

# Renewable Energy and Hydrogen in the Netherlands

Current status overview

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06 September 2023



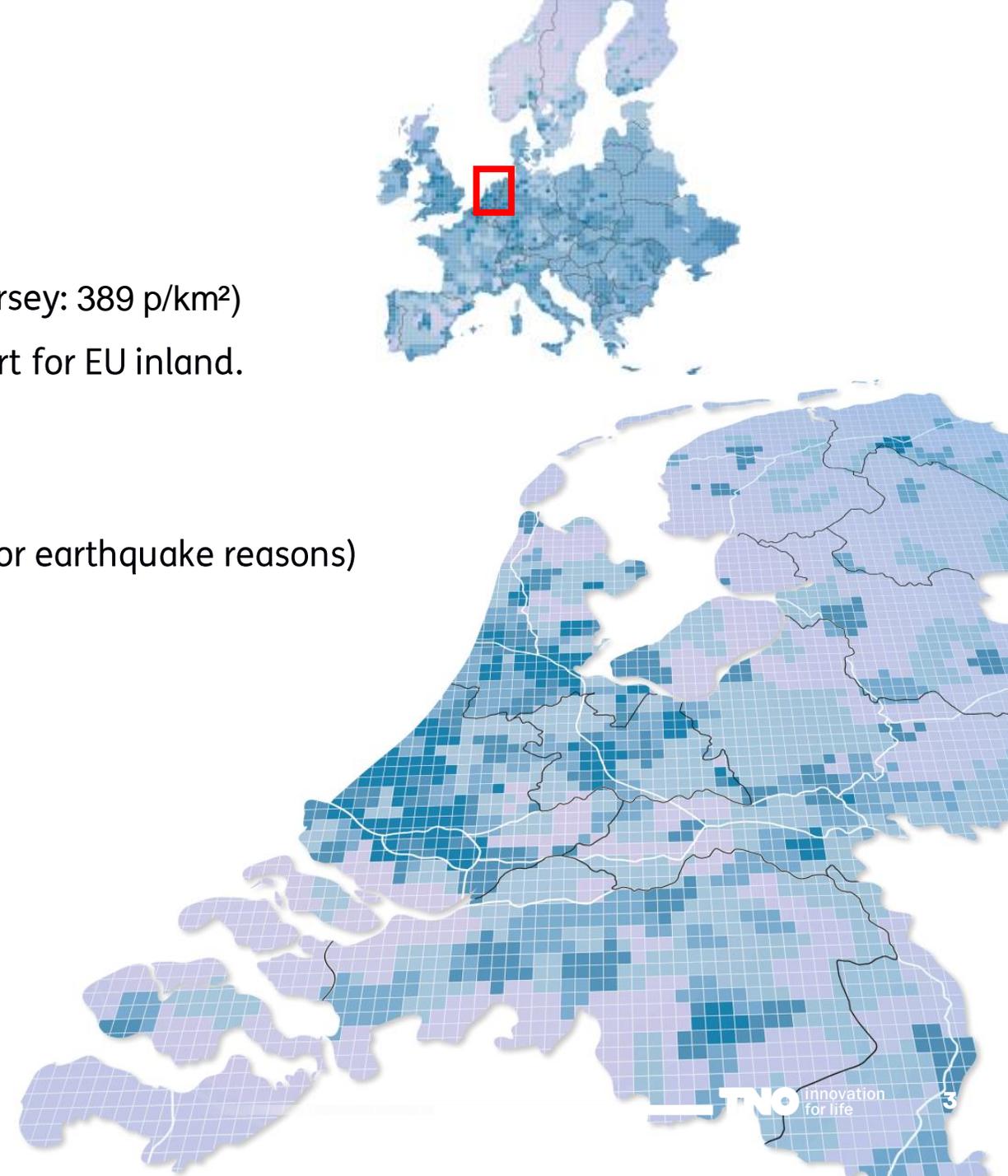
# Agenda



1. Renewable energy in the Netherlands
2. Solar and Wind energy production
3. Hydrogen
4. Offshore Hydrogen
5. TNO

# Renewable energy in the Netherlands

- Small and densely populated country (416 p/km<sup>2</sup>) (New Jersey: 389 p/km<sup>2</sup>)
- Heavy industry (steel, refineries, fertilizer plants etc), import for EU inland.
- Since the 60's, highly dependent on oil and gas. Yet now:
  - Less domestic production (large Groningen field closed for earthquake reasons)
  - Import restrictions from Russia
- Focus for new energy carriers:
  - Residual biomass (rely on import)
  - The North Sea
    - Offshore wind
    - Offshore solar
    - CO<sub>2</sub> storage



