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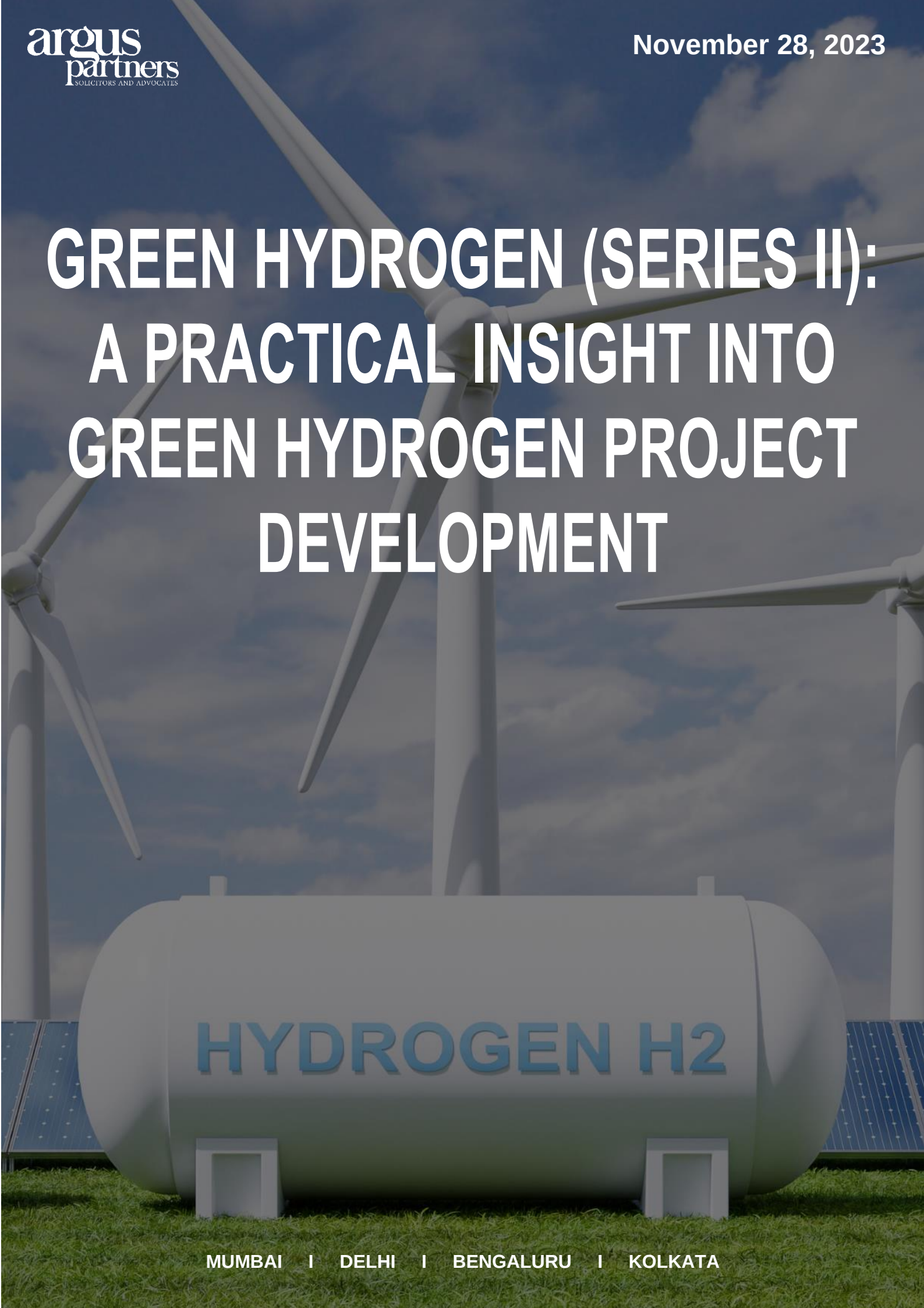
GREEN HYDROGEN (SERIES II): A PRACTICAL INSIGHT INTO GREEN HYDROGEN PROJECT DEVELOPMENT



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I. INTRODUCTION

The green hydrogen sector has seen rampant development in recent years with the international community showing significant interest in reducing the reliance on fossil fuels and preventing harmful climate change. The buzz surrounding the green hydrogen sector gained momentum following the United Nations Climate Change Conference of Parties 26 (**COP 26**) held in November 2021, where the participating nations agreed to achieve net zero carbon emissions by the year 2070. India, as a signatory to COP 26, has already embarked on a journey to become a green hydrogen hub for the world.

