Hydrogen fuel cells' coming of age?

Published 9 March 2021

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Hydrogen is all the buzz today. But it feels like we have been here before. The concept of a hydrogen fuel cell was developed in 18391. As early as in the 1970s auto manufacturers were producing demonstration hydrogen fuel cell vehicles and some industry pundits were talking about them revolutionising the car industry. However, in the 1970s, 80s, 90s, 2000s and 2010s hydrogen fuel cell cars failed to make any meaningful inroads. So why will the 2020s be any different? We believe in 2020 an investment tipping point was reached. Many countries that have signed up to climate goal targets realise that a mixture of alternative energy sources will be required to meet those goals. Reliance on just a handful of renewable energy sources can leave countries at risk of energy shortages. Lithium-ion batteries have been the mainstay of the electric vehicle market and are likely to remain so for the next decade. However, the lithium-ion battery took 20 years of research and development before being commercialised in the early 1990s and only decades after was used in earnest in vehicles. Hydrogen fuel cells likewise are possibly at the earlier stages of commercialisation in vehicles.

Colour-coded by emissions

While fuel-cell cars produce zero emissions at the tailpipe, producing the hydrogen in the first place has historically been a polluting business. Most of the hydrogen produced today uses natural gas as a feedstock, which is hardly a zero-carbon fuel. This 'grey hydrogen' makes up about 95% of current production and is relatively cheap. However, it is possible to produce hydrogen from renewable sources of energy. To be clear, very little of the hydrogen supply today comes from this 'green hydrogen' source, but the investment pipeline has suddenly picked up the pace, indicating that this century old idea could come to fruition. Somewhere in the middle is 'blue hydrogen', which is made by fossil fuels, but carbon emissions are reduced using technologies like carbon capture, utilisation and sequestration.

Electrolyser demand rising

The process of making hydrogen requires an electrolyser – a piece of equipment that can separate hydrogen and oxygen from water using an electrical current. The electrical current can be provided through renewable sources. According to Bloomberg New Energy Finance, shipments of electrolyser's rose to 200 megawatts in 2020 - a 30% rise compared to 2019. That is still relatively small but 17 gigawatts of electrolyser capacity has been announced by the year 2030. Moreover, it seems that policymakers are getting behind hydrogen. Nine countries plus the European Union have announced hydrogen roadmaps in 2020. If we were to total up their targets, we could see 65 gigawatts of electrolyser capacity by 2030. While these may be ambitions without specific concrete funding behind them, the policy direction is clearly

positive for hydrogen. As we have seen with lithium-ion batteries, production on a larger scale can drive down costs. If green hydrogen costs can fall, the adoption of hydrogen fuel cells may rise.

Source: BloombergNEF Hydrogen Electrolyser Database.

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A battery value chain index that evolves with the market

When looking at the electrochemical storage and battery value chain we want to be sure that we are capturing not only today's technology but emerging technologies that could propel the energy transition in years to come. The WisdomTree Battery Solutions Index has more than a quarter of its exposure to emerging technologies. Out of the 36 subsectors in this index, hydrogen fuel cells - considered an emerging technology - is the largest subsector, accounting for 12% of the index (and eight of the 93 constituents in the index) 2. If indeed hydrogen fuel cells follow the path of lithium-ion batteries, The WisdomTree Battery Solutions Index could be well positioned to capture this evolution in the energy transition megatrend.

1 William Gove is generally credited with creating the world's first fuel cell in 1839, although he termed it a "gas voltaic battery". He produced an electric current using an electrochemical reaction between hydrogen and oxygen over a platinum catalyst.

2 As of 17 February 2021.

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