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## The Reality Behind Green Hydrogen's Soaring Hype

Renewably produced hydrogen has great potential and some powerful allies. But it's not a decarbonization panacea.

JASON DEIGN | NOVEMBER 28, 2019



*The Reality Behind Green Hydrogen's Soaring Hype*

Green hydrogen produced using renewable energy is increasingly seen as a key asset for grid and transport decarbonization.

Interest in the technology is surging. Shell believes the hydrogen sector (<https://www.greentechmedia.com/articles/read/shell-new-energies-evp-hydrogen-subsidies-will-pay-off-like-they-did-for-so>) deserves the same levels of support that went to solar energy over the years.

But at least in the medium term, the decarbonization potential of hydrogen is limited. In some areas, it's "just not economical, and it won't be," said Wood Mackenzie senior analyst Ben Gallagher.

Green hydrogen remains relatively inefficient and expensive today. It has an end-to-end efficiency of around 30 percent, said Gallagher.

As a result, it's hard to see it being used for electricity generation in markets such as the U.S., where natural gas prices are expected to remain low for the foreseeable future.

Similar challenges could hamper attempts to make hydrogen a viable alternative to electrification in the automotive sector.

"On the mobility side, you not only have the electrolyzer, you have a large distribution network that you need to build out," said Gallagher. "Compared to either EVs or gasoline, I don't understand how it's going to be cost-competitive in any way, anytime soon."

## Not much "green" today

Gallagher's views echo the findings of a major report ([https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Sep/IRENA\\_Hydrogen\\_2019.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Sep/IRENA_Hydrogen_2019.pdf)) on green hydrogen published by the International Renewable Energy Agency (Irena) in September, which warned that the fuel "should not be considered a panacea."

"A hydrogen-based energy transition will not happen overnight," Irena's report states. "Hydrogen will likely trail other strategies such as electrification of end-use sectors, and its use will target specific applications. The need for a dedicated new supply infrastructure may limit hydrogen use."

Despite the challenges, many are bullish on green hydrogen's growth prospects.

In research ([https://www.woodmac.com/our-expertise/focus/transition/green-hydrogen-production-2019/?utm\\_source=gtm&utm\\_medium=article&utm\\_campaign=wmpr\\_greenhydrogen19](https://www.woodmac.com/our-expertise/focus/transition/green-hydrogen-production-2019/?utm_source=gtm&utm_medium=article&utm_campaign=wmpr_greenhydrogen19)) published last month, Wood Mackenzie said more than 3.2 gigawatts of green hydrogen electrolyzer capacity might be deployed between now and 2025, a 1,272 percent increase on the 253 megawatts installed from 2000 to the end of 2019.

“The large increase in the 2019-2025 period is partially due to the nascency of the market,” Gallagher said. “But aggressive targets in East Asia and increased interest from major international stakeholders will drive deployment in the near term.”

Green hydrogen is produced when renewable power is used in the electrolysis process. The resulting hydrogen can be used later to return electricity to the grid via a fuel cell.

At present, around 99 percent of the roughly 130 million tons of hydrogen a year used for industrial processes — mostly oil refining and ammonia production — is made using coal or lignite gasification processes, or steam methane reformation.

The hydrogen industry is looking to move away from these carbon-intensive production methods, either by pairing steam methane reformation with carbon capture and storage or by using renewable energy to power water electrolysis.

Neither option is cheap, though. And the first one, which yields what's called “blue” hydrogen, is not inherently carbon-free, Irena noted.

“Development of blue hydrogen as a transition solution also faces challenges in terms of production upscaling and supply logistics,” said the agency.

On the other hand, the cost of green hydrogen looks set to fall as electrolyzer production ramps up and renewable energies get cheaper.

As a result of these changing dynamics, Wood Mackenzie expects green hydrogen production to be competitive with gasification and steam methane reformation by 2030 in Australia, Germany and Japan.

## Playing the heating card

Given that current production methods account for around 2.5 percent of all global carbon emissions, once renewable-energy-based electrolysis becomes competitive, “[green] hydrogen will be used to replace [other forms of] hydrogen,” said Gallagher.

Beyond that, green hydrogen's fortunes will likely be tied to how efficient its production and usage can become.

Neil Crumpton, a U.K. energy consultant and former chair of the green hydrogen advocacy group called Planet Hydrogen, said next-generation electrolyzers might be able to achieve a near 80 percent conversion efficiency.

This could bring up green hydrogen's round-trip efficiency for electricity production to between 45 percent and 50 percent depending on the type of fuel cell, turbine or gas engine used to deliver power to the grid.

The efficiency could be higher if hydrogen were used for heating instead of electricity production. "All the thermal energy could be available for heating," said Crumpton. "The electrolyzer's reject heat could also be utilized to heat buildings."

The wide range of possible uses for green hydrogen means that efficient and cost-effective production could be a boon for countries where high levels of renewable energy generation are already leading to significant amounts of curtailment.

Hydrogen can be transported by ship, so it could release "otherwise stranded renewable energy resources" in places such as Australia (<https://www.greentechmedia.com/articles/read/how-australia-is-looking-to-develop-a-hydrogen-economy1>), said Crumpton. "In a well-designed system with timely deployment of transmission lines, there would be zero curtailment necessary," he said.

"All the electricity generated would either meet consumer demand [or be sent] to electrolyzers."

This is a vision that has seduced countries such as China and Germany (<https://www.greentechmedia.com/articles/read/10-countries-moving-towards-a-green-hydrogen-economy>), along with companies the size of Shell and BP (<https://www.greentechmedia.com/articles/read/bp-gets-a-new-ceo-for-the-zero-carbon-era>).

But it's a vision that is still some way off.

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Learn more about Wood Mackenzie's green hydrogen report here  
([https://www.woodmac.com/our-expertise/focus/transition/green-hydrogen-production-2019/?utm\\_source=gtm&utm\\_medium=article&utm\\_campaign=wmpr\\_greenhydrogen19](https://www.woodmac.com/our-expertise/focus/transition/green-hydrogen-production-2019/?utm_source=gtm&utm_medium=article&utm_campaign=wmpr_greenhydrogen19)).

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