

# Unlocking potential of the North Sea

*North Sea Energy & PosHYdon*



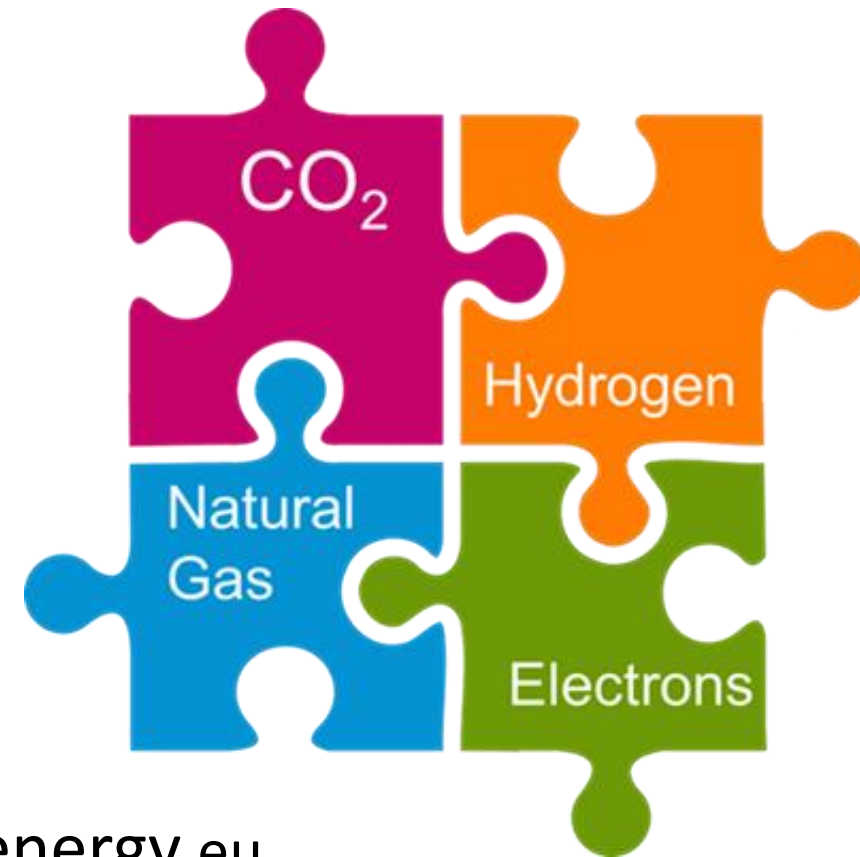
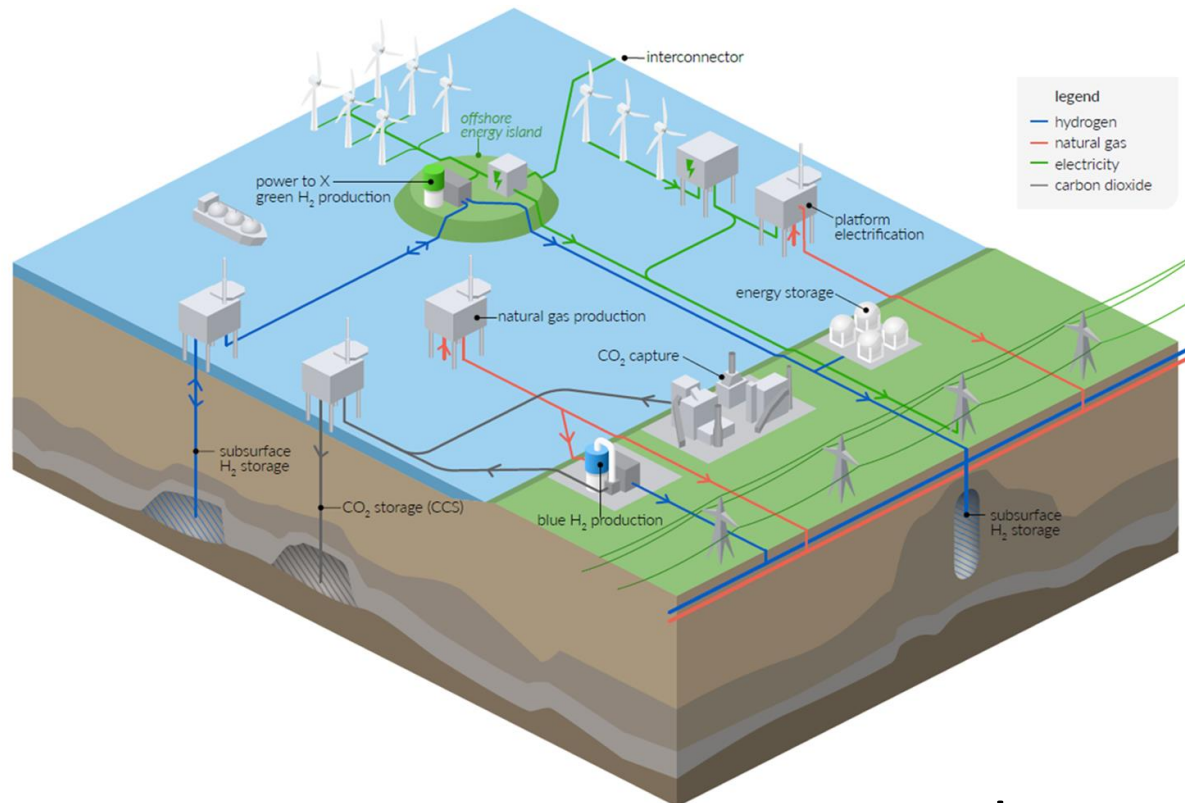
International Conference on Maritime Hydrogen and Marine Energy | 20 October 2021

