Green Hydrogen: Towards a carbon neutral economy in India

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1 Introduction

Hydrogen is seen as the next big step in India's journey towards a carbon neutral economy. This update summarises some of the key aspects of India's Green Hydrogen Mission, Green Hydrogen Policy and the future outlook for a green hydrogen economy in India.

India's energy future is at a pivotal point, given its commitment to cut down carbon emissions by 2030 and achieve zero-carbon emissions by 2070. Historically, it has relied on imports from oil-rich nations to fulfil its fuel and energy demands. However, recent world events such as the Russia-Ukraine war have shown the unsustainability of this approach. While solar PV and lithium-ion batteries have led the energy transition to low-carbon, clean technologies globally, India's success in manufacturing them at an economical industrial scale has been limited. Hydrogen, especially green hydrogen, is therefore seen as the next step in India's transition to a carbon-neutral economy. Green hydrogen can also be used to produce green ammonia, another renewable, carbon-free source of energy, mainly used in the manufacture of fertilisers. In fact, '*The Energy and Resources Institute*' (TERI) hails green hydrogen as the next '*clean energy prize*' requiring coordinated action from the Indian government and energy industry to reap its benefits.

2 What is green hydrogen?

Hydrogen is the only gas that does not emit any carbon dioxide upon burning and leaves water as its residue. Depending upon the method of its production (which can be carbon-intensive), hydrogen is classified as brown, blue, grey, green and recently, even turquoise. Grey and blue hydrogen are produced by splitting methane with steam into hydrogen and carbon dioxide. However, the capture and storage of carbon dioxide produced from this method is cost-intensive and hence production at an industrial scale may not be economically viable. Green hydrogen is the only type that is produced in a climate-neutral manner by the electrolysis of water, splitting it into hydrogen and oxygen, using renewable sources of energy.

Given the current state of technology, while green hydrogen is considered one of the key drivers to achieving net zero-emission targets, the biggest challenge in adopting a green hydrogen economy is its cost of production and long-term storage. Electrolysis is an expensive process requiring large amounts of electricity, the source of which should be renewable instead of conventional. Therefore, an optimum process to produce green hydrogen to the extent where the benefits of economies of scale can start kicking in, is not yet in place. The need of the hour is to have concerted efforts from both the government and industry players to incentivise and economise the production of green hydrogen, respectively.

To this end, the government announced the proposal of a National Hydrogen Mission on 15 August 2021 and released its Green Hydrogen Policy (Policy) on 17 February 2022. In January 2023, the government approved the National Green Hydrogen Mission (Mission) with an initial outlay of INR 19,744 crore to achieve the

objective of making India a '*global hub*' for production, usage and export of green hydrogen. The Mission and the Policy are discussed below.

3 The National Green Hydrogen Mission

The Mission is divided into two phases: (i) Phase I (2022-23 to 2025-26) - focused on indigenisation of value chain and increasing production of green hydrogen; and (ii) Phase II (2026-27 to 2029-30) - focused on development of commercial scale projects in steel, mobility and shipping sectors and enhancing penetration of green hydrogen across all potential sectors such as railways and aviation, through pilot projects. The Mission contemplates some of the following interventions to achieve the overarching objectives:

a. Developing strategic international partnerships to facilitate export of green hydrogen and its derivative products;

b. Creating demand by prescribing a minimum share of consumption of green hydrogen or its derivative products, as feedstock or energy by designated consumers in sectors such as petroleum refining and natural gas networks.

c. Establishing a legal framework (through the Energy Conservation Act, 2001) to empower the government to specify the minimum share of energy and feedstock consumption from non-fossil fuel-based sources, which will ensure the enforcement of consumption targets for green hydrogen and its derivatives.

d. To achieve stability in long term agreements, aggregating demand through a framework of bidding and procurement processes. The Ministry of New and Renewable Energy (MNRE), as the nodal agency under the Mission, is tasked with framing model guidelines for a transparent competitive bidding process for procurement of green hydrogen and its derivatives and to develop a suitable regulatory framework for certification of green hydrogen and its derivatives as having been produced from non-conventional sources.

e. Incentivising production of low-cost green hydrogen and domestic manufacturing of related equipment and technologies through a comprehensive incentive program offering a bouquet of financial incentives and non-financial measures, known as Strategic Interventions for Green Hydrogen Transition (SIGHT).

For better implementation of the Mission, an Empowered Group will be set up with the objective of overseeing the Mission activities, providing guidance, continuously monitoring progress, recommending policy interventions and approving mid-course corrections. The group is empowered to appoint sub-committees comprising experts.

4 The Green Hydrogen Policy

The Policy aims to reduce India's dependence on fossil fuels/fossil fuel-based stocks and transition to the adoption of green hydrogen and green ammonia.

