

Boosting Green Hydrogen

Syllabus- GS 3: Conservation, Environmental Pollution and Degradation

INTRODUCTION:

- Prime Minister Narendra Modi recently announced that India would aim for **net-zero carbon emissions** by **2070**. The announcement was given credence by the country's solar achievements since 2015.
- India is the **only major economy whose policies and actions are on track to limit global average temperature rise below 2°C above pre-industrial levels**, as envisioned in the Paris Agreement.

ABOUT GREEN HYDROGEN:

- Hydrogen, when produced by electrolysis using renewable energy (like Solar, Wind), is known as Green Hydrogen.

- It is produced by splitting water into hydrogen and oxygen using an electrolyzer that may be **powered by electricity generated from renewable energy** sources.

- The hydrogen produced is coded with a colour, depending on the method of its production. While **hydrogen generated through renewable energy sources is green**, it is **blue when the carbon generated from the process is captured and stored** without dispersing it in the atmosphere. When the **carbon is not captured**, the generated hydrogen is labelled grey.

- Thus green Hydrogen has no carbon footprint.

Five shades of hydrogen

Green	Blue	Turquoise	Grey	Brown
Electricity from renewable sources is used to electrolyse water H_2O and separate the hydrogen H_2 and oxygen O_2 .	Produced using natural gas via "steam reformation"; most of the greenhouse gas emissions are captured and stored.	Produced using natural gas via "pyrolysis" by separating methane into hydrogen H_2 and solid carbon dioxide CO_2 .	Produced using natural gas via "steam reformation", but with no carbon capture and storage.	Produced using coal instead of natural gas, but with no carbon capture and storage; this remains the cheapest form.

USES OF HYDROGEN:-

- Hydrogen is an energy carrier, which can **store a tremendous amount of energy**. Hydrogen 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.

National Hydrogen Energy Mission

- The Union Budget for 2021-22 has announced a **National Hydrogen Energy Mission (NHM)** to use hydrogen as an energy source, especially in transportation sector.
- It focuses on **generation of hydrogen from green power resources**. Which will link India's growing renewable capacity with the hydrogen economy.
- The usage of hydrogen will on one hand help India in achieving its emission goals under the **Paris Agreement**, on the other will also **reduce import dependency on fossil fuels**.
- Hydrogen fuel is a zero-emission fuel burned with oxygen. It can be used in **fuel cells or internal combustion engines**. It is also used as a **fuel for spacecraft propulsion**.

- India consumes about six million tonnes of hydrogen every year for the production of ammonia and methanol in industrial sectors, including fertilisers and refineries. The hydrogen used is mostly **grey hydrogen** (produced **using coal** where the emissions are released to the air).

INDIA HAS A HEAD START

- As of now, 75% of India's energy demand is met by coal and oil, including imports. This is expected to increase. Therefore, the **synergy between renewable energy and green hydrogen must be tapped to tackle the dependence on fossil fuel and take greater advantage of India's solar capacity**.
- With India's solar capacity increasing nearly 3,000 times in less than a decade, the cost of solar energy has reached a low of **Rs. 2 per kWh**. This gives India a unique head start in scaling up the use of green hydrogen.
- India's current **grey hydrogen** production is **six million tonnes per annum**, which is around **8.5% of global annual production**. India should replace this with green hydrogen and **reduce dependence on imported ammonia**.
- India should aim to **produce 4-6 million tonnes of green hydrogen per annum** by the end of the decade and export at least 2 million tonnes per annum. India has already taken the first step with the Indian Oil Corporation floating a global tender to set up two green hydrogen generations units at the **Mathura** and **Panipat** refineries.

CONCLUSION

At present, more than 30 countries have hydrogen road maps and over 200 largescale hydrogen projects across the value chain. If all the projects come to fruition, total investments will reach \$300 billion in spending by 2030. Governments worldwide have committed to more than \$70 billion in public funding, to develop a hydrogen economy. With its abundant and cheap solar energy, India has the upper hand to tap into these investments and lead global efforts in transitioning to green hydrogen.