

2º Congreso
Internacional
de Hidrógeno

ROTTERDAM: HYDROGEN HUB OF EUROPE

PORT OF ROTTERDAM FACTS

2023



**AWARDED BEST
PORT INFRASTRUCTURE**

100.000
INLAND
VESSELS
PER YEAR

30.000
SEA-GOING
VESSELS
PER YEAR



€63 BILLION
ADDED VALUE,
8.2% OF DUTCH BBP

42 KM
PORT AREA



**4 CRUDE OIL
REFINERIES**



**45 PETROCHEMICAL
COMPANIES**



**4 VEGETABLE OIL
REFINERIES**



3 BIOFUEL PLANTS



**CURRENT HYDROGEN
PRODUCTION 0,4-0,5 MTON**



**13% OF TOTAL
EU ENERGY CONSUMPTION
PASSES ROTTERDAM**



**GATEWAY TO A MARKET OF
440 MILLION CONSUMERS**

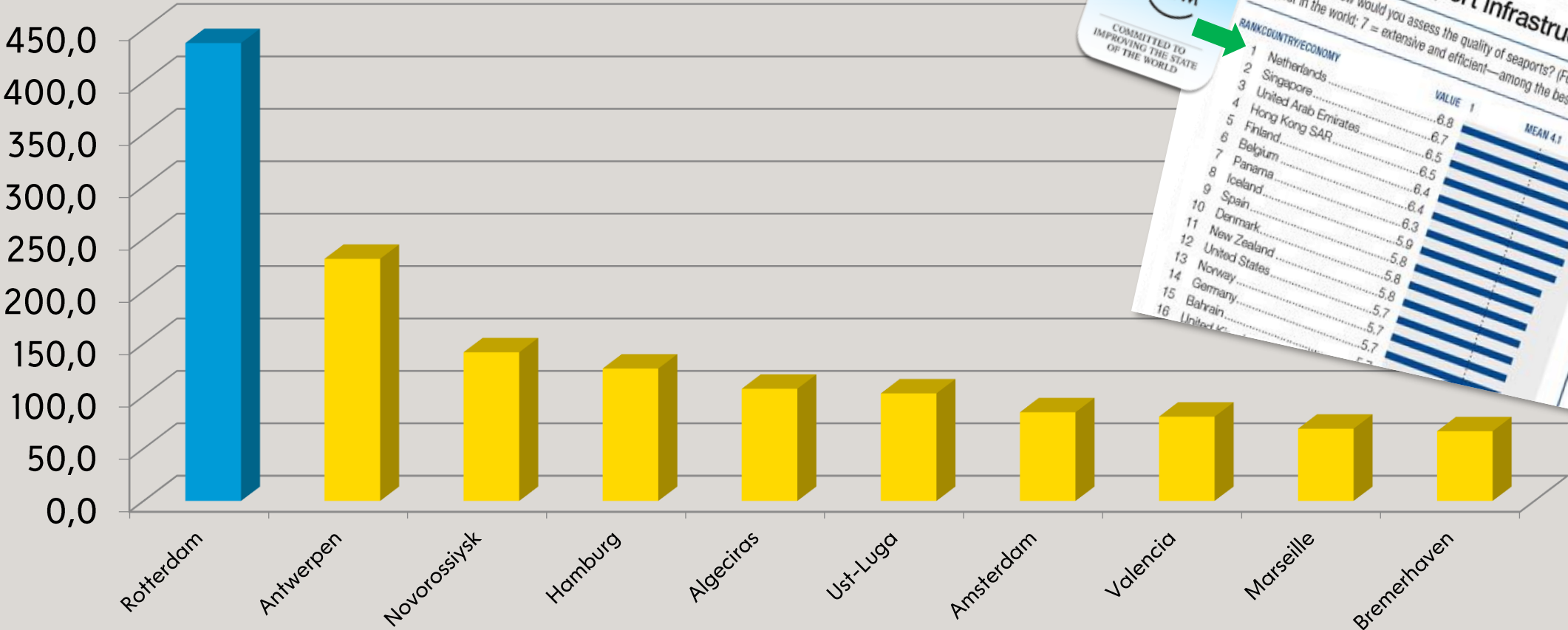


LARGEST EUROPEAN PORT



565.000
DIRECT & INDIRECT JOBS

2020 TOP 10 EUROPEAN HARBOURS (MLN. TON)



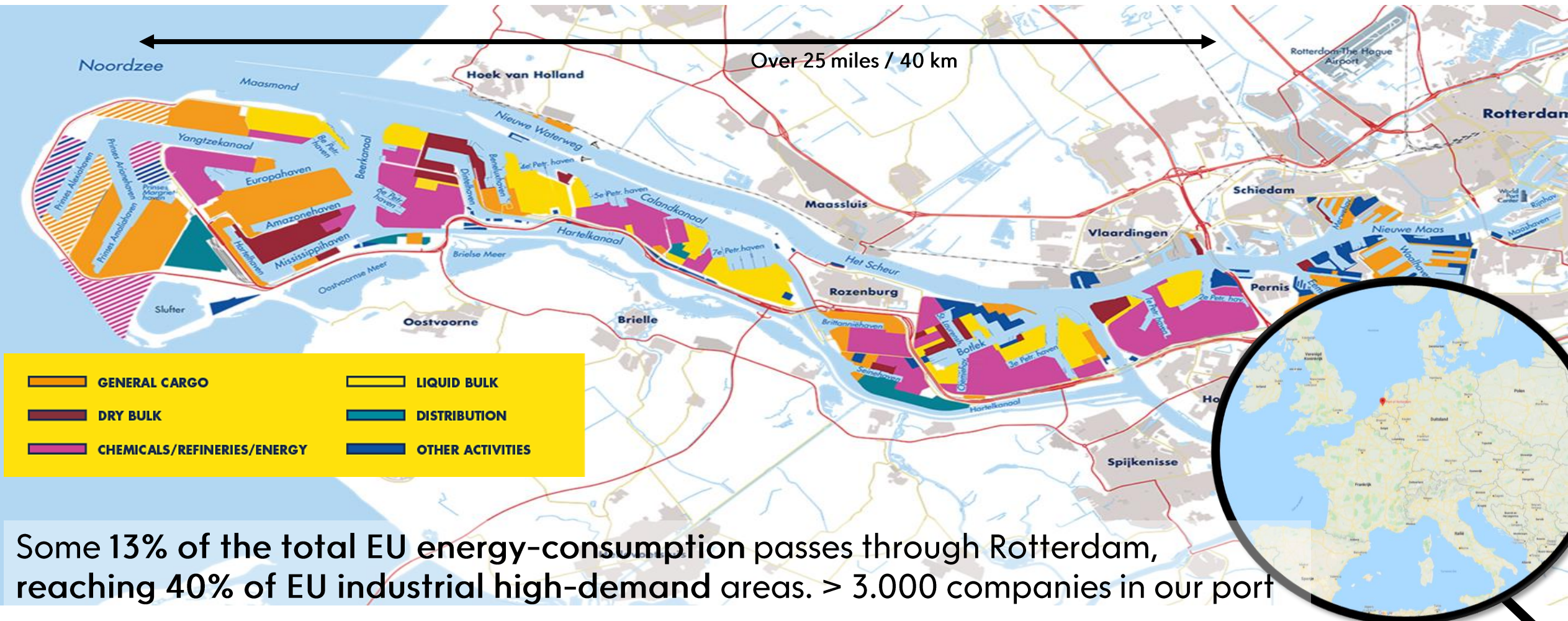
WORLD ECONOMIC FORUM
COMMITTED TO IMPROVING THE STATE OF THE WORLD

2.04 Quality of port infrastructure
in your country, how would you assess the quality of seaports? (For landlocked countries: How accessible is the worst in the world; 7 = extensive and efficient—among the best in the world) | 2013–14 weighted average

