



# Hydrogen Projects in the UK

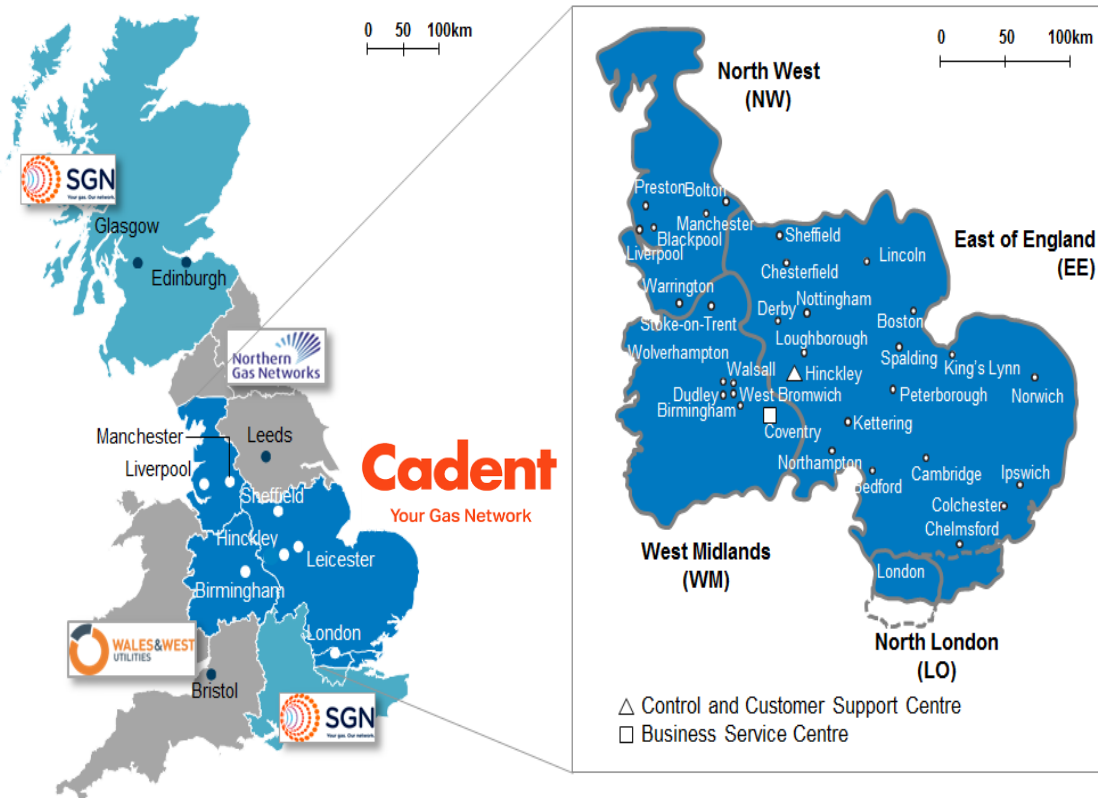
## A Network perspective

Huw Sullivan

**Cadent**  
Your Gas Network

# Cadent - distributes gas to major centres of population and Humber & Mersey industrial clusters

## Overview of UK gas distribution networks



**Largest distributor of gas in the UK - c50%**

**Supply the North West:**

**Supply Humber and Mersey industry**

**WE ARE AT THE FOREFRONT OF THE EVOLUTION OF THE UK GAS INDUSTRY**

# A strategy for decarbonising UK gas supply

## Reduce Carbon Intensity of a Gas Network

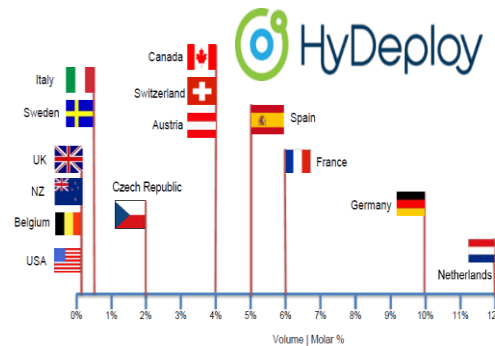
Bio-methane



Bio-SNG



Hydrogen Blend



100% Hydrogen

HyNet North West



## Progressively supply 100% hydrogen to selected consumers

Industry



transport fuels



Power



New developments





# BioSNG and Hydrogen

**Cadent**  
Your Gas Network

# BioSNG

## Turning black bag waste into gas

**We are helping to fund the world's first commercially operating BioSNG plant making gas from household waste.**

### Benefits

- ✓ The facility will accept 10,000 tonnes of waste from the local area and produce 22GWh of BioSNG per annum, enough to heat 1,500 homes or fuel 75 heavy good vehicles, using the existing gas distribution network.
- ✓ Once operational the facility will reduce greenhouse gas emissions by more than 5,000 tonnes per annum.

