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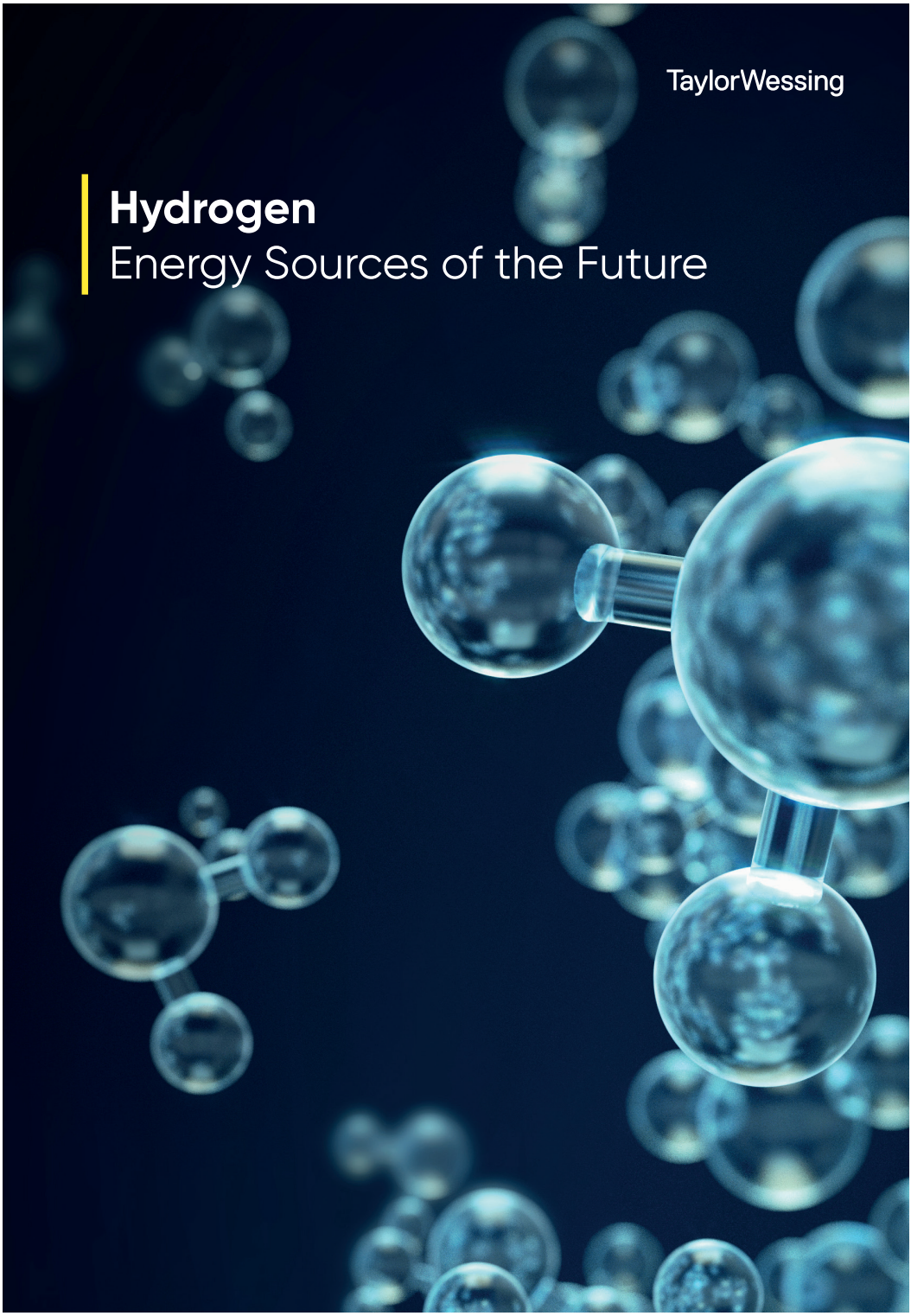
Hydrogen
Energy Sources of the Future



Hydrogen
Energy Sources of the Future

The energy demand of our globalized world is constantly expanding, not least due to increasing mobility, data processing and industrial production. Climate change poses a major challenge. Most of the fuels used for the mobility of the world population, in an industrial context or for energy supply are usually neither renewable nor environmentally friendly. For the long-term success of the energy turnaround and for climate protection, alternatives to fossil fuels are needed. The same applies to achieving the ambitious climate targets of the European Union and the German environmental targets based on them. Hydrogen can and will play a key role in the future as a versatile source of energy. It can make it possible to significantly reduce CO_2 emissions in industry and transport by using renewable energy sources. According to the EU Commission, hydrogen should play a central role in the European energy market by 2030 at the latest.