Joris Koornneef, TNO

<https://north-sea-energy.eu>

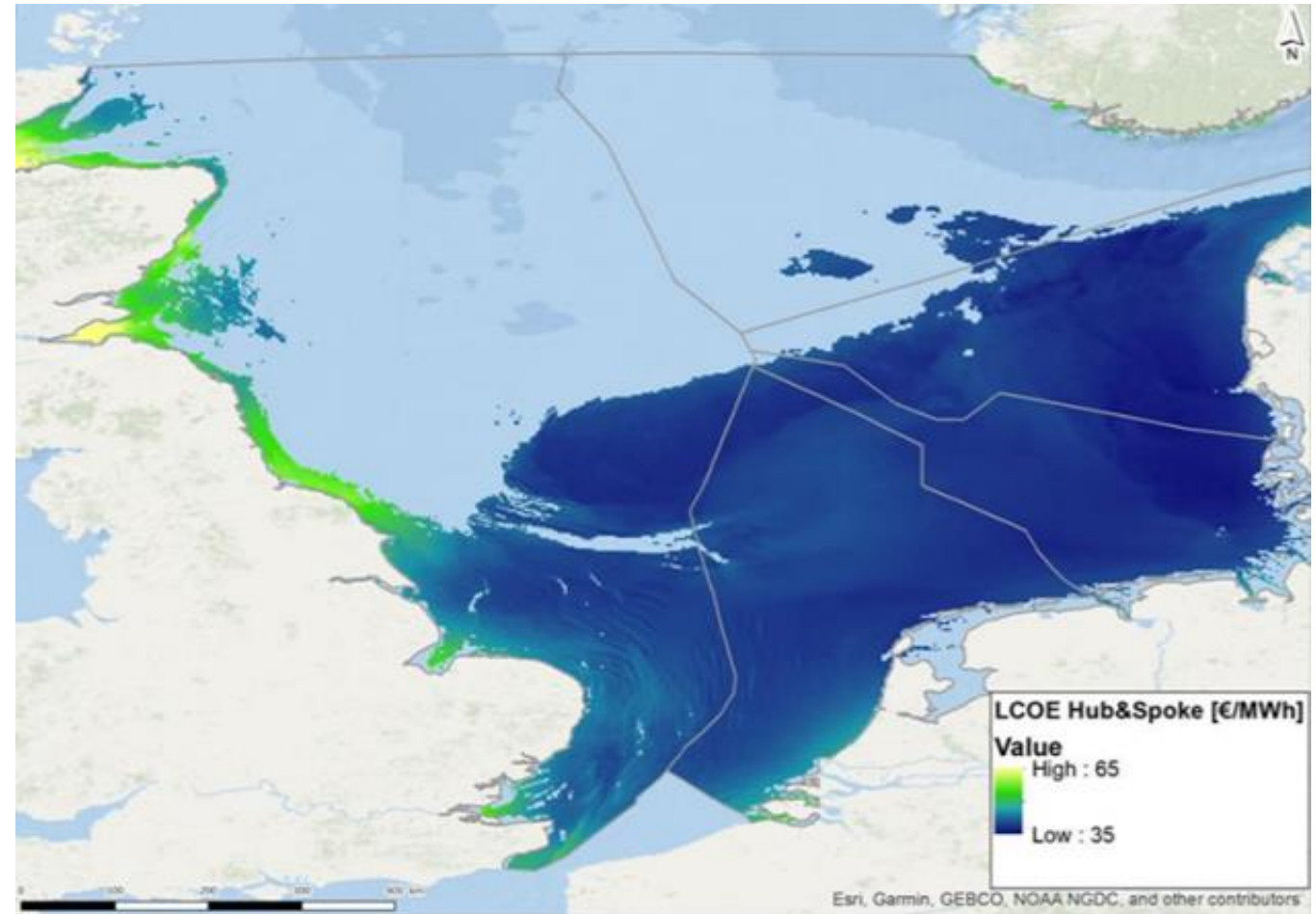
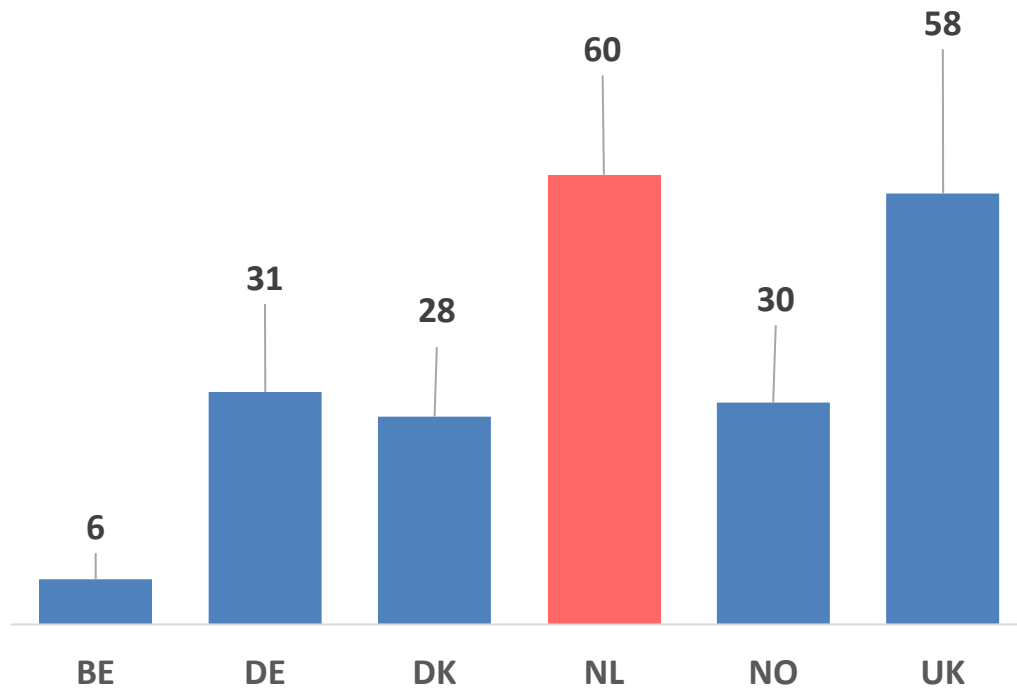
# North Sea Energy Program

