Hydrogen and HEAVENN

*Power to the molecules*

Patrick Cnubben

New Energy Coalition
Agenda

- EU flagship project HEAVENN
- A lot of initiatives and projects
- Next steps
Where are we located?
Green Hydrogen Economy in the Northern Netherlands
Becoming an Integrated Hydrogen Economy

- Linking individual projects and developing local H₂ infrastructure, represents the next development stage towards a local H₂ economy.

- H₂ Valleys should establish local H₂ nuclei.

- Part of a clear local strategy to start a long-term green energy transition.

- Backed-up by political commitment.
The North: Perfect match

• The region is perfectly positioned and willing to develop an integrated green H2 economy, due to:

  • The large-scale existing and planned supply of renewable electricity (RES), including onshore and offshore wind as well as solar, as well as strong interconnections with larger wind-based areas in Denmark and Germany

  • The existing large-scale chemical industry already experienced in production and handling of H2

  • The existing gas transmission and large-scale underground storage infrastructure
The North: Perfect match

• The potential to scale-up and export green H2 to other EU regions by land and sea

• The ongoing decarbonization of mobility in urban areas

• The strong knowledge and industry-led innovation infrastructure. The political support at local and regional level, e.g. through the three northern provinces (Groningen, Drenthe and Friesland), substantiated by the development of a “Green H2 Economy” roadmap in 2017.
HEAVENN

The consortium
• Stichting Energy Valley, part of New Energy Coalition
• 29 entities from 7 EU countries (NL, D, DK, B, UK, ES and E)
• Parties from business: large, mid-sized and SME, associations, knowledge institutions, expert advisories, regional development institutions

Broad national and international support
• Over 60 parties from over 12 countries have given their support to the project via the means of a Letter of Support
• The project also can rely on broad political support covering the whole political spectrum – nationally and EU level
Industrial feedstock

- Facilitation of supply of green H2 to ‘green’ methanol production process, full output 20 MW (Delfzijl)

- Facilitation of Supply of green H2 to produce renewable “drop-in” e-fuels for transport applications, full output 40 MW (Delfzijl)

- Total initial industrial H2 demand estimated going up up to > approx 7,000 tpy by 2022
Heat & Power

- Heat for residential and municipal buildings (100 and 250: Hoogeveen and Groningen)
- 2 (-10) MW Electrolyser for industrial heat (Emmen)
- Back-up power datacenter 100kW fuel cell supply based on green H2 (Groningen)
- On-shore auxiliary power 100 kW for inland boats/barges (Delfzijl)
- Total heat & power H2 demand: expected to increase to >500 tpy
Mobility

- Buses: 10 FC buses in Emmen
- Passenger and light duty: 105 FC passenger cars and 10 vans
- Heavy duty: 4 special trucks and 8 HDVs
- 4 HRS (2 x 350 bar, extension/upgrade to 700 bar)
- Maritime/inland barge
- Total mobility H2 demand: estimated 680 tpy
Storage & Infrastructure

- Studies & preparatory work for the deployment of repurposed and new H2 pipelines
- Realisation of (polymer-based) pipeline connections on the Delfzijl Chemical complex connecting supply and demand
- Deployment of new H2 pipeline between GZI site and the Emmtec Industry Park
- Distribution of H2 across the region via virtual gas pipelines i.e. trailers
- Deployment of underground gas storage system
More than Heavenn
Roll out to mass application
European Hydrogen Valley’s Platform
Hydrogen perspective
Mission Innovation Hydrogen Valley Platform

We have gathered the first comprehensive overview of H2Vs globally and identified 40 relevant projects together with IC8 members.

Global Hydrogen Valley projects and status of IC8 feedback

- **Netherlands**
  - HEAVENN
  - TSO 2020
  - Hydrogen Delta

- **United Kingdom**
  - HyNet North West England
  - BIG HIT Orkney Island
  - H21 North of England

- **Canada**
  - Hydrogen Cluster British Columbia

- **USA**
  - California Fuel Cell Project

- **Chile**
  - Hydrogen Valley Atacama

- **France**
  - Zero emission valley
  - Auvergne-Rhône-Alpes
  - HyPort
  - Normandie

- **Europe (IPCE)**
  - Blue Danube
  - Black Horse
  - Silver Frog
  - Green Octopus
  - Rainbow Unihycom
  - Green Spider
  - Blue Dolphin

- **Germany**
  - H2Rivers
  - Norddeutsches Realabor
  - Heyways4 future
  - HydroHub Fenne
  - eFarm

- **China**
  - Pearl River Delta (Foshan)
  - Beijing-Zhengjiakou
  - Daling
  - Rujiao

- **Japan**
  - Fukuoka Hydrogen Strategy
  - Fukushima Plan for New Energy Society

- **Thailand**
  - Phi Suea House

- **Saudi Arabia**
  - NEOM

- **UAE**
  - Mohammed bin Rashid al-Maktoum Solar Park

- **Australia**
  - South Australia
  - Hydrogen Action Plan
    - Neoen Crystal Brook Energy Park
    - Port Lincoln

Source: Roland Barger
Global developments

SOME KEY ON GOING LARGE « FLAGSHIP » PROJECTS

- H2 MOBILITY ENERGY NETWORK
  - SSAB
  - LKAB
  - VATTENFALL
  - TOTAL
  - Shell
  - Equinor

- HYBRIT - STEEL CO2 FREE
  - SSAB
  - LKAB
  - VATTENFALL

- NORTHERN LIGHTS
  - CO2 transportation & storage
  - Equinor
  - TOTAL

- MAGNUM H2 POWER PLANT
  - VATTENFALL
  - Gasunie
  - Equinor

- H2 FC TRUCKS
  - Toyota
  - Shell
  - Kenworth

- H2 FC TRUCKS FLEET
  - Shell
  - Storengy
  - Cadent
  - Innovyn

- H2 MOBILITY
  - Honda
  - Nissan
  - Iwatani
  - JHyM

- H2 MOBILITY NETWORK
  - Johnson Matthey
  - Progasenergy
  - Northern Gas Networks

- HYNET & H21 HEATING UK
  - JCM

- CENTURION - CAVERN - ENERGY FLEXIBILITY
  - Cadent

- LH2 SUPPLY CHAIN
  - Kawasaki

- GREEN H2 PROD FOR AMMONIA
  - & Others

- Some key on going large « flagship » projects

Foreseen CO2 abatement of project at scale (Mt)

- ~2
- ~4.5
- ~5
- ~0.5
- ~3.7
- ~>30
- ~1.7
- ~1.3
20+ H2 busses
Hydrogen mobility
Hydrogen Transport & Storage

New Energy Coalition

Delfzijl
Groningen
Emmen
Hoogeveen
Nouryon
Emmtece
More wheels!
TSO 2020
Electric “Transmission and Storage Options” along TEN-E and TEN T corridors for 2020
TSO 2020
Electric “Transmission and Storage Options” along TEN-E and TEN T corridors for 2020
Value chain solutions
Equipment
Trucks & Ships & Trains
Built environment

MET VERENIGDE KRACHT,

FASE 1: Nijstad Oost
100 woningen

FASE 2: Erflanden
1100 woningen

FASE 3: Centrale Ten Arlo
H₂ productie met lokaal opgewekte zonne energie

NAAR EEN VERANTWOORDE TOEKOMST
Join us in Heavenn!

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