Hydrogen - Energy Sources of the Future

Hydrogen is suitable as an energy source, as a starting material for greenhouse gas neutral applications, as a link between the heating, mobility, electricity and industrial sectors, and for storage and transport. Particularly promising is its use for storing electricity from fluctuating renewable energies and as an energy source in industry, heavy duty traffic or in shipping and aviation. A whole range of different feasibility studies, real laboratories and hydrogen grid or electrolyser projects are already being planned and implemented throughout Europe.

1 Hydrogen?

Depending on the origin and type of production, different categories of hydrogen can be distinguished:

Green Hydrogen

Green hydrogen is produced by the electrolysis of water. This type of production is completely emission-free if renewable energies are exclusively used during the process. This type of production currently accounts for a very small proportion of hydrogen production.

Blue / Turquoise Hydrogen

Blue hydrogen is produced like black / grey hydrogen, but combined with carbon capture and storage (CCS)). This type of production also accounts for only a very small proportion of current hydrogen production. In the case of turquoise hydrogen, methane is thermally split to produce solid carbon. In order to achieve CO_2 neutrality of this process, it is necessary to use CO_2-neutral energy sources and to bind the resulting carbon permanently.

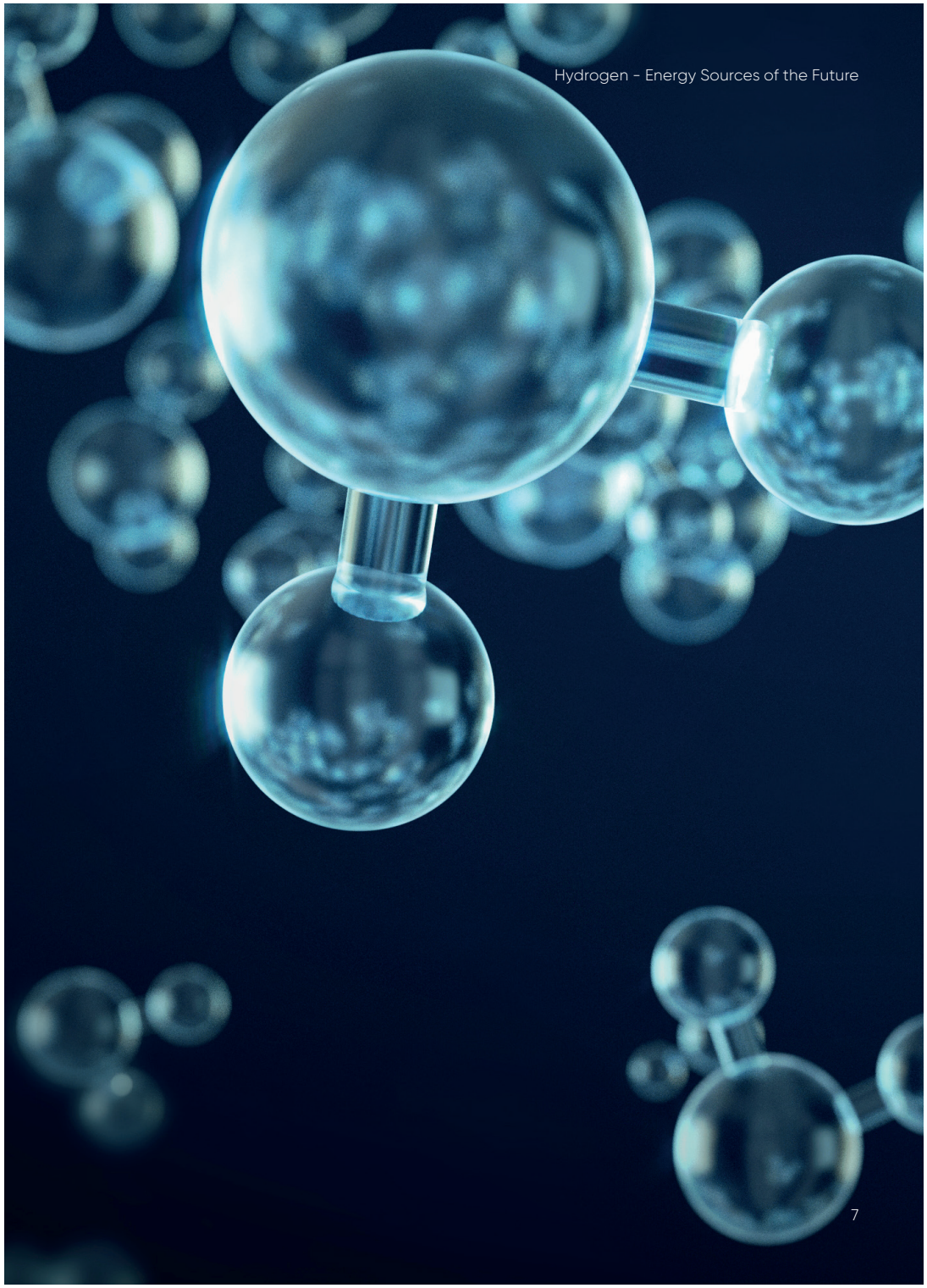
Black / Grey Hydrogen

This type of hydrogen is obtained from fossil fuels and accounts for about 98 % of current hydrogen production. During the production process natural gas is converted into hydrogen under the influence of heat. This process produces CO_2, which is released unused into the atmosphere.

2 | **EU Green Deal –** Development of the Energy Market

The first draft of the EU Climate Protection Law presented in March 2020 (the so-called Green Deal) is a concept presented by the European Commission with the aim of reducing the EU's net greenhouse gas emissions to zero by 2050, making it the first continent to become climate neutral. It includes an investment plan that is expected to activate 1 billion Euros of public and private investment over the decade. In this context, several well-known investors and investment companies have already announced that they will at least partially decarbonise their portfolios and withdraw from environmentally unfriendly investments.

