The Future Role for Gas and Decarbonising Heat

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Rural Services Network
Rural Decarbonisation Seminar
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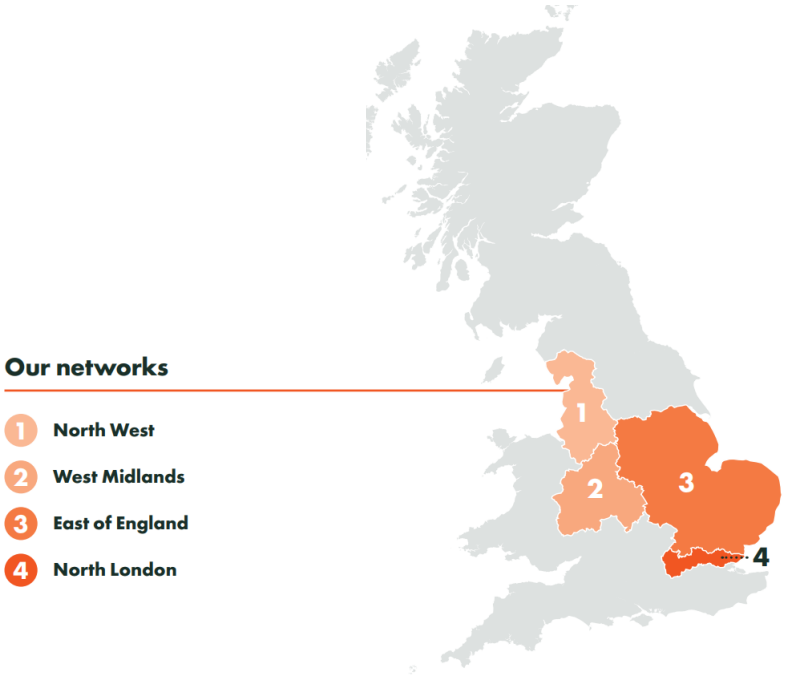
Introduction to Cadent



Largest distributor of gas in the UK

- Own and operate 4 of 8 Gas Distribution Networks in the UK
- Serving 11m customers across the UK
- Accounting for nearly 50% of the UK gas distribution market
- 131,000 km of Gas pipeline

Regulatory responsibilities

- Safe and reliable gas supply to homes
- Emergency response
- Asset management and other mains replacement work

High quality asset base and workforce

- Property, pipelines, above ground assets, control systems, fleet, technology
- Nearly 5,700 FTEs plus two strategic partnerships involving c. 4,500 delivery staff

Agenda

Introduction

What role will the gas distribution network have in the future energy system?

- Is it technically feasible and safe to transport and use hydrogen?
- How do the economics of hydrogen compare to alternatives?
- What is the role for other green gases?
- What are consumers' preferences for hydrogen vs. alternatives?
- How might the energy transition happen?
- What policy and regulatory mechanisms are needed?

