HyFLOW

WaterstofNet

*“creating the **flow** of **hy**drogen between **Fl**anders – The Netherlands (**Low** Lands), facilitated by the ports”*

Lier, 19 juni 2019

Content

1. Starting points
2. Announcements/plans
3. Compromise between ambition and realism

Starting points

1. What will be the business for the ports in 2030 – 2040 – 2050 ?

2. What will be the situation of the transport grid of natural gas in 2030 – 2040 – 2050 ?

3. How can we incorporate large amounts of offshore wind /green hydrogen in 2030 – 2040 – 2050 ?

Starting points

1. Flanders – Netherlands is optimally situated and equipped for large scale conversion of offshore wind energy in renewable gas
    1. Coast line of > 400 km
    2. Dense gas grid
    3. Overseas electrical and gas connections

2. A future “hydrogen corridor” between Zeebrugge and Eemshaven using existing pipelines, connecting ports, can be the backbone for a green hydrogen economy
    1. Current injection points for offshore wind Eemshaven, Rotterdam and Zeebrugge
    2. Transport by pipelines
    3. Cross-border experience can guide Europe

3. Step by step approach needed

4. Individual projects to be coupled to this future hydrogen corridor

5. Interest from industry and government from Flanders/Netherlands

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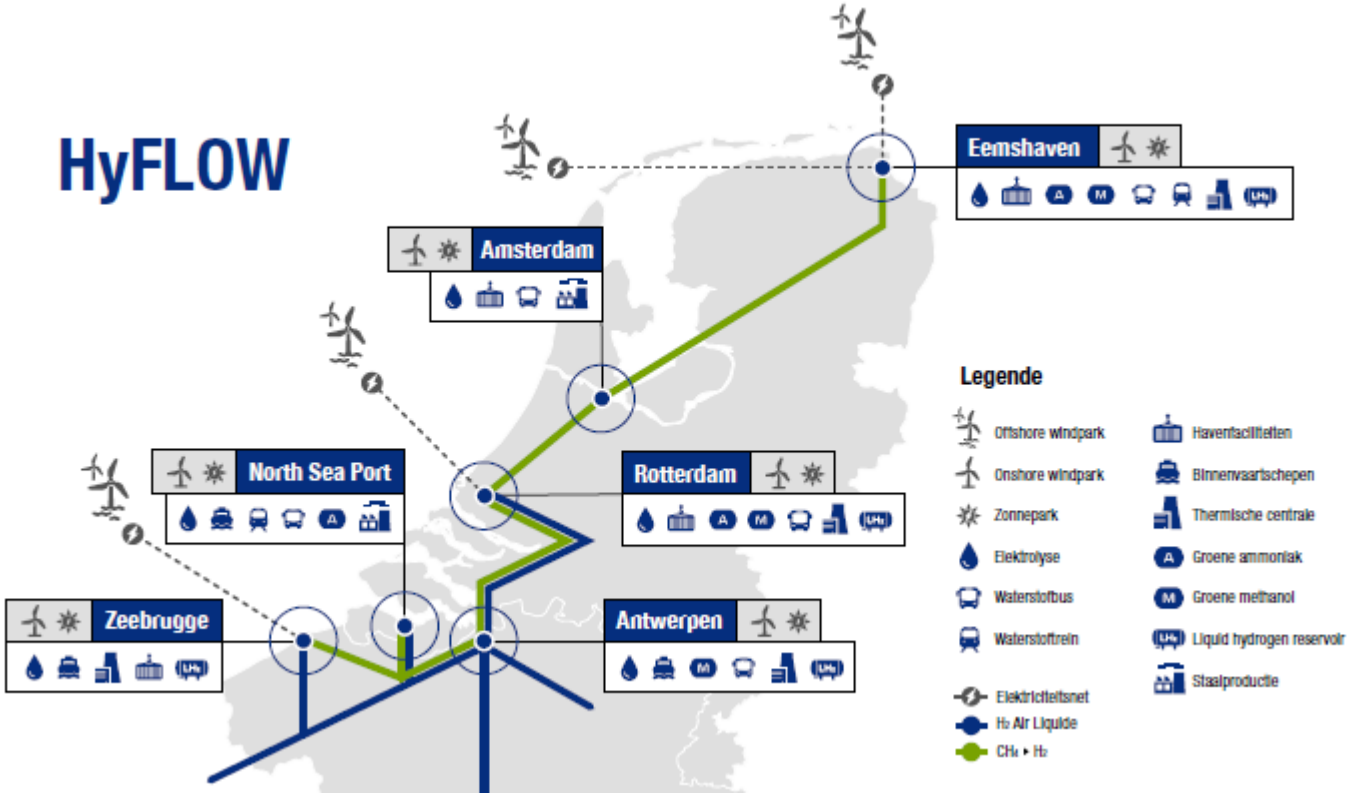
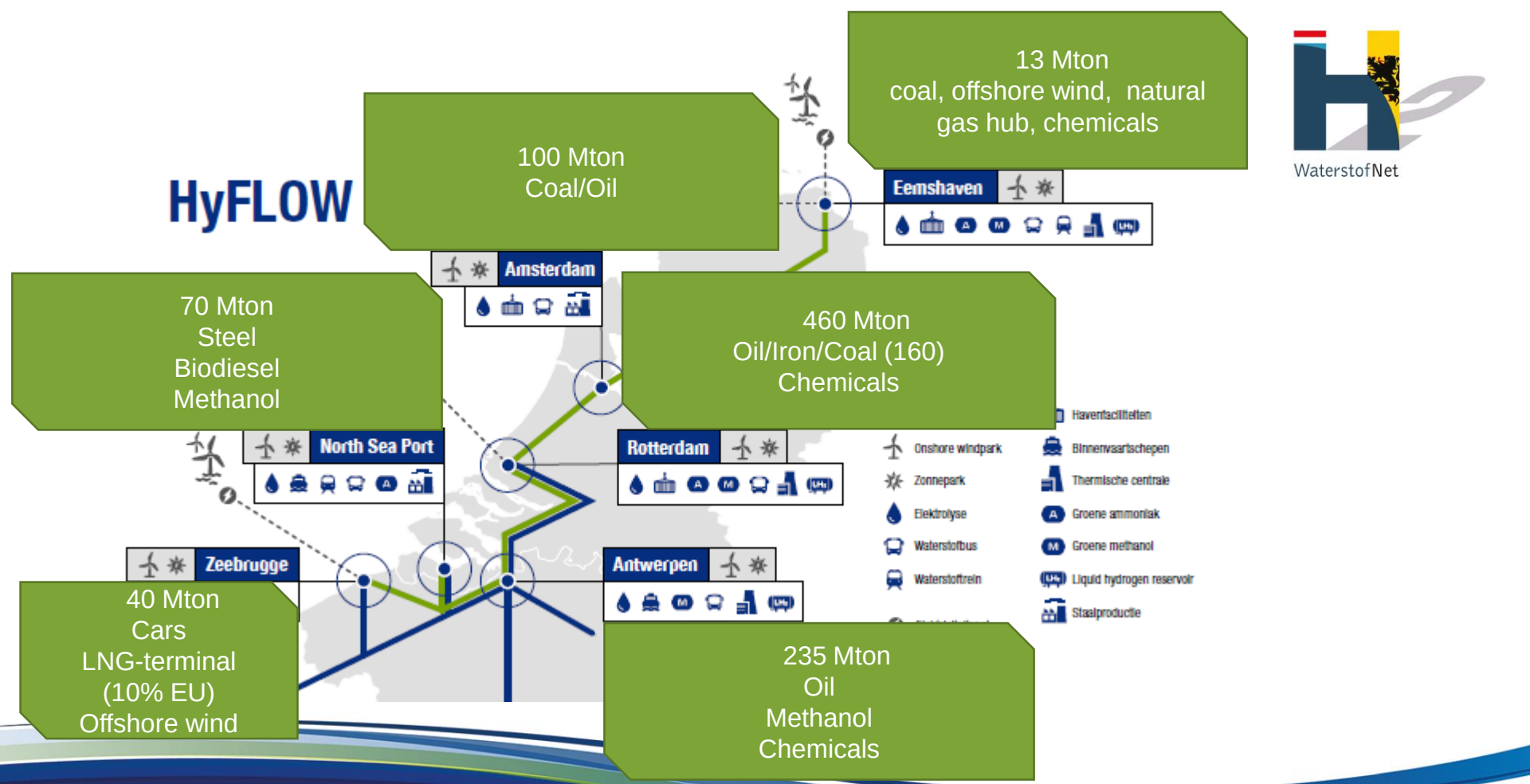
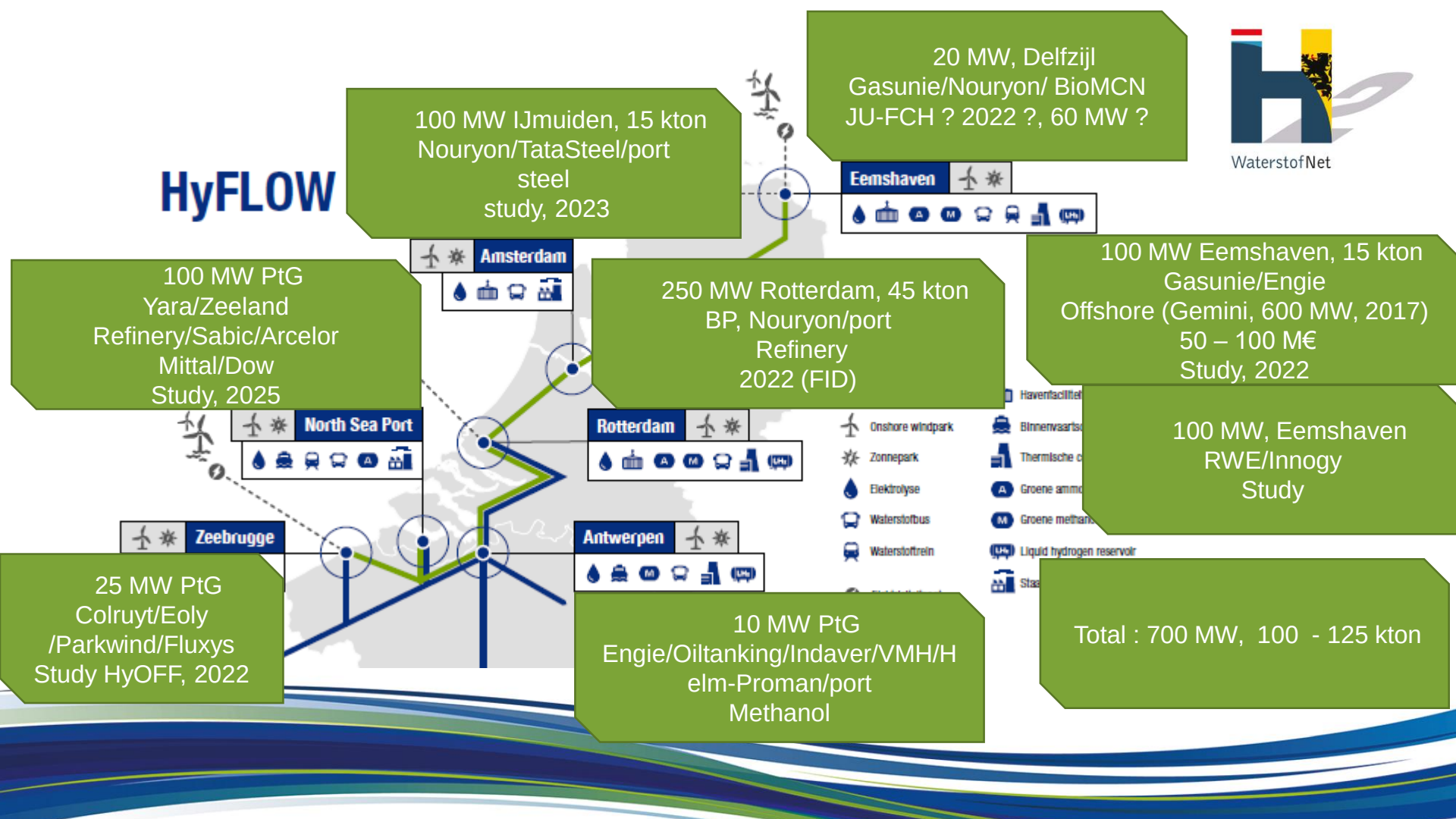
HyFLOW




