

Stephenson Harwood's Hydrogen 2nd Quarterly Insight

This is Stephenson Harwood's second hydrogen quarterly insight which is aimed at providing you with legal updates relevant to the industry and bring you up to speed on some of the most exciting hydrogen developments in a number of key sectors.

It was hoped that this insight would comment on the UK Government's Hydrogen Strategy. However, the Government announced in late July 2021 that the Strategy (that was revealed in the 2020 Energy White Paper for publication in early 2021) was still not ready to be published.

This announcement has not been welcomed by anyone. Interested parties need certainty in order to continue and/or start investing in hydrogen in the UK. Given the speed of progress across the globe over the last number of months alone, the UK cannot delay any much further without it seriously impacting its goal of "deliver[ing] a world leading hydrogen market".

A small number of hydrogen projects are nevertheless thankfully continuing to be announced across the UK. Appreciating a number of projects are quickly approaching final investment decisions after successful feasibility studies, the stakeholders are then confronted with an incoherent patchwork of regulatory and licencing regimes. Stephenson Harwood with the assistance of Gordon Nardell QC from Twenty Essex prepared a "Regulation & Licence Highway" analysis which gives a treetops view of the present system developers must navigate. This analysis can be found [here](#).

Grab a cup of coffee and let us quickly bring you up to speed on the most talked about hydrogen developments over recent months.

Hydrogen policies

- The most significant policy of the last quarter was BEIS' announcement of the Net Zero Innovation Programme ("**NZIP**"). As part of the 10 Point Plan, the NZIP is a £1billion portfolio to directly support net zero and innovation and will run from 2021-2025.

In relation to hydrogen, £60million has been initially allocated to support novel production methods and uses through grants and innovation competitions. For example, later in 2021, NZIP will launch a competition to commercialise innovative longer duration energy storage projects. The funding aims to create 8,000 UK hydrogen jobs. There are high hopes for the NZIP, given its predecessor – the Energy Innovation Programme which ran from 2015 to 2021 – issued £505m of grants and supported successful hydrogen projects such as Hy4Heat.

- In the international arena, the UK entered into a strategic partnership with Saudi Arabia and re-affirmed the bilateral energy relationship with Norway. The UK will cooperate with these countries on hydrogen (amongst other energy sources), particularly with regards to building capacity and sharing expertise.
- At the G7 summit in Cornwall, countries such as Korea and Australia explicitly expressed support for G7 efforts to upscale hydrogen as well as CCUS.

Projects

The hydrogen space continues to benefit from involvement by oil and gas companies seeking to diversify their businesses and reduce their emissions. Some exciting projects have been announced over the last number of months and while some commentators note some of them appear somewhat aspirational, the increasing project size is impressive.

Power

- Norwegian oil company, Equinor, has confirmed it will partner with SSE Thermal to develop in the UK what is claimed to be the world's first 100% hydrogen-fuelled power station. SSE and Equinor announced that they would be developing a large-scale pure

hydrogen power plant with a separate carbon capture and storage element close to the Humber estuary in the northeast of England. Named the Keadby Hydrogen power station project, the scheme aims to have a capacity of up to 900MW. Equinor and SSE have suggested that the plant could be brought online before the end of the decade.

- Further down the UK's east coast, Teesside will soon become home to the UK's first net zero power station as part of the region's industrial renewables cluster. BP has announced plans to build the UK's largest hydrogen plant in the region. The facility would produce up to 1GW of "blue" hydrogen, which would account for 20% of the UK's hydrogen target.

This project further boosts the region's ambitions to become a clean energy powerhouse for the UK and support other nearby industries in converting to use hydrogen over natural gas and other energy sources.

- ITM Power has partnered with Scottish Power to develop a major "green" hydrogen facility that it says will use the U.K.'s largest electrolyser. Located near Glasgow in Scotland, the project will use a 20MW electrolyser and be powered by a 40MW solar farm and battery storage scheme of 50MW.

Offshore

- Glasgow's University of Strathclyde has joined forces with researchers from the Universities of Nottingham, Cardiff, Newcastle and Imperial College London, as well as 28 industrial partners, among whom are BP, Scottish Power, National Grid and ENI to explore the potential of turning offshore wind and marine renewable energy into hydrogen and ammonia fuels for use in heating, energy storage and decarbonisation of transport. It's a £10m project and comes at the perfect time before Glasgow hosts COP26.
- Cerulean Winds, a green infrastructure developer, is looking to decarbonise the oil and gas assets in the UK Continental Shelf through a £10 billion wind and hydrogen project. Details are still light but the 200-turbine floating development is aiming to displace 20 million tonnes of CO₂. The largest floating turbines, with 3GW per hour of

capacity, will provide power to offshore facilities and more than 1.5GW per hour to onshore green hydrogen plants.