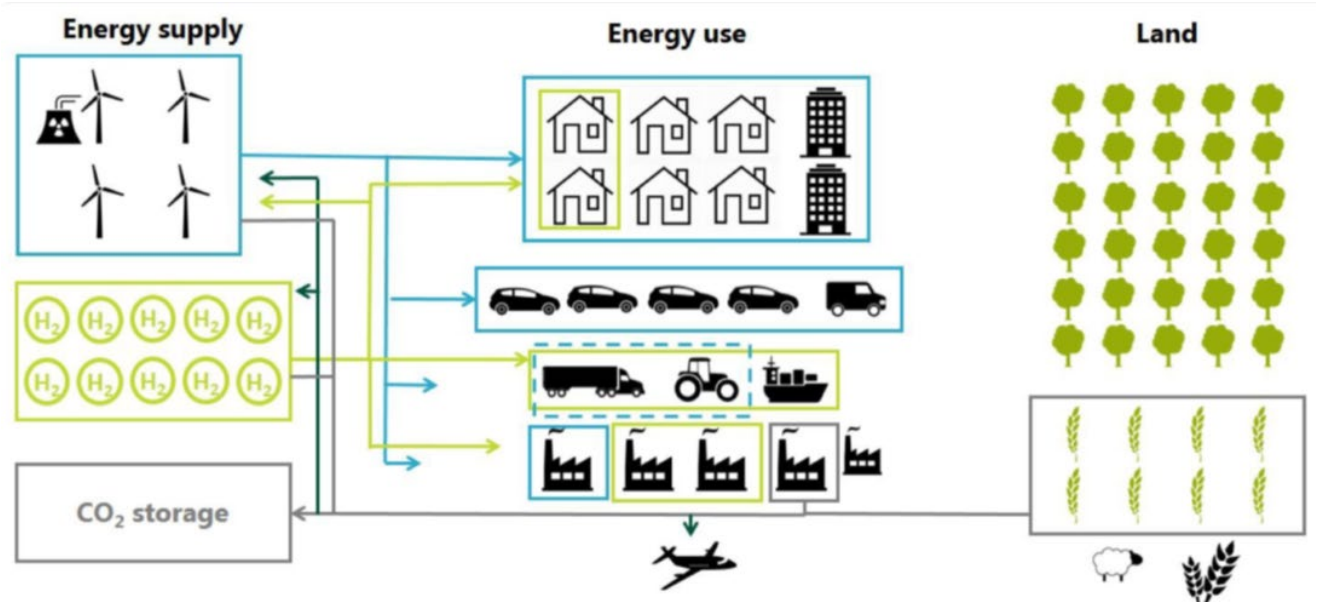
As we build greater clarity on these questions, we will be able to identify the future investment needed in our infrastructure and our homes and businesses

We are on a five-year journey with expected clarity on the Heat policy framework c. 2025.

What I'm covering today:

1. The Hydrogen Journey
2. Whole system decision making
3. The Householder is key
4. Off Gas Grid Developments

Hydrogen has become ‘a thing’…



Chris Stark (CCC):
“System costs are not a major differentiator between electrical and hydrogen heat, so public support will likely determine the shape of our decarbonised future.”

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HyDeploy – blending hydrogen

Blending gas up to 20%

Minimum disruption to customers

Because no appliance changes

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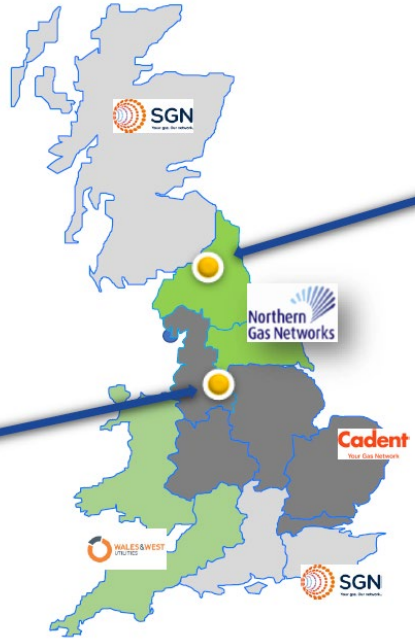
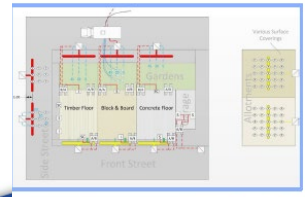
H21 Projects: Repurposing the existing natural gas network

Aim: To provide the safety and technical evidence case that the below 7 bar distribution network can be repurposed to 100% hydrogen

HSE Science Division Buxton





DNVGL Spadeadam

Successfully obtained two rounds of NIC funding
- c. £17m Joint funded by Ofgem and the GNOs
- Two project phases concluding in 2020 and 2021 respectively

Phase 1 - Leakage and background testing
- Two test facilities established at Buxton and Spadeadam
- Testing the leakage levels of existing assets on Hydrogen
- Both above ground and buried assets
- Comparing the leakage levels to those on natural gas
- Assessing the consequence of any small or large leak
- Assessing ignition potential and explosion severity

Phase 2 - Network operations and unoccupied trials
- Utilises existing Spadeadam facility from Phase 1
- Identifies required changes to GDN operational procedures
- Determines competencies of future gas engineers
- Tests and reviews network conversion protocols
- Prepares for unoccupied trial on repurposed network

Culminates in the production of a Quantitative Risk Assessment for repurposing the below 7 bar network in September 2020.

