

Press Release · Pressemitteilung

Current trends in the transport and storage of green hydrogen

Hamburg, June 2, 2022 - Green hydrogen will be one of the mainstays in the climate-neutral energy system of the future - especially in places where demand for energy is high or cannot be covered using traditional battery solutions for reasons of cost, weight or space. In order to guarantee the usability of this energy medium at any time and in the required quantity, investments and rapid development of the infrastructure for transporting and storing hydrogen are now necessary.

Who are the key players and companies tackling this challenge? Where are new hydrogen and fuel cell technologies materialising? At the H2 EXPO & CONFERENCE in Hamburg, being held from September 27 - 30 as part of WindEnergy Hamburg, the leading global trade fair for the wind industry, the focus will be on innovative solutions and application-ready developments for a successful energy transition. Bernd Aufderheide, CEO of Hamburg Messe und Congress explained: "To get to a climate-neutral future, there will be no way around green hydrogen. The H2EXPO & CONFERENCE focuses on networking and cultivating the exchange of knowledge between leading technology providers, research institutions, industrial consumers and politicians. In the four-day conference programme which accompanies the trade fair, we shall also be showing how the switch from using fossil fuels to using green hydrogen can be successful."

Accelerated ramping-up of the hydrogen economy

A year ago the talk was of expanding the "green hydrogen" energy sector gradually, with supply and demand being controlled continuously and in parallel. However, the drastic increase in gas prices has meant that green hydrogen produced from wind and solar energy is already cheaper in some parts of Europe, Africa and the Middle East than grey hydrogen produced from natural gas. In April, Handelsblatt reported an analysis by Bloomberg New Energy Finance (BNEF) showing that a kilogram of grey hydrogen currently costs \$6.71 in these regions, compared to \$4.84 to \$6.68 per kilogram of green hydrogen.

Electrolysis capacities are being greatly expanded

As part of the Green Deal, the European Union expects electrolysis capacities to expand from the current 1,000 MW to 40,000 MW by 2030. A market worth billions is developing, in which key players such as Uniper and Kawasaki are just as involved as young companies such as Lhyfe.

Electrolytic processes are being used to generate green hydrogen, which can be supplied with large volumes of e.g. wind power, so that water can be broken down into hydrogen and oxygen. As the smallest element of the periodic table, molecular hydrogen H₂ is a colourless and odourless gas. It is highly reactive and does not release any climate-impacting emissions when it is converted into electricity. But because of its volatility, special conditions have to be observed for its transport and storage.

From generation to storage

Because the density of hydrogen under atmospheric pressure conditions is very low, around 90 g/m³, the gas must be compressed or liquefied to prepare it for storage and transport. Various procedures exist to do this: At a temperature of -253 °C one can store hydrogen in liquid form in insulated cryogenic tanks. The element can be stored in gaseous form under high pressure in special pressure tanks or in underground caverns. In addition, there are other options for storage involving absorption, where hydrogen is accumulated on carrier media. In solid form it can be stored in the form of carbon or metal hydrates. Suitable liquid carrier media are referred to as LOHC (Liquid Organic Hydrogen Carriers).

Transport and delivery – centralised or decentralised

The state of aggregation and the carrier medium for the stored hydrogen determine how it is transported. Specially manufactured trucks and rail wagons are suitable for overland transport, while gas tankers can bring large quantities of liquid hydrogen from producer countries across the oceans to coastal regions of importing countries, such as from Namibia to Rotterdam. Static pipeline infrastructure, on the other hand, is used to transport gaseous hydrogen to end consumers who are connected to the gas grid. Building such gas networks involves investment costs - but existing gas lines can also be upgraded in such a way that the volatile hydrogen is not able to escape. Such conversion is cheaper and utilises the excellent gas infrastructure that exists in many places, which in the future will no longer be needed for transporting fossil fuels.

Regional projects are gaining momentum

On February 4, 2022, the Hamburg Port Authority (HPA) and the H2 specialist Air Products signed a declaration of intent to build up a hydrogen value chain within the Port of Hamburg. The goal: The Port of Hamburg is to become climate-neutral.

The hydrogen project HH-WIN (Hamburg Hydrogen Industry Network) also underlines the ambitious objective of the Hamburg metropolitan region with regard to climate neutrality: By 2030, a secure supply infrastructure for the hydrogen requirements of Hamburg's industrial activities will be established here in a national and European network. Embedded in the industry network of the EEHH (Erneuerbare Energien Hamburg Clusteragentur GmbH), Gasnetze Hamburg is the project sponsor for this ground-breaking project.

Yet another north-west European hydrogen mega-project is NorthH2. The key players in this project are Eneco Equinor, Gasunie, RWE, Shell and the port of Groningen Seaports. Together, the goal of the project partners is to establish a system of offshore wind farms, electrolyzers for the production of green hydrogen, H2 gas stores and H2 gas pipelines. With a target electrolytic capacity of 4 GW by 2030 and more than 10 GW by 2040, a powerful nucleus for green hydrogen is to be created in the north of the Netherlands, which will develop into a driving force for the hydrogen economy and the connected industrial clusters in north-west Europe.

Strategic hydrogen partnerships are materialising globally

This is all to do with energy security at all levels of society. At the same time, the huge increase in gas prices over recent weeks has had serious consequences, particularly for industrialised nations. A rapid expansion of renewable energy sources will be required to eliminate any dependency on imported fossil fuels as quickly as possible. Consortia such as WindStrom Erneuerbare Energien GmbH, which plan, build and operate wind farms in Germany and other European countries, are significantly involved in this undertaking. In addition to the extensive expansion of power grids, the development of a hydrogen infrastructure also requires functional collaboration both on an economic and a political level. This is how internationally interwoven trading networks are created: On the one hand, technology is transferred to the states that can produce an abundance of renewable energy. These in turn export the green hydrogen required by industrialised nations as energy suppliers for energy provision, industrial production, and mobility. As a component of the German hydrogen strategy, strategic hydrogen alliances are being forged with Australia, South Africa and West Africa. For example, the Potential Atlas of Hydrogen, which was presented by the Federal Ministry of Education and Research, shows that up to 165,000 terawatt hours (TWh) of hydrogen could be produced annually in West Africa alone. As a comparison: Germany consumes around 520 TWh of electricity annually, while the Economic Community of West African States (ECOWAS) altogether only consumes 53 TWh.

The options resulting for de-carbonising global economic cycles are truly significant. The project manager of WindEnergy Hamburg, Andreas Arnheim: "The supply and utilisation of energy is in a state of upheaval, and new demands and business development opportunities are emerging almost every day along the entire hydrogen value chain. We are very much looking forward to bringing together highly innovative companies,

industry experts, and consumers during the H2 EXPO & CONFERENCE and setting the course for the future together.”

H2EXPO & CONFERENCE – the networking event for the international hydrogen industry The H2EXPO & CONFERENCE, which will be held from September 27th to 30th 2022, parallel to WindEnergy Hamburg (the leading global trade fair for the wind industry), will become an international meeting place for everything related to the production, distribution and utilisation of green hydrogen. An attractive networking platform shall be erected over four days in Hall A2 at the Hamburg Exhibition Centre. Here, players from business and politics shall trade information about the latest trends and the future of the international hydrogen economy in networking areas and side events. H2 technology providers from all over the world shall present their solutions, innovations and projects. Top speakers from politics, science and business are also expected to speak on the conference stage about topics such as regulation, technologies, and the future of green hydrogen.

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