

How India's push for green hydrogen could help clean up the whole world

Hydrogen is the cleanest fuel, but almost all of it is locked up with other elements in the form of water, hydrocarbons, etc. The current commercial processes of extracting hydrogen pollute the atmosphere, but 'green hydrogen' is set to change that. And with the recently approved National Green Hydrogen Mission, India aims to achieve leadership in this field by 2030. **Sanjay Dutta** explains

What is green hydrogen?

Hydrogen produced by electrolysis of water, using electricity from solar or wind power projects, is designated 'green' hydrogen – or increasingly, just GH2.

Why is GH2 seen as the 'fuel of the future'?

It is considered the cleanest fuel because its production or consumption does not leave any carbon trail. But it requires large amounts of energy to produce.

What do hydrogen's colour codes signify?

The colour codes indicate the source. Grey hydrogen extracted from natural gas is the most common type in use at present. Brown hydrogen is produced through gasification of coal. This process emits greenhouse gases as a byproduct. Blue hydrogen is tapped from greenhouse gases locked up in carbon capture and storage facilities.

What are the applications of hydrogen?

At present hydrogen use is limited to large industries, such as oil refineries, steel, fertilisers and bulk chemicals. A major application will be for blending with CNG and PNG, to clean up their emissions.

When was the GH2 mission launched?

PM Narendra Modi first laid out the plan at the third renewable energy investors meet in November 2020. Finance minister Nirmala Sitharaman articulated the roadmap by announcing the mission in her Budget speech on February 1, 2021. The power ministry on February 17, 2022 notified GH2 and green ammonia policy enablers. Finally, the Cabinet approved an incentive package to seed the market on January 4 this year.



Price Challenge | Pricing will be key to green hydrogen's viability. It costs about ₹300/kg (\$3.6), as against grey hydrogen, whose price has risen from ₹130/kg (\$1.6) to ₹200-250/kg (\$2.4-\$3) in the wake of the Ukraine conflict. The government plans to bring GH2's price down to about ₹130/kg by 2030

\$2 billion | Amount India intends to spend to develop a GH2 ecosystem

60GW | India's likely GH2 capacity by 2030 would be largest in the world

₹1 lakh crore | Potential savings from reduced oil and gas imports once

GH2 takes off

3.6 gigatonnes | Projected reduction in CO2 emissions till 2050 if GH2 is adopted

10% | India's estimated share in global hydrogen demand by 2050

What is the Hydrogen Mission's aim?

To strengthen India's pole position in climate action and energy transition as well as reduce dependence on energy imports. GH2 can potentially lead to savings of Rs 1 lakh crore in India's energy import bill and cut out 68% of expensive gas shipments by replacing traditional industrial fuel/feedstock. The government sees India meeting 10% of global GH2 demand by 2030.

How much does hydrogen cost?

Prices of hydrogen vary according to source, market conditions and currency rates. GH2 currently costs Rs 300/kg. The average cost of grey hydrogen extracted from natural gas – the commonly used form of hydrogen – averaged Rs 130/kg but has been Rs 200-250/kg since

the Ukraine conflict.

How much incentive is India offering to develop a GH2 ecosystem?

A little over \$2 billion. Most of this money will go towards supporting 15GW (gigawatts) of domestic electrolyser manufacturing capacity by 2030. By then the government believes India will have a capacity of 60GW, expected to be the largest in the world. The remaining funds will be used for strategic intervention to help projects.

How many other countries are promoting GH2?

Official documents indicate 25 countries are chasing the GH2 dream with support from their governments. Germany is offering the highest support at \$10.3 billion, followed by the US with \$9 billion, France \$8.2

billion and the European Union \$4.3 billion.

Which Indian companies are investing in GH2 projects?

State-run IndianOil and GAIL have announced commercial scale GH2 plans. NTPC this week became the first entity to blend PNG with GH2. GAIL and IOC have pilots for blending CNG with grey hydrogen. Oil India Ltd is running hydrogen buses in Kaziranga National Park, Assam. In the private sector, Reliance Industries Ltd, Adani Group and ACME Group have mega-size plans for manufacturing electrolyzers, as well as GH2 and green ammonia units.

What are the drawbacks of hydrogen?

Hydrogen is highly inflammable due to its high energy density and is risky to transport or store. This means either GH2 plants must be set up near consumption sites and green power wheeled from afar, or the gas must be converted into liquid ammonia for transporting. Both options impact the overall project economics.

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