80-Twenty of Industry

Hydrogen & India – Will this be a pair that will entice global investors to script a new energy saga?

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Hydrogen & India - Will this be a pair that will entice global investors to script a new energy saga?

Positive market momentum for hydrogen with 200+ projects announced globally – GW scale projects fast catching the pace as well

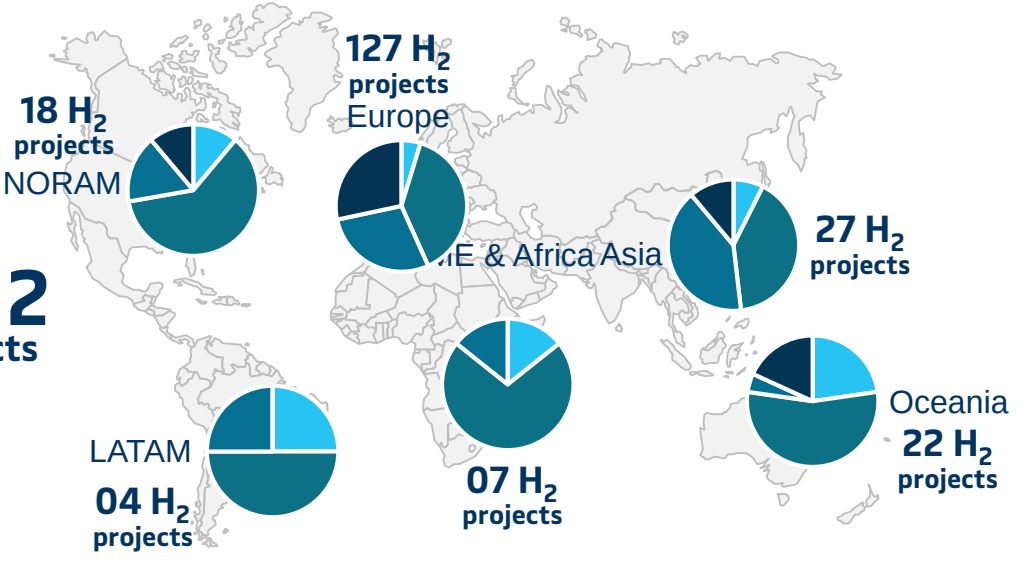
There has been a great buzz around entire H_2 value chain projects across the globe with around 17 giga-scale production projects (i.e., >1 GW for renewable and over 200 thousand tons per annum of low-carbon hydrogen) already announced. Europe, Asia and Oceania are the leading regions comprising bulk of hydrogen value chain projects. With focus upon greener source of energy generation and reducing carbon emissions in transport projects it is quintessential to look H_2 as a tenable alternative.

Currently, of the total projects close to 55% are housed in Europe. However, the demand centers are spread well across not only in Europe but also in countries like that of Japan and South Korea. The focus for Asian countries lie upon the road transportation applications, green ammonia, LH_2 & LOHC projects, while Europe seems to have championed multiple integrated hydrogen economy projects. The major driver has been the development in cross industry and policy co-operation from which India can draw a leaf in order to build an even environment for H_2 development in the country.

228 H_2

announced projects

- Integrated H_2
- Transportation
- Large Scale H_2
- Giga-scale H_2



17 Projects

Giga-scale production: Renewable H_2 projects >1GW and low-carbon H_2 projects >200 kt p.a.

90 Projects

Large scale projects: Industrial usage like refinery, ammonia, power, methanol, steel & industry feedstock

53 Projects

Transport projects: Trains, ships, trucks, cars & other hydrogen-based mobility applications

45 Projects

Integrated H_2: integrated H_2 economy, cross-industry and projects with different types of end-uses