The Policy effectively encourages the industry, especially the manufacturing, transport, and power sectors, to produce and use green hydrogen by offering the following key incentives:

a. Green hydrogen manufacturers may purchase renewable power from the power exchange or set up renewable energy projects, either themselves or through a developer. An expedited open access process that allows non-discriminatory access to transmission and distribution infrastructure for sourcing renewable energy will be granted to green hydrogen manufacturers within 15 days of receipt of

application. Grid connectivity will also be provided to these manufacturers on a priority basis, to reduce procedural delays.

While there is an enabling framework to expedite the grant of open access to renewable energy projects supplying power to green hydrogen manufacturers, this would need to be adopted and implemented at a state level for intra-state open access. In the absence of directions from relevant state electricity regulatory commissions (**SERCs**) on the grant of expedited open access for such projects, it is unclear how the Policy will be implemented at the state level.

b. Renewable power projects selling power for green hydrogen manufacture will be allowed to bank any unconsumed renewable power with the distribution companies (**Discoms**) for up to 30 days - banking charges will be determined by the relevant SERC. The banking charges cannot be more than the difference of average tariff of renewable energy bought by the Discom in the previous year and the average market clearing price in the day ahead market during the month in which the renewable energy is banked.

   As is the case with open access, since SERCs have jurisdiction over the provision of banking facilities and the determination of banking charges within their respective states, the rules and regulations for banking facilities vary from state to state. By providing for banking facilities for renewable projects selling power to green hydrogen manufacturers, the Policy attempts to introduce a uniform standard on banking for renewable projects across the country. However, its implementation will still be subject to SERCs recognising this intent of the government and making banking facilities available at a state level. Previously, energy banking facilities were introduced for wind and solar projects at the state level. However, states have recently been withdrawing these facilities given the increased financial burden it imposes on Discoms. Since this policy is likely to have a similar impact on Discoms, it is possible that states may be hesitant to grant banking facilities in this case as well.

c. Discoms can procure and supply renewable energy to manufacturers of green hydrogen in their states at concessional prices, which includes the cost of procurement, wheeling charges, and a small margin, as determined by the relevant SERC.

d. Inter-state transmission charges will be waived for a period of 25 years for manufacturers of green hydrogen where projects have been commissioned before 30 June 2025.

   However, to the extent connectivity and open access to the intra-state grid are required, intra-state open access charges will still apply, and these charges vary from state to state. Further, the waiver is only applicable to projects commissioned within three years of the Policy which may be too short a timeline given the end consumer market is still at a nascent stage.

e. As an additional incentive for green hydrogen manufacturers, renewable energy consumed for green hydrogen production will be counted towards their renewable purchase obligation (**RPO**). RPO is a mechanism by which certain entities (such as Discoms, bulk consumers, etc.) are obligated to purchase a certain percentage of their total electricity requirement from renewable energy sources.

f. To facilitate the ease of doing business, the MNRE will establish a single portal for providing statutory clearances for setting up green hydrogen manufacturing projects in a time-bound manner.

   While setting up a portal to integrate approvals and clearances is a good idea, its success lies in its implementation. For example, the portal needs to seamlessly integrate both central and state level clearances without re-directing users to multiple windows. The portal needs to be designed based on past

experiences of other departments or ministries having similar portals, such as the National Single Window System implemented for business approvals in India.

g. Manufacturers of green hydrogen will be allowed to set up bunkers near ports for storage of green hydrogen for export/use by shipping. Land for this purpose will be provided by Port Authorities at applicable charges, however, it is not clear from the Policy whether the Port Authorities will provide land around the ports or berths within the ports.

5 Way forward

While the Mission and Policy are a step in the right direction, as with any new initiative, its success will largely depend on wide-scale adoption. Media reports indicate that the government is currently contemplating a competitive bidding process for the procurement of green hydrogen. It is also looking to establish intermediaries between green hydrogen procurers and suppliers to aggregate demand across consumers. The provision of pooling of tariffs by the traders is also being considered.

Further, reports indicate that to provide sufficient time for recovering the costs of setting up green hydrogen projects (since such projects are usually capital intensive), the government is considering mandating that agreements to buy green hydrogen from such projects be for a minimum period of 15 years.

As part of its measures to promote the usage of hydrogen, the government's pilot initiative blends hydrogen with compressed natural gas (CNG) to the extent of 18%, to be used as transportation fuel at Rajghat Bus depot. Under this pilot, 50 buses in Delhi are plying on blended hydrogen in CNG.

While the green hydrogen industry has significant potential to accelerate the achievement of India's green energy goals, the whole supply chain associated with this industry is yet to be established. As this supply chain and infrastructure build, more clarity and challenges will also emerge. However, to scale up use and investments in the sector, concerted effort from both the government and private sector participants will certainly be required.