9 March 2023

Belgian Offshore Days

Green Hydrogen Landscape in the North Sea Region

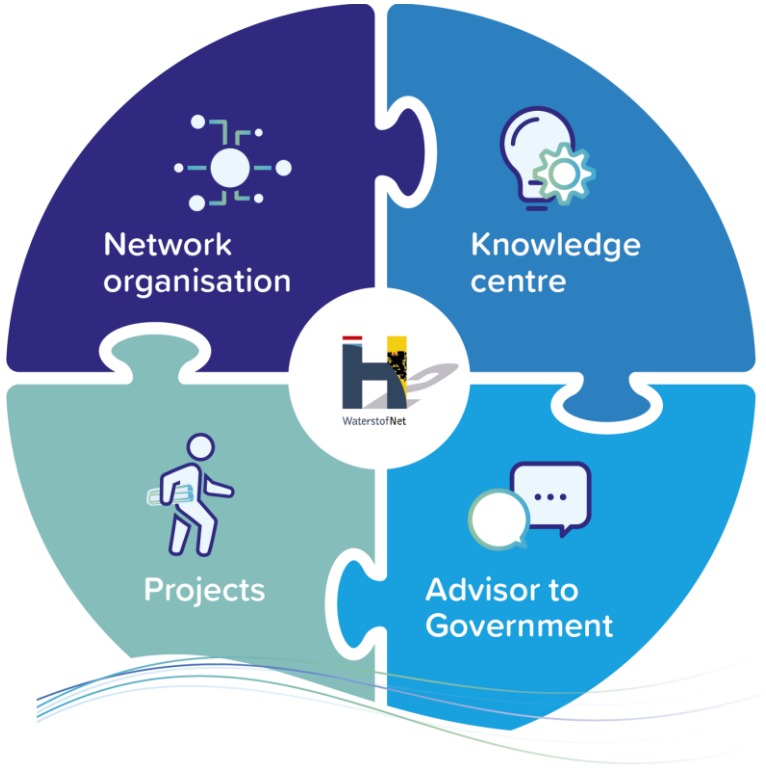
WaterstofNet

Agenda

- **About WaterstofNet**
- **Green Hydrogen State of the Nations Summary Report**
- **Q&A**

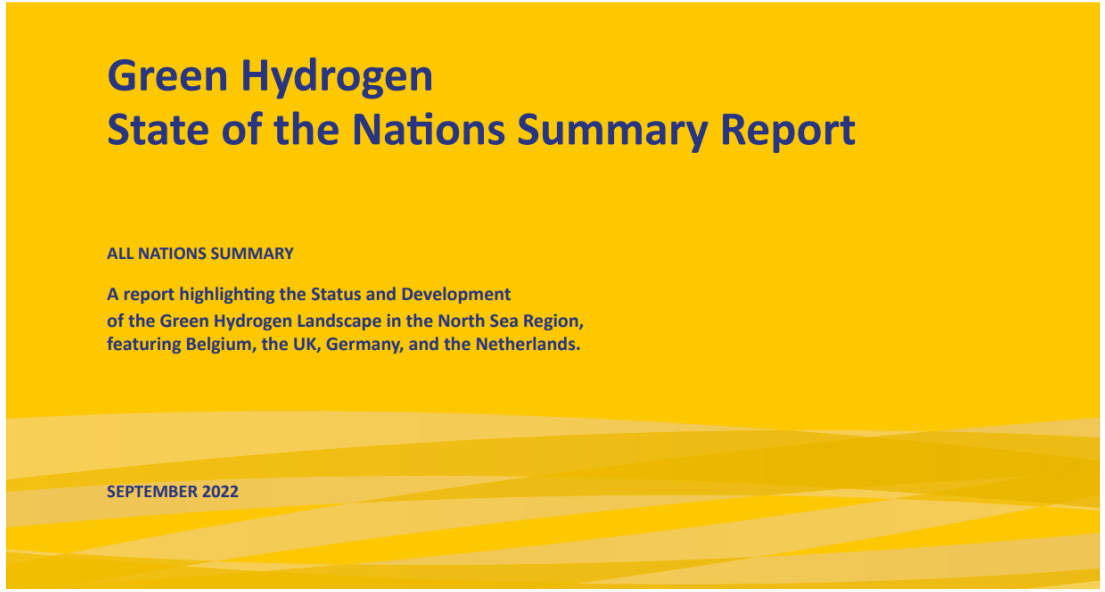
WaterstofNet: over 10 years of H2 experience

- °2009, non profit, 14 persons
- Offices in Turnhout (B) and Helmond (Nl)
- 4 pillars
  - ✓ Industrial cluster with > 150 members
  - ✓ Projectorganisation > 20 projects
  - ✓ Partner of governments
  - ✓ Knowledge, analyses, hydrogen academy
- Hands-on experience



Green Hydrogen State of the Nations Summary Report (2022)

