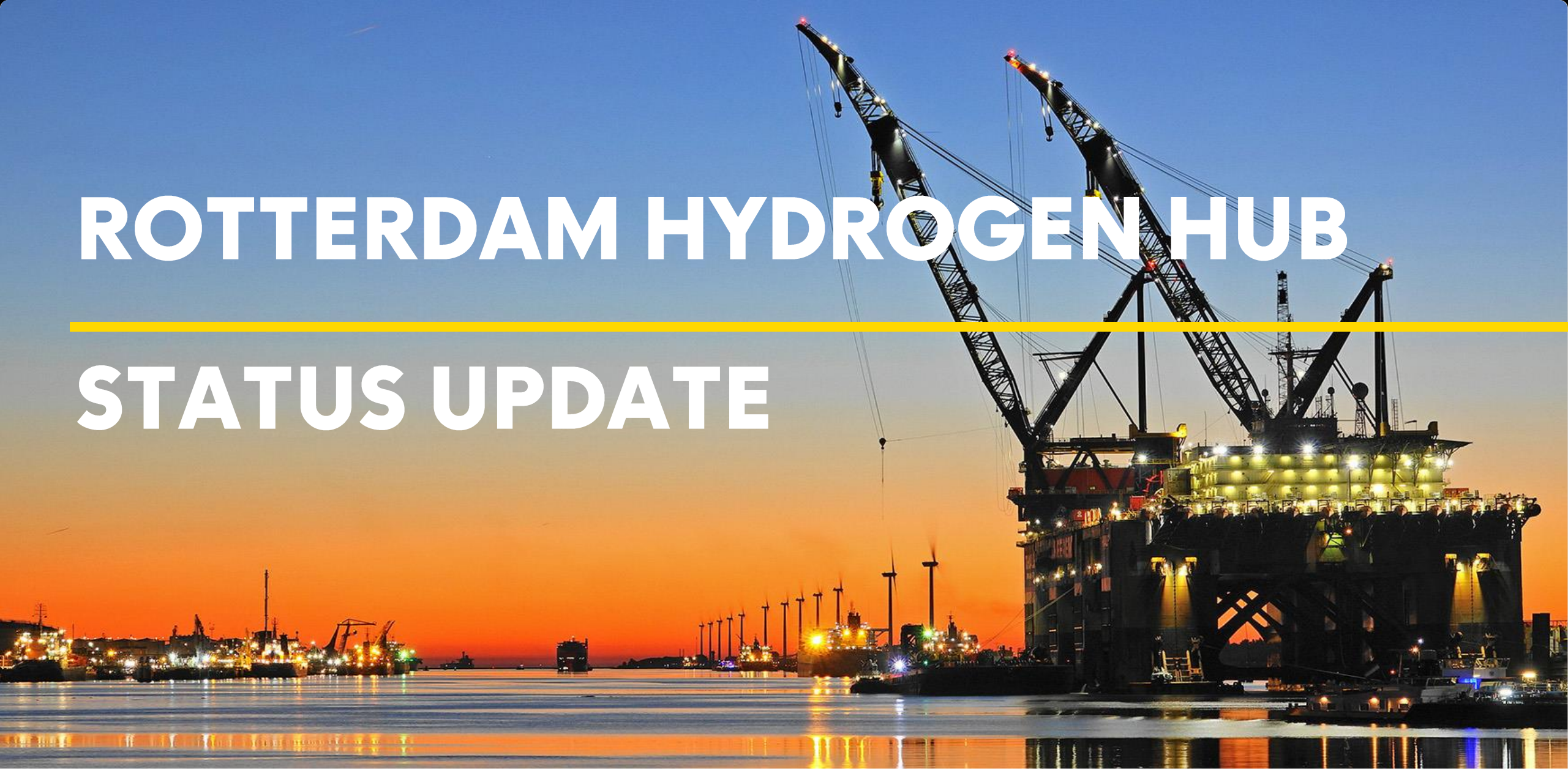




ROTTERDAM HYDROGEN HUB

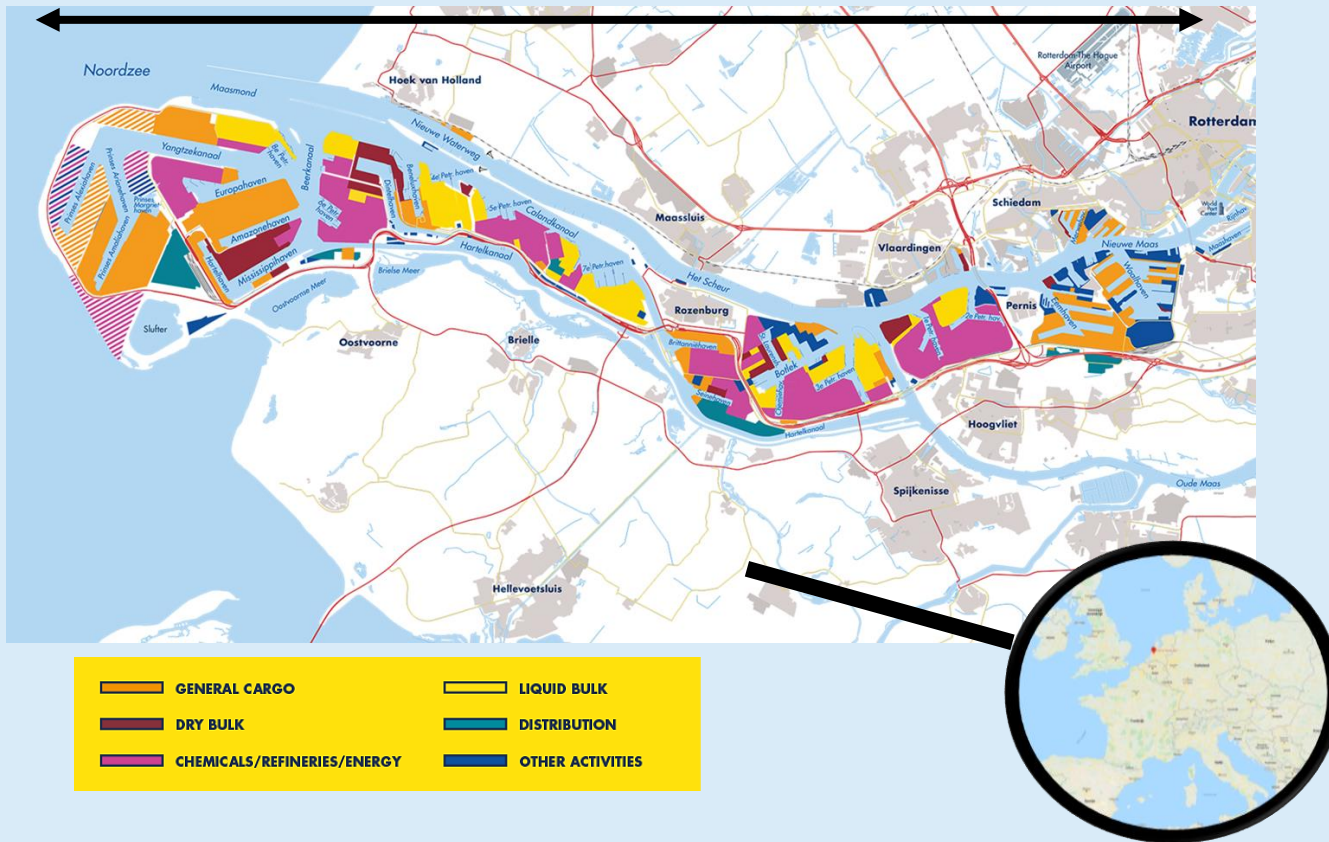
STATUS UPDATE

Martijn Coopman
August 24 2022

*The Port of Rotterdam is searching for Partners
to kick-start and accelerate the Green Hydrogen Supplychain
from Overseas to NW Europe via the Port of Rotterdam.*

