

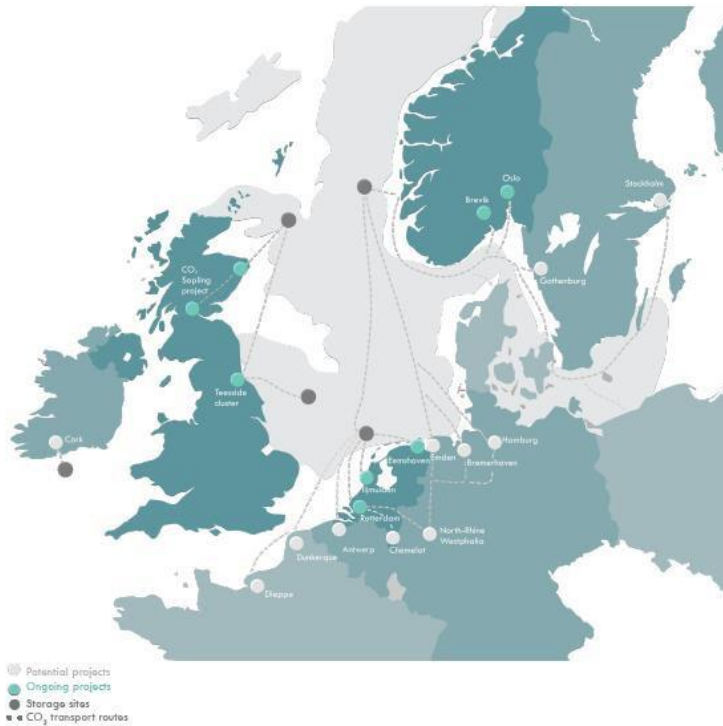
CCS and Hydrogen Projects

Northern Lights - Decarbonising Industry
H21 North of England – Decarbonising Heat
H2M-Magnum – Decarbonising Electricity
Zero Carbon Humber – Decarbonising Industry

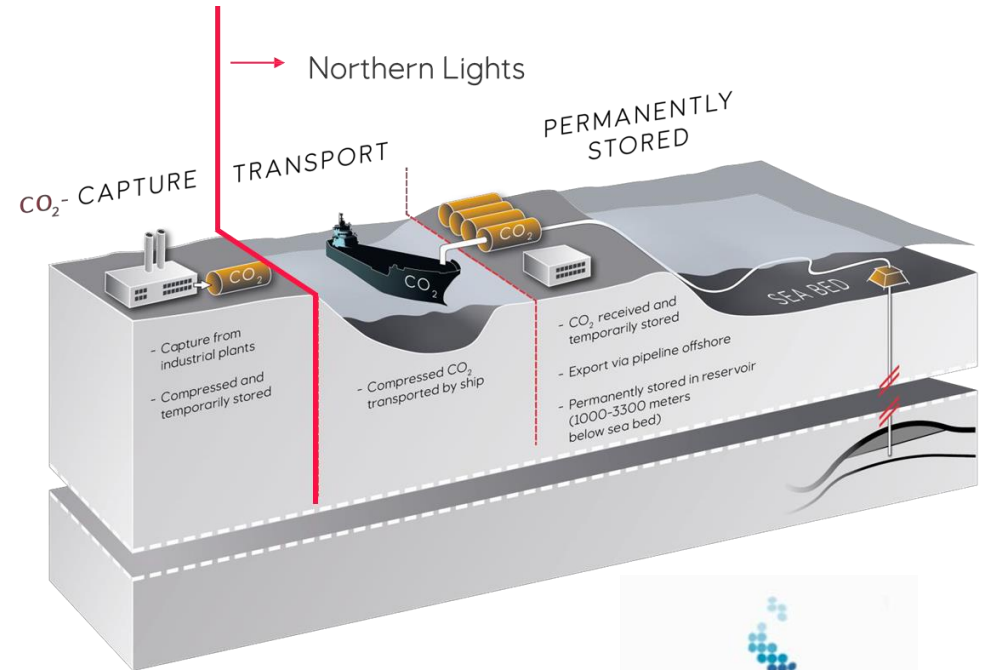
A European “open source” network for CO₂ removal