- Smart offshore connections will save society costs, time, space, ecological impacts and CO<sub>2</sub> emissions.
- Potential as a pioneer region for the European Green Deal.
- Includes pilots and projects to test and demonstrate innovative concepts in practice.



# Offshore wind: Vast potential and pivotal to reach Paris targets affordably.

Offshore Wind deployment in the  
North Sea  
by 2050 (GW)



North Sea Wind Power Hub Consortium, "Cost evaluation of the North Sea - Offshore Wind Post 2030," 2019.



# Offshore wind towards 2040

- Complex puzzle:
  - Space (where to build and land to shore? Conflicts? Synergies? Nature vs Climate)
  - Economy (sustainable business case? nearby electric, further as hydrogen?)
  - Timing (which ones first?, overcapacity electrons? E-market and H<sub>2</sub> market?)



# Hydrogen supply and demand in 2050

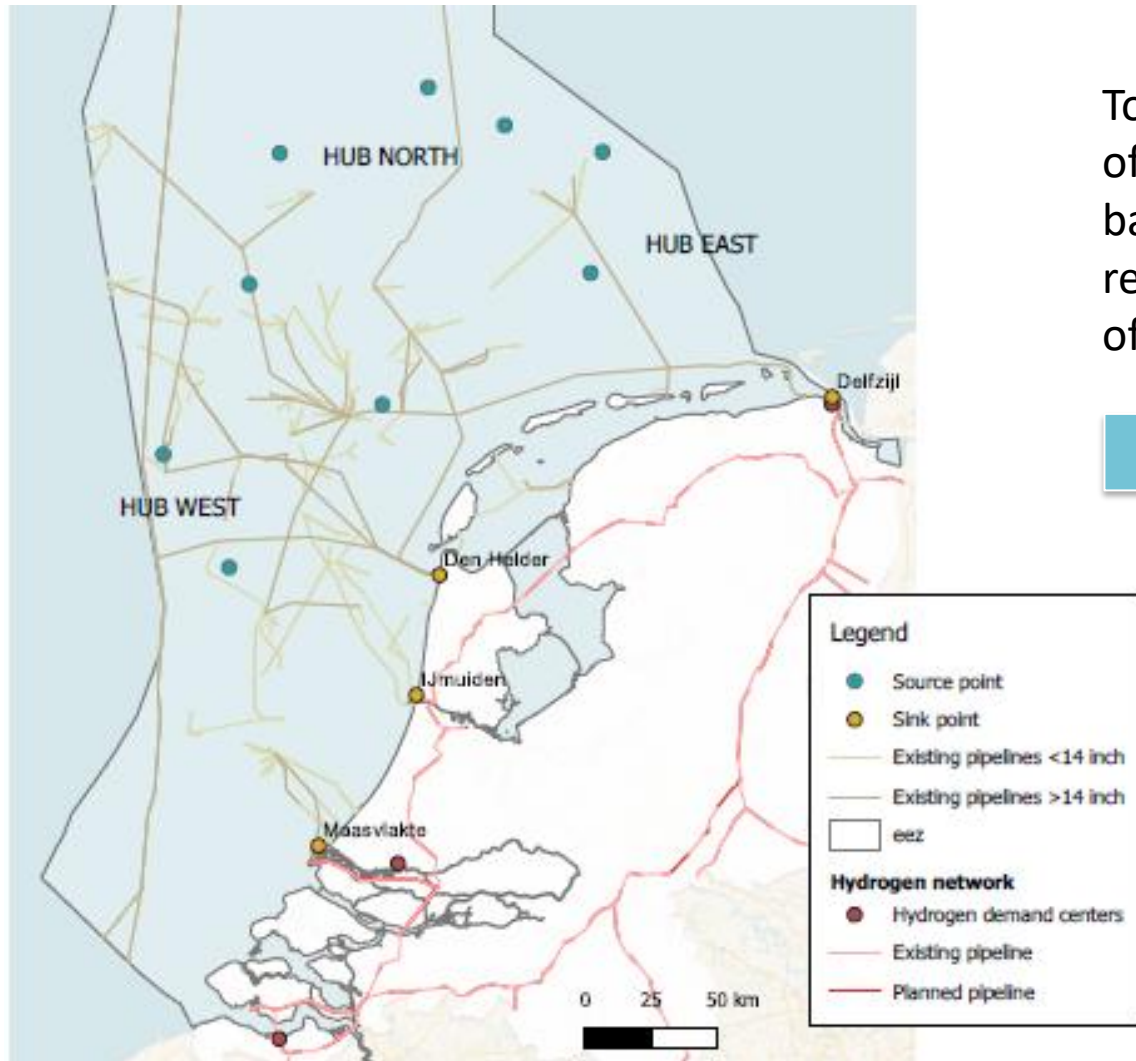
## Exploratory scenario North Sea Energy for Netherlands

- **Transmission** of offshore wind energy to shore as **electricity** will remain dominant.
- **Hydrogen**: is a robust solution in the future energy system with a balanced mix of blue and green hydrogen production (on- and offshore)

