

Green hydrogen and  
offshore wind:  
Connecting the dots in  
the North Sea

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**cruh21** is enabling energy innovation in Offshore Hydrogen

- Strategic project consulting in the energy industry, emerged at the end of 2020 from the AquaVentus initiative as the former AquaVentus coordination office.
- Interdisciplinary team of consultants from various fields, such as engineering, law, communication, social sciences, etc.
- Excellent starting position at the interface between industry and research, e.g. in the context of the hydrogen lead projects

Strategy  
Technology  
Energy industry  
Regulatory  
Communication  
Network & Stakeholders



## Offshore & Hydrogen



### Services

- Strategy, innovation and technology consulting
- Concept development & feasibility studies
- Tender support
- Regulatory

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## Hydrogen & sector coupling



### Services

- Strategy, innovation and technology consulting
- Concept development & feasibility studies
- due diligence
- Development, analysis and optimization of business cases
- Funding consulting

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## Network & Communication



### Services

- Stakeholder management
- Partnering, Matchmaking
- Concept development
- Communication, PR & PA
- Network management

## Fit for 55

- 13 guidelines to achieve climate targets: package can push Green Hydrogen and PtX forward

## REPowerEU

- Production and import of 20 million tonnes renewable H2 in the EU by 2030
- Important Projects of Common European Interest (IPCEIs) on hydrogen

















## Esbjerg Declaration signed by Belgium, Denmark, Germany and the Netherlands

- **North Sea** as a Green Power Plant of Europe: multiple connected offshore projects and hubs
- Offshore wind production at massive scale (65 GW by 2030 and 150 GW by 2050)
- Electricity and green hydrogen interconnectors
- 20 GW of Offshore and Onshore Hydrogen by 2030

Promising start but lack of specific targets and regulations for offshore H2



## Hydrogen production in the North Sea

	 Project name	Description	Country	Status	
1	SEN-1	offshore hydrogen production on a central platform (290 MW – 1 GW)	DE	Tender 2023	
2	AquaDuctus	GW-scale open access hydrogen pipeline	DE	Feasibility	
3	Aquaprimus	2x14 MW prototype of a production-ready distributed generation unit	DE	Feasibility	
4	Aquasector+	10 GW offshore hydrogen by 2035	DE	Feasibility	
5	NorthH <sub>2</sub>	10 GW wind - 1 million T/a H <sub>2</sub> by 2040	NL	Feasibility	
6	Danish energy island	First artificial energy island, 3 -10 GW wind	DK	Tender 2023	
7	AmpHytrite	Centralised offshore H <sub>2</sub> from wind production	NL	Feasibility	
8	H <sub>2</sub> opZee	300-500 MW EI. & 10-12 GW existing Pipeline	NL	Feasibility	
9	Oyster	H <sub>2</sub> Production Onshore & Offshore	UK	Design	
10	PosHYdon	1 MW EI. - 146,000 T/a H <sub>2</sub>	NL	Construction	
11	Dolphyn	10 MW FOWT with el. & storage, 4 GW 2030	UK	Trials in 2023	
12	Deep Purple	Offshore electrolysis & subsea storage	NOR	Concept	
13	Haladane	Offshore Wind & H <sub>2</sub> , use of existing pipelines	UK	Design	
14	Salamander	200 MW FOWT & optional H <sub>2</sub> Production	UK	Planning	
15	Hydrogen Turbine 1	Integrated electrolyser into an offshore wind turbine	UK	Licensing	



\*project location still unknown

## Status Quo

- Existing national and regional Hydrogen strategy
- Targets for Offshore Wind: 30 GW by 2030, 40 by 2035, 70 GW by 2045
- No specific details on the share of Offshore Hydrogen
- Permitting process and area availability are currently hindering these goals (fisheries, environmental protection, military use...)

## Developments

- Specific agreement on Offshore Hydrogen by the new government
- Amendment of the National Hydrogen Strategy: 10 GW electrolysis target by 2030
- SEN-1 tender in 2023: Area for production of green hydrogen with up to 1 GW wind capacity (in total)