- **INN2Power project - Interreg North Sea Region**
- Four country reports**: BE, NL, DE, UK – One Summary Report**
- Give overview of the hydrogen economy in the North Sea Region
- **Topics**
  - Infrastructure
  - Policy Landscape
  - Projects Development Pipeline
  - Challenges & Opportunities for green hydrogen sector
  - Barriers & Opportunities for Innovation



Hydrogen infrastructure

- **EU Hydrogen Backbone**
  - **31 energy infrastructure operators**, including those from BE, DE, UK and NL
  - **Five** pan-European 2 supply and import **corridors** emerging by 2030 (Corridor C: North Sea)
  - 53,000km by 2040, primarily based on **repurposed existing natural gas infrastructure**.
- **Industrial clusters & ports**
  - Connecting industrial clusters and **Ports of Rotterdam, Zeebrugge, Antwerp, Wilhemshaven and Brunsbüttel**
  - **NL** aims to be ready by 2027, connecting all industrial clusters, storage facilities and neighbouring networks
  - **DE** prioritizes hydrogen clusters in the North-West, Ruhr area and in the East, the Central German Chemical Triangle
  - **BE** focusses on connecting import terminal in Zeebrugge to industrial clusters of Antwerp and Ghent, and Liège + connection with **DE by 2028**.
- **UK**
  - **Four of the five industrial clusters** could be connected and form the basis of a GB hydrogen transmission backbone **by 2030**

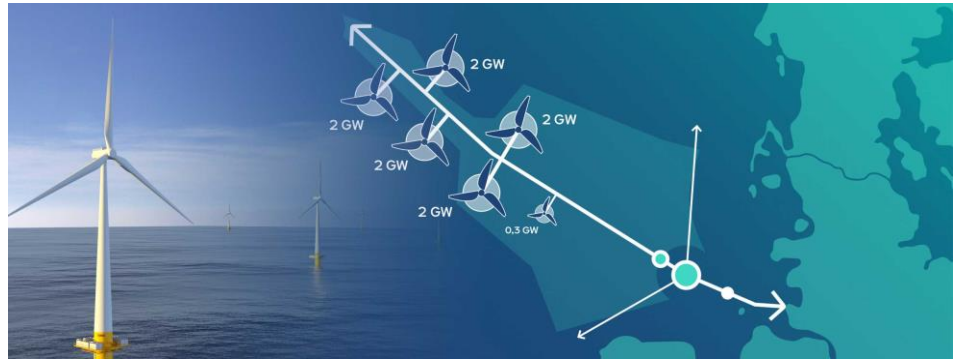
Belgium

- **Policy landscape**
  - Positioning BE as an **import & transit hub -** small **local production (150 MW) -** focus on both **low carbon and renewable** hydrogen
  - Strengthening **technological leadership,** cfr. Flemish Hydrogen Vision

- **Projects development**
  - Building 2 large scale **electrolyser plants** in Flanders (Cummins) and Wallonia (John Cockeril) – IPCEI
  - **Hyofwind**: a **25 MW hydrogen** plant in Zeebrugge (onshore), using offshore wind energy
- **Challenges**
  - **Small,** densely populated country **- limited** renewable energy **potential -** complex **state structure**
  - **Limited budget for research, development and innovation**,
- **Opportunities**
  - **Logistical assets – Ports -** largest **hydrogen pipeline** running to its seaports and transport hydrogen to its industrial cluster
  - **Leadership in H2 technology with** electrolysers, state of the art membranes, H2 busses & garbage trucks, H2 panels, etç

Germany

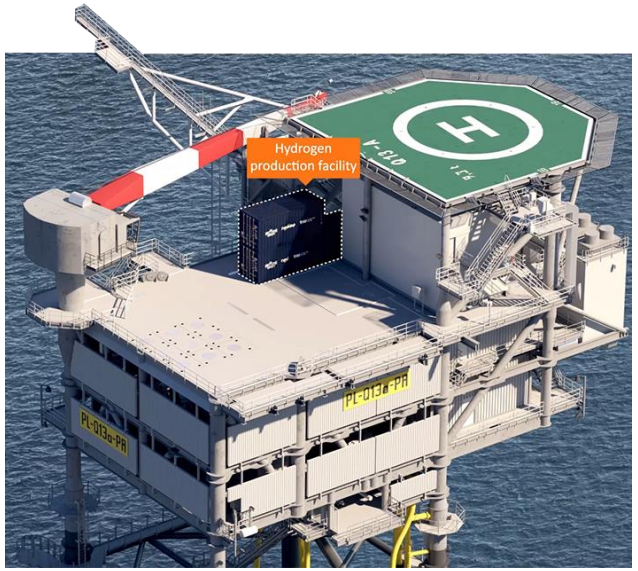
- **Policy landscape**
  - Target of **5GW by 2030, and 5GW extra by 2035 or 2040 -** focus on **renewable hydrogen only**
  - Creation of a Hydrogen Research Network and **National Hydrogen Council**
- **Projects development**
  - Tender **500MW of offshore wind** annually over six years from 2023 for the production **of green hydrogen at sea**
  - **AquaVentus project** - 10 gigawatts by 2035 - 1 million metric tons of green H2



