CCS and Hydrogen Projects

Northern Lights - Decarbonising Industry

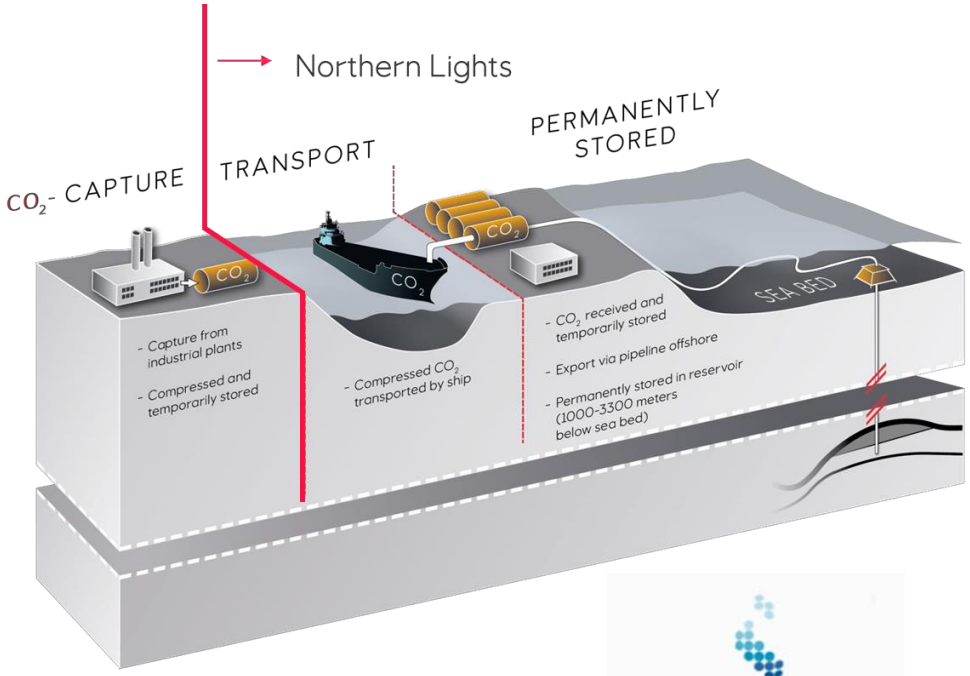
H21 North of England – Decarbonising Heat

