
Bird & Bird & International Green Hydrogen Report

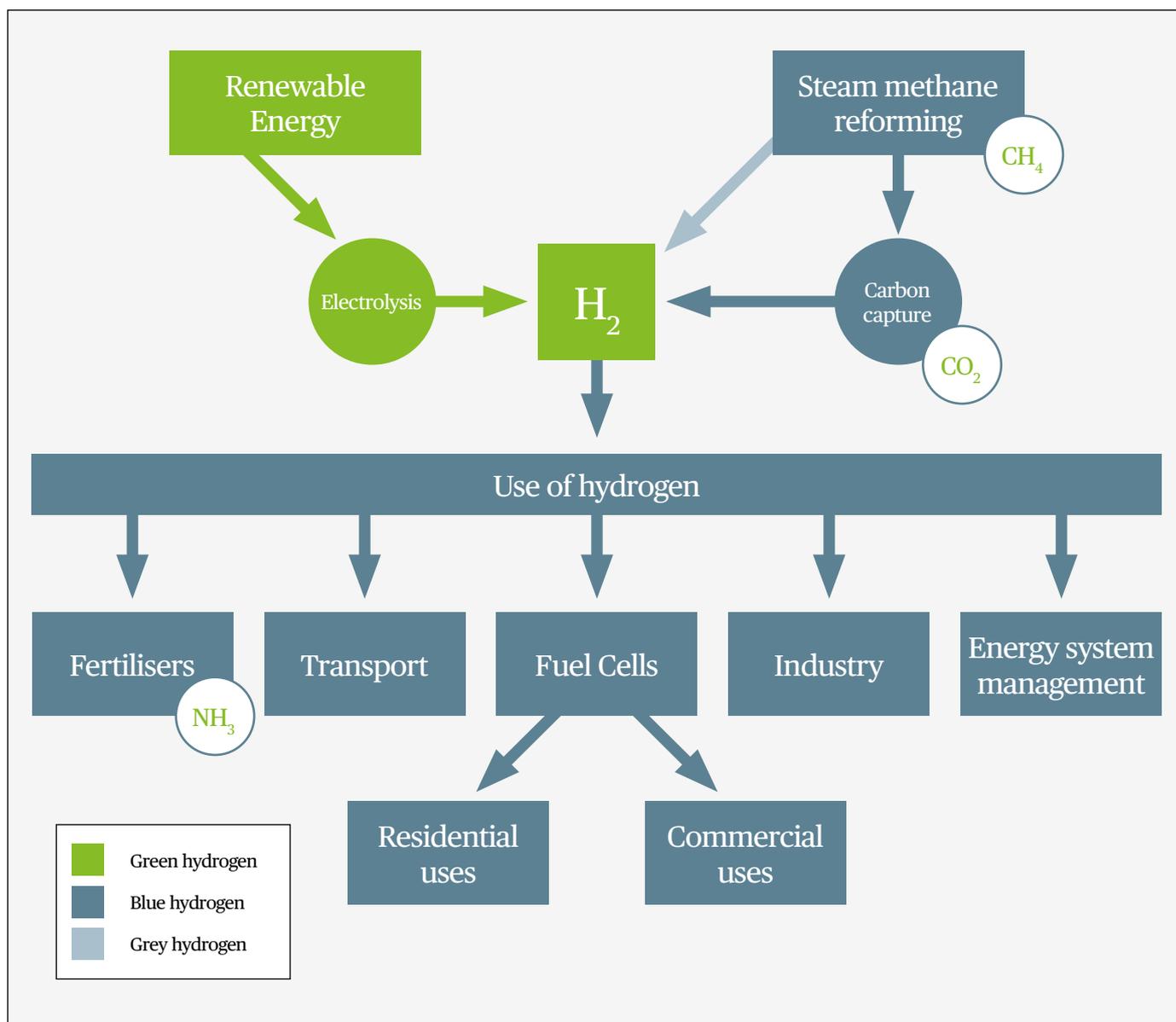
2021



Focus on hydrogen:

Hydrogen is clean and versatile

Whether as an energy carrier (basis for fuels), as energy storage for renewable energies, as a climate-neutral fuel in transport, as an essential element of sector coupling (dovetailing green electricity with the heat and mobility sectors as well as industry) or as a means of decarbonising CO₂ sources (such as the cement industry).



Accordingly, the desires surrounding the use of hydrogen are growing - and with them the legal questions that arise in this context. For these are as diverse as the usability of hydrogen.

The legal issues

A successful energy transition can only be achieved by combining security of supply, affordability and environmental compatibility with innovative and intelligent climate protection. This requires an alternative option to the fossil fuels that are still predominantly used at present.

