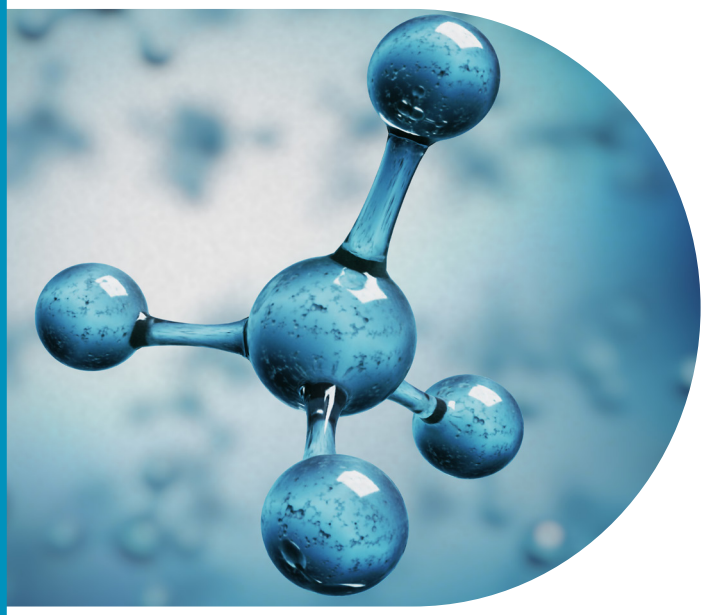
30 NOVEMBER 2022



GREEN HYDROGEN GROWTH

The use of ammonia as a carrier is enabling the expansion of trade in green hydrogen

According to a recent report* the use of green hydrogen as an energy carrier is set to provide a way of transporting renewable electricity over long distances, linking low-cost production sites – regions with an abundance of wind or solar power – with demand centres needing to import green hydrogen.

Hydrogen – especially emissions-free green hydrogen – is an important source of energy in achieving a carbon-neutral economy. To produce green hydrogen, renewable energy is converted into hydrogen through electrolysis, with platinum-based proton exchange membrane (PEM) electrolysers a key technology.

The production of green hydrogen could grow by almost five times to 614 megatonnes per year between now and 2050 to satisfy clean energy demands in a world transitioning to net zero. The global capacity for electrolysers producing green hydrogen needed to meet this demand is forecast to increase from the 300 megawatts installed now to approximately 5,000 gigawatts of electrolyser capacity in 2050. However, this growth potential is predicated on the establishment of a global trade in green hydrogen as a commodity.

Today, the transportation and storage of hydrogen is mainly based on compressed hydrogen, which, due to its low density, needs to be stored at either extremely high pressures (350-700 bar) or as a liquid at extremely low temperatures (-253°C), requiring specialist handling.

An alternative is to first transform the hydrogen into a commodity with a higher density by volume that is easier and more cost-effective to transport, for example ammonia. Ammonia gas can be stored as a liquid at room temperature under a pressure of just 10 bar, or under atmospheric pressure at -33°C. More than 125 million tonnes of ammonia are produced worldwide every year and processed into fertiliser in agriculture or used in chemical processes, among other things.

Using ammonia as a carrier to transport hydrogen enables the use of existing, well-developed supply-chain infrastructure and trading mechanisms.

There are signs that a global market in green hydrogen or green hydrogen derivatives is emerging. Picture credit: RWE

RWE, the multinational energy company, views green ammonia – produced without the use of fossil fuels – as the most competitive hydrogen derivative with the highest level of technological maturity.

There are signs that a global market in green hydrogen or green hydrogen derivatives is emerging, with over 80 announcements between 2020 and 2021 for projects or collaborations that relate to global hydrogen or ammonia trade. Based on these announcements, the most active prospective importers are Germany, Japan and the Netherlands and the most active prospective exporter is Australia. The focus on strengthening Europe's long-term sustainable security of energy supply has provided additional impetus to the aim of boosting the region's future hydrogen capability and availability.

Pipeline projects

In the UK, at the Port of Immingham, Associated British Ports is partnering with gas and chemical supplier Air Products to import green ammonia from production locations around the world. This will be used to produce green hydrogen, stimulating demand and supporting the development of a local and national green hydrogen market.

The creation of North-West Europe's first green ammonia hub, by refurbishing and expanding an existing energy storage facility at Vlissingen in the Netherlands, is being evaluated by Uniper, the German energy company, and Vesta Terminals. The site is well located for the supply of green ammonia by seagoing vessels, and in a second phase it could be connected to the Dutch hydrogen pipeline network.

Uniper is looking to develop several access points for green energy into Europe. At the German Port of Wilhelmshaven, it is also planning an import terminal for green ammonia which will be equipped with an ammonia cracker for reconversion of the ammonia to green hydrogen and nitrogen. The terminal will be connected to the hydrogen network and would be capable of supplying around 295,000 metric tons of hydrogen, or 10 per cent of the demand expected for the whole of Germany, in 2030.

**IRENA (2022), Global hydrogen trade to meet the 1.5°C climate goal: Part I – Trade outlook for 2050 and way forward, International Renewable Energy Agency, Abu Dhabi*

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