THE PORT OF ROTTERDAM IS THE ENERGY HUB OF EUROPE

Over 25 miles / 40 km

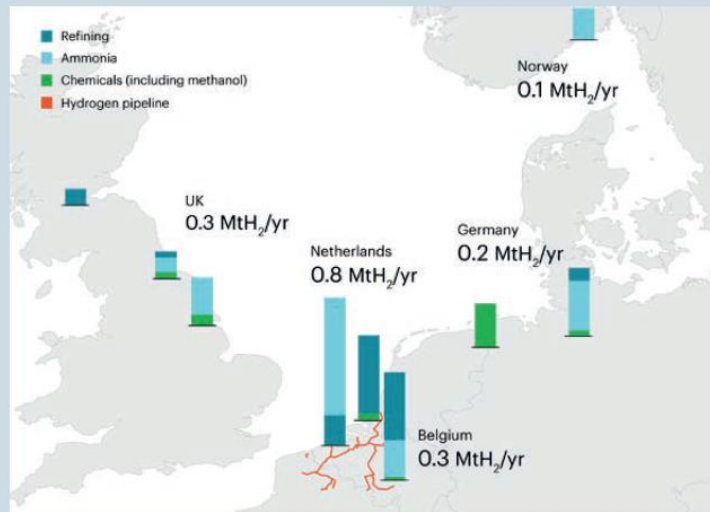


- At this time 13% of the total EU energy-consumption passes through Rotterdam
- Largest port in Europe, 10th port worldwide
- Total employment 385,000 people*
- Total added value € 45,6 billion (6.2% GNP)*
- Visits (2019):
 - 29,491 sea-going vessels
 - 107,000 inland navigation
- 3.000 companies
- Throughput (2019): 469.4 mln tons; 148 million TEU
 - 45% Liquid bulk
 - 32% containers
 - 17% dry bulk
 - 6% Breakbulk

BUILDING ON AN EXISTING HYDROGEN MARKET & NETWORK

1. Currently NW Europe's hydrogen market already well developed. Mostly for industrial uses.
2. Existing Hydrogen networks between Rotterdam, Belgium and Northern France.
3. Rotterdam is the spoke in the wheel

