The Green Energy Revolution Needs You!

Employment Landscape in the Green Hydrogen Ecosystem

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As the world intensifies its response to climate change, green hydrogen is gaining recognition as a vital component of the clean energy transition. In India, increased investments and strong policy backing are accelerating growth in this emerging sector, driving a sharp rise in the need for skilled talent. For students, graduates, and professionals, the green hydrogen industry offers more than employment— it provides an opportunity to build meaningful, resilient careers that contribute to a sustainable future.

Research & Development (R&D): Fuel for Innovation: At the heart of the green hydrogen revolution lies cutting-edge research and innovation. R&D professionals are responsible for developing new technologies that make green hydrogen production more efficient, affordable, and scalable. From designing high-efficiency electrolysers to developing robust hydrogen storage systems and advanced fuel cells, this space is ideal for those who thrive on experimentation, problem-solving, and long-term impact.

What to Study: B.Tech/M.Tech in Chemical Engineering, Mechanical Engineering, Materials Science, or a Ph.D. in Physics or Renewable Energy.

Where to Study in India:

- IIT Bombay, IIT Madras, and IIT Delhi (Specialisations in Energy Science and Engineering)
- IISc Bangalore (Department of Sustainable Energy)
- CSIR Institutes (e.g. NCL Pune, CECRI Karaikudi)

Key Employers: CSIR labs, DRDO, IITs, Reliance New Energy, Cummins, Siemens, and other local and global clean-tech firms.

2. Engineering & Project Development: Building the Backbone: Turning green hydrogen concepts into operational reality requires multi-disciplinary engineering expertise. Professionals in this segment design, plan, and manage the construction of hydrogen production facilities, including integration with solar and wind farms, pipelines, storage tanks, and refuelling stations. Project managers ensure timely, cost-effective, and safe delivery of complex infrastructure.

What to Study: B.Tech/M.Tech in Mechanical, Electrical, Civil, or Chemical Engineering, Project Management certifications (e.g., PMP)

Where to Study:

- NITs and IITs
- Anna University, VIT, BITS Pilani (Strong focus on renewable energy infrastructure)
- NICMAR (for infrastructure and project management)

Key Employers: NTPC, Adani New Industries, Tata Power, ReNew Power, BPCL, GAIL, global EPC firms like L&T, Technip, and Worley etc.

3. Manufacturing & Operations: Where Tech Meets the Floor: As India scales up hydrogen technology deployment, it needs a robust manufacturing and operations workforce. These roles involve the assembly of electrolysers, monitoring fuel cell production, plant maintenance, safety checks, and process optimisation. With the rise of hydrogen clusters and hubs, this segment promises thousands of job opportunities at the ground level.

What to Study: Diplomas in Mechanical, Electrical, or Production Engineering; ITI certifications in plant operation, welding, or instrumentation

Where to Study:

- Government and Private ITIs
- Polytechnics across India
- NSDC-accredited training partners

Key Employers: IOCL, BHEL, MSMEs, renewable manufacturing startups, and global hydrogen equipment suppliers.

4. Policy, Regulation & Certification: Shaping the Rules of the Game: The success of green hydrogen hinges on supportive policies, robust certification schemes, and safety regulations. Experts in this space work with governments, international bodies, and think tanks to develop hydrogen standards, emissions benchmarks, subsidies, and public-private partnerships. This field blends science, law, and diplomacy.

What to Study: Degrees in Public Policy, Environmental Law, Climate Studies, or International Relations.

Where to Study:

- TERI School of Advanced Studies (Delhi)
- Indian School of Public Policy
- National Law School, Bangalore (Environmental Law)

Key Employers: MNRE, NITI Aayog, Bureau of Indian Standards, UNDP, IRENA, energy law firms and policy research institutes.

5. Finance, Investment & ESG: Fuel for Growth: Hydrogen projects involve capital-intensive infrastructure and long investment timelines. Professionals in this area handle project finance, green bonds, carbon trading, ESG compliance, and sustainability-linked lending. It's perfect for those who enjoy working at the nexus of finance, sustainability, and strategy.

What to Study: B.Com, BBA, MBA in Finance or Sustainability, Chartered Financial Analyst (CFA), ESG certification (e.g., GRI Standards, SASB)

Where to Study:

- IIM Ahmedabad, IIM Bangalore (MBA

Continued on page 2

Continued from page 1

From Vision to Execution ...

gas in high-temperature processes and act as a feedstock in chemical production, significantly reducing emissions.

Transport: For long-haul transport— like shipping, aviation, and heavy-duty trucking— electrification is often impractical. Green hydrogen and its derivatives (like ammonia or e-fuels) offer a clean alternative for decarbonising these modes of transport.

Enabling Renewable Energy Integration: Energy Storage: Hydrogen acts as a long-duration energy storage medium, converting surplus renewable electricity into hydrogen during off-peak periods and reusing it later for power generation or fuel. This helps stabilise the grid and balance supply-demand fluctuations.

Grid Balancing: Green hydrogen can be used in fuel cells or turbines to generate electricity when renewable output drops, making power systems more resilient and less dependent on fossil fuels.