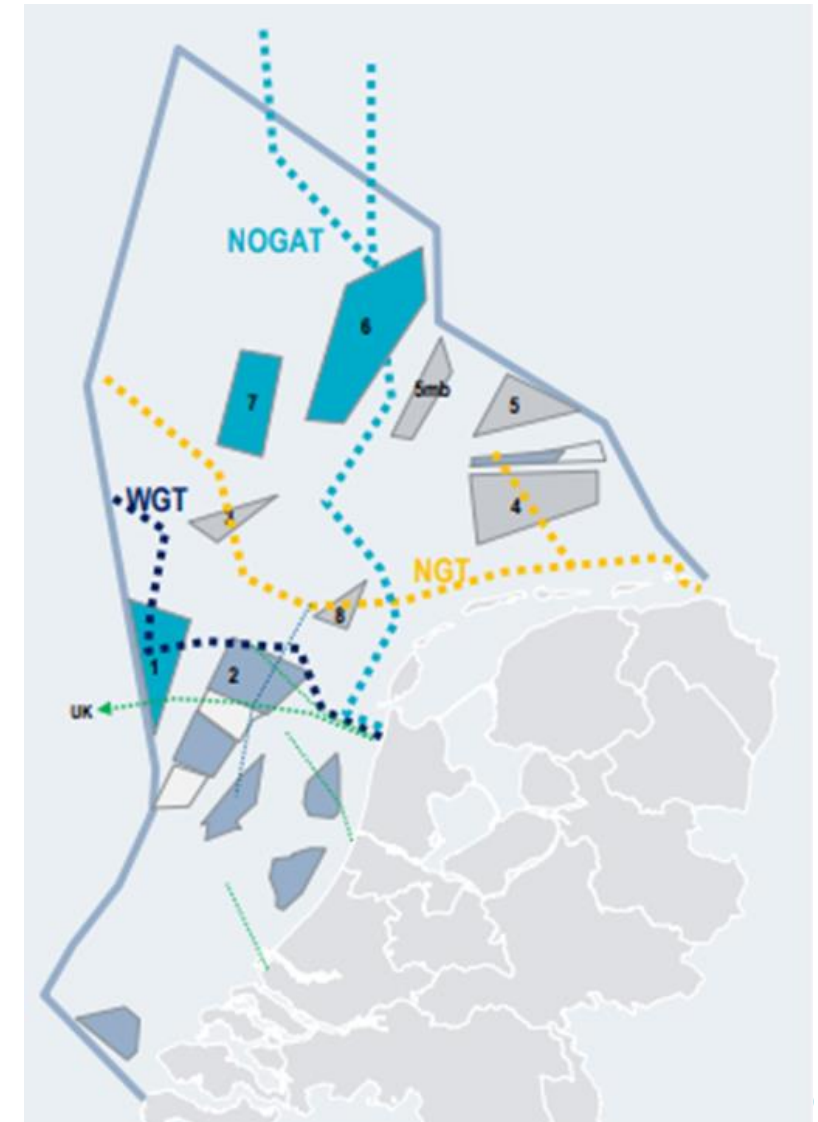


# Hydrogen backbone in the Netherlands

## Hubs for green hydrogen