North Sea hydrogen demand capacity by sector and pipeline infrastructure, 2018

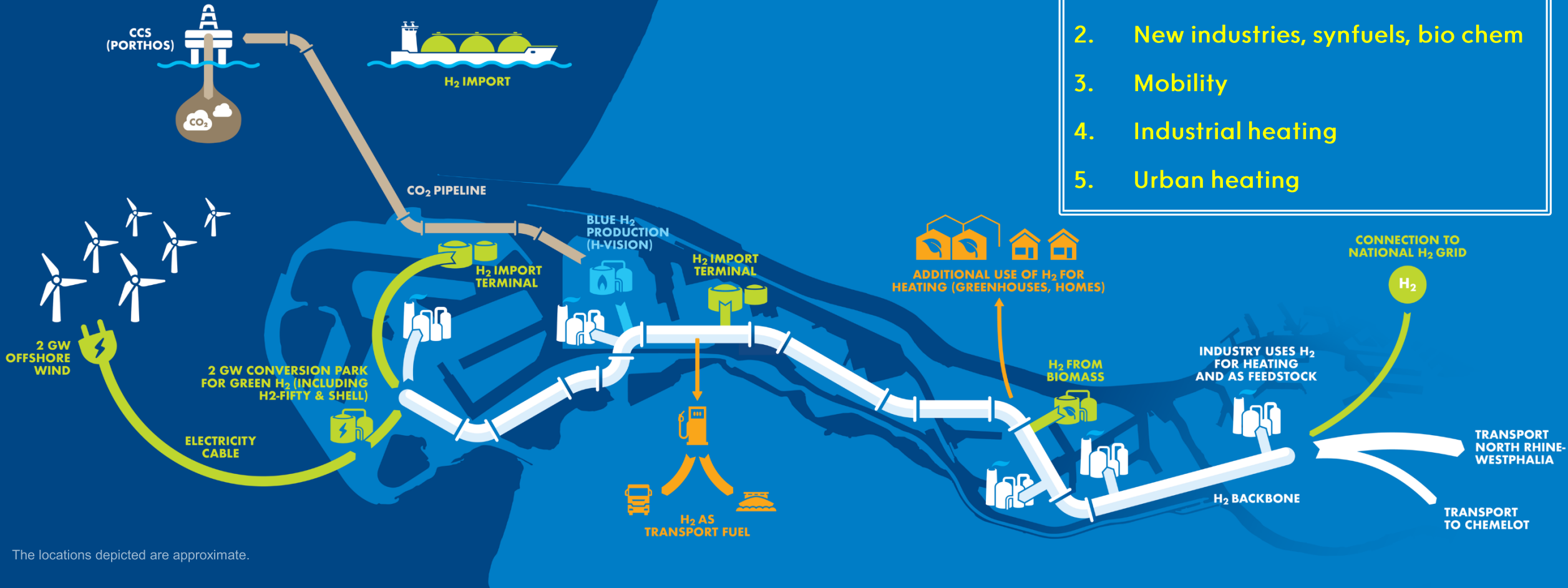


Source: *The Future of Hydrogen*, June 2019



Existing hydrogen networks linking Netherlands, Belgium and Northern France

HYDROGEN ECONOMY IN ROTTERDAM STARTS WITH BACKBONE

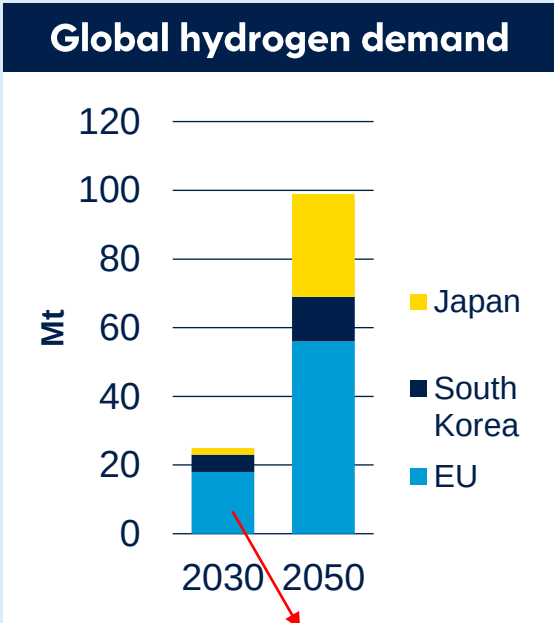


Hydrogen demand will grow for:

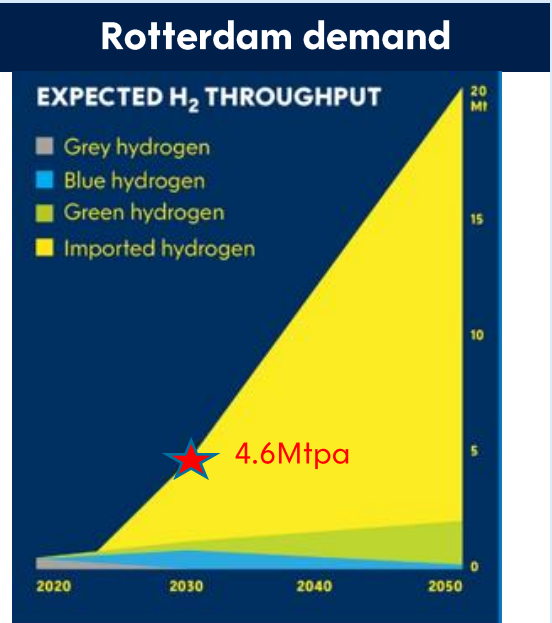
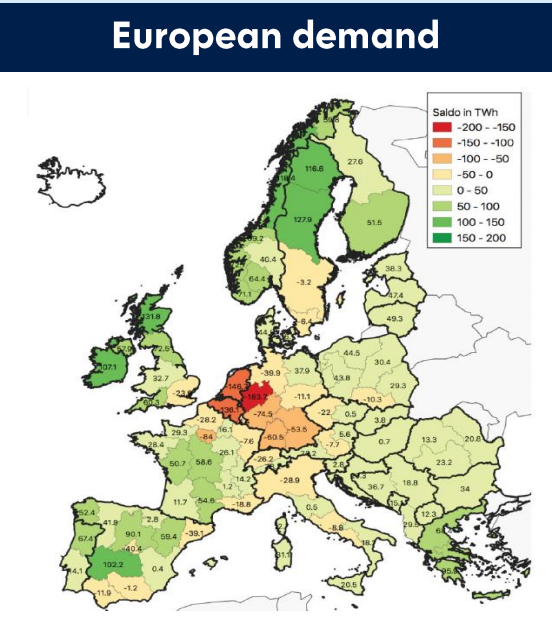
1. Industrial feedstock
2. New industries, synfuels, bio chem
3. Mobility
4. Industrial heating
5. Urban heating

A HUGE NEW MARKET IS DEVELOPING

CATALYSED BY THE UKRAINE CRISIS



Of which 10 Mtpa imports



Today - 2030

The first green and blue hydrogen proof of concept projects are being developed. Major scaling commencing 2027. Europe aims for development of 40GW renewable in- and 40GW outside Europe. Recent Repowe EU plans suggest 10 mtpa local & 10 mtpa imports

2030 - 2050

Rapid scale-up due to regulatory incentives (ETS, carbon border adjustments, more clear regulation of hydrogen trading and transport, timed to emerging EU backbone) aimed at achieving the next climate target.