- The Netherlands Enterprise Agency (RVO) has confirmed the subsidy of EUR 3.6 million to the PosHYdon offshore green hydrogen pilot project. PosHYdon will integrate offshore wind, offshore gas and hydrogen production, and will be the world's first offshore green hydrogen pilot on a working platform.
- Shell and Uniper have signed a memorandum of understanding to work on the development of new hydrogen projects across Europe. The companies intend to cooperate on the identification of new opportunities in Germany, the Netherlands and potentially a number of other European countries. The initial project mooted is to work ways to transport large amounts of hydrogen from electrolysis hubs that are planned for the ports of Rotterdam and Wilhelmshaven into German industrial centres like North Rhine Westphalia. It appears that ambition is not in short supply so the scope could significantly expand in future.

Marine

An increasing number of maritime companies are publicly supporting blue or green hydrogen to help steer the maritime industry away from polluting bunker fuel. Shipping alone produces about 3 per cent of global greenhouse gas emissions and the International Maritime Organization, the UN agency that regulates the global industry, wants to at least halve its impact by 2050.

- Norwegian ferry operator Norled recently took delivery of the world's first liquid hydrogen-powered ferry, MF Hydra. The vessel was designed by compatriot ship design and engineering company LMG Marin and constructed at Westcon shipyard. A DNV-classed vessel will be able to reach a speed of 9 knots with fuel cells of 2x200 kW and generators and 2x440 kW. The vessel is equipped with an 80 cbm tank for hydrogen storage. According to the LMG Marin, the ship will be ready to sail "once the supply is available, hopefully in the next few months."
- ABS released a paper "Sustainability Whitepaper: Hydrogen as Marine Fuel explores the gas" which explores hydrogen's potential to reduce emissions from shipping, while evaluating its safety,

regulatory and design implications. The report also details industry projects utilizing hydrogen and the projected role for hydrogen both in the maritime industry and beyond.

- Swiss-based shipping group MSC, gas group Snam and Italian shipbuilder Fincantieri are teaming up on a feasibility study for constructing the world's first hydrogen-powered cruise ship. Assessing whether to proceed with the project the three companies are researching logistical and technological issues over the next year.
- A new research and testing facility has been created in Cornwall to drive the replacement of fossil fuels with hydrogen in the marine and boating sector. The Cornwall Marine Hydrogen Centre is a European funded project at the University of Exeter's Penryn Campus in Cornwall, dedicated to testing the marinisation of hydrogen systems for small to medium vessels.
- Green Hydrogen Systems is a Dutch designer and manufacturer of standardised and modular alkaline electrolysis electrolyzers for the production of green hydrogen that was established in 2007. In December 2020, it secured an investment of €20 million (\$24 million). In June 2021, Green Hydrogen Systems completed an over-subscribed IPO. The company delivered five units of a 22-strong order book prior to the IPO. Its customers include Danish wind developer Ørsted, and French hydrogen producer Lhyfe.
- Shell announced in April 2021 that it was conducting a feasibility study with partners to trial the use of hydrogen fuel cells for ships in Singapore. The trial will involve the development and installation of an auxiliary power unit fuel cell on an existing roll-on/roll-off vessel that transports goods, vehicles and equipment on lorries between Singapore and Shell's Pulau Bukom manufacturing site located on an island near the mainland.

Finance

Whilst project financing continues to be discussed as a suitable model for financing hydrogen projects a number of factors still limit its adoption in this sector. These include the need for established bankable offtake, which is still lacking for most hydrogen projects due to the experimental nature of the proposed technology and/or the lack of

commercially proven offtake uses for hydrogen. Further the large number of projects that have been implemented so far are being developed by start-ups and therefore lack sponsors with the ability to provide the necessary level of collateral to make such projects bankable. This may be beginning to change however with the growing involvement of traditional players in the energy sector. Siemens, for example, is seemingly willing to provide co-investment financial backing to hydrogen projects it is involved in.

Another key factor is the current life cycle of most hydrogen projects. The Hydrogen Council (an international coalition of energy, transport, industry companies as well as financiers) estimates that the total global investment into hydrogen projects (along the entire production chain) through to 2030 is \$500 billion. However only 30% of this can be considered mature – i.e. in planning stage, has passed a final investment decision or can be associated to a project in construction or operational. Only a fraction of these mature projects, being those that are most developed and either commissioned or close to be commissioned, would be suitable candidates for project financing.

