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Independent power producers need supply chain optimization road map to attain 3000GW of green hydrogen penetration

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Written by Guest

October 30, 2023 16:15 IST

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– By Rahul Garg

If you are an independent power producer, infrastructure project developer, sub-contractor or a supplier, will you bet on the chances of scaling green hydrogen? Like all things manufacturing that travel from the lab scale scientific prototype to industrial scale commercial prototype, green hydrogen too has an inflexion point beyond which it will attain critical mass. From now that green hydrogen is in a stage of industrial infancy to the next when it will reach the commanding heights of the economy, independent power producers need to watch out for one number, 3000GW of renewable energy penetration. From there on, the economies of scale set in. Here's the rationale

reach the commanding heights of the economy, independent power producers need to watch out for one number, 3000GW of renewable energy penetration. From there on, the economies of scale set in. Here's the rationale based on techno-economic analysis.

1. Think Scale from the Word "Go" and Build Processes from the Ground Up

The CII B20 India 2023 task force report asserts that between 2023 and 2030 a 3X growth in capex investment in renewable energy will lead to 3X growth in renewable energy penetration and a 6X decline in carbon emissions across the global economy. This equation will hold true once renewable energy reaches 3000 GW. Infrastructure project developers and independent power producers need to go big on the size of installed capacity to be able to harvest the economies of scale accruing from the high degree of operating leverage. Large capacity installation for green hydrogen projects will increase the capex investment requirement but reduce the opex beyond the inflexion point, which is the key to reducing the cost of green hydrogen from USD 3/kg to USD 1.5/kg; a 50% drop.

2. Build a Demand Led Supply Chain and Pump Prime Capex into the National Infrastructure Pipeline

Three major applications of green hydrogen are green steel, green cement, and green ammonia. Sectors that have a government anchor at the point of origin of the infrastructure supply chain will see faster and greater adoption of green hydrogen derivatives. Green steel and green cement will witness faster adoption once nodal government agencies like MoRTH, NHAI, NHIDCL, and Indian Railways include green steel and green cement in the bill of quantities for infrastructure projects. India's National Infrastructure Pipeline which currently has 8000+ projects worth INR 108 lakh crores under implementation is the key to stimulating aggregate demand for green steel and green cement. Further, site aggregation models for pilot infrastructure projects using green steel and green cement will unlock additional 2-3% material cost savings due to economies of scale.

3.Build a National Green Hydrogen Grid Storage and Pipeline Network to Zero Down Logistical Gaps

We need to learn from what China could have done better. A leading investment bank has called out the excess production of green production in China. It has also raised red flags for green hydrogen projects in China over the cost disadvantages arising from the lack of adequate logistical infrastructure and non-strategic location of the projects. Some of the big green hydrogen projects are in Inner Mongolia and Xinjian in the west whereas potential buyers are in the cities across eastern China. There is another insight that we can draw from the oxygen crisis during the second wave of the COVID19 pandemic. The oxygen demand hotspots were in the north and west whereas the sources of oxygen available with steel plants are in the eastern part of India. Most facilities with the potential for input renewable energy required for green hydrogen production are concentrated in the west, viz, Gujarat and Rajasthan. The logistical distance between Ahmedabad and Kolkata is approximately 2500 KM. This marker should suffice to visualize the gravity of the energy accessibility challenge. While colocation of green hydrogen projects at steel plants will provide obvious cost benefits, we should build a national green hydrogen grid storage and pipeline network along the lines of a hub and spoke model.

3. Scale Solar Energy and Electrolyser Manufacturing for Green Hydrogen

Of the multiple cost drivers, electrolyser capacity and input renewable energy together account for 85% of the levelized cost of green hydrogen (LCOH) production. The key to reducing the cost of green hydrogen lies in making the input, viz, solar energy affordable. Further, stacks account for 45% of electrolyser costs, while balance of plant accounts for the remaining 55%. Of the four types of electrolysers namely alkaline, polymer electron membrane (PEM), anodic electron membrane (AEM), and solid oxide, the first two have attained industrial scale and are relatively more affordable than the latter two. A policy recommendation that may be worth considering is the inclusion of local capacity expansion of alkaline and PEM electrolysers in the ambit of the productivity-linked incentive (PLI) and "Make in India" initiatives. Vendor consolidation for input solar energy and electrolyser manufacturing can reduce green hydrogen costs by 5-8%.

4. Prioritize Execution Rigor and Digital Supply Chain Transformation to Steer Clear of Time Overruns

The interest meter on project finance always keeps ticking and is a nightmare for infrastructure project developers. The adoption of new age supply chain processes and construction technologies can enable this. For instance, the use of prefabricated structures and pre-engineered buildings may lead to a 10-15% increase in material costs (OPEX). But it will lead to project completion 10 to 15 weeks ahead of schedule and therefore 10-15% higher EBITDA. Similarly digital procurement transformation projects like catalog-based buying may take 4 years before the return on investment becomes visible. But it can reduce the PR-to-PO process from 4 days to 3 minutes. What's the value of saving 4 days in India's core sectors? The national average speed of road construction in India is 25 KM per day, meaning that 100 KM of road can be built in 4 days. For a road development project of 1 KM aggregate lead in the state of Uttar Pradesh, with greenfield alignment of 2 lanes, it can lead to additional revenue of INR 3.4 crores per KM and INR 340 crores in 4 days for a road developer.

Green Hydrogen: India's Opportunity to Reimagine Its Place in the Global Supply Chain

Every industrial revolution has been built on the foundations of energy. Green hydrogen is India's opportunity to find its rightful place in the global supply chain, courtesy the backward linkage with solar energy, fuel cells and electrolyzers and forward linkage with green steel, green cement, and green ammonia. India needs to take the trajectory of a startup's journey from seed to scale to achieve self-reliance in green hydrogen for its domestic use as well as for the global market. If we sow the right seeds now, the plant will take some time to spread its roots, but once it attains full bloom, the entire B2B industrial supply chain will reap its fruits.

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