RANK	COUNTRY/ECONOMY	VALUE
1	Netherlands	6.8
2	Singapore	6.7
3	United Arab Emirates	6.5
4	Hong Kong SAR	6.5
5	Finland	6.4
6	Belgium	6.4
7	Panama	6.3
8	Iceland	6.3
9	Spain	5.9
10	Denmark	5.8
11	New Zealand	5.8
12	United States	5.7
13	Norway	5.7
14	Germany	5.7
15	Bahrain	5.7
16	United Kingdom	5.7

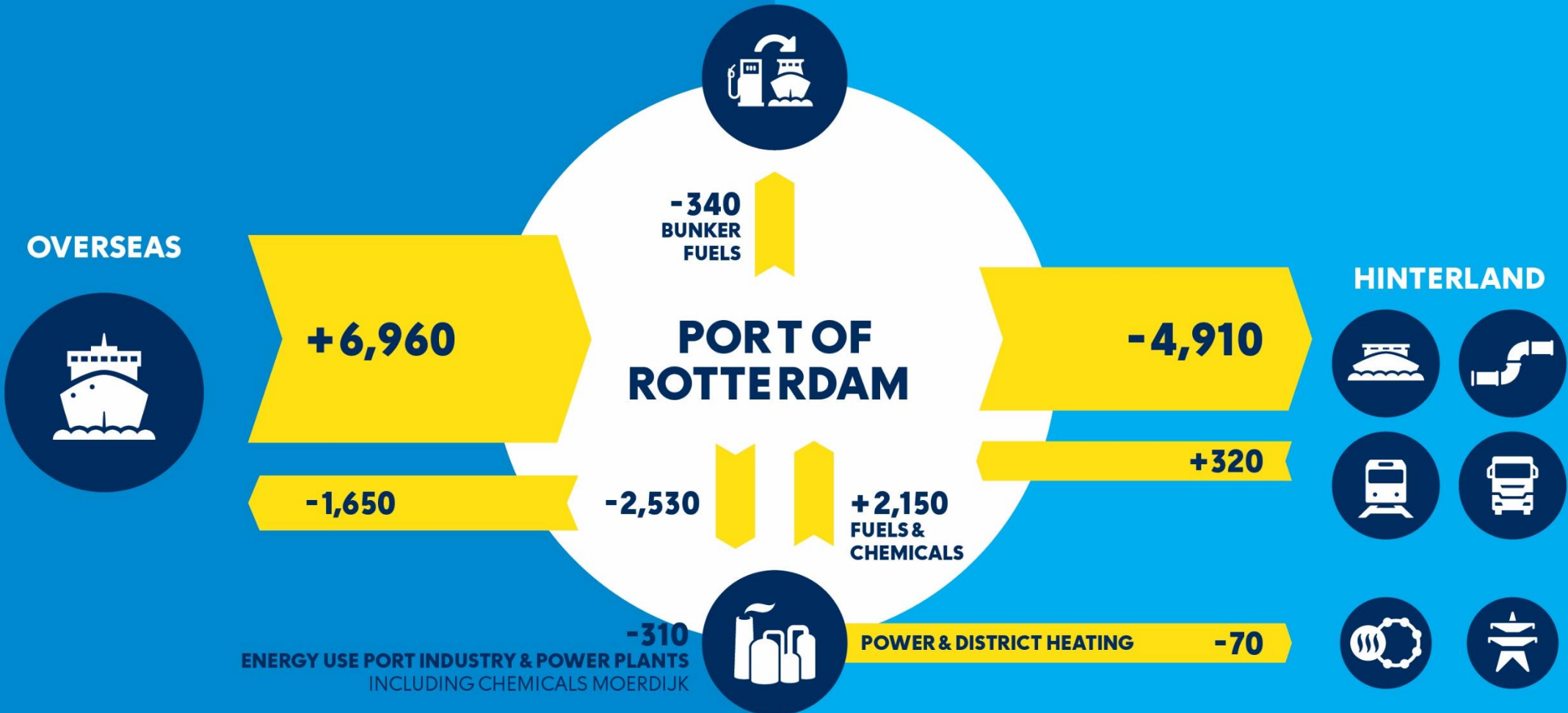
MEAN 4.1

PORT OF ROTTERDAM - ENERGY HUB OF NW EUROPE



THE PORT OF ROTTERDAM IS AN ENERGY HUB

Numbers in PJ



ENERGY TRANSITION BASED ON 4 PILLARS

PILLAR

1

**EFFICIENCY AND
INFRASTRUCTURE**

PILLAR

2

**A NEW ENERGY
SYSTEM**

PILLAR

3

**A NEW FEEDSTOCK
AND FUEL SYSTEM**

PILLAR

4

**SUSTAINABLE
TRANSPORT**

-55% CO₂ IN 2030
(COMPARED TO 1990)