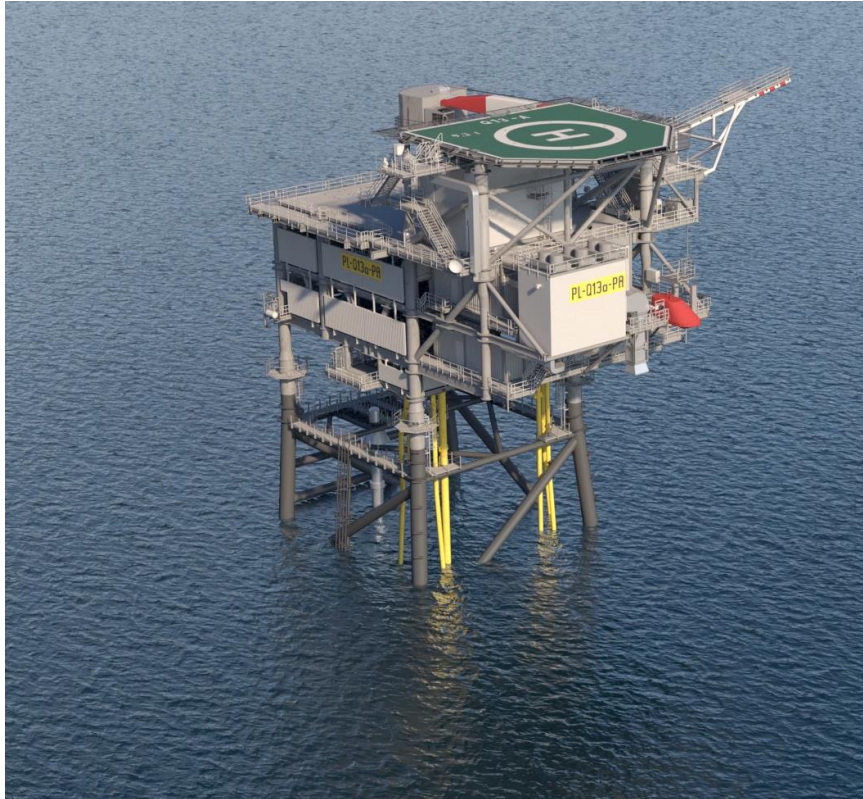


Towards  
offshore  
backbone with  
re-use of  
offshore assets

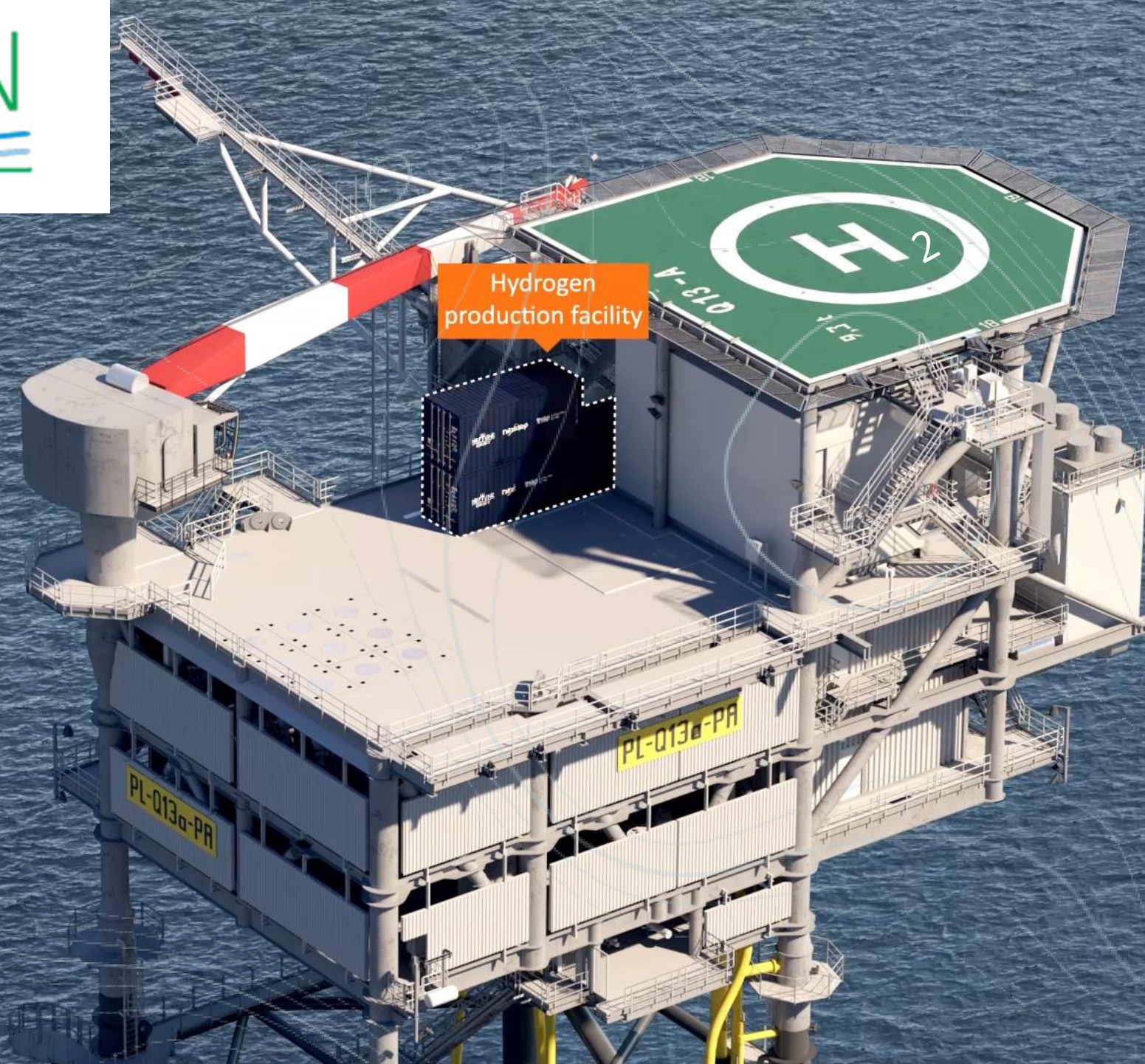




