KING STUBB & KASIVA
ADVOCATES AND ATTORNEYS

NEW DELHI | MUMBAI | BANGALORE | HYDERABAD | CHENNAI | KOCHI | PUNE | MANGALORE

A-Z ON GREEN HYDROGEN INITIATIVES AROUND THE WORLD

SPECIAL EDITION NEWSLETTER FOR
NOVEMBER DECEMBER 2023

INTRODUCTION – UNDERSTANDING THE BUZZ AROUND GREEN HYDROGEN

Green hydrogen refers to hydrogen that is generated via the process of electrolysis or conversion of biomass, including electricity generated from renewable sources which is banked with the grid as per the Indian regulations.

The use of hydrogen as an energy carrier is increasingly recognised as a critical component in the pursuit of decarbonizing industries that are difficult to transition away from high-carbon sources. Several industries, including iron ore and steel, fertilisers, refining, methanol, and marine transportation, are responsible for significant emissions of carbon dioxide (CO2). To achieve a substantial reduction in carbon emissions, the use of carbon-free hydrogen will be of utmost importance. Hydrogen is now being extensively researched as a potential primary solution for several uses in high-emitting industries, including heavy-duty trucks and aircraft.

The aforementioned phenomenon has led to an increasing worldwide inclination towards hydrogen as a whole, with a specific focus on green hydrogen. The potential for a substantial increase in worldwide demand for hydrogen by 2050 is driven by the convergence of two factors: the decreasing costs associated with hydrogen production and the escalating need for decarbonization. This surge in demand, which is projected to reach over 400 percent, will primarily be propelled by the industry and transportation sectors.

Currently, a considerable number of nations have established or are in the process of establishing comprehensive policies or roadmaps to facilitate the development of a hydrogen-based economy. These initiatives often encompass the implementation of various financial incentives aimed at expediting the shift towards this alternative energy source.

In the paragraphs ahead, we will explore how different nations are steering their course toward a sustainable hydrogen future and conclude by highlighting the growth of Hydrogen-based start-ups in India.

INDIA – STRATEGIES AND INCENTIVES

India's dedication to a more environmentally sustainable future is substantiated by its National Green Hydrogen Mission, which is per the country's objectives of achieving energy self-sufficiency by 2047 and attaining carbon neutrality by 2070. The primary objective of the mission is to prioritise the use of green hydrogen as a crucial component in India's ongoing shift towards sustainable energy sources. India declared its ambition to become an exporter of hydrogen to Japan, South Korea, and Europe. Various hydrogen-powered vehicles have been developed and demonstrated under projects supported by the Government of India.

- In 2023, the **National Green Hydrogen Mission** marked a significant step in the promotion of green hydrogen for India, through the Strategic Interventions for Green Hydrogen Transition (SIGHT) program, the mission allocated a financial incentive budget of INR 17,490 crore. Within this allocation, INR 13,050 crore was designated for green hydrogen production, while INR 4,440 crore was set aside for electrolyser manufacturing.

Like the Production Linked Incentive scheme, the SIGHT program extends fiscal benefits for three and five years for green hydrogen production and electrolyser manufacturing, respectively.

While the program is comprehensive, certain aspects lack clarification such as the definition of 'Green Hydrogen,' guidelines for monitoring the 60,000 hours performance guarantee of manufactured electrolysers, and protocols for verifying the localized content of the manufactured product.

- The Central Motor Vehicles (Eighth Amendment) Rules, 2023 came into force one of the additions to the Central Motor Vehicle Rules, 1989, is Rule 125M, which pertains to the Type Approval of Hydrogen Internal Combustion Engine (ICE) Vehicles. This rule follows Rule 125L and outlines the safety and procedural requirements for type approval of internal combustion engine vehicles in the M and N categories powered by liquid or compressed gaseous hydrogen.

Introducing Rule 125M signifies a significant step towards adopting hydrogen as an alternative fuel for vehicles. It provides a regulatory framework for the production and use of hydrogen-powered vehicles, ensuring that they meet the necessary safety and performance standards.

The Indian government think tank NITI Aayog and the Rocky Mountain Institute (RMI) outlined a blueprint for positioning India as a leading green hydrogen producer. The report, titled **"Harnessing Green Hydrogen: Opportunities for Deep Decarbonization in India,"** envisions India potentially boasting the world's largest green hydrogen generation capacity, exceeding 60 GW by 2030. It was published in February 2022, and is an integral component of the National Hydrogen Policy.