CO₂ NEUTRAL IN 2050

ENERGY TRANSITION BECOMES VISIBLE

SHORE-POWER
CALANDKANAAL



WARMTELIJN
USE OF WASTE HEAT



SHELL BIOFUEL PLANT



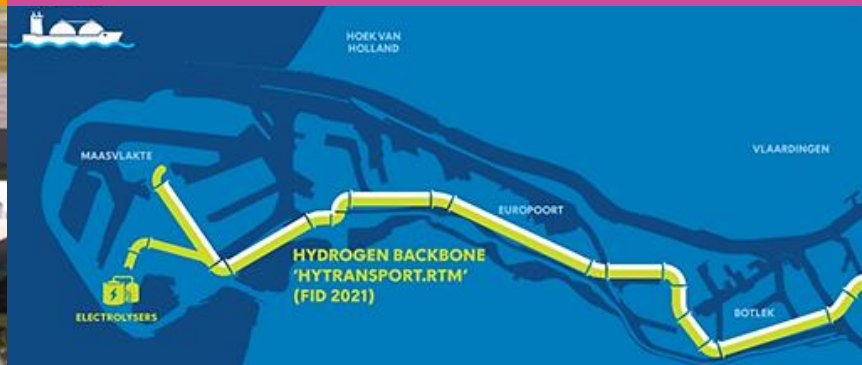
PORTHOS CCS



HOLLAND HYDROGEN 1

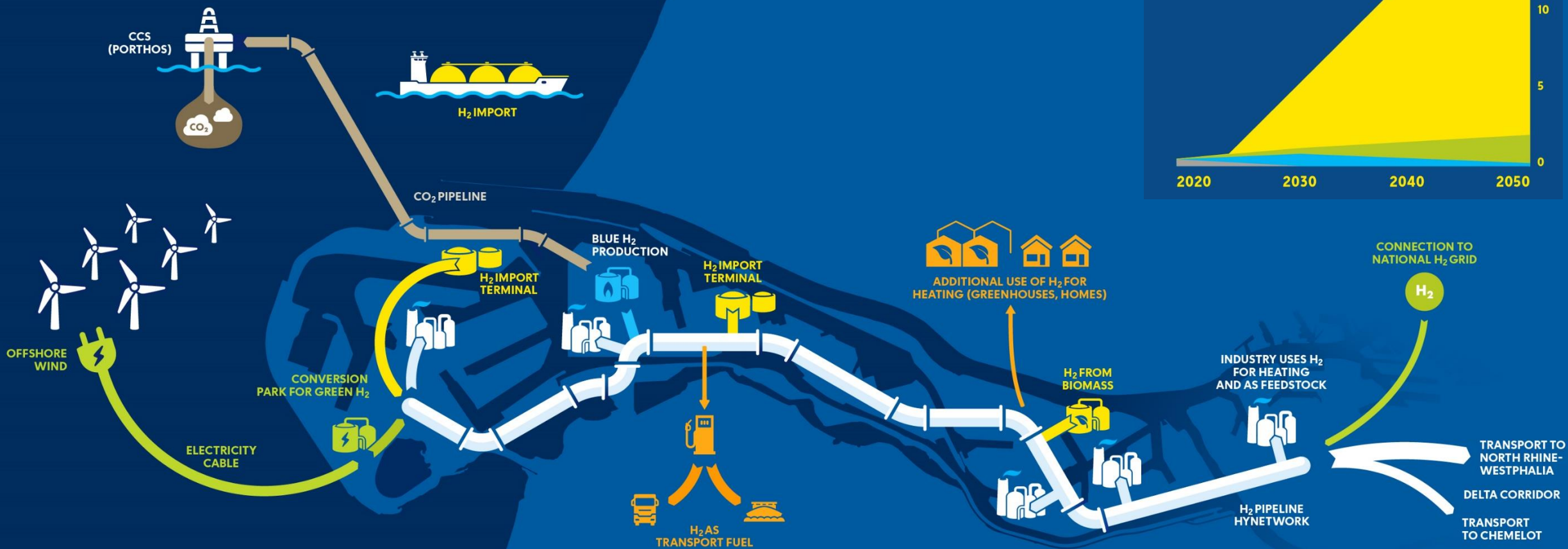
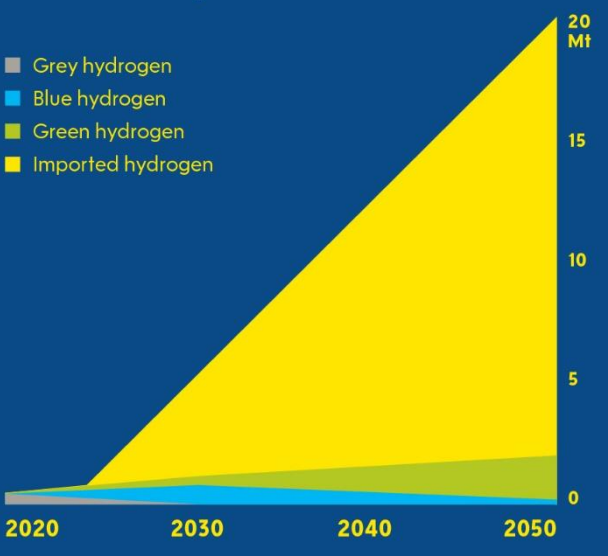


HYTRANSPORT



HYDROGEN ECOSYSTEM IN ROTTERDAM

EXPECTED H₂ VOLUMES







7.4 GW WINDFARMS NORTH SEA CONNECTED TO ROTTERDAM

7.4 GW = 35% of all windpower projects in the Dutch part of the North Sea.

These projects are to be realized before 2030.

Consultation with the government about projects after 2030 has started.

WINDFARMS		CAPACITY	OPERATIONAL
Hollandse Kust Zuid		1,4 GW	2023
IJmuiden Ver Beta		2 GW	2029
IJmuiden Ver Gamma		2 GW	Before 2030
Nederwiek Beta		2 GW	Before 2030
Total		7,4 GW	