After the corona crisis escalated in Europe from mid-March 2020 onwards and brought the global economy to a standstill, the EU heads of state and government decided on an aid package worth billions to revive the European economy. The exact form of this aid package and its impact on the Green Deal are still unclear. However, the EU Commission and the EU Parliament intend to give the "green transition" and digitalisation a central role in the planned reconstruction fund and presented corresponding pro-grammes. Whether and how the reconstruction programme will be linked to the green transformation of the European economy remains to be seen. If this is continued under the forthcoming German EU Council Presidency, which Germany intends to use to further advance climate protection, it will represent an opportunity for the European renewable energy market and also for the hydrogen industry.



3 The German Market

Hydrogen production in Germany is currently not competitive

Under the current framework conditions, the production and use of hydrogen is not yet economically viable. This is due on the one hand to the fact that the use of fossil fuels is currently still cheaper and on the other hand to the fact that hydrogen technology is a new technology, so that the technology costs are still high. In addition, there are legal regulations in force to date, such as the EC Renewable Energy Law surcharge on electrolysers. However, as technology continues to develop, generating costs are expected to decrease in the future. According to a recent study by the Hydrogen Council, it is estimated that the cost of producing green hydrogen from dedicated European offshore wind farms can be reduced from about $2.50 per kg by 2030, compared to about $1.50 per kg for grey hydrogen today.

Industry is also in favour of expanding hydrogen production in Germany and has presented the 10-point plan of the Power-to-X Alliance (whose members include Audi, BP and Uniper). Among other things, the plan calls for an expansion target of 5,000 MW by 2025 and the abolition of the Renewable Energy Law surcharge for electrolysers.

A National Hydrogen Strategy

The German government plans to promote the use of green hydrogen in particular. To this end, the "National Hydrogen Strategy" of the Federal Government was adopted at the beginning of June 2020, which provides for about 9 billion Euros in funding.

The Federal Government lists a whole range of measures here, subdivided according to subject areas. The initial aim is to create a "home market" for domestic hydrogen production and use. Building on this, international markets and cooperation for hydrogen are to be established. One of the aims is to create generating plants with a total capacity of up to 5 GW in Germany by 2030. Another 5 GW are to be added by 2035, or 2040 at the latest. To monitor the implementation and further development of the national hydrogen atoms, a committee of state secretaries for hydrogen from the ministries concerned is to be formed, as well as a national hydrogen council consisting of high-ranking experts from industry, science and civic society.

