GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH
RAJYA SABHA
UNSTARRED QUESTION No. 1557
(ANSWERED ON 12.02.2026)

GREEN HYDROGEN AND BIO-MANUFACTURING

1557. SHRI NARESH BANSAL:
SHRI MAYANKKUMAR NAYAK:
SHRI KIRAN CHOUDHRY:
SHRI BABUBHAI JASANGBHAI DESAI:
SHRI NARAYANA KORAGAPPA:
SMT. SANGEETA YADAV:

Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) whether DSIR/CSIR has achieved breakthroughs in indigenous green hydrogen technologies;
(b) the manner in which Bio-RIDE scheme is promoting the development of biomanufacturing and biofoundry capacity;
(c) the number of sanctioned Green Hydrogen Valleys projects; and
(d) the manner in which these initiatives contribute to India's net-zero and energy transition goals ?

ANSWER

MINISTER OF STATE (INDEPENDENT CHARGE) FOR THE
MINISTRY OF SCIENCE AND TECHNOLOGY AND EARTH SCIENCES

(DR. JITENDRA SINGH)

(a) Yes, Council of Scientific and Industrial Research (CSIR) has achieved significant indigenous breakthroughs across the green hydrogen value chain through mission-mode and industry-collaborative programmes. This includes the development and demonstration of Proton Exchange Membrane (PEM) fuel cell stacks that have powered India's first indigenous hydrogen fuel cell bus and inland waterway vessel. Further, development of Anion Exchange Membrane (AEM), Electrolyzer Proton Exchange Membrane (PEM), Electrolyzer and Solid Oxide Electrolyzer Cell (SOEC) electrolyzers, fuel cells, and hydrogen storage systems with a focus on indigenization and cost reduction has been going on. CSIR has additionally developed a solar-assisted bio-electrochemical process for green hydrogen production from wastewater at pilot scale, enabling decentralized hydrogen generation with simultaneous wastewater treatment.

(b) The Bio-RIDE (Biotechnology Research Innovation and Entrepreneurship Development) scheme of the Department of Biotechnology (DBT) is being implemented with an outlay of Rs. 9,197 crore for the period 2021-22 to 2025-26, covering three key components:

(i) Biotechnology Research & Development (R&D),
(ii) Industrial & Entrepreneurship Development (I&ED), and
(iii) Biomanufacturing and Biofoundry

The Bio-RIDE scheme integrates and scales up support provided under earlier DBT initiatives, thereby strengthening continuity across the biotechnology innovation value chain. Under its Biomanufacturing and Biofoundry component, the scheme supports the establishment and strengthening of shared biomanufacturing infrastructure, pilot- and demonstration-scale facilities, biofoundries, and automation platforms to enable scale-up and commercialization of bio-based products.

DBT also supported network and consortia-based research and demonstration projects aimed at advancing net-zero-oriented green hydrogen pathways through biological routes. Large-scale cultivation of Azolla in wastewater has enabled simultaneous nutrient recovery and the generation of value-added biomass suitable for biohydrogen production. Additionally, aquatic plant biomass and deoiled algal biomass have been used as potential second- and third-generation feedstocks for pilot-scale biohydrogen production.

Further, DBT through the Biotechnology Industry Research Assistance Council (BIRAC) also supports startups, MSMEs, and academia–industry collaborations for the development, validation, and manufacturing of biotechnology solutions.

(c) The Government of India is implementing the National Green Hydrogen Mission (NGHM), with an objective to make India a global hub of production, usage, and export of green hydrogen and its derivatives.

The revised scheme guidelines for setting up the Hydrogen Valley Innovation Cluster (HVIC) and Green Hydrogen Hubs in India under the National Green Hydrogen Mission (NGHM) have already been issued by the Ministry of New and Renewable Energy (MNRE). Under Component A of the scheme, i.e., Hydrogen Valley Innovation cluster (HVIC), four projects have been awarded to be developed as Hydrogen Valley Innovation Clusters (HVICS), namely, Jodhpur hydrogen valley, Odisha hydrogen valley, Pune hydrogen valley, and Kerala hydrogen valley.

(d)

- These initiatives contribute to India’s Net-Zero commitments and energy transition goals by strengthening indigenous capabilities in clean energy, sustainable manufacturing, and low-carbon industrial processes.
- Hydrogen Valley Innovation cluster (HVIC) supports India's net-zero and energy transition goals by creating local, end-to-end green hydrogen systems that contribute towards decarbonization and reducing reliance on fossil fuels.
- The Bio-RIDE scheme**,** by promoting biomanufacturing and biofoundry capacity, enables the development of bio-based alternatives to energy-intensive and carbon-intensive products, including bio-fuels, bio-chemicals, enzymes, and sustainable materials. DBT also implemented a dedicated vertical for scaling up the Carbon Capture Utilization Integrated Bio manufacturing to bring in industry-oriented bio solutions via CO_2 bioconversion to fuels, chemicals and materials.
- The Ministry of New and Renewable Energy (MNRE) has launched the National Green Hydrogen Mission (NGHM) in 2023 intending to "decarbonize hard-to-abate sectors". BIRAC, the Section-8 Company of DBT, has been nominated as the Implementing Agency for the production of green hydrogen using biomass-based and other innovative technology-based pilot projects under NGHM. The initiative will extend financial assistance of INR 100 Crore for innovative technologies of green hydrogen production. This initiative is a part of the roadmap for reaching the goal of 5 MMT of Green Hydrogen production annually by 2030 and achieving Net Zero emissions by 2070.

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