WindEnergy Hamburg 2022, September 29
Indo-German Dialogue on Green Hydrogen and Offshore Wind

European Developments of Green Hydrogen Production with Offshore Wind

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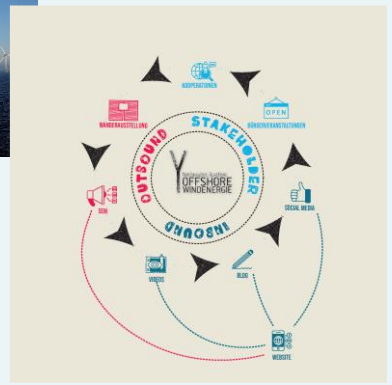
Who we are – Foundation OFFSHORE WIND ENERGY

- was founded on initiative of the Federal Ministry of Environmental Affairs in 2005
- is a Lower Saxonian Foundation with HO in Varel
- aims at fostering, promoting and exploring the development of offshore wind & green hydrogen in Germany & Europe
- is an independent, nationwide and nonparty think-tank
- acts as a networking & communication platform for stakeholders from politics, the economy and science
- supports offshore wind development through a broad variety of activities, such as studies, events, projects, test side preparation, consultancy
- Curatorship represents the whole range of relevant stakeholders: operators, TSOs, manufacturer, suppliers, insurance companies, investment trusts & banks, associations, federal & state ministries

The Foundation is currently conceptualizing & launching projects and initiatives on military & offshore wind, co-use, environmental impact of OWFs, skilled workforce, acceptance, offshore rescue & safety

Alpha Ventus – Germany's 1st



National Offshore Test Side

Project OWE & Green Hydrogen

SeaOff – Decommissioning of OWPs

BeBeO – demand-driven night marking

GOI German Offshore-Wind Initiative

Support Project for German SMEs

Offshore Wind & Green Hydrogen

European & German Hydrogen Strategies

European H2-Strategy (July 2020)	National H2-Strategy (June 2020)	H2-Strategy North German States (November 2019)
Main goal: Increase the share of H2 in the European Energy Mix from 2% today to 13 – 14% in 2050	**Main goal:** Establish H2 as an option in decarbonisation	**Main goal:** Development of a H2-economy till 2035, which meets the regional demand (nearly) completely
2020 – 2024: Capacity of electrolyzers: min. 6 GW Renewable H2 production: up to 1 Mt/a (33 TWh/a) Full workload hours of electrolyzers: 7860 h/a	Situation today: H2-demand: 55 TWh (3,85 TWh/a from electrolyzers	2025: Capacity of electrolyzers: min. 0,5 GW (in Northern Germany)
2025 – 2030 Capacity of electrolyzers: min. 40 GW Renewable H2 production: 10 Mt/a (333 TWh/a) Full workload hours of electrolyzers: 8760 h/a	2030 H2-demand: 90 – 110 TWh Capacity of electrolyzers: up to 5 GW H2-production: up to 14 TWh/a Full workload hours of electrolyzers: 4000 h/a	2030: Capacity of electrolyzers: min. 5 GW (in Northern Germany)
	2035 – 2040 Capacity of electrolyzers: up to 10 GW H2-production: 28 TWh	

Under Revision

Raise to 10 GW according to coalition agreement

Under Revision

REPowerEU Plan (May 22) as reaction to Russian invasion: joint purchasing mechanism & 10 Mio/t/a domestic production + 10 Mio/t/a imports by 2030

EU decarbonization package; gas & nuclear power as sustainable investments

Esbjerg Declaration

- Joint declaration of Germany, Denmark, Belgium & the Netherlands on 18 May, 2022
- Joint effort to build 65 GW OWE until 2030
- Joint effort to build 150 GW until 2050
- 20 GW green H2 until 2030 with on- and offshore wind

