HYDROGEN – A VECTOR FOR DECARBONATION

In Europe, hydrogen accounts today for less than 2% of our energy consumption. It is mainly used to produce chemical products, such as plastics and fertilisers, and 96% of this hydrogen is produced from natural gas, emitting significant amounts of CO_2 throughout the generation process. Global hydrogen production results in close to 900m tons of CO_2 per year, according to the IEA. By **PIERRE-LOUIS DELON**, *vice-president,* **FINERGREEN**.

After the pandemic, the European recovery plan made green hydrogen a priority, as a driver to stimulate growth and resilience, and as a pillar to reduce greenhouse gases emissions – the objective is to cut them out by at least 55% by 2030 and reach carbon neutrality by 2050. This energy transition is urgent, and every sector has a role to play: power, industry, mobility, buildings, agriculture, etc. Some are hard to abate, and hydrogen is at least a part of the solution. For that, hydrogen needs to be renewable, produced from water electrolysis thanks to renewable electricity, or low carbon, produced from more traditional systems coupled with carbon sequestration modules.

Green hydrogen will help to reduce our dependence on fossil fuels and, beyond carbon emissions, on geopolitical crisis impacts and on global market shocks. The European strategy for hydrogen deployment in Europe is ambitious, with 40GW of green hydrogen production capacity installed by 2030, and the same level for importations in Europe of green hydrogen produced in the neighbouring countries. The ambitious strategy for the development of hydrogen is also relayed in many European countries at the national level: France, Germany, Spain, Portugal, the UK, Belgium, etc. According to the IRENA, green hydrogen will account for 12% of global final energy use by 2050.

One of the main benefits of hydrogen is to bring flexibility. It can be stored in large amounts and for large period of times, which is complementary to short-term battery storage. Green hydrogen can also be transformed again into electricity thanks to the electrolysis “reverse reaction” in fuel cells. It can be transported, by tankers across the oceans, by pipelines, or by truck inlands. It can be transformed into green ammonia and used as a fuel for maritime transport and to produce fertiliser for the agriculture, as well as into methanol to complement the production processes based on biomass. It can then be used in the industry for every process requiring hydrogen, in the mobility business as a green fuel, or in other application based on gas, replacing or blended with natural gas.

A fully electrified system is not viable or feasible, taking the example of heating: a full direct electrification would require a significant increase in power generation and grid capacity that would be used in winter only. We still need to rely on gas, with the strong condition to use green gas. Hydrogen could then be the missing bridge between the electricity and the gas grids to optimise the production system and integrate as much as possible the intermittent renewable energies. The challenge is also for Europe to retain a certain leadership in the industry and to create jobs and wealth. And all this will relying on technology we have mastered since the 19th century, electrolysis.

A DEPLOYMENT IMPLYING SIGNIFICANT INVESTMENTS

The European Union, in December 2021, published a set of legislative proposals to decarbonise the gas market by facilitating the uptake of renewable and low carbon gases, including hydrogen, and to ensure energy security for all citizens in Europe. The idea is to enable the energy transition by building the necessary markets, network, framework, and infrastructure. One of the main objectives presented is to establish a real market for hydrogen, to make it a commodity. Another one is the creation of the European Network of Network Operators for Hydrogen (ENNOH), as the governance entity in charge of promoting the development of dedicated infrastructure, lifting reglementary barriers, and supporting the interconnection between the different networks and countries. These proposals should lead to the production of 10m tons of green hydrogen per year in Europe by 2030.

The deployment of green hydrogen is engaged but still facing some barriers: cost, regulation, tracking, midstream infrastructure, and certification. And for the whole industry value chain to develop, from upstream to downstream, it will require a significant amount of financing.

First, for the hydrogen transport infrastructure, as large hydrogen consumption and production in Europe will be achieved only with it. That's the purpose of the European Hydrogen Backbone, targeting investments of €27bn to €64bn on conversion of existing natural gas pipelines (75%) and construction of new hydrogen dedicated pipes (25%). Second, from now to 2030, according to the European Union, investments in electrolysers could range between €24bn and €42b. Significant investments should also be made for scaling up solar and wind electricity production capacity, for retrofitting the existing hydrogen production plants with carbon capture and storage, for distributing and storing hydrogen, for developing the refuelling stations ecosystem, etc. These large amounts of financing will come from both public support and private investors.

Talking about subsidies, the Green Deal, and in particular the Innovation Fund are bringing some critical support to the green hydrogen industry in Europe and this should continue. Not only for the production infrastructure, but also for the remainder of the value chain, midstream infrastructure, electrolyser giga-factories, etc. Policies and support mechanisms, within the global hydrogen plans being established in the different countries, are set to support investments in this industry and impulse the move. There is still quite a lot of uncertainty in how these plans will concretely be implemented, but the willingness is here and has been communicated. Capex subsidies, contracts for difference for the hydrogen produced, or tenders – the next months and years will tell us more.

Solar and wind energy are examples: supporting the industry at the beginning enabled the transition and the deployment, scale-up, progress on the learning curve, and then it reached parity with traditional energy sources, which is necessary for a technology to soar.