Hydrogen projects are therefore still generally reliant on government and institutional grants and investment. Siemens Energy's investment in the Hari Oni pilot green hydrogen (and potentially green methanol) project in southern Chile is backed by an €8m grant from the German Ministry of Economic Affairs. The anticipated £240m Net Zero Hydrogen Fund to be made available under the UK government's delayed Hydrogen Strategy therefore remains crucial to the development of the Hydrogen sector (and associated finance market) in the UK. Likewise, it's probable that dual product projects (such as the Hari Oni project) where the other product has a more established offtake use may prove to be the fastest route to hydrogen project financing transactions. India's Acme Solar Holdings have recently launched, alongside financial advisors Synergy Consulting, a debt raising for a proposed \$2.5m solar powered green hydrogen and ammonia project in Oman. The project would have the benefit of established and bankable ammonia offtake to Europe, America and Asia.

In the absence of a developed project financing sector the majority of third party investments in hydrogen projects remains the purview of investment funds and venture capital. Such investments are largely on a project by project basis

with no clearly identifiable market wide investment parameters.

The below projects have been publicly announced recently and it is interesting to see the different approaches being taken by different stakeholders to financing such projects:

- Ineos's announcement this July of its £25m investment in HydrogenOne Capital Growth however highlights the development, and potential, of listed funds as a vehicle for investment in the hydrogen sector. Timed likely to coincide with the original intended publication of the UK Government's Hydrogen Strategy and its anticipated Net Zero Hydrogen Fund, Ineos' investment would see it as a 10% cornerstone investor for HydrogenOne Capital Growth's targeted £250m IPO. The listed fund model has already been widely adopted across other renewables sectors and has the benefit of the ability to access bank/institutional debt on a portfolio rather than a project specific basis. The Ineos and HydrogenOne Capital Growth announcement comes off the back of successful similar clean energy flotations in Europe in recent months, including the renewable energy arm of the Spanish conglomerate Acciona, the introduction of Hydrogène de France on Euronext Paris, and the IPO of Denmark-based Green Hydrogen Systems on Nasdaq Copenhagen.
- Aberdeen City Council is searching for a partner to help it build a £215million green hydrogen production hub. The Council's invitation to tender puts the overall price tag of the facility at £215m, with Aberdeen City Council having "agreed in principle" to fund £19.4m from its capital programme in the project. The JV partner is expected to provide "finance and investment for the opportunity" as well as resources including scoping, design, project management and other elements.

Our green and blue hydrogen clients are already working with HNWs, funders and international financial institutions. Our clients are however always interested in discussing project finance and/or corporate finance possibilities in the sector. If you may be able to assist our clients, please do get in touch.

Aviation

Adoption of low carbon fuels continues to look like it is ready to take off in the aviation sector, with industry and government continually publicly recognising the important role of hydrogen in decarbonising the skies.

- Sustainable Aviation, an association of industry leaders, has recently announced that the UK aviation industry has set a target of 15% reduction in emissions by 2030, rising to 40% by 2040. They have called for '*a positive, long-term signal for investment in aerospace technology and the development of hybrid, electric and hydrogen-powered aircraft through increased and extended funding for the Aerospace Technology Institute.*'
- The Government has launched the first round of its £3 million Zero Emission Flight Infrastructure ("ZEFI") competition for hydrogen and electric aircraft. The competition will provide grants of up to £50,000 to fund research and development into priority areas which include hydrogen storage and handling, as well as future demand scenarios for use of green hydrogen at UK airports.
- Despite much focus being placed on sustainable aviation fuels as the short term solution to aviation emissions, outfits like US based Universal Hydrogen are working to quicken the introduction of hydrogen powered airplanes into the near future. Founder Paul Eremenko describes the company, which transports hydrogen in modular capsules over the existing container freight network, as 'the Nespresso capsule of hydrogen'. In order to accelerate adoption, the company is also developing a conversion kit to retrofit existing regional aircraft with a hydrogen-electric powertrain.
- As referenced in our last quarterly update, Airbus's and ZeroAvia's announcements in the sector were more recently joined by confirmation that Icelandair has turned its clean-energy focus to hydrogen, signing an LOI with Universal Hydrogen, to "*pursue the implementation of green hydrogen, a carbon-free aviation fuel, as a propellant for Icelandair's domestic aircraft fleet*".

Automotive

This quarter has seen the focus on cleaner vehicles continue to gain momentum across the globe. The vast majority of vehicles on our roads today are still powered by fossil fuels and while hydrogen is making great progress in the sector, getting to net zero vehicle emissions will likely involve both electricity and hydrogen playing major roles.