2050 - onwards

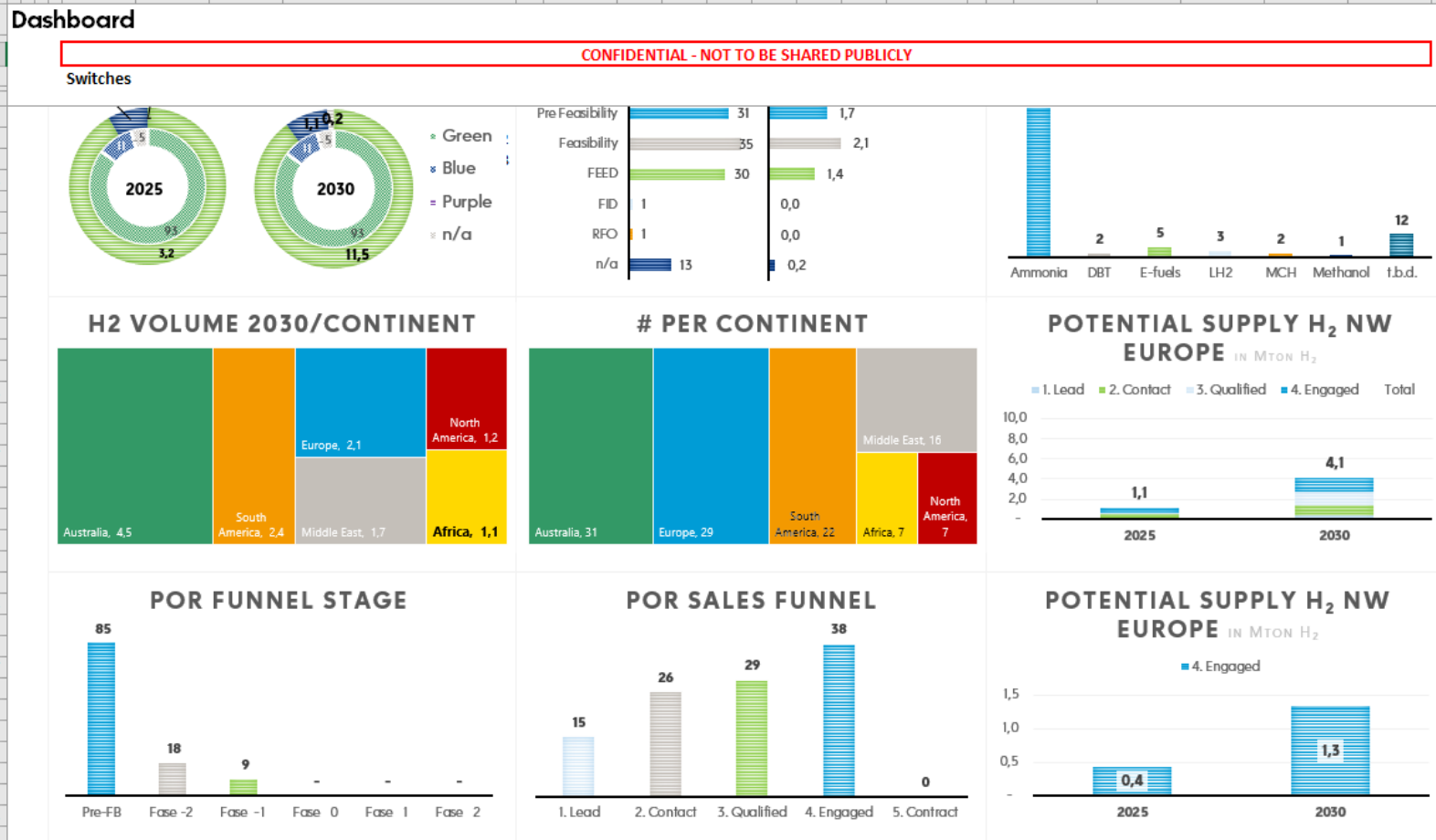
Hydrogen will be an intrinsic part of our integrated energy system.