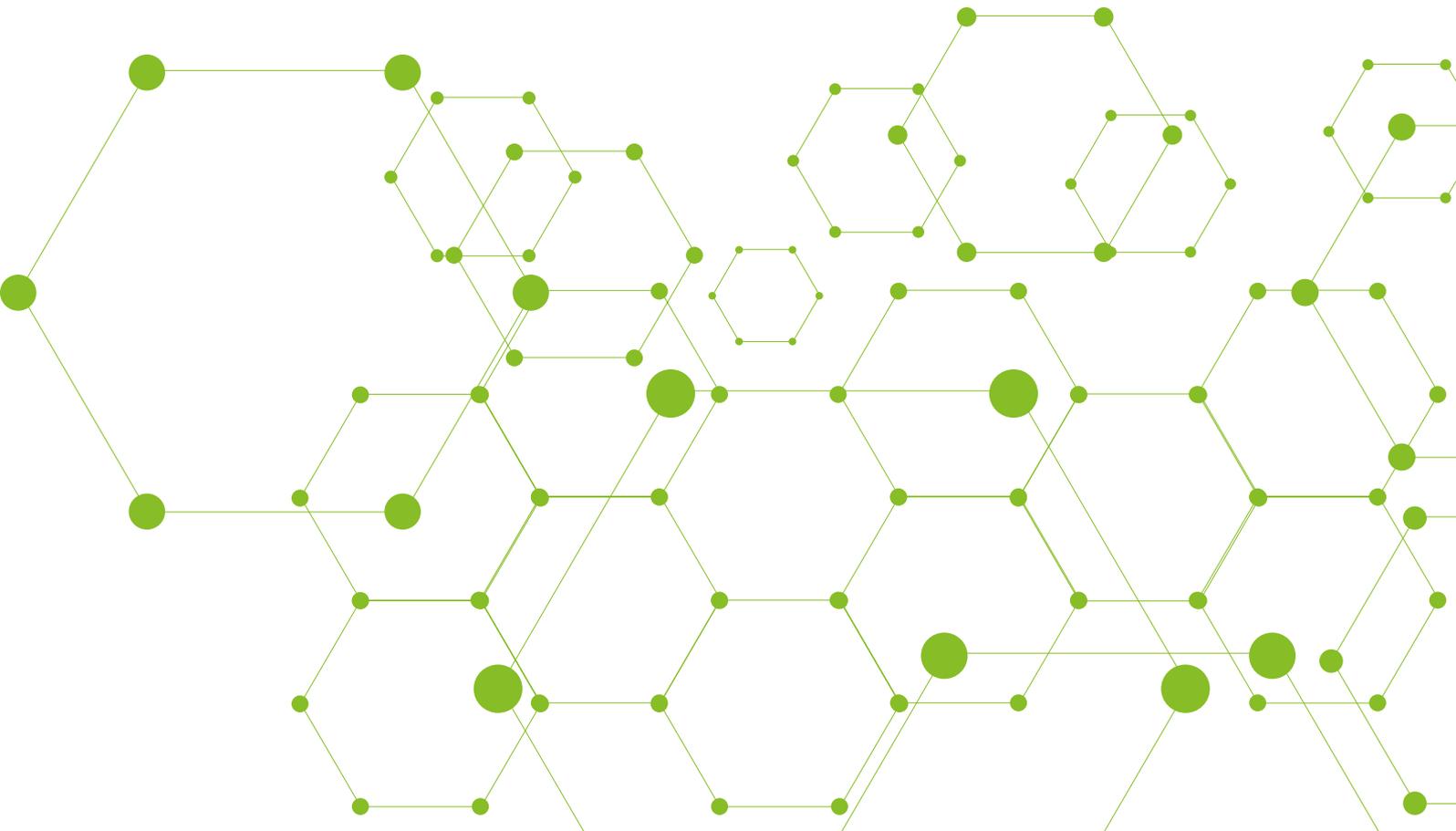
Hydrogen has a key role to play in the energy transition. This is because, in addition to numerous other advantages as a renewable energy carrier, it makes it possible to significantly reduce CO2 emissions.

Green hydrogen is the petroleum of tomorrow

The flexible energy carrier is indispensable for the energy transition and opens up new markets within the framework of the entire value chain: **technologies, generation, storage, infrastructure and use including logistics** and important aspects of **quality infrastructure**.

Our hydrogen-focused team has already successfully supported and strategically advised various projects on the practical use of hydrogen technology. We generally work in cross-jurisdictional teams and cooperate with technical consulting specialists where necessary.

Following this approach, we would like to support you as a strong and competent legal advisor in the implementation phase that has now begun and bring about an optimised change in the use of energy sources together with you.



Core legal areas

In the following, we would like to highlight some of the key legal areas surrounding hydrogen.

Hydrogen & Regulation

In the context of the production, transport, distribution and consumption of hydrogen, numerous regulatory provisions must be observed.

A key legal and economic issue is the double burden of certain levies and charges that still applies in the context of energy storage and thus also the use of hydrogen.

Another key issue in terms of regulatory law is the development of a nationwide - or European - **hydrogen infrastructure**. Without a sufficient infrastructure, it is obvious that the full potential of hydrogen cannot be exploited.

“If, in addition, subsidies are granted to develop an innovative technology or to fund a project, was funded, it is important to observe the subsidy law requirements for the proper use of the subsidies. In individual cases, this may justify, among other things, strict compliance with all obligations under public and European procurement law regarding the tendering of contracts. In the event of non-compliance with the subsidy requirements, there is a risk that the subsidies will have to be repaid - plus interest!



In any case

The regulatory framework offers lucrative business models, but the resulting obligations must be strictly observed!



In any case

Protect and defend your intellectual property!

Hydrogen & Contracts

The implementation of hydrogen production or **storage projects** (e.g. power-to-gas plants) or **infrastructure projects** (e.g. the development of a hydrogen infrastructure) require a balanced and solid contractual basis. The complexity of the contracts required for these projects should be considered from the very beginning.

Hydrogen & IP

Many promising projects in the field of hydrogen production or transport and distribution start with a pioneering invention. For example, **high-performance storage technologies need to be developed in order** to be competitive and attractive to consumers. These inventions need to be protected, for example through **patent protection** at national and international level. Likewise, your patents should be effectively enforceable against any imitators.

Conversely, when developing new products and processes around hydrogen, you should consider the increasing density of third-party patents and also design your new product with a view to ensuring your “Freedom to Operate” as far as possible.

In addition, you have an understandable interest in enforcing your intellectual property rights against imitators (if necessary, also independently of your cooperation partner).