- A recent study by the International Council on Clean Transportation¹ concluded that electric vehicles and hydrogen fuel cell vehicles are currently the only solutions for clean passenger vehicles. As there will be some challenges relying on electrical passenger vehicles (for example, limitations on grid capacity), hydrogen fuel cells will eventually need to step in at some point.
- During the Olympics and Paralympics, officials are being driven around in 500 cars and 100 buses made by Toyota and running on fuel cells. Portable power plants are being used, that consume hydrogen and emit only water vapour. Although some discussions around this initiative has focused on its high cost, the widespread visibility of the Olympics means that it is an effective way of showcasing the feasibility and safety of hydrogen use across the city. We are confident that this success will assist in the long term success of hydrogen not just in Tokyo and Asia, but across the world where entities and governments get to see hydrogen clean the air as it transports people around a city successfully.
- While Riversimple has been around for a number of years, the UK car manufacturer recently made a number of exciting announcements. Firstly, it announced that its manufacturing facility in Wales is due to open in 2024. Off the back of announcing that it has formed a partnership with Siemens, Riversimple successfully closed a round of £1.5m funding from a consortium of Angels Invest Wales, Wales Angel Co-investment Fund and a crowd funding campaign. With funding in hand, Riversimple plans to start production of the 'Rasa' in 2023, with a "light goods vehicle" the following years and a plan of making 5,000 vehicles per year.

¹ [A global comparison of the life-cycle greenhouse gas emissions of combustion engine and electric passenger cars | International Council on Clean Transportation \(theicct.org\)](https://www.theicct.org/)

Showing what efficiencies are possible, we thought it great to see that a recent Siemens hackathon saw a team of engineers explore ways of increasing the efficiency of Riversimple's factory which resulted in a 20% reduction of the factory's footprint and other efficiency measures.²

- Last month, the Mayor of London Sadiq Khan launched England's first hydrogen fuel cell double-decker buses.³ The 20 new hydrogen fuel cell buses were manufactured by Wrightbus in Northern Ireland and the hydrogen fuel cylinders were manufactured by Luxfer in Nottingham.

Initially, the hydrogen will be produced at Air Liquide's plant in Runcorn (where waste industrial hydrogen is harnessed) and from 2023, the intention is for the hydrogen to be produced by an electrolyser connected to an offshore wind farm.

- The owners of JCB are also speaking out on the benefits of using hydrogen in larger vehicles, such as construction vehicles, rather than electrification. JCB highlighted that batteries need to be large and heavy in order to power such large vehicles and also would have to be refuelled very regularly. Hydrogen-powered combustion engines can be comparatively smaller and can run in more rural locations as they do not need to be refuelled as regularly. JCB engineers have been developing such engines, finding ways to burn a small amount of hydrogen so that harmful gases such as nitrogen oxide are not released.

JCB is confident that it will be able to mass produce these engines for customers to test by the end of next year. It is expected that JCB will quickly apply their engines across the spectrum of heavy transportation industry to buses, trains, trucks and even ships.

² [Siemens hackathon harnesses engineering talent and digital tools to reduce Riversimple car factory footprint by 20%](#)

³ [Mayor launches England's first hydrogen double decker buses | London City Hall](#)

Get in touch



Cathal Leigh-Doyle

Senior associate
T: +44 20 7809 2658
E: cathal.leigh-doyle@shlegal.com



Jonathan Cripps

Partner
T: +44 20 7809 2084
E: jonathan.cripps@shlegal.com



Tom Adams

Partner
T: +44 20 7809 2628
E: tom.adams@shlegal.com



Bertie Chilton

Senior associate
T: +44 20 7809 2094
E: bertie.chilton@shlegal.com



Nick Abel Smith

Associate
T: +44 20 7809 2177
E: nick.abelsmith@shlegal.com



Francesca Cadoux-Hudson

Trainee solicitor
T: +44 20 7809 2846
E: francesca.cadoux-hudson@shlegal.com



John Hogg

Trainee solicitor
T: +44 20 7809 2931
E: john.hogg@shlegal.com



Andy Ross

Trainee solicitor
T: +44 20 7801 4166
E: andy.ross@shlegal.com

Staying in touch

Having already been instructed on a high number of UK and EU based hydrogen projects, Stephenson Harwood has a leading team of specialist lawyers with true strength and depth of knowledge in all aspects of hydrogen production, storage and transportation in a broad range of sectors.

If there is anything arising from our newsletter, or if you have any questions about the content covered in our online seminar series, we are very happy to set up a zoom call to discuss or alternatively, please email us.

Our previous online hydrogen seminars can be found here: <https://www.shlegal.com/insights/hydrogen-projects>

Episode 1 discussed the terminology, technology and why hydrogen is becoming an essential part of sustainable energy strategies.

Episode 2 explored major UK hydrogen projects with hydrogen developers, who discussed feasibility studies, construction, production, storage, usage and other project considerations.

Information contained in these insights and seminars should not be applied to any set of facts without seeking legal advice.

If you would like your technology, company and/or project listed in our next insight, please let us know and we will happily discuss it further.

Further insights by Stephenson Harwood LLP can be found [here](#).

We also have an information hub solely focussed on offshore energy which can be found [here](#).