



Unlocking Hydrogen's Potential

How Deblending can create new opportunities for transport

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The National Transmission System (NTS)

The role of gas:

23m
Gas
customers
across the UK

85%
of UK
households use
gas for heat

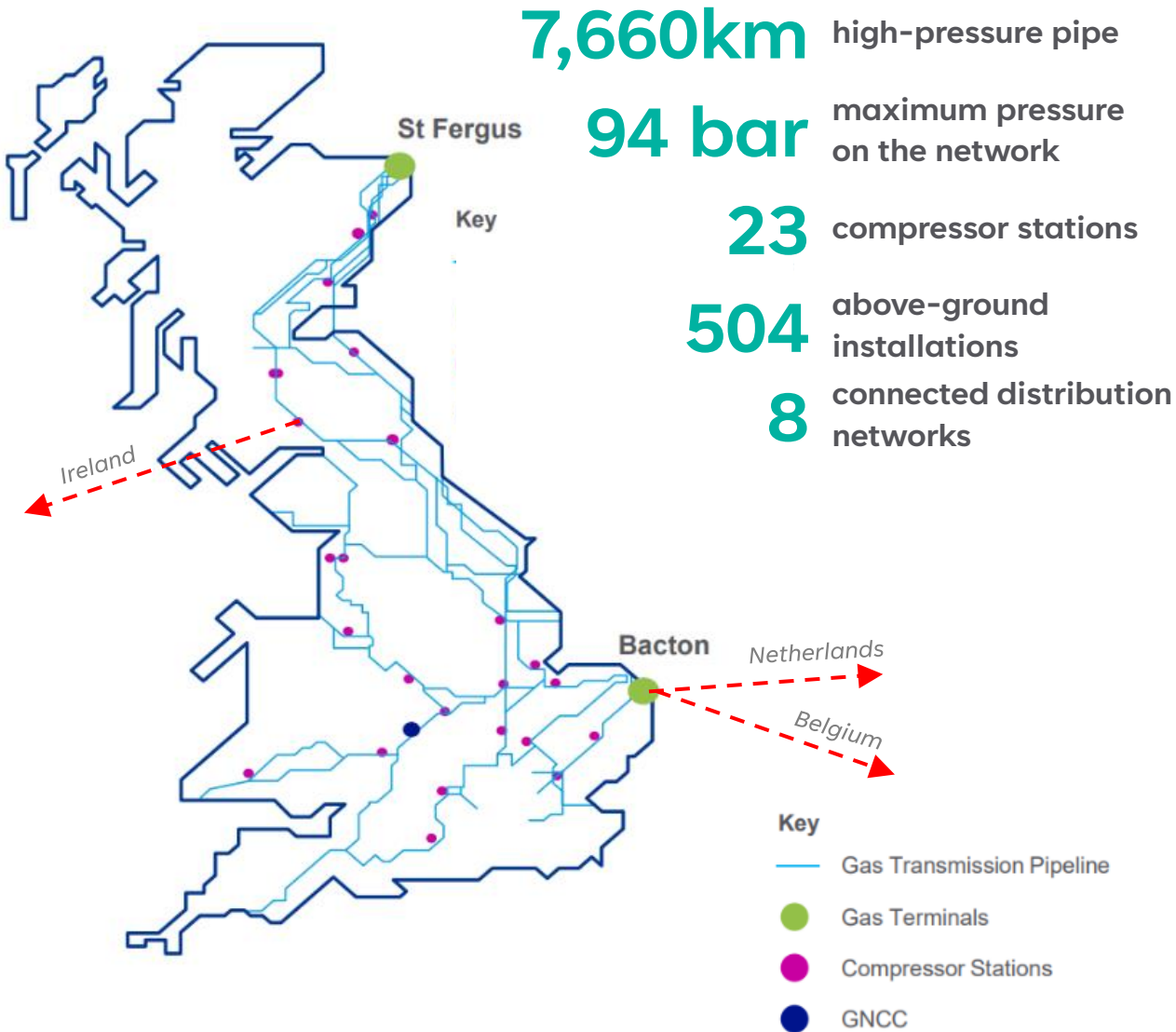
881 TWh
of energy is
supplied by the
NTS each year

UK gas demand:

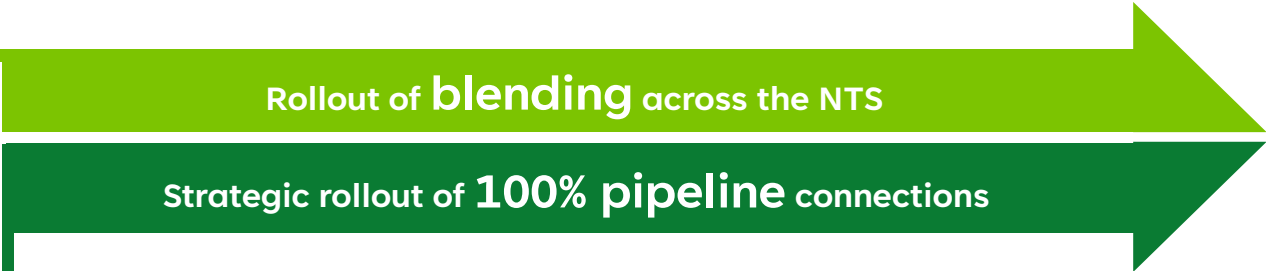
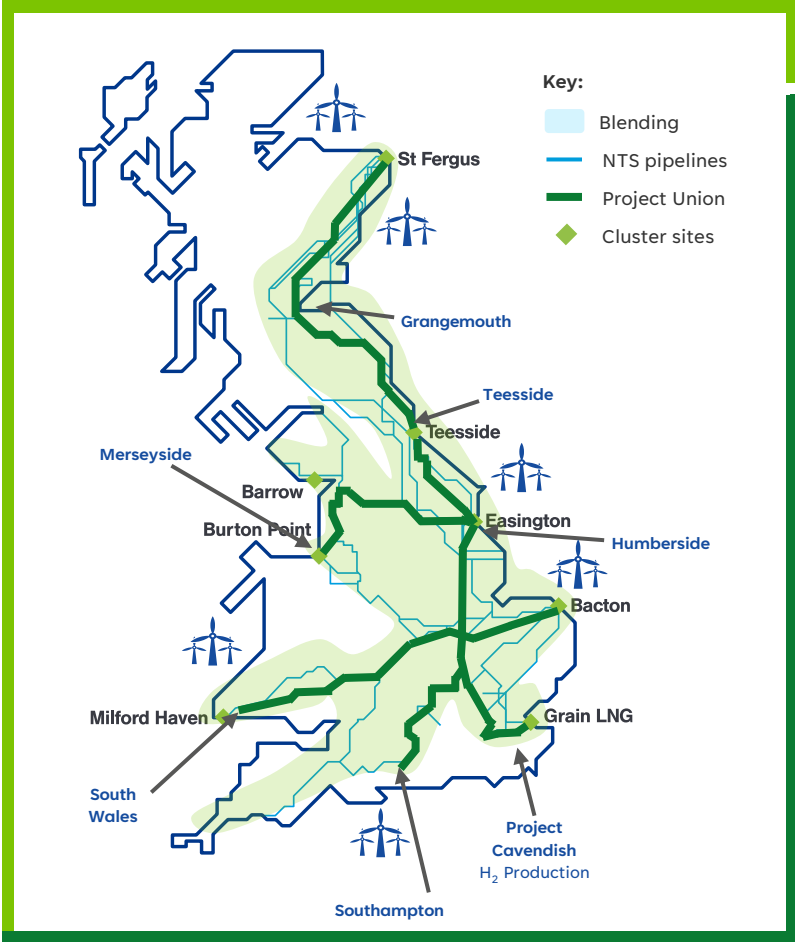
39%
Power
Generation

38%
Domestic
Use

23%
Industrial &
Commercial




Dual Pathway to a hydrogen NTS: hydrogen blending and rollout of 100% hydrogen pipelines





Delivering a **Dual Pathway** to transitioning the NTS to hydrogen:

- ➡ In 2024/5 low level hydrogen blending on will be facilitated on the transmission network
- ➡ From 2025 onwards blending could extend and increase up to 20% - more if deblanding technology can be proven.
- ➡ In 2028/9 Project Union will deliver the first phases of 100% hydrogen transmission pipeline between the northern clusters
- ➡ By 2033 Project Union will have delivered a circa 2000km hydrogen backbone joining key production and use clusters
- ➡ Asset conversion continues to 2045 to deliver a complete 100% hydrogen network.