Hydrogen & Cooperation

For the success of your engagement, it is necessary that you place your cooperation with partners on a solid **foundation under the respective company law**. The establishment of a joint venture or a common project company, to which know-how, industrial property rights, technology or services can be contributed in addition to financial resources, is a typical example. At the heart of this is the **joint venture agreement**, which must describe the common goal of the cooperation just as clearly as the respective services of the cooperation partners. The possibilities of the partners to influence the development of a company must also be regulated. All relevant contracts

should be drafted clearly, practically and with foresight and take enough account of the special features of the technologies and their change or further development. We accompany and advise you in all necessary strategic decisions and the practical steps of setting up such a joint venture, whether in connection with research and development, production or distribution or a combination of both.

Do you intend to play a role in the growing market around hydrogen and are you planning to acquire a company, a significant stake or a start-up in this area? We would be happy to support you in these cases with our experienced team, which, in addition to the necessary corporate/M&A expertise, knows all the relevant legal interfaces. This includes, for example, questions of intellectual property or financing law as well as the other aspects surrounding hydrogen and the associated special questions.

And beyond that

In addition to the topics highlighted as examples, a wide range of other questions can arise, such as the financing of projects.



In any case

Shape your cooperation and your acquisitions and make them solid, forward-looking and resilient!



Australia

According to Australia's national science research agency, the CSIRO, roadmap, upcoming policy support from Commonwealth and State Governments may assist the Hydrogen industry in obtaining the required economies of scale to enable the hydrogen industry to reach a "tipping point and become economically sustainable thereafter".

Legal framework overview

Although there is currently no specifically targeted regulatory framework for hydrogen production in Australia, a 2019 preliminary legal review commissioned by the Department of Industry, Innovation and Science identified approximately 730 pieces of legislation and 119 standards across Australia's jurisdictions that are potentially relevant to the hydrogen industry and supply chain development.

In November 2019, the Hydrogen Working Group, established by the Council of Australian Governments ("COAG") Energy Council, released the Australian National Hydrogen Strategy. The strategy aims to establish Australia's hydrogen industry as a major global player by 2030.

As part of the National Hydrogen Strategy, the Australian Government will review the existing legal framework as needed to support the industry by removing barriers to development and ensuring safety.

In July 2020, Australia adopted a suite of eight international standards for the safe use, transport and trade of hydrogen across Australia.

Funding & Support schemes

In 2018, the CSIRO released the National Hydrogen Roadmap. Its primary objective is to provide a blueprint for the development of the hydrogen industry in Australia, particularly in investments amongst industry, government, research and other stakeholder groups.

From 2015 to 2019, over \$146 million of funding was invested by the Australian Government in hydrogen-related projects. These were, and continue to be, administered through two key entities: the Australian Renewable Energy Agency ("ARENA") and the Clean Energy Finance Corporation ("CEFC").

In April 2020 ARENA launched a \$70 million hydrogen funding round from which seven applicants were shortlisted. The shortlisted applicants have developed projects of 10MW or larger electrolysers with various end uses, as inter alia transportation, gas injection or renewable ammonia production. The projects

are powered by either on-site renewable generation, purchase of Renewable Energy Certificates or power contracted from a renewable Power Purchase Agreement ("PPA").

In May 2020, the Australian Government also launched the \$300 million "Advancing Hydrogen Fund", administered by the CEFC. Through the fund, the CEFC shall provide debt or equity finance to eligible large-scale commercial and industrial projects, typically requiring \$10 million or more.

State Governments in Queensland, Western Australia, Tasmania, New South Wales, Victoria and South Australia have also launched funding and support initiatives to foster hydrogen development in their respective states.

Up-coming evolution

The Australian hydrogen industry has gained momentum in the past year, with several current projects being commissioned to demonstrate the potential uses of hydrogen gas in the domestic market. Indeed, the "Technology Investment Roadmap" reinforces the Australian Government's previously announced "priority technology stretch goal" of clean "H2 under \$2" (per kilogram), with the medium-term seeing an expansion of the domestic hydrogen industry and the long term, the development of an export industry, leveraging off Australia's expertise and infrastructure to develop strong supply chains in the global low emissions economy.

Australia has a strong potential to become a leader in the clean hydrogen export market, for several key reasons, including that it has an extensive renewable energy production capacity, it has a track record in building large-scale energy industries, and its proximity to high-demand economies provides ease of access to key opportunities in regional markets.

Some recent examples

The government of Western Australia announced in January 2021 that it has received 65 expressions of interest ("EOI") from Australia, Japan, Korea, India, Germany, Spain, the UK, France to produce and export commercial quantities of hydrogen from a new hub that may feature up to 270 MW from wind generation and to 1250MW from solar photovoltaic installations located in the Oakajee Strategic Industrial Area ("SIA"). In January 2021, an ASX-listed gas exploration company formed a joint venture to focus on the creation of four hydrogen production facilities on Australia's

east coast. It also announced a Memorandum of Understanding to collaborate on the development of an Australian network of hydrogen refuelling points. In February 2021, a joint venture was announced to develop hydrogen production and export facilities on the southern coast of Victoria. In February 2021, the

Queensland government announced a partnership with a Japanese engineering firm to complete a feasibility study into a green hydrogen production facility. The National Energy Resources Australia (NERA) unveiled in February 2021 a \$1.85 million investment in 13 regional hydrogen technology clusters over the 6 Australian States.

Finland

Finland's target, to become carbon neutral by 2035 and carbon negative by 2050, is some of the most ambitious targets in the world. Although Finland does not have a separate hydrogen strategy, hydrogen is considered to be an integral part of the national energy and climate strategy. Business Finland (the Finnish government organization for innovation funding and trade, travel and investment promotion) published in November 2020 a national hydrogen roadmap that analyses Finland's strengths and opportunities in the hydrogen field. The roadmap serves as a basis for developing the hydrogen policy and determining the role of hydrogen in the national energy and climate strategy. Furthermore, investments in power-to-X technologies play a key role in Finland's Recovery and Resilience Plan, published in May 2021.

