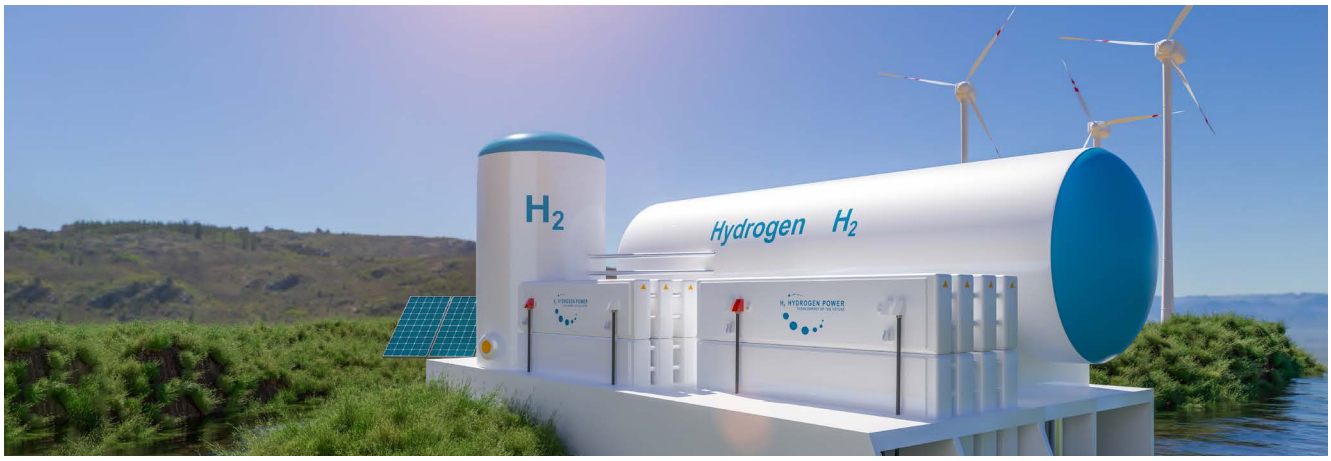
‘Green’ hydrogen: the oil of the zero-carbon future



- **Governments are committing to green hydrogen as a replacement for fossil fuels, leading to projections of substantial increases in production over 30 years.***
- **Green hydrogen, produced with renewable energy, is believed by many governments to be the key to reducing carbon emissions where electrification alone cannot.**
- **The gas has a role to play across many sectors – power generation, transportation, building heat and power, and industry.**
- **Its production is projected to grow significantly, making a case for investing money in the companies at the centre of the hydrogen economy.**

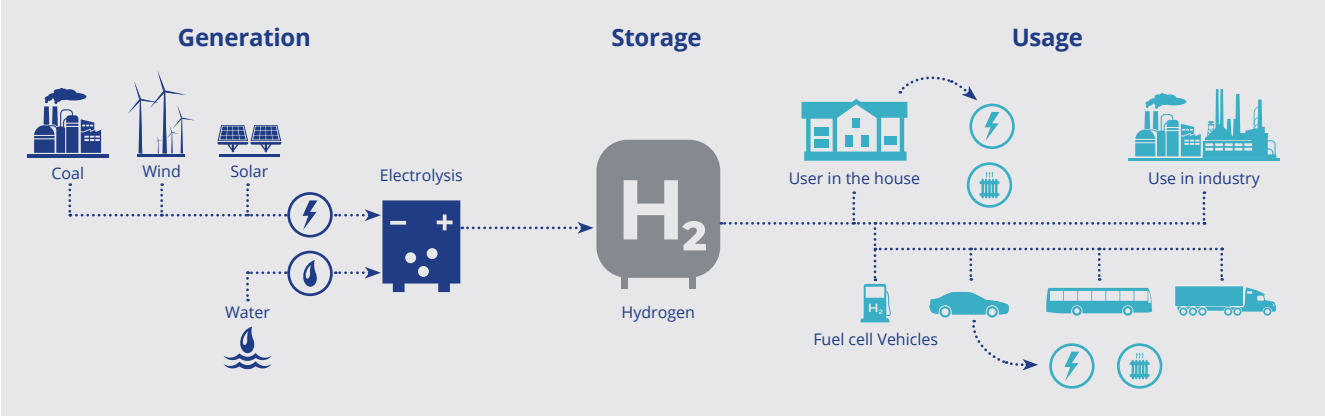
Introduction

Climate change is the defining challenge of our time. Human activities are held responsible for the long-term heating of Earth’s climate system, observed since the pre-industrial period.