ROTTERDAM TO SUPPLY EUROPE WITH 4.6 MEGATONS OF HYDROGEN BY 2030 TOGETHER WITH INTERNATIONAL PARTNERS



DASHBOARD POR PROJECT DATABASE

STATUS MAY 2021: ~100#
(export focussed projects)



1. Ratio green vs blue and other colors
2. What stage are the projects in?
3. Which carrier ?
4. Production H2 in Mtpa per continent in 2030
5. # large scale H2 projects per continent
6. Forecast volumes for export to NW Europa ready in 2025 en 2030

SOUTH AUSTRALIA - PORT OF ROTTERDAM HYDROGEN SUPPLY CHAIN

PRE - FEASIBILITY STUDY



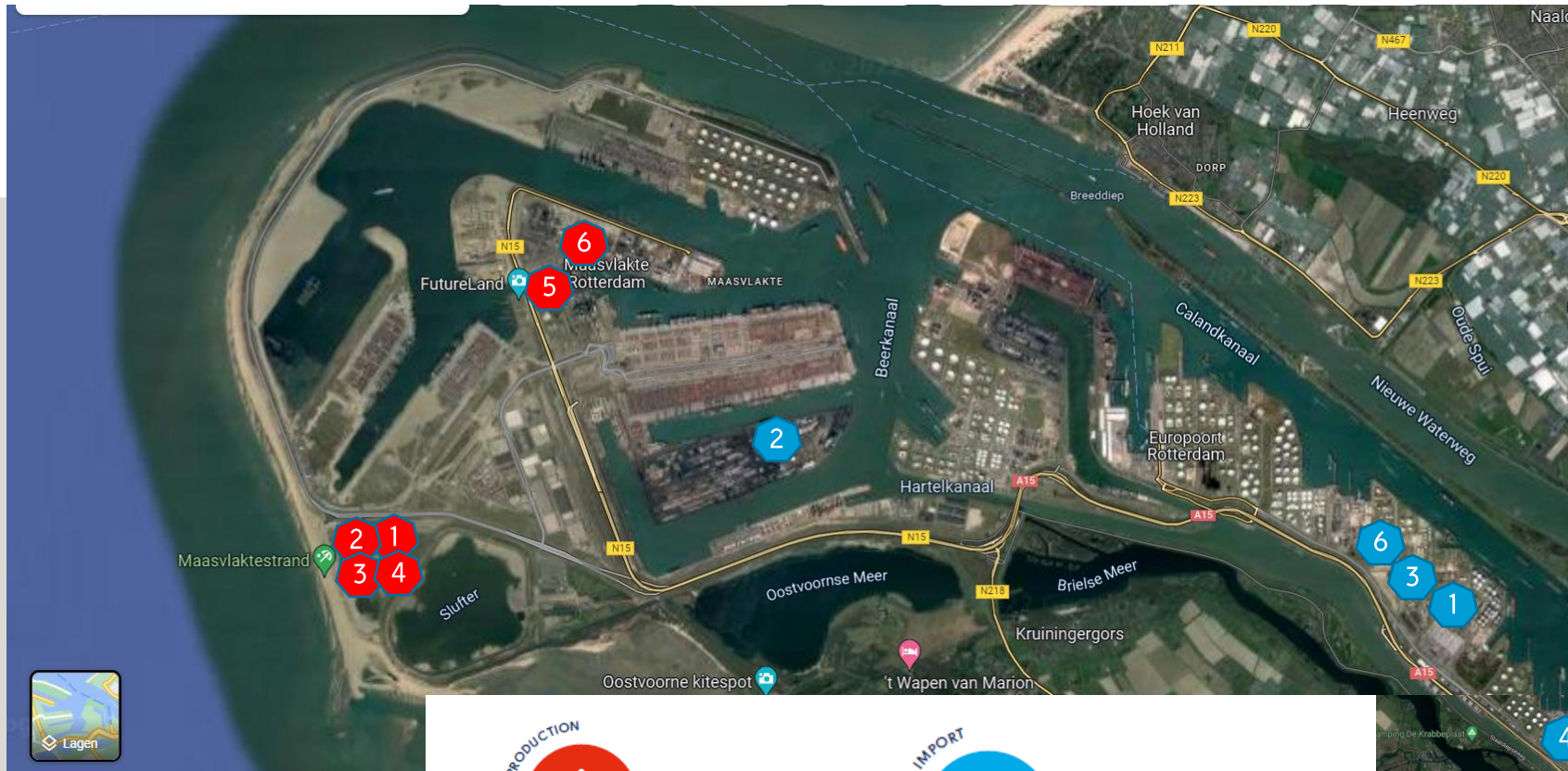
Executive presentation
8th of December 2021