The report stated that India's hydrogen demand will increase more than four times by 2050, making up 10% of the world's hydrogen demand. As a result, it advises facilitating investment through demand gathering and dollar-based green hydrogen bidding. In the long run, by 2050, the majority of the demand growth will be for steel and heavy-duty transportation. Both will fulfil 52% of the entire demand.

In line with the goals of the Hydrogen Mission, a significant portion of the Green Hydrogen Policy deals with initiatives that encourage the production of green hydrogen. **These initiatives are:**

-25-year waiver of inter-state transmission charges for green hydrogen/ green ammonia projects that are commissioned before June 30, 2025;

-Land allotment in dedicated renewable energy parks, and identification of manufacturing zones for production;

-Guaranteed procurement of renewable energy for production, via open access mechanism and connectivity to be granted on priority. Distribution companies can charge such projects only procurement cost, wheeling charges, and a small margin as determined by the relevant state electricity regulatory commission;

-The Ministry of New and Renewable Energy will develop a portal to grant permission and clearances for the manufacturers of Green Hydrogen. The portal shall enable the government to grant all sorts of permits within 30 days from the date of application;

-The manufacturer will be granted open access to source renewable energy in 15 days from the date of receipt of the application. The applicant can procure this renewable energy from anywhere, energy plant, power exchange or any third party.

US – LEGISLATION AND INCENTIVES

-Bipartisan Infrastructure Law (BIL), also known as the Infrastructure Investment and Jobs Act (IIJA), allocated a historic $1.2 trillion for transportation and infrastructure spending. This funding includes funding for new investments and programs, making it a significant initiative for organizations aiming to advance their clean energy strategies.

The BIL covers a wide array of sectors, including broadband internet, rail, transit, clean energy, and water infrastructure. Importantly, all programs under BIL must align with the Justice40 Initiative, ensuring that 40% of the funds benefit disadvantaged communities historically marginalized and overburdened with pollution.

For organizations focusing on decarbonization, the BIL provides substantial funding opportunities,

particularly in the energy and transportation sectors. Key points for Hydrogen Production include:

Funding for Clean Hydrogen Production:

-The BIL includes various grant programs targeting clean hydrogen production, such as the $7 billion Regional Clean Hydrogen Hubs ("H2Hubs") program.

-The H2Hubs aim to drive clean hydrogen utilization in energy-intensive sectors like fertilizer, steel, and shipping, offering significant incentives for industrial companies, utilities, and higher education institutions.

-Organizations should engage with energy experts to assess and optimize clean hydrogen utilization within their energy and sustainability strategies.

-By understanding these funding opportunities and taking strategic actions, organizations can leverage the BIL to advance their clean energy initiatives and contribute to a more sustainable future.

-The **Inflation Reduction Act** offers a Clean Hydrogen Production Tax Credit (PTC) to facilities beginning construction by the end of 2032.

This includes various credits throughout the value chain, such as renewable credits, leading to over $3/kg in credits for green hydrogen production. Developers of blue hydrogen production facilities may opt for the Investment Tax Credit (ITC), receiving up to 30% ITC based on production process carbon intensity. IRA strengthens green hydrogen adoption by providing tax credits for low-carbon hydrogen production and hydrogen fuel cell-electric vehicles.

While the Act supports production methods, it needs more backing for new infrastructure necessary for hydrogen distribution. More regulatory support is essential to scale up this aspect of the market. Currently, a majority of hydrogen in the USA is produced and consumed on-site, with limited distribution via trucks and pipelines, primarily in the Gulf Region, covering a total distance of 1,600 miles.

Key Incentives:

The Clean Hydrogen Production Tax Credit
This is a 10-year incentive program for clean hydrogen production, offering credits of up to $3.00 per kilogram. Additionally, projects have the option to receive a 30% investment tax credit under Section 48 of the Internal Revenue Code. The incentive structure comprises four tiers, each varying based on the carbon intensity of the hydrogen production pathway.

Alternative Fuel Infrastructure Tax Credit
This benefit is accessible for alternative fuels utilized to power motor vehicles. A credit of $0.50 per gallon applies to the following alternative fuels: natural gas, liquefied hydrogen, propane, P-Series fuel, liquid fuel produced from coal via the Fischer-Tropsch processed and compressed or liquefied gas derived from biomass.