# HUB & Hydrogen PERSPECTIVE





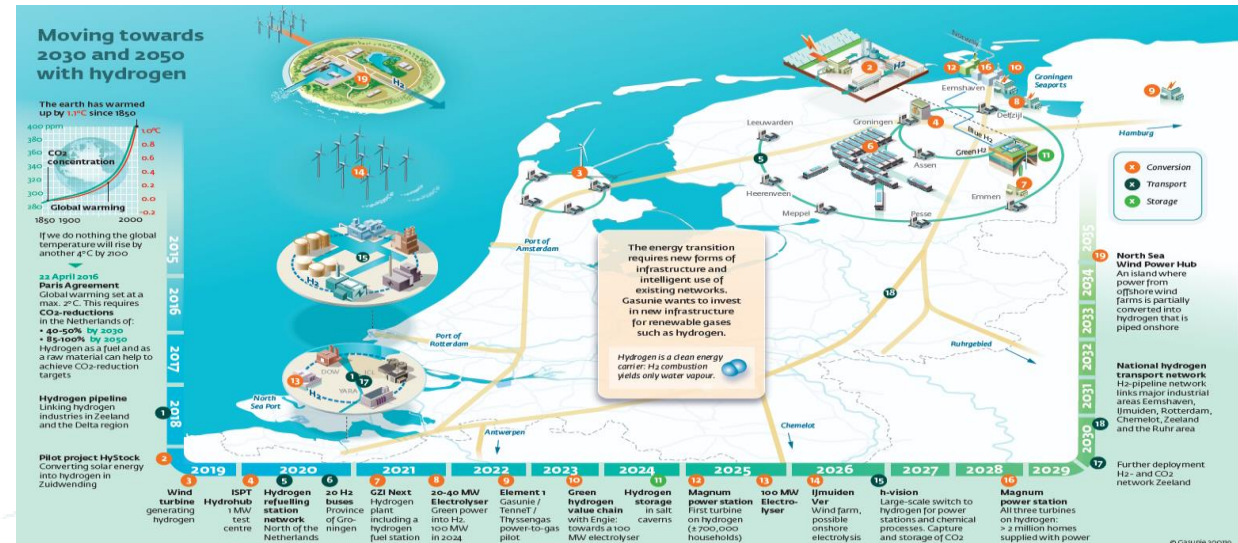
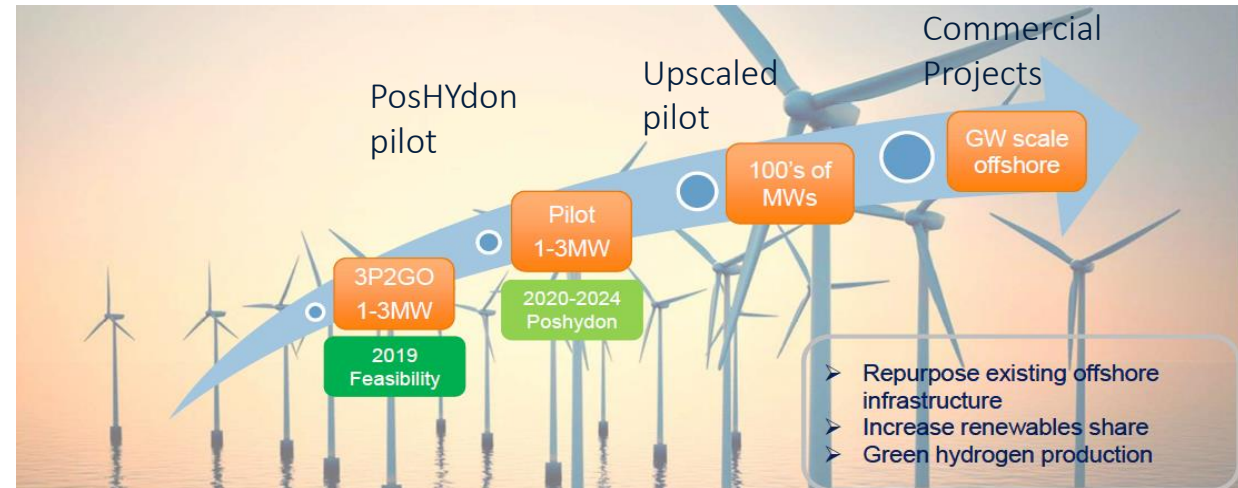