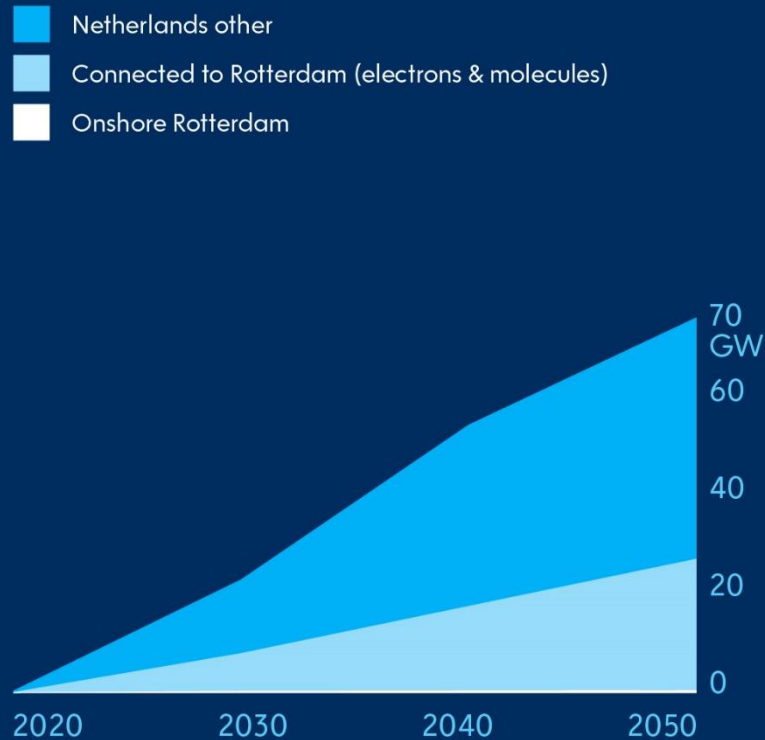
CONNECTION WITH WIND FARMS AT SEA



EUROPE'S HYDROGEN HUB

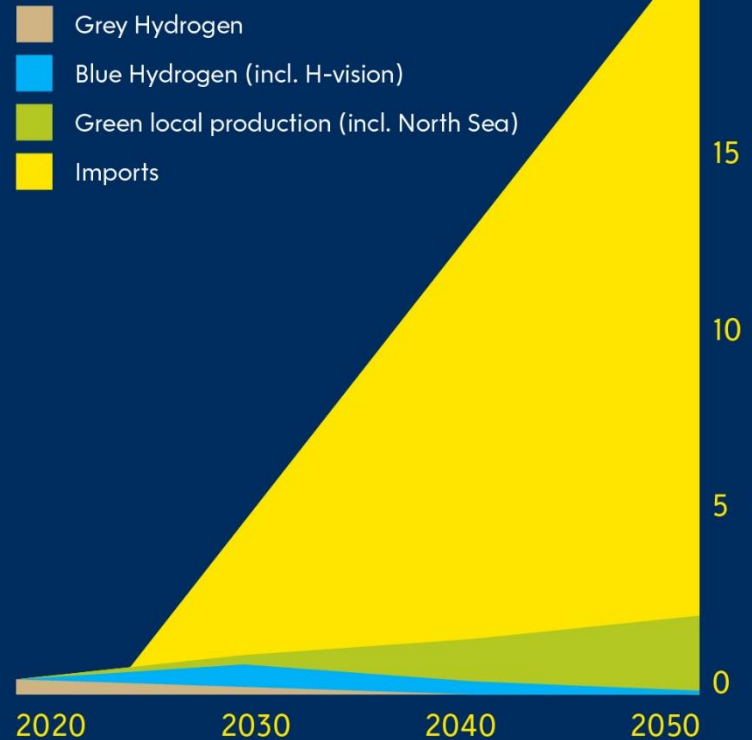
Ambitions for offshore wind and hydrogen

NL offshore renewable energy up to 2050



Source: Min. EZK, Kamerbrief windenergie op zee 20302050 (2022)

Hydrogen in Rotterdam up to 2050



Rotterdam plays a huge role in fulfilling EU ambitions 2030



EU green hydrogen production

Using 0.6 Mton Rotterdam green & low carbon hydrogen production



EU hydrogen import

Using 4.0 Mton Rotterdam green hydrogen import

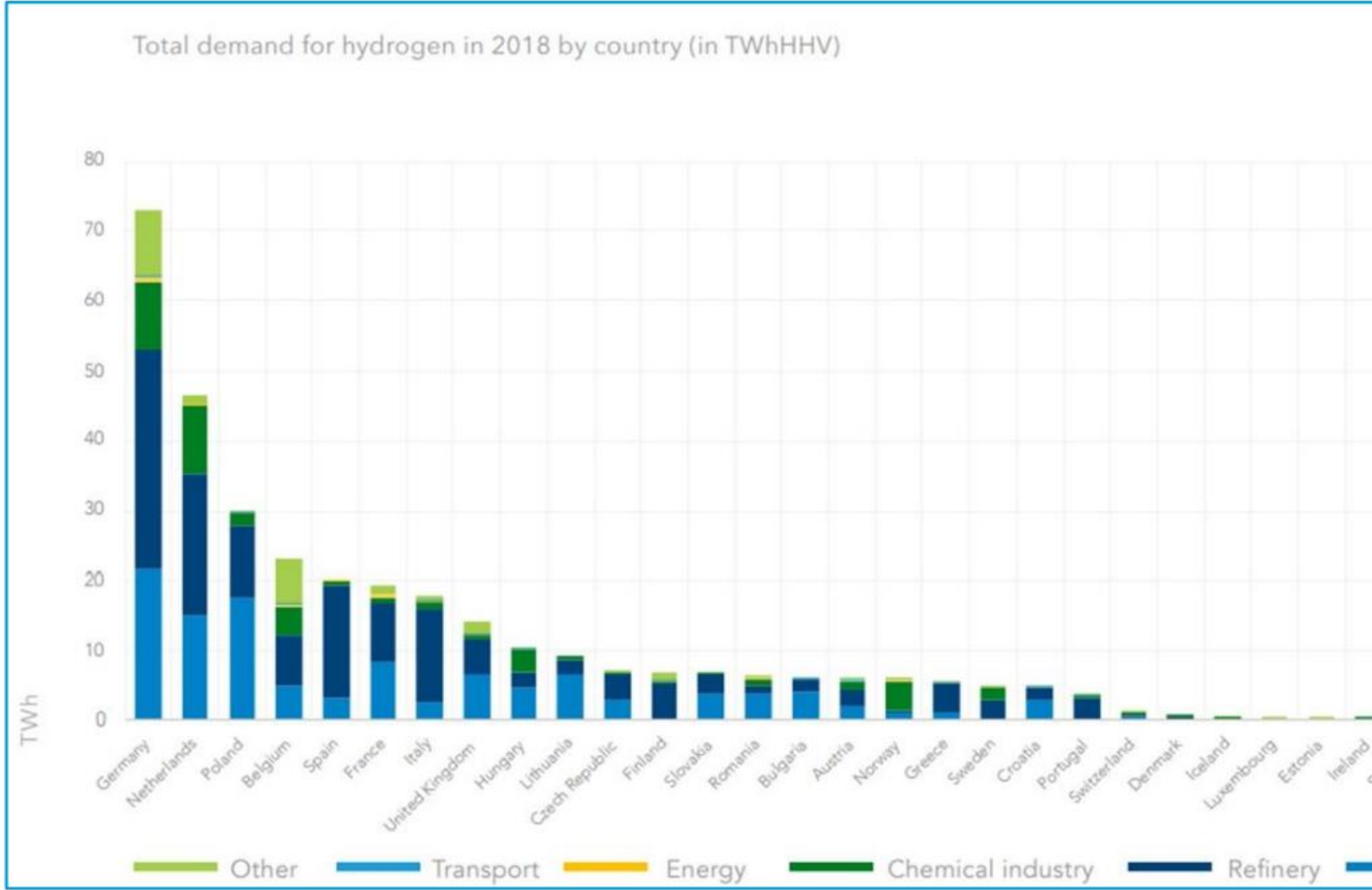
Rule of thumb:





HYDROGEN IS NOT NEW IN ROTTERDAM..

Figure 3 - Hydrogen use by EU countries, the Netherlands being second in row



Source: Hydrogen Europe (2020).

A DEDICATED SITE FOR ELECTROLYSIS



Besides electrolysis there is the **H-VISION** project. This joint development of leading industries aims at making low-carbon hydrogen by decarbonizing refinery gases. First plant in 2027.