From January 1, 2023, onwards, fueling equipment designed for natural gas, propane, hydrogen, electricity, E85, or diesel fuel blends containing a minimum of 20% biodiesel is eligible for a tax credit of 30% of the equipment cost, or 6% if the property is subject to depreciation, not exceeding $100,000.

The Internal Revenue Service (IRS) defines alternative fuels as propane, natural gas, liquefied hydrogen, liquid fuel derived from coal through the Fischer-Tropsch process, liquid hydrocarbons derived from biomass, and P-Series fuels. Biodiesel, ethanol, and renewable diesel are not considered alternative fuels by the IRS. While the term "hydrocarbons" includes liquids that contain oxygen, hydrogen, and carbon and as such "liquid hydrocarbons derived from biomass" includes ethanol, biodiesel, and renewable diesel, the IRS specifically excluded these fuels from the definition.

Hydrogen Demonstration Project Grants
This initiative allocates funds to hydrogen demonstration projects that have the potential to decrease hydrogen costs, minimize carbon emissions and local air pollution, generate well-paying employment opportunities, and offer advantages to underserved communities. Hydrogen Shot concentrates

on a range of projects addressing technological challenges in hydrogen production, storage, distribution, and utilization, encompassing fuel cell technologies.

The Regional Clean Hydrogen Hubs (H2Hubs)
This program is overseen by the U.S. Department of Energy (DOE). It aims to support the establishment of a minimum of four regional networks comprising hydrogen producers, potential consumers of hydrogen, and essential connecting infrastructure located in close proximity.

Clean hydrogen, as per this program, refers to hydrogen generated with a carbon intensity equal to or less than 2 kilograms of carbon dioxide equivalent produced at the production site per kilogram of hydrogen.

UK: ENERGY ACT AND STRATEGIES

The UK Government has outlined the goal of achieving 10 gigawatts (GW) of low carbon hydrogen by 2030, with half of this capacity dedicated to green hydrogen sourced from renewables. In a strategic move, ministers have set an interim target of 2GW by 2025, incorporating 1GW specifically from green hydrogen. The analysis indicates that meeting these targets could result in the creation of over 12,000 jobs and the attraction of £11 billion in private investment. Despite the current operational capacity standing at only 5 megawatts (MW) for green hydrogen projects in the UK, the Hydrogen Production Business Model is poised to play a pivotal role in jumpstarting a foundational level of substantial operational projects. Its key function is mitigating risks and reducing financial barriers to pave the way for widespread success.

UK Hydrogen Strategy
In August 2021, the Department for Business, Energy & Industrial Strategy presented the "**UK Hydrogen Strategy**" to the Parliament, designed to establish a thriving low-carbon hydrogen sector in the UK. The strategy includes measures to rapidly scale up production, support innovation, and address barriers to hydrogen uptake across the value chain.

Energy Act, 2023
This legislation addresses energy production, security, and the regulation of the energy market.

Key Aspects of the Legislation:

-It includes provisions related to carbon dioxide transport and storage licensing, commercial agreements for carbon capture, hydrogen production and transportation, new technologies like low-carbon heat schemes and hydrogen grid trials, the Independent System Operator and Planner, gas and electricity industry codes, financial support for energy-intensive activities, heat networks, energy-efficient appliances, premises' energy performance, energy savings opportunity schemes, core fuel sector resilience, offshore energy production with a focus on environmental protection, licensing, and decommissioning. It also covers the civil nuclear sector, including the Civil Nuclear Constabulary and pensions, along with connected matters.

-The legislation introduces the concept of a **"hydrogen transport revenue support contract,"** involving a hydrogen transport counterparty as a participant, established based on a directive issued under section 62(1).

-The Act establishes mechanisms to enable funding for government-backed low-carbon hydrogen projects integral to the future hydrogen economy. It defines a "low carbon hydrogen producer" as an entity engaged in hydrogen-producing activities in the UK, contributing to greenhouse gas emissions reduction, as determined by the Secretary of State. The Act does not specify specific criteria for this evaluation.

-The Act enables the commencement of the first major hydrogen heating trial, evaluating the feasibility of existing gas network infrastructures in carrying 100% hydrogen. The trial's outcomes will provide insights into the potential of technology to decarbonize heat.