In our Green Hydrogen-Series I, we have discussed at length the specific measures adopted by India, pursuant to the National Green Hydrogen Mission guidelines issued on January 04, 2023, at the central level and other specific policies adopted by respective state governments for facilitating the development of the green hydrogen industry. Such policy measures include: (i) production linked incentives for green hydrogen and electrolysers; (ii) facilitation of land by state governments for green hydrogen projects; (iii) giving priority to the supply of renewable energy to green hydrogen plants; and (iv) investment in research and development aimed at reducing the cost of green hydrogen. The National Green Hydrogen Mission states that India's annual hydrogen consumption amounts to approximately 5 million metric tons.[1]

While the Indian government has been proactively working to create a robust and futuristic framework for the green hydrogen sector, the road ahead, especially for establishing green hydrogen projects, seems challenging considering the novelty of the sector and the lack of cost-effective methods to procure various equipment like electrolysers, storage cylinders, etc.

Keeping this in view, this article delves into the practical considerations for the establishment of green hydrogen projects and endeavors to highlight the challenges that lay ahead in this unexplored territory.

II. PROJECT ESTABLISHMENT STAGES AND CHALLENGES

The process of establishing a green hydrogen project requires taking into consideration factors such as project cost and funding, procurement of land, undertaking various environmental compliances, etc.

a. ***Cost of project establishment***

Electrolyser

Most of the costs associated with green hydrogen projects are attributed to the electrolysers, accounting for approximately 60% -70% of the project cost. This has also been recognized by the Ministry of New & Renewable Energy (**MNRE**) which has acknowledged that the primary factors influencing the production cost of green hydrogen is the cost associated with electrolysers and the renewable energy used as input.[2] Currently, majority of the electrolysers are being imported from other countries.[3] Under the aegis of the strategic interventions for green hydrogen transition (**SIGHT**) program, specific incentives have been identified for indigenous manufacturing of electrolysers based on the efficiency and quality of such electrolysers. Grant of the financial incentives provided by the government under the SIGHT program for incentivizing indigenous manufacturing of

electrolysers, are subject to the electrolysers achieving performance quotient based on its specific energy consumption. Consequently, the incentives that can be realized by a company are entirely dependent on the efficiencies of the electrolysers produced in India.

Storage

In order to ensure the shift to green hydrogen and to reduce the industrial reliance on fossil fuels, it is important to develop a robust infrastructure for storage of hydrogen. Storing and transportation of hydrogen is a major challenge given its low density and flammability.[4] Hydrogen is stored either in its pure form (in liquid or compressed gas state) or chemically bonded form (chemical compounds or adsorption).

Due to the substantial costs linked with liquefaction and cryogenic storage required for storing liquid hydrogen, the on-site storage cost of liquid hydrogen is approximately five times higher than that of gaseous hydrogen.[5] There are storage facilities available for storing natural gas, however, to convert these facilities from natural gas to hydrogen storage, proper surveys, R&D, studies and testing of these storage facilities must be done. This is because there are key differences between the two fuels such as extreme low molecular weight of hydrogen, differing flammability rates, etc.[6]

These factors are to be taken into consideration before developing a storage facility for green hydrogen. The cost of development of such storage infrastructure consequently impacts the cost of establishment of a green hydrogen project.

Transportation

Hydrogen can be transported post compression or transformation into different states or composition in cryogenic tanks.[7] These cryogenic tanks and vessels need to be well-insulated to prevent the hydrogen from warming up and turning back into a gas.[8] Depending on the transportation infrastructure for hydrogen, as per the preliminarily estimates by the industry experts, the cost of hydrogen may increase by 2 to 3 times if other cost incentive methods of transportation are not developed.[9]

This adds to the infrastructure cost which is to be considered while establishing a project. Currently, R&D in storage and transportation is yet to be developed and the solutions available are extravagant and require consideration.