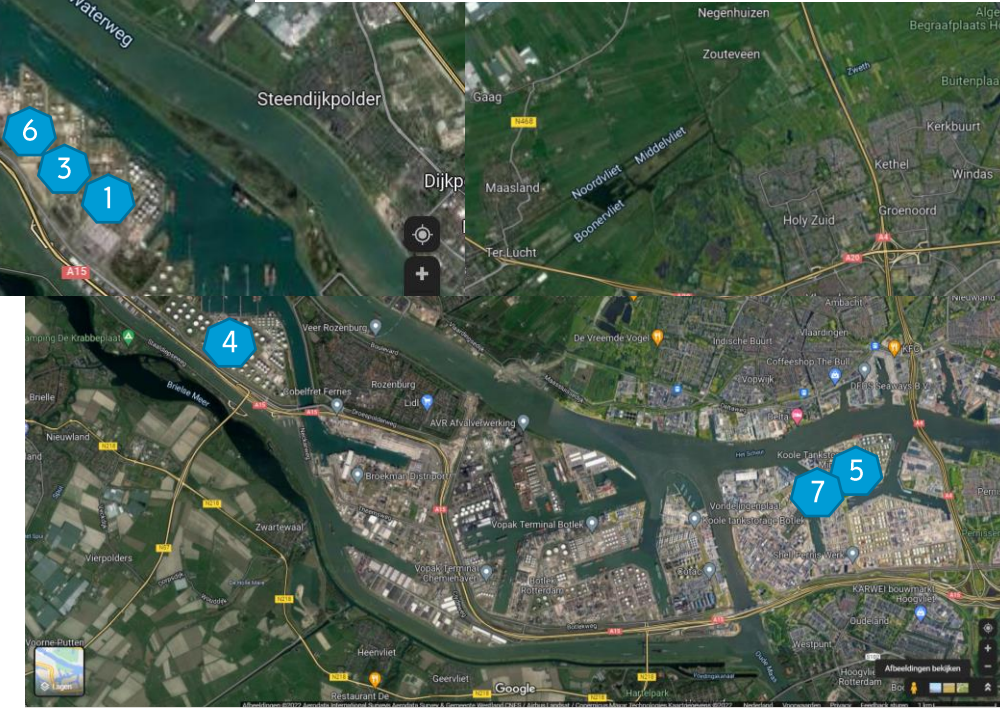
Government of South Australia
Department for Energy and Mining



**Port of
Rotterdam**



- 1 HyTrucks
- 2 Rh2ine
- 3 Green Energy Refuelling Station (GERS)
- 4 Hydrogen public bus transport Goerree Overflakkee - Hoekse Waard
- 5 Everfuel Refuelling Station Heinenoord
- 6 Rhine Hydrogen Integration Network of Excellence (RH2INE)



- 1 Connecting offshore wind energy
- 2 H2-Fifty
- 3 Shell - Holland Hydrogen I
- 4 AirLiquide
- 5 Conversiepark Maasvlakte
- 6 Uniper
- 7 Multiplhy
- 8 AVR e-thor
- 9 H-vision



- 1 OCI
- 2 ACE Terminal
- 3 Global Energy Storage (GES)
- 4 Vopak
- 5 Koole, Chiyoda, Mitsubishi, Port of Rotterdam
- 6 Air products & Gunvor
- 7 Koole & Horisonti Energi
- 8 Shell, Vopak

NATIONAL AND INTERNATIONAL INFRASTRUCTURE IS CRUCIAL

Right now, Rotterdam supplies a large part of NW-Europe's industries, including North Rhine-Westphalia, with fossil fuels and feedstock.

To supply these with the vast quantities of sustainable energy and feedstock needed to decarbonize, new infrastructure like the Delta Corridor has to be developed.

- LEGEND**
- Delta Corridor (LPG/propene, butane, CO₂ en H₂)
 - ... Possible extension Delta Corridor
 - HyTransPort.RTM (connected to the Delta Corridor & the Dutch national H₂-grid)
 - Dutch national H₂-grid (HyWay27)



A DECADE OF CHANGE

2024

First Green ammonia imports start

2025

H₂ backbone (HyTransPort.RTM) operational

Shell 200 MW electrolyser operational on conversion park

2025

Road transport: 1000 H₂ powered trucks of which 500 in Rotterdam

LOHC import at industry scale

Uniper 100 MW electrolyser operational (towards 500 MW in 2030)

H₂-Fifty 250 MW electrolyser operational (BP, HyCC)

