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EU-INDIA
CLEAN ENERGY & CLIMATE PARTNERSHIP

Report on EU-India CECP activities

at

International Conference on Green Hydrogen

Bharat Mandapam, New Delhi

September 2024

Conference Report

pwc EUROCHAMBRES

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Contents

1. Introduction

This report is developed under the project "Support to the India – EU Clean Energy and Climate Partnership (CECP)", which is financed from the Partnership Instrument of European Union (EU) General Budget and managed by the EU Delegation to India. It is carried out as part of the contract titled "Provision of Technical Assistance Services to the Programme Clean Energy and Climate Partnership".

India's National Green Hydrogen Mission

The National Green Hydrogen Mission was launched in January 2023. It aims to establish a robust Green Hydrogen ecosystem in India. This initiative focuses on synergizing demand and supply, enabling policy and regulatory frameworks, and fostering innovative and affordable solutions. Green Hydrogen has the potential to replace fossil fuels and fossil-based feedstocks in several hard-to-abate sectors such as refineries, fertilizers, steel, and chemicals, as well as in aviation and shipping.

International Conference on Green Hydrogen (ICGH-2024)

The Government of India organized the International Conference on Green Hydrogen (ICGH-2024) from September 11 to 13, 2024, at Bharat Mandapam, New Delhi. This conference discussed recent advances and upcoming technologies across the entire Green Hydrogen value chain. It provided a platform for the global scientific community and industry to discuss the evolving Green Hydrogen landscape and network.

The three-day mega event featured plenary talks, expert panel discussions, and technical deliberations focused on establishing a Green Hydrogen ecosystem and catalyzing a systemic approach to meet global decarbonization goals through Green Hydrogen. In addition to domain-specific interactions on hydrogen production, storage, distribution, and downstream applications, the conference also covered green financing, human resource upskilling, and startup initiatives in this area.

2. Sessions at ICGH 2024

From the 11th to the 13th of September 2024, under ICGH 2024, EU-India CECP featured/participated in two sessions where expert speakers from the EU shared their insights, perspectives, and best practices in the EU for the green hydrogen sector.

2.1 Session-1: Addressing Safety Concerns through Regulation, Codes and Standards in Hydrogen Ecosystem and Collaborative Approaches for Building Testing

Moderator: Mr. Hemant Mallya, Fellow, CEEW

Speakers	Designation	Company
Mr. Jorgo Chatzimarkakis	Chief Executive Officer	Hydrogen Europe
Dr. Sturle Harald Pedersen	Chairman of the Board	Greenstat Hydrogen Sri Lanka Pvt Ltd
Mr. Deepak Kumar Aggarwal	Scientist-F	BIS
Mr. Srinivasa Rao Keta	Controller of Explosives	Petroleum and Explosives Safety Organization (PESO)
Mr. Nawal Kishore Pande	Joint Director	Process and Engineering, Oil Industry
Prof. Rahul Nabar	Adjust Associate Professor, Department of Chemical Engineering,	IIT Bombay

Takeaways from Session 1

Session 1, titled "Addressing Safety Concerns through Regulation, Codes, and Standards in the Hydrogen Ecosystem and Collaborative Approaches for Building Testing," provided critical insights into the multifaceted challenges and solutions related to hydrogen safety and regulation. The discussion began by addressing the high propensity for hydrogen leakage due to its small molecular size. This characteristic raises significant safety concerns, particularly regarding fugitive emissions and their potential impact on the atmospheric stoichiometric ratio and global warming. The historical context of the Hindenburg disaster was used to underscore the importance of accurate understanding and perception of hydrogen's properties. Initial accidents must be avoided to build trust in hydrogen technology, emphasizing the necessity of adhering to stringent safety standards and conducting thorough pilot studies before large-scale implementation.

The crucial role of regulatory bodies, such as the Bureau of Indian Standards (BIS), was discussed extensively. BIS is rapidly developing and implementing standards to support the hydrogen ecosystem, focusing on safety across various stages of hydrogen production, storage, and usage. Collaborative approaches in standard development were highlighted, involving continuous engagement with stakeholders, technical experts, and R&D institutes to address unique safety challenges. The urgency of rapidly scaling up the hydrogen ecosystem necessitates swift development and adaptation of standards, balancing innovation with safety.

The need for international collaboration was emphasized, particularly in the context of manufacturing electrolyzers and fuel cells for export. Interoperability and adherence to international standards are essential for scaling up the hydrogen ecosystem globally. Participants highlighted the critical importance of

safety standards and the role of global forums such as the International Hydrogen Trade Forum and the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) in standardizing metrics like carbon footprints. There were also calls for a global agency similar to the International Renewable Energy Agency (IRENA) or the International Atomic Energy Agency (IAEA) to oversee hydrogen standards and ensure their global acceptance.