The burning of fossil fuels is considered the primary contributor to global warming. Burning oil, gas and coal releases large amounts of carbon dioxide, a greenhouse gas, into the air. These carbon emissions trap heat in our atmosphere.

To stop the heating, governments are committing to making their economies carbon neutral over the next 30 years. To achieve this highly ambitious goal, they are scaling up alternative sources of green energy, to take the place of fossil fuels. Playing a vital part is green hydrogen, often referred to as tomorrow’s energy source due to the breadth of its applications across power generation, transportation, building heat and power, and industry.

Green hydrogen should be the goal



*Source: https://ec.europa.eu/clima/policies/strategies/2050_en

Governments, especially in Europe, are putting green hydrogen at the centre of their plans for the energy transition. To give a sense of the growth required, independent forecasters project that green hydrogen will reach 13-24% of the global energy mix in 2050, up from just 2% in 2018, growing at an annualised compound rate of 8%.[1]

For that reason, we believe there is a strong case for investing in the companies making green hydrogen and storing it, as well as those making the fuel cells that convert it to electricity and electrolysers needed for its production.

Supportive policy background

At the Paris climate agreement in 2016, the EU and more than 190 states signed an agreement to act to hold the rise in global average temperature "well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius."

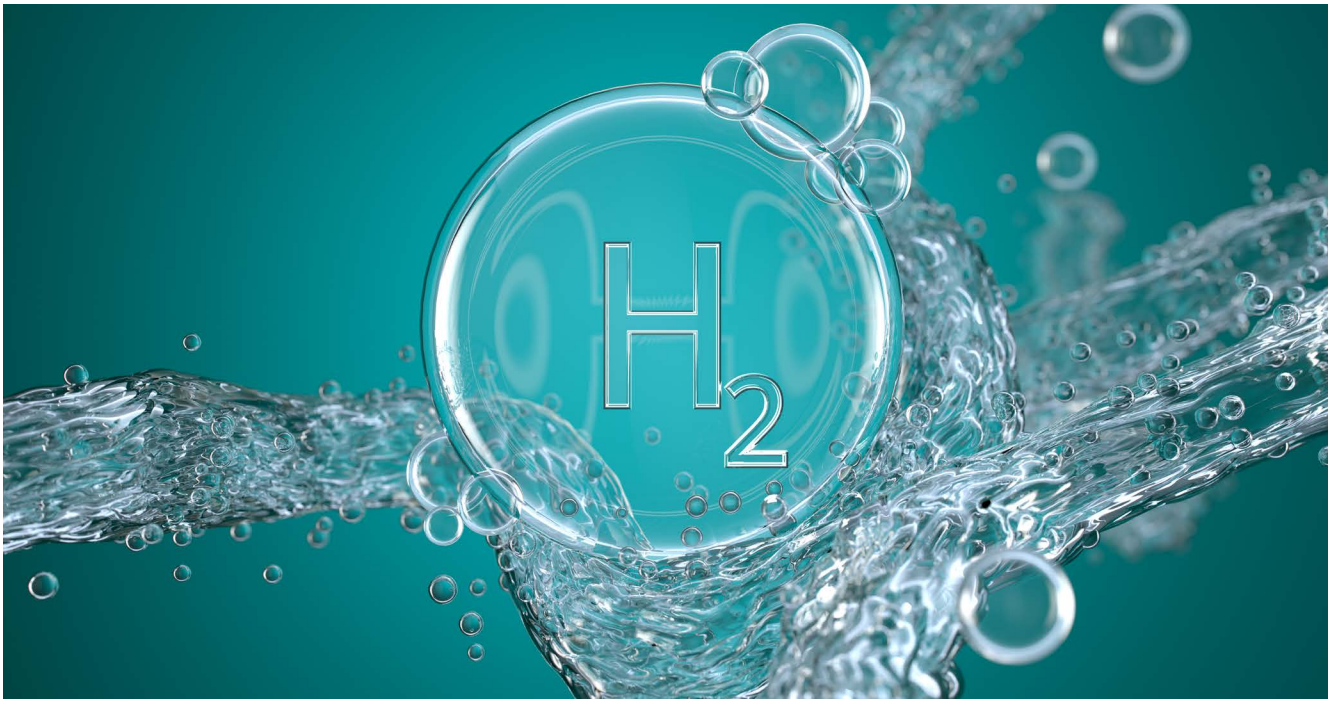
Already the policies are being put in place to achieve carbon neutrality by 2050 or sooner. In the US, President Joe Biden has recently unveiled his $2tn infrastructure drive that includes $350bn directly for clean energy. At state level, the California Fuel Cell Partnership has plans for 1,000 green hydrogen stations and up to 1 million electric vehicles powered by hydrogen fuel cells by 2030.