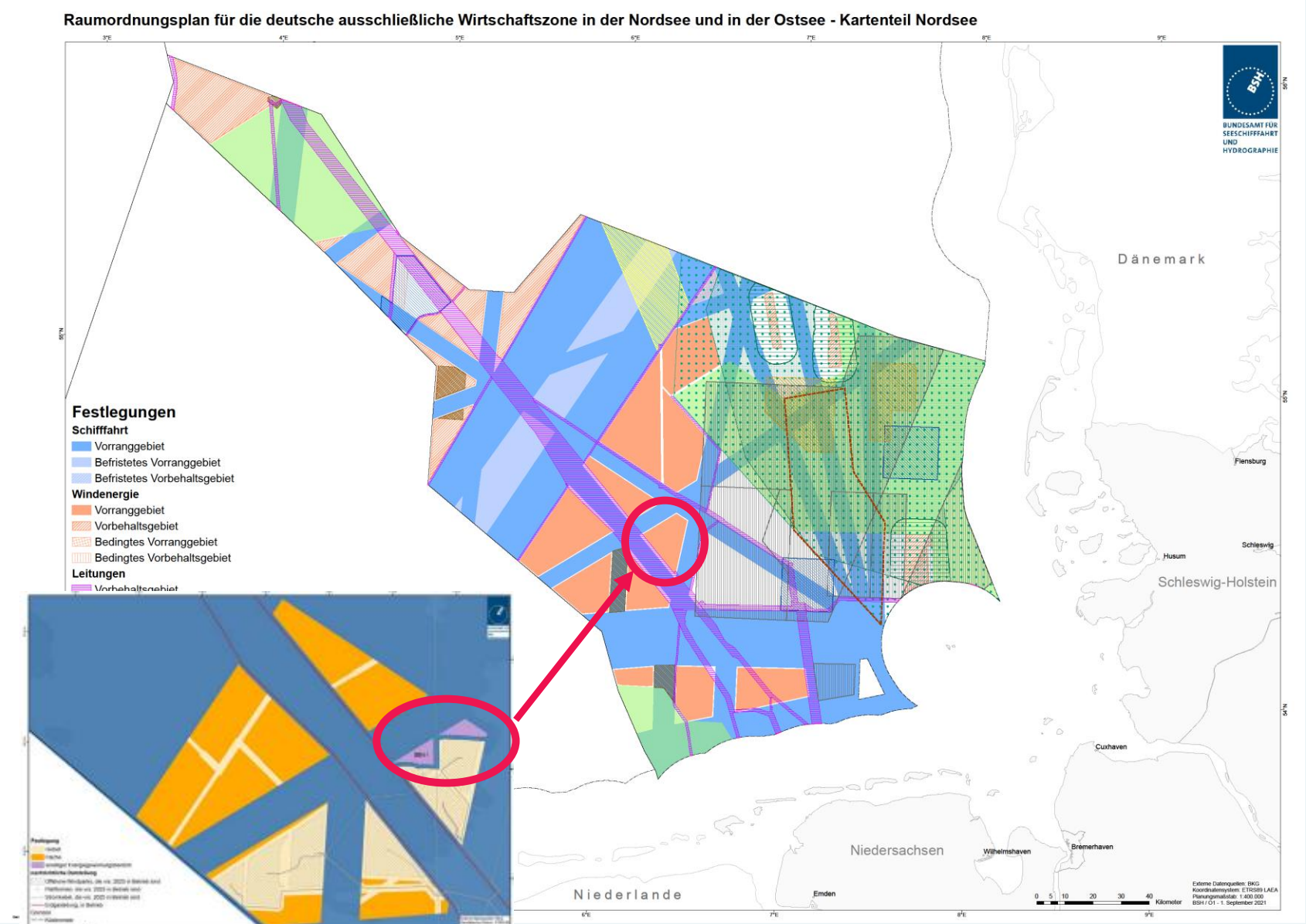
Foundation of a Europe Hydrogen Bank announced

- 14 September, 2022
- 3bn capital
- Seed capital from 38 bn innovation fund
- To give security from demand side
- Details not clear yet

H2 Global Mechanism

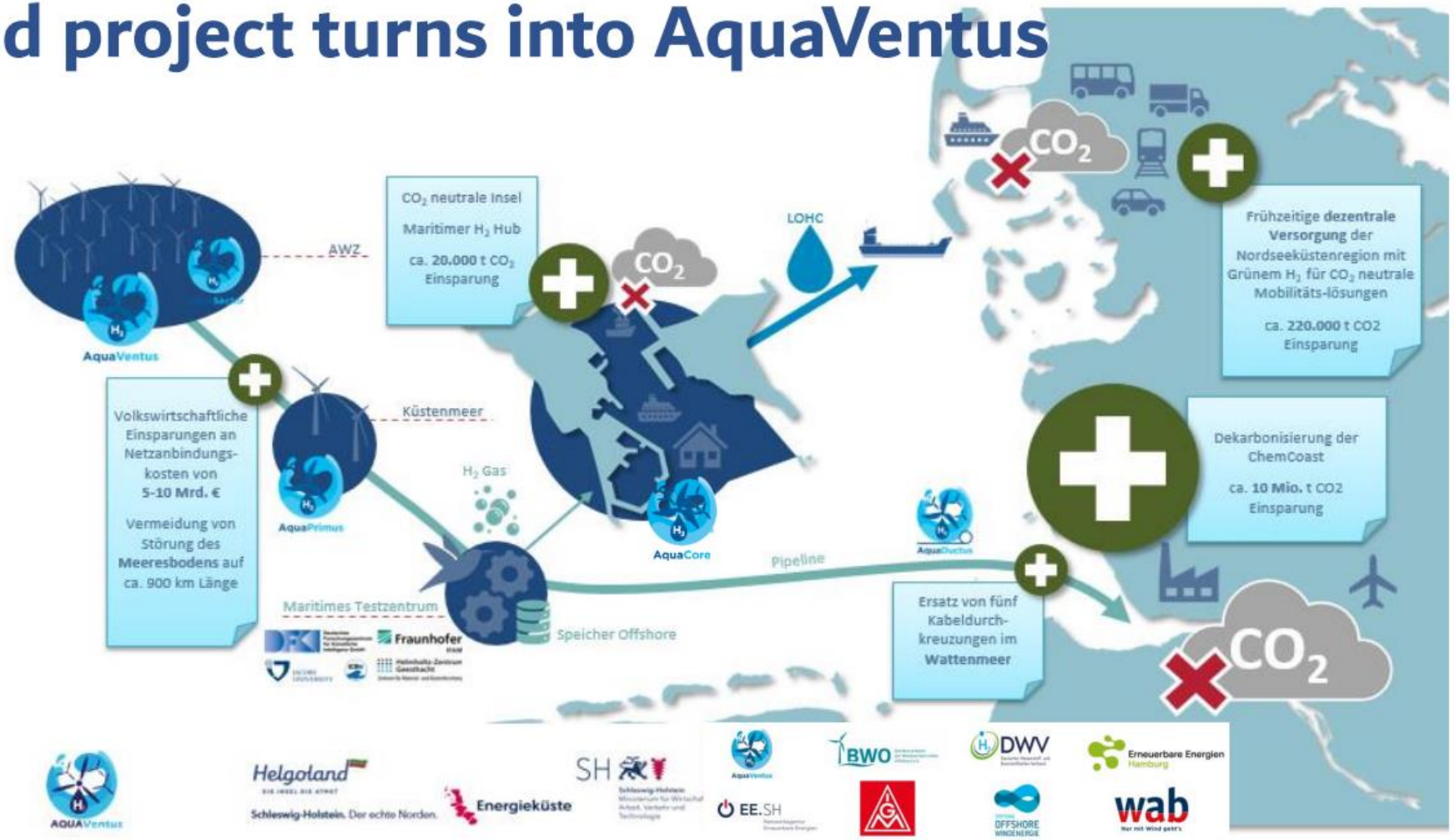
Germany

- Offshore wind indispensable energy source for electrolyzers
- Germany will have to import major share of it’s H2 demand
- How much will offshore electrolysis complement onshore?
- no complete regulatory framework in place for offshore H2 production
- 1st offshore wind to hydrogen site auctioned (next) year



