

# Market Assessment

Denmark's potential in a future hydrogen economy

March 2023



# Summary

## Denmark will benefit from planning a hydrogen infrastructure with inter-connectors to neighbouring countries

This is the main message from a market assessment conducted by the CIP Foundation. The market assessment concludes that there is a large, potentially unmet demand for green hydrogen from our closest neighbours and that Denmark has the potential to become a major hydrogen exporter. However, the potential may never materialise if action is not taken, and the necessary political decisions not made now. A hydrogen infrastructure connected to neighbouring countries will contribute to ensuring energy independence, making Europe greener and making Denmark richer.

### HYDROGEN PLAYS A CENTRAL ROLE IN THE GREEN TRANSITION

European climate goals and desire for energy independence will drive a fundamental transformation of the energy system towards 2050. The expansion of volatile, renewable energy resources will be significant, and green hydrogen based on renewable energy will play a pivotal role in balancing the electricity system as well as in the transformation of European industry, agriculture, aviation, and shipping. Green hydrogen will replace traditional fossil fuels – either directly or refined as Power-to-X products.

### THE EU WILL PRODUCE AND IMPORT HYDROGEN

With increased consumption of hydrogen from renewable sources, a new green energy market will emerge. The EU plans to produce 10 million tonnes of hydrogen per year by 2030 and has a goal of importing equivalent amounts from outside the EU, corresponding to a total EU consumption of up to 700 TWh. The next few years will be crucial in determining who gets to supply this market.

It will not only be up to private actors, but rather countries that create the best framework for the expansion of renewable energy and electrolysis capacity and ensure easy market access.

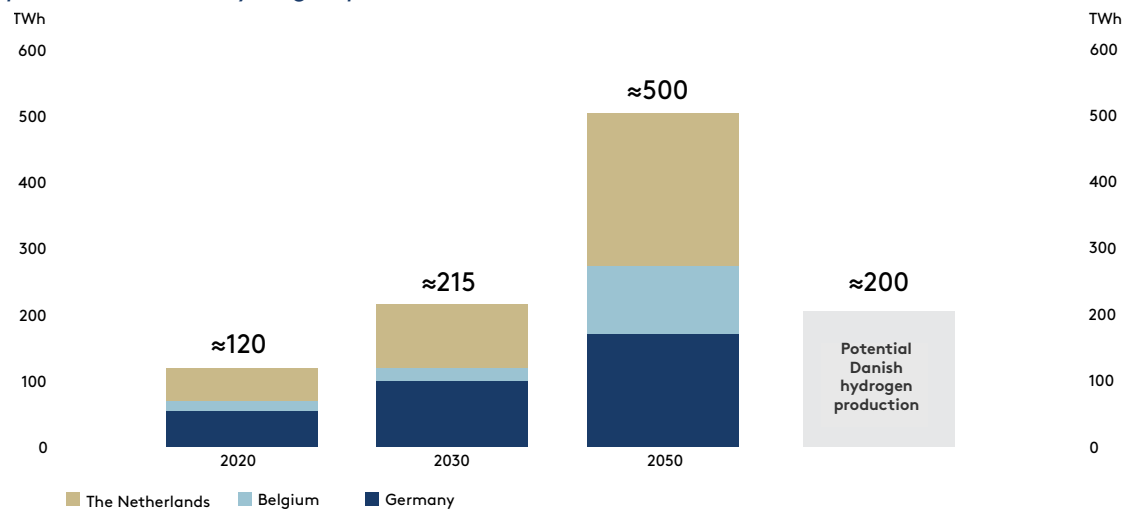
### THE GREEN POTENTIAL OF DENMARK

Denmark has a large wind potential, and especially in the North Sea, we have large, good areas with a lot of wind resources in shallow waters. This gives Denmark the lowest production costs of large quantities of renewable electricity among all North Sea countries, and the expansion of renewable energy can be significantly cost-effective, especially if we also introduce offshore hydrogen production.

### SURPLUS OF GREEN ELECTRICITY BEFORE OTHER COUNTRIES

According to the Danish Energy Agency, Denmark will become self-sufficient with green electricity by 2027, and when it comes to green hydrogen, we can become more than self-sufficient by 2030. At the same time, the hydrogen demand of Germany, the Netherlands, and Belgium will grow significantly. Hence, Denmark can from the outset sell our entire surplus of green hydrogen to neighbouring countries and much more over time. These countries are especially interesting because they have politically chosen a strategy to achieve their green transition resting on import of green hydrogen.