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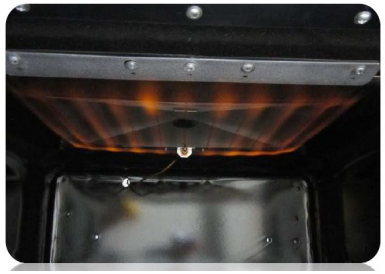
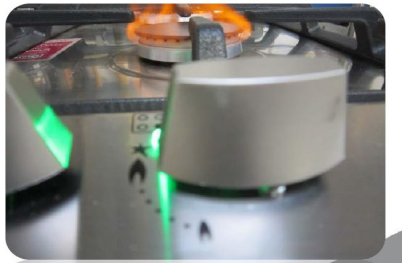
Hy4Heat programme





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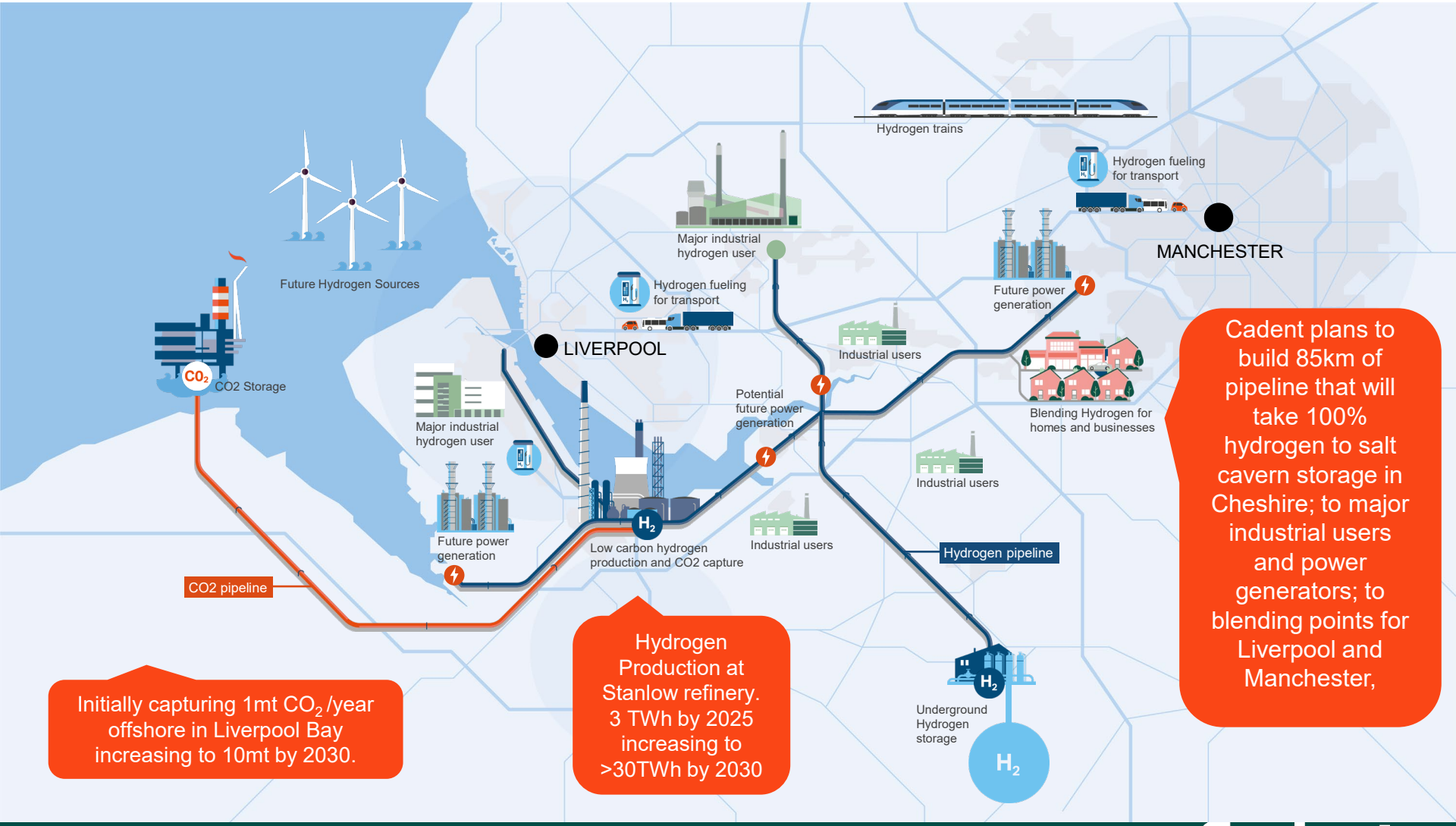
HyNet overview