Renewable Energy input cost

Around 55KW hours of renewable power is needed to produce a kilogram of green hydrogen.[10] Renewable energy (**RE**) for green hydrogen production can be sourced in two ways i.e., (i) from RE projects through third party power purchase agreements; and/or (ii) establishing or acquiring a new captive RE project from which the power can be sourced. In case a new RE project is being established, it needs to be ensured that such project is commissioned prior to the commercial operations date of the green hydrogen plant. Given that RE source is an infirm source of power, ensuring round the clock availability is also a major challenge. While the Green Hydrogen Policy, 2022 notified by the Ministry of Power (**Green Hydrogen Policy**) provides for banking of power with the distribution companies for 30 days by the green hydrogen manufacturer to ensure round the clock availability,

energy storage systems may also be required to be developed. Consequently, installing such energy storage systems will also add to the cost of establishing a green hydrogen project.

NITI Aayog had, in its report on green hydrogen, pondered upon this aspect and recommended, *inter alia*, the adoption of a viability gap funding (**VGF**) model to scale the green hydrogen production in India.[11] The VGF model envisages the government to grant marginal funding to green hydrogen developers to bridge the difference between the cost of grey hydrogen and that of green hydrogen and can be an essential tool to catalyze the growth of green hydrogen industry.

b. ***Procurement of suitable land***

Establishing a green hydrogen plant is both a capital intensive and a labor-intensive process as it requires an array of resources being pooled together at one location for enabling the hydrogen value chain to function effectively. Consequently, the process of identifying and procuring a suitable land for setting up a large scale green hydrogen plant can be challenging due to the number of steps involved, i.e., (i) shortlisting feasible location for establishing the project; (ii) procuring land in conformity with the applicable central and state restrictions on land acquisition in the concerned area; (iii) conversion of land use to industrial purposes, if required; (iv) assessing availability of or feasibility of producing renewable energy at such location; (v) assessing the feasibility of sourcing water resources, transport connectivity from the land; (vii) assessing the legacy land issues, if any; (vii) ensuring proper transfer of title on the land; (viii) applicability of compensation for acquisition of land; and (ix) conforming with the applicable environment related restrictions.[12] A green hydrogen manufacturer should consider procuring land near demand centers in order to ensure cost effective solutions to meet demand.

While some state governments have proposed to lease government fallow land to set up manufacturing facilities, identifying waste, non-fertile land and creating a land bank for leasing out land, etc., no concrete step has been taken in this regard.

c. ***Water for electrolysis***

Production of hydrogen through electrolysis requires large quantities of water for producing significantly small quantity of hydrogen gas. Researchers have suggested that approximately 9 litres of water are required to produce a mere 1 kg of hydrogen.[13] Ensuring constant availability and supply of such massive amounts of water will require setting up of green hydrogen plants at such strategic locations which can guarantee the constant supply of water to the project while also keeping its environmental impact in check.[14] Further, to counter against any shortage or disruption in water supply, projects may also have to rely on ground water usage which requires the approval of the Central Ground Water Authority (**CGWA**). As a necessary precaution, a project site should be identified taking into consideration the industrial clusters identified by CGWA in its notification.

d. ***Environmental compliances***

The establishment of any project requires the entity to obtain a consent to establish (**CTE**) under the Air (Prevention & Control of Pollution) Act, 1981 (**Air Act**), Hazardous Wastes

(Management, Handling and Transboundary Movement) Rules, 2008, and the Water (Prevention & Control of Pollution) Act, 1974 (**Water Act**) from the concerned state pollution control board, prior to undertaking any development of the project. Further, for commencing any operations on the establishment, obtaining a consent to operate (**CTO**) under the Air Act and Water Act from the concerned state pollution control board is a pre-requisite.

The grant of CTE and CTO by the respective state pollution control board is subject to the classification of the industry into red, orange, green or white category by the Central Pollution Control Board (**CPCB**) based on its pollution index scores. Such classification is pertinent to determine, *inter alia*, the location, applicable pollution control compliances and levies on the concerned entity.