Legal framework overview

As the main context is to view Finland as a member state in the European Union the development of sector integration and the hydrogen economy in the EU is strongly reflected on a national level. However, as for many other counties, Finland does currently not have a comprehensive legislative framework for the use of hydrogen as an energy carrier as provided for in the proposals generated by EU's "Fit for 55" climate package of July 2021. At present, the legislation in place solely governs hydrogen's use for industrial purposes i.e. production, storage, safety. Hydrogen compliant and future-proof legislative planning is fortunately on the national agenda.

In order to contribute to the national climate targets and to further facilitate and stimulate the hydrogen economy and advancement of new technologies pursuant to the EU Hydrogen and Sector Integration Strategies, the Ministry of Economic Affairs and Employment appointed a working group in July 2020 tasked with identifying the needs, opportunities and obstacles of energy sector integration, and to assess the possibilities for promoting the hydrogen economy and Power-to-X technologies. The Final report of the working group on sector integration was published in June 2021 highlighting that the legislative projects contained in the EU's Fit for 55 climate package will be

shaping the content of future legislation while bringing inevitable changes to the national regulatory landscape.

Funding & Support schemes

As part of the Sustainable Growth Programme, the Finnish Government allocated EUR 150 million in public funding to projects related to hydrogen technology and carbon capture and utilisation. Funding will be directed to national projects and projects linked to the hydrogen IPCEI (Important Project of Common European Interest). The call for IPCEI applications closed 4 July 2021. The projects will support the objective of the Government to achieve a carbon neutral Finland by 2035.

Up-coming evolution

Finland has a proactive history in the field, both research organisations and companies have been active in developing fuel cell applications and utilisation of hydrogen - a full and working value chain for hydrogen, and decades of experience in large-scale industrial use of hydrogen is already present. In Finland, hydrogen is currently produced for the needs of industries such as oil refining, mainly from natural gas, the share of renewables is currently very limited. In addition, hydrogen arises as a by-product of certain industrial processes. However, alternative gases, e.g. mixing of hydrogen with natural gas, synthetic gas, bio- and gases produced from recycled raw materials and clean hydrogen have been given a key role in supporting the transformation of energy systems and bring solutions to energy transmission, storage and flexibility needs. Finland looks at hydrogen in the energy market from the same starting point as other solutions that promote the integration of energy systems. Promotional activities are to be directed to hydrogen production methods that utilize zero-emission electricity (or are otherwise low-emission). This requires clean power generation technologies strong European electricity transmission connections and innovation investments in the development of hydrogen technology. Moreover, it is equally important to make necessary adjustments in different laws and

regulations so that the large-scale hydrogen production, transport, storage, and use can take place in the most efficient way.

Some recent examples

As stated in the national Hydrogen Roadmap, hydrogen offers for Finland great opportunity to create wide range of new businesses throughout the entire hydrogen value chain. To showcase the level of determination both private and public actors are already making significant contributions to hydrogen projects. Just to mention a few of these initiatives:

The Finnish gas transmission system operator, Gasgrid Finland, joined in April 2021 the European Hydrogen Backbone (EHB) initiative that envisions a European 39,700 km hydrogen transmission network by 2040. The EHB mirrors the vision of 23 European gas transmission network operators on how the infrastructure could be developed to support the

achievement of carbon neutrality targets. The network would link the envisioned hydrogen infrastructure of 21 European countries and connect 11 new countries.

A national company-led Hydrogen Cluster was established in April 2021 to accelerate hydrogen economy and exports of hydrogen-related solutions.

An international network, called BotH nia, was established in April 2021 for promoting and building a large-scale hydrogen economy around the Gulf of Bothnia.

P2X Solutions, a Finnish pioneer in green hydrogen and Power-to-X technology, intends to build Finland's first green hydrogen production plant in Harjavalta. When commissioned, the facility will produce green hydrogen for e.g. industrial needs by using electricity produced from renewable energy sources. The planned production facility has a capacity of 20 megawatts and as by-products it generates oxygen and thermal energy needed by industries.

France

The French Government unveiled on September 2020 its national hydrogen strategy. €7.2 billion of public support will be granted for the next 10 years, including €2 billion from the “Big Green Recovery Plan”, a component of the national “Recovery Plan” (“Plan de relance”). France aims to achieve carbon neutrality by 2050 and become a leader in green technology for the production of decarbonised hydrogen.

Legal framework overview

In accordance with the November 2019 Energy and Climate Law, the so-called “Hydrogen Ordinance” dated February 17th, 2021 (n°2021-167) grants hydrogen an independent legal status. This detailed legal framework aims to promote the French hydrogen sector development, in particular by referring to three different types of hydrogen (renewable hydrogen (“hydrogène renouvelable”) dissociated from low carbon hydrogen (“hydrogène bas-carbone”) and from carbonaceous/fossil hydrogen (“hydrogène carboné”).

To be qualified as renewable hydrogen, hydrogen must be produced (1) either by electrolysis using electricity produced by renewable energy sources or by any other technology using exclusively one or more renewable energy sources, and (2) whose production process does not exceed a greenhouse gas emission threshold.

In addition, the Hydrogen Ordinance provides for

guarantees of origin and unprecedented guarantees of traceability for renewable and low-carbon hydrogen to give clearer information to buyers and useful input to suppliers.

This 1st step as part of the definition of a legal framework is a strong signal for investors, project developers and industrialists.

Funding & Support schemes

The Hydrogen Ordinance provides that renewable and low-carbon hydrogen producers are eligible for a support scheme in the form of investment aid (“CAPEX”), operating aid (“OPEX”), or a combination of both.

