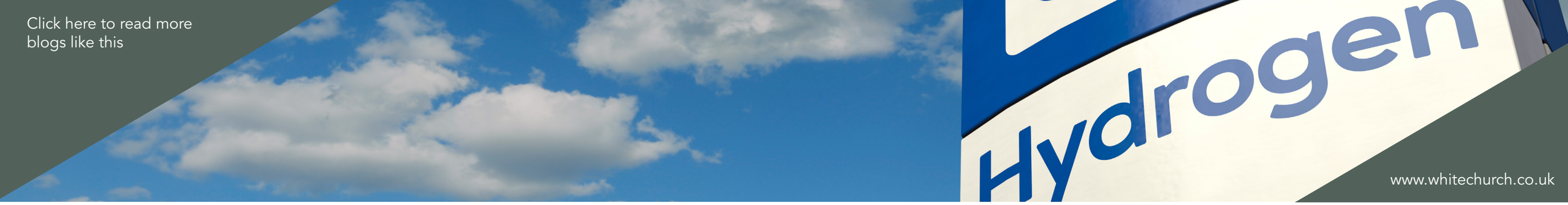

Hydrogen - the renewable energy resource to watch?

ESG, SRI, renewable energy - it's everywhere as we look to #buildbackbetter from the pandemic. You can't avoid it, particularly in the financial world, and it's important for us to understand the ways society is changing. You may have missed it - after all, it is colorless & odorless - but there is a new buzz around hydrogen. When burnt hydrogen produces water as a sole by-product, and some believe this could offer a feasible pathway for the decarbonization of sectors such as residential heating (by replacing natural gas) and transport (in the form of hydrogen fuels cells). Governments across the world are increasingly featuring hydrogen in their net-zero strategies. The UK government recently unveiled its new hydrogen strategy, committing £500 million for hydrogen initiatives. It hopes to bolster this commitment with £4 billion of private investment to produce 5 gigawatts (GW) of 'low carbon' hydrogen by 2030, roughly equivalent to the energy required to power 1.5 million UK homes. The EU has similarly ambitious plans, targeting 40 GW of hydrogen production by 2030. It could spend as much as £425 billion on hydrogen production by 2050. Hydrogen has the potential for use across virtually all sectors. In transport, we see hydrogen as a viable replacement for diesel in trucks, trains and marine vessels. Japanese engine manufacturers Kawasaki Heavy Industries, Yanmar Power Technology and Japan Engine recently formed a consortium with the aim of developing hydrogen fueled engines for large ocean-going ships. In heavy industry too, hydrogen offers a route to decarbonization. Steelmaking is a notoriously carbon intensive process, but it is also part of the solution – demand for steel in the construction of wind turbines for instance, is growing rapidly. Here, a combination of electrification and hydrogen could eliminate the need for coking coal. Swedish steelmakers SSAB recently produced its first 'fossil-free' steel – it hopes to bring the product to market within 5 years.

Sounds too good to be true? Possibly. To understand why requires us to delve a little into its chemistry. Hydrogen is the most abundant element in the Universe, and there is a near limitless supply here on Earth. Only problem is that it is rarely found as pure hydrogen (H2). Instead, it is most commonly found as a component in other abundant molecules, such as water (H2O) and natural gas (CH4). Extracting pure hydrogen from these species is an energy hungry process that can offset the potential benefits of using hydrogen in the first place. It may be invisible, but hydrogen comes in many colours depending on how it's produced:

» Grey Hydrogen: at present, almost all industrially produced hydrogen is derived through a process called steam reforming. This 'grey' hydrogen is cheap and easy to produce but requires natural gas and releases CO2. As a result, grey hydrogen has a large carbon footprint – greater, in fact, than simply burning natural gas.

» Blue hydrogen: this is produced in the same way as grey hydrogen, but CO2 emissions are reduced through carbon capture and storage (CCS). Many oil and gas producers have thrown their weight behind blue hydrogen. In North Dakota, two loss-making synthetic gas plants are to be converted to blue hydrogen facilities. Likewise, in a call with investors last month, the CEO of SaudiAramco expressed support for blue hydrogen production at facilities in Saudi Arabia, citing increased demand from Asian markets. However, critics of blue hydrogen argue that its environmental credentials are overstated. It still comes with a substantial carbon footprint. Methane, the main component in natural gas, is an extremely potent greenhouse gas – it is 28 times more effective at heating the atmosphere than CO2. A recent study showed that methane leaking from US fracking sites might actually result in a larger carbon footprint than energy provided by conventional natural gas. Chris Jackson, chair of the UK Hydrogen and Fuel Cell Association, agrees - he recently resigned in response to the UK government's push for more blue hydrogen, calling it 'an expensive distraction'.

» Green Hydrogen: In our view, the future of the hydrogen economy lies in 'green' hydrogen. Production of green hydrogen is not reliant on natural gas – rather, it is produced via electrolysis of water. Electrolysis uses electricity to split water into its component parts, hydrogen and oxygen. The required electricity is provided by an ultra-low carbon source, such as wind, meaning that the hydrogen produced has a carbon footprint approaching zero. That's not to say there aren't hurdles to be overcome. In water scarce regions, desalination will be needed to use seawater, but this adds complexity and crucially, cost. Also problematic is the limited supply of ultra-low carbon energy. While renewables share of global energy supply jumped to 28% in Q1 2020, demand continues to outstrip supply as countries scramble to decarbonize their grids. Despite this, we see opportunities to overcome these hurdles that do not exist for other hues. For instance, at times of low demand, North Sea wind turbines can produce more energy than the UK requires. The EU funded OYSTER consortium, which includes the renewables giant Ørsted, is exploring the use of marinized electrolysers to make use of surplus supply by producing hydrogen at source.

So, is green hydrogen the way forward to #buildbackbetter in our post-pandemic world? Ultimately, the greatest challenge for hydrogen is cost. For instance, in transportation, hydrogen fuel cells must be cost-competitive with conventional fuels on a per-mile basis. While government subsidies are likely to play a part, further research is needed to enhance production efficiency and reduce infrastructure costs. We believe that investment in these areas and throughout the entire hydrogen supply chain will be critical for accelerating the path to net-zero.