# Solar and Wind energy production

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## Windenergie op zee

met kabelroutes van het net op zee



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Most recent tender: Hollandse Kust West, 2x0.7GW, incl. system integration:

Current tender: IJmuiden Ver – 2x2 GW, incl focus on system integration:

- Investments in offshore solar energy – up to 50 MWp
- Investments in new electricity demand (with geographical scope) operational at times of high OWF output, up to 1 GW
- operational in 2028/2029

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# Hydrogen

## Onshore

- 7 IPCEI projects (1,15 GW) (currently 1 FID voor 0.2 GW)
- 2 projects in SDE++; 2 x 25 MW by H2Volt.
- H2Hollandia (Solar + electrolysis: 5 MW).
- HYGRO project (direct coupling between wind turbine and electrolyzer, complete value chain).

## Offshore

- <100 MW (2028)
- 500 MW (2031)
- Smaller pilots (Poshydon)

## Consumers

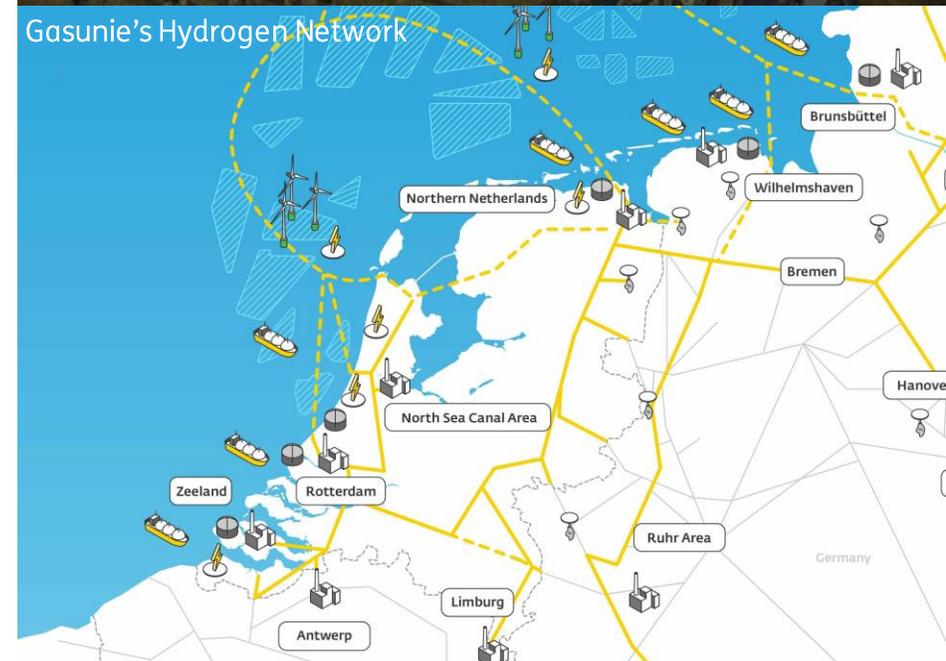
- Refineries (Shell, BP, Exxon)
- Fertilizer plants (OCI, YARA)
- Tata Steel (DRI)