Specific safety concerns related to the storage and transportation of hydrogen in India were also addressed. Due to hydrogen's low density and high reactivity, it must be handled with extreme care across various stages, including production, storage, transportation, and utilization. The Indian regulatory framework has adopted several international standards, such as NFPA and ISO, to ensure safety. Emphasis was placed on safety distances, layout planning, and risk assessments. The importance of robust engineering designs, proper material selection, and the use of sensors and detectors to mitigate risks was highlighted.

Engineering can never be 100% perfect, making effective management practices crucial. The session highlighted established technologies for managing natural gas, such as sensors and infrared technologies, and explored how these could be adapted for hydrogen. The need for indigenization of these technologies was emphasized to ensure they are both affordable and validated for safety. Leveraging existing knowledge from the petroleum and natural gas industries is essential, but starting from scratch should be avoided due to time and resource constraints.

The financial risks associated with hydrogen democratization were discussed, with insurance premiums being high due to the lack of sufficient data on hydrogen-related incidents. This uncertainty necessitates rigorous testing and validation to build confidence among financial institutions and the public. The importance of continuous monitoring, updating regulations, and balancing safety with innovation was stressed. Robust R&D infrastructure is essential for developing effective safety measures and standards.

The session underscored the need for a global body to oversee hydrogen safety and standardization, facilitating international cooperation and ensuring the harmonization of standards. The idea of India playing a significant role in this global initiative was proposed, highlighting the country's commitment to advancing the hydrogen economy.

In summary, the session highlighted the critical importance of safety in the hydrogen ecosystem, the need for rapid development and adaptation of standards, and the essential role of international collaboration. While hydrogen has immense potential as a clean energy source, achieving a successful transition requires meticulous planning, robust safety measures, and a collaborative approach to standardization and testing.

2.2 Session-2: Natural Resource Management/Digital Approaches for better Implementation of Green Hydrogen ecosystem

Moderator: Prof. Dr. R.R. Sonde, Professor, IIT Delhi - Abu Dhabi Campus, Visiting Distinguished Professor, IIT R; Adjunct Professor at IIT Jodhpur, IIT Jammu, IIT Gandhinagar and Formerly Executive Vice President, CTO and Member of Board of Executive Council, Thermax Ltd.

Speakers	Designation	Company
Mr. Praseeth Prabhakaran	Project Engineer	DVGW
Mr. R.C. Agarwal	Executive Director; Centre for High Technology	Ministry of Petroleum & Natural Gas
Prof. Samar Das	Professor, School of Chemistry	University of Hyderabad
Mr. G.V. Shankar	President & CEO	Global Connect Inc.
Dr Aravind Kumar Chandiran	Professor Department of Chemical Engineering and Head, Centre for Photo- and Electro-Chemical Energy Sciences (C-PEC)	Indian Institute of Technology – Madras.
Mr. Ankit Sharma	Head Business Development, Utilities and Technologies	Hero Future Energies

Takeaways from Session 2

Session 2, focused on "Natural Resource Management and Digital Approaches for Better Implementation of the Green Hydrogen Ecosystem," explored two main areas: maximizing natural resources and utilizing digital infrastructure to enhance the hydrogen value chain in India. The session began by emphasizing the importance of efficiently managing natural resources to support the green hydrogen ecosystem and leveraging digital tools to expedite hydrogen deployment at scale.The discussion underscored the urgency of transitioning to a carbon-free economy by 2050, driven by growing energy demand and the need for energy independence. While traditional resource management for oil and coal was straightforward, green hydrogen requires a more sophisticated approach due to the scarcity of materials like nickel and graphite. The panelists highlighted the importance of a circular economy, where materials are recycled and reused to ensure sustainability, aligning with national goals of energy independence, economic development, and energy justice.

The panelists emphasized the role of academia and industry in managing natural resources, noting the importance of government mandates to drive industry actions. Past successes with sulfur removal and emission standards were cited as examples. Strategic partnerships, both domestic and international, were highlighted as essential for accessing critical materials and technologies, mitigating risks, and ensuring a stable supply of resources. The conversation also touched on digital infrastructure's significance in enhancing the hydrogen value chain. Tools such as artificial intelligence (AI), machine learning (ML), satellite imaging, and geographic information systems (GIS) can optimize resource management and accelerate hydrogen deployment by improving efficiency, reducing costs, and ensuring reliability. Blockchain technology was discussed as a means to ensure transparency and traceability in resource management.

