The energy transition is considered a catalyst for the supply of clean, secure and affordable energy in Germany. In the fight against climate change, hydrogen made with renewable electricity (green hydrogen) is increasingly regarded as the solution for the decarbonisation of industry sectors with particularly high emissions, such as heavy industry and aviation. Green hydrogen is also regarded as an alternative to the support for carbon capture and storage (CCS), which is required when producing hydrogen from natural gas.

Germany has ambitions to become a leader in green hydrogen associated technologies, and the German Government recently published its National Hydrogen Strategy (NWS) setting out its plans to fulfil these ambitions. Below, we set out the current state of play and the Government’s plans to implement the NWS.
About 20 billion standard cubic metres of hydrogen is currently produced in Germany annually. Only 5% of this is green hydrogen with the other 95% mainly produced from fossil fuels such as natural gas or coal; industry players are aiming to change this in particular by building the required plants (power-to-gas plants, electrolysers, hydrogen liquefiers) over the next years.

1Green hydrogen is zero carbon hydrogen produced through electrolysis using renewable energies.

TRANSPORT AND STORAGE OF HYDROGEN IN GERMANY

Hydrogen can be transported a number of ways including via pipelines, tankers and trucks: NRW has a 240 kilometres (km) long hydrogen pipeline already suitable for transport over longer distances. Various industry partners are planning to construct a 130 kilometres long hydrogen pipeline from Lingen to Gelsenkirchen in NRW (Get H2 Nucleus). Also, recently German TSOs unveiled a plan to roll out a hydrogen starting grid (H2-Startnetz) by 2030 to connect demand priorities in NRW and Lower Saxony with green gas projects for hydrogen production in northern Germany. By the end of 2030, investments of about €660 million will be required to implement that network. Of the planned 1,200km, about 1,100km should be available for the transport of hydrogen with the conversion of existing natural gas pipelines, leaving only about 100km that would have to be built.

Salt caverns are suitable for storing larger quantities of hydrogen and Germany has cavern storage facilities with a total working gas volume of 10.6 billion standard cubic metres for hydrogen of which 3.8 billion standard cubic metres are located in NRW.

USE OF HYDROGEN IN GERMANY

Possible applications of hydrogen include rail transport, road transport, aviation, shipping and other industries and quite a few projects have either already been launched or are under serious consideration:

- In rail transport, hydrogen is particularly attractive for tracks that have no overhead contact line
- In public road and freight road transport, hydrogen would also prove advantageous in comparison with electric vehicles as the charging times and weight of the batteries needed for electric vehicles are not always economically feasible. To this end, Daimler,
Iveco, Volvo as well as OMV and Shell have launched the consortium "H2Accelerate" (H2A) on hydrogen trucks.

- For road travel, there are currently only a total of 87 hydrogen filling stations across the country. The German Automobile Club ADAC estimates that about 1,000 stations are required to secure nationwide supply.

- Thyssen-Krupp is aiming to produce climate-neutral steel by 2050 and has begun a project on the use of green hydrogen in blast furnaces. In cooperation with RWE, the transportation of green hydrogen from Lingen is envisaged once the hydrogen network is established.

- Various utilities want to increase the use of hydrogen in electricity production and for example Uniper, in cooperation with Siemens, is examining how gas power plants can become more environmentally friendly. Converting excess green electrical energy into energy-rich hydrogen and methane that can be stored and then used to power fuel cells can help with the energy turnaround.

- Deutsche Bahn will start test operations with a hydrogen train from Siemens in the Tuebingen area in 2024. The train will be equipped with a yet to be developed hydrogen engine and shall be as efficient as electric multiple unit trains with a range of 600 km. Deutsche Bahn is developing a new type of hydrogen filling stations, allowing the train to be refuelled in the same time as conventional trains. The German government recently presented three large-scale research projects on green hydrogen:

  - **H2Giga**: research project, co-ordinated by thyssenkrupp, of developing technologies for the serial construction of standard water electrolysers.
  
