

Energy Law

Stephenson Harwood's Hydrogen Quarterly Insight

In addition to Stephenson Harwood's hydrogen seminar series, Stephenson Harwood will publish a hydrogen quarterly insight which will provide you with legal updates relevant to the industry and explore hydrogen developments in a number of key sectors.

Due to the policy landscape for hydrogen in the UK being in its infancy and the lack of any relevant hydrogen legal updates we can provide you with at this time, we thought we would start our insight series focusing on exciting projects under development in key sectors, namely: projects, maritime, rail, automotive, aviation and finance.

It is widely accepted that any increase in hydrogen use cases will assist the sector overall in reducing the cost of hydrogen production and, while stakeholders will be focused on their specific use cases, seeing all of the exciting projects across many sectors instils great confidence that hydrogen is going to become a corner stone in the UK's net zero energy mix. That said, in order for the UK to meet its carbon objectives, gigawatt scale hydrogen production processes will be needed sooner rather than later.

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

Hydrogen regulatory and legal issues will be addressed in future insights as and when they are publicly released.

You will most likely already be aware that over the last number of months, the UK government published;

- (1) the Energy White Paper setting out concrete plans for reaching Net Zero by 2050; and
- (2) its 10 Point "Green" Plan.

Our commentary and analysis on these policies can be found here:

[The UK's Energy White Paper: Not many surprises, but 2021 will have to be a busy year](#)

[The UK government has set out its 10-point clean energy plan – what comes next?](#)

We are now eagerly awaiting the UK government's dedicated Hydrogen Strategy that is due to be published in early 2021. This will hopefully provide much sought after clarity on how the UK government intends to meet its hydrogen goals. While 30 countries have published their hydrogen strategies already, all involved are keen for the UK not to be left any further behind in the race to develop hydrogen.

In the meantime:

- the Hydrogen Counsel and McKinsey & Co. published an extremely insightful and interesting paper on hydrogen investment, market development and cost competitiveness in February which we recommend as essential reading for all those interested in hydrogen; and
- The UK Hydrogen and Fuel Cell Association (UKHFCA) released a roadmap for green

hydrogen deployment by 2050. UKHFCAsaid industry leaders and hydrogen experts across the UK have *"outlined their concerns that the Treasury will repeat past mistakes and ultimately damage the economy, job creation and the UK's position as a global hydrogen leader"*. The roadmap also includes a series of policy recommendations, from *"oven ready"*, to short and medium term opportunities. Their public launch on 23 February 2021 covered several interesting topics and highlighted that: the hydrogen transition cannot follow previous energy transitions timelines, the hydrogen transition must be developed immediately, and the transition must be underwritten by clear UK government policies. The presentation is recommended viewing for anyone interested in the UK's hydrogen market.

Projects

The UK market is closely watching a number of demonstrator projects with excitement and interest. The number of commercial scale projects under consideration is growing extremely quickly, however most projects in the UK remain under layers of confidentiality. The following projects are in the public realm:

Production processes

- BEIS have put money towards the HySpirits 2 project which is exploring the use of hydrogen applications in a whisky distillery. The project is bringing together industry partners including global distilling group Edrington and local craft distillery Orkney Distilling Ltd. In something of a theme, BEIS has also granted Protium Green Solutions more than £70,000 to help incorporate hydrogen combustion technology into Bruichladdich Distillery on the isle of Islay in Scotland. Hydrogen is seen as a key part of helping remote locations achieve net zero.

Offshore

- Hydrogen offshore production is developing as quickly as onshore production in some respects. Hydrogen East has kicked off a new research study to explore the potential for hydrogen production off the coast of East Anglia. The study will provide a map of existing offshore and onshore energy-related infrastructure and develop options and scenarios for where wind farms, gas platforms, subsea pipelines and cables could be integrated or repurposed over time to

support hydrogen production, with the Bacton terminal on North Norfolk's coast being used for injection into the national grid.

- It was also announced that a hydrogen consortium has been given £4.5 million in EU funding towards the integration of hydrogen with offshore wind. The consortium includes Orsted, ITM Power, Siemens Gamesa and Element Energy.

Homes

- The Heating and Hotwater Industry Council and UK boiler manufacturers have said they will support any future UK Government legislation which mandates all new models of domestic boilers to be *"hydrogen-ready"* from 2025. The announcement follows Worcester Bosch's plea for the government to set a mandate that by 2025, all new boilers on sale should be hydrogen-ready.

