Energy Intelligence

Energy Intelligence Premium Weekly

Thursday, October 27, 2022

Energy Transition: Assessing Hydrogen's Potential

Green hydrogen costs will decline sharply this decade but will typically lag cheaper blue hydrogen without significant subsidies, according to our newly released levelized cost of hydrogen (LCOH) analysis. Both need to reduce costs substantially to compete in end-use markets, absent further direct policy support.

- **Blue hydrogen is expected to maintain its cost advantage this decade.** Blue hydrogen should typically remain much cheaper to produce than green hydrogen despite its dependency on carbon capture and storage (CCS). Our LCOH assessment pegs 2020 baseline blue hydrogen costs around 50% below green even if using a natural gas input cost of $20/MMBtu. Gas at $5/MMBtu pulls costs below $2/kg, giving advantage to cheap gas in the Mideast and US. A return to 2015-19 gas price averages of around $2.50/MMBtu there would knock costs to a highly competitive ~$1/kg. But unprecedented gas market volatility and record prices in the Ukraine crisis present challenges for competitiveness and investment appetite, if sustained. Policy incentives also typically favor green hydrogen, skewing economics.

- **Green hydrogen costs are likely to fall significantly over the long run.** Declining wind and solar power costs and electrolyzer capex costs will drive green hydrogen lower this decade — although pace and scale remains uncertain. Our midcase scenario sees costs roughly halving by 2030 — to $2.20-$4.40/kg vs. $7.30/kg in 2020 — on fast improvements in electrolyzer load factors and more rapid input cost declines. The lower end would close in on $2/kg, a key threshold. We have greater line of sight on falling renewable electricity costs, with our latest levelized cost of energy report showing solar and onshore wind extending their cost advantages over natural gas in most regions by 2030. Less certain is how quickly electrolyzer costs can drop. Here, higher efficiency rates, economies of scale and reduced materials needs will prove crucial.

- **Transport and conversion costs may cap global trade.** We see Europe and East Asia (Japan, South Korea) as likely prime importers due to high domestic hydrogen costs and limited gas/renewables capacity. Among exporters, the US and Mideast are best placed on blue hydrogen, with the Mideast, Africa, Latin America and Australia leading on green. But costs for future transportation and conversion will remain high, at up to $2-$3/kg, challenging widespread trade. Pipelines are the leading option, best suited to shorter distances such as North Africa to Europe, followed by ammonia or methanol shipping, preferably without reconversion to limit costs and energy losses. Liquefied hydrogen shipping may be prohibitively expensive given reconversion. Geopolitics may influence some trade dynamics. Europe, for instance, could favor domestic production to limit external dependency post-Ukraine. China is eyeing self-sufficiency for energy security.

- **Hydrogen needs to be much cheaper to compete in most new end-uses.** Many potential applications are being considered, including transportation, power generation, heating and industry. Competitiveness will depend on fossil fuel and carbon prices, technology developments, policy support and other factors. But we see hydrogen needing to fall well below $2/kg in most applications — and other decarbonization options like CCS and direct electrification will still present market penetration challenges. From a purely cost standpoint, we see greatest scope for hydrogen to compete against oil products in heavy-duty, long-range transport (e.g. trucking, shipping, rail). Industrial applications (e.g. steelmaking) and displacing gray hydrogen in refineries present compelling market opportunities. Hydrogen could carve out a role in storage (excess renewable power) and backup (displacing gas or coal) in power generation.

- **Despite cost challenges, sizable opportunities for hydrogen exist.** Hydrogen's ultimate role will depend heavily on external factors, including policy, wider CCS ramp-up and rollout of renewable electricity. We note that capturing a 10% share of final energy demand by 2050 — as some scenarios suggest — would create a hydrogen industry several times the size of LNG today. But hype is a risk, and we see limits to global uptake. Key questions surround hopes for use in road transport and rapid growth of global trade. A more likely path, in our view, is incremental growth from local/fixed applications (led by industrial uses) to wider regional trade post-2030, with select uses in heavy-duty transport. We see policies primarily aiding green output on the supply side, while carbon pricing/taxes (as in Europe) could help foster demand — albeit with risks that alternative decarbonization solutions are also supported. Focused support for the full hydrogen value chain is required to realize more ambitious growth.

