

National Green Hydrogen Mission: India's Plan to Develop Green Hydrogen

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Paper - III
(Environment)

The Union Cabinet on Wednesday approved a ₹19,744 crore National Green Hydrogen mission that aims to make India a 'global hub' for using, producing and exporting green hydrogen.

The Union Cabinet has cleared a ₹19,744 crore National Green Hydrogen (NGH) mission that aims to facilitate the production of hydrogen from renewable energy. Hydrogen is an essential industrial fuel that has a range of uses from producing ammonia, making steel and cement, to powering fuel cells that can run buses and cars. However, the cheapest way to manufacture this is to rely on fossil fuel such as coal and natural gas and this produces carbon emissions. The concerns over global warming and the gradual but steady embrace of alternative fuels have stoked the world's interest in producing hydrogen from renewable energy sources such as solar and wind energy.

What Is Green Hydrogen?

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 produced from coal. Grey hydrogen is produced from natural gas while 'Blue' hydrogen is from fossil fuel sources where the ensuring carbon emitted is captured via carbon-capture processes. Green hydrogen is when hydrogen is produced via electrolysis, the splitting of water into hydrogen and oxygen with electricity generated from renewable energy sources such as solar or wind and its byproduct water, water vapor. This is the most environmentally sustainable way of producing hydrogen.

What Is The Caveat?

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 \$0.9-1.5 to produce while grey hydrogen costs \$1.7-2.3 and blue hydrogen can cost anywhere from \$1.3-3.6. However, green hydrogen costs \$3.5-5.5 per kg, according to a 2020 analysis by the Council for Energy, Environment and Water.

What Is The National Green Hydrogen Mission?

The intent of the mission is to incentivise the commercial production of green hydrogen and make India a net exporter of the fuel. The mission has laid out a target to develop green hydrogen production capacity of at least 5 MMT (Million Metric Tonne) per annum. This is alongside adding renewable energy capacity of about 125 GW (gigawatt) in the country. This will 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.

By 2030, the Centre hopes its investments will bring in investments worth ₹8 trillion and create over six lakh jobs. Moreover, about 50 MMT per annum of CO₂ emissions are expected to be averted by 2030. As per its Nationally Determined Contribution (NDC) to meeting the goals of the Paris Agreement, India has committed to reduce emissions intensity of its GDP by 45% by 2030, from 2005 levels.

How Will The Mission Support Green Hydrogen Production?

The Mission will “facilitate demand creation, production, utilisation and export of Green Hydrogen,” says a press release from the Ministry for New and Renewable Energy. There are two umbrella sub-missions under the programme. The first is the Strategic Interventions for Green Hydrogen Transition Programme (SIGHT), that will fund the domestic manufacturing of electrolyzers and produce green hydrogen. The second is to support pilot projects in emerging end-use sectors and production pathways. States and regions capable of supporting large scale production and/or utilisation of hydrogen will be identified and developed as Green Hydrogen Hubs. According to the Ministry, ₹17,490 crore would be for the SIGHT

Hydrogen:

- Hydrogen is the first and lightest element on the periodic table. Since hydrogen weighs less than air, it tends to rise up in the atmosphere and is therefore rarely found in pure form. Hydrogen is a non-toxic, nonmetallic, odorless, tasteless, colorless, and highly flammable diatomic gas at standard temperature and pressure.
- Hydrogen is a cleaner alternative to methane, also known as natural gas. It is the most abundant chemical element, contributing 75% of the mass of the universe.

The future of hydrogen

Hydrogen can be used to power vehicles, generate electricity, power the industry, and heat our homes and businesses. It could make a huge difference in our carbon emissions and will be critical to achieving net zero.

Why is hydrogen important as a future clean energy source?