23 Projects

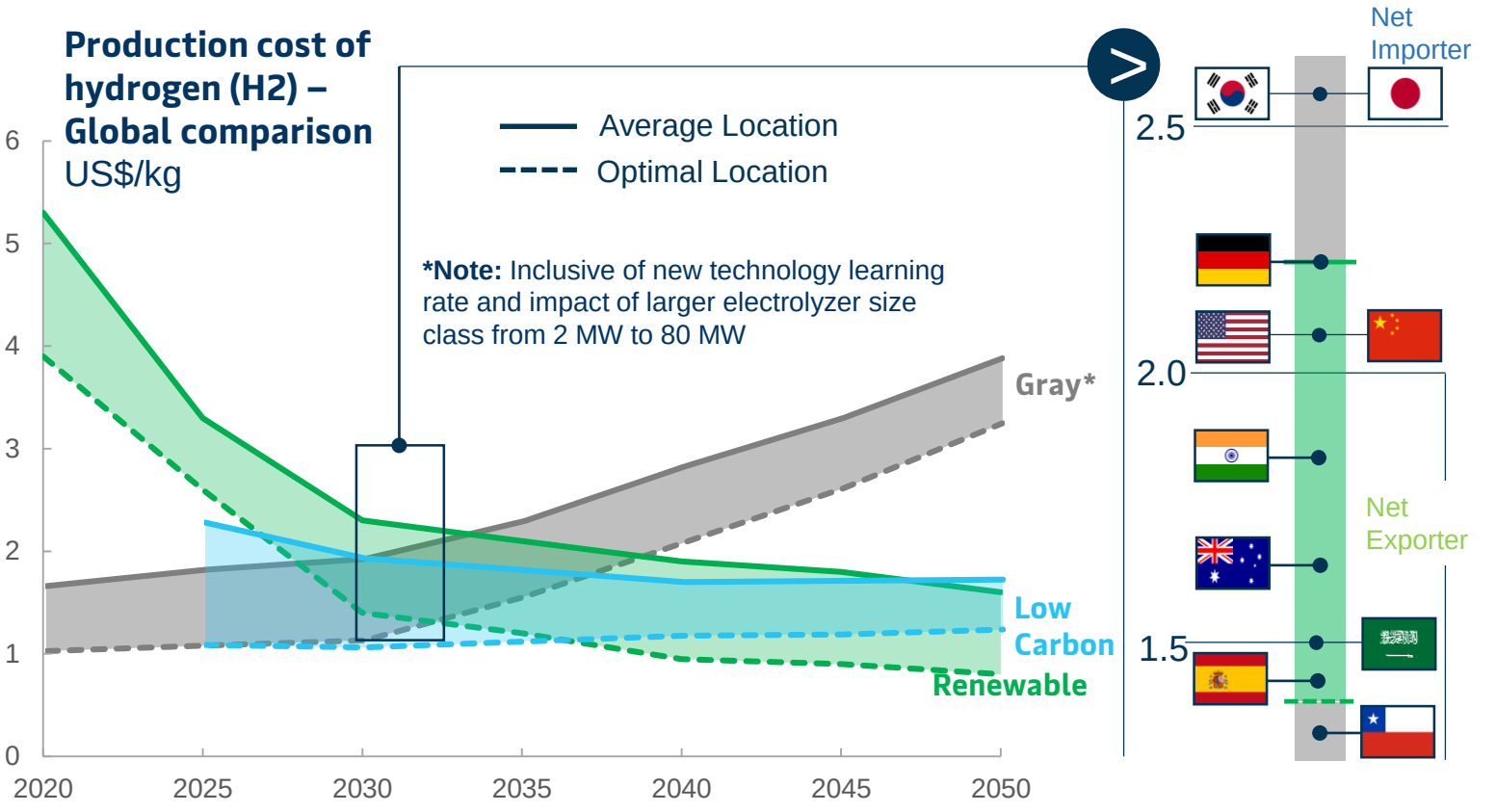
Infrastructure projects: H2 distribution, transportation, conversion and storage projects distributed across globe with major share in Europe only.

Source: Eninrac research, McKinsey Insights & Channel Checks

Why green H_2 is pegged as a game changer in India?

India has been no different when it comes to investments for H_2 from the world in terms of sentiments to say the least. With companies like Reliance, Adani, IOCL and NTPC all geared up with ambitious green H_2 plans, India certainly looks poised for a carbon free transition. Also, with National Hydrogen Mission the country aims to become the largest exporter and producer of green H_2. Strategic collaborations, massive technological investments and ideal policy & regulatory interface for Indian firms is shaping the green H_2 market in the country to acquire a fast pace by 2025. This shall be inline with projections that by 2050, 3/4th of all the hydrogen produced shall be green produced by renewable energy and electrolysis.

For India, the scene shall be dominated by low-cost renewable projects like solar PV electrolysis or wind-based electrolysis could see the green hydrogen cost as low as $1.5/kg to $2.3/kg which shall increase the competitiveness by 2030, respectively. Thus, India shall be the destination next for global investments for green hydrogen projects .



