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The AquaDuctus undersea pipeline is to transport green hydrogen from the North Sea, part of the AquaVentus initiative. Picture credit: RWE

DECARBONISING THE FUTURE

As a zero-carbon fuel, green hydrogen — which can help achieve net zero — has significant growth potential

Platinum-based proton exchange membrane (PEM) electrolysis can produce green hydrogen from renewable energy sources, enhancing grid stability and power storage, bringing about sustainable and dependable power sector transformation.

Yet this is just one aspect of the transformative power of green hydrogen. It is a carbon-free fuel which, according to Siemens Mobility, is the 'oil of the future', produced by the electrolysis of water using electricity from renewable sources, typically wind and solar.

As an energy carrier green hydrogen enables 'sector coupling', allowing decarbonisation of the wider economy through the integration of renewable power generation with consumers of energy, providing the medium by which renewable energy is transferred across the supply chain, displacing fossil fuels.

Crucially, green hydrogen overcomes constraints such as proximity to renewable infrastructure, delivering the emissions-free benefits of renewable energy beyond traditional hubs. Even hard-to-abate industries - heavy industry and heavy transport which account for around 40 per cent of total carbon emissions and where direct electrification or battery technology is not optimal - can benefit.

Effectively, through green hydrogen, excess renewable energy can be harnessed and supplied to end-users, for example to be used in refuelling networks for fuel cell electric vehicles.

Developing supply chains

Green hydrogen has the potential to become a global commodity that is traded in much the same way as oil and gas is today. However, this depends on the availability of the necessary, scalable infrastructure to store and transport it.

Picture credit: RWE

While scope exists to utilise existing gas networks, projects involving new hydrogen pipeline systems are already underway, with a major initiative in the North Sea highlighting how sector coupling might be achieved by building-out across the hydrogen value chain, from the production of green hydrogen using offshore wind energy, to its transportation via a new pipeline to consumers on shore in mainland Germany and beyond.

The plan is to create ten gigawatts of generation capacity by 2035, enough to produce up to one million tonnes of green hydrogen per year, making a substantial contribution towards the decarbonisation of energy supply in Europe.

Siemens Gas and Power has signed a co-operation agreement with Uniper, a global energy company, to develop projects aimed at the decarbonisation of Uniper's power generation activities. The collaboration is focused on the promotion of sector coupling, addressing the entire value chain and looking at the energy, mobility and industry sectors together. The partners will also consider the feasibility of repurposing Uniper's existing gas turbines and gas storage facilities for the use of hydrogen.

The total global demand for hydrogen is currently at around 70 to 80 megatons a year with over 90 per cent derived from fossil fuels, mainly natural gas. Siemens estimates that, by 2050, this will have risen to over 450 megatons per year, dominated by green hydrogen and essential to achieving global decarbonisation. The scale of this growth ensures that a wide range of technologies will be employed to achieve the most cost- and CO_2-effective solutions.

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