H2M-Magnum – Decarbonising Electricity

Zero Carbon Humber – Decarbonising Industry

A European “open source” network for CO2 removal

Source: Bellona Europe



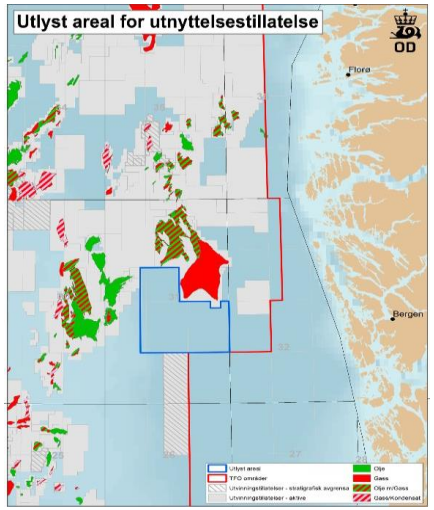
GASSNOVA

equinor

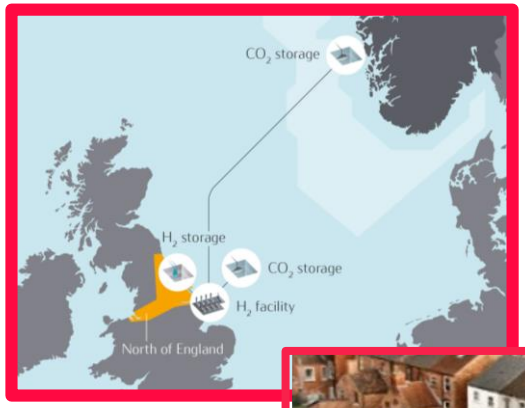
TOTAL

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

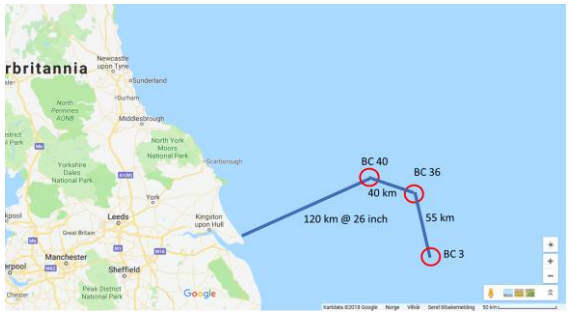
H21 NoE supply concept

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

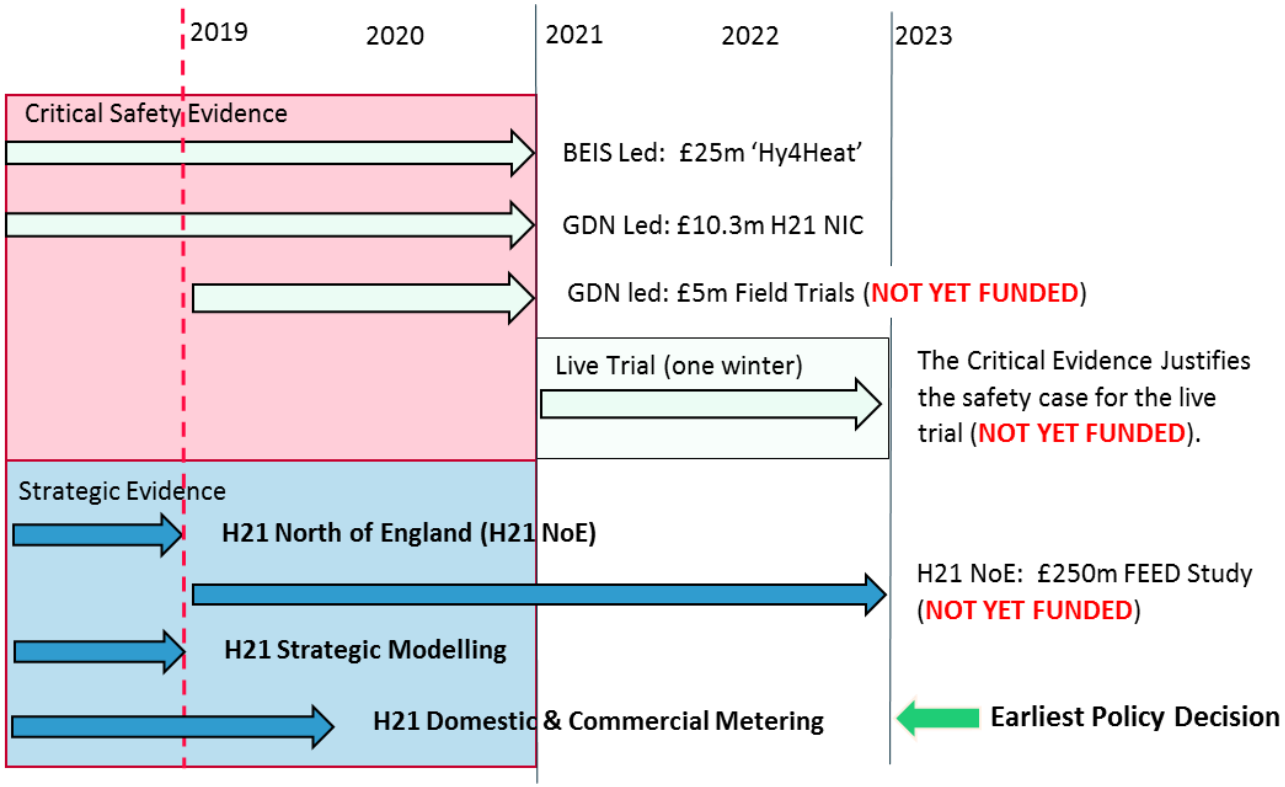
- Location: Bundter
- Capacity: +600 Million @ 17 mtpa
- Configuration: Saline aquifers

H21 - What will it cost?