Net Zero
2050


Levelling up, Job Creation


Global Leader in Green Innovation


Providing flexibility and optionality

Why Hydrogen for Transport Applications?



In 2035 – no more diesel engine trucks (<29 T GVW) can be sold in the UK



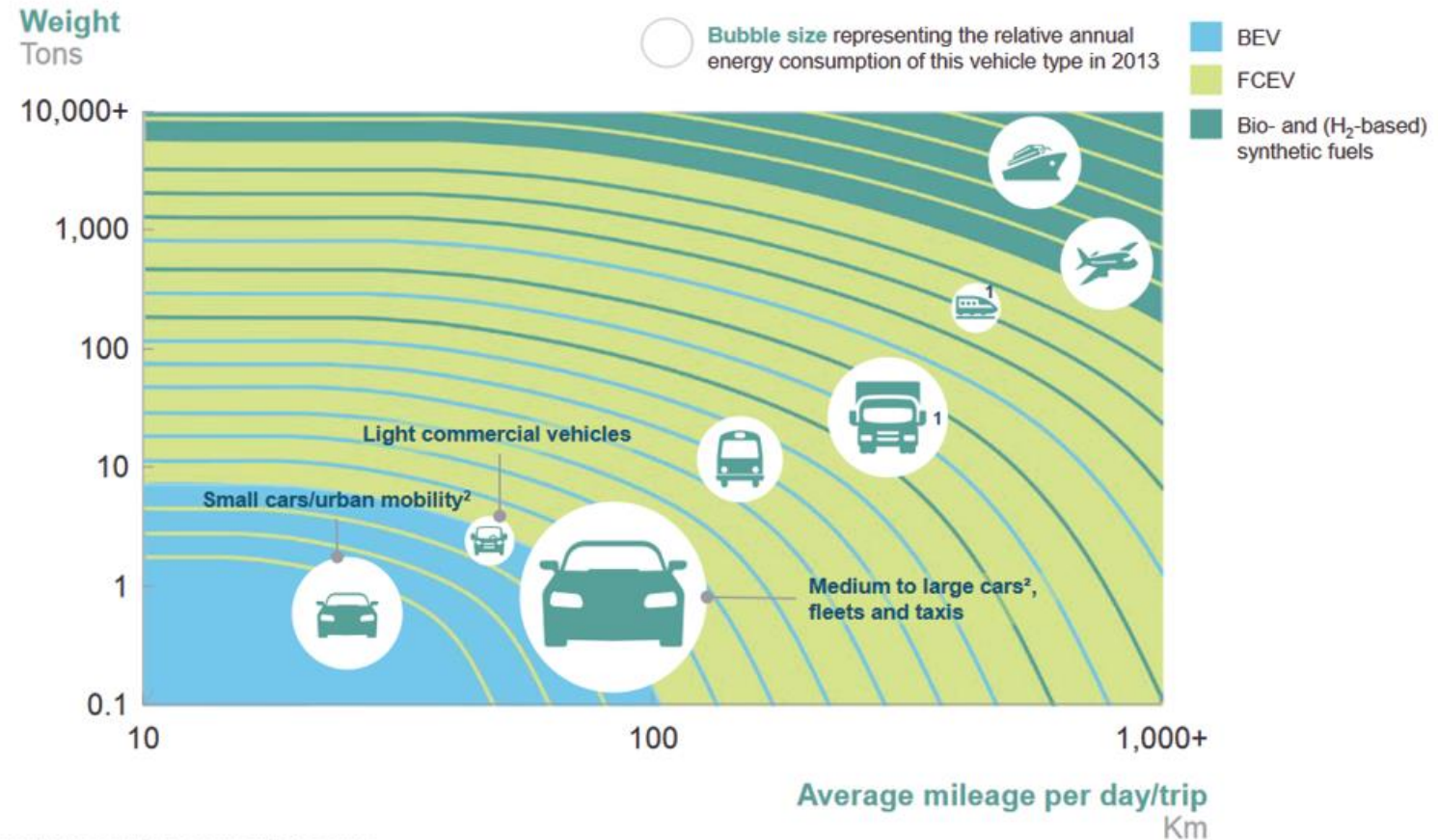
Hydrogen can provide a solution for hard to electrify rail lines such as rural long-distance lines