While the CPCB has kept hydrogen in red category subject to the category of the main plant,[15] there is lack of clarity on the industrial categorization of '*green hydrogen*'. This categorization of industries is based on their pollution index score i.e., attributable to water pollution, air pollution, hazardous waste generation and consumption of resources. It is relevant to observe that this lack of clarity on the industrial categorization of green hydrogen may put it in the red category, where a project proponent will have to go through additional red tapes to get environmental clearances.

III. IMPLEMENTATION OF THE CURRENT POLICIES

The Indian government is proactively working to facilitate the rapid growth of the green hydrogen industry and to encourage a swift adoption of this fuel in the market, in the form of multiple incentives, grant of funds and resources for establishing green hydrogen plants which have been elaborately discussed in Green Hydrogen-Series I. Nevertheless, the outcome of the plan will largely depend on the effective implementation and monitoring of the government's policies, and measures and the market response towards the green hydrogen sector. Some of the measures undertaken by the government to address the issues discussed in the previous section are detailed below:

a. Single Window Clearance for Green Hydrogen Projects

As a major step towards facilitating ease of obtaining requisite approvals, consents and licenses, the Green Hydrogen Policy envisaged the establishment of a single portal for granting all statutory permits and consents required for undertaking manufacture, transportation, storage and distribution of green hydrogen or green ammonia.[16] Subsequently, the Department for Promotion of Industry and Internal Trade facilitated the green hydrogen page on the National Single Window System (**NSWS**) for granting approvals relating to setting up of manufacturing plants for green hydrogen or its derivatives and undertaking storage, transportation and distribution activities for such products (**Portal**).[17]

The Portal is intended to simplify the process and promote ease of doing business in the green hydrogen sector. The Portal has been unveiled to guide the entities venturing into the green hydrogen sector and to list out the compliances, both central and state specific licenses, approvals, and consents, required to be obtained by the entities for setting up green hydrogen manufacturing facilities, or undertaking storage, transportation and/or

distribution of green hydrogen.[18] The Portal generates a list of applicable central and state specific statutory clearances and permissions based on the description of business activities proposed to be undertaken by the concerned entity taking into consideration the following factors and enables the applicants to apply for all such clearances and permissions through NSWS's single window mechanism:

i. products to be manufactured, i.e., green hydrogen or electrolyser;
ii. nature of activity(s) to be carried out, i.e., green hydrogen production, hydrogen storage and transportation, green hydrogen derivatives and/or green hydrogen applications;
iii. the state in which the business will be established;
iv. utilities necessary for establishing and operating the business; and
v. roles and responsibilities to be discharged for the business and compliances to be undertaken therefor, i.e., labour and boilers, registration, metrology and/or pollution/ environment.

The major compliances set out on the Portal for the entities undertaking activities in the green hydrogen sector have been summarized in Annexure 1 of this article.

b. ***Measures for Production Cost***

The cost of producing green hydrogen is significantly high in comparison to that of grey hydrogen as green hydrogen is produced by electrolysis of water using renewable energy.[19] The central government and several state governments have adopted positive measures in the form of production linked incentives through its SIGHT program, waiver of inter-state transmission charges, etc.[20] The Reserve Bank of India (**RBI**) has also stepped up to promote investment in the renewable energy sector by allowing the scheduled commercial banks and non-banking financial companies registered with the RBI to offer 'green deposits' to its customers. The proceeds of such green deposits will be allocated for financing, *inter alia*, renewable energy projects including biomass or hydropower energy projects.

c. ***Availability of Renewable Energy***

The Green Hydrogen Policy included some positive measures in this regard, inasmuch as it provided that the inter-state transmission systems for renewable energy capacity that have been set up for green hydrogen/ green ammonia production will be prioritized for grant of connectivity under the Electricity (Transmission system planning, development and recovery of Inter State Transmission charges) Rules, 2021.[21]

However, such measures cannot guarantee the round the clock availability of renewable energy in the required amount for smooth operation of the green hydrogen plants, a challenge which needs to be crippled by a more viable approach and positive contribution of various stakeholders in the industry.

d. ***Transportation***

In order to make the transportation of renewable energy cost effective, the Department of Science and Technology (**DST**), earlier this year, invited bidders to set up hydrogen valley innovation clusters similar to the model adopted by the European countries, encompassing

the entire hydrogen value chain including production, storage, transportation and distribution to multiple sectors.[22] The hydrogen valleys will be set up under public-private partnership with the DST allocating up to Rs. 30 crores or 50% of the cost of the project, whichever is lower.