Supporting Energy Security and Diversification: Green hydrogen allows countries to reduce reliance on imported fossil fuels by tapping into domestic renewable resources. This diversification enhances energy sovereignty while lowering carbon intensity.

Enabling the Circular Carbon Economy: Green hydrogen can be used to produce synthetic fuels or combined with captured CO_2 to create low-carbon chemicals and fuels, closing the loop in industrial carbon use.

Global Trade and Economic Opportunity: As international demand for clean hydrogen grows, countries with abundant renewable energy— like India, Australia, and the Middle East— can become key exporters of green hydrogen or its derivatives, fostering low-carbon economic growth.

The National Green Hydrogen Mission: Key Highlights

Unveiled on January 4 2023, the National Green Hydrogen Mission (NHM) represents a pivotal development in India's evolving energy strategy. Backed by an initial allocation of Rs. 19,744 crore (approximately US$ 2.37 billion), the mission aims to position India as a leading global player in the production, utilisation, and export of green hydrogen. More than just a domestic energy solution, the NHM is a strategic initiative to tap into the rapidly growing global hydrogen market.

The mission aligns with India's broader goals of achieving energy self-reliance and reducing its dependence on imported fossil fuels, which currently meet over 40% of the country's primary energy requirements. By advancing green hydrogen, India seeks not only to decarbonise energy-intensive sectors but also to create significant economic value, including the generation of over 600,000 jobs. Leveraging its vast solar and wind energy resources, India targets the production of at least 5 million metric tonnes (MMT) of green hydrogen per year by 2030, with the potential to double that capacity if global demand continues to rise.

A Phased Roadmap to a Hydrogen Economy

The NHM adopts a phased implementation strategy to build a comprehensive hydrogen ecosystem.

Phase I (2022–2026) concentrates on generating demand and enhancing domestic electrolyser manufacturing. Initial deployment will focus on sectors such as oil refineries, fertilisers, and urban gas systems. Pilot initiatives in steel production, heavy transport, and shipping will be launched, alongside the introduction of regulatory standards to guide the sector's early development.

Phase II (2026–2030) anticipates that the cost of green hydrogen will reach parity with fossil-based alternatives in key applications, paving the way for commercial-scale adoption. Expansion into newer sectors, including railways and aviation, will be supported through pilot projects and advanced R&D efforts targeting cost reduction, efficiency, and technology readiness.

To complement production and usage, the mission outlines the development of essential infrastructure— hydrogen hubs, refuelling stations, and pipelines— that will facilitate the storage, distribution, and scaling of green hydrogen. A strong emphasis is placed on research and innovation, particularly in improving electrolysis and storage technologies, ensuring that India remains competitive as the hydrogen economy matures.

Recent Developments in India's Hydrogen Strategy

- In August 2025, Deendayal Port Authority commissioned a fully Indian-developed **1 MW** green hydrogen plant (expandable to **10 MW**), expected to yield **140 tonnes**/year, serving buses and port infrastructure— marking India's first port-based hydrogen facility.
- In May 2024, GAIL inaugurated India's first green hydrogen facility in Madhya Pradesh, producing up to **4.3 tonnes/** day at 99.999% purity, initially blending hydrogen with natural gas and later supplying nearby retail users.
- Indian refiners, notably Indian Oil Corp., plan hydrogen investments worth Rs. 2 trillion, including a flagship 10,000 tonnes per anum plant due for commissioning by the end of 2027 in Panipat— positioned to substantially reduce emissions in refinery operations.
- A recent JV between BPCL and Sembcorp targets green hydrogen, ammonia and port decarbonisation in Odisha— strengthening India's renewable energy commitments as it aims for **500 GW** clean capacity by 2030.
- In July 2025, the Ministry of Science & Technology awarded US$ 7.8 million to four innovation cluster projects, enhancing R&D around hydrogen production, storage, and utilisation— the largest wave of smaller-scale project funding under NHM.
- Industry is mobilising behind MSMEs as hydrogen enablers: Hyundai Motors and IIT Madras are working with Tamil Nadu support to localise electrolyser manufacturing and fuel-cell development, bolstering India's domestic hydrogen ecosystem.
- At the NextGen Summit 2025, experts reiterated that cost reduction, technology synergy, and demand creation remain paramount to ensuring scalability and sustainability of hydrogen adoption in India.
- Draft rules launched in 2025 propose a threshold-based green hydrogen certification **(≤ 2 kg CO_2/kg H_2)**, surpassing the EU's standard of **3.38 kg/ kg**— demonstrating India's ambition to set global benchmarks.
- Agreements such as those with the European Investment Bank and strategic diplomatic alliances (e.g. G20 High Level principles, EU India cooperation) pave the way for billions in infrastructure funding and export alignment.

These developments signal a concrete shift from pilot concept to project execution. India is not only leveraging indigenous technology (e.g. electrolyser development for ports and refineries) but also attracting strategic investment via public–private partnerships and international collaboration. The emerging framework of carbon intensity thresholds, grid access, and infrastructure planning reflects a more sophisticated approach— moving towards cost-competitiveness and export readiness.