To achieve a successful energy turnaround, hydrogen is to be established as an **alternative source of energy**. Fossil fuel is not to be used in the future in air, sea and heavy-duty traffic. Instead, alternative fuels based on renewable electricity will be used. This includes for example, kerosene produced by the PtX process

Industry already requires 55 TWh of hydrogen today. This demand is still mainly covered by using fossil energy sources. In addition, there is also the large energy requirement to operate the industries. Both the use of green hydrogen as a raw material and as an energy source, for example in steel production, offer great potential on the way to CO_2 neutrality. The resulting enormous demand for hydrogen should make German industry a driver in the market ramp-up of hydrogen according to the National Hydrogen Strategy and also an international pioneer for hydrogen technologies.

Moreover, the promotion of the hydrogen market can only succeed if the appropriate **infrastructure** is in place. Since Germany already has a good gas infrastructure, the extent to which the existing gas infrastructure can be used for hydrogen transport is being discussed.

According to the National Hydrogen Strategy, the EU's Renewable Energy Directive (**RED II**) is to be implemented by 2020: By 2030, the mandatory share of renewable fuels in the transport sector is to be increased significantly above the EU targets. In order to achieve this goal, the Energy and Climate Fund will provide, among other things, 3.6 billion Euros as additional support for investments in vehicles with alternative technologies (including hydrogen).

A further pillar of the National Hydrogen Strategy is the financing of so-called "real laboratories", in which, among other things, the production and application of hydrogen is to be tested on an industrial scale. 600 million Euros are to be made available for this purpose for the period from 2020 to 2023.

4 Legal Aspects

However, the legal challenges associated with the production, transport and use of hydrogen as an energy source are hardly reflected in the National Hydrogen Strategy. A new regulatory framework has not been created and existing regulatory obstacles are hardly addressed.

The current outstanding questions include the **classification of hydrogen** in the already existing legal regulations and the resulting consequences.

For example, hydrogen produced by water electrolysis is explicitly put on an equal footing with gas within the meaning of Section 3 No. 19a of the German Energy Industry Act (**EnWG**) and biogas within the meaning of Section 3 No. 10c of the EnWG. The extent to which the EnWG is applicable to the hydrogen economy as a whole and whether the existing gas infrastructure can be used with hydrogen from a legal point of view is not yet clear.

This also applies to the question of how hydrogen can be integrated into the regulatory regime of other energy legislation. This becomes relevant, for example, in view of the **privileges and subsidies under the Renewable Energy Sources Act (EEG)**. In this context, the exemption from the EEG surcharge for electrolysis electricity is currently being discussed.

Depending on the corresponding integration of hydrogen in the energy industry law, it will also be decided on which basis there is an **entitlement to grid connection**, the obligation to pay a grid fee or even the possibility of including the construction costs of a power-to-gas plant in the grid costs.

Finally, it is still unclear whether the operation of hydrogen infrastructures through **cooperation between electricity and gas network operators** must comply with the **unbundling regulations** or whether it is in line with them. This means the regulation based on European law that the generation of energy and its distribution via the networks should be in different hands; network operators in the gas and electricity sectors are prohibited from generating, storing and distributing it. Nevertheless, electricity and gas network operators want to pursue power-to-gas projects. The Federal Network Agency takes a critical view of such projects and argues that power-to-gas technology is not a technical necessity for the network in the foreseeable future. Criticism is also being voiced from industry, with the objection that the construction and operation of sector coupling plants should be left to the market and not transferred to the regulated sector with its regulated equity interest rates.

In addition to energy law issues, the economic assessment of a project will also be influenced by the admissibility of **state subsidies** under European subsidy law and the approvability of large plants in particular under the Federal Emission Control Act.

Against the background that the use of hydrogen is politically desired at both German and European level and that Germany and the EU want to create a corresponding legal framework, it is important to always keep an eye on possible legal changes and to be able to react and seize opportunities as soon as they arise.

If you have any questions or need advice on related or general energy economic issues, please do not hesitate to contact us.

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