



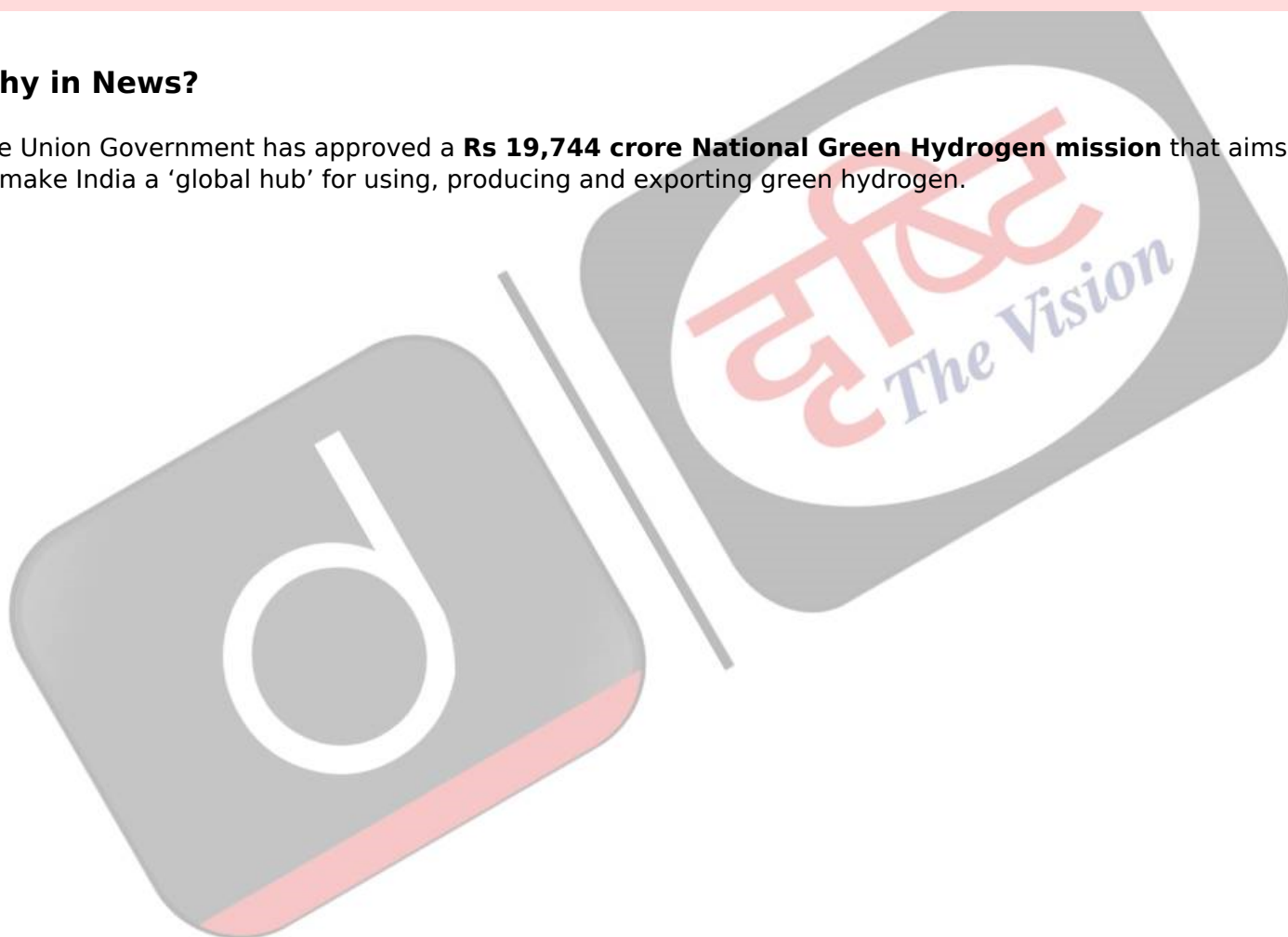
National Green Hydrogen Mission

Prelims: Green Hydrogen, Renewable Energy.

Mains: National Green hydrogen Mission and Related Challenges.

Why in News?

The Union Government has approved a **Rs 19,744 crore National Green Hydrogen mission** that aims to make India a 'global hub' for using, producing and exporting green hydrogen.



UNION CABINET APPROVES NATIONAL GREEN HYDROGEN MISSION

EXPECTED DELIVERABLES BY 2030

At least
5 MMT
GH₂ annual
production

60-100 GW
electrolyser capacity

125 GW
RE capacity for
GH₂ generation
and associated
transmission
network



Total outlay approved: ₹ 19,744 crore



Rs 1 lakh crore
import savings

50 MMT

CO₂ annual emissions averted



6 lakh
jobs



Rs 8 lakh crore
investment



moneycontrol

What is the National Green Hydrogen Mission?

▪ About:

- It is a program to **incentivise the commercial production of green hydrogen and make India a net exporter** of the fuel.
- The Mission will facilitate demand creation, production, utilization and export of Green Hydrogen.

