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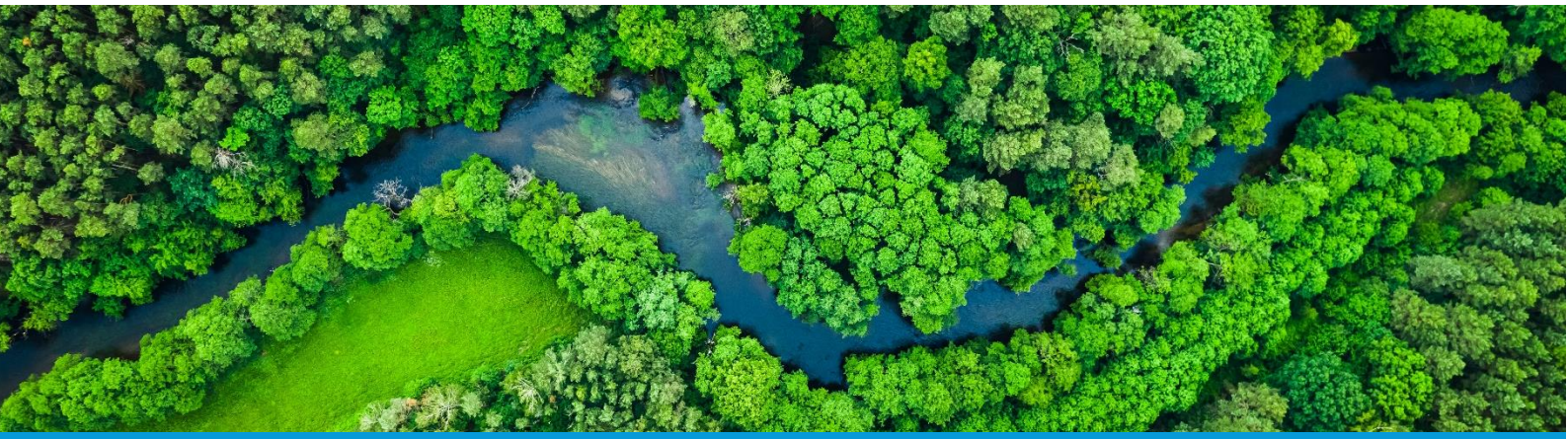

Stephenson Harwood's Hydrogen Quarterly Insight – November 2022

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

For many UK hydrogen companies, the last number of months were extremely busy finalising and submitting their applications before the 12 October 2022 deadline for the Hydrogen Business Model and Net Zero Hydrogen Fund: Electrolytic Allocation Round 2022. We wish our clients and contacts the best of luck with their applications.

COP27 opened on 6 November 2022 in Egypt and hydrogen was once again high on the agenda as being critical for countries to implement the Paris Agreement.

The Hydrogen Council's "Hydrogen for Net Zero" report estimated that 660 million tonnes of renewable and low carbon hydrogen will be needed by 2050 to achieve Net Zero. Of particular note in the same report was that only 10% of proposed hydrogen investments have reached a final investment decision (FID), are under construction, or are already operational.

Members of Stephenson Harwood's Hydrogen Team, namely Jonathan Cripps and Cathal Leigh-Doyle, both spoke at The Hydrogen Decade Summit's conference in London in October 2022. It was clear from the discussions and presentations on the day that there is an increasing awareness amongst stakeholders that reasonable risk allocation in hydrogen projects is essential for early movers. Significantly, the overall sentiment of the conference was that hydrogen is well on its way and will only continue to grow. With the climate change warnings from COP27 being ever more stark, hydrogen clearly has a vital role to play. Snippets from the conference can be found here: The Hydrogen Decade Summit: Videos | LinkedIn

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 Low Carbon Hydrogen Business Model is now in full swing – the deadline to express interest in the electrolytic allocation round for 2022 was 7 September.

Whilst the final details of the contract remain unknown, the heads of terms have been published and BEIS have held a series of workshops.

Some of the key takeaways from these are:

The business model is both similar and different to offshore wind: the business model is based on the contracts for difference ("**CfD**") used in low carbon Allocation Round 4. The means that the hydrogen producer will be 'topped up' if their costs of production and agreed margin (the 'strike price') exceeds the cost of natural gas. In addition to this price support, BEIS will also provide volume support, should offtakers purchase low volumes of hydrogen, which could lead to facilities becoming uneconomic to operate.

The business model works best where the offtaker is switching from gas: because the CfD model uses as its benchmark the cost of natural gas, it makes sense (at least in these early allocation rounds) for the hydrogen producer to sell hydrogen a price that is equivalent to the natural gas price as well. This means that a gas to hydrogen switch is fairly straightforward from a commercial perspective. However it also means that other fuel transitions – such as diesel to hydrogen for vehicles – are less straightforward.