Building a Resilient and Inclusive Hydrogen Ecosystem

As India accelerates its green hydrogen journey, success will hinge not only on technological advancements but also on addressing critical enablers. Water sustainability must be prioritised through water-efficient electrolysis and alternative sourcing in water-scarce regions. Achieving cost competitiveness remains vital, requiring continued innovation, scale, and targeted fiscal incentives. Demand creation through clear mandates, blending targets, and industrial use-cases must evolve in parallel with production.

Safety standards, lifecycle carbon accounting, and robust certification frameworks are essential to ensure environmental integrity and global credibility. Public engagement, skill development, and MSME participation will drive broader acceptance and employment. Finally, strategic planning for export infrastructure and public– private financing mechanisms will determine India's role in the global hydrogen market. With a balanced, inclusive, and forward-looking approach, India is poised to shape a clean and competitive hydrogen economy.

(The author is a senior journalist. Views expressed are personal)

Continued from page 1

The Green Energy Revolution...

with sustainability focus)
- ISB Hyderabad (PGP in Infrastructure or ESG)
- XLRI (for responsible finance and strategy)

Key Employers: Multilateral banks, ESG consultants, energy venture capitalists, sovereign wealth funds, and hydrogen start-ups.

6. Trade & Export Strategy: Going Global: With India aspiring to become a green hydrogen exporter, there is rising demand for professionals in export planning, international logistics, supply chain optimisation, and trade diplomacy. These roles focus on building cross-border corridors, securing buyers, and shaping global value chains.

What to Study: Degrees in International Business, Logistics Management, Public Policy or Economics

Where to Study:
- Indian Institute of Foreign Trade (IIFT)
- Symbiosis Institute of International Business
- Indian Maritime University (for port and logistics focus)

Key Employers: EXIM Bank, port authorities, logistics majors, shipping companies, and international trade missions.

7. Education, Training & Skill Development: Empowering the Workforce: With the sector still in its infancy, training the next generation of workers is vital. Education and training professionals design hydrogen-specific courses, conduct industrial training, and upskill technicians and engineers. If you enjoy teaching, mentoring, or curriculum development, this is a rewarding space.

What to Study: B.Ed, M.Ed in Technical Education, Engineering with teaching experience, Curriculum Design certifications.

Where to Study:
- NSDC Training of Trainers (ToT) programmes
- IIT Madras (Centre for Outreach and Skill Development)
- ITI and Skill India-accredited teaching programmes.

Key Employers: NSDC, Skill India, ITIs, hydrogen sector companies, and private training providers.

In-Demand Skills Across the Sector
- **Technical**: Electrolysis, fuel cell engineering, hydrogen safety, thermo-fluid systems.
- **Digital:** Industrial IoT, SCADA systems, digital twin simulations, predictive maintenance tools.
- **Environmental**: Life Cycle Assessment (LCA), ISO 14064 carbon accounting, emissions modelling.
- **Soft Skills:** Collaboration across disciplines, strategic thinking, technical writing, and effective communication.

Career Pathways & Growth Prospects

The green hydrogen sector presents a wide array of dynamic and rapidly evolving career pathways, suited to individuals from varied academic and professional backgrounds. Opportunities span the entire value chain— from production and storage to distribution, utilisation, and policy development.

At the entry level, positions include technicians, junior engineers, and project coordinators, who are involved in operational tasks, maintenance of facilities, and the implementation of pilot projects. These roles are essential to the day-to-day running of green hydrogen operations and provide a strong foundation for future advancement.

As professionals gain experience, mid-level roles become accessible in areas such as process engineering, electrochemistry, Environmental, Social and Governance (ESG) consulting, regulatory analysis, and project management. There is strong demand for those with interdisciplinary expertise— combining engineering, environmental science, and economics— as the sector grows and integrates with broader energy systems and climate policy frameworks.

At the senior level, roles in Research and Development (R&D) leadership, project development, green finance, and policy advisory are increasingly important. These positions typically involve overseeing large-scale infrastructure projects, shaping national and international hydrogen strategies, and securing investment through climate finance mechanisms and public-private partnerships.

In India, starting salaries for graduates in engineering, science, or policy typically range from Rs. 5 to Rs. 10 lakh per annum (LPA). Individuals with postgraduate qualifications, relevant certifications, or international exposure may command significantly higher packages. As professionals move into strategic roles— such as project finance, plant commissioning, or technology commercialisation—salaries can exceed Rs. 30 LPA.

Internationally, the earning potential is even greater. In global hydrogen hubs such as Germany, the Netherlands, the United Arab Emirates, Saudi Arabia, and Australia, professionals with hands-on experience in electrolysis, hydrogen storage, or fuel cell systems can expect to earn between US$80,000 and US$ 150,000 per year, with higher compensation available in senior or specialist roles linked to major export-led projects.

Beyond financial rewards, careers in green hydrogen offer long-term professional growth, international mobility, and the chance to work across multiple sectors— including renewable energy, mobility, manufacturing, and chemicals. As nations place hydrogen at the heart of their decarbonisation strategies, professionals in this field are well-positioned to lead the next chapter in the global clean energy transition.

(The author is a NEET/JEE Coach and Career Counsellor. Views expressed are personal).