

4. 3rd International Conference on Green Hydrogen – Economy

At the 3rd International Conference on Green Hydrogen, the Union Minister for New & Renewable Energy highlighted the National Green Hydrogen Mission (NGHM) as a catalyst for India's clean energy transition, job creation, and global leadership in green hydrogen. Launched by the Government of India in January 2023, the National Green Hydrogen Mission is led by the Ministry of New & Renewable Energy (MNRE). It is a flagship clean-energy initiative designed to transform India's energy landscape and support the long-term goals of energy independence by 2047 and net-zero emissions by 2070. The Mission envisions India becoming a global hub for green hydrogen production, consumption, and export, leveraging its vast renewable energy potential.

Mission Outcomes – What the Mission Seeks to Achieve

- 1. Large-Scale Green Hydrogen Production Capacity** – The Mission targets the creation of 5 million tonnes (5 MTPA) of green hydrogen production capacity by 2030, with associated renewable energy capacity of 125 GW. This will significantly reduce reliance on imported fossil fuels such as LNG, crude oil, and ammonia.
- 2. Industrial Decarbonization** – Green hydrogen is expected to replace grey hydrogen (currently produced using natural gas), especially in energy-intensive, hard-to-abate sectors. Sectors like steel, fertilizers, refineries, ammonia, methanol, shipping, and heavy mobility will gradually adopt green hydrogen-based technologies.
- 3. Cost Reduction and Domestic Technology Development** – The Mission aims to reduce the cost of green hydrogen to \$1 per kg in the long term, making India globally competitive. This includes scaling up domestic manufacturing of electrolyzers, and driving innovation in storage, transport, and end-use technologies.
- 4. Job Creation and Economic Growth** – According to government estimates, the Mission may generate 6 lakh+ jobs, especially in renewable energy, electrolyzers, transport, engineering, and R&D.
- 5. Export Leadership** – India aims to become a major exporter of green hydrogen, green ammonia, and green methanol to markets in Europe, Japan, South Korea, and the Middle East. This aligns with global commitments to green supply chains and sustainable fuels.
- 6. Reduction in Carbon Emissions** – By displacing fossil fuels, the Mission is expected to cut 50 million tonnes of CO₂ emissions annually by 2030.

Key Objectives

- 1. Reduce Fossil Fuel Dependence** – Green hydrogen provides an alternative clean fuel for sectors that currently rely heavily on coal and natural gas. It supports India's broader goal of reducing crude oil imports and improving energy security.
- 2. Enable Green Hydrogen Exports** – Establishing ports with green hydrogen export facilities, specialized shipping terminals, and green ammonia pipelines. Attracting global investment from countries seeking long-term green energy supply chains.
- 3. Stimulate Innovation and Economic Growth** – Incentivizing start-ups, advanced materials development, electrolyser innovation, and domestic manufacturing capabilities. Funding R&D centers and innovation clusters in hydrogen technologies.
- 4. Promote Green Hydrogen Hubs** – Identification of Green Hydrogen Hubs across states such as Gujarat, Rajasthan, Tamil Nadu, Karnataka, and Odisha. These hubs will integrate renewable energy plants, electrolyzers, manufacturing clusters, and logistics networks.
- 5. Strengthen Public-Private Partnerships** – Encouraging participation of industry leaders, PSUs (NTPC, IOCL, ONGC), global investors, and renewable energy companies. Promoting technology transfer and collaborative research.

Challenges

- 1. High Production Costs** – Electrolyzers are expensive and mostly imported. Renewable electricity—required to create green hydrogen—makes up nearly 70–80% of production cost, keeping prices high.
- 2. Infrastructure Gaps** – India lacks a dedicated hydrogen transportation network (pipelines, cryogenic

tanks). Hydrogen refueling stations for mobility are limited to pilot projects. Large-scale storage solutions like salt cavern storage are still under exploration.

3. Technology Immaturity – Many end-use technologies in steel, shipping, trucking, and fertilizers remain in trial or demonstration stages. Electrolyser technologies like PEM, alkaline, SOEC require scaling up and cost reduction.

4. Complex Policy Coordination – Green hydrogen involves multiple ministries—MNRE, MoP, MoEFCC, MoCI, MoHUA, MoPNG, MoCA—all requiring aligned policies. Land acquisition, transmission network expansion, water access, and permitting remain cumbersome.

5. Strong Global Competition – EU's REPowerEU strategy, the US Inflation Reduction Act (IRA), and China's dominance in electrolyser manufacturing create a competitive global landscape. India must balance cost competitiveness with technology leadership.

6. Water Availability Concerns – Producing 1 kg of hydrogen requires 9 liters of demineralized water, raising sustainability concerns in water-stressed areas. Requires investment in wastewater recovery and desalination.

Way Ahead – Strategic Priorities for India

1. Scale Domestic Electrolyser Manufacturing – Promote indigenous manufacturing under PLI schemes, local R&D, and technology standardization. Aim to reduce costs and dependency on foreign imports.

2. Expand Green Hydrogen Pilot Projects – Implement early-scale projects in steel plants (green steel), refineries, fertilizer units, and long-haul mobility. Use results to refine standards and policy frameworks.

3. Build Hydrogen Infrastructure – Develop hydrogen pipelines, refueling stations, port terminals, and salt cavern storage. Create integrated Green Hydrogen Hubs for efficient supply chains.

4. Boost R&D and Innovation – Invest in advanced electrolyser technologies (PEM, SOFC, AEM). Support research in hydrogen turbines, hydrogen-compatible steel, and green ammonia shipping.

5. Ensure Policy Coherence – Create a unified national policy framework covering energy, industry, transport, water, and finance. Simplify regulations for land, transmission, and water allocation.

6. Leverage Renewable Energy Surplus – States like Gujarat, Rajasthan, and Tamil Nadu have high solar-wind potential. Integrating renewable energy with hydrogen production will lower costs and improve reliability.

7. Align with Global Markets – Develop international partnerships with the EU, Japan, Korea, and Middle East for long-term export contracts. Establish internationally recognized certification for "green" hydrogen purity and origin.

Conclusion

The National Green Hydrogen Mission is India's long-term strategy to decarbonize industries, reduce fossil fuel imports, and emerge as a global leader in clean energy. By focusing on cost reduction, infrastructure, innovation, and strong policy alignment, India can position itself at the forefront of the global green hydrogen economy.

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