▪ Sub Schemes:

- **Strategic Interventions for Green Hydrogen Transition Programme (SIGHT):**
 - It will **fund the domestic manufacturing of electrolyzers and produce green hydrogen.**
- **Green Hydrogen Hubs:**
 - States and regions capable of supporting large scale production and/or utilization of hydrogen **will be identified and developed as Green Hydrogen Hubs.**

▪ Objective:

- Developing green hydrogen production capacity of at least **5 MMT (Million Metric Tonne) per annum**, alongside adding **renewable energy capacity of about 125 GW (gigawatt) in India** by 2030.
- It aims to **entail over Rs 8 lakh crore of total investments** and is expected to generate six lakh jobs.
- It will also lead to **a cumulative reduction in fossil fuel imports by over Rs 1 lakh crore** and an abatement of nearly 50 MT of annual greenhouse gas emissions.

▪ Nodal Ministry:

- Ministry of New and Renewable Energy
- **Significance:**
 - It will help entail the **decarbonisation of the industrial, mobility and energy sectors**; reducing dependence on imported fossil fuels and feedstock; developing indigenous manufacturing capabilities; creating employment opportunities; and developing new technologies such as efficient fuel cells.
- **Potential:**
 - India has a **favourable geographic location and abundance of sunlight and wind for the production** of green hydrogen.
 - Green hydrogen technologies are **being promoted in sectors where direct electrification isn't feasible**.
 - Heavy duty, long-range transport, some industrial sectors and long-term storage in the power sector are some of these sectors.
 - The nascent stage of this industry **allows for the creation of regional hubs that export high-value green products and engineering**, procurement and construction services.

What are the Challenges?

- **In Nascent Stages Globally:**
 - Green hydrogen development is still in the nascent stages globally and while India can take the lead in being a major producer, **it doesn't have the necessary infrastructure yet** to execute all these intermediary steps.
- **Economic Sustainability:**
 - One of the biggest challenges faced by the industry for using hydrogen commercially is the **economic sustainability of extracting green hydrogen**.
 - For transportation fuel cells, hydrogen must be cost-competitive with conventional fuels and technologies on a per-mile basis.

What is Green Hydrogen?

- **About:**
 - Hydrogen is a **key industrial fuel that has a variety of applications including the production of ammonia (a key fertilizer)**, steel, refineries and electricity.
 - However, all of the hydrogen manufactured now is the **so-called 'black or brown' hydrogen because they are produced from coal**.
 - Hydrogen is the most abundant element in the universe. But pure, or the elemental hydrogen, is very scarce. It almost always exists in compounds like with oxygen to form H₂O, or water.
 - But when **electric current is passed through water, it splits it into elemental oxygen and hydrogen through electrolysis**. And **if the electricity used for this process comes from a renewable source** like wind or solar then the hydrogen thus **produced is referred to as green hydrogen**.
 - Colors attached to hydrogen indicate the **source of electricity used to derive the hydrogen molecule**. For instance, if coal is used, it is referred to as brown hydrogen.
- **Current Production:**
 - Green hydrogen currently accounts **for less than 1% of global hydrogen production** due to it being **expensive to produce**.
 - A kilogram of black hydrogen costs USD 0.9-1.5 to produce while grey hydrogen costs USD 1.7-2.3 and blue hydrogen can cost anywhere from USD 1.3-3.6. However, green hydrogen costs USD 3.5-5.5 per kg, according to a 2020 analysis by the Council for Energy, Environment and Water.
- **Need for Producing Green Hydrogen:**
 - Hydrogen is a great source of energy **because of its high energy content per unit of weight**, which is why it is used **as rocket fuel**.
 - Green hydrogen in particular is **one of the cleanest sources of energy with close to zero emission**. It can be used in **fuel cells for cars or in energy-guzzling industries like fertilizers** and steel manufacturing.
 - Countries across the world **are working on building green hydrogen capacity as it**

- can ensure energy security** and also help in cutting carbon emission.
- Green hydrogen has become a global buzzword, especially as the world is facing its biggest-ever energy crisis and the threat of **climate change** is turning into a reality.

What are the other Initiatives Related to Renewable energy?

- [Jawaharlal Nehru National Solar Mission \(JNNSM\).](#)
- [International Solar Alliance.](#)
- [PM- KUSUM.](#)
- [National Wind-Solar Hybrid Policy.](#)
- [Rooftop Solar Scheme.](#)

Way Forward

- There is a need to announce **incentives to convince enough users of industrial hydrogen to adopt green hydrogen.**
- India needs to develop **supply chains in the form of pipelines, tankers, intermediate storage and last leg distribution networks** as well as put in place an effective skill development programme to ensure that lakhs of workers can be suitably trained to adapt to a viable green hydrogen economy.
- India has the **potential to bring down the cost of green hydrogen by using low-cost renewable generating plants** and cost-curtailment experience gained through solar and wind reverse auctions.
 - Huge market **potential, owing to the young demography and thriving economy, will be a long-term benefit for the government** while pushing the application of hydrogen-based technologies.

For Infographic, [click here.](#)

UPSC Civil Services Examination Previous Year Question (PYQ)

Q. Hydrogen fuel cell vehicles produce one of the following as “exhaust” (2010)

- (a) NH_3
- (b) CH_4
- (c) H_2O
- (d) H_2O_2

Ans: (c)

Exp:

- **A fuel cell is a device that converts chemical energy (energy stored in molecular bonds) into electrical energy.**
- It uses Hydrogen gas (H_2) and Oxygen gas (O_2) as fuel and the products of the reaction in the cell are water (H_2O), electricity, and heat.
- This is a big improvement over internal combustion engines, coal-burning power plants, and nuclear power plants, all of which produce harmful byproducts. **Therefore, option (c) is the correct answer**

[Source: TH](#)

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