The European Union (EU) has plans for at least six gigawatts of renewable hydrogen electrolysers by 2024 and at least 40 GW by 2030. Meanwhile, in the southern hemisphere Australia is funding AUD370 million for new hydrogen projects, including electrolysers, vehicles powered by hydrogen fuel cells and refuelling stations.

Hydrogen's colour spectrum

So what is hydrogen? It's the world's most abundant gas, often produced by electrolysis of water. So-called 'green' hydrogen is predicted by the EU and others to be the fuel of the future, playing a crucial role in the transition to a low-carbon economy. It all comes down to how hydrogen is produced. Green hydrogen is created by generating electricity through renewable power and passing it through an electrolyser that separates water into hydrogen and oxygen. Since it is emission-less, green is the optimal hydrogen production method.

There's a whole spectrum of colours used to describe hydrogen, depending on how it's generated. For instance, blue hydrogen is produced from steam-methane reforming (SMR) of fossil fuels (mainly natural gas) and capturing the greenhouse gas emissions. It's regarded as an attractive intermediate solution during the energy transition. The chief other form of hydrogen is grey, which is generated through SMR of fossil fuels and will need to be phased out by 2050 if there are any hopes of a 2° Celsius target being reached.



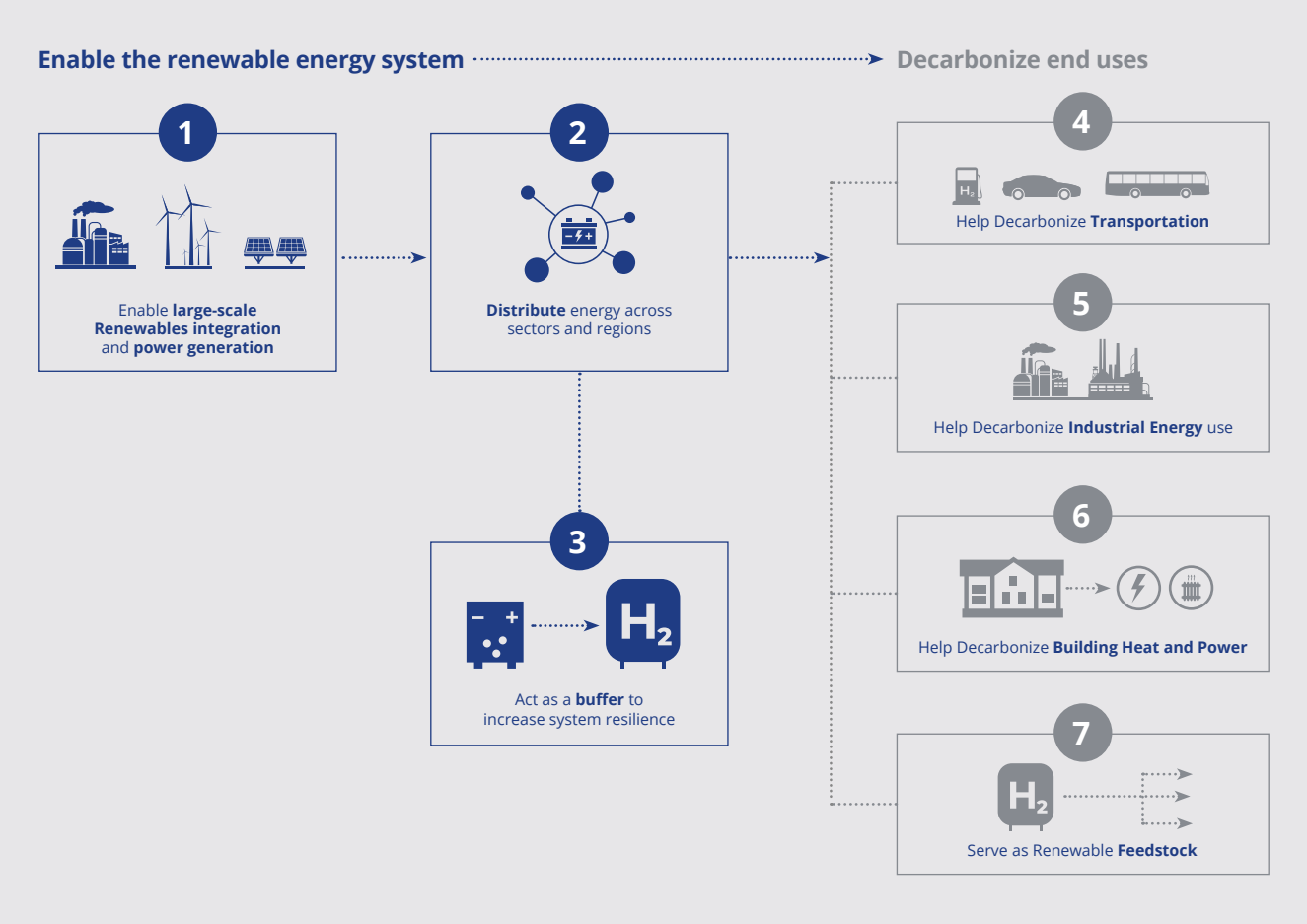
[1] Hydrogen Council and Bloomberg New Energy Finance.