Germany: AquaVentus

Small Island project turns into AquaVentus

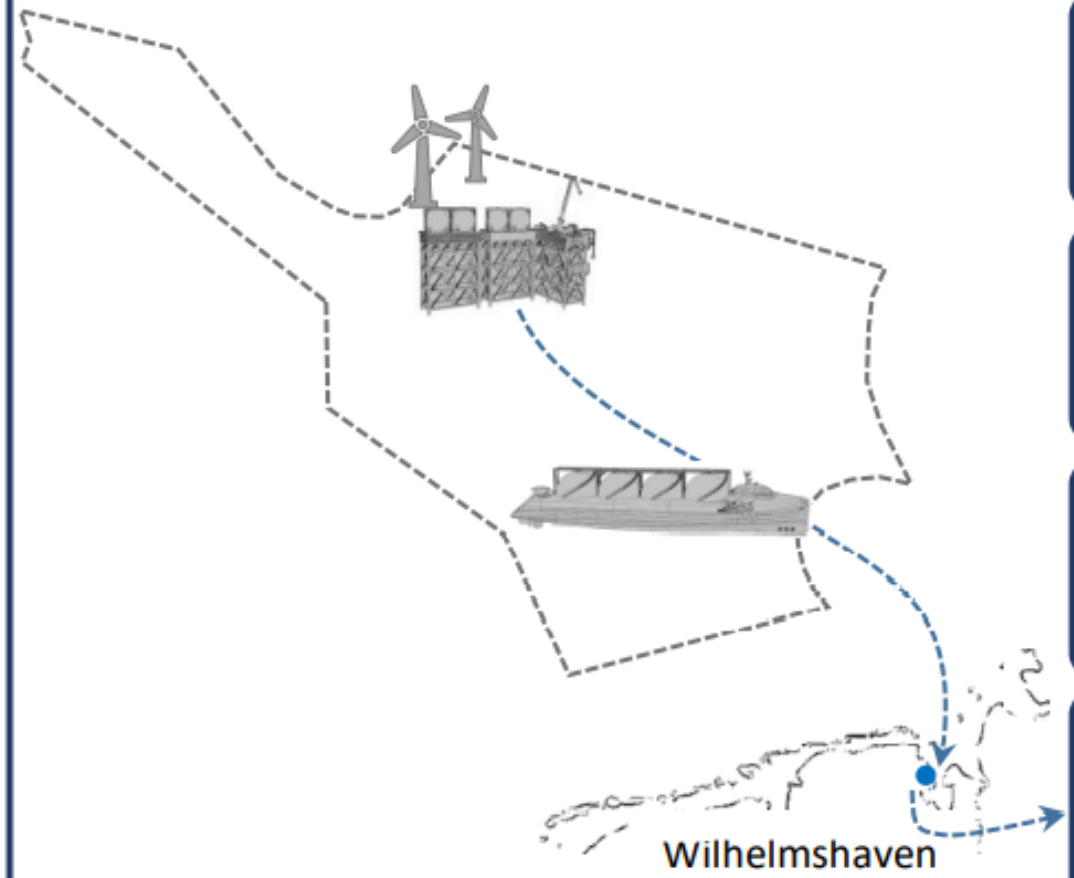


Dec, 19th 2019

What is the Energy ***real*** potential in the North Sea

Germany: NorthH2Sea

The Concept



Offshore Windfarm

- Large scale wind turbines (15 MW+ Generation)
- Excellent wind conditions (>5.000 FLH)
- Continuous wind energy production, similar to baseload

Desalination & Electrolysis

- Desalination of seawater with process waste heat
- Highly efficient PEM electrolysis plant
- Production of green hydrogen without chemicals

