WORKING TOGETHER ON THE BEST POSSIBLE PORT.
MAKE IT HAPPEN.
Port and industrial area

Port of Rotterdam

- Largest port in Europe, 10th port worldwide
- Total employment 385,000 people*
- Total added value € 45.6 billion (6.2% GNP)*
- Visits (2018):
  - 29,476 sea-going vessels
  - 107,000 inland navigation
  - 3,000 companies
- Throughput (2018): 469 mln tons
  - 45% Liquid bulk
  - 32% containers
  - 17% dry bulk
  - 6% Breakbulk

* source: Erasmus University
Position of Rotterdam in the current energy system (2018 figures)

- 8,800 petajoule (PJ) per seagoing vessel (more than 3x the Dutch energy consumption & 13% of the energy consumption of Europa).
- For the production of steam, heat and electricity in the Port of Rotterdam & Moerdijk, 430 PJ of energy was used (29 Mton CO₂ emissions / 16% of the total Dutch emissions).

Ambition (2050)

- Transforming the position of an energy port into a sustainable energy hub for NW Europe
- 95% of CO₂ emission reduction in the port (Assumption: over 50% of energy saving is possible by 2050, results in 190 PJ of energy consumption in 2050). This requires 2.5 – 6.4 GW electrolysis capacity with full operating hours.
- Import terminal for Renewable Fuels
Energy Transition: Towards a new energy and circular material system

Committed to the Paris Agreement
- 2030: 49% reduction of CO₂
- 2050: Climate neutral

Wuppertal pathways (2016):
- Goal: develop pathways for the Port of Rotterdam to 98% CO₂ reduction
- Together with all relevant stakeholders

Climate action program, Three steps towards a sustainable industry cluster (2018)
- H₂ as a pillar of the port energy transition strategy
- Others: CCS, renewables, electrification, alternative fuels, biobased economy, circular economy, etc.
Current hydrogen situation in Rotterdam

- Current hydrogen demand per year in Rotterdam is 300 - 400 kt (36-48 PJ \( \text{LHV} \)), mainly used for oil refinery
- Main suppliers are Air Liquide and Air Products with world scale SMR-plants, own production on refineries and the chlorine plant of Nouryon
- SMR-plants are being connected to CCUS network (Porthos)
- In the Port of Rotterdam 2 hydrogen grids exist from Air Products (regional network) and Air Liquide (international network)
Local/regional Hydrogen Development
a stepwise approach

Production

- **Blue Hydrogen**: H-vision, a project exploring local production of blue hydrogen (made from natural gas and decarbonized with CCS). This hydrogen can be used to provide local industries with high-temperature heat and for electricity generation.

- **Green Hydrogen**: Several initiatives in large scale electrolysis. Largest development is collaboration between Port of Rotterdam, Nouryon and BP: 250 MW (impact: 40 kton/a green H₂, avoiding 360 kton CO₂/a)

Consumption

- Use as a resource in industries: feedstock (P-to-X) & high-temperature heat
- Emission free shipping and (heavy) road transportation (trucks)
- Use as a buffer for Power System (ProSumer)

Infrastructure

- 2GW conversion park (leading to efficient land-use and modest infrastructural investments for producers)
- Large scale open access hydrogen backbone (pipeline)
- Development of a bunkering showcase, together with several inland barges

Import/export

- Importing hydrogen will become necessary, because of a lack of regional potential to cost-effectively generate enough sustainable energy

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Green Energy & Feedstock for NW-Europe (<2050)
2000 PJ/a

Connect to NW-Europe Network (<2040)
250 PJ/a

Start the market (<2030)
50 PJ/a, 2 GW Electrolysers in PoR

Power market connected with molecules

HIC connect to NL H2-network

Rotterdam H2 import terminal in full operation

Blue & Green H2

Backbone in HIC
POWER UP YOUR IDEAS
MAKE IT HAPPEN

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LET’S CONNECT
Blue Hydrogen

H-Vision project: Collaboration for large scale production and usage of blue hydrogen (natural gas with CCS)

16% CO₂-emission reduction in Rotterdam
2.2 – 4.3 Mton CO₂-emission reduction in 2026 – 2031 per year
3200 MW 700 kton H₂ per year

Hub
Start Rotterdam as a Hydrogen hub

Green Hydrogen

250 MW water electrolyser connected to offshore windpower for the production of green hydrogen for BP’s refinery

Potential to grow
350 kton CO₂-emission reduction
250 MW 45 kton H₂ per year

Part of 2GW conversion park development
Connect offshore wind farms with hydrogen production