Local production and use is currently favoured: in the absence of a hydrogen distribution network, and no settled approach to the blending of hydrogen into the gas distribution network, it is likely that successful projects will have hydrogen production and use sited fairly close to each other.

Finance

Government involvement and support remains crucial to developing hydrogen projects and to building the market to a point that debt financing becomes more generally viable. Nevertheless, equity raisings and funding continue to dominate the newsfeed for Hydrogen projects.

Recent examples include the €260m series B equity raising by H2 Green Steel, the Swedish green hydrogen powered steel producer covered below, and Airbus' investment into the Ardian Infrastructure-backed Hy24's Clean Hydrogen Infrastructure Fund.

Even though hydrogen production by electrolysis is a proven technology, in reality both the commercial and physical infrastructure to bring hydrogen as a fuel to mass markets remain underdeveloped and pose problems for debt providers looking for guaranteed offtake. Progress is however being made on projects tied directly to specific industrial uses as highlighted below.

- H2 Green Steel has recently announced the provision from a group of lenders of a multi-billion financing package to fund the construction of its planned hydrogen-powered steel plant in Boden, Norther Sweden. The debt package announced by the Swedish company includes:
    - conditional commitment letters for €3.3bn of senior debt from SEK, the Swedish Export Credit Agency, BNP Paribas, ING, UniCredit, Société General and KfW IPEX-Bank;
    - €750m of senior debt from EIB, who has received board approval for the transaction;
    - a conditional commitment letter with a leading infrastructure fund comprising large Nordic investors for a c. €500 million junior debt facility; and
    - letters of intent from ECAs, including Euler Hermes, providing credit support guarantees for 95% of €1.5 billion of the senior debt and the Swedish National Office providing a green credit guarantee for 80% of €1 billion of the senior debt.

- The European Investment Bank and Instituto de Crédito Oficial have entered into a €88m green finance loan with Iberdrola, the Spanish renewables group. The proceeds of the loans will be used to finance construction of "one of the largest" green hydrogen production plants in Europe for use in the industrial sector. The 20MW project will utilise 100MW of PV solar generation to generate green hydrogen for use by

Fertiberia at their fertiliser plant in the industrial town of Peurtollano. The green hydrogen will largely replace currently utilised grey hydrogen feedstock. Total investment in the combined solar and hydrogen project has reached €150m. Fertiberia and Iberdrola plan to roll out this model to other Feriberia sites in Spain by 2027, requiring a total green hydrogen production capacity of 40,000 tonnes per year.

- The UK Government announced on 6 April 2022 that it is underwriting a £400m loan to Johnson Matthey. Johnson Matthey is a global leader in the production of sustainable chemicals and technologies. The loan will support Johnson Matthey's hydrogen innovation and R&D in sustainable technology with the goal of helping the UK reach net-zero by 2050 and in particular achieving the national targets of 10GW of low-carbon hydrogen production by 2030. The financing is being provided by HSBC, Sumitomo Mitsui Banking Corporation, and Bank of America. The UK Government is backing the loan through UK Export Finance.

Rail

Hydrogen continues to be a hot topic in rail and this quarter has been no exception. Hydrogen fuel, along with electrification and battery power, will play a key role in decarbonising the rail industry. Consultancy firm Roland Berger has forecasted that, by 2035, 20% of regional trains in Europe are set to run on hydrogen. There is now a focus on making hydrogen more accessible to train operators; for example, continued exploration into the conversion of existing rail rolling stock to run on hydrogen should help to bring down the cost of using it as an alternative fuel.

Key updates in the rail sector include:

- Statkraft, Europe's largest generator of renewable energy, has announced plans to build a green hydrogen production facility at a former Royal Naval armaments depot in Pembrokeshire. The hub would produce roughly three tonnes of green hydrogen per day, which could be used to fuel trains running on railway lines west of Swansea.
- The University of St Andrews has led an innovative hydrogen change project in Scotland to convert a former ScotRail train to run on green hydrogen produced at Bo'ness. Testing of the hydrogen train commenced in August, demonstrating its potential to help Scotland achieve its goal of removing all diesel trains on passenger services by 2035.
- HS2 has completed successful testing of its hydrogen generators in London. The generators are a cleaner, greener replacement for the diesel generators which power machinery for the site, improving air quality for the construction workforce and local communities.
- Rolling stock manufacturer CAF has moved to the next stage of testing on its hydrogen-powered train that uses a hybrid of hydrogen fuel cells and batteries. Having successfully performed static testing, CAF has started dynamic test runs with a range of power demand conditions.
- Alstom's Coradia iLint train, the world's first train to run on a hydrogen fuel cell, has now become the first passenger service train based on hydrogen technology. In Germany, it has been taking part in regular passenger service since the middle of August, and on 15 September it successfully travelled 1,175km without needing to refuel its hydrogen tank.
- Alstom has also partnered with the Saudi Railway Company to explore a possible rollout of hydrogen trains and associated infrastructure in Saudi Arabia. Earlier this year, Saudi Arabia announced it would be more than doubling its existing rail network and will now work with Alstom to reduce its railway's dependency on fossil fuels and hydrocarbons.