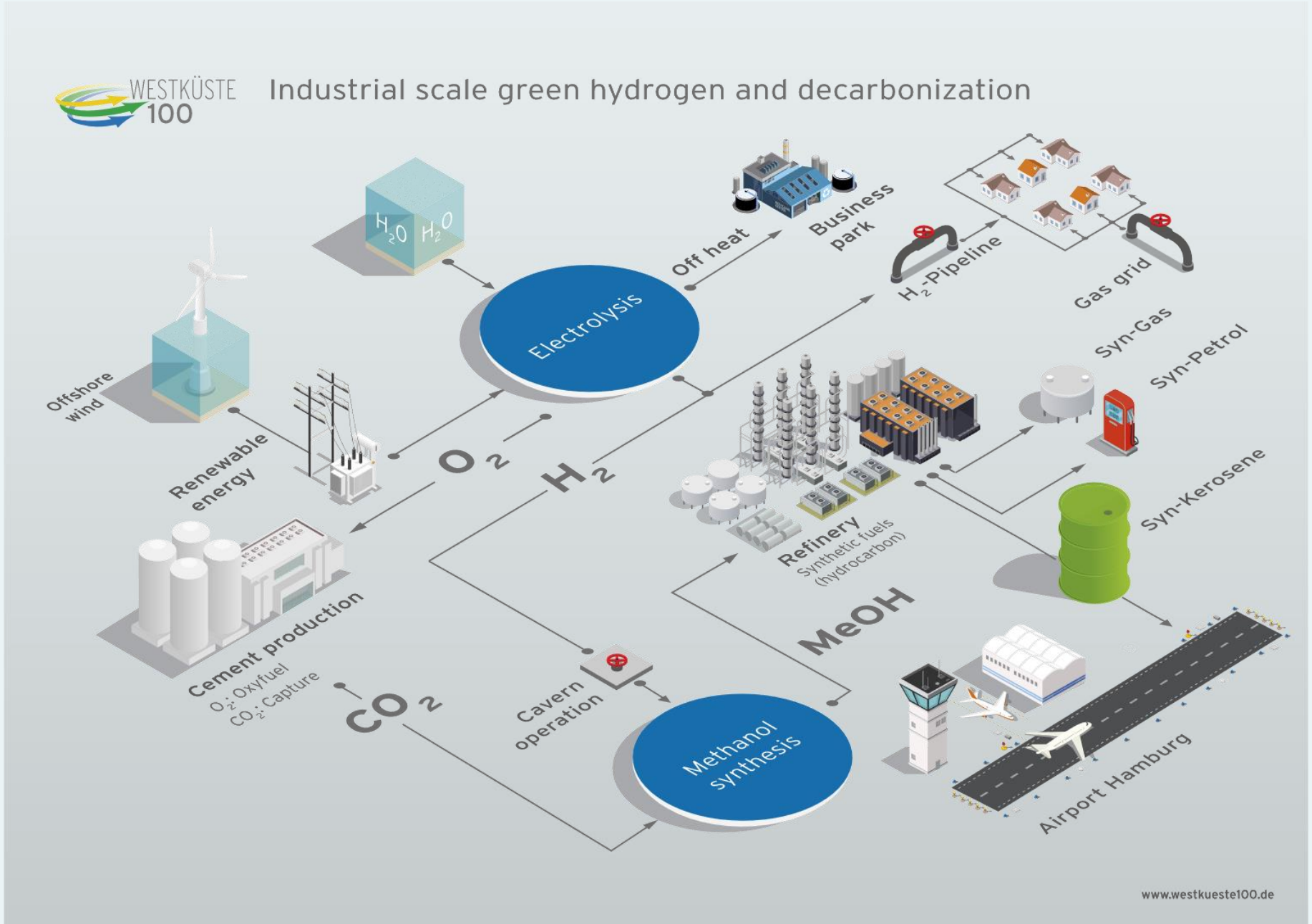
Storage & Transport

- Transport of green hydrogen in liquefied condition
- Vessel propulsion via hydrogen, including the „boil off" H2
- New type of ship