Projected 75-95TWh of UK demand for hydrogen-based fuels by 2050
DfT Clean Maritime Plan



Hydrogen can support aviation both directly and through alternative fuels



¹ Battery-hydrogen hybrid to ensure sufficient power

² Split in A- and B-segment LDVs (small cars) and C+-segment LDVs (medium to large cars) based on a 30% market share of A/B-segment cars and a 50% less energy demand

Source: Toyota, Hyundai, Daimler

The case for hydrogen transport

A Toyota Mirai just did 623 miles on a single tank of hydrogen

5.6kg

Mirai breaks Hyundai Nexo's record for going furthest on a tank of hydrogen

Jan 2021

Toyota Mirai sets 845-mile hydrogen mileage record

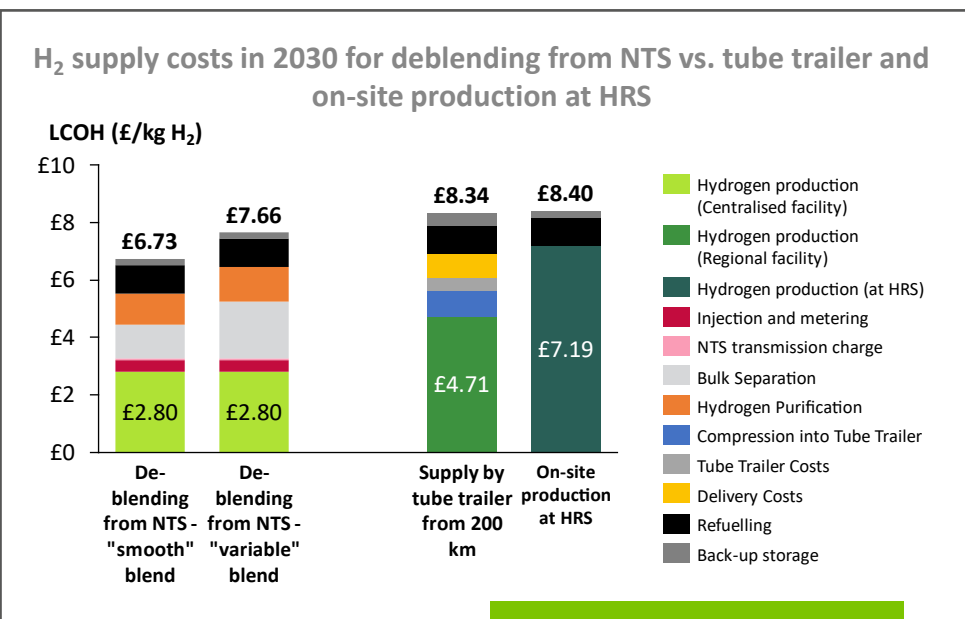
5.6kg

Toyota's hydrogen fuel cell Mirai travels a record-setting distance between fill-ups with the help of professional hypermilers and simple maintenance.

Oct 2021

Green hydrogen costs 'can hit \$2/kg benchmark' by 2030: BNEF

A scaled-up industry could deliver green hydrogen for a benchmark cost of \$2/kg in 2030 and \$1/kg in 2050 in many parts of the world according to Bloomberg New Energy Finance.



Blended pathway

Opportunity for further
~£2/kg reduction
LCOH: £4.50/kg by 2030

Pure H₂ pathway

'Producing green hydrogen for \$1/kg is achievable in some countries by 2030': WoodMac

Dramatic drops in the price of electrolyzers, combined with low-cost renewable energy, can enable green H₂ to be the cheapest form of hydrogen by the end of the decade, analyst says

Transport use cases

World's first hydrogen-powered digger set to drive on UK roads

JCB

The first digger powered by a hydrogen combustion engine will soon be on UK roads and building sites.