  
gogreengas



# Plant under construction

SECURED,  
RESIDUAL WASTE

CONVERSION TO HIGH  
QUALITY SYNGAS

CONVERSION TO  
BioSNG

NETWORK DELIVERY  
& HGV FLEET



Or H2



CO<sub>2</sub> SALES

**PILOT PLANT HAS SUCCESSFULLY PROVEN H2 PRODUCTION  
THE WORLD'S FIRST GRID CONNECTED, FULL CHAIN, WASTE TO  
SNG FACILITY OPERATING UNDER COMMERCIAL CONDITIONS**



Department  
for Transport





# HyDeploy and Hydeploy 2

**Positive progress towards  
reducing UK carbon  
emissions through blending**

**Cadent**  
Your Gas Network

# Project objective

*John Newton is covering this !*

To demonstrate for the first time that a blend of hydrogen and natural gas can be distributed and utilised safely & efficiently in the UK distribution network without disruptive changes for consumers.

## Potential to Deliver

29TWh of low carbon heat per annum equating to saving:  
CO<sub>2e</sub> of 120 million tonnes & £8 billion cumulatively by 2050.

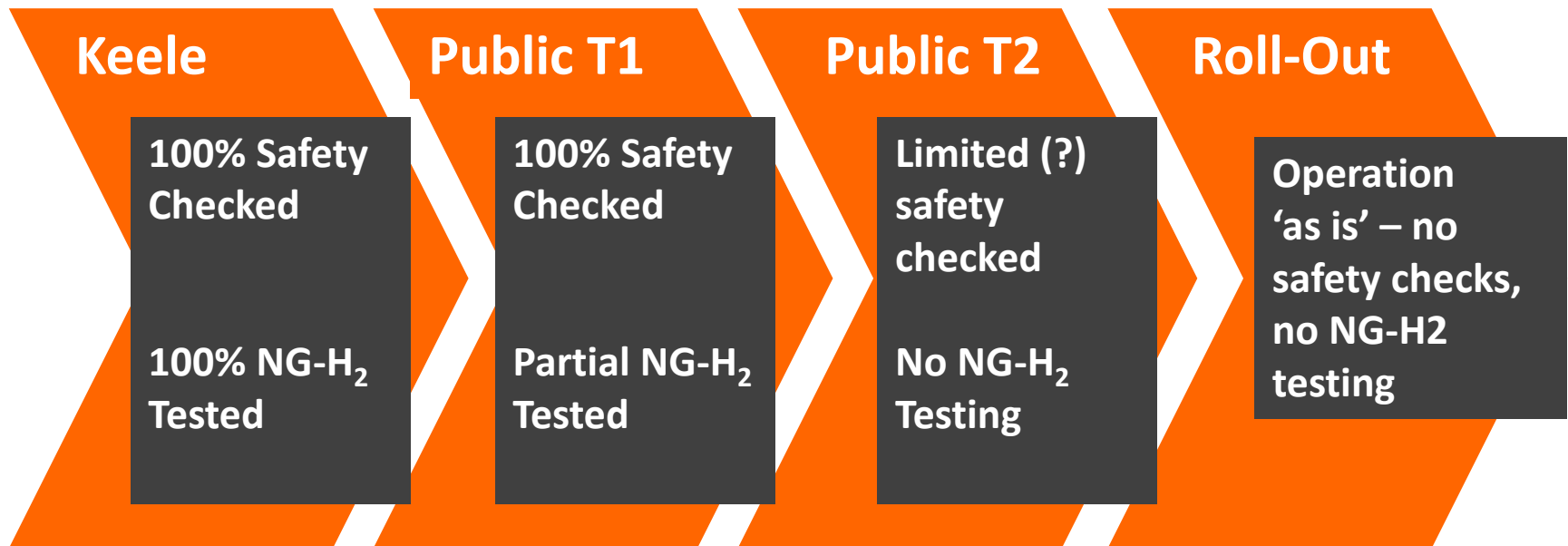


*Project Funded under OFGEM's  
Network Innovation Programme*



# HyDeploy and Hydeploy 2

## Public Trial Principles



# HyNet North West



**Delivering carbon  
Reduction savings in  
The North West of  
England**

**Cadent**  
Your Gas Network



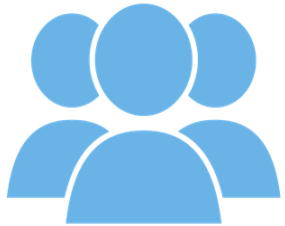
**Hydrogen production** at central plant between Runcorn and Ellesmere Port.  
 New **hydrogen pipeline** to supply **industrial gas users** & enable network injection for blend  
**Hydrogen 'blended'** into distribution network to supply households.  
 Use of existing pipeline and offshore rig infrastructure for CO2 storage, creating extendable **CCS infrastructure**.  
 Pipeline spurs from hydrogen pipeline to gas network, **power generation and vehicle refuelling hubs**

## Key data for HyNet NW

Parameter	Data
Peak displacement of natural gas use by industry	510 MW
Peak displacement of natural gas in the distribution network	380 MW
Number of customers receiving a (15-20%) hydrogen blend	2 Million
Total carbon dioxide (CO <sub>2</sub> ) abated per annum	1.1 Million tonnes
Total cost of Project infrastructure	£0.92 Billion