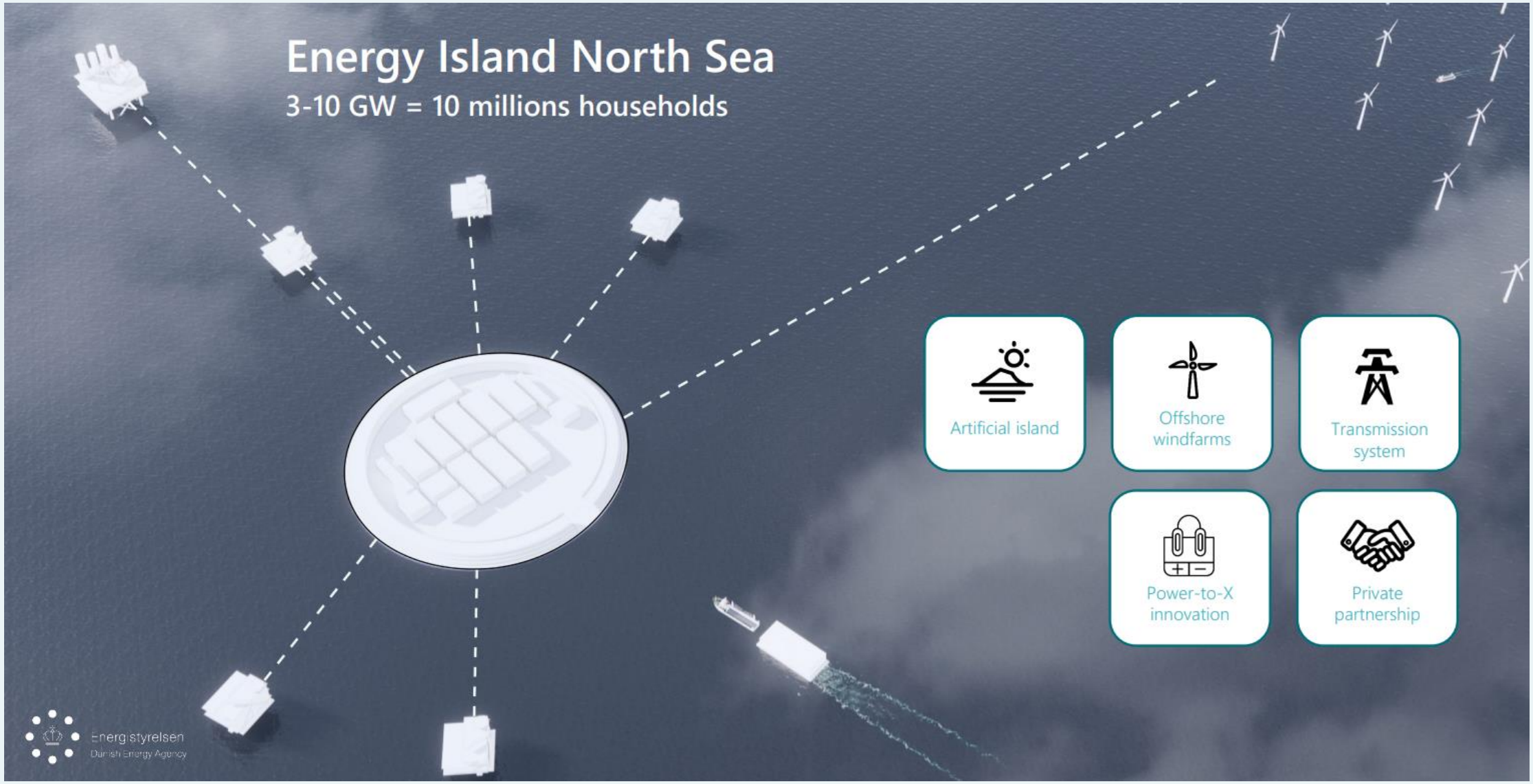
Offtake

- Industry (steel production, fertilizer production,refineries)
- Mobility (trains, trucks, busses)
- Heating sector