The session continued with an exploration of the roles of human resources, digital infrastructure, and industry collaboration in advancing the hydrogen economy. Emphasis was placed on the need for a skilled workforce, including scientists, engineers, and professionals in policy, economics, and finance. Integrating digital infrastructure to monitor the safety, performance, and health of the hydrogen ecosystem is crucial, requiring education and training programs to build this skilled workforce.

Industry collaboration was highlighted as a way to develop platform technologies funded jointly by industry and government, allowing for shared investments and risks. Examples of competitors collaborating to address common challenges showcased the potential for such partnerships to drive innovation and efficiency.

The session also addressed the practical challenges of scaling up hydrogen technologies, emphasizing the need to prioritize electrification before converting energy to hydrogen and viewing hydrogen as an energy carrier. Government support and subsidies were deemed crucial to making green hydrogen economically viable. Advanced technologies like satellite imaging and GIS were discussed to map natural resources and identify potential hydrogen production sites, providing valuable data for informed decision-making.

In the context of industry collaboration, the potential for creating a single database to consolidate information on hydrogen products and compliance with safety standards was discussed. This database would streamline the verification process and ensure products meet necessary standards. The importance of digital tools in ensuring reliability and efficiency of hydrogen technologies was emphasized, with a call for greater collaboration between industry and regulatory bodies.

The session concluded with a call for a collaborative and innovative approach to overcome the challenges associated with transitioning to a carbon-free economy. The discussions underscored the critical importance of efficient natural resource management, digital infrastructure, and industry collaboration in supporting the green hydrogen ecosystem. Achieving national goals of energy independence, economic development, and sustainability requires meticulous planning, robust safety measures, and a collective effort from all stakeholders.

In summary, Session 2 highlighted the multifaceted approach needed to advance the green hydrogen ecosystem. The discussions emphasized the importance of strategic resource management, leveraging digital tools, and fostering industry collaboration to overcome challenges and capitalize on opportunities presented by the hydrogen economy. The session reinforced the need for a comprehensive and integrated approach to ensure the successful implementation and scaling of green hydrogen technologies.

3. Potential areas where the Government of India (GoI) would benefit from EU Technical Assistance

Based on the discussions from the sessions on "Addressing Safety Concerns through Regulation, Codes, and Standards in the Hydrogen Ecosystem" and "Natural Resource Management and Digital Approaches for Better Implementation of the Green Hydrogen Ecosystem," several areas have been identified where the Government of India (GoI) could benefit from EU technical assistance.

1. **Development and Harmonization of Safety Standards:**
   India can leverage the EU's extensive experience in hydrogen safety standards to develop and harmonize its own safety protocols. This assistance could ensure India's hydrogen infrastructure meets international benchmarks, facilitating global integration.

2. **Advanced Research and Development (R&D):**
   EU's advanced R&D capabilities in material science, electrolyser technologies, and fuel cells can enhance India's efforts to develop efficient and cost-effective hydrogen technologies. Joint research projects and knowledge exchange programs would be beneficial.

3. **Digital Infrastructure and Technological Integration:**
   EU's expertise in deploying digital tools like AI, ML, satellite imaging, and GIS can help India optimize resource management and accelerate hydrogen deployment. Technical assistance in implementing these technologies can improve the efficiency and reliability of India's hydrogen value chain.

4. **Strategic Partnerships for Resource Management:**
   India can benefit from EU's experience in international collaborations to secure critical materials and technologies. This assistance could include facilitating partnerships between Indian and EU companies and providing access to EU supply chains.

5. **Workforce Development and Capacity Building:**
   EU's established education and training programs can help India build a skilled workforce proficient in hydrogen technologies. Collaborative initiatives such as exchange programs and joint training modules can support this effort.

6. **Policy and Regulatory Frameworks:**
   EU's experience in formulating effective hydrogen policies and regulations can guide India in developing supportive policy frameworks. This could include policy advisory services and capacity-building workshops for Indian policymakers.

In summary, India can benefit from EU technical assistance in safety standards, advanced R&D, digital infrastructure, strategic partnerships, workforce development and policy frameworks. These collaborative efforts can accelerate the development of India's green hydrogen ecosystem, ensuring alignment with global standards and best practices.

4. Annexure

Session 1: Addressing Safety Concerns through Regulation, Codes and Standards in Hydrogen Ecosystem and Collaborative Approaches for Building Testing

Session 2: Natural Resource Management/Digital Approaches for better Implementation of Green Hydrogen ecosystem

About EU-India CECP

The EU-India CECP aims to reinforce cooperation between the EU and India on climate change and energy with a view to ensure a secure, clean, affordable and reliable energy supply for all and to progress in the implementation of the Paris Agreement.

For more details, please visit:

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