However, there is no clarity on the inter-state and cross border transportation of green hydrogen. There is need to develop a legal framework and infrastructure for inter-state and cross border transportation of green hydrogen as well as to set out the international safety standards to be adopted in such transportation.

e. ***Standard of green hydrogen and certification***

The MNRE on August 19, 2023, notified an office memorandum on the green hydrogen standard for categorizing hydrogen as 'green hydrogen'. The standard defines green hydrogen as the hydrogen obtained from renewable resources including through electrolysis or biomass conversion. The standard also limits greenhouse emissions arising from water treatment, electrolysis, gas purification, drying and compression of hydrogen, biomass processing, heat/ steam generation and conversion of biomass, to less than or equal to 2kg carbon dioxide equivalent/ kg hydrogen, taken as an average over the last 12-month period. The MNRE's green hydrogen standard has also envisaged the release of a detailed methodology for measuring, reporting, monitoring, onsite verification, and certification of green hydrogen.

Despite the central and state government's efforts in facilitating a robust green hydrogen ecosystem in India in the form of multiple incentives, grant of funds and resources for establishing green hydrogen plants, the growth of the sector will ultimately depend on factors such as practical ease of doing business and cost competitiveness.

IV. WAY FORWARD

The ambition of decarbonization of the industries is repelled by the lack of requisite infrastructure to deal with the shift to green hydrogen and reduce the industrial reliance on fossil fuels. As discussed, each stage of the hydrogen value chain requires a robust infrastructure comprising of (i) production facilities with uninterrupted access to renewable energy; (ii) infrastructure for storage of hydrogen in high-pressure gas cylinders (gaseous hydrogen), cryogenic tanks (liquid hydrogen) or creation of metal hydrides (storage in solid form); (iii) dedicated pipelines, cryogenic liquid tanker trucks or gaseous tube trailers for transportation; and (iv) hydrogen refueling stations for facilitating its end-use. The lack of proper R&D and infrastructure to support the green hydrogen industry lies at the core of the hurdles in India's goal of becoming a green hydrogen hub.

Though the central and the state governments have taken initiatives to address few of the challenges present in the establishment of green hydrogen projects, there remain several hurdles that require keen consideration. These include the costs associated with electrolysers and storage, streamlining of processes for grant of approval from the pollution control boards. These challenges and corresponding suggestions have been detailed herein:

a. ***Cost and funding***

As earlier discussed in this article, there are currently no domestically developed electrolysers; they are imported from abroad. Due to the incentive schemes in India being tied to the efficiency of the electrolysers, their cost remains high. The MNRE secretary in January 2023, informed that the government is contemplated waiving off import duty on electrolysers, initially for 2-3 years, till the domestic manufacturing capacity of electrolysers is scaled up.[23]

Further, NITI Aayog's suggestion on VGF model to scale the green hydrogen production in India must be considered by the government to effectively address the funding challenges. Sectors of high priority such as steel, heavy duty transport, refineries should be identified and for such sectors a thorough assessment of the viability gap must be undertaken to determine the necessary financial support for phased transition into the green hydrogen economy.[24]

b. ***Implementation and Monitoring***

The Indian government needs to balance the interplay between the growth of green hydrogen sector with the economic and environmental aspects by: (i) designating specific authorities and wings of the government for managing specific components of the hydrogen value chain; and (ii) demarcating the powers and responsibilities of the central government and state governments to avoid conflict.

