

PGES Net Zero Gas Mains – Kyle Martin, Lane Clark & Peacock

Summary text

One of the valuable features of "green" hydrogen (hydrogen produced using electrolyzers powered by renewable energy sources) is that it uses excess renewable energy generation. Using National Grid's Future Energy Scenario LCP Energy Analytics showed that, by 2035, renewable energy generation in the UK will exceed demand in 48% of all hours. The net result of this will be that 20% of that renewable energy generated could go to waste without sufficient flexible capacity on the system (such as Interconnection and storage); a situation made worse by baseload capacity that is not flexible. There should, therefore, be an opportunity to make use of that free power, which is where the business case for green hydrogen electrolyzers can be made.

However, further thought is needed about the balance between electrolyser capacity and renewable generation. LCP analysis suggests that building the first 1GW electrolyzers in 2040 would create a system cost benefit compared to building additional offshore wind assets to reach the same overall renewable generation: the principle being that the load factors would be very high and, therefore, there would be strong demand for electrolyser capacity. Conversely, building the last 1GW of electrolyzers in 2040 (in a scenario where there are 11GW) would create a greater system cost than building additional offshore wind assets, with the system benefitting from greater generation capacity and less electrolyser capacity.

Finding a balance between the supply and demand of hydrogen is not just a future problem – it is already a concern being grappled with by investors and is essential to make business models work. While most of the current debate around hydrogen has centred on production, and specifically the costs of production, one of the main drivers of growth in hydrogen production will be the certainty of downstream demand. This has been impacted significantly in recent years by the emergence of electric vehicles as the future of the automotive industry and of electric heat pumps as central to the government's strategy for the decarbonisation of domestic heating.

Nonetheless, there are a number of promising use cases. Hydrogen could potentially play a crucial role in the decarbonisation of long-distance aviation, shipping, and industrial processes, where heavy fuels are required. Pilots are already running with councils and local authorities looking to decarbonise refuse truck fleets within the next 24 months, with hydrogen powered vehicles starting to enter the market.

The extent to which hydrogen is used across the economy will determine the scale of the production, demand and transportation infrastructure. If the use of hydrogen remains niche there may only be a need to match supply and demand at a local level. However, if hydrogen use is more widespread then it would justify the use of a transmission system to move hydrogen around the country.

The UK government will need to carefully consider any regulatory framework that is implemented. LCP Energy Analytics analysis shows that electrolyzers can create system benefits but fully understanding how hydrogen fits into a net-zero economy still needs to be decided.