**Figure 1: The expected hydrogen demand of Germany, Belgium and the Netherlands will surpass the potential Danish hydrogen production**



Sources: 2020: TNO PUBLIEK (2020) for the Netherlands, Deloitte (2021) for Belgium and Federal Ministry for Economic Affairs and Energy (2020) for Germany, 2030: Economie (2022) for Belgium, Federal Ministry for Economic Affairs and Energy (2020) for Germany and Ministry of Economic Affairs and Climate Policy (2020) for the Netherlands, and 2050: estimated by COWI. Remarks: Denmark's hydrogen export in 2030 is expected to make up 16 TWh according to the CIP Foundation's calculations based on the Danish Energy Agency - Energistyrelsen (2023) and the Danish government's climate partnership for energy and supply - klimapartnerskab for energi og forsyning (2020)

By 2030, the three countries expect to consume around 215 TWh of hydrogen with an import of more than 140 TWh of hydrogen, even in a conservative scenario. Denmark may supply 16 TWh or just over 10% of the total import need of these countries with an increasing potential over time.

#### EXPORT POTENTIAL UP TO DKK 100 BILLION

The expected import of green hydrogen in Germany, the Netherlands, and Belgium correspond to a market value of DKK 70 billion by 2030, of which Denmark may take up to DKK 8 billion. The export market for green hydrogen will grow in line with the green transition in the years to come. If Denmark utilizes all its currently known and screened areas for renewable energy, there is an opportunity to export for around DKK 100 billion annually.

This corresponds to the current Danish export of energy technologies and services. In comparison, some of the largest Danish export industries, life science and the food cluster, correspond to around DKK 152 billion and DKK 164 billion, respectively.

The current fossil-based hydrogen market in Germany, the Netherlands and Belgium amounts to approximately 120 TWh and lends hope to a future green hydrogen export from Denmark (around 16 TWh by 2030) by its sheer size – much larger than Denmark's immediate production expectations.

#### INTERNATIONAL PIPELINES AND INTERCONNECTORS ARE CRUCIAL FOR EXPORT OPPORTUNITIES

Based on the export opportunities, Danish decision-makers may initiate the planning of a hydrogen infrastructure with connections to relevant countries and increase the expansion of renewable energy. Pipelines linked to demand markets are a prerequisite for Danish developers to invest in electrolysis

capacity and the built-out of renewable energy giving crucial market access. A hydrogen pipeline infrastructure is necessary for the creation of a hydrogen market in Denmark and supporting the green transition of not only Denmark, but also our nearest neighbors.

The demand for green hydrogen from south of the border, combined with significant potential for production of renewable energy, create a unique position for Denmark in the green transition of Northern Europe, beneficial to both the climate, the European energy supply, and the Danish economy.

However, many others also compete for the green hydrogen market. While the hydrogen demand from the Netherlands, Germany, and Belgium constitutes a unique opportunity for Denmark, these countries also look elsewhere for hydrogen supply and have already entered into agreements for importing hydrogen from more distant countries.

#### OTHER COUNTRIES ARE ALREADY PLANNING AND DEVELOPING HYDROGEN INFRASTRUCTURE

Hydrogen infrastructure already exist in several central European countries due to their current use of fossil-based hydrogen for their industries. Furthermore, the countries have advanced their plans for further expansion and retrofitting of the gas infrastructure. These plans may bypass Denmark if we do not show that we are ready to enter the market.

By early 2023, German RWE and Norwegian Equinor entered into an agreement for an underwater hydrogen pipeline through Danish territorial waters. At first, the pipeline will supply Germany with blue hydrogen directly from Norway.

Similarly, there are several examples of countries entering into import agreements with Middle Eastern and Southern European countries for hydrogen supply. For every long-term purchase agreement that is signed, the market that can otherwise be covered from Denmark becomes smaller.

The situation requires action from Danish decision-makers. Therefore, based on the market assessment, the CIP Foundation provides three recommendations for Danish decision-makers:

- **Plan for establishing a hydrogen infrastructure connected to other countries**
- **Accelerate the expansion of renewable energy**
- **Establish framework conditions to allow for the Danish part of the North Sea to be developed and utilized for the benefit of Europe's green transition**



[Link to full market assessment \(in Danish\)](#)