HyFLOW
100 Mton
Coal/Oil
13 Mton
coal, offshore wind, natural
gas hub, chemicals
Eemshaven
Amsterdam
70 Mton
Steel
Biodiesel
Methanol
460 Mton
Oil/Iron/Coal (160)
Chemicals
North Sea Port
Rotterdam
Zeebrugge
Antwerpen
40 Mton
Cars
LNG-terminal
(10% EU)
Offshore wind
235 Mton
Oil
Methanol
Chemicals
Onshore windpark
Zonnepark
Elektrolyse
Waterstofbus
Waterstoftrein
Binnenvaartschepen
Thermische centrale
Groene ammoniak
Groene methanol
Liquid hydrogen reservoir
Staalproductie
WaterstofNet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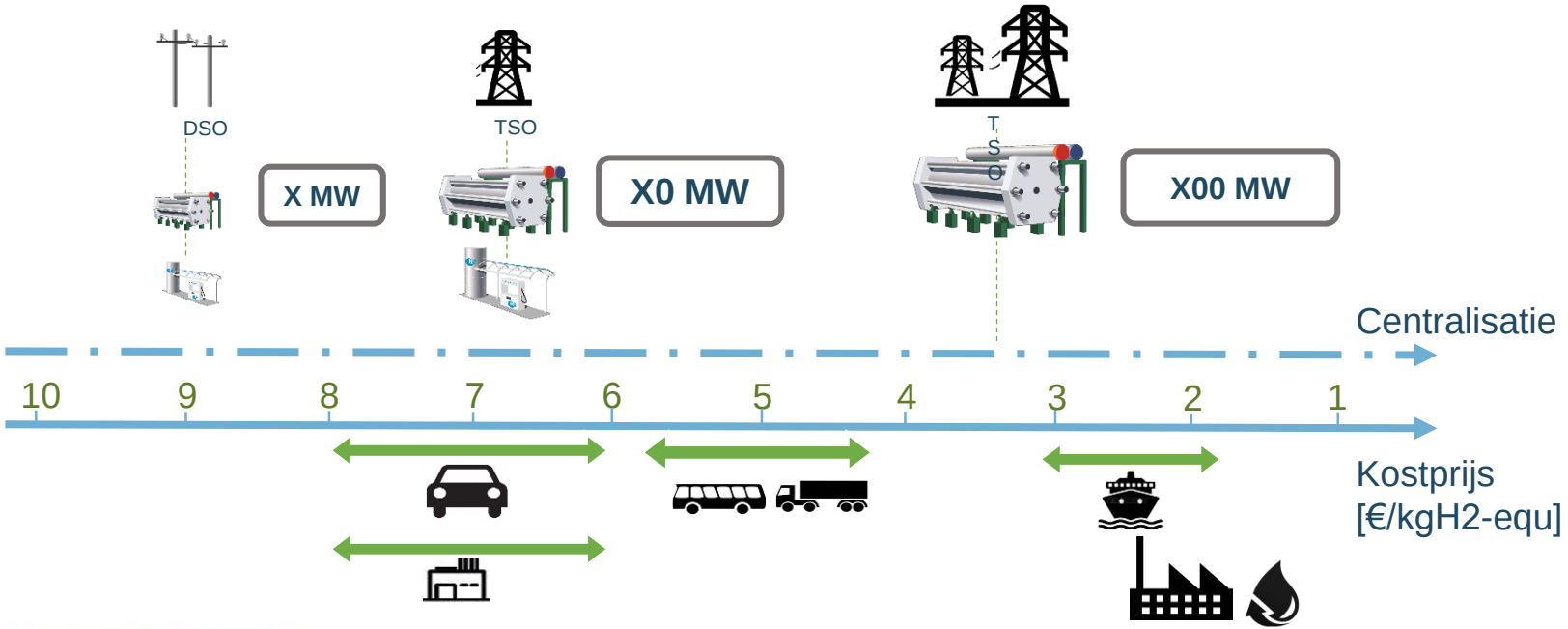
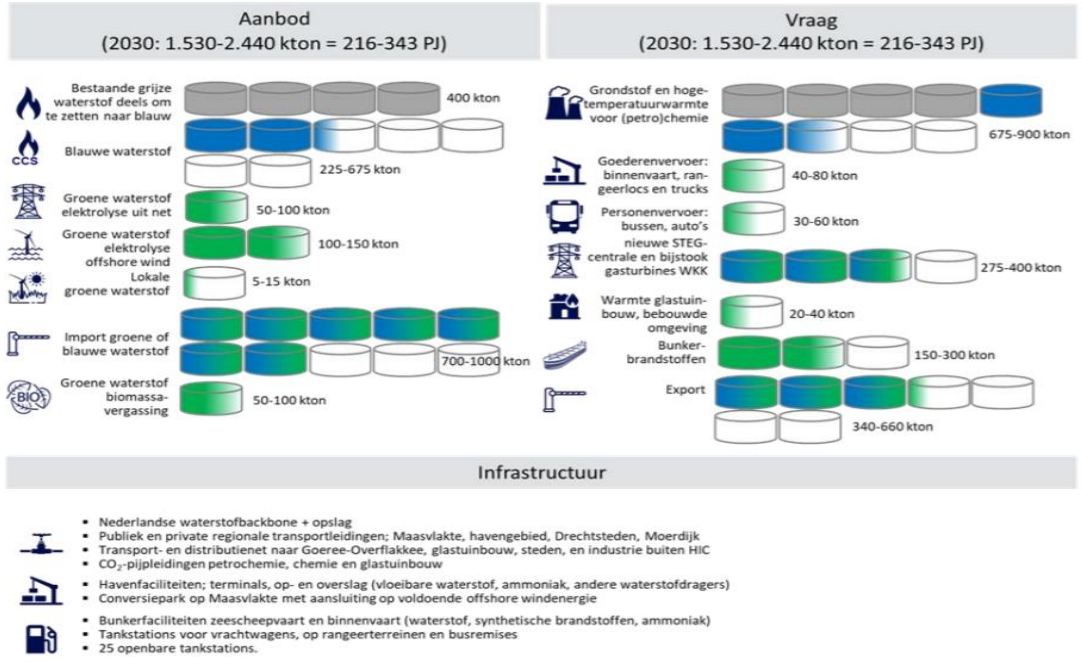
20 MW, Delfzijl
Gasunie/Nouryon/ BioMCN
JU-FCH ? 2022 ?, 60 MW ?
100 MW IJmuiden, 15 kton
Nouryon/TataSteel/port
steel
study, 2023
Eemshaven
100 MW PtG
Yara/Zeeland
Refinery/Sabic/Arcelor
Mittal/Dow
Study, 2025
Amsterdam
250 MW Rotterdam, 45 kton
BP, Nouryon/port
Refinery
2022 (FID)
100 MW Eemshaven, 15 kton
Gasunie/Engie
Offshore (Gemini, 600 MW, 2017)
50 – 100 M€
Study, 2022
North Sea Port
Rotterdam
Onshore windpark
Zonnepark
Elektrolyse
Waterstofbus
Waterstoftrein
Liquid hydrogen reservoir
100 MW, Eemshaven
RWE/Innogy
Study
Zeebrugge
Antwerpen
25 MW PtG
Colruyt/Eoly
/Parkwind/Fluxys
Study HyOFF, 2022
10 MW PtG
Engie/Oiltanking/Indaver/VMH/H
elm-Proman/port
Methanol
Total : 700 MW, 100 - 125 kton