THE EUROPEAN CO₂ NETWORK

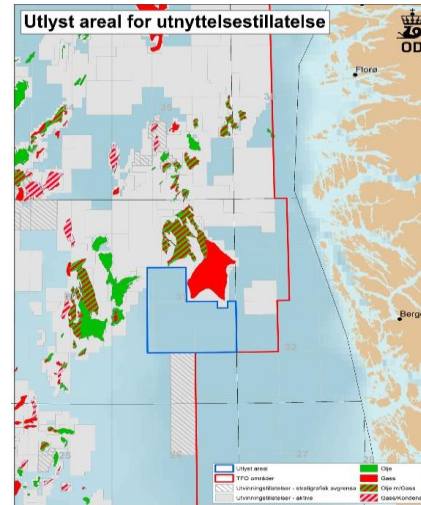


Source: Bellona Europe

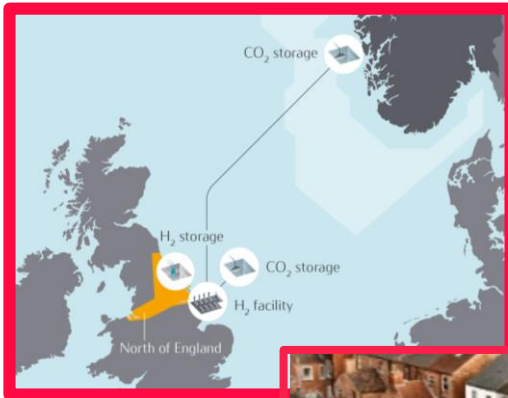


Project status & future

- **Transport, intermediate storage, pipeline**
FEED to be delivered Q3 2019
- **Storage**
 - Use permission Nr 001 given for “Aurora” south of Troll
 - Confirmation well to be drilled November 2019, subsea equipment is being built
- **Potential beyond anchor customers**
In dialogue with 15 possible users in 8 European countries
- **Investment decisions**
Planned for December 2020 (State budget)
- **Operational 2023**
Then all emitters have a storage solution – start capture!



H21 North of England



System approach to decarbonise residential heating and distributed gas

Energy: ~85 TWh (12.5% of UK population)

/ 12 GW hydrogen production

CO2 emissions reduction: 12,5 Mt CO2 pa

CO2 storage offshore UK / Norway

8 TWh (seasonal) hydrogen storage

CO2 footprint 14,5 g/KWh

Unlimited system coupling

CAPEX: £23 billion



H21 NoE supply concept



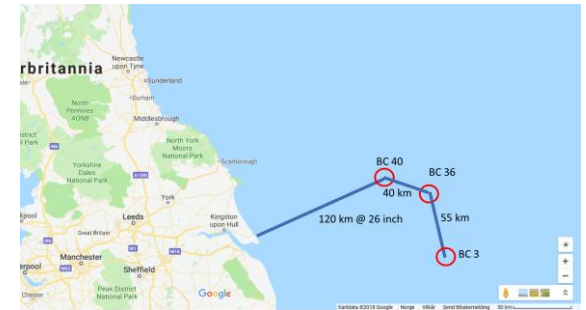
Greenfield Hydrogen Facility

- Location: Easington
- Capacity: 12 GW
- Configuration: Multi train, self-sufficient with power



Hydrogen Storage

- Location: Aldbrough
- Capacity: 8 TWh
- Configuration: 56 caverns at 300,000 m³



CO2 Storage

- Location: Bundter
- Capacity: +600 Million @ 17 mtpa
- Configuration: Saline aquifers

