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GREEN HYDROGEN MISSION-HYDROGEN ECONOMY

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ABSTRACT

Green Hydrogen a new-age fuel serve as an inspiration for the global Clean Energy Transition. The Mission will lead to significant **decarbonization** of the economy, reduced dependence on fossil fuel imports, and enable India to assume technology and market leadership in Green Hydrogen. Mission outcomes projected over **Rs. Eight lakh crore** in total investments with a hefty budget and a program that aims to produce **5 million metric tons/annum of clean hydrogen fuel by 2030**. Hydrogen has a very good gravimetric energy density –on this measure, hydrogen beats diesel, petrol, jet fuels and LNG. It is colorless can be defined as a **clean fuel** that emits only water when burnt or oxidized. Objective of NGHM is production of Hydrogen by using solar and wind energy with the help of **electrolizers** without emission of Greenhouse gases. That's why we called **Green Hydrogen**. The mission is proposed to be implemented in a phased manner. This will contribute to India's aim to become **Aatmanirbhar** (self-reliant) through clean energy and serve as an inspiration for the global Clean Energy Transition.

KEYWORDS: Green hydrogen, decarbonization, electrolisers, **Aatmanirbhar Bharat.**

INTRODUCTION

National Green Hydrogen Mission (NGHM) is an ambitious project of Govt. of India. India's leap into mainstreaming a new-age fuel. The overarching objective of the Mission is to make India the Global Hub for production, usage and export of Green Hydrogen and its derivatives. This will contribute to India's aim to become **Aatmanirbhar** (self-reliant) through clean energy and serve as an inspiration for the global Clean Energy Transition. The Mission will lead to significant **decarbonization** of the economy, reduced dependence on fossil fuel imports, and enable India to assume technology and market leadership in Green Hydrogen. Cumulative reduction in fossil fuel imports over one lakh crore. The Green Hydrogen Mission, a program that aims to produce **5 million metric tons/annum of clean hydrogen fuel by 2030**. **Urja Mantra Lai** launched hydrogen/ammonia policy on Feb. 2022. Developed countries already launched their National policy on Green Hydrogen. **Reliance Industries** and **Adani Group** – two of India's biggest conglomerates – have been in the race to produce green hydrogen. In the next eight years, the production of green hydrogen is expected to bring with it **an additional 125 gigawatts** of renewable energy capacity and create six lakh jobs. This transition towards a cleaner alternative hinges one pivotal action: accelerating **India's decarbonization**. India's push for green hydrogen production is part of the government's larger move toward increasing the adoption of renewable and green sources of energy. India's renewable energy capacity **grew to** 116 GW by the end of 2022. Green hydrogen fits right into this move away from fossil fuels.

Why Hydrogen:

Hydrogen is the **most abundant** and **lightest element** in the universe. Hydrogen has a very good gravimetric energy density – the amount of energy carried per unit weight. On this measure, hydrogen beats diesel, petrol, and jet fuel by a factor of around three, and LNG by a factor of 2.7 – which is why it makes a **great rocket fuel.** It could also play an essential role in **tomorrow's energy mix**- from fueling cars, trains, trucks, ships to

generating electricity and heating buildings. Hydrogen is also used in removing of sulfur from petroleum products, in fertilizers, in methanol production as well as in the iron, steel and space industries. That's because it's a colorless can be defined as a **clean fuel** that emits only water when burnt or oxidized.
Currently for production of Hydrogen we are using **Naphtha and Petroleum**. Around half of the world's industrial Hydrogen comes from natural gas (methane). However, the traditional method of extracting Hydrogen from natural gas also creates around 10 tons of CO2 from every tons of Hydrogen produced. Therefore, we needed to find a **more sustainable way** to produce it.

What is green Hydrogen:

Objective of NGHM is production of Hydrogen by using solar and wind energy with the help of **electrolizers** without emission of Greenhouse gases. That's why we called **Green Hydrogen**. This technology is based on the generation of hydrogen-a universal, light and highly reactive fuel-through a chemical process known as **electrolysis**. This method uses an electric current to separate the hydrogen from oxygen in water. Green Hydrogen is in the **company** of solar, wind, hydro and nuclear in India's bouquet of renewable energy sources. The hype of green hydrogen lies in its ability to replace fossil fuels in the production of carbon-heavy materials like steel and cement, as well as to power jet planes and ships. Hydrogen is **considered to become viable** for production only at a cost of around Rs 100 per kg. Depending on the method and amount of greenhouse gas ultimately released, hydrogen is called **brown, gray or blue.**

• Black / Brown / Grey hydrogen is produced via coal or lignite gasification (black or brown), or via a process called steam methane reformation (SMR) of natural gas or methane (grey). These tend to be mostly carbon intensive processes.

• Blue hydrogen is produced via natural gas or coal gasification combined with carbon capture storage (CCS) or carbon capture use (CCU) technologies to reduce carbon emissions.

• Green hydrogen is produced using electrolysis of water with electricity generated by renewable energy. The carbon intensity ultimately depends on the carbon neutrality of the source of electricity (i.e., the more renewable energy there is in the electricity fuel mix, the "greener" the hydrogen produced).

Advantages of green hydrogen:

Sustainable 100%: green hydrogen does not emit polluting gases either during combustion or during production.

Storable: hydrogen is easy to store, which allows it to be used subsequently for other purposes and at times other than immediately after its production.

Versatile: green hydrogen can be transformed into electricity or synthetic gas and used for commercial, industrial or mobility purposes.