A tender process will be carried out depending on economic and environmental criteria, and will be open to any producer established in a Member State of the European Union's territory or within the European Economic Area.

Moreover, unveiled in 2020, the Multiannual Energy Program (“Programmation pluriannuelle de l'énergie” or “PPE”), set up for the periods 2019-2023 and 2024-2028, provides for an increase in financial support for the French hydrogen sector.

The Big Green Recovery Plan sets out three key measures for green hydrogen industry: (1) to install enough electrolyzers to make a significant contribution

¹ ‘Beschluss des Bundesrates zur Schaffung eines Rechtsrahmens für eine Wasserstoffwirtschaft’ published on 27 November 2020

to the decarbonisation of the economy; (2) to develop clean mobility, particularly for heavy vehicles; and (3) to foster the development of a clean hydrogen industry in France.

As part of the Big Green Recovery Plan, several calls for projects have been launched in 2020; further calls for projects dedicated to decarbonized hydrogen or hydrogen as a solution to industrial sector decarbonization are expected locally in 2021 and 2022.

In addition to the support mechanism and local calls for projects, decarbonized hydrogen projects will be funded through the PIA (Investment for the future program) and the IPCEI (important project of common European interest).

Some recent examples

France has a central role to play in the decarbonisation of aviation: French aviation companies benefiting from State aid and thus €300 million have been allocated so far in 2020 to projects ranging from the Hyperion hydrogen propulsion project, to the Majestic wing efficiency project, which hopes to reduce aircraft emissions by up to 5%.

Indeed, the Airbus fleet represents approximately 45% of all aircraft in circulation, and Safran, through CFM International, supplies over 70% of all medium-haul aircraft engines.

In January 2021, Air Liquide - a specialist in industrial gases - has taken a 40% stake in H2V Normandy, which has developed a project for the massive production of low-carbon hydrogen by electrolysis of water, with the intention of subsequently investing in this project. It represents an investment of €300 million.

HysetCo is a joint venture created by Air Liquide, IDEX, STEP and Toyota, and dedicated to the development of hydrogen mobility. It owns the largest fleet of hydrogen taxis in the world, operated by Hype. Thanks to a €100 million fundraising, HysetCo has financed the acquisition of Slota Group, an historical Parisian taxi operator and will build two new hydrogen refuelling stations. The Slota fleet will gradually be replaced by the Toyota Mirai - a fuel cell vehicle - and will be operated by Hype. The objective is to achieve zero emissions for taxis and VTC for the Paris Olympic Games in 2024.

Germany

While only 5% of the German hydrogen production (4% at a world-wide level) is produced by electrolysis, Germany has ambitions to become a leader in green hydrogen associated technologies, and the German Government adopted its National Hydrogen Strategy (“NWS”) to achieve these goals and ambitions.

Legal framework overview

There is no consistent and complete legal framework covering the hydrogen value chain in Germany, whereas renewable energy is supported under the EEG (“*Erneuerbare Energien Gesetz*”). Initially, statutory feed-in tariffs were paid by the grid operators who took off the electricity. Meanwhile, only small plants still benefit from feed-in tariffs, whereas other installations have to sell the electricity and can receive additional support as a ‘market premium’ payable by the grid operator.

In June 2020, prompted by a Bundesrat decision¹ and the NWS, the German Bundestag amended the EEG, as it has been published on 28 December 2020. The EEG 2021 framework benefits to hydrogen storage and plans inter alia that the payment of the EEG-surcharge (“*EEG-Umlage*”) shall be reduced to zero for electricity

consumed by a green hydrogen production installation, irrespective of its intended use. Further to that, the revised EEG 2021 expressly refers to “green” hydrogen - dependent on its manufacturing process and privileged contrary to other categories of hydrogen (i.e. grey etc.). For reasons of better transparency in this context, a regulation of the German Government, expected during the year 2021, will define in more detail the requirement for hydrogen to be qualified as “green” hydrogen in the sense above and in differentiation to other categories of hydrogen.

Up-coming evolution

German industry players are aiming to turn into green hydrogen production by building the required plants (power-to-gas plants, electrolysis plants, hydrogen liquefiers) over the next years.

By 2030, hydrogen production plants with a total capacity of up to 5GW shall be built. By 2035, and at the latest 2040, 10GW should be installed.

Gas network operators have started planning for a separate gas grid, partially drawing on existing gas pipelines.

Most recently, in February 2021, the German Government passed a draft amendment to the EnWG (“*Energiewirtschaftsgesetz*”) for the development of a pure hydrogen infrastructure. The draft grants pure hydrogen an independent legal status, creates a legal framework and suitable conditions for the development of a national hydrogen economy. The legislative process is still pending.

Some recent examples

A project has been initiated to replace the fossil fuel-based hydrogen used by the Heide oil refinery near Hamburg with carbon-free hydrogen produced from renewable energy sources using an adjacent 30MW

electrolysis plant.

Through the support of the German firm Siemens, which is developing “P2X” converters, Germany aims to become one of the main exporters of technologies for converting electrical energy into chemical, liquid or gaseous energy sources, such as hydrogen.

The German’s NWS also seeks to import substantial quantities of hydrogen from partner countries. In that perspective and as announced by the Australian Government, Australia and Germany announced a partnership to assess the feasibility of a hydrogen supply chain, and opened expressions of interest to involve Australian industry.

Italy

According to the Integrated National Energy and Climate Plan, Green hydrogen is considered as having a key role in reaching the target of reducing Italian greenhouse gas emissions by at least 30% (40% at European level) by 2030, compared to 1990.

Legal framework overview

Hydrogen was recognised by the Italian government as a renewable energy source in 2016, but the Italian legal framework covering production, exploitation and connection of hydrogen is imprecise, which has often proven to be an impediment for the industrial proponents and hydrogen producers.