FINANCING IN THE GREEN HYDROGEN INDUSTRY

We hear a lot of noise dealing with investment and financing in the green hydrogen industry: companies launching IPOs, new dedicated investment funds being created, developers, manufacturers/suppliers, operators raising funds to step up to their industrial growth phase. As the industry is nascent – again, not only the use of hydrogen or the electrolysis technology, but in its booming trend and its coupling with renewables – many new players are also emerging, raising funds to finance their development. Even-if the underlying value created is based on infrastructure, the typology of investment is in those cases more venture capital or private equity oriented. The panel of investors attracted to the industry is then very large, from venture capital to infrastructure funds.

An interesting trend we observe on the market is that the consortium approach is favoured: HyDeal Espana – ArcelorMittal, Enagas, Fertiberia, DH2 Energy; Green H2 Atlantic in Portugal – Engie, Galp, Vestas, EDPR, Bondalti, Martifer; the Catalina project in the north-eastern Spanish region of Aragon – CIP, Enagas, Naturgy, Fertiberia and Vestas. The main objective is to structure a sponsors' team with obviously more financial resources than an isolated player, but also a great mix of competencies, positions over the value chain, market visions. Project developer, offtaker, supplier, TSO, energy manager, infrastructure fund or asset manager: the consortia publicly announced so far gather some of these different profiles.

This kind of consortium also improves the projects' bankability, benefiting from the track record and experience of the different sponsors, their commercial relationship with financiers, their creditworthiness. Most of the time an offtaker is part of the sponsors within the consortium. That's where the consortium approach is probably the most bankable, as it truly makes the link between the demand, in a necessity to consume low carbon resources rather than fossil fuels, and the offer, targeting to produce sufficient volumes at a competitive price.

Down to the asset level, green hydrogen production plants, like renewable infrastructures, are or will be financed with project finance schemes. It is still quite new, the first examples are mainly seen for pilot projects, but banks are closely looking at it. Finergreen has been sounding potential lenders to seek financing for concrete green hydrogen projects in Europe, and the main feedback is that banks are ready: they are closely looking at it and some have already a great knowledge of the industry.

Except for pilot projects or demonstrators, most green hydrogen production projects are still under-development and would need several months or sometimes years to reach a ready-to-be financed stage. But potential lenders are keen to review the projects, provide some bankability guidance for the remaining development work to be performed, and communicate some first indicative financing conditions and structuring options. Moving forward hand-by-hand is a very constructive approach to achieve project financing in favourable conditions, and then to achieve construction and operation of the projects, which is everybody's goal in the end.

Commercial banks, development finance institutions, export credit agencies are keen to finance green hydrogen projects, still respecting their scope of intervention, and can be part of a mixed banking pool. In terms of structuring, without entering too much into details we have seen at Finergreen that mini-perms types of credit as well as long-

term amortising credits can be proposed. In other words, debt financing options do exist. A robust financial model, backing inputs and hypothesis by the conditions proposed in the different contracts or agreements under negotiations or already signed, is a key tool for banks to assess different structuring options.

The main criteria for bankability observed are divided into three categories: offtake, stakeholders, and midstream/regulation.

On the offtake side, the counterparty creditworthiness is obviously a key factor. We have also noted that banks were closely looking at the viability of the hydrogen purchase agreements' main terms and conditions: is this volume of green hydrogen achievable with that project design and sizing? Would the project need more flexibility to secure its level of hydrogen produced and sold and then its cashflow levels? Is the price realistic and relevant compared with the market?

Then, as always and maybe even more for these first of a kind projects, talking about several hundred MW of electrolysers fed with green electricity for example, the solidness of stakeholders is strictly analysed by potential lenders. The EPC or EPCs, the interface management between the renewable electricity production plants and the electrolyser, the OEMs and their ability to respect their commitments in terms of deadline and quality of the equipment provided, the contemplated guarantees and liquidated damages. When referring to the huge capacity of electrolysers announced by developers in Europe for the coming years, we understand the importance of the manufacturing gigafactories to be built on time. Here again, it reminds us to consider the green hydrogen industry as a whole when talking about its deployment.

On the third point, the grid regulation for midstream purposes, dealing with green hydrogen injection is still pending or not fully defined in the European countries: maximum levels of blending, quality parameters, registration procedures. In the case of direct injection between a production plant and a consumer, the stakes are not the same as a specific pipeline is built; then it rather deals with the development and authorisations issues that could be faced to implement the infrastructure.

ON THE WAY TO PARITY

Today, green hydrogen is not yet reaching parity with competitive energy sources. To reach low levellised cost of hydrogen (LCOH), it is a chicken and egg phenomenon: costs will drop only if significant volumes of electrolysers are manufactured, and projects are built. Waiting for costs to be low to develop projects would prevent the industry from growing. In the meantime, project viability must rely on efforts from all the parties in terms of regulation and incentives (authorities), expected returns (investors), cost efficiency based on large orders (manufacturers, contractors), the price to pay to switch to green hydrogen (offtakers), and financial engineering and structuring. The current energy crisis and sky-scraping prices could make green hydrogen profitable compared with the market sooner than forecast. For a consumer, securing green supply at a stable price for the next 10 or 15 years is probably much more interesting than undergoing high volatility and high prices of conventional and contaminant commodities. ■