# PosHYdon first step towards needed scale-up

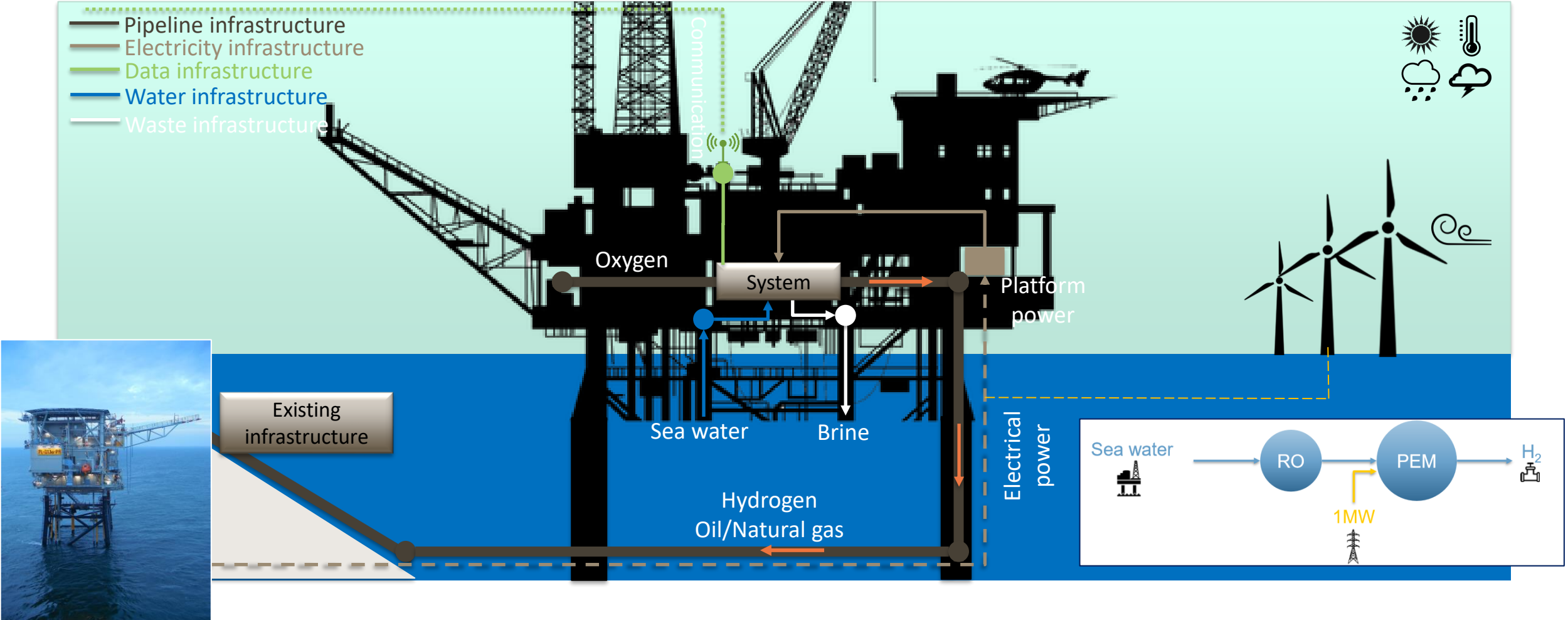
## Hydrogen:

- PosHYdon
- Scale up towards 10 MW
- 500 MW design on the table in North Sea Energy programme
- Final target at GW scale



# PosHYdon

Pilot for offshore hydrogen production

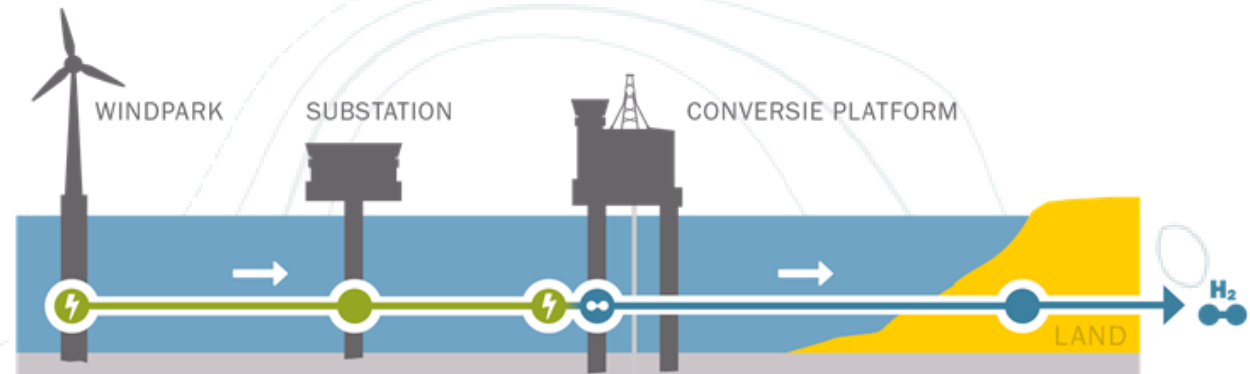
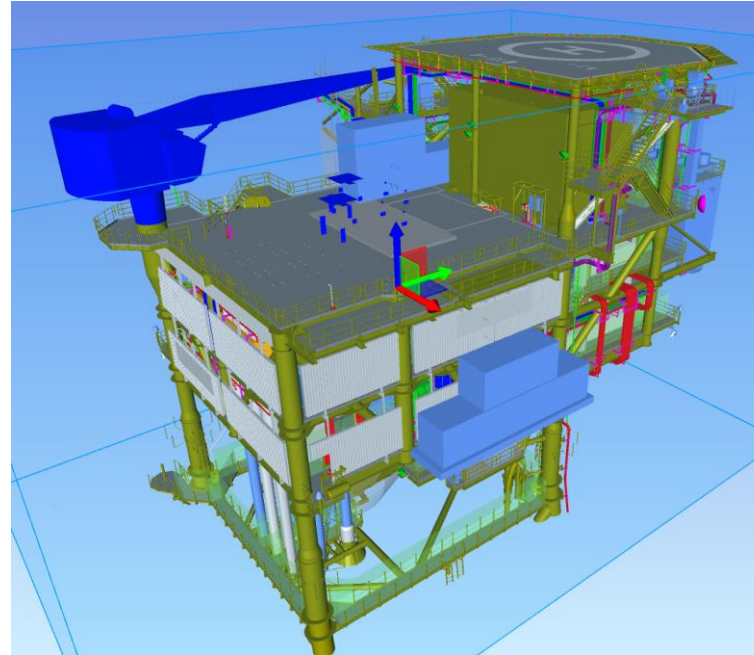


Q13a platform  
(Neptune Energy)



# PosHYdon: some facts

Type:	PEM electrolyser
Nr. of Cell stacks:	1
Input power:	1 MW
Water consumption:	300 l/h
Hydrogen flow:	200 Nm <sup>3</sup> /h
Hydrogen purity:	99.998%
Outlet pressure:	20- 30 barg
Footprint:	2 x 20ft container
Weight:	lifting weight of < 20 tonnes
Cable	9 MVA, 25 kV



# Q13A-A HYDROGEN PILOT PROJECT

## UPDATE

- Hydrogen pilot project to demonstrate green hydrogen production offshore
  - **Safety:** how to create a safe environment to handle hydrogen (and oxygen) on a live oil & gas platform?
  - **Technical:** Address limitations of co-production of H2 and North Sea gas water desalination - power fluctuation and electrolyser performance
  - **Regulatory:** Identify and address requirements related to permitting, certification and entry specs .
  - **Operational:** Logistic and training and competencies gap analysis
  - **Economical:** How to maintain value of H2 while admixed with natural gas? Contract for difference, certificates of origin? Economics will be run for large scale H2 production offshore
- Current status:
  - Consortium has kicked safety study work
  - Technical analysis ongoing on existing electrolyser design
  - Entry specs are being discussed.