Some negative aspect also high cost, high energy consumption and safety issues

Phased Approach:

Considering the nascent status of the sector and the rapidly evolving profile of the industry, the mission is proposed to be implemented in a phased manner.

Phase I (2022-23 to 2025-26)

focusing initially on deployment of Green Hydrogen in sectors that are already using hydrogen, and evolving an ecosystem for R&D, regulations and pilot projects.

Phase II (2026-27 to 2029-30)

Green Hydrogen costs are expected to become competitive with fossil-fuel based alternatives in refinery and fertilizer sector by the beginning of the second phase, allowing for accelerated growth in production. Depending upon the evolution of **costs and market demand**, the potential for taking up **commercial scale** Green Hydrogen based projects in steel, mobility and shipping sectors will be explored. At the same time, it is proposed to undertake pilot projects in other potential sectors like railways, aviation etc. R&D activities will be scaled up for continuous development of products. The second phase activities would **enhance penetration** across all potential sectors to drive deep **decarbonization of the economy**.

Project's opportunity:

Project gives an opportunity to India that consumption and import dependency on **fossil fuel** can **reduce by 5%** and emission of **co2 reduce by 1.6%.** Financial yr. 2021-22 Govt. spend Rs/14 lack cr. on imported fossil fuels. Mission can reduce Rs/ 69000/cr by 2030. Project can secure us from **Geo- Political- disturbance e.g. Russia – Ukraine war**, helpful in development of new economy as well as export market in the world. **COP 26** Glasgow targets net zero production by 2070 addressed by PM (**Panchamrit commitment**)

Independent India:

Pilot project in emerging end-use sectors and production pathways. In the next eight years, the production of green hydrogen is expected to bring with it an additional 125 gigawatts of renewable energy capacity and create six lakh jobs. Demand for green hydrogen in India is projected to rise over **four fold** by **2050**, according to the **NITI Aayog**. India strengthens his Export market- in future as **Europe Sangh** may import **10 MTPA by 2030**

Implementation Roadmap:

The strategies identified under the Mission will be implemented in a planned and coordinated manner. The phased approach of the Mission will enable taking up foundational activities like the regulatory framework and pilot projects while also creating demand and early deployment. Later phases will build on these activities and undertake green initiatives in new sectors of the economy. Activities will be taken up in close coordination with respective **stakeholders** to achieve the Mission objectives.

Govt. of India is planning to develop **best ecosystem** for production of green hydrogen. Need to Implementation of Policies on green hydrogen by the **State Govt**.. Govt. need to develop hub and valley for major production. Ready to move in **Single window clearance** system for different Pariyojnaye. Develop a clear and simple platform for export system for green hydrogen, ammonia and electrolisers etc**.**

Mission Implementation Timeline Year:

2022-23, 2023-24 ,2024-25, 2025-26, 2026-27, 2027-28, 2028-29 and 2029-30. The key actions and implementation timelines are summarized in the following heads: **Facilitate, Green Fertilizers, Sight, Pilots & Hubs, Regulations & Standards, R&D Consultation**

Expected Outcomes:

A National Portal for the submission of application, sanctioning of projects, their approval, disbursal of funds, monitoring of projects, dissemination of knowledge and awareness about the Mission and connecting stakeholders will be established during the early stages of the program and populated as the Mission progresses. Other Ministries/Departments will implement green hydrogen projects in respective sectors (including fertilizers, refining, natural gas, transport, shipping, steel etc.). Green Hydrogen projects will also create dedicated **Green Hydrogen cells** to coordinate the respective activities under the Mission. Efforts will be made to leverage existing institutions under administrative control of/funded by various Ministries/Departments like **Mop NG, DST, DSIR, ISRO**, etc. for implementation, testing, standardization, R&D activities etc. to ensure optimum utilization of resources.

India's Green Hydrogen **Production Capacity** Will Reach at Least **5 MMT Per Annum**

Renewable Energy Capacity **Addition of ~125 GW**

Create Over **6 lakh Full Time Jobs**

50 MMT per annum of CO2 Emissions are Expected to be Averted Over

₹8 lakh crore in Total Investments

CONCLUSION Green Hydrogen is likely to play a critical role in India's **energy transition,** particularly in decarbonization of hard to abate sectors. The National Green Hydrogen Mission is a step in this direction. The Mission is expected to facilitate deployment of Green Hydrogen ecosystem and create opportunities for **innovation and investments** across the Green Hydrogen value chain, translating into investments, jobs and **economic growth**. This transition towards a **cleaner alternative** hinges one pivotal action: accelerating India's decarbonization or **Ecofriendly** environment and aspire to become **hydrogen economy**. This Mission reflects as a **Game Changing Mission** and India's leap into mainstreaming a **new-age fuel**.

REFERENCES:

National portal of India https://www.india.gov.in> spotlight

A Green Hydrogen Economy for India https://www.ceew.in>sites>

Policy and Technology Imperatives to Lower Production Cost: T. Biswas, D. Yadav and A. G. Bhaskar. Dec. 2020.

Harnessing Green Hydrogen Report. Jun 2022 https://www.niti.gov.in>sites >

Geen-hydrogen https://www.iberdrola.com > sustainability >

Department of Science & Technology https://dst.gov.in > sites

India Country Status Report on Hydrogen and Fuel Cell.

Introduction to Hydrogen Technology By K.S.V. Santhanam, Roman J.Press, Massoud J. Miri.