Germany: Westcoast 100



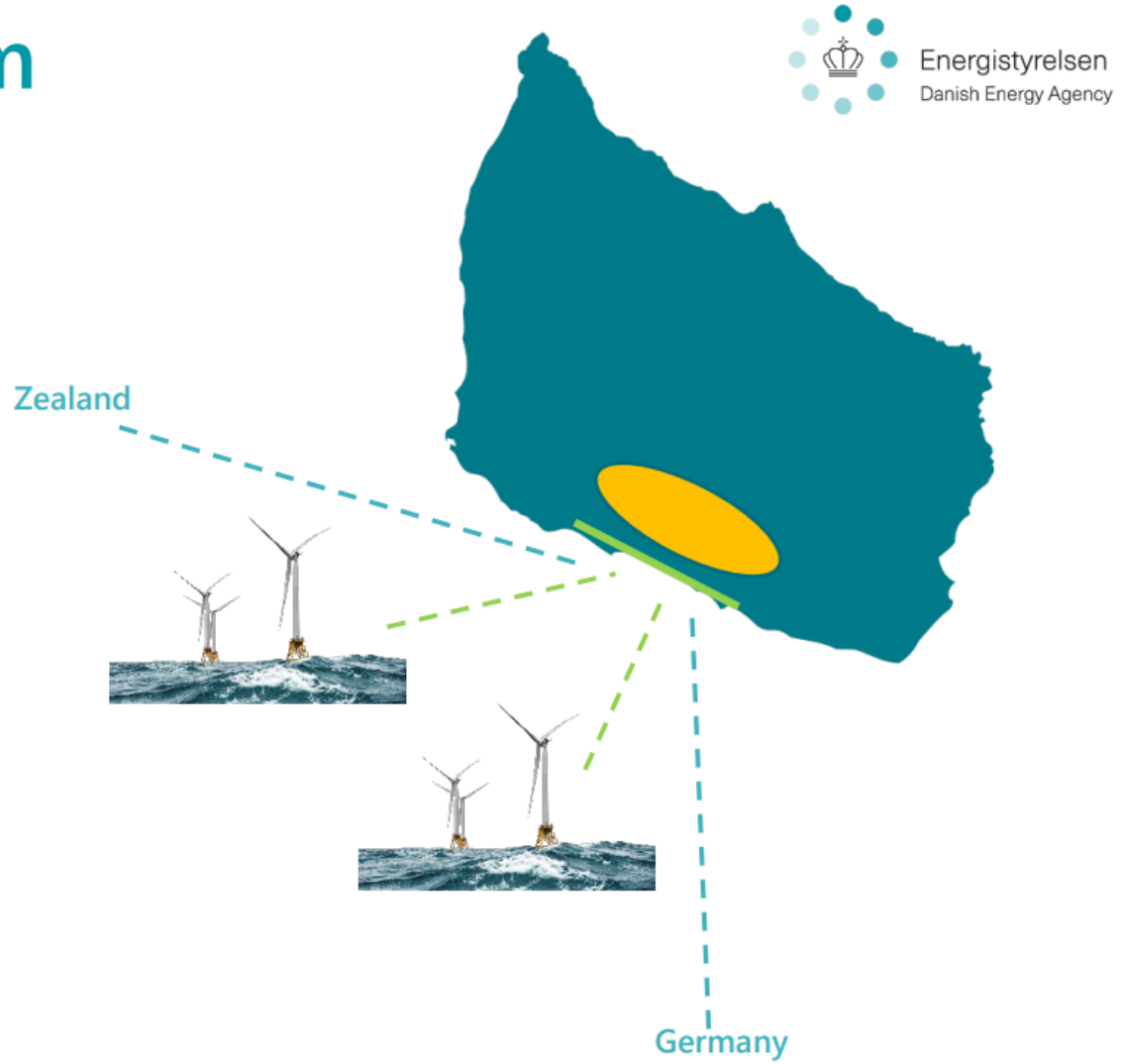
Denmark: Danish Energy Island



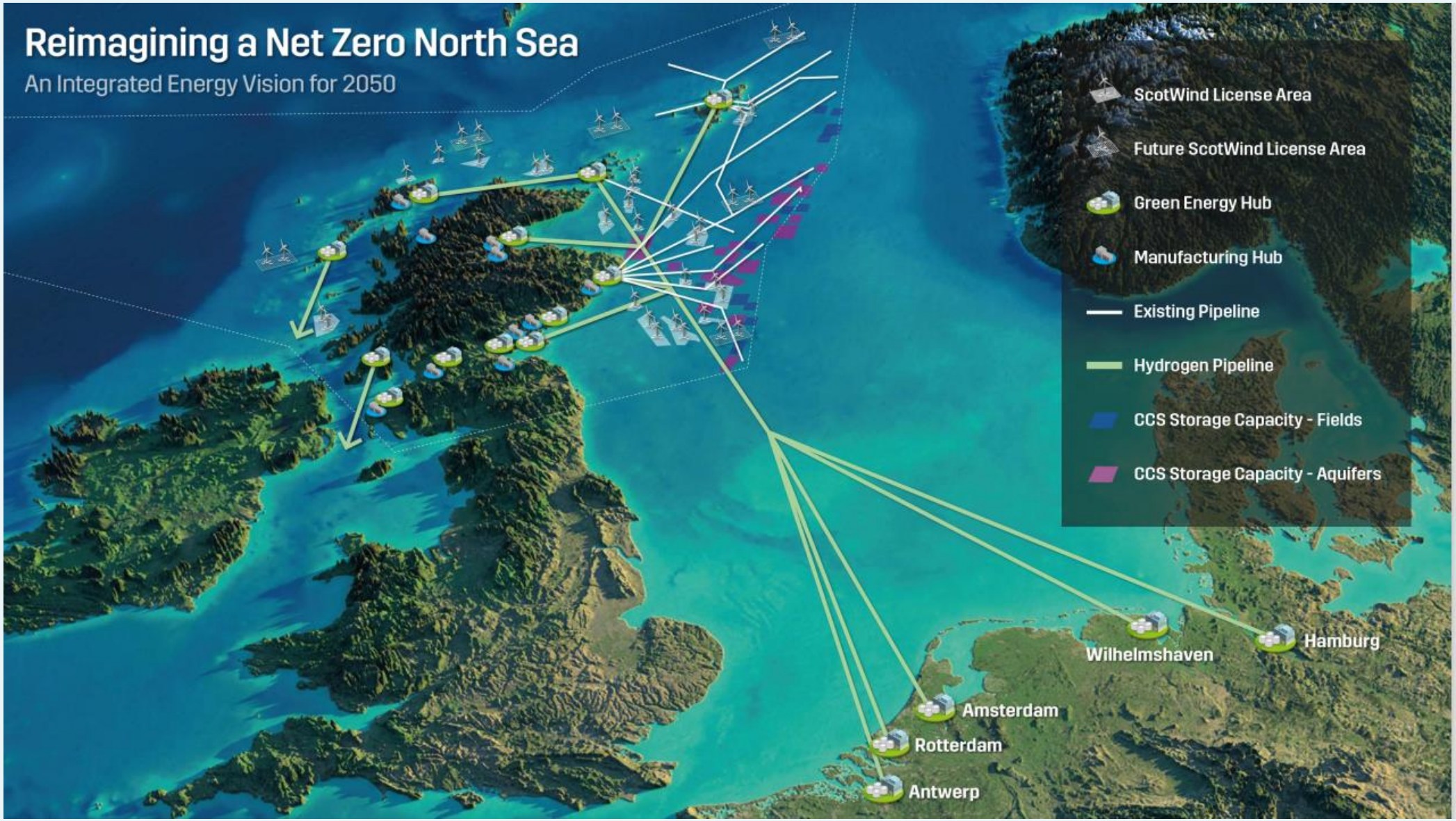
Denmark: Bornholm Energy Island

Energy Island Bornholm

- 3 GW of offshore wind, instead of the initially planned 2 GW by 2030
- Several offshore wind farms with onshore facilities on Bornholm
- Connection to Zealand and Germany
- Subsea cable connecting Denmark and Germany will have a length of approx. 470 km
- Provides enough green power to supply the electricity needed by 3.3 million Danish or 4.5 million German households