The legislation introduces two key funding mechanisms:

A levy imposed on gas shippers and financial support from the Exchequer.

The UK government considers hydrogen a crucial low-carbon solution for achieving its net-zero emissions target by 2050 and meeting the Sixth Carbon Budget goal by 2035. Low-carbon hydrogen is viewed as a versatile replacement for high-carbon fuels, providing flexible energy for power, heat, and transportation.

In August, 2023 the UK government published its low-carbon hydrogen agreement (LCHA), the contract that underpins its low-carbon business model, it aims to offer financial assistance to hydrogen producers by bridging the operating cost gap between low-carbon and higher-carbon fuels through 15-year contracts.

EU: HYDROGEN STRATEGY AND RECENT STRATEGIES

The European hydrogen strategy

The European Union (EU) committed to achieving 40 GW of hydrogen electrolyser capacity by 2030, nearly twice the capacity of China's Three Gorges Dam, the world's largest power plant. To realise this goal, the EU plans to secure up to EUR 470 billion in public and private investments by 2050. Additionally, an import supply chain with an extra 40 GW from neighbouring countries in Central Europe and North Africa is in the works.

Several European Member States have announced their targets for green hydrogen production. These targets, accounting for over 50% of the EU's 40 GW electrolyser capacity goal by 2030, highlight the region's commitment to hydrogen development. Some recent strategies for boosting green hydrogen production by EU member states.

Member States	Recent Strategies
Portugal	Portugal implemented the National Hydrogen Strategy in alignment with the Council of Ministers' Resolution 63/2020, the strategy supports national and EU decarbonisation objectives, providing stability and incentives for the energy sector, along with it a collaborative project involving several European Partners for H2 Sines project, moreover, Portugal aims to establish a green hydrogen production industrial cluster in Sines.
Germany	The German cabinet approved a new hydrogen strategy that provides guidelines for hydrogen production, transport infrastructure, and market plans. The strategy prioritises importing green hydrogen via ships instead of relying solely on domestic production, along with it, funding for a hydrogen network spanning over 1,800 km in Germany is anticipated to be ava ilable by 2027/2028 through the European Union's Important Projects of Common European Interest (IPCEI) financing scheme. The goal is to connect all major generation, import, and storage centers to customers by 2030. From 2024 onwards, Germany's publicly accessible hydrogen network will progressively furnish green hydrogen to industrial companies and the mobility sector, including gas stations in Lower Saxony and North Rhine-Westphalia, ensuring non-discriminatory access.
Netherlands	The government announced plans to boost subsidies for the production of hydrogen from renewable sources, referred to as 'green hydrogen.' In the coming year, an additional 1 billion euros ($1.1 billion) will be allocated for this purpose, followed by an additional 3.9 billion euros in the subsequent years. This financial commitment states the nation's commitment to fostering sustainable energy practices and further propelling the development of green hydrogen technology.

Member States	Recent Strategies
Belgium	In order to decrease the EU's dependence on Russian fossil fuels, there is an ambitious goal to domestically produce and import 10 million tonnes of renewable hydrogen by 2030. Belgium, with a primary emphasis on the port of Antwerp-Bruges, aims to establish it as the leading entry point for green hydrogen in Europe. Given its strategic location, the port currently stands as one of Europe's significant energy hubs, facilitating the transportation of 10% of the EU's gas and maintaining connections with offshore wind farms in the North Sea. Moreover, Belgium adopted its National Hydrogen Strategy in 2021, with an aim to "position Belgium as an import and transit hub for green hydrogen in Europe" and make it "a leader in hydrogen technologies".
Finland	The construction of Finland's inaugural industrial-scale green hydrogen production facility commenced in January 2023, thus contributing to the advancement of green hydrogen technology.

The European Commission published two acts with detailed rules for the EU definition of renewable hydrogen, that lists conditions under which hydrogen-based fuels and energy carriers can be considered renewable fuels of non-biological origin (RFNBOs) and provide a methodology for calculating life-cycle greenhouse gas emissions for RFNBOs. These regulations are part of a comprehensive EU framework for hydrogen, ensuring that all RFNBOs are derived from renewable electricity. The EU aims to achieve 10 million tonnes of domestic renewable hydrogen import an additional 10 million tonnes by 2030.

