasthan, Uttar Pradesh, Odisha and Tamil Nadu are drafting policies for developing green hydrogen hubs. Gujarat's draft policy aims to [produce 3MMT per annum](#) of green hydrogen. Odisha plans to develop a [hydrogen hub at Paradip Port](#) capable of producing green hydrogen, using/handling green hydrogen, storage and transportation (potentially exports).

Taking the cue from the union and state governments, a few public and private sector enterprises are undertaking green hydrogen/ammonia pilot projects for various applications. These include Oil India, NTPC, Gujarat Gas, ACME Cleantech Ventures, L&T and Tata Steel. Reliance Industries has announced a plan to invest Rs5 trillion (~US\$60.6 billion) over the next 10-15 years for green hydrogen supply chain development.

India faces some early-stage obstacles in building the green hydrogen industry

Although the use of hydrogen in industrial applications is not new, producing green hydrogen and increasing its applications across industries require new policies and infrastructure. This leads to some challenges India must overcome to build the green hydrogen industry.

One of the main missing pieces of India's green hydrogen strategy so far is the lack of an end-use obligation on the current or potential hydrogen users. This leads to a lack of certainty over the offtake arrangements of hydrogen projects, resulting in lower investments and a higher cost of financing. Companies are wary to invest substantially in green hydrogen without knowing their potential consumers.

The other significant challenge is the lack of a standard definition of green/clean hydrogen across countries and regions. Globally, the green hydrogen framework is still evolving with [debate over the definition of green hydrogen](#) and mechanisms for tracking and tracing the green attributes. As hydrogen will be a global commodity, the variations in standards and regulations could limit international trade.

Finally, the estimated cost of green hydrogen currently is twice as much as conventional/grey hydrogen. Capital expenditure and regular plant operating spends account for about 51% of grey hydrogen, with energy cost (i.e., natural gas cost) accounting for the remaining cost. In green hydrogen's case, the cost of renewable power generation and transmitting renewable power account for the majority (~70%) of the total cost. Therefore, to make green hydrogen competitive, there is a need to bring down both capital (electrolysers and balance of systems) costs and, more importantly, renewable energy generation and distribution costs.

Overall, the government estimates that reaching the 5MMT per annum production target by 2030 requires [an investment of Rs8 trillion \(~US\\$97 billion\)](#).

Generating demand through policy support

The government can use a combination of incentives, mandates, and supply-demand matching measures to create demand certainty.

The government can provide grants and/or tax credits for green hydrogen demonstration projects, hydrogen logistics infrastructure development and the introduction of zero-emission vehicle fleets. These measures will lower the cost of green hydrogen and increase its adoption.

Mandates could include gradually increasing green hydrogen purchase obligations on current and potential users, such as oil refiners, piped natural gas suppliers and steel producers. Subsequently, the government can bring in more sectors, including ammonia manufacturing and long-haul transportation, under this regime when green hydrogen costs reduce.

To improve investor confidence and aid price discovery, the government may aggregate demand and supply through a third-party government entity for the initial set of projects. Such an arrangement will ensure supply-demand matching and help assure offtake and price discovery.

Developing green hydrogen standards and regulations

India should develop a robust green hydrogen certification that is internationally aligned and accepted to build the green hydrogen industry. Developing standards and regulations that govern green hydrogen will not only boost the confidence of international investors but also help Indian green hydrogen producers access export markets.

Tracking the origin and quality of hydrogen will also help trade in domestic and international markets. The certification system design should create a transparent market by addressing the information asymmetries between green hydrogen buyers and producers/sellers.

Various countries and the European Union are defining green/clean hydrogen by setting a carbon emissions cap per kg of hydrogen produced. They are also developing various other norms for measuring green attributes. For example, the [European Commission proposal](#) requires green hydrogen production [using electrolysers connected to new renewable power](#) capacity and not the electricity grid. Further, the Commission is also proposing the requirement of green hydrogen producers to match their production with their contracted renewables monthly.

In the U.S., the Treasury Department has yet to release the full guidelines for green hydrogen, specifically the guidance on determining the emissions intensity of green hydrogen production. On the other hand, the U.S. Department of Energy has proposed a clean hydrogen production standard.

India is also in [the process of finalising the definition](#) and standards. The country has already taken the lead and has [proposed a discussion on global standards](#) for green/clean/low-carbon and has [proposed a discussion on global standards](#) for green/clean/low-carbon through the G20 forum for international economic cooperation. India should continue striving to standardise definitions in international forums even as countries/regions are still working on developing green hydrogen standards.

Using policy tools to reduce the cost of green hydrogen

Green hydrogen will become competitive when its cost reduces to under US\$2 per kg, at which point it can replace grey hydrogen use. The government has several tools to reduce costs – some of which are already under implementation.

The government can reduce or waive renewable power transmission and distribution charges. It has already [waived transmission charges for 25 years](#) on the inter-state transmission system, but it is also critical that states implement this policy on state transmission networks.

Further, the government can also introduce power banking facilities for renewable power generated for green hydrogen production.

Another measure could be introducing a complete open-access mechanism for procuring renewable power for green hydrogen production. This will ensure the procurement of renewable energy from any producer by just paying the transmission and wheeling charges without fixed/demand charges.

Finally, the government can incentivise the production of green hydrogen and the manufacturing of electrolysers. The government is in the process of introducing [an incentive of up to Rs30-50 \(US\\$0.37-0.61\) per kg \(or 10% of the cost\)](#) for producing green hydrogen. India has also earmarked a total Rs174.9 billion (~US\$2.1 billion) for production-linked incentives for producing green hydrogen and electrolysers. As India readies various incentives for green hydrogen production and electrolyser manufacturing, it needs to clarify some policy elements, including the import of electrolyser components from China.

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