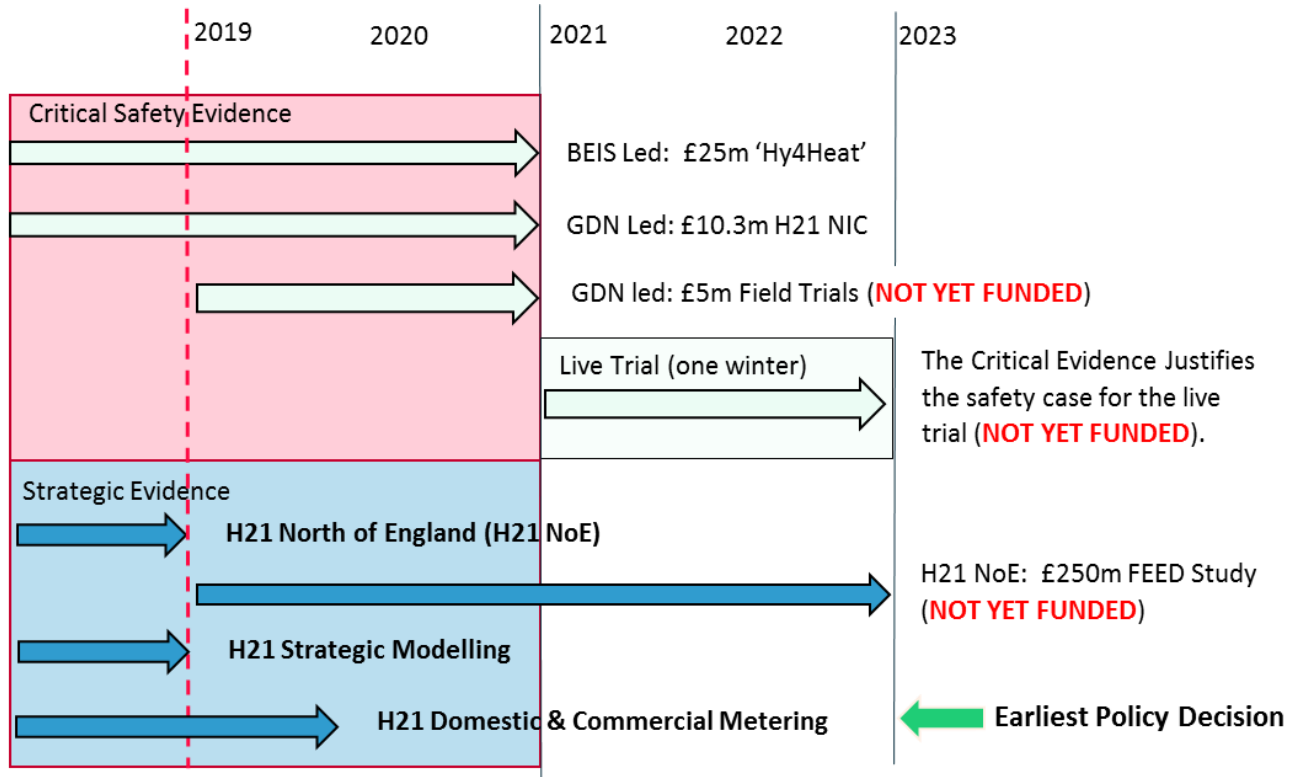
H21 - What will it cost?

2035 Residential Prices

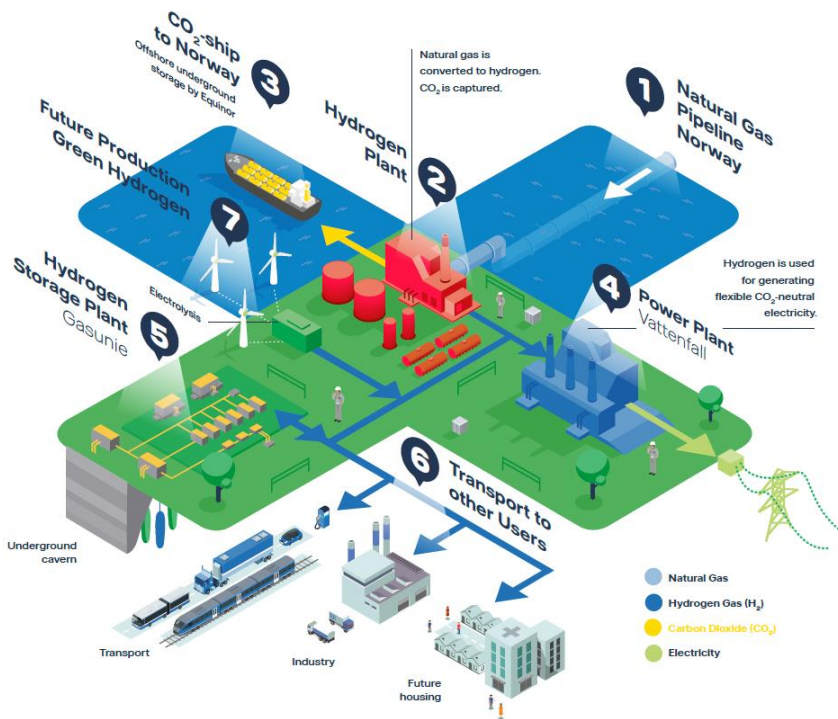


| | <u>2035 Residential Prices</u> | <u>CO2 Footprint</u> |
|-------------|---------------------------------------|-----------------------------|
| Electricity | £200/MWh (BEIS Projection) | 50 g/KWh |
| Natural Gas | £50/MWh (BEIS Projection) | 200 g/KWh |
| Hydrogen | £75/MWh (H21) | 15 g/KWh (H21) |

