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How realistic is a hydrogen-powered economy?

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How realistic is a hydrogen-powered economy?

By GAVIN MAGUIRE

CLEAN-BURNING hydrogen has been hyped as a potential solution to a swath of climate-related energy problems, from fuelling trucks and powering industry to generating electricity – all while emitting only puffs of harmless vapour.

The fuel is getting backing from an array of influential stakeholders, including fossil fuel firms which hope to avoid future stranded oil and gas assets by switching to the production, distribution and storage of hydrogen instead.

But for such a bright future to become reality, there needs to be a rapid and widespread surge in hydrogen demand that will justify a concurrent jump up in hydrogen production – ideally from renewable energy sources so that the fuel's only climate footprint is water.

Very little green hydrogen, or hydrogen produced from green energy sources, exists today, as most current hydrogen is made using natural gas, and known as blue hydrogen.

But several firms have committed to scaling up green hydrogen output over the coming decade, using solar or wind energy to power electrolysers that will split water into its constituent parts, hydrogen and oxygen.

The prevailing hope is that the ongoing acceleration in renewable energy development will trigger a surge in renewable energy supplies and a sharp drop in the cost of power produced from green sources.

In turn, that should drive the cost of renewable-powered electrolysis below that of other forms of hydrogen production, and allow for a rapid global surge in green hydrogen output.

Feasible future

While industry analysts can see a viable path to greater hydrogen supply, it is less clear how the demand side pans out.

Hydrogen can theoretically be used for a variety of purposes, but it is difficult to assess the most likely major applications decades from now, even if we can assume steadily declining prices.

Further complicating the picture is that many firms which are considered as viable potential users of green hydrogen currently use very little or none of it, and will need several years and hefty budgets to retool power systems to run effectively off hydrogen.

Currently, more than 90% of the world's hydrogen is used for just three industrial applications: to lower sulphur content in diesel by refiners, to produce methanol used by fuel blenders, and to make ammonia for fertilisers and chemicals.

However, risk assurance firm DNV has taken a stab at laying out where growth is likely by geography and industry through 2050, and highlighted 15 likely usage cases come mid-century.

Industrial heat

Currently accounting for less than 1% of global hydrogen consumption, the deployment of hydrogen as a direct heating source for industry will be the largest single usage case for hydrogen by 2050, DNV data shows.

Industrial heating will account for nearly 80 million tonnes of the roughly 341 million tonnes used globally in 2050, mainly in China and the Indian subcontinent, followed by Europe, the Middle East and North America.

As China and India look set to remain major global manufacturing hubs for decades, it makes sense that their industries will be big users of power fuels, and seek ways to reduce emissions.

However, a key challenge in those countries will be how to economically install the plumbing needed to connect industrial burners with hydrogen suppliers.

In Europe and the United States, extensive existing natural gas pipelines can be easily converted to hydrogen carriers, allowing businesses to switch over from gas to hydrogen once market conditions dictate.

Many industry and factories across Asia and elsewhere, however, run off their own coal boilers and lack a network of connecting pipelines that can potentially feed them hydrogen in a cheap and safe manner.

China and India plan to increase pipeline connectivity in the coming years, but given the prioritisation of developing renewable power over fossil fuels are unlikely to match the scale of pipeline connectivity in Europe where a vast majority of heavy industry and large manufacturers have direct pipelined gas.

Without pipelines, industries in Asia and elsewhere looking to use hydrogen may need to rely on more piecemeal delivery systems such as truck fleets, which will be more costly than wholesale pipeline systems and may slow the uptake of hydrogen as a primary fuel source.

Going direct

Large refineries, chemical producers, smelters and fuel blending operations may have an easier time in tapping hydrogen than smaller industrial plants and factories, and look set to account for roughly half of global hydrogen use by 2050, DNV data shows.

Such businesses are more likely to receive government support for energy system overhauls than factories due to their importance to the local and international economy.

Operations like refineries and smelters also tend to be located on large and remote land parcels that can be more easily connected to pipeline systems than more numerous but more dispersed factories.

Office and residential buildings that are already connected to gas systems can also easily convert from gas to hydrogen for heating and power, and look set to account for around 6% of global use by 2050.

The aviation and rail systems are also expected to become notable users of hydrogen once prices become more attractive and industrial knowledge about handling and storage of the fuel improves.

In all, DNV data shows strong growth potential for hydrogen use across a variety of industries by 2050.

But the price of hydrogen versus alternative fuels, as well as the ability to supply the hydrogen economically to where it is needed, remain major hurdles that the industry will need to clear if the fuel is to fulfil its promise as the clean-burning solution to many of today's dirty energy problems. — Reuters

Gavin Maguire is a columnist for Reuters. The views expressed here are the writer's own.