Freeport East Hydrogen Hub

- The Budget's green light for the Freeport East Hydrogen Hub is being applauded as a major step towards delivering on Boris Johnson's statement that the UK will be *"putting a big bet on hydrogen"*. At its peak, the project will produce 1GW of hydrogen (20% of the 5GW target in the Prime Minister's Ten Point Plan). Low-carbon hydrogen will be produced for a multitude of end users in and around the future Freeport. For example, Sizewell C aims to move workers around the site using hydrogen buses, making the site as low-carbon as possible. The Freeport East Hydrogen Hub is great news for the UK hydrogen economy and the main parties involved, namely: Sizewell C, EDF, Ryse Hydrogen, Wrightbus, Port of Felixstowe and JCB.

Marine

Hydrogen fuel cells continue to be viewed as one of the most promising technologies to meet the maritime industry's goal of reducing and eliminating greenhouse gas emissions. While the debates rage on whether ammonia or hydrogen is more suitable, it is clear that both sources of energy have advantages. In our opinion, when further research and testing is undertaken, we are confident that vessels will be easily categorised on the basis of their specific use cases and thereafter be regarded as generally more suitable for either hydrogen or ammonia.

Large cargo vessels

- Ballard Power Systems and Global Energy Ventures have signed a MoU for the development of a new fuel cell-powered ship called "C-H2 ship". The large-scale ocean-going vessel is designed to transport up to 2,000 tonnes of compressed green hydrogen at 250 bar. In the short term, a demonstrator C-H2 ship will be developed with a hydrogen propulsion requirement of 10MW. In the longer term, the C-H2 ship will have a propulsion power requirement of 26MW at full scale.

Tugs, dredgers, passenger and coasters in the Netherlands

- The Netherlands published plans to use hydrogen to decarbonise its maritime industry and shipyards. It aims to achieve this through a partnership between TECO 2030 ASA and Thecla Bodewes Shipyards. The partnership includes manufacturing, installation, testing, and common marketing hydrogen equipment and uses.

Barges

- Hydrogen-powered barges are planned to be operational on the Rhine by 2024. Covestro and NPRC have joined forces as part of the RH2INE Initiative (Rhine Hydrogen Integration Network of Excellence).

CTVs

- While this was announced in 2020, the offshore renewables market is closely watching to see Piriou's concept for a hybrid hydrogen-powered crew transfer vessel. The proposed CTV measures 27m x 9.7m and can carry 24 technicians, three crew members and 5 tonnes of cargo. Propulsion would be split between a pair of 1,000kW diesel engines and twin 140kW fuel cells, for a top speed of 25knots, and the hydrogen would be stored in a 20' container.

Finance

There is still no merchant market for hydrogen and as developers will know only too well, for any hydrogen project to be financeable, it must have a bankable offtake scheme as a prerequisite. In the short term, the development of sector specific offtake agreements and financiers becoming comfortable with the technology risk are key to increasing the ease of financing hydrogen projects.

- On 10 February 2021, Legal & General launched the first Hydrogen Economy UCITS ETF. The \$201.8m ETF is tracked on the Solactive Hydrogen Economy Index NTR, we expect this to be the first of many hydrogen specific ETFs to be launched over the next number of months and years.
- During the UK's 2020 Spending Review, the UK Government announced plans for a UK National Infrastructure Bank to support its pledges to "level-up" the UK and reach "net-zero carbon" by 2050. Since the concept was announced, investors have been left to wonder what its role will be and how exactly it will be run. The UK's Budget was announced on Wednesday the 3 March 2020 and the Treasury has confirmed that it will focus on supporting new technologies that are too risky for private finance and would contribute to meeting the government's target of net zero carbon emissions by 2050. The bank will launch with £12bn in capitalisation and aims to attract up to £40bn of private investment into green projects.
- The Budget also included a program for issuing at least £15bn of green bonds in order to raise funds for such decarbonising projects. It is set to be issued in the summer of 2021.

As interest develops in lending and investment markets the range of financing options available to hydrogen project sponsors will expand. Currently the majority of hydrogen projects that have announced financing recently are relying on corporate financing although some hydrogen related project financings and bond financings have also been announced. We can expect interest in project financing and bond financing to increase, especially off the back of the growth of the green finance trend. This will require projects to develop into scale and both sponsors and financiers to get comfortable with the structure of proposed projects (notably how integrated they are into their feedstock supplies or offtake end product) and the final offtake arrangements.

Aviation

Hydrogen packs three times as much energy per kilogram as kerosene, the current standard aviation fuel. Fuel cells produce electricity more efficiently than aircraft engines; therefore, in ground operations, aviation fuel can be saved and emissions reduced.

Despite several attempts since the 1980s to use hydrogen as a power source in aviation, nothing has really taken off, until now it appears.

