Green Hydrogen

Why in news?

Recently the Ministry of New and Renewable Energy has introduced pioneering scheme to advance green hydrogen adoption though pilot projects.

Green Hydrogen
• Hydrogen is an abundant, cheap and clean-burning which is described as the fuel of the future. • It 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).

What are the advantages of green hydrogen?

- **Reduction of emissions**- Green hydrogen, produced from renewable energy sources, offers a clean alternative to traditional fossil fuels it will significantly reduce harmful emissions such as carbon dioxide and particulate matter.
- **Curbing pollution**- The adoption of hydrogen fuel in transportation can play a crucial role in curbing pollution in Indian cities, which are grappling with severe air quality issues.
- **Meet climate goals**- India has committed to ambitious climate targets under the Paris Agreement and Panchamrit was adopted by India at COP26.

Panchamrit
• *By 2030*, India will • Reach its non-fossil energy capacity to 500 GW • Meet 50% of its energy requirements from renewable energy • Reduce the total projected carbon emissions by 1 billion tonnes • Reduce the carbon intensity of its economy by less than 45% • *By 2070*, India will achieve the target of Net Zero.

- **Reducing fossil fuel imports**- By developing a domestic green hydrogen industry, India can reduce its dependence on costly fossil fuel imports, enhance energy security, and diversify its energy sources, thereby bolstering its resilience to supply disruptions and price fluctuations in the global energy market.
- **Business opportunity**- The transition to green hydrogen presents a significant business opportunity for India, both domestically and internationally. emerging hydrogen economy, attracting investment, creating jobs, and driving economic growth in key sectors such as manufacturing, energy, and transportation.
- **Zero carbon emission**- Hydrogen Fuel Cell Vehicles utilize hydrogen through

combustion (similar to diesel and petrol cars) but emit no carbon

- **Energy efficiency**- The Hydrogen Fuel Cell Electric Vehicles convert hydrogen stored in a high-pressure tank into electricity via electrochemical reactions, research indicates that burning hydrogen in ICE vehicles is less energy-efficient than using it in fuel cells.

Steps taken by India to promote green hydrogen
• **Scheme for green hydrogen in transportation**- It validate technical feasibility and performance of green hydrogen as a transportation fuel. • **Pilot projects for mobility**- It will assess the practicality of green hydrogen as a fuel in buses, trucks and four wheelers that will help bridge the viability gap arising from the relatively higher capital costs associated with hydrogen powered vehicles. • **National green hydrogen mission**- It aims to position India as a global hub for green hydrogen production, usage and export, this would make India self-reliant in clean energy and inspire a global transition towards cleaner energy sources. • **SIGHT**- Strategic Interventions for Green Hydrogen Transition includes financial incentive mechanisms for manufacturing electrolysers, green hydrogen production to promote green hydrogen adoption. • **Green hydrogen hubs**- It will identify and develop regions capable of supporting large-scale green hydrogen production and utilization which will serve as green hydrogen hubs. • **Enabling policy framework-** The mission will waive interstate transmission charges for renewable energy in green energy production, facilitate renewable energy banking and time bound grant of open access and connectivity to facilitate green hydrogen production. • India's *1st Green Hydrogen plant in stainless steel sector* is recently inaugurated in Haryana, it will be the world's 1st off-grid Green Hydrogen plant for the stainless-steel industry and the world's 1st Green Hydrogen plant with rooftop and floating solar.

What are the challenges in green hydrogen?

- **High cost**- The high cost of producing green hydrogen, primarily due to the energy-intensive electrolysis process, remains a major barrier.
- **Logistical challenges**- Green hydrogen requires specialized infrastructure for storage and transportation, which adds to the overall cost and complexity of the hydrogen supply chain.
- **Infrastructure deficit**- The high cost of infrastructure deployment and limited consumer demand pose significant challenges.
- **Market dynamics**- Green hydrogen currently faces stiff competition from conventional fuels and battery electric vehicles (BEVs), particularly in terms of fuel costs and infrastructure availability.
- **Storage concerns**- The lack of suitable storage solutions for high-pressure hydrogen cylinders presents a significant technical barrier.
- **Safety concerns**- Hydrogen's flammability requires stringent safety standards and protocols for handling and storage, especially at refueling stations.
- **Stiff competition**- Advances in battery technology and the decreasing cost of electric vehicle batteries pose a long-term challenge to the viability of hydrogen fuel cell vehicles, particularly in the heavy-duty commercial vehicle sector.

References

1. Indian Express- Challenges and opportunities for green hydrogen
2. PIB- Pilot project in green hydrogen