Projects

The number of UK hydrogen projects continues to increase. Notable announcements this quarter were:

- UK green hydrogen developer, Protium, has increased the capacity of its Tees Valley Net Zero hydrogen project by 30MW, bringing total output to approximately 70MW. The project is due to complete in 2026 and will be developed in two phases. The first will involve the delivery of an equivalent to 17.2MW capacity through the operation of a PEM electrolyser. The second will deliver an equivalent of 68.8MW. Teesside's largest PEM electrolyser will be supported by the creation of a green hydrogen storage facility, which will help local manufacturers and logistics firms make the switch from natural gas and diesel.

- The first low-carbon hydrogen fuel hub in Greater Manchester and the largest of its kind in the UK has been given planning permission. Trafford council has approved Carlton Power's £300 million scheme at Manchester Road in Carrington. It will ultimately have the capacity to generate 200MW of energy. The project, first put forward in March 2021, is the UK's largest green hydrogen scheme to have received planning consent. The Council hopes the project will catalyse low carbon generation and provide greater energy security in the North West, and boost investment in new energy infrastructure and job creation. The energy will power heavy goods vehicles and buses as well as energy for industry and other transport operators.

- As introduced above, former Royal Navy arms depot in Pembrokeshire is set to house Statkraft's first green hydrogen project in the UK.

- ROCKWOOL's factory in Bridgend, Wales, UK confirmed that it would use green hydrogen to replace natural gas in the Bridgend factory's combustion systems and curing ovens. This project Backed by £400,000 ($461,750) in funding from the Net Zero Innovation Portfolio (NZIP) under BEIS through its Hydrogen Accelerator programme.

Offshore

- Vattenfall confirmed that it was awarded £9.3 million from the Net Zero Innovation Portfolio Low Carbon Hydrogen Supply 2 Fund for an offshore project in Aberdeen. The funding will be used to develop the world's first hydrogen-producing offshore wind turbine with the electrolyser sited directly onto the operational turbine.

- HydrogenOne, the listed LSE investment fund dedicated to clean hydrogen, invested EUR10million in Strohm, the Dutch manufacturer or hydrogen pipelines.

- Iv-Offshore & Energy has developed an offshore platform with a capacity of 500MW using offshore wind energy to produce the hydrogen. The dimensions of the offshore hydrogen platform as comparable to a 1.3GW HVDC substation.

Marine

The shipping industry's focus on decarbonisation is picking up pace with vessel owners, investors and shareholders increasingly questioning how the sector will comply with IMO commitments towards 2050 "net zero" from 50% GHG reduction agreed today.

- The first hydrogen bunkering license was issued in August 2022 to Windcat Workboats. This will enable the Hydrocat 48, crew transfer vessel, to refuel with hydrogen in the Amsterdam port. Windcat Workboats has confirmed that it aims to take more hydrogen-powered vessels into use in the future.

- Clarksons recently confirmed that there are 6 hydrogen-ready large vessels on order in shipyards around the world.

- TECO2030, Shell and its partners announced it will retrofit an 18.600DWT product tanker with a 2.4MW fuel cell system and 4,000kg compressed hydrogen storage demonstration by 2024. This project has received EUR5M in Horizon Europe support.

- Industry bodies are urging for a well-to-wake approach to calculating emissions of alternative fuels as a way of ensuring overall emissions reduction targets are achieved.

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Aviation

- ZeroAvia has announced the acquisition of fuel cell innovator HyPoint. As mentioned in last quarter's issue, HyPoint specialises in turbo-air cooled HTPEM fuel cells for use in aviation / air mobility and had earlier this year moved the bulk of its R&D to the UK. Val Miftakhkhov, CEO and Founder of ZeroAvia, has described the acquisition as an important strategic step in strengthening ZeroAvia's leadership position in hydrogen-electric powertrain development for aviation.