Enduser is key



4. HyFLOW

- Rotterdam



Figuur 1 Waterstof in 2030: aanbod, vraag en infrastructuur in Zuid-Holland.

3. Hydrogen Europe: IPCEI

IPCEI 1: Netherlands, Belgium & Germany:

- Off-shore wind
- L-gas pipelines
- Electrolyser capacitity
- Trucks
- Light Duty Vehicles

4. HyFLOW

- Governments:
  - Netherlands
    - EZK — interest in hydrogen
    - Provinces — interest, but what after elections
  - Flanders
    - Innovation — Moonshot: interest in CCU (400 M€)
    - Provinces — interest in Antwerp, East-Flanders, West-Flanders
    - What after elections in May ?
  - NorthReinWestfalian
    - Interest in chemicals and mobility
    - 14 billion euro for transition out of coal
    - Structural cooperation with Flanders and Netherlands

Unique selling points

- Actual large hydrogen production for industry
- Longest underground pipeline-network in Europe, owned by Air Liquide
- Strong increase in offshore wind
- Unique/dense grid for transport of natural gas
- Strong heavy duty logistics

Ambition and realism

- Talking of 100 MW electrolyser, but reality is that ‘only’ 10 MW has been proved
- Institutional discussions needed on operation/bunsiness case of gas grid (natural gas/hydrogen): ownership, maintenance, access, regulated-non-regulated
- Need for end users to pay extra for hydrogen
- Availability of equipment (production as well as use)
- Step by step needed: Flanders-Netherlands unique position

4. Next steps

- Quantifying data/value chain of hydrogen for each port
- Concept infrastructure, starting from natural gas
- Discussion with governments in Flanders – Netherlands
- Plan for 2030 with projects/data/actors