# A North West hydrogen cluster

**A major opportunity for new industrial growth**



**Blend for  
customers with  
minimal  
disruption**



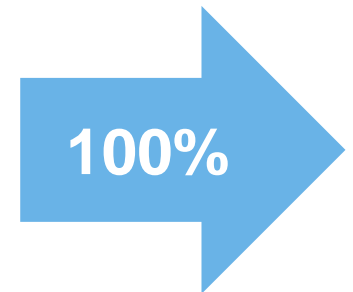
**Up to 100% to  
industry for  
major  
emissions  
reductions**



**Low carbon  
transport  
when  
infrastructure  
in place**



**Use in power  
generation to  
produce low  
carbon energy**



**Move towards  
100% hydrogen in  
distribution  
network**



## Liverpool Bay (ENI): A low cost and practical option for UK's first CCS deployment

- Liverpool Bay can be operating by 2025
- Estimated storage capacity of 130 million tonnes.\*
- Extension to Humberside, operating by c.2030
- Uses existing infrastructure due for decommissioning within this time frame.



# Economy

## Security and growth

- Protects energy intensive industry and jobs.
- Attracts inward investment.
- Stimulates investment in other renewable energy.
- Cost effective use of existing infrastructure.
- Exportable skills base for hydrogen and CCUS technologies.
- GVA of £17Bn to 2050 and creates 5,000 jobs by 2025



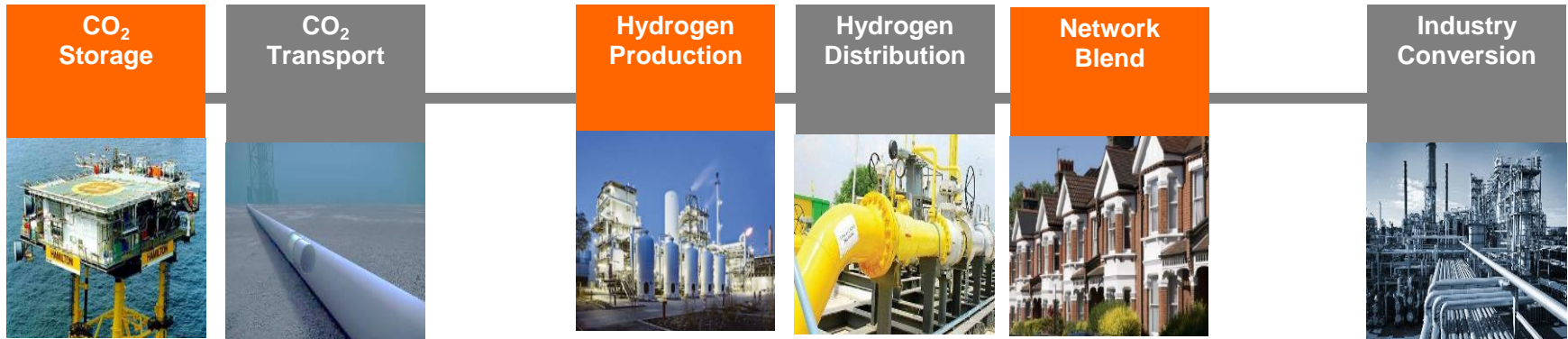
# Environment

## CO<sub>2</sub> savings and cleaner air

- Avoids 1 million tonnes of carbon dioxide emissions.
- Provides 5-6 TWh per annum of heat in Phase 1.
- Lower carbon heat for homes with minimal disruption to consumers.
- Hydrogen infrastructure can facilitate vehicle fuelling hubs for cleaner air.



# Illustrative Project Economics



Capex £920m  
Opex £60m

Hydrogen Price: £39/MWh Cost of Abatement: £114/te CO<sub>2</sub>  
*Compared with*

**Cost of Abatement**  
**£150-200/te CO<sub>2</sub>**

**Cost of Abatement**  
**£300/te CO<sub>2</sub>**

**ELECTROLYSIS**  
**Cost of Abatement**  
**£500/te CO<sub>2</sub>**

## Next steps – Government Policy and Routes to Fund

# Key asks from HyNET NW to government in context of Industrial Strategy



HM Government

- To set out firm policy direction to support CCUS by end of 2018
- Ofgem recognition that the Hynet project is the type of change they need to support to meet 2050 targets
- Development support (£s) to provide evidence base to support long term policy





# Other Industry Hydrogen Projects



## H21 Leeds City Gate

- Technical feasibility and economic feasibility of converting Leeds's existing network to 100% Vol H2
- Run by NGN's internal H21 team
- 2017 NIC project supported by all GDN's



## Hy4Heat

- Looking at the technical feasibility of 100% H2 downstream of the meter
- £25m commissioned by BEIS
- Looks at the practicalities of using H2 in homes



## H100

- Looks to demonstrate the safe delivery of 100% hydrogen into a new network
- Run by SGN and looks at the potential conversion of a municipality such as Aberdeen



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