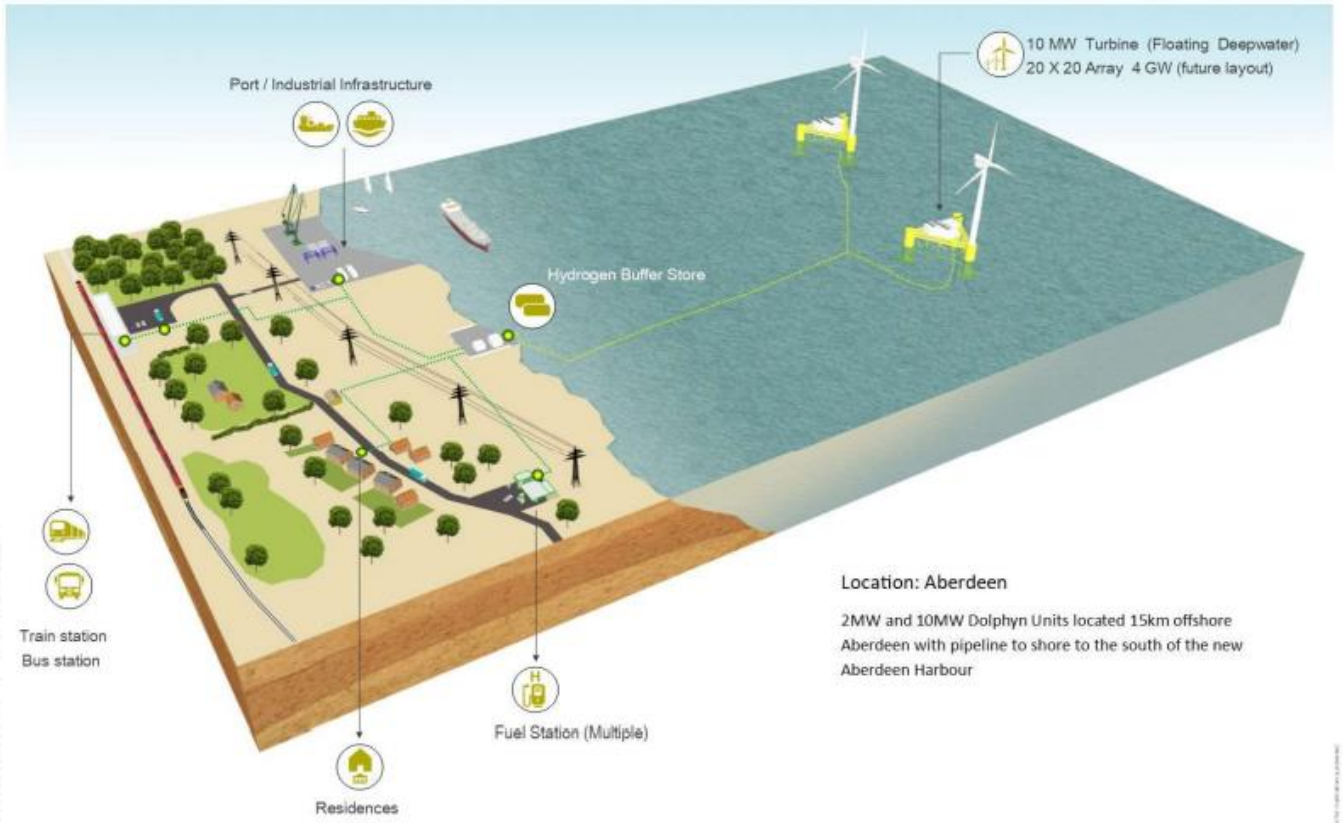


Scotland


Reimagining a Net Zero North Sea
An Integrated Energy Vision for 2050
ScotWind License Area
Future ScotWind License Area
Green Energy Hub
Manufacturing Hub
Existing Pipeline
Hydrogen Pipeline
CCS Storage Capacity - Fields
CCS Storage Capacity - Aquifers
Wilhelmshaven
Hamburg
Amsterdam
Rotterdam
Antwerp

Denmark: Bornholm Energy Island

10 MW Demonstration Project, Aberdeen



Location: Aberdeen

2MW and 10MW Dolphyn Units located 15km offshore Aberdeen with pipeline to shore to the south of the new Aberdeen Harbour

2 MW FEED: Jan 2000 – May 2021

- -150 Studies
- Full Set of P&ID's, PFD's, Layouts, Structural Drawings, Electrical Drawings
- Safety Case and Consent Development