For instance, no legal provision differentiates between authorisation procedures to produce fossil fuel-based hydrogen and to produce green hydrogen obtained through electrolysis process, which leads to the same level of restrictions being imposed. Then, local public authorities may require different requirements for land use.

These discrepancies between the legal areas concerned may lead to uncertainty to develop and implement

hydrogen projects. Thus, legislation is needed to define the framework for authorisation processes and incentive systems.

Funding & Support schemes

Hydrogen production by electrolysis is still costly, but equipment’s developers and suppliers are currently seeking to adapt their technologies to provide affordable green hydrogen. In that perspective, national and European financial support schemes have been already implemented or are in the process of being defined.

Investments required to achieve the Italian new green deal objectives should reach the quota of €50 billion up to 2030.

Up-coming evolution

The Italian Government is drafting guidelines for a National Hydrogen Strategy to develop the Italian hydrogen industry to enhance its attractiveness for producers and investors and to strengthen the Italian industry in the European hydrogen market.

Poland

Poland is currently the third largest producer of hydrogen in Europe and the fifth largest worldwide. According to estimates from the Ministry of Climate & Environment, we produce approximately 1 million tonnes of H₂ per year. However, hydrogen in Poland is produced in processes that generate CO₂ emissions, which is why it has become necessary to start implementing clean hydrogen production technology based on electrolysis using renewable energy. This is the aim of the Polish Hydrogen Strategy project.

Review of the legal framework

Current legislation does not provide comprehensive regulations relating directly to hydrogen or any legal definition, thus making it difficult to determine the legal status and areas that concern hydrogen. Regulations relating to gaseous fuels (gases) are mostly applied to the principles of, i.a., hydrogen production, hydrogen storage, and technical supervision of equipment used for hydrogen handling, transportation and storage. Only a few legal regulations directly refer to hydrogen, such as the Excise Duties Act, which exempts hydrogen powered vehicles from excise duty.

Financing and hydrogen programmes

The Polish government plans to allocate its own budgetary funds to implement objectives related to its hydrogen strategy, as well as to mobilise investors to make full use of the funds available under the European programmes. It is assumed that the implementation of objectives related to implementing hydrogen technologies in the energy sector and transport and ensuring the planned production (50 MW of electrolyzers) will require investments of a dozen or so billion zlotys. According to these assumptions, PLN 2 billion is to be spent by 2025, and a total of almost PLN 17 billion by 2030.

The establishment of a multiannual programme to support development of hydrogen technology, as well as the launch of programmes to support R & D in the field of hydrogen technology, and the mobilisation of financial support from strategic programmes and EU funds, taking into account the resources available to the European Commission, are envisaged to ensure the financing of the objectives related to the development of hydrogen policy.

Upcoming changes

Recognising the need to create a regulatory framework for the hydrogen in the Polish legal system, the Ministry of Climate and Environment has developed its draft “Polish Hydrogen Strategy until 2030 with an outlook until 2040”. It has identified six goals: implementation

of hydrogen technology in the power sector, use of hydrogen as an alternative fuel in transport, support for the decarbonisation of industry, production of hydrogen in new installations, efficient and safe hydrogen transmission, and creation of a stable regulatory environment. The consultation process on the draft Polish Hydrogen Strategy has just been completed.

The most important actions in this regard include establishing, still in 2021, a regulatory framework for the hydrogen as an alternative fuel in transport, creation of a legal basis for the hydrogen market and, in the long-term perspective, development of a legislative hydrogen package - legislation defining details of the market operations, implementing EU law in this area and a system of incentives for the production of low-carbon hydrogen.

Some recent actions

The Polish Hydrogen Strategy is part of the Polish government’s strategy, which is in line with the assumptions of the National Energy and Climate Plans (KPEiK), the Polish Energy Policy until 2040 (PEP2040), the Strategy for Responsible Development until 2020 (with an outlook until 2030), and the National Policy Framework for the Development of Alternative Fuels Infrastructure.

On 18 August 2020, an Inter-Ministerial Team for hydrogen economy was set up to work under the leadership of the Government Plenipotentiary for Hydrogen Economy.

In December 2020, Poland, together with 22 other EU countries, signed the IPCEI on low-carbon and renewable energy-produced hydrogen. The aim of the joint initiative is to build a hydrogen value chain in the EU that will enable its use in transport, energy and industry.

The draft regulatory solutions intended to be gathered in one sector regulation (operatively known as the Polish hydrogen law act) are currently the subject of conceptual work. Our Energy & Utilities Sector Group in Poland will participate in those works substantially, also in cooperation with interested industrial associations. For more information, please do not hesitate to get in touch with our lawyers from Warsaw office directly engaged in the abovementioned process (Grzegorz Pizon, Partner and Katarzyna Siwa, Senior Associate).

Singapore

Singapore is emerging as a hub for the development of hydrogen technology, which may enable Singapore to reduce its carbon footprint in the future by producing green hydrogen.

Legal framework overview

Singapore does not have a specific legislative framework for the use of hydrogen as an energy resource, and the current regulatory regime only governs its use for industrial purposes.

The main regulations governing the use of hydrogen in Singapore is the Fire Safety Act (Cap. 109A of Singapore), which stipulates that hydrogen is a highly “flammable material”, so licenses are required for its storage, import, transportation, dispensation and conveyance over pipelines. Further, hydrogen is deemed a “dangerous substance” under the Workplace Safety and Health (Major Hazard Installations) Regulations 2017, which is Singapore’s workplace health and safety laws, mandating enhanced safety measures for occupiers of premises that process, manufacture or store hydrogen in bulk.