2026

RH₂INE: 12 inland barges on H₂ operational

Pipelines to Chemelot and North Rhine – Westphalia operational (Delta Corridor)

2027

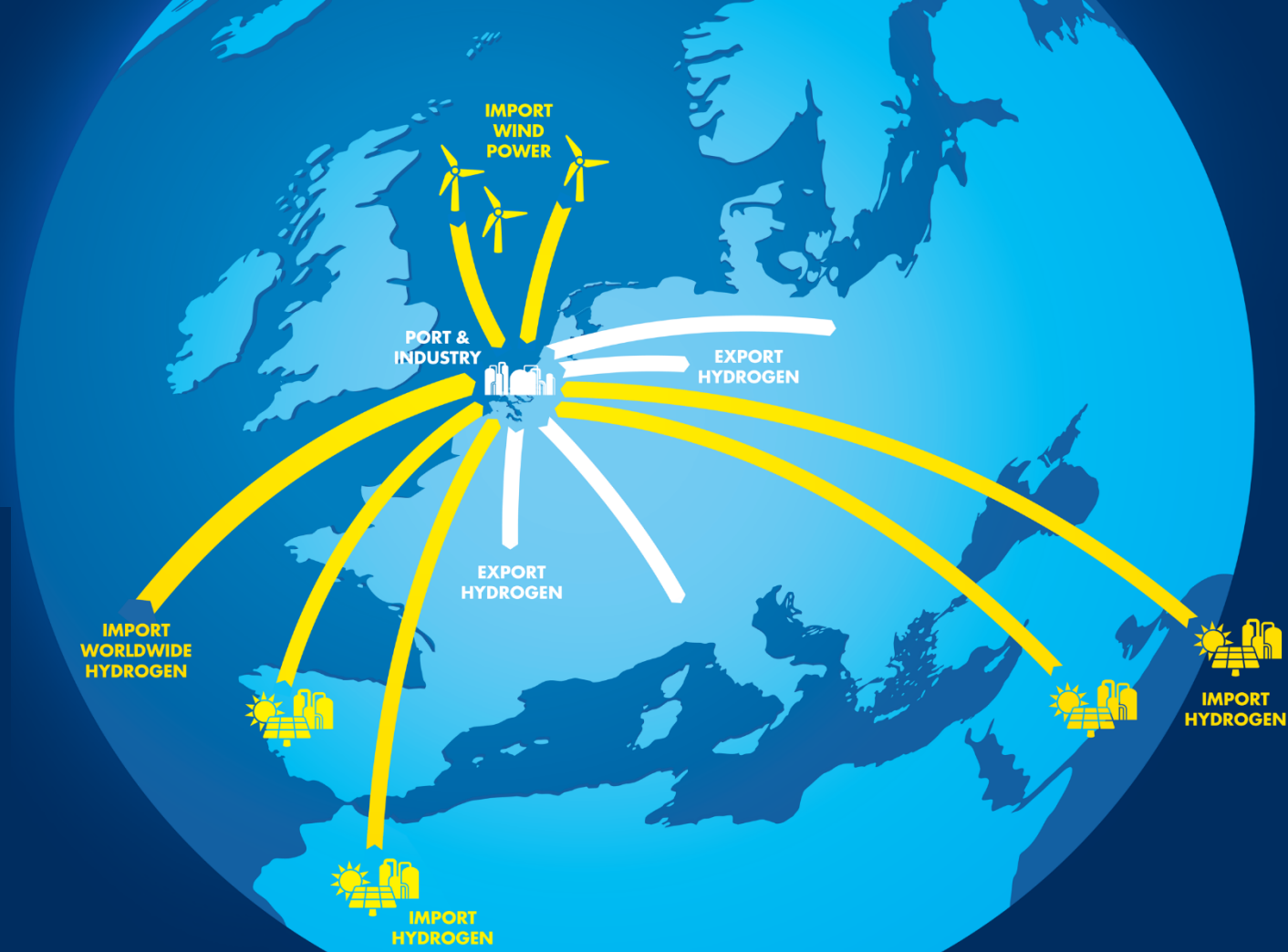
LH₂ terminal operational

H-vision operational (blue H₂)

2030

2 – 4 Mt Hydrogen imports

2 – 2,5 GW electrolyzers operational



ROTTERDAM HYDROGEN HUB OF EUROPE

We look forward to a long term partnership,
leading to a better world for all.