  - **H2Mare**: research project, co-ordinated by Siemens Energy, relating to offshore production of hydrogen and its derivatives with wind power. The project intends to construct as of 2026 a combined offshore wind farm and electrolyser site in the German North Sea. Specific location and capacity of the projected site have not been determined yet.
  
  - **TransportHyDE** project: co-ordinated by the Max-Planck-Society, will develop, evaluate and demonstrate technologies for the transport of hydrogen.

- Airbus intends to introduce a hydrogen aircraft onto the market by 2035. Hybrid aircraft models are also being researched for medium- and long-distance flights.

- As of February 2021, energy service provider EWE in cooperation with the German
Aerospace Center (DLR) will build a cavern storage facility in salt rock at a depth of around 1,000 metres in Brandenburg to store for the first time 100 per cent pure hydrogen.

### THE FEDERAL GOVERNMENT’S STRATEGY

On 10 June 2020, the German Government adopted its national hydrogen strategy NWS:

- According to the NWS, only green hydrogen is sustainable in the long term and should therefore be promoted by the NWS. Due to Germany’s close integration with the European energy supply infrastructure however, and in view of the increase in demand for energy in Germany, CO2-neutral hydrogen (blue\(^2\) and turquoise\(^3\) hydrogen) may also be used, at least temporarily.

- By 2030, hydrogen production plants with a total capacity of up to 5GW are to be built. By 2035, and at the latest 2040, 10GW should be installed. These projections were the subject of controversial discussions and there are views that they are not ambitious enough.

- The Government expects that about 90TWh to 110TWh of hydrogen will be needed in Germany by 2030; 5GW corresponds to a green hydrogen production of 14TWh, for which 20TWh of electricity from renewable energies is required. As hydrogen demand cannot be met through domestic hydrogen production alone, the further demand will need to be covered through imports, particularly from countries bordering the North and the Baltic Sea but also from southern Europe. The potential for the production of hydrogen in other countries should therefore be developed, especially within the EU.

- According to a recent amendment of the German Renewable Energy Act (EEG) that requires issuance of a specific ordinance to become effective, the levy on electricity used for the production of hydrogen will be either be significantly reduced or, in the case of green hydrogen, even reduced to zero.

- The privileges of the EEG amendment are not limited to the EEG levy. The Combined Heat and Power Act (KWKG) now includes similar privileges resulting in a reduction or exemption of the levy.

- Opportunities for new businesses and cooperation models between operators of electrolysers and TSOs in line with the regulatory unbundling regime will be developed.

- A further objective under the NWS is the exploration of potential tendering schemes for the production of green hydrogen, e.g. to help decarbonise the chemical and steel industries.
industries.

- In an initial reaction to the NWS, the German Chamber of Industry and Commerce criticised the exclusive commitment within the NWS to green hydrogen, and demanded more openness towards blue and turquoise hydrogen as it is considered green hydrogen cannot cover the potential demand for hydrogen in Germany in the foreseeable future.

- On 3 June 2020, the federal cabinet (Bundeskabinett) passed a draft of the Wind Energy at Sea Act (Windenergie-auf-See-Gesetz), which envisages the possibility of constructing offshore wind farms that do not require connection to the electricity grid. Instead, the electricity generated in these offshore wind farms is to be used directly at sea without using the grid, e.g. through the operation of an offshore electrolysis plant for the production of green hydrogen.

- Although the construction and operation of offshore electrolysers is much more expensive compared to onshore facilities, the additional cost is compensated by the saving in investment costs for connection to the electricity grid. Such electrolysers could also be operated using other facilities including oil and gas platforms.

2 Blue hydrogen is hydrogen where the emerging CO2 is captured and stored during its production.

3 Turquoise hydrogen is hydrogen that is produced by the thermal cracking of methane and solid carbon is produced instead of CO2

**KEY CONTACTS**

If you have any questions, or would like to know how this might affect your business, phone, or email these key contacts.

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