Another approach may be the revision of overall greenhouse gases emission thresholds across the various industrial segments to make the adoption of green hydrogen an unescapable alternative. Much like the Green Hydrogen Policy, which allowed for purchase of green hydrogen to be computed towards the renewable energy purchase obligation of entities, the scope of corporate social responsibility of Indian entities may also be expanded to include investment in green hydrogen sector.

c. ***Transportation***

The development of new pipelines for transportation of natural gases must be undertaken keeping in view the factors required to maintain hydrogen at proper temperature and pressure limits. In order to avoid dual cost for laying out pipelines, it is beneficial to develop and design such pipelines which can work with both natural gas and hydrogen. To optimize cost efficiency, it is advantageous to engineer and construct pipelines that can accommodate both natural gas and hydrogen, effectively halving the investment expenditure.

d. Land

The Ministry of and Natural Gas has suggested to explore the repurposing of reclaimed and closed coal and lignite mine lands.[25] These closed coal and lignite mine lands can be used for establishing green hydrogen plants. It is essential that careful planning is done to minimize any adverse impact, but it is undisputable that such locations are ideal for development of green hydrogen project because of availability of existing freshwater and

transportation resources for mining activities, which can be useful for the process of electrolysis and consequently, for the production of green hydrogen.[26]

V. CONCLUDING REMARKS

While there are multiple challenges that remain unaddressed, it appears that India's green hydrogen journey has begun in the right direction with various stakeholders, such as central government, state governments, industrialists, etc. taking serious interest in overcoming the challenges faced by India in its path of becoming a global leader in green hydrogen sector. Recently, the Power and New and Renewable Energy Minister of India convened a meeting to assess the challenges faced by the Indian developers in undertaking green hydrogen projects. The Minister assured to take effective measures with respect to the cost related issues ranging from regulatory provisions for dual connectivity, contractual conditions, levy of demand charges by state governments, policies for special economic zones.[27] Additionally, given the bountiful renewable resources available in India for producing green hydrogen, it can be expected that the vision of the National Green Hydrogen Mission can be very well turned into reality. Most importantly, the outlook of the Indian government and its proactive responsiveness in addressing the challenges faced by the developers in the green hydrogen sector, can be expected to ensure a positive growth of this sector.

ANNEXURE 1

1. Central Approvals

Transportation	Production	Storage	Distribution
Export house certificate – EOU **[Foreign Trade Policy]**	Approval for Gas Cylinder Testing Station – Issued by PESO[1] **[Gas Cylinders Rules, 2016 – Form GCT]**	License to Store Compressed gas in pressure vessel(s) – Issued by PESO **[SMPV (U) Rules, 2016 – Form LS-1A (Form-III)]**	For sale of explosives of Class 1,2,3,4,5,6 or 7 in a magazine[2] – Issued by PESO **[Explosives Rules, 2008 – Form LE-3 (Form 21)]**
Importer Exporter Code (IEC) **[Section 7 – The Foreign Trade (Development and Regulation) Act, 1992]**	License to fill compressed gas in cylinders – Issued by PESO **[Gas Cylinders Rules, 2016 – Form E]**		
Approval of Permission to Transport Compressed Gas in ISO Tank Container within Indian Territory – Issued by PESO **[SMPV (U) Rules, 2016[3] - Form LS-2A]**	Approval of Mining Plan (for all minerals other than Hydrocarbon/ Energy Minerals, Atomic Minerals and Minor Minerals) **[Section 5(2)(b) of the Mines & Minerals (Regulation & Development) Act, 1957]** (within 90 days from the application)		
License to Import Explosives – Issued by PESO **[Explosives Rules, 2008 – FORM LE-8 (Import)]**	Product certification scheme for use of ISI mark – Scheme I under Bureau of Indian Standards (Conformity		

[1] Petroleum & Explosives Safety Organization (**PESO**).
[2] "magazine" refers to a building or structure (other than an explosives manufacturing building) intended for storage of explosives, specially constructed in accordance with the specification provided under these rules or of a design and approved by the Chief Controller.
[3] Static and Mobile Pressure Vessels (Unfired) Rules (2016) (**SMPV**).