PROJECT/COMPANY	ELECTROLYSER CAPACITY	FID	OPERATIONAL
A. H2-Fifty (bp & HyCC)	250 MW	2023	2025
B. Holland Hydrogen 1 (Shell)	200 MW	Q2 2022	2024
C. Air Liquide	200 MW	2023	2025
D. X	200 MW	2024	2026
Uniper	100-500 MW	2023	2025-2030



GREEN HYDROGEN PRODUCTION STARTS AT A DEDICATED SITE FOR ELECTROLYSIS

Ambition Rotterdam

2030: 2.5GW (onshore)

2050: 20GW (onshore & offshore)



Conversion park 1

COMPANY	CAPACITY	PLANNED FID	OPERATIONAL
bp & HYCC: H2-Fifty	250MW	2023	Q2 2025
Shell: Holland Hydrogen 1	200MW	2022 ✓	Q2 2024
Air Liquide: CurtHyl	200MW	2023	2024–2025
Not announced	200MW	2024	2025–2026

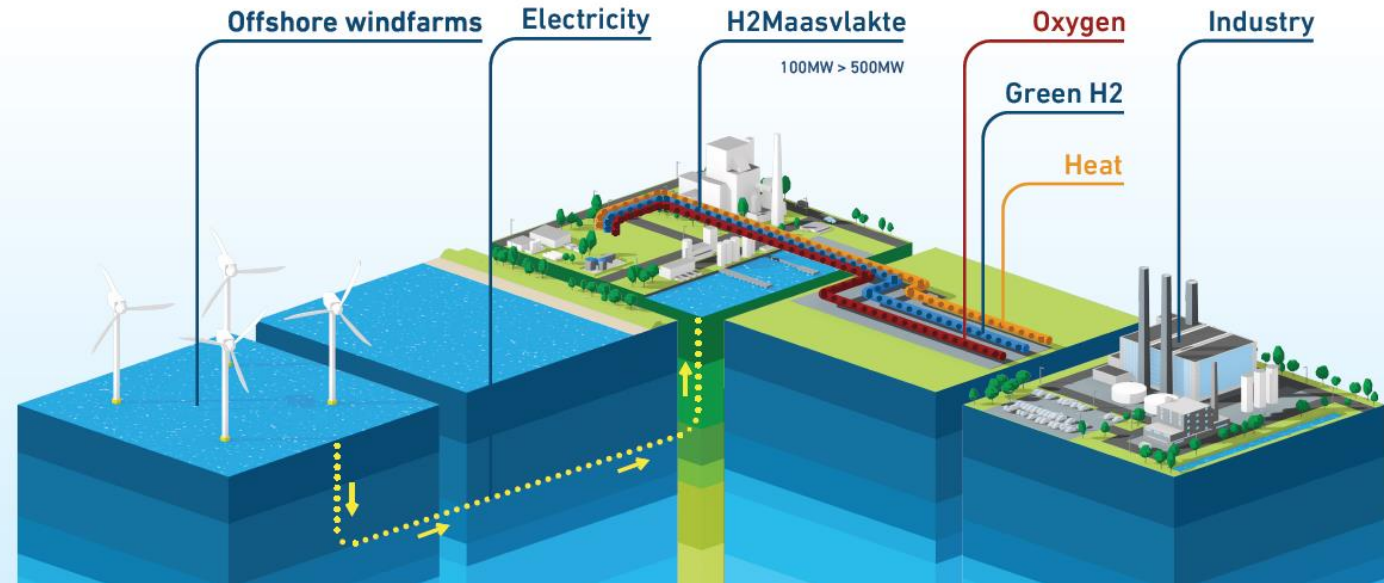
COMPANY	CAPACITY	PLANNED FID	OPERATIONAL
Uniper: H2Maasvlakte	100-500MW	2023–2028	2025–2030







