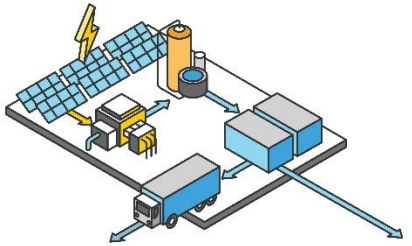
About TSO2020



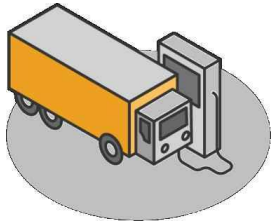
- Grid Stability Studies
- Cost Benefit Analysis
- Market Studies

Research

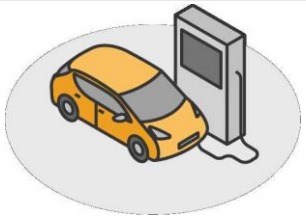
TSO 2020

Pilots

- Hystock Zuidwending 1MW elektrolyser



- Delfzijl Hydrogen hub



- H2 refuelling station Green Planet Pesse

Co-financed by the Connecting Europe Facility of the European Union

Movie TSO2020

gasunie
crossing borders in energy

gasunie
crossing borders in energy

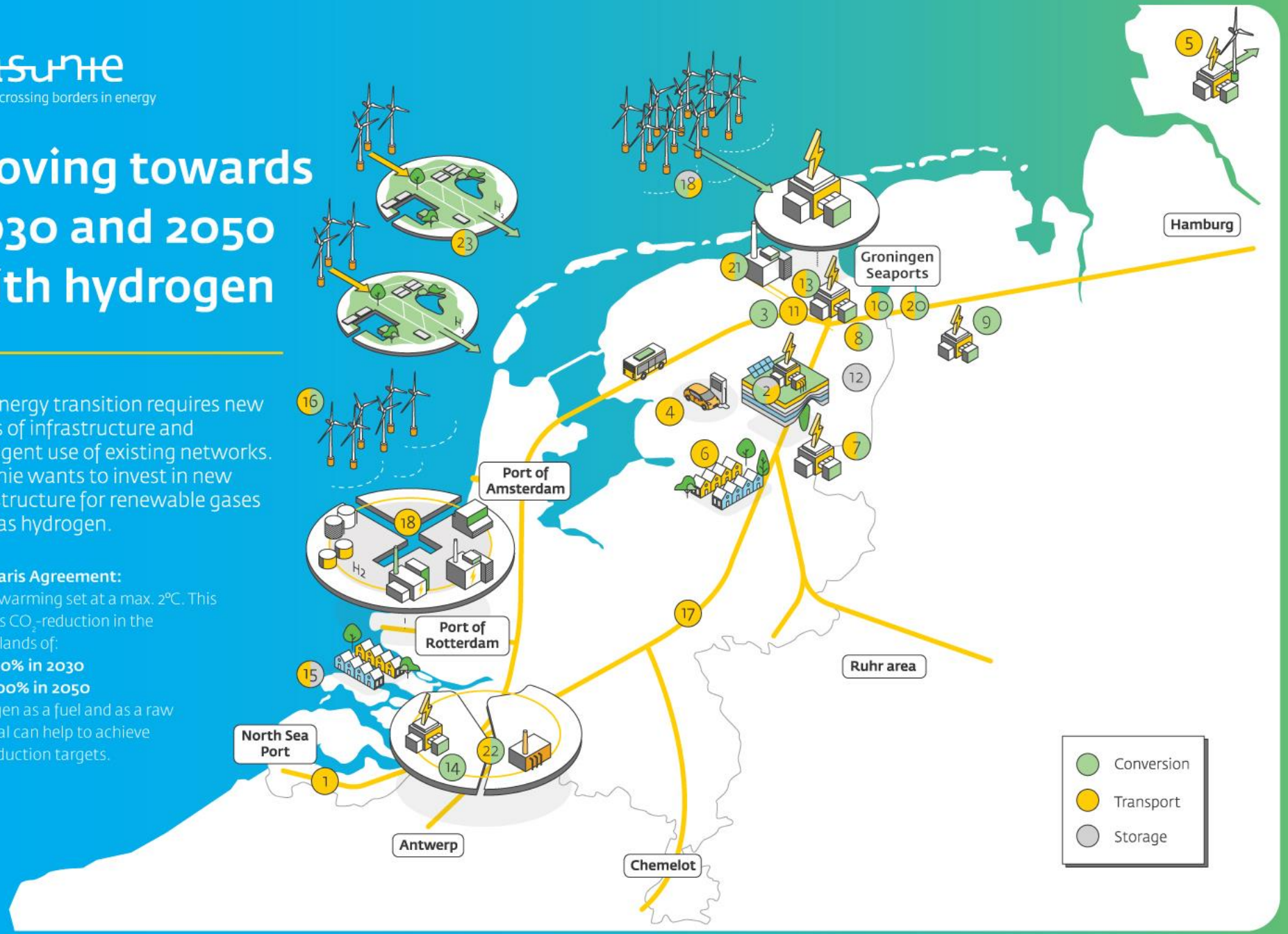
Moving towards 2030 and 2050 with hydrogen