Laws to regulate the deployment, import and use of hydrogen will be required in due course if the Government believes that hydrogen has a viable role to play in Singapore’s energy future. In September 2019, the Prime Minister’s Office commissioned a “Consultancy Study on Hydrogen Imports and Downstream Applications for Singapore”. The study will involve market and technical studies on the potential sources of hydrogen imports based on costs, availability, technical feasibility and supply security up to 2050; and we foresee this would serve as a foundation to developing an appropriate legal framework in Singapore for hydrogen deployment.

Funding & Support schemes

In July 2020, the Energy Market Authority of Singapore (“EMA”) collaborated with Korea Institute of Energy Technology Evaluation and Planning (“KETEP”) to launch a joint grant call for innovative solutions to enable the use of hydrogen for power generation. The solutions should aim to address the storage, transportation and delivery of hydrogen gas in a safe and cost-effective manner, and energy-efficient and emissions-free pathways for hydrogen production.

With a view to accelerate the technical and economic viability of low-carbon energy technologies from 2020 to 2025, the Government announced a S\$49 million Low-Carbon Energy Research Funding Initiative in October 2020. This will support research, development and demonstration projects in emerging energy technologies like in the area of hydrogen.

To encourage innovation amongst SMEs, Enterprise Singapore (Singapore’s statutory board in charge of enterprise development and SME growth) and Innovation Norway jointly organised a Virtual Mission Trip to Norway for local market players (with participation from taxi companies, refuelling station operators, bus companies and industry associations) to study the deployment of Hydrogen Fuel Cell Vehicles in Norway.

Some recent examples

In March 2020, five Singapore companies (comprising of energy and urban development company, Sembcorp Industries; and national port terminal operators, PSA Corp. Ltd and Jurong Port Pte. Ltd.) entered into a Memorandum of Understanding with two Japanese companies to study how hydrogen can be utilized as a low-carbon alternative in order to contribute towards a clean and sustainable energy future for Singapore. The companies will develop methods of using hydrogen as a low carbon energy source, such as research and development of technologies related to the import, transportation and storage of hydrogen.

In June 2020, Keppel Data Centres and Mitsubishi Heavy Industries signed a Memorandum of Understanding to jointly explore the implementation of the hydrogen powered tri-generation plant to power data centres in Singapore.

The Government-owned electricity and gas distribution company, SP Group, has piloted a Hydrogen Energy System in October 2019, in partnership with investment firm Marubeni Corporation and Tohoku University in Japan. The system harnesses solar energy to release hydrogen, through electrolysis, which will be used to generate electricity during periods where there is no light, such as at night or cloudy days.

² <https://www.sgn.co.uk/news/h100-five-ofgem-approved-world-first-hydrogen-heating-network>

Up-coming evolution

Although the hydrogen market in Singapore is still at early stages of growth, there seems to be keen interest amongst local players in the energy market to explore hydrogen use and deployment. This is bolstered by the Government's support for exploring low-carbon energy alternatives including hydrogen, and their recognition that hydrogen could potentially play a key role in Singapore's efforts to decarbonise.

Given its small size, Singapore will likely need to look (at least, in part) in importing hydrogen for use.

The "Consultancy Study on Hydrogen Imports and Downstream Applications for Singapore" remains a key document to assess how Singapore should prepare to embrace a hydrogen economy.

In the meantime, there will likely be more projects and collaborations in the pipeline between industry companies to explore research and development in hydrogen development suitable to Singapore's size, climate and population density.

Spain

Spain is emerging as a hotspot for the development of renewable energies, specifically green hydrogen, due to its production capacity in solar and wind energy.

Legal framework overview

Although there is currently no specific legislation for hydrogen in Spain, we have seen recent developments aiming to boost the development of green hydrogen in Spain.

The National Energy and Climate Plan ("NECP") approved in 2020 for 2021-2030 considers the development and production of green hydrogen and renewable energy as one of the main objectives of the Energy sector in Spain.

In November 2019 the working sub-group on hydrogen technologies of the Ministry of Industry, Commerce and Tourism published a report on certain recommended legislative developments. Amongst other initiative, the working sub-group recommended that the licenses and authorisations for green hydrogen production plants were more flexible and that production of hydrogen through electrolyzers does not require a full environment authorisation (*autorización ambiental integrada*).

In October 2020 the Spanish Government approved the Hydrogen Roadmap identifying the opportunities for Spain arising from the development of green hydrogen and outlining the main actions to be taken from a legal, logistic and technical views.

Up-coming evolution

Currently, most of hydrogen in Spain is used for industrial purposes, mainly in refineries and chemical industries - all of which is "grey" hydrogen. However, many are turning to low-carbon hydrogen-based options.

The Hydrogen Roadmap foresees that prior to 2030 there will be electrolyzers installed in Spain for a total power of 4 GW and that green hydrogen will represent at least 25% of the total amount of hydrogen used in Spain.

Some recent examples

Some key projects are currently being conducted and implemented in Spain, such as a joint Spanish-Italian transmission system operators' proposal to produce hydrogen in industrial quantities (called "*Green Crane*").

In 2021, the energy company Naturgy is promoting sustainable mobility and has presented to the Spanish Ministry of Ecological Transition a roadmap for the development and implementation of 38 hydrogen stations throughout Spain.

Iberdrola's hydrogen has ambitious plans to construct large hydrogen plants and supply public transport with green hydrogen.

Acciona and Enagas will build a green hydrogen plant in Mallorca. They have acquired electrolyzers from Hydrogenics for a total annual capacity of production of 300 tonnes of green hydrogen.

The Netherlands

The Netherlands is Europe's largest producer of hydrogen after Germany. According to the Dutch Government Strategy on Hydrogen, green hydrogen is essential for achieving the national energy transition goals and maintaining energy-intensive industries.