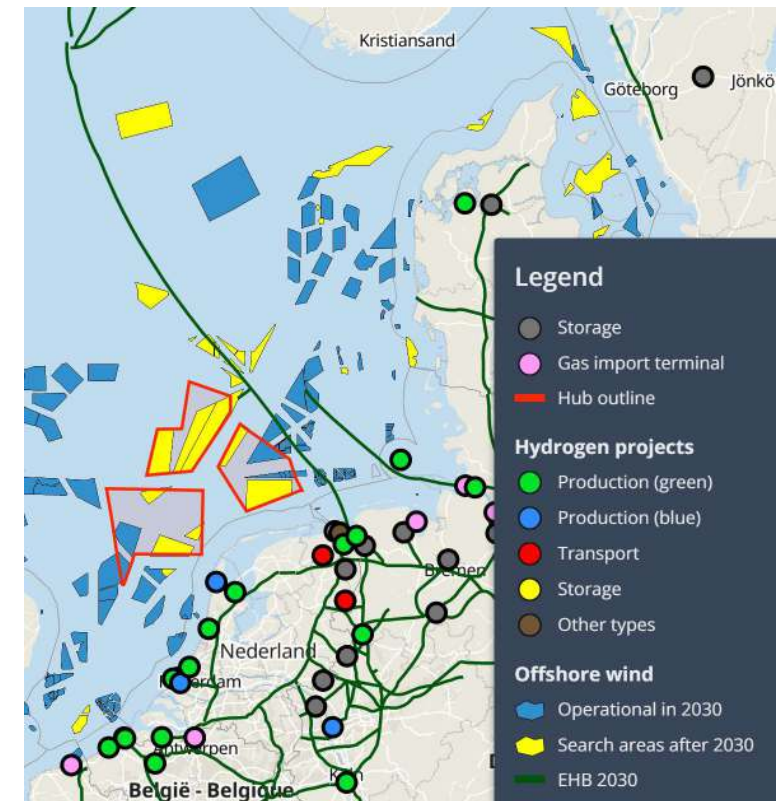


## Status Quo

- Existing Dutch Hydrogen Strategy
- Several oil and gas platforms, existing pipeline infrastructure
- Targets for Offshore Wind: 22 GW by 2030, 50 GW by 2040, 70 GW by 2050
- 3 to 4 GW Hydrogen by 2030, mostly onshore

## Developments

- Roadmap for offshore H<sub>2</sub> production (NSE Program)
- Four energy hubs identified to combine power and hydrogen production
- Investment in onshore H<sub>2</sub> infrastructure approved
- H<sub>2</sub> offshore infrastructure in concept phase: discussions on modification of H<sub>2</sub> content in gas transport pipelines



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# Sector coupling offshore - North Sea Wind Power Hub

## Vision of a European power system in the North Sea based on "power islands"

- Transnational, hybrid and cross-sectoral approach to harness the potential of the North Sea and exploit synergies



## Hub-and-spoke concept

large amounts of offshore wind connected to one another, across countries while integrating different energy sectors and energy carriers

### Pros (+)

- Synergies across energy sectors
- Minimized environmental impact
- Higher security of supply

### Cons (-)

- More upfront investment
- Increased regulatory and market complexity



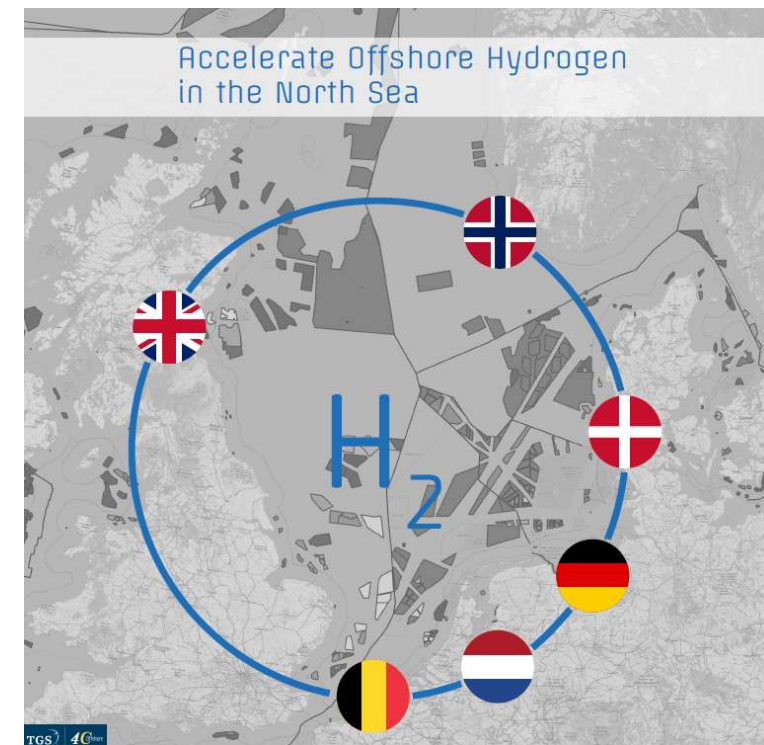
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The overall goal of the MOHN project is to develop a **strategy** to accelerate the implementation of **offshore electrolysis capacity** in the German and European North Sea.

## Objectives and main tasks

- **Align** together existing national and regional **initiatives** and **stakeholder** activities into a coordinated and accepted master plan
  - Survey, workshops, interviews
  - Identify **obstacles** and report about **best practice** among countries
- **Develop framework conditions** and provide results to stakeholders and regulators
  - GIS study to **identify areas for offshore electrolysis** and analyze cost drivers
  - Modelling of **economic impact of prospective and transnational planning** (project partner Fraunhofer IEG)
  - **Initial assessment of environmental impact** by comparing development scenarios (project partner Hereon Institute)



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We are looking forward to your **Feedback!**

## Thank You!

**Meiko Neumann**  
Managing director  
Tel: +49 (40) 3346553-77  
[neumann@cruh21.com](mailto:neumann@cruh21.com)

**Meryem Maghrebi**  
Consultant  
Tel: +49 (40) 3346553-69  
[maghrebi@cruh21.com](mailto:maghrebi@cruh21.com)

**cruh21 GmbH**  
Erste Brunnenstraße 1  
D-20459 Hamburg  
+49 (40) 3346553-60

[www.cruh21.com](http://www.cruh21.com)