Initially capturing 1mt CO_2 /year offshore in Liverpool Bay increasing to 10mt by 2030.

Hydrogen Production at Stanlow refinery. 3 TWh by 2025 increasing to >30TWh by 2030

Cadent plans to build 85km of pipeline that will take 100% hydrogen to salt cavern storage in Cheshire; to major industrial users and power generators; to blending points for Liverpool and Manchester,

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Timelines have been laid out to 2030

£500m to generate 5GW of hydrogen production capacity by 2030

2021 – Hydrogen strategy – preferred business models

2023 – Necessary testing completed to allow up to 20% blending of hydrogen into the gas network

2023 – Hydrogen heating trials on local neighbourhood

2025 – Large village hydrogen trial

2028 – Hydrogen town

Other relevant milestones:

- **2023 –** Proposed mandate for hydrogen-ready appliances
- **2025 –** Firm decisions on heat policy
- **2023 or 2025** – No gas boilers in new builds
- **2028** – 600k heat pumps installed/yr
- **2033 –** CCC proposed ‘cut over’ from natural gas to something else

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The economic case for hydrogen versus alternatives is complex and requires a 'whole system' perspective

Key factors influencing the economics of hydrogen relative to alternatives:

	Key questions	Key considerations
Ramping up production	• What will it cost to ramp up hydrogen production (blue and green) versus renewable power generation?	• Production and storage needs to be sufficient to meet *peak* demand as well as overall demand – which is currently done by gas • Future cost of hydrogen is currently less certain than future cost of electricity
Readying networks	• What will it cost to convert and maintain or decommission existing gas networks? • How much electricity grid reinforcement is needed and what will it cost?	• Distribution networks need to be able to meet peak power demand, which will increase significantly from today in all future scenarios
Switching over consumers	• What are the relative costs of switching to hydrogen boilers and appliances versus switching to heat pumps or hybrid systems?	• In many cases heat pumps will also require insulation to be upgraded and radiators to be replaced
Broader energy system implications	• How can we ensure the future energy system is sufficiently resilient and reliable? • How do changes elsewhere in the energy system affect the case for hydrogen?	• The future energy system will need to be sufficiently flexible to handle daily, seasonal and yearly fluctuations in wind and sunshine • The move to EVs will place considerable additional strain on the power network

Similar questions apply to off gas grid decarbonisation as well as at a regional and national level