- Fuel is a chemical that can be ‘burnt’ to provide useful energy. Burning normally means that chemical bonds between the elements in the fuel are broken and the elements chemically combine with oxygen (often from the air).
- Methane is the main constituent of 'natural gas' from oil and gas fields. We've continued to use natural gas because it's a readily available resource, it's cost-effective and it's a cleaner alternative to coal, the dirtiest fossil fuel that we historically relied on for heating and to generate electricity.
- When natural gas is burnt, it provides heat energy. But a waste product alongside the water is carbon dioxide, which when released into the atmosphere contributes to climate change. Burning hydrogen does not release carbon dioxide.

programme, ₹1,466 crore for pilot projects and hydrogen hubs, ₹400 crore for research and development and ₹388 crore for other parts of the mission.

What Are The Challenges Ahead?

Several major industrial houses have announced plans to facilitate India's adoption of green hydrogen. However, they are all premised on India being able to access a reliable stream of components, upgrading the manufacturing and skill levels of its small and medium manufacturing enterprises and developing a transmission network that can supply the hydrogen produced from supply-spots to industrial centres across the country. Many advanced economies have also announced plans and policies to develop such an economy and given their advanced industrial infrastructure, can steal a march over India.

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. It also needs to announce incentives to convince enough users of industrial hydrogen to adopt green hydrogen. It 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.

Why are colored words given to a colorless gas?

- Green hydrogen, blue hydrogen, brown hydrogen and even yellow hydrogen, turquoise hydrogen and pink hydrogen. They are essentially color codes, or nicknames, used to differentiate between types of hydrogen within the energy industry.
- Depending on the type of products used, different colors are assigned to hydrogen. But there is no universal naming convention and these color definitions can change over time and even between countries.

Is hydrogen already being used as a fuel?

- Yes. There are already cars that run on hydrogen fuel cells. In Japan there are 96 public hydrogen refuelling stations, allowing you to fill up just as you would with petrol or diesel and in the same time frame as a traditional fuel car. Germany has 80 of these hydrogen stations and the United States is third with 42 stations.
- Hydrogen is also an exciting lightweight fuel option for road, air and shipping transportation. The international delivery company DHL already has a fleet of 100 'H2 panel vans', capable of travelling 500kms without refuelling.

Hydrogen as an alternative green fuel in India and other countries?

- India has set itself a target of achieving net zero by 2070, which means we need to start preparing to transition our gas use in the coming years. One of the ways we propose to do this is through hydrogen.
- In the UK, the current National Transmission System (NTS) transports natural gas across the country. NTS is a unique and complex network that uses steel pipes to transport natural gas at high pressure.
- In the USA, TheHyGrid Project, one of the first and largest clean hydrogen projects located on Long Island, was launched in 2021.

Net Zero

- Net zero refers to the balance between the amount of greenhouse gas produced and the amount removed from the atmosphere. That is, net zero means achieving a balance between greenhouse gases released into the atmosphere and greenhouse gases taken out of the atmosphere. Net zero is important because it is the best way to combat climate change by reducing global warming.
- From countries and companies to individuals, tackling climate change is top of the agenda and one way to help us do this is to reach net zero. The United Kingdom was the first major economy in the world to set a legally binding goal of being net zero by 2050.

Expected Question

Que. With reference to the National Green Hydrogen Mission, consider the following statements -

1. The objective of this mission is to make India a 'Global Hub' for the use, production and export of green hydrogen.
2. Under this mission, a target has been set to develop green hydrogen production capacity of at least 5 MMT (million metric tonnes) per year.

Which of the statements given above is/are correct?

- (a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

Answer : C

Mains Expected Question & Format

Que.: What is Green Hydrogen? State its importance and throw light on the "National Green Hydrogen Mission" started by the Government of India.

Answer Format :

- ❖ Explain what is green hydrogen.
- ❖ Explain the importance of Green Hydrogen and 'National Green Hydrogen Mission'.
- ❖ Give a balanced conclusion stating green hydrogen as the fuel of the future.

Note: - The question of the main examination given for practice is designed keeping in mind the upcoming UPSC mains examination. Therefore, to get an answer to this question, you can take the help of this source as well as other sources related to this topic.