Source: Eninrac research, National H_2 Mission, McKinsey & Channel Checks

Very good chance of green hydrogen to break even with gray hydrogen in India by 2030 – India might see a break-even for green and gray hydrogen as early as 2030 driven by primarily three factors –

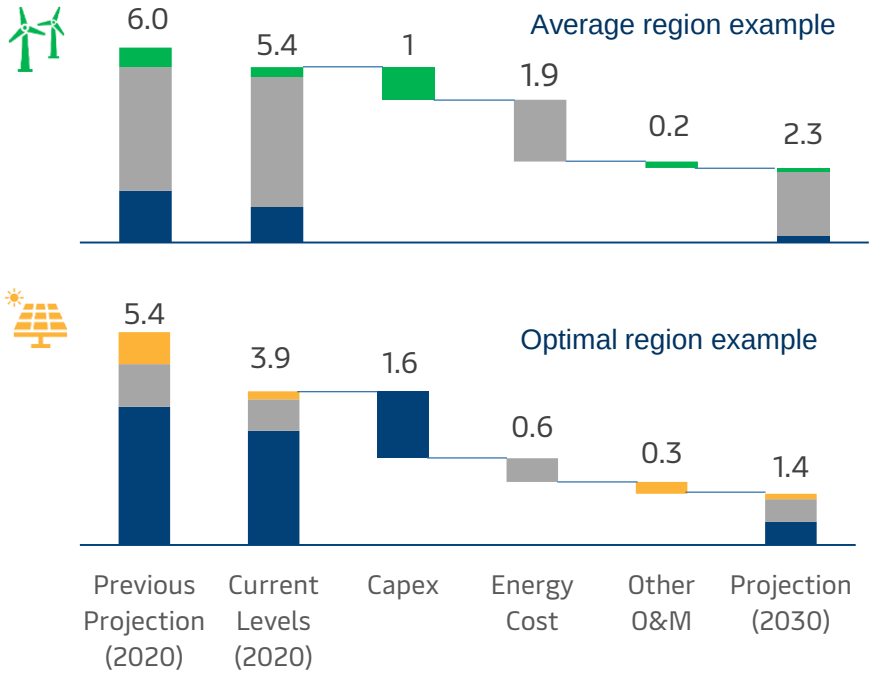
- Falling Capex for electrolyzer
- LCOE for renewable power generation is on continuous decline
- Globally larger capacity utilization for RE based H_2 projects are witnessed

Key Assumptions –

- Gas price $2.6 – 7/Mmbtu
- Cost of CO2/Ton in US$ - $30 (2020), $50 (2030), $150 (2040) & $300 (2050)
- LCOE ₹1.90 - ₹5.50/kWh (2020), ₹1.00-₹2.90/kWh (2030) & ₹0.50-₹1.90/kWh

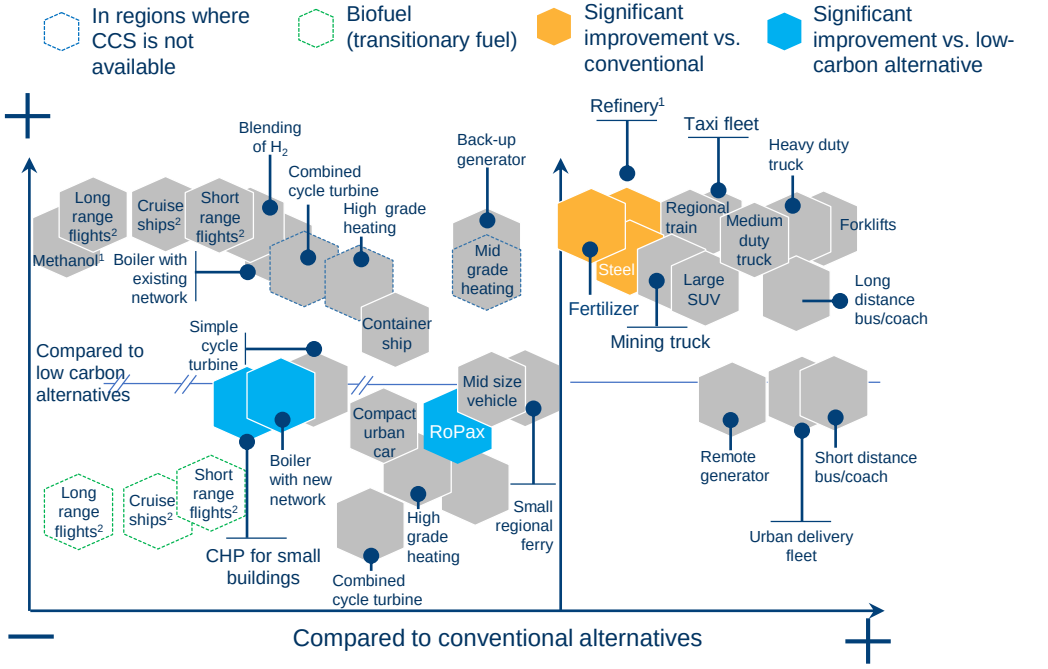
What shall shape the lower cost for green hydrogen in India and transform its competitiveness for the country?