Legal framework overview

According to the ministerial decree on gas quality (“Regeling Gaskwaliteit”), the Dutch legal framework allows hydrogen injection up to 0.5% in regional gas distribution systems. The Dutch Government is discussing the matter with network operators and large industrial users. The Government is also considering the possibility of mandatory injection of green hydrogen (physically or through certificates) to create a demand for green hydrogen.

Funding & Support schemes

Compared to the previous Renewable Energy Production Incentive Scheme (“SDE+”), the new 2020 and broadened “SDE++” targets of a 49% reduction in CO2 emissions in the Netherlands by 2030 compared to 1990 and 95% by 2050.

SDE++ is a support mechanism for which ecological technologies are eligible and available through calls for tenders. This mechanism consists of a subsidy to compensate for the difference between the cost price of the technologies (the “base amount”) and the market value of the product that the technologies delivers (the “market price”). It stimulates competition between different technologies and offers long-term security to investors.

The Government is looking into the possibility of the expansion of demonstration and pilot projects with green hydrogen under the DEI+ and HER+ subsidies.

Up-coming evolution

According to the 2019 “National Climate Agreement”, the stakeholders have formulated a goal to scale-up electrolysis to 500MW between 2022 and 2025; and 3GW to 4GW between 2026 and 2030.

In the national “Energy and Climate Plan 2021-2030”, the program for hydrogen is further explained. Amongst others, price reductions for electrolysis and renewable energy are needed for mass production of hydrogen, and it must be assessed how electrolysis installations can contribute to the incorporation of renewable energy in the energy system and what consequences this will have for the infrastructure.

Many projects are in a transition phase between pilots and other options for CO2 reduction in the roll-out phase.

Some recent examples

In 2020, the Dutch Government announced several international agreements such as collaboration with the Portuguese Government regarding the export of green hydrogen from Portugal to the Netherlands.

Announced in 2020, the “NorthH2 green hydrogen Project” aims to produce green hydrogen through renewable electricity generated by a 3/4GW offshore windfarm in 2030, rising to 10GW by 2040.

The “Project Hy3” is a project between the Netherlands and Germany whereby the possibilities of international hydrogen infrastructure, delivery to industrial regions and a link to wind at sea is investigated.

The “HyWay 27” is a project between the Dutch Ministry of Economic Affairs and Climate Policy, TenneT and Gasunie on the development of a national hydrogen infrastructure.

The United Kingdom

The UK is a world leader in pioneering the use of hydrogen for heating by blending hydrogen with natural gas. In November 2020, the U.K. Government published its Ten Point Plan for a Green Industrial Revolution (the Ten Point Plan) which outlined its commitment to driving the growth of low carbon hydrogen. This was followed up by a detailed Energy White Paper published in December 2020. The UK is aiming for a low-carbon hydrogen production capacity of 5 GW by 2030 and has committed to spending £0.5billion on the development of new hydrogen technologies.

Currently, the main use of hydrogen in the UK is in industrial petrochemical manufacture, and it is predominantly produced from fossil fuels. However, government has identified this sector as a focus for the transition to green hydrogen. To date, green hydrogen production has been limited to localised demonstration projects, such as BIG HIT in Orkney. Little hydrogen is transported away from central production sites.

Legal framework overview

In common with many other jurisdictions, the UK does not have a well-defined legal framework for hydrogen projects specifically. The UK's gas hydrogen sector is subject to the legislative requirements of the Gas Act 1986 and is regulated by the Office of Gas and Electricity Markets (Ofgem) as part of the existing gas network used principally for the supply of natural gas.

In relation to hydrogen use in vehicles, the UK has limited regulation for certain types of "L category" motorcycles using hydrogen combustion and hydrogen fuel cells. There needs to be wider regulation of its application in other vehicle types.

For storage hydrogen is treated as dangerous and flammable industrial chemical. Storage is subject to environmental permitting and is controlled through the Hazardous Substances regime.

An operational and economic barrier to the deployment of hydrogen production is the lack of a dedicated planning or environmental regime. Hydrogen projects must navigate the existing legislative framework that applies to gases generally. This situation creates numerous gaps and uncertainties.

Funding & Support schemes

The Ten Point Plan and the White Paper set out that the drive to increase the UK's hydrogen production capacity will be supported by a Net Zero Hydrogen

Fund of £240 million for new hydrogen production facilities. By 2030, the Government expects that there will be up to £4billion of private investment in the industry.

The White Paper announced the government's ambitious plan to establish a "hydrogen neighbourhood" run entirely on hydrogen in 2023, backed by to £500m of funding. The future aim is to establish a "hydrogen town" by 2025.

Up-coming evolution

Elsewhere in the Ten Point Plan, the UK government has outlined various ambitions and aims regarding hydrogen as to create and support up to 250,000 green jobs.

In spring 2021, the UK government's hydrogen strategy is due to be published which will set out business models and the revenue mechanisms for private sector investment. There will also be a consultation on the government's preferred business and legal models for hydrogen in 2021 in order to finalise hydrogen models in 2022.

In relation to wholesale energy markets, under the Brexit trade and co-operation agreement, the parties agree to co-operate and access the actions needed to facilitate the integration of gas from natural sources, which would include the development of blended hydrogen through the natural gas system.

Some recent examples

The UK government has announced £28 million in funding for five demonstration projects focused on hydrogen production. The submitted projects include two described as "low-carbon hydrogen plants" and one that uses offshore wind power to produce hydrogen through electrolysis - a green hydrogen production method.

Evidencing the UK's pioneering approach to the use of hydrogen in heat networks, Scotia Gas Networks, one of the biggest gas distribution companies in the UK has recently received approval for funding from Ofgem² for a world-first project to use 100% green hydrogen heating in residential homes.

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