



# Green Hydrogen

## Why in News

According to the [International Renewable Energy Agency \(IRENA\)](#), hydrogen will make up 12% of the energy mix by 2050.

- The agency also **suggested that about 66% of this hydrogen used must come from water instead of natural gas.**
- Recently, IRENA has released the 'World Energy Transitions Outlook' Report.

## Hydrogen

- **Hydrogen** is one of the most abundant elements on earth for a **cleaner alternative fuel option.**
- **Type of hydrogen** depend up on the process of its formation:
  - **Green hydrogen** is produced by **electrolysis of water using renewable energy (like Solar, Wind)** and has a **lower carbon footprint.**
    - Electricity splits water into hydrogen and oxygen.
    - **By Products** : Water, Water Vapor.
  - **Brown hydrogen** is produced **using coal** where the emissions are released to the air.
  - **Grey hydrogen** is produced from **natural gas** where the associated **emissions are released to the air.**
  - **Blue hydrogen** is produced from natural gas, where the **emissions are captured** using carbon capture and storage.
- **Uses:**
  - Hydrogen is an energy carrier, not an energy source and can **deliver or store a tremendous amount of energy.**
  - It can be used in [fuel cells](#) to generate electricity, or power and heat.
    - Today, hydrogen is most commonly used in petroleum refining and fertilizer production, while transportation and utilities are emerging markets.
  - Hydrogen and fuel cells can provide energy for use in diverse applications, including distributed or combined-heat-and-power; backup power; systems for storing and enabling renewable energy; portable power etc.
  - Due to their high efficiency and **zero-or near zero-emissions operation**, hydrogen and fuel cells have the potential to [reduce greenhouse gas emission](#) in many applications.

## Key Points

- **Current Status Worldwide:**
  - **Less than 1% of hydrogen produced is green hydrogen.**

- Manufacturing and **deployment of electrolyzers will have to increase** at an unprecedented rate by 2050 from the current capacity of 0.3 gigawatts to almost 5,000 gigawatts.

#### ▪ **Indian Scenario:**

- **Consumption of Hydrogen: India consumes about six million tonnes** of hydrogen every year for the production of ammonia and methanol in industrial sectors, including fertilisers and refineries.
  - This could **increase to 28 million tonnes by 2050**, principally due to the rising demand from the industry, but also due to the expansion of transport and power sectors.
- **Cost of Green Hydrogen:** By 2030, the cost of green hydrogen is expected to compete with that of **hydrocarbon fuels** (coal, Crude Oil, natural gas).
  - The price will decrease further as production and sales increase. It is also projected that India's hydrogen demand will increase five-fold by 2050, with 80% of it being green.
- **Exporter of Green Hydrogen:** India will become a net exporter of green hydrogen by 2030 due to its cheap renewable energy tariffs.

#### ▪ **Benefits of Using Green Hydrogen for India:**

- Green hydrogen **can drive [India's transition to clean energy](#)**, combat [climate change](#).
  - Under the [Paris Climate Agreement](#), India pledged to reduce the emission intensity of its economy by 33-35% from 2005 levels by 2030.
- It will **reduce import dependency on fossil fuels**.
- The localisation of electrolyser production and the development of green hydrogen projects **can create a new green technologies market in India worth \$18-20 billion and thousands of jobs**.

#### ▪ **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 **Ministry of New and Renewable Energy (MNRE)** has circulated a draft cabinet note to **establish a hydrogen ecosystem** in the country.
- 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.

#### ▪ **Challenges:**

- **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.
- **High Costs and Lack of Supporting Infrastructure:**
  - **Fuel cells** which convert hydrogen fuel to usable energy for cars, are still expensive.
  - The hydrogen station infrastructure needed to refuel hydrogen fuel cell cars is still widely underdeveloped.

#### ▪ **Step Taken:**

- The Union Budget for 2021-22 has announced a [National Hydrogen Energy Mission](#)

**(NHM)** that will draw up a road map for using hydrogen as an energy source.

◦ **Indian Initiatives for Renewable Energy:**

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

## Way Forward

- **Set a national target for green hydrogen and electrolyser capacity:** A phased manufacturing programme should be used to build a vibrant hydrogen products export industry in India such as green steel (commercial hydrogen steel plant).
- **Implement complementary solutions that create virtuous cycles:** For example hydrogen infrastructure can be set up for refueling, heating and generating electricity at airports.
- **Decentralised Production:** Decentralised hydrogen production must be promoted through open access of renewable power to an electrolyser (which splits water to form H<sub>2</sub> and O<sub>2</sub> using electricity).
- **Providing Finance:** Policymakers must facilitate investments in early-stage piloting and the research and development needed to advance the technology for use in India.

**Source: DTE**

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