Wind & solar based hydrogen production cost trajectory – Global benchmarks & India (US$)



Source: Eninrac research & analysis, National H_2 Mission, & Channel checks

H_2 competitiveness as per end use application – India & World – 2030 projections



1. Clean H_2 is the only alternative
2. Carbon break-even cost represents average cost over lifetime of asset

Source: Eninrac research & analysis, McKinsey & Channel Checks

With the emergence of demand centers in Asia that shall be dominated by China, Japan & South Korea, India can certainly integrate its renewable capacity built up for both solar PV and wind to generate green hydrogen in bulk and transform it to a net exporter. Having said so, the challenge to be addressed for Indian market to flourish for green hydrogen shall be two layered. First, being the distribution of hydrogen resources and its associated infrastructure. Following this the orientation of end use industries adapting green hydrogen coupled with cost competitiveness available with green hydrogen shall pose a challenge as well.

The juncture at which India stands as of now for H_2 trajectory thus calls for an in-depth market research covering all the bases of business & dynamics around it. Therefore, as global market research & consultancy eninrac is producing a market research report encompassing business case, current hydrogen market size along with location fitment analysis as well. Consecutively, the report shall also cover cost competitiveness for producing H_2 in India aligned with the objective of being a net exporter. Also, the dossier shall address the adaptability index of H_2 for end application with entire depth & breadth of end use industries.

Key Signpost – The hydrogen market in India can potentially develop at a brisk pace, provided the ecosystem of production, distribution and end use application must be aligned with investments

For India to be a flourishing market for hydrogen the prelude is set and rolling, however the pathways will not be an easy grind. While intent of many big conglomerates and even international players to invest big in H_2 market of India is seen a major driver, it doesn't come with cost competitiveness' guarantee which indeed shall be holding the key to unlock efficient distribution & transmission of H_2 for end use application. Players involved in infrastructure creation for transmission of other forms of energy including electricity and gas must be coherent with idea of distribution of hydrogen for long term as it would be around one-eighth time cheaper while transmitting 10 times the energy content. In the short- to medium-term, the most competitive setup for large-scale clean hydrogen applications involves co-locating hydrogen production on- or near-site. The industry can then use this scaled production to supply the fuel to other hydrogen users in the vicinity, such as refueling stations for trucks and trains, and smaller industrial users.

Prima facie lack of credible market information is another challenge poised to be addressed and at eninrac our focus is to aim for studying the markets which are multi-layered and have challenges for each core segment of market be it input, process or output. Therefore, we are channelizing our resources to deliver an industry first dossier of its kind for hydrogen market in India which covers cost breakdown analysis for production, shipping & distribution, end use application for both domestic and international markets couple with key demand drivers.

About Eninrac Consulting

Eninrac is a leading provider of market research, advisory and consulting services in the energy and infrastructure space to different stakeholders across the globe. Our team of experts blends extensive knowledge of all aspects of the energy and infrastructure industry to provide unmatched analytical insights, innovative strategies, and measurable value creation for our clients. We add value with pace, certainty and strategic agility and strive to exceed client expectations by delivering consistent results. We help our clients in unlocking potential and empowering organisations to achieve business objectives and goal effectively.

We at Eninrac put clients at the centre of our business and transform their risks into high rewarding opportunities through our innovative solutions.

To learn more about our service capabilities , visit https://eninrac.com/

> Truth is ever to be found in the simplicity, and not in the multiplicity and confusion of things
>
> **- Sir Isaac Newton**

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