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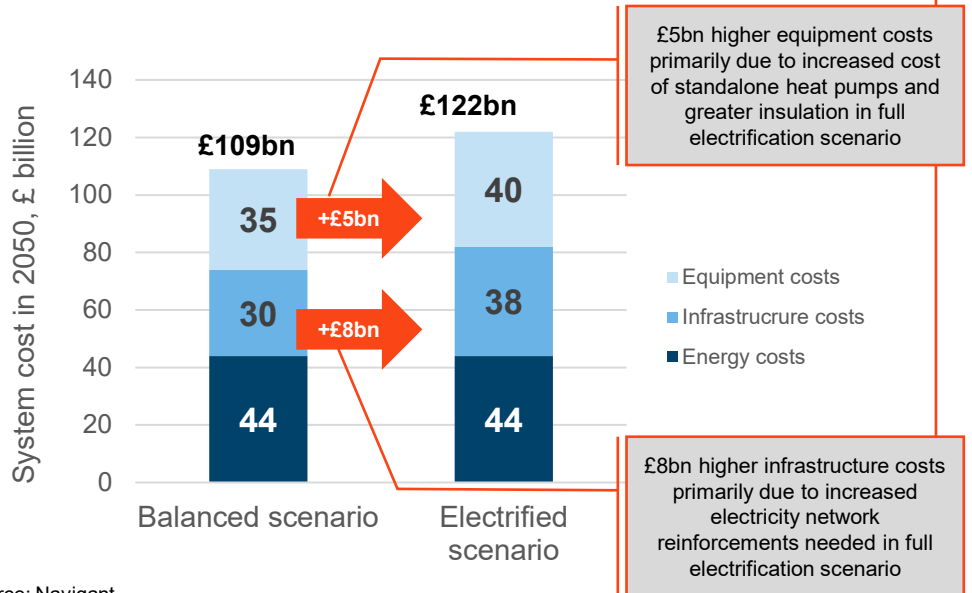
A future energy system incorporating both hydrogen and heat pumps is likely to have the lowest whole system cost

- Multiple studies including ones recently published by Navigant and Imperial College have concluded that a balanced energy system incorporating both hydrogen and heat pumps for domestic heating is likely to have the lowest whole system cost:
  - Navigant concluded that whole system costs would be £13 billion cheaper for a balanced scenario versus full electrification
  - Imperial College concluded that a balanced scenario would be £4bn p.a. cheaper than either a full electrification pathway and £36bn cheaper than a full hydrogen pathway
- Lower costs are primarily driven by the reduced need to reinforce electricity distribution networks and the lower cost to convert some homes to hydrogen compared to heat pumps

The differences between scenarios are small in relative terms and the results are highly sensitive to assumptions, suggesting that while the economics are important, they are unlikely to be the deciding factor alone

Navigant comparison of whole energy system cost for balanced energy system incorporating hydrogen vs. full electrification



Source: Navigant

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Customer preferences will be key to heat decarbonisation:

1. Cost, reliability and control are the most important attributes to customers
2. Customers expect cost of installation to be a barrier to having greener solutions, but expect greener solutions to be cheaper to run
3. If you are in a vulnerable situation, you value reliability and control higher due to your complex and diverse needs
4. Those in fuel poverty have to be more cost-conscious, but do not completely minimise spending
5. Tenure is the biggest driver in differences of opinion and property type does not have as significant an impact
6. Customers want as close to a like-for-like switch as possible
7. Hydrogen-ready boilers were customers' clear Low Carbon Technology preference
8. Sustainability is a consideration, but other factors tend to play a much stronger role in decision-making
9. Customers want Government to mandate change and incentivise the transition
10. Customers want homeowners to be able to choose from a prescribed shortlist and trust consumer advocacy groups and local tradespeople to advise on their decision

Decarbonising Heating Off the Gas Grid

- Government are considering tackling “High Carbon” Oil and Coal heating ahead of wider heat policy decisions
- We are advocating a whole system whole community approach to decarbonising, rather than encouraging or incentivising individuals acting independently.
- In some circumstances the gas network represents the optimum lower carbon solution:
  - Least disruptive transition for the home with scope to convert on fail
  - Hydrogen-ready boilers to enable future hydrogen conversion
  - A whole community solution
- Proposed future ban on gas network extensions would remove this option.

OFF GAS GRID COMMUNITIES ARE LIKELY TO BE THE TRAIL BLAZERS FOR UK HEAT DECARBONISATION

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