Energy Intelligence REPORTS

Hydrogen Costs Are Falling But Challenges Remain
Low-carbon hydrogen attracts huge industry interest and will see costs fall, but at this early stage still faces challenges... ***click for full report***

Renewable Costs Spike, But Keep Competitive Advantage
Renewable electricity costs have increased in 2022, but fossil fuel prices have increased even more, according to our latest levelized cost of energy analysis... ***click for full report***

China Taking Crown in Low-Cost Electrolyzers
China is maintaining the lowest-cost advantage in manufacturing electrolyzers needed for green hydrogen — a reminder of its leadership in solar... ***click for full report***

Hydrogen Growth in Europe Fueled by Subsidies
Brussels sees hydrogen as key to replacing fossil fuels in hard-to-electrify sectors of the economy and is financially backing early-stage projects... ***click for full report***

Law Puts US in Front on Clean Hydrogen
US developers see big opportunity as generous incentives from a new law help carbon-free hydrogen compete immediately... ***click for full report***

Energy Intelligence SERVICES

Energy Transition

- News
- Analysis
- Research
- Data

Energy Intelligence EXPERTS

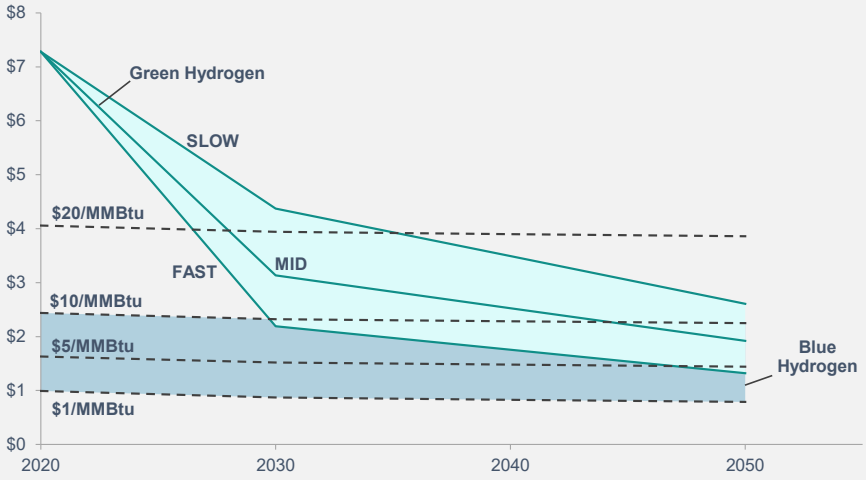
Alex Martinos
Director, Energy Transition Research
+44 (0)20 7518 2248
amartinos@energyintel.com

Philippe Roos
Senior Reporter
+33 6 2286 3776
proos@energyintel.com

Sam Burman
Senior Research Analyst
+44 7548 105124
sburman@energyintel.com

Thursday, October 27, 2022

Global Hydrogen Production Costs
Energy Intelligence LCOH* Analysis ($/kg)



Note: *LCOH = Levelized Cost of Hydrogen. See full report for details and key assumptions.
Source: Energy Intelligence

ABOUT ENERGY INTELLIGENCE PREMIUM

Delivering just the right amount of tailored, relevant and concise insights to senior executives

The digital age has brought an abundance of unfiltered and often unreliable information, which takes time to sift through.

The **Energy Intelligence Premium** service provides senior executives with concise, value-added information on key issues to help quickly understand the global energy landscape.

The service provides you with both a high-level overview and the means to drill down to the granular level, through:

- The Daily Email – Our Must-Read News Stories
- The Weekly Email – Our Take on a Key Industry Topic
- The Bundle – Customized Content & Data Solution
- Access to Energy Intelligence Analysts

Energy Intelligence Premium CONTACTS

Sales:
Geoff Wright
Global Head of Sales & Marketing
+1 646 616 0836
gwright@energyintel.com

Content:
Casey Merriman
Editor, EI Premium
+1 832 687 8770
cmerriman@energyintel.com