2035 Residential Prices

	2035 Residential Prices	CO2 Footprint
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

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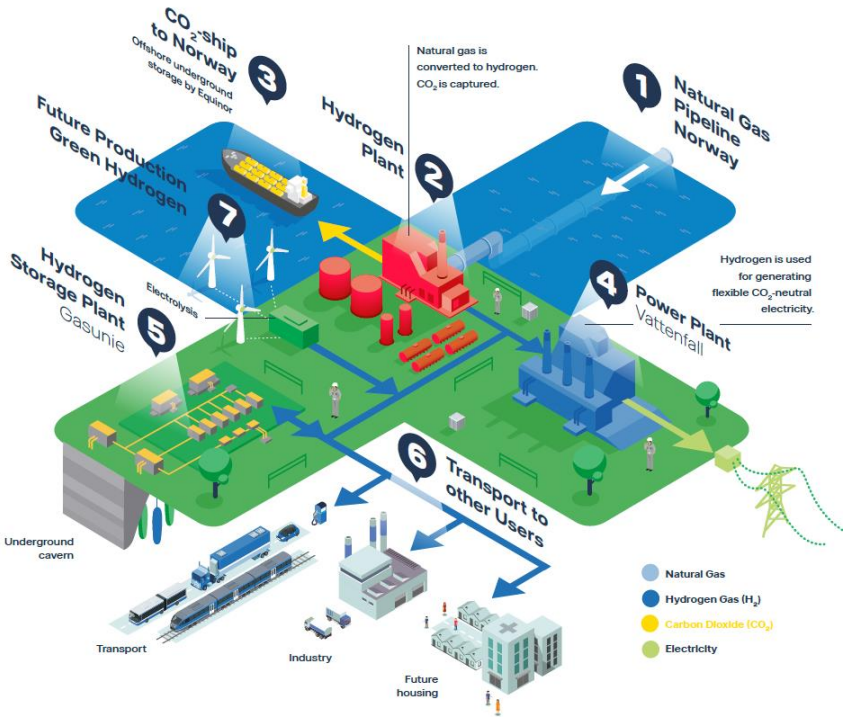
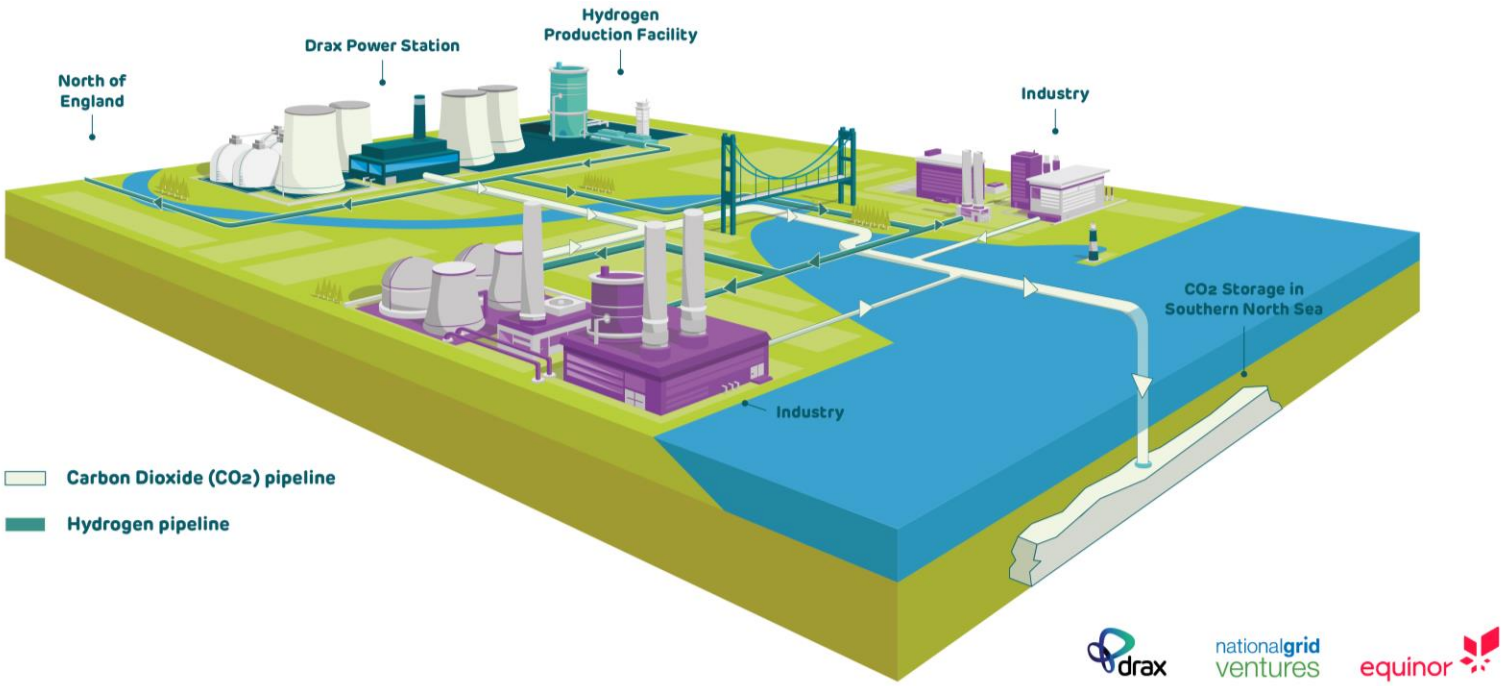


- Energy: 8-12 TWh
- CO2 emissions reduction of 2 Mton/year
- Utilise existing gas power plants and gas infrastructure
- Switch fuel from natural gas to clean H2
- Clean, flexible electricity as back-up for solar and wind
- Launch large-scale H2 economy
- Partners: gasunie & NUON VATTENFALL

Zero Carbon Humber

Our vision



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Steinar Eikaas