	Assessment) Regulations, 2018 **[Section 13 of Bureau of Indian Standards Act, 2016]** (within 1 to 4 months)		
	For Use of explosives of class 1, 2,3,4,5,6 or 7 in a magazine – Issued by PESO **[Explosives Rules, 2008 – FORM LE-3 (FORM 22)]**		
	Registration under the Contract Labour (Regulation and Abolition) Act, 1970 **[Section 7, Contract Labour (Regulation and Abolition) Act, 1970]**		
	Industrial License **[Section 11 of Industries (Development and Regulation) Act, 1951]**		
	Explosives other than Fireworks, Gunpowder, ANFO, LOX and SME – Issued by PESO **[Explosives Rules, 2008 – FORM LE-1 (FORM 20)]**		
	Approval for Pipelines – Issued by PESO **[Petroleum Rules, 2002 – FORM PLP]**		

	Incorporation of a Company **[Section 7 of the Companies Act, 2013]**		
	Forest Clearance **[Section 2 of the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980]**		
	Approval of fabrication workshop for fabrication of cryogenic/non cryogenic pressure vessel / Safety fittings / Safety kit / Vaporizer – Issued by PESO **[SMPV (U) Rules, 2016 – Form PV]**		
	Environmental clearance for undertaking specific projects or activities **[Section 3 of the Environment (Protection) Act, 1986 – EIA Notification, 2006]**		
	Industrial Entrepreneur's Memorandum[4]		

[4] Industrial undertakings exempted from the requirements of Industrial Licensing under the Industries (Development and Regulation) Act, 1951 are required to file information relating to setting up of industries as Industrial Entrepreneur Memorandum, https://services.dpiit.gov.in/lms/iemServices.

2. State Approvals

State	List of approvals	Average Timelines for Grant of Approvals (days)
Gujarat	Registration under the Interstate Migrant Workers Act **[Section 4 of Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979]**	30
	Consent to Establish and Consent to Operate plant and machinery **[Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 & Section 21 of the Air (Prevention and Control of Pollution) Act, 1981]**	120
	Factory License Application **[Rule 4 of Gujarat Factories Rules, 1963]**	90
	Building Plan Approval -UDD **[Section 27 of Gujarat Town Planning and Urban Development Act, 1976]**	30
	GIDC - Water Supply Application **[Gujarat Industrial Development Corporation (Supply of Water to the Industrial Estates), Regulations, 1991, (First Amendment) Rules, 2010]**	10
	Building Plan Approval – GIDC (Gujarat Industrial Development, General Development conditions for plot/land allotted in GIDC Estate Regulations) **[The Gujarat Industrial Development Act, 1962]**	30
	Registration Application under the Contract Labour Act **[Section 7 of the Contract Labour (Regulation and Abolition) Act, 1970]**	30

	Factory Plan Application **[Rule 3 of Gujarat Factories Rules, 1963]**	90
	Employer's Registration Form - Professional Tax **[Section 5 of the Gujarat State Tax on Professions, Trades, Callings and Employments Act, 1976]**	1
Kerala	Consent to Establish and Consent to Operate plant and machinery **[Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 & Section 21 of the Air (Prevention and Control of Pollution) Act, 1981]**	120
	Permit for Constructing New Factory under Section 2M **[Factories Act, 1948]**	90
	Registration under Inter-State Migrant Workmen (Re & Cs) Act 1979 **[Section 4 of Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979]**	15
	Registration under Building and Other Construction Workers Act 1996 **[Section 7 of Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996]**	15
	Clearance for Water Connection **[Section 38 of the Kerala Water Supply and Sewerage Act, 1986]**	15 days (Urban areas); 30 days (Rural areas)
	Application for water connection **[Section 38(4) of the Kerala Water Supply and Sewerage Act, 1986]**	30 (Rural areas)
	Layout Approval **[Rule 3 of the Kerala Factories Rules, 1957]**	30