Feb 2023

Aberdeen's hydrogen double decker buses notch up 100,000 miles of operation

Apr 2021



Mercedes-Benz hydrogen truck prototype covers more than 650 miles on one fill

Oct 2023

China's First Hydrogen Fuel Cell Vessel Enters Service



HyNTS
FutureGrid
Compression

Refuelling
Station

HyNTS
FutureGrid
Deblending

HyNTS
FutureGrid
Phase 1 Facility



FutureGrid Deblending

Lead



Project Partners



HyET Hydrogen Efficient purification & compression



ELEMENT 2

Cadent Your Gas Network

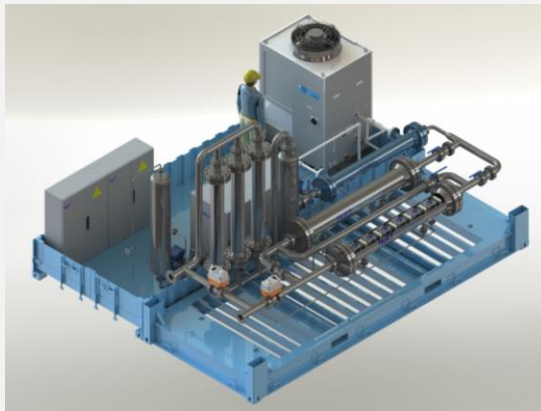
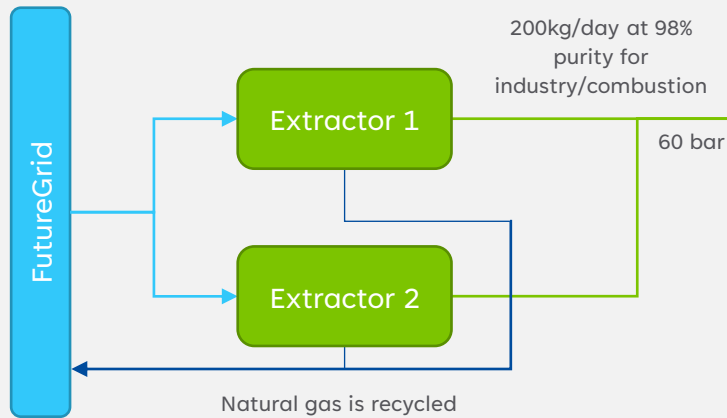


SGN Your gas. Our network.

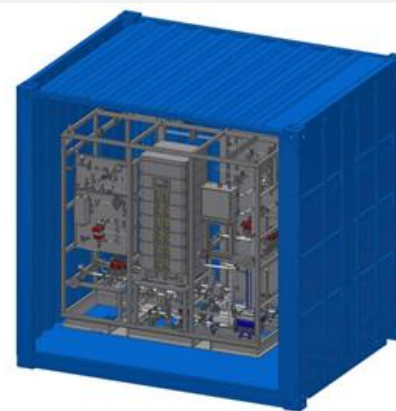
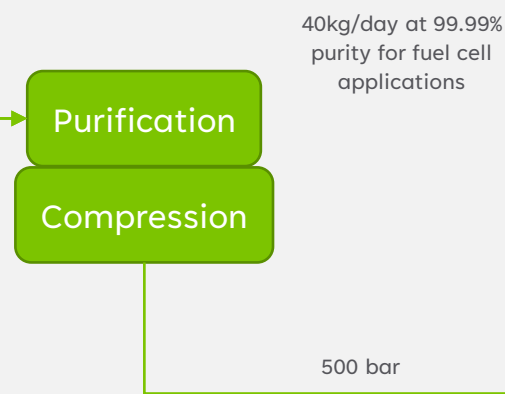


WALES & WEST UTILITIES

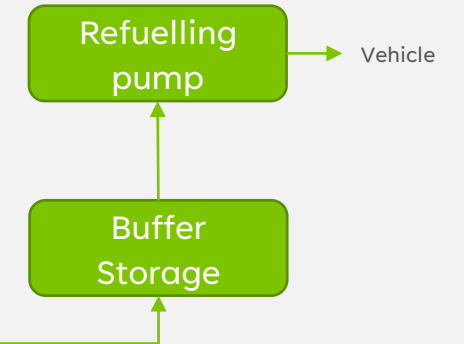
Entry & Bulk Separation



Purification & Compression



Refuelling Station





national gas transmission



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