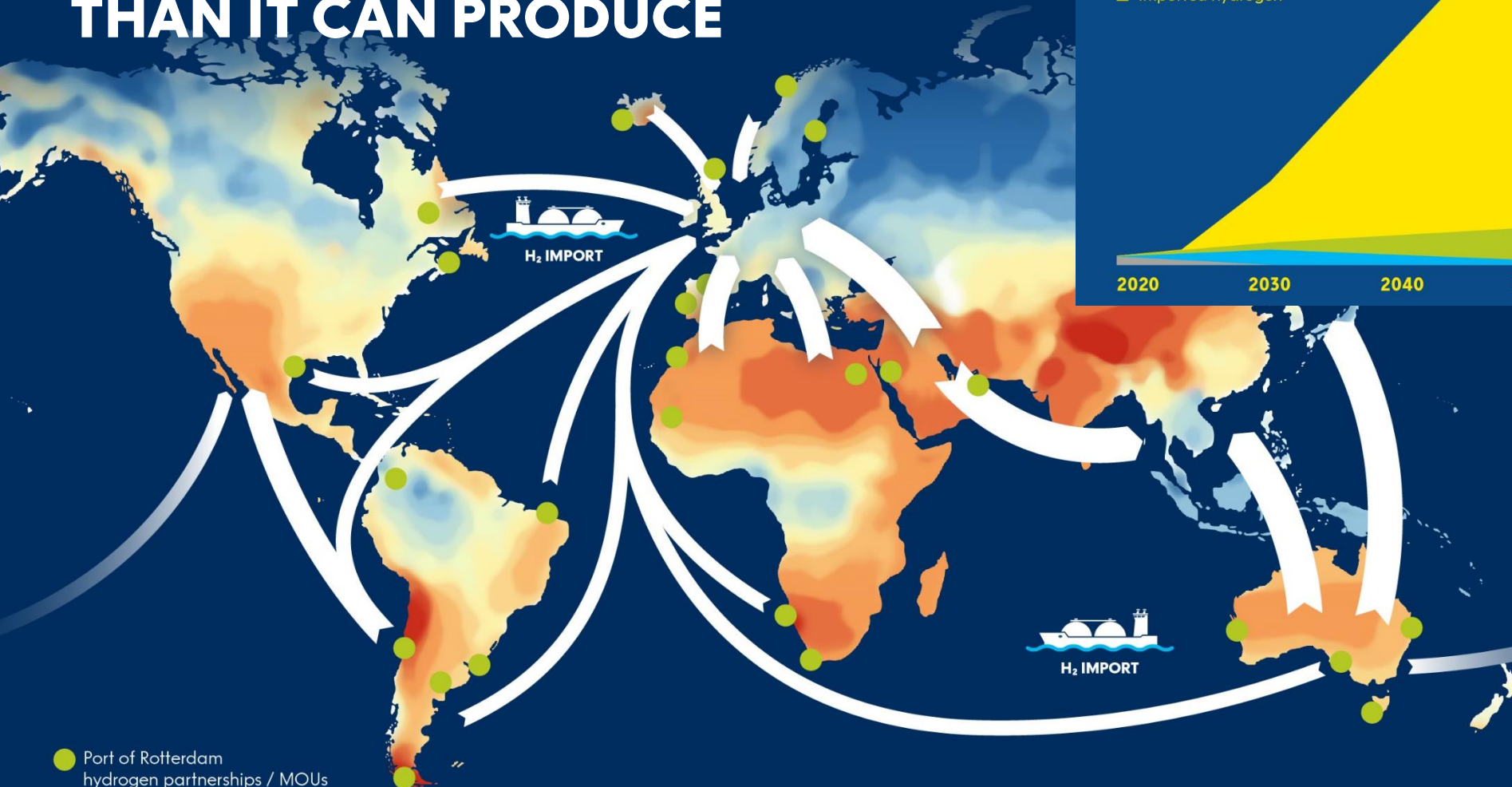
H2Maasvlakte



BOTH NEW & REFURBISHED NATURAL GAS PIPES ARE NEEDED



IMPORTS ARE ESSENTIAL, AS EUROPE USES MORE ENERGY THAN IT CAN PRODUCE

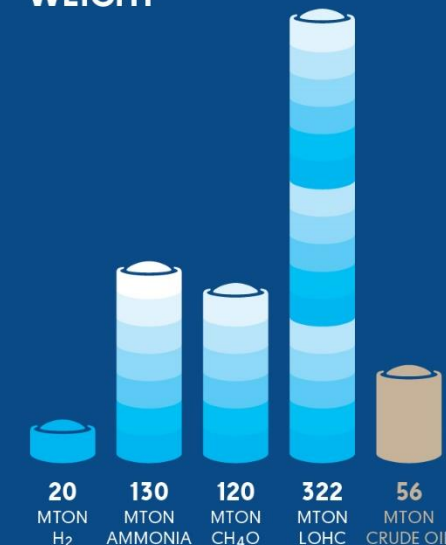


● Port of Rotterdam
hydrogen partnerships / MOUs

EXPECTED H₂ VOLUMES



WEIGHT



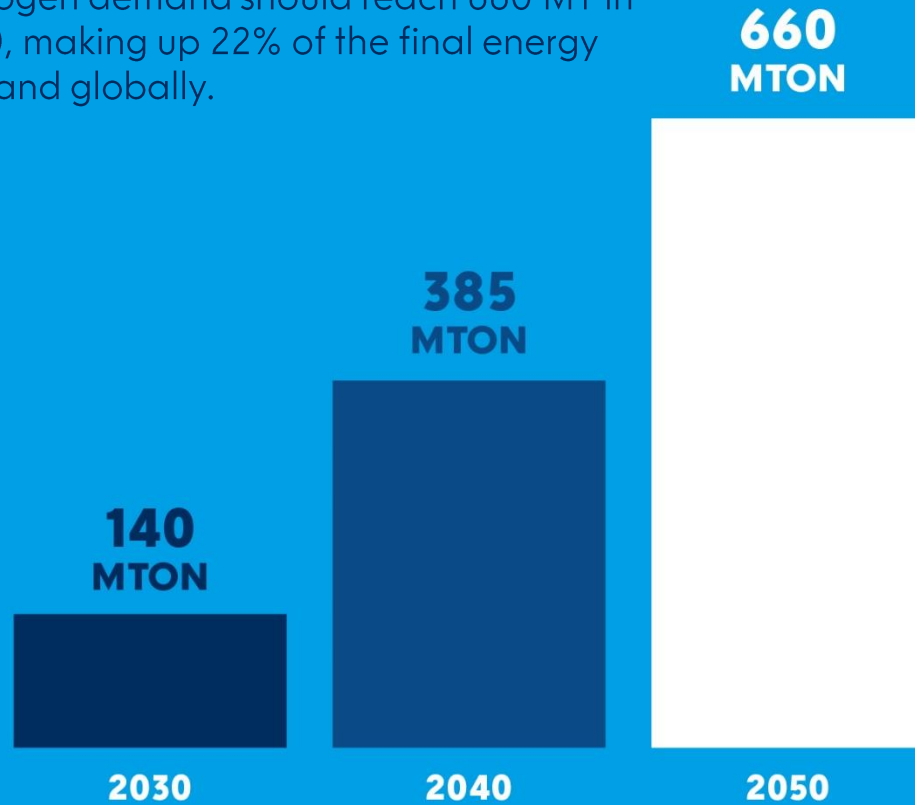
Imports are expected to start around 2025 in Rotterdam.

Hydrogen will come in a range of forms, with different weights and volumes.

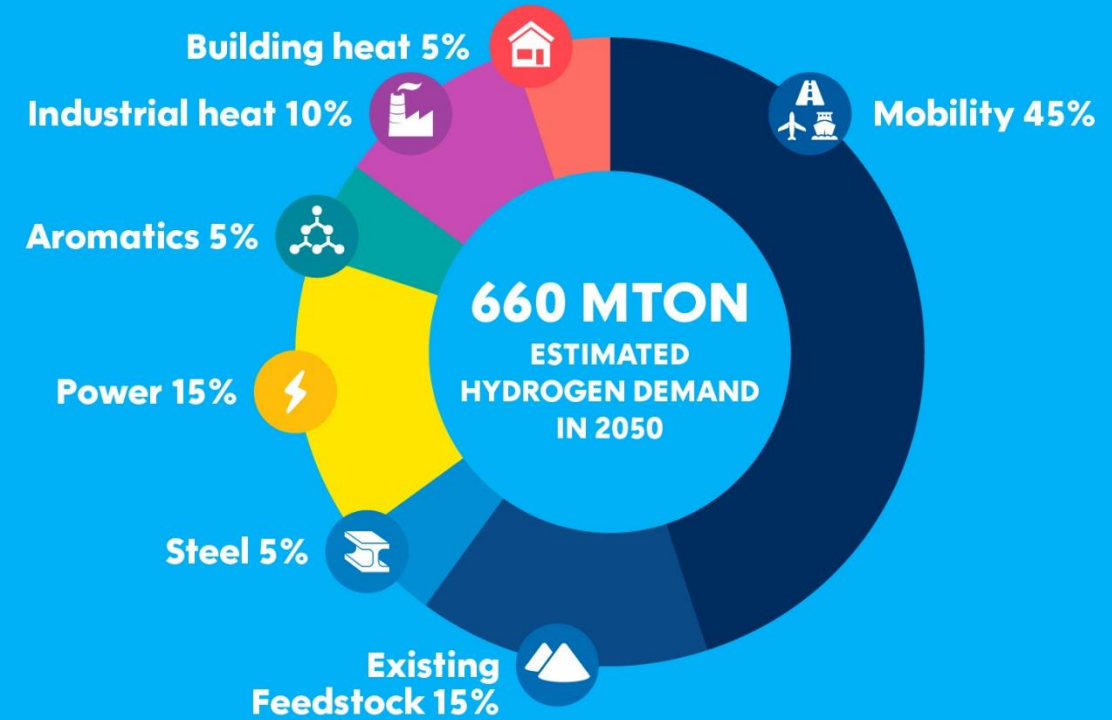
FORECAST DEMAND & USE OF HYDROGEN WORLDWIDE

THE GLOBAL HYDROGEN MARKET IN 2050

To meet net-zero targets, long-term hydrogen demand should reach 660 MT in 2050, making up 22% of the final energy demand globally.

