

capital hydrogen

Working in partnership to deliver
Hydrogen to London, the South
East and the East of England

Capital Hydrogen is a 15-20 year programme which could deliver a transition to hydrogen for gas pipeline networks in London, the East of England and the South East.

The programme could help achieve Net Zero, generate skilled jobs, boost energy independence and allow greater choice to customers, including the most vulnerable.

The programme roadmap has been informed by a feasibility study that identifies London's hydrogen demand and shows how re-purposed and new pipelines will be developed to carry hydrogen to customers.