10 MW Pre-FEED: March 2021 – June 2022

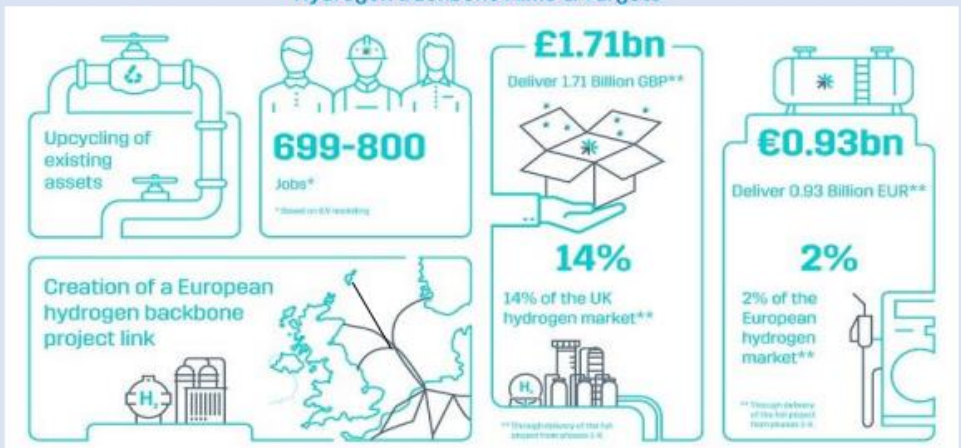
Scotland: Hydrogen Backbone Link

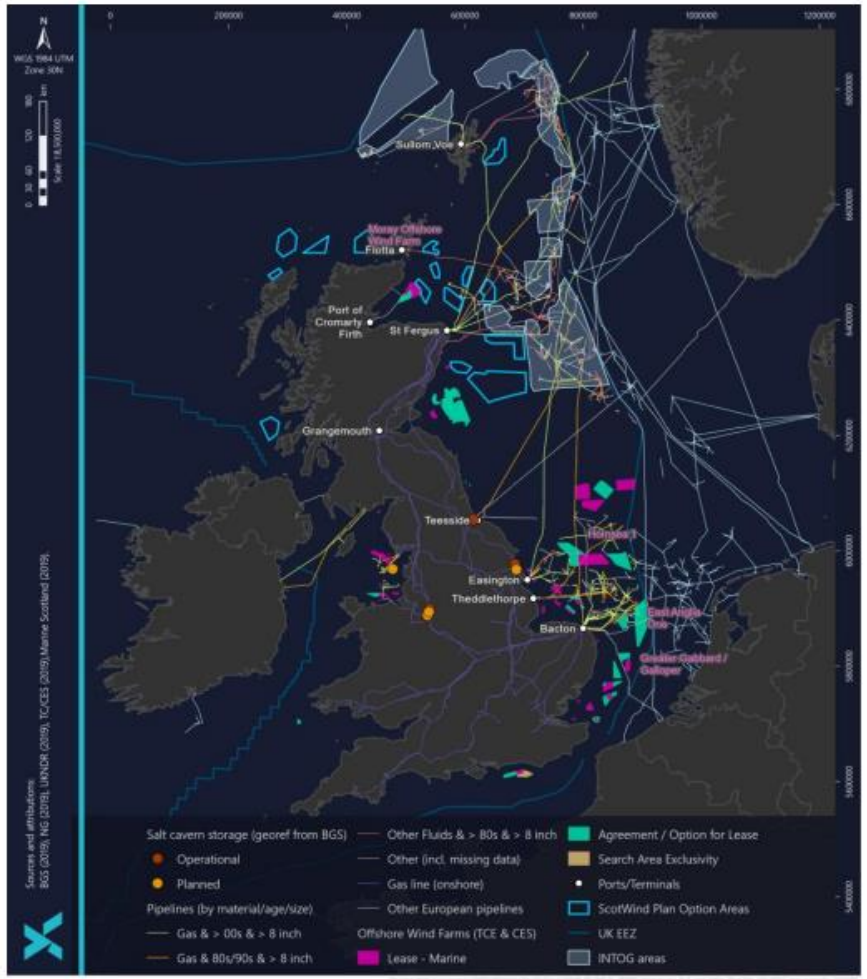
Hydrogen Backbone Link

Hydrogen Backbone Link Project Scope of Work

- Option Identification, Route Assessment and GIS Mapping
- Pipeline Re-Use Assessment
- Blending & De-Blending
- Inter-Seasonal Storage
- Compression Systems
- Metering
- Valves and New Materials
- Safety System Analysis - Regulations and Specifications / Operational
- Economic Modelling
- Phase 3 & 4 Project Build Out

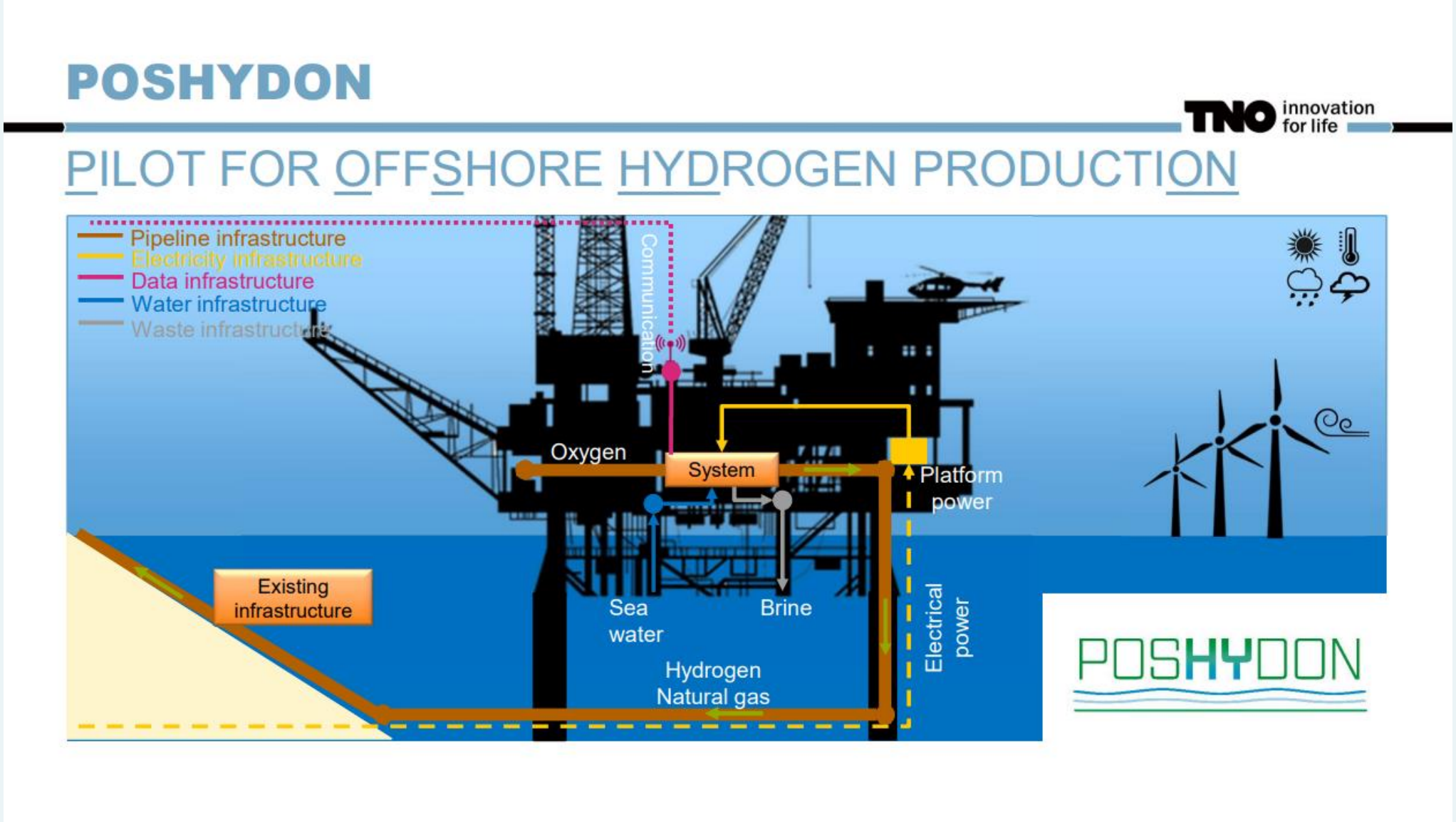
Hydrogen Backbone Aims & Targets





Scottish Government Riaghaltas na h-Alba gov.scot · kellas MIDSTREAM · Shell · EQ EnQuest · Shetland Islands Council · Crown Estate Scotland · Wood Mackenzie · XODUS · wood. · Worley · DNV·GL · SGN · nationalgrid

Netherlands: POSHYDON



Thank you for your attention!

Happy to get in touch…

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