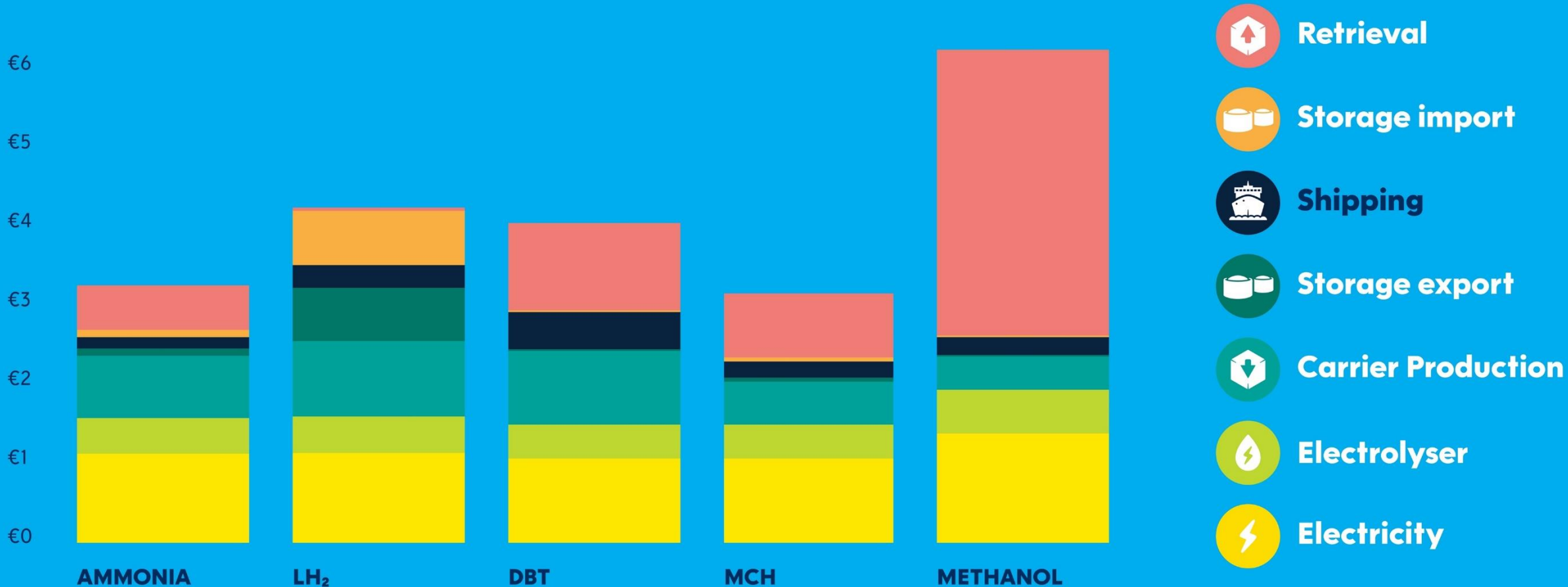


Source: Hydrogen Council, McKinsey & Company, Hydrogen for Net-Zero (2021)



SHIPPING COSTS ARE A SMALL PART OF TOTAL COSTS

FIGURES ARE ORIGINATING FROM A COST MODEL AS PART OF A PRE-FEASIBILITY STUDY
DISTANCE SOUTH AMERICA – ROTTERDAM



PORT OF ROTTERDAM IS READY TO RECEIVE ALL TYPES OF CARRIERS

Green ammonia

One existing terminal.
4 new ammonia terminals
announced.

LOHC

Conversion of 2 existing terminals,
first pilot in 2023.

LH2

2 Feasibility studies for
new terminal completed.
Possible before 2030.

Green methanol

Multiple existing terminals.
Already a European methanol hub.

Powders

Other technologies are also
being explored (e.g. NaBH₂).



Cracking facilities in study.

8 HYDROGEN TERMINAL PROJECTS ANNOUNCED

More initiatives expected

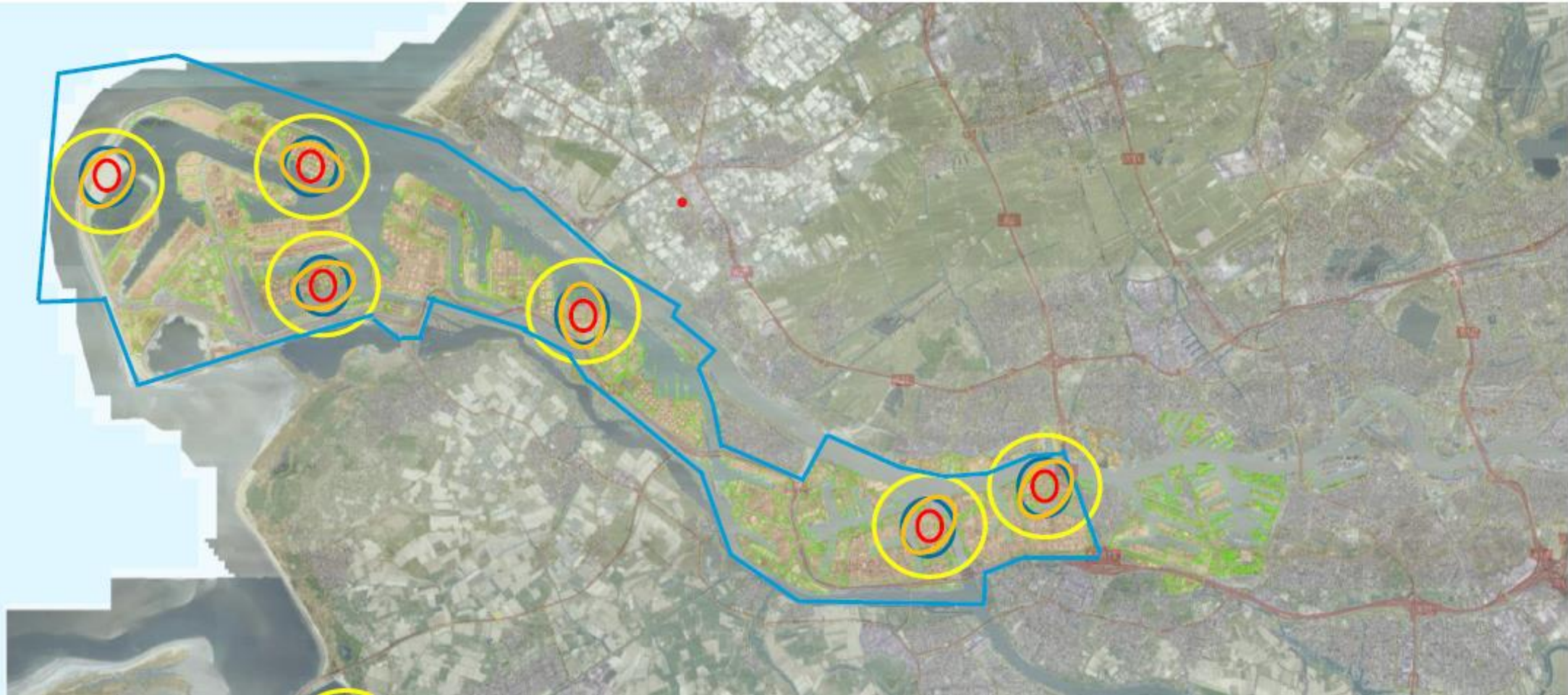




The image is an aerial photograph of a large industrial port facility. In the upper portion, a container terminal is visible, characterized by numerous colorful shipping containers stacked in neat rows and several large gantry cranes positioned along the waterfront. Two large container ships are docked at the terminal. Below the container terminal, a body of water separates it from another industrial area. This lower area features a refinery or petrochemical plant, identifiable by its complex network of pipes, storage tanks, and tall distillation columns. Several large, cylindrical storage tanks are prominent in the foreground. A red-hulled ship is docked at a pier in front of the refinery. In the bottom left corner, a smaller cargo ship is visible. The overall scene depicts a busy and large-scale industrial operation.