CHINA

China currently holds the title of the world's largest hydrogen producer. Beyond conventional applications like using hydrogen as feedstock for oil refining or ammonia production, China has set ambitious targets for its utilisation in the transportation sector.

The recently disclosed **14th Five-Year Plan** features hydrogen as a prioritised emerging industry in China, with a clear objective to elevate the share of renewables-based hydrogen to 50% of total production by 2030. This commitment is noteworthy given the country's current heavy reliance on coal for hydrogen generation. In line with the approach taken by the United States, Carbon Capture and Storage (CCS) technologies are envisioned to play a crucial role in decarbonizing hydrogen production.

While a national hydrogen development strategy is yet to be published, there is anticipation of detailed plans outlining future hydrogen applications.

At the provincial level, regions like Shandong are striving to establish industrial hydrogen clusters that seamlessly integrate various hydrogen application opportunities. Initiatives such as pilot programs for steel production using renewables-based hydrogen have also been set in motion.

Furthermore, provincial plans encompass the accelerated construction of hydrogen refueling stations and the continuation of subsidies for fuel cell vehicles. Observers in the market also anticipate the expansion of existing subsidies and investment programs in the transport sector to include hydrogen delivery and storage infrastructure, as well as CCS and electrolysis technology. However, the precise extent of these investments remains uncertain until the national hydrogen development strategy is formally outlined.

JAPAN

In 2017, Japan introduced its "Basic Hydrogen Strategy," envisioning the widespread use of hydrogen in households and industries. Additionally, hydrogen was integrated into 10 out of 14 key technology areas outlined in Japan's "Green Growth Strategy" published in 2020. This initiative was part of Japan's goal to reduce dependence on imported fossil fuels.

On June 6, 2023, the Basic Hydrogen Strategy was revised for the first time in six years during the Renewable Energy and Hydrogen Ministerial Meeting. The revised plan involves a substantial investment exceeding 15 trillion Japanese yen over 15 years from both public and private sectors into the hydrogen and ammonia supply chain, attracting significant attention.

Japan aims to increase its hydrogen consumption, from approximately 300,000 tons currently to 6 million tons by 2030, constituting around 4.5% of the primary energy consumption, up from the current 0.2%. This growth will be supported by 300,000 tons of domestically produced renewable hydrogen in 2030 and 5-10 million tons in 2050, further imports will supplement the remaining demand, with a focus on natural gas-based and renewables-based hydrogen. While there is no specific quantitative target for renewables-based hydrogen imports yet, Japan aims for domestic production to be 100% renewable-based by 2030.

Like China, Japan has been actively exploring the use of hydrogen in transportation since the 2000s. Japan's goal is to have 800,000 fuel-cell vehicles on the roads by 2030, constituting approximately 1% of the current registered vehicles. Interestingly, Japan also envisions the widespread use of hydrogen in residential areas. By 2030, it is expected that 5.3 million fuel cell units will provide local power and heating for households, as well as power for the industrial sector.

In order to implement hydrogen applications across the economy, Japan is working towards specific goals related to reducing costs and increasing power efficiency. Research and development programs are closely tied to these targets. With substantial public investments, the focus is on developing its hydrogen infrastructure within the country, this is complemented by regulatory reforms, subsidies, and the establishment of an international hydrogen supply chain. Currently, two demonstration projects in Australia and Brunei are being envisioned as part of this initiative.

COMPARATIVE ANALYSIS – LESSONS FROM AROUND THE WORLD FOR GREEN HYDROGEN

In recent years, there has been a global shift toward achieving carbon neutrality, with major countries swiftly enacting policies and investment plans for decarbonizing their economies.

-Notably, the **United Kingdom** has introduced *contracts for difference (CfD) scheme,* supporting price differentials between low-carbon hydrogen and fossil fuels through the "Low Carbon Hydrogen Business Model." **Germany,** on the other hand, established the "*H2Global Foundation*" for hydrogen purchasing and sales through bidding processes, accompanied by a government support commitment of 900 million euros. These measures place these countries ahead of Japan in implementing specific support systems. Additionally, the **United States** is planning substantial investments in the hydrogen industry, including *preferential measures for clean hydrogen production based on new tax systems* outlined in the Inflation Reduction Act of 2022.