Tomorrow's everyday energy?

Hydrogen looks set to have widespread applications, helping to replace fossil fuels in hopefully tomorrow's zero carbon economy and playing a vital role in the energy transition. Its applications include power generation, transport, industry energy, building heat and power, and as feedstock for industrial uses such as production of steel, ammonia and methanol. Consequently, it's anticipated that hydrogen demand could increase tenfold from 2015 levels by 2050.[2]

In some instances, green hydrogen fulfils a role that electrification cannot. For instance, its high energy density makes it more suitable than electricity for powering anything especially heavy, such as aircraft and ships.

Hydrogen can play 7 roles in the energy transition



In many cases, the technology is in place for hydrogen to be deployed, but in others it will take many years. It's already technically possible, for instance, to use blended hydrogen for heat and power in buildings.[3] Similarly, in transportation it can be used as fuel for medium and large cars, as well as buses, trains and passenger ships. But it's unlikely to be a fuel for freight ships or aircraft until 2030 at least.

Cost: the gamechanger

Of course, the extent to which green energy fulfils its potential depends on cost. Currently, green hydrogen is more expensive than fossil fuels. However, to judge by the experience of other renewable energy sources, the cost should fall as electrolyser capacity scales up. Over the ten years from 2010 to 2019, for instance, the cost of energy generated from solar photovoltaics fell by 82%,

[2] Hydrogen Council. Hydrogen Scaling Up report, 2017.
[3] Hydrogen Council.

from concentrating solar power by 47%, from onshore wind by 39% and from offshore wind by 29%.[4] Independent forecasts suggest that green hydrogen costs should follow a similar trajectory over the 30 years to 2050, as renewable energy production and electrolyser capacity are scaled up.

Investment case

Bringing everything together, there is a strong case for investing in the companies focused on producing and storing green hydrogen. The EU and other countries are putting the gas at the centre of their plans for cutting carbon emissions, aiming to rapidly increase the number of renewable energy powered electrolysers. As wind turbines and solar cells become abundant, they will provide a low-cost renewable energy source for powering electrolysers making hydrogen.

It seems that Europe and other parts of the world have committed to making green hydrogen a major part of the solution as they seek to tackle the generational problem of climate change.

Author

Dominik Schmaus

Product Manager, VanEck

Gaining exposure to the hydrogen economy

With targeted exposure to the largest global stocks in the hydrogen economy, the VanEck Hydrogen ETF (VanEck Vectors Hydrogen Economy UCITS ETF) provides investors access to what we believe is an emerging megatrend as the world transitions away from the limited capacity of fossil fuels. HDRO's holdings comprise a diversified mix of companies which are engaged primarily in hydrogen production and fuel cells, and in the respective infrastructure.

Risk: Investors should consider risks before investing. See dedicated risk factors section on our website.

[4] International Renewable Energy Agency. Renewable Power Generation Costs in 2019.