- In September, easyJet unveiled its new roadmap for reaching net-zero, with the company's ultimate ambition being flying on zero carbon emission hydrogen powered aircraft. easyJet's ambitions are supported by its partnership with Rolls-Royce to develop hydrogen combustion engine technology for narrowbody aircraft. Indeed, Rolls-Royce is now making final preparations for the first ground test of a hydrogen fuelled AE 2100 engine.

- American Airlines has announced a strategic equity investment in Universal Hydrogen Co, a company aiming to build a hydrogen distribution network for aviation through the use of modular capsules. The investment was described by American's Chief Financial Officer Derek Kerr as "a vote of confidence for green hydrogen as a key element of a sustainable future for our industry." This follows American's investment earlier this year in hydrogen-electric engine developer ZeroAvia.

- A joint project involving Lufthansa Technik, German Aerospace Agency, Hamburg Airport and ZAL Cetnre for Applied Aeronautical Research has confirmed that a decommissioned Airbus A320 shall be used for testing maintenance and group processed for future hydrogen-powered aircraft.

Automotive

RTFOs

The Renewable Transport Fuel Obligation ("**RTFO**") originally came into operation in April 2008 in the UK to encourage the production and use of renewable transport fuels that do not damage the environment.

On 20 July 2022, the UK government published the *draft Renewable Transport Fuel Obligations (Amendment) Order 2022.* The draft Order will make the changes announced in the government consultation response published on 19 July 2022 to improve flexibility when determining the eligibility of hydrogen and other renewable fuels of non-biological origin in the RTFO. The key changes set out in the consultation response were:

- amending the Renewable Transport Fuel Obligations Order 2007 (SI 2007/3072) (RTFO Order 2007) to include a definition of 'additionality'; and
- reclassifying hydrogen produced from biomethane reformation without substantial CCS to be eligible for standard renewable transport fuel certificates.

The clarification of "additionality" is welcomed by stakeholders as it will in practice give more flexibility to green hydrogen producers.

The new RTFO Guidance on Hydrogen and renewable fuels of non-biological origin applies now, even though the Order amending the RTFO legislation has not yet come into force.

Batteries and hydrogen

Although there has historically been competition between EVs and hydrogen-powered automotives, the evidence increasingly suggests (and our clients appear to agree) that not only can both coexist, but both will be needed to decarbonise the automotive sector.

The Advanced Propulsion Centre ("**APC**") (joint venture between automotive companies and the Government, which conducts research and provides funding for innovation in the automotive sector) recently highlighted the need for investment in hydrogen-fuelled automotives in its latest report, in order to deal with this potential shortfall in the availability of batteries for EVs.

Other announcements of note include:

- First Hydrogen announced that its hydrogen-powered Light Commercial Vehicles ("**LCVs**") have been certified legal on British roads by the Vehicle Certification Authority. Customer trials of the LCVs on public roads will start in January 2023 and will continue for 24 months. A total of 13 UK fleet operators in various industries including telecoms, utilities, infrastructure, delivery, grocery and healthcare have signed up to participate in the trials. First Hydrogen are hoping to showcase the benefits of using hydrogen to fuel LCVs, as the two demonstrator vehicles

will offer 400-600km of range on a single refuelling, which takes just a few minutes.

- London-listed Johnson Matthey has announced that it is building an £80 million "gigafactory" specialising in the manufacture of hydrogen fuel cell components, with operations planned to start in the first half of 2024. In a statement, the company said that the facility in Royston, England, would be able to produce 3 gigawatts of proton exchange membrane fuel cell (also known as polymer electrolyte membrane fuel cells) components per year. The idea is that these fuel cells will be used in hydrogen-powered vehicles.

- Hydrogen UK (a group representing 50 businesses from across the hydrogen space) have recommended that the Government should introduce a target to increase the number of hydrogen refuelling stations in the UK to 200 this decade. Although this ambitious target has not yet been made policy, refuelling infrastructure is slowly beginning to emerge in the UK.

- Element 2 partnered with Exelby Services to open the UK's first public hydrogen refuelling stations on the A1(M) and the M6. The sites are located at Conegarth, Yorkshire, and Golden Fleece, Cumbria, and will provide hydrogen refuelling services for hydrogen-powered Heavy Goods Vehicles.

- Element 2 also announced its partnership with FCEV manufacturer Riversimple in Wales. Element 2 will become Riversimple's core refuelling infrastructure partner under the partnership.

- Polish-based Solaris confirmed that it will deliver four hydrogen-powered buses to Venice, Italy, following the conclusion of two contracts exceeding $2.4m.

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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 hydrogen seminars can be found here.

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.

Episode 3 discussed the use of hydrogen and batteries in the energy transition and what issues must be addressed for the technology to achieve its market potential.

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.

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