ZeroAvia

- ZeroAvia successfully completed a number of flight tests in California, starting in Q1 2019, proving its hydrogen design could be used in longer-distance configurations. Since 2019, ZeroAvia has received increasing attention in the aviation sector after a number of recent announcements including: successfully being awarded funding through two grants as part of the UK Government's Future Flight Challenge, partnering with British Airways, and receiving \$21.4m investment funding from a combination of high profile investors. ZeroAvia is aiming to have its first commercial offering of 10-20 seats achieving a 500NM range by 2023.

Airbus

- In September 2020, Airbus revealed three concepts for hydrogen-powered zero-emission commercial aircraft which could enter service by 2035. In January 2021, Airbus confirmed that it is undertaking studies to determine how scalable a hydrogen fuel cell "pod" configuration, among others, could be to large commercial aircraft. According to Airbus, their engineers are unveiling a completely new configuration which will permit hydrogen to be the primary power source. The innovative approach consists of six, eight-bladed hydrogen-fuel-cell-powered "pods" mounted beneath the aircraft wing. Airbus confirmed it patented its new configuration and it is expected Airbus has several more patent applications pending.
- The 2nd International Hydrogen Aviation Conference (IHAC 2021) is currently scheduled to be held in Glasgow, Scotland on Thursday, 2nd September 2021. IHAC is set to focus on the use of hydrogen in aviation, the associated benefits and emerging challenges. Interested parties will no doubt be closely watching to see what announcements are made during the conference.

Rail

Alstom has called for a £10bn investment programme in UK rail and mass transit systems. Alstom's report states that 300-400 hydrogen trains

could be launched simply with a like for like replacement of diesels.

Alstom have been making headlines for many years since launching the two Coradia iLint trains in September 2018. Coradia iLint is the first passenger train in the world to be powered by a hydrogen fuel cell, which generates electrical energy for propulsion.

Alstom has recently confirmed that serial production of this ground-breaking innovation for rail transport is currently underway and the first hydrogen-powered series trains will be in regular service in Germany and Austria from 2022.

In the UK, Ballard confirmed that it received an order to supply fuel cell modules for Scotland's first hydrogen-powered train. The order comes from UK hydrogen and fuel cell integration company Arcola Energy, which leads a consortium put together to create a deployment-ready platform for hydrogen-powered train development. It is planned that the hydrogen train will be demonstrated during COP26 which will be held in Glasgow in November 2021.

Automotive

With sales of electric vehicles increasing, many question what role hydrogen will play in the private automotive sector. The uptake of hydrogen vehicles has somewhat struggled to date because of the lack of infrastructure. In reality, there are currently only a handful of hydrogen-fuel stations in the UK. That said, the number of sites is increasingly steadily.

- Car rental firm Enterprise has added 17 Toyota Mirai saloons to its UK fleet as a pilot programme in a bid to deliver zero emission transport.
- Leeds Bradford Airport entered into a partnership with ITM Power to create a hydrogen vehicle hub at the airport. The current design is to create a sustainable energy hub that would use hydrogen and rapid EV charging facilities to power the airport's fleet of vehicles, as well as allowing the airport to fuel the next generation of hydrogen and EV powered ground handling vehicles. Work is currently scheduled to start in 2022.
- Aberdeen City Council is also currently working with public and private sector stakeholders to develop a commercially viable 'Hydrogen Hub' in the city. The key requirement of the hub is to make hydrogen available at a price which makes further deployment of hydrogen vehicles (and other

non-transport related demands) economically viable. Aberdeen City Council had early success with hydrogen when working with BOC, having installed a hydrogen refuelling station at the Kittybrewster bus depot.

There have also been a high number of exciting announcements in the commercial automotive sector over the last few months.

- A brand-new hydrogen-powered bus has been unveiled by NFI Group subsidiary Alexander Dennis Limited ("ADL"). The Scottish company has launched the H2.0 bus, promising a zero-emission range of up to 300 miles. Designed and fully built in Britain, H2.0 is ADL's second-generation hydrogen platform. It is hoped the vehicle will hit roads before the end of 2021.

Interestingly, Scania, one of the world's largest heavy-duty vehicle manufacturers confirmed:

"Scania has invested in hydrogen technologies and is currently the only heavy-duty vehicle manufacturer with vehicles in operations with customers... However, going forward the use of hydrogen for such applications will be limited since three times as much renewable electricity is needed to power a hydrogen truck compared to a battery electric truck. A great deal of energy is namely lost in the production, distribution, and conversion back to electricity"

However in contrast, Nikola's "Two" is still being promoted as a high-efficiency hydrogen fuel-cell for long haul applications.

We expect all of the major long haul and heavy-duty manufacturers shall in due course confirm their stance in relation to hydrogen.

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



Francesca Cadoux-Hudson

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



Andy Ross

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.

We plan to host a finance episode in early 2021 where we will discuss financing hydrogen projects and new technologies in the energy sector.

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](#).