æe Terminal

INDICATIVE H2 IMPORT LOCATIONS WITHIN SAFETY CONTOUR IN ROTTERDAM



○ NH3 –
100kth H2

○ NH3 –
18Mton H2

○ LH2 –
100kth H2

○ LH2 –
18Mton H2

MULTIPLE HYDROGEN PROJECTS THROUGHOUT THE VALUE CHAIN



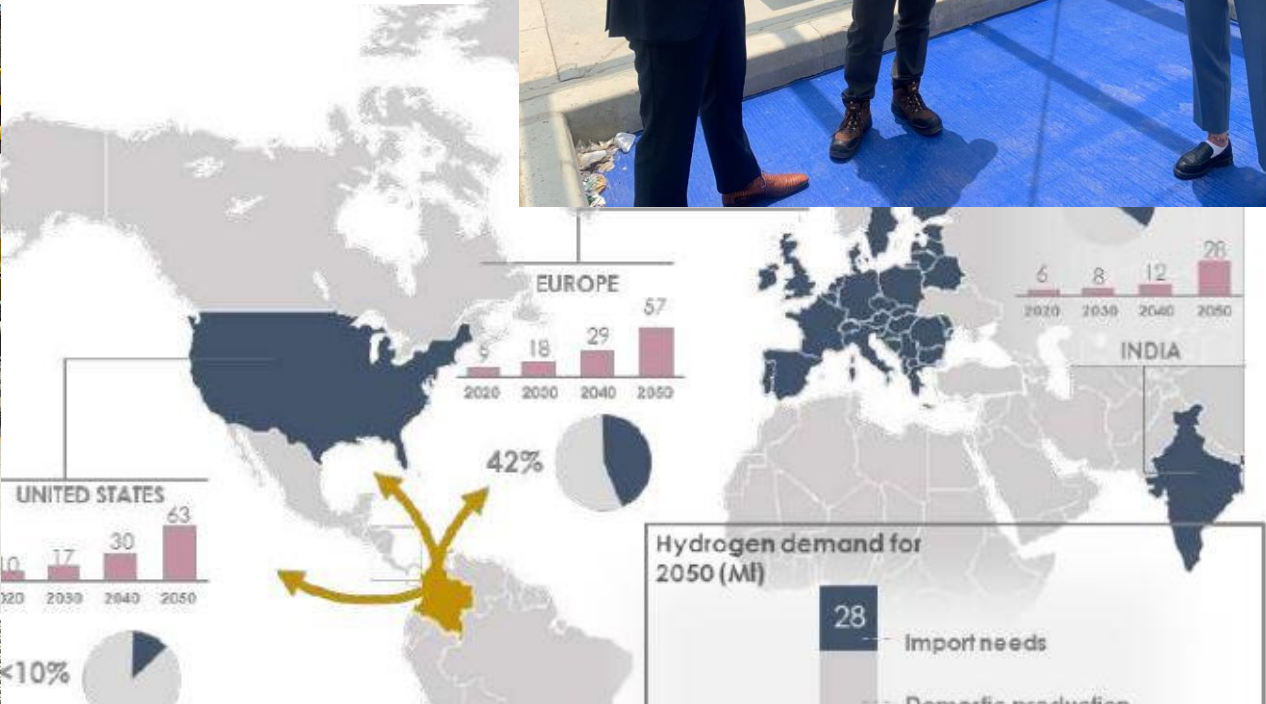
PLANNING

	2023	2024	2025	2026	2027	2030
Production			First 200 MW electrolyser operational		First H-vision plant operational	2,5 GW electrolyzers operational (0.25 Mton H ₂) 0,35 Mton low carbon H ₂ production
Import	Expansion existing ammonia terminal operational	First green ammonia imports		First new import terminal for green ammonia operational LOHC imports at industry scale	First LH ₂ terminal operational	4 Mton H ₂ imports
Infrastructure			'Hydrogen network' pipeline in the port operational		'Delta Corridor' pipelines to Chemelot, North Rhine-Westfalia operational	
Use	First tank station for trucks operational		First green hydrogen replaces grey in refineries Road transport: 1000 H ₂ powered trucks (500 in Rotterdam)	'Condor' hydrogen powered inland barges operational		

WHAT ROLE WILL COLOMBIA TAKE?



National low-carbon H₂ goals for 2030



**Hoja de ruta
del hidrógeno
en Colombia**



4,6 Mton
HYDROGEN
IN 2030

ROTTERDAM
EUROPE'S
HYDROGEN
HUB

EUROPE

COMPANIES CAN SUPPLY
4,6 MT HYDROGEN
VIA ROTTERDAM IN 2030

WITH HYDROGEN

ROTTERDAM
FACILITIES &
INFRASTRUCTURE

IMPORT
FACILITIES

INFRA-
STRUCTURE

LOCAL PRODUCTION & IMPORTS VIA ROTTERDAM: 4,6 MTON HYDROGEN IS FEASIBLE IN 2030



WHAT IS NECESSARY



**Fast and reliable
permitting**
(incl. nitrogen regulations)



**A robust H₂ certification
scheme for imports**



**Stimulation of demand and
closing the financial gap with
CO₂-emitting alternatives**
(like contracts for difference)



**Parallel development
of public and private
H₂ infrastructure**



Financing run-up risks
(especially for infrastructure)



**Societal acceptance of new
energy carriers**

CONCLUSION

**20 Mton hydrogen =
200 Mton CO₂-reduction**



Rotterdam is on track to be Europe's Hydrogen Hub

- 4.6 Mton hydrogen is feasible in 2030
- Local production & imports
- Pipeline infrastructure connecting industrial clusters
- PoR asked by State to research import opportunities



First projects are being built, many more upcoming

- FID's taken for 200 MW electrolysis, import terminal NH₃
- Several FID's expected in 2023
- >20 MOU's regarding import



Stimulating policies and regulations are needed

- Regulatory masterplan for permitting, stimulation of demand, certification, contracts for difference etc.



WORLD HYDROGEN 2023

SUMMIT & EXHIBITION

9 - 11 MAY 2023

ROTTERDAM AHOY, NETHERLANDS

In Partnership With:



**City of
Rotterdam**



Thank you for your attention

Erik van der Heijden

Htc.heijden@portofrotterdam.com