The next steps



H2M – Magnum, Netherlands



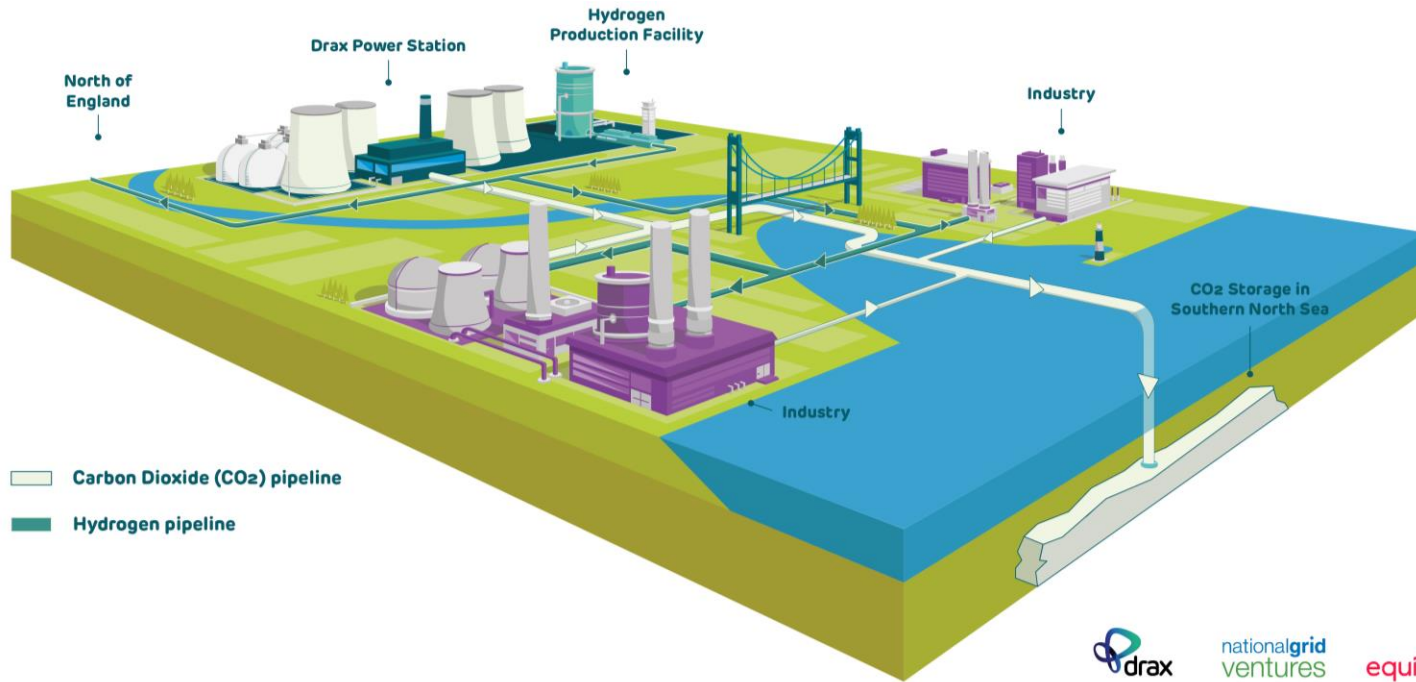
- **Energy:** 8-12 TWh
- **CO₂** emissions reduction of 2 Mton/year
- Utilise existing gas power plants and gas **infrastructure**
- Switch fuel from natural gas to clean H₂
- **Clean, flexible** electricity as **back-up** for solar and wind
- Launch large-scale H₂ economy

• **Partners:** gasunie &



Zero Carbon Humber

Our vision



CCS Projects

Northern Lights - Decarbonising industry

H21 North of England – Decarbonising heat

H2M-Magnum – Decarbonising electricity

Zero Carbon Humber - Decarbonising industry

Steinar Eikaas

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