## Transport and Storage

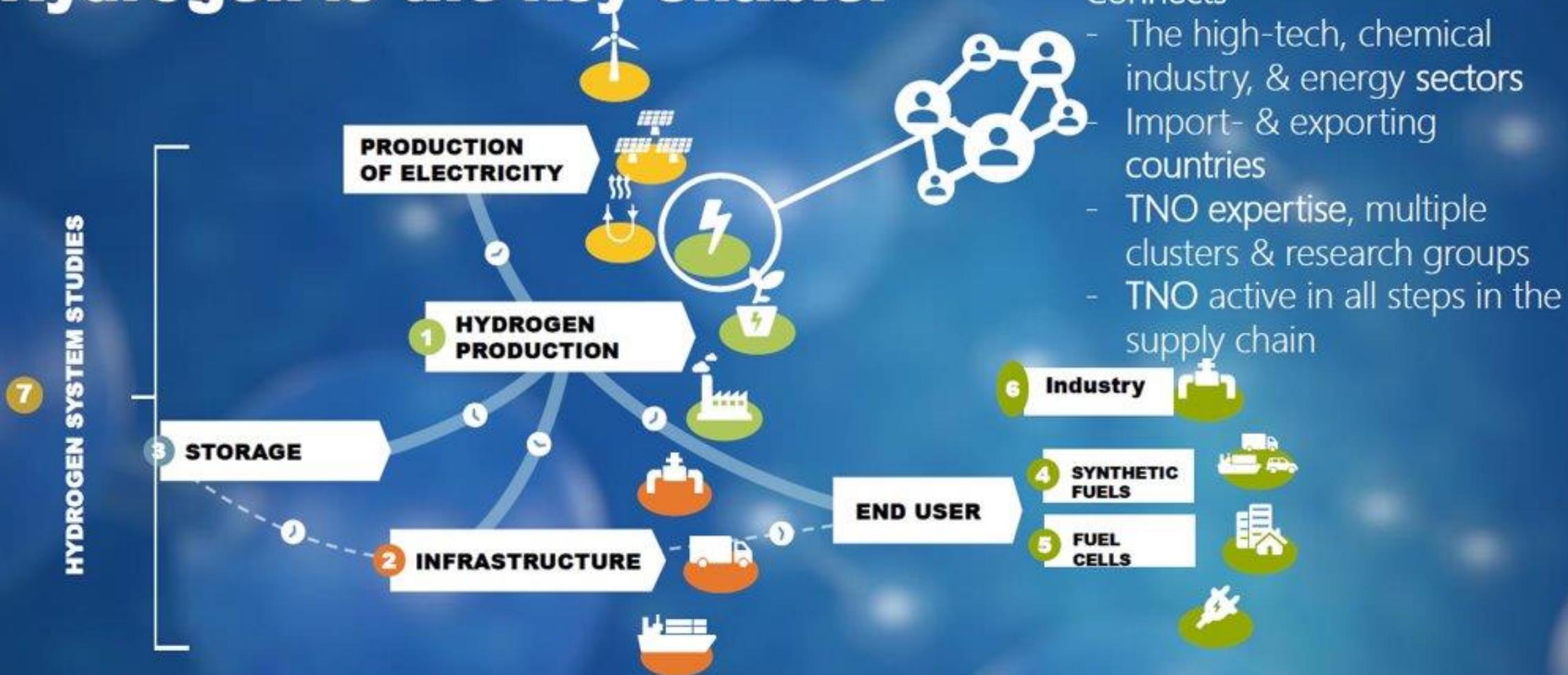
- Hydrogen backbone
- (Zuidwending, 4 salt caverns)



Shell Holland Hydrogen 1- Port of Rotterdam



# Hydrogen is *the* key enabler



# TNO and H2 system integration

## Technology development (examples):

- Faraday Lab – Electrolyzer scale up, with industriale partners
- SwitchLab – small scale system integration demonstrator lab - Wind / solar / Hydrogen / batteries

## Pilots and multi-stakeholder projects (examples):

- PosHydon (offshore H2 production)
- North Sea Energy (offshore system integration)
- Offshore Solar (floating solar in sea conditions)
- Energy system modelling (energy based / physics based)
- Storage (H2 in salt caverns and reservoirs, but also NG and CO2)

## Knowledge sharing platforms (together with Dutch Ministry):

- HEROW (offshore hydrogen production)
- SHIP NL (hydrogen import)





# **We need to work on this jointly**

Bridge the gaps between the world wide hydrogen ambitions and the current state of play.

# Contact

- TNO website
  - [Innovation for life | TNO](#)
  - [System transition: to a CO2-free energy system | TNO](#)
- Project websites
  - [Poshydon | Green Hydrogen Energy](#)
  - [North Sea Energy \(north-sea-energy.eu\)](#)
  - [HEROW \(topsectorenergie.nl\)](#) (offshore hydrogen production knowledge sharing platform)
- Lennert Buijs
  - [Lennert Buijs | LinkedIn](#)