-China, the EU, and Japan share a common goal of expanding their green hydrogen sectors, with a focus on cost, infrastructure, and markets. While the **EU** aims to *reduce electricity costs in hydrogen production* and **Japan** *invests in electrolysers for hydrogen imports*, **China** pursues a comprehensive approach, emphasising industrial parks and employing ALK and PEM technologies.

-China's hydrogen development differs due to its unique industry standards and certification system. Collaboration between provinces and regions is crucial for unified hydrogen development, fostering common

technical standards. The land-intensive nature of green hydrogen production poses challenges, prompting land-scarce countries like **Japan and South Korea** to consider importing rather than producing domestically.

India, beyond meeting domestic demand, aims to become a key green hydrogen export hub, targeting regions like Japan, the EU, South Korea, Singapore, and others. Competition with major exporters like the Middle East and Australia is anticipated. While the EU market penetration might be limited, India sees potential in South Korean, Singaporean, and Japanese markets. Various export scenarios are presented, with green ammonia exports expected to meet demand due to shipping considerations.

Considering government and stakeholder estimates, the aggregate import demand for Singapore, Japan, Korea, and the EU is projected to be - 12.5 million tons by 2030. Scenarios outline India meeting a portion of these demands, with investments of $17.5 billion for 6% and $26.9 billion for 10% of the overall import market by 2030, primarily through green ammonia exports.

GREEN ENERGY, BRIGHT FUTURE: HYDROGEN START-UPS POWERING INDIA'S FUTURE

Hydrogen when used in fuel cells, produces electricity with water as the only by-product, making it an attractive alternative to fossil fuels. However, the challenge has always been to produce, store, and transport hydrogen efficiently and economically. This is where hydrogen-based start-ups come into play. They are leveraging cutting-edge technology and innovative business models to overcome these challenges and unlock the potential of hydrogen energy.

The journey of hydrogen-based or energy start-ups has just started, but the early signs are promising. They are attracting significant investment from venture capitalists, governments, and major corporations. According to a report by the Hydrogen Council, the global hydrogen market could reach $2.5 trillion by 2050, creating 30 million jobs worldwide. This presents a massive opportunity for hydrogen-based start-ups.

However, like any other start-up, they also face numerous challenges. The technology is still in its nascent stage, and there are significant technical and regulatory hurdles to overcome. Moreover, they need to compete with established energy companies and other renewable energy technologies. Therefore, the success of these start-ups will depend on their ability to learn from their experiences, adapt to changing circumstances, and continuously innovate.

India, with its ambitious renewable energy targets and rapidly growing economy, presents a unique opportunity for hydrogen-based start-ups. The country has set a target to install 450 GW of renewable energy capacity by 2030, and hydrogen can play a crucial role in achieving this target. Moreover, India's vast population and growing energy demand mean that there is a huge market for clean energy solutions.

Several hydrogen-based start-ups have already started their journey in India. The evolution of hydrogen-based companies is reshaping India's energy landscape, aligning with the nation's ambitious sustainability goals. Among these Start-ups is Reinwo Labs, an enterprise focused on advancing green hydrogen technologies hence, revolutionising how India produces and consumes energy. One of the products, Hyd gas is a ground-breaking solution that generates hydrogen from readily available tap water, indicating a transformative era in both household and commercial cooking. Further, Hyd gas redefines traditional LPG usage, contributing to India's hydrogen production targets. This vision aligns seamlessly with the nation's larger objectives of reducing carbon emissions and fostering renewable energy sources. The company's focus on green hydrogen isn't just about technological innovation; it's a commitment to environmental stewardship.

Elicius Energy Private Limited, another forward-looking entity in this realm, has emerged as a significant player in boosting India's hydrogen production. Their contributions to advancing fuel cell technology align with the country's energy objectives. Elicius Energy's focus on harnessing the potential of hydrogen for energy production deepens its commitment to a cleaner, more efficient future.

These start-ups not only contribute to India's renewable energy goals but also create jobs, foster innovation, and promote sustainable development. They are also providing learnings for other start-ups and stakeholders in the hydrogen ecosystem. For instance, they are demonstrating that it is possible to build a successful business around hydrogen energy, despite the challenges. They are also showing how to navigate the regulatory landscape, engage with stakeholders, and leverage technology to create value.

Looking ahead, the future of hydrogen-based start-ups in India and globally looks bright. As the world transitions to a low-carbon economy, the demand for clean energy solutions will only increase. Moreover, advancements in technology and supportive government policies are making hydrogen energy more viable and attractive.

However, to fully realize the potential of hydrogen energy, there is a need for an effort from all stakeholders. Governments need to create a supportive regulatory environment and provide incentives for hydrogen-based start-ups. Investors need to provide the necessary capital and take a long-term view of their investments. Established energy companies need to collaborate with start-ups and share their expertise and resources. Finally, start-ups themselves need to continuously innovate, learn from their experiences, and stay resilient in the face of challenges.

Hence, hydrogen-based start-ups have started a journey that could revolutionise the energy sector and contribute significantly to the fight against climate change. Their success will depend on their ability to leverage technology, navigate challenges, and adapt to a rapidly evolving market. India, with its renewable energy targets and growing market, presents a unique opportunity for these start-ups. The learnings from the early pioneers in this field will be invaluable for future start-ups and stakeholders in the hydrogen ecosystem. As we look to the future, it is clear that hydrogen energy holds immense potential, and hydrogen-based start-ups are at the forefront of unlocking this potential.

CONCLUSION

In India there is a lack of demand-side incentives that would drive the demand for green hydrogen within the country, similar to the systems in place in the E.U. and the U.S. Amid the global commitment to Sustainable Development Goals and the proactive implementation of strategic initiatives worldwide, it is imperative to acknowledge the substantial progress achieved thus far. However, as we navigate the path ahead, our attention must be keenly directed toward the emerging challenges that demand our consideration.

Undoubtedly, the legislative frameworks and incentives introduced in support of the Green Hydrogen Plan stand as significant milestones in our journey. Yet, we cannot afford to downplay the obstacles that persist. Issues such as the elevated costs associated with hydrogen production, delivery, storage, and conversion, coupled with the absence of a robust hydrogen infrastructure, necessitate immediate and concerted efforts.

Furthermore, addressing non-technical aspects is equally crucial. This involves the development of standardized codes, the promotion of safety best practices, and the establishment of a resilient supply chain and a skilled workforce capable of sustaining a hydrogen-based energy system and economy.

Recognizing these challenges and proactively taking measures to surmount them is imperative. The legislation enacted represents the initial strides taken by governments, paving the way for the global competitiveness of the hydrogen industry. By confronting these challenges head-on and embracing innovative solutions, we can lay the foundation for a sustainable and prosperous future powered by hydrogen energy.

DISCLAIMER

D +91 11 41318191 | T +91 11 41032969 | www.ksandk.com | info@ksandk.com

KEY CONTACTS

Jidesh Kumar
Managing Partner
jidesh@ksandk.com

Rajesh Sivaswamy
Senior Partner
rajesh@ksandk.com

Pooja Chatterjee
Partner
pooja.chatterjee@ksandk.com

Aurelia Menezes
Partner
aurelia@ksandk.com

NEW DELHI
Unit-14, Ground Floor, DLF Tower-A, Jasola, New Delhi
Tel: +911141318190/41032969
Email: delhi@ksandk.com

BANGALORE
1A & 1B, Lavelle Mansion, 1/2, Lavelle Road, Bangalore
Tel: +91 80 41179111/41179222,
Email: bangalore@ksandk.com

CHENNAI
211, Alpha Wing, Second Floor, Raheja Towers, #177, Anna Salai, Chennai
Tel: +91 44 28605955/28606955
Email: chennai@ksandk.com

MUMBAI
61, Atlanta Building, Jamnalal Bajaj Road, Nariman Point, Mumbai
Tel: +91 22 62372076/22020080
Email: mumbai@ksandk.com

HYDERABAD
609, Shangrila Plaza, Road no. 2, Banjara Hills, Hyderabad, Telangana
Tel: +91 40 48516011/+91 40 48506011
Email: hyderabad@ksandk.com

KOCHI
1st Floor, Manavalan Building, Banerji Road, Ernakulam, Kochi
Tel: +91 484-3592950
Email: kochi@ksandk.com

PUNE
Bootstart Cowork, 1st Floor, Arcadian Building Plot No 12, Lane 5A, Koregaon Park, Pune
Tel: +91 9952966619
Email: pune@ksandk.com

MANGALORE
Office No. 406, 4th Floor, Ajanta Business Center, Kapikad, Bejai, Mangalore- 575004
Tel: +91 8244634375
Email: mangalore@ksandk.com