	New Factory License **[Rule 4 of the Kerala Factories Rules, 1957]**	60
Rajasthan	Permission for drawing water from river/reservoir	NA
	Consent to Establish and Consent to Operate plant and machinery **[Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 & Section 21 of the Air (Prevention and Control of Pollution) Act, 1981]**	120
	Generator Permission Certificate **[Electrical Inspectorate Department eServices (Rajasthan Single Window Clearance Portal) under Regulation 32 of Central Electricity Authority Regulations, 2010]**	NA
	New Water Connection – RIICO **[Rule 14(a), RIICO Disposal of Land Rules, 1979]**	20
	Conversion of Land Use (90A) – UDH **[Section 90A of the Rajasthan Land Revenue Act, 1956]**	30
	Change of Land Use (Residential to Commercial) **[Rajasthan Urban Area Rule 2010]**	NA
	Allotment of Land (Preferential Allotment) **[Rule 3 and 6 of the RIICO Disposal of Land Rules, 1979]**	NA
	Approval of Building Plans **[Rule 3(R)(5) of the RIICO Disposal of Land Rules, 1979]**	NA
	Building Plan Approval System (DA- Jaipur)	30
	Registration under Inter-State Migrant Workmen (RE & CS) Act, 1979 (Contractor)	15

	[Section 4 of Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979]	
	Allotment of Land (Normal Allotment) **[Rule 3 of the RIICO Disposal of Land Rules, 1979]**	NA
	Building Plan/ Map Approval - Local Self Government	30
	Conversion of Land Use (Agriculture to Non-Agriculture in Rural Area) under Raj. Land Revenue Rules, 2007 (New) **[Rule 9 of Rajasthan Land Revenue (Conversion of Agricultural land for non-agricultural purposes in rural areas) Rules, 2007]**	90
	Registration Application under the Contract Labour Act **[Section 7 of the Contract Labour (Regulation and Abolition) Act, 1970]**	15 (Contractor) 30 (Principal Employer)
	Factory Building Plan Approval under Factories Act, 1948 **[Rule 3A of the Rajasthan Factories Rules, 1951]**	30
	Building Plan Approval System (DA- Ajmer, Jodhpur, UIT)	30
	Registration of Establishments for Employing Building and Other Construction Workers **[Section 7 of the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996]**	15
	Conversion of Land Use (Agriculture to Non-Agriculture in Urban Area) **[Rajasthan Land Revenue Rules, 2012 - Local Self Government Department]**	NA
	Factory License **[Rule 4 of the Rajasthan Factories Rules, 1951]**	60

	Registration under Inter-State Migrant Workmen (RE & CS) Act, 1979 (Principal Employer) **[Section 4 of Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979]**	30
	Consent to Operate (CTO) or Consolidated Consent and Authorization (CCA) **[Section 25 of the Water (Prevention and Control of Pollution) Act, 1974] and Section 21 of the Air (Prevention and Control of Pollution) Act, 1981**]	120
	Consent to Establish (CTE) **[Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 & Section 21 of the Air (Prevention and Control of Pollution) Act, 1981]**	120
	Approval for Electrical Installation/ Sanction of Power **[Rule 14(b) of the RIICO Disposal of Land Rules, 1979]**	NA

[1] Ministry of New and Renewable Energy, *National Green Hydrogen Mission* (Jan., 2023), https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2023/01/2023011390.pdf.

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[8] *Id.*

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[10] Ministry of Petroleum and Natural Gas, *Hydrogen Times* (July, 2023), https://mopng.gov.in/files/article/articlefiles/2023Q2.pdf.

[11] NITI Aayog, *Harnessing Green Hydrogen* (June, 2022), https://www.planningcommission.gov.in/sites/default/files/2023-02/Harnessing_Green_Hydrogen_V21_DIGITAL_29062022.pdf.

[12] Ministry of New and Renewable Energy and UNSAID, *Investment Landscape of Green Hydrogen, South Asia Regional Energy Partnership* (May, 2023), https://sarepenergy.net/wp-content/uploads/2023/05/GREEN-HYDROGEN-FINAL-Version.pdf.

[13] *Id.*

[14] ETEnergyworld, *Green Hydrogen adoption in India- Opportunities, challenges and the way ahead* (May 12, 2023), https://energy.economictimes.indiatimes.com/news/renewable/green-hydrogen-adoption-in-india-opportunities-challenges-and-the-way-ahead/100177937

[15] CPCB, *Modified Directions under Section 18(1)(b) of the Water (Prevention & Control of Pollution) Act, 1974 and the Air (Prevention & Control of Pollution) Act, 1981 Regarding Harmonization of Classification of Industrial Sector Under Red/Orange/Green/White Categories* (Mar. 07, 2016).

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