- **Challenges**
  - **Cost gap** between grey and renewable H2 → Carbon Contracts for Difference (**H2Global**)
  - Lack of **skilled workers**
- **Opportunities**
  - "Enormous growth potential" for the **German mechanical engineering sector** and other branches of industry
  - Offshore wind **research institutes already active in the field of green hydrogen**

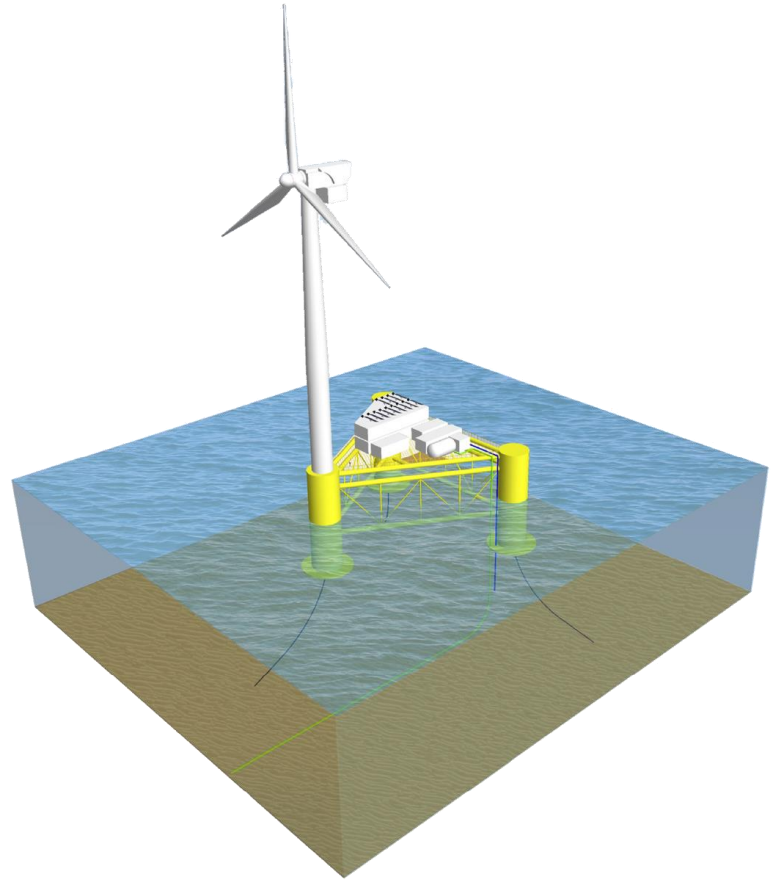
The Netherlands

- **Policy landscape**
  - **Large offshore wind/green H2 potential -** Focusing on both **renewable and low carbon hydrogen**
  - Also aiming to become an **import hub** for the rest of Europe
- **Projects development**
  - **PosHYdon and NorthH2 -** combination of offshore wind and green hydrogen production
  - **800 million** through IPCEI for hydrogen production projects, combined capacity of **1,1GW**
- **Challenges**
  - Need to invest and build up a hydrogen ecosystem to transfer intangible assets, **including talent, knowledge and innovation**
  - Skilled **workforce** not sufficiently available yet
- **Opportunities**
  - Ensuring **20,000 jobs of the natural gas industry**
  - Collaborations with **technical universities** put forward as solutions



United Kingdom

- **Policy landscape**
  - **10GW** by 2030 - **“At least” half** coming from **green** hydrogen – UK will become a hydrogen **exporter**
  - Twin-track approach: both **green and blue** hydrogen will be pursued
- **Projects development**
  - **Dolphyn project,** 100-300MW of offshore floating wind-powered electrolysis
  - Projects looking into how green hydrogen can combine with **desalination**
- **Challenges**
  - Relatively low existing gas **storage capacity**
  - Policy and **regulatory uncertainty - Planning and permitting** needing to be simpler and faster
- **Opportunities**
  - Significant **economy opportunity** for the UK - £320bn of GVA and 120,000 jobs by 2050 through **electrolyser production**
  - **Repositioning of major oil and gas companies** across the North Sea



Conclusions & synergies

- **Backbone**
  - Focus on **ports and industrial clusters** first - **interconnecting countries** also crucial
  - Important role for **terminals** in **Zeebrugge and Rotterdam** as entry point towards rest of Europe
- **Supply and demand of H2**
  - Relatively **limited renewable energy potential + high industrial demand** in BE, NL and DE
  - The UK in the longer run could become **renewable hydrogen supplier** for these countries
- **Challenges:**
  - **Regulatory uncertainty** as one of the main barriers in developing a mature hydrogen economy
  - **A lack of skilled workers** is something becoming more acute in all countries
- **Opportunities**
  - Ensuring **many jobs and skills of the fossil fuel industry -** Fossil **infrastructure** can be repurposed
  - Already today, **offshore wind and green hydrogen** are seeing premature synergies and **projects** being developed in this field

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Bedankt voor uw aandacht!

Thank you for your attention!

WaterstofNet