The energy transition requires new forms of infrastructure and intelligent use of existing networks. Gasunie wants to invest in new infrastructure for renewable gases such as hydrogen.

2016 Paris Agreement:
Global warming set at a max. 2ºC. This requires CO_2-reduction in the Netherlands of:

- **40-50% in 2030**
- **85-100% in 2050**

Hydrogen as a fuel and as a raw material can help to achieve CO_2-reduction targets.



2017
1 Hydrogen pipeline

2018
2 HyStock

2019
3 Hydrohub

2020
4 Hydrogen re-fuelling stations and buses

5 H_2-projekt Haurup

2021
6 Hydrogen district Hoogeveen

7 GZI Next

2022
8 Djewels

2023
9 Element 1

10 HyNetherlands

2024
11 Northern H2 infra

2025
13 H2M

2026
14 CUST

12 Hydrogen storage

15 Hydrogen district Stad aan 't Haringvliet

16 North Sea Wind Farm

17 Backbone

2027
19 H-vision

2028
20 HyNetherlands

18 NorthH_2

2029
21 H2M phase 2

22 CUST

2030
23 North Sea Wind Power Hub

Highlights research

- Cost benefit analysis
  - Developing the hydrogen will foster economic, environmental and societal benefits for the Northern Netherlands, focusing first on electricity/mobility markets coupling but without taking industries out of the picture
  - The electrolyser outperforms the battery for the considered KPIs for any given year of a specific scenario
  - Optimisation of bid strategies improves the business case of the electrolyser
- Grid stability studies
  - Large-scale electrolyser capacity is technically promising for the procurement of ancillary services (e.g. primary frequency control). Yet, the business model of power-to-gas will determine the market participation.
  - Different advanced control methods attached to large-scale-electrolysers lead to significant improvement of in the mitigation of active power imbalances. Remarkably, the time response of the control actions by the electrolysers is faster and more effective than other competitive solutions (e.g. battery storage). This is important to prevent electrical power disruptions and blackouts in future.
  - Studies done in other tests systems showed that electrolysers have potential to improve other important technical performance concerns due to high RES: e.g. network congestion, local voltage stability and rotor angle stability.
- Market studies
  - Market uptake
    - Deployment of existing hydrogen based technology has the biggest influence of getting the hydrogen demand up
    - Policy should focus on supporting this deployment to get industrial CO2 emissions down
    - Suitable regulations should be in place reducing CO2 emissions f.i. by introducing fees for CO2 pollution
  - Regional perspectives (North Netherlands, Lower Saxony and North Rhine Westphalia)
    - The specific hydrogen demand in industry (refineries, chemicals and steel) will remain constant up to 2040.
    - The development of the zero emission transport sector and the mileage will further increase
  - Potential synergy locations for TEN-E and TEN-T corridors
    - Hot spots identified (Rotterdam, Utrecht, Nijmegen, Dusseldorf/Duisburg and Cologne): in all hot spots public transport buses, ports, logistic hubs are spatially clustered. Large demand determined by chemical industry, refinery and steel production
    - Other hotspots developing are apparent in the region Northern Netherlands and Lower Saxony to Hamburg.
    - Pooling demand in the hot spots will result in economies of scale for H2 production, H2 infrastructure and H2 storage

Please find all available reports on our website www.tso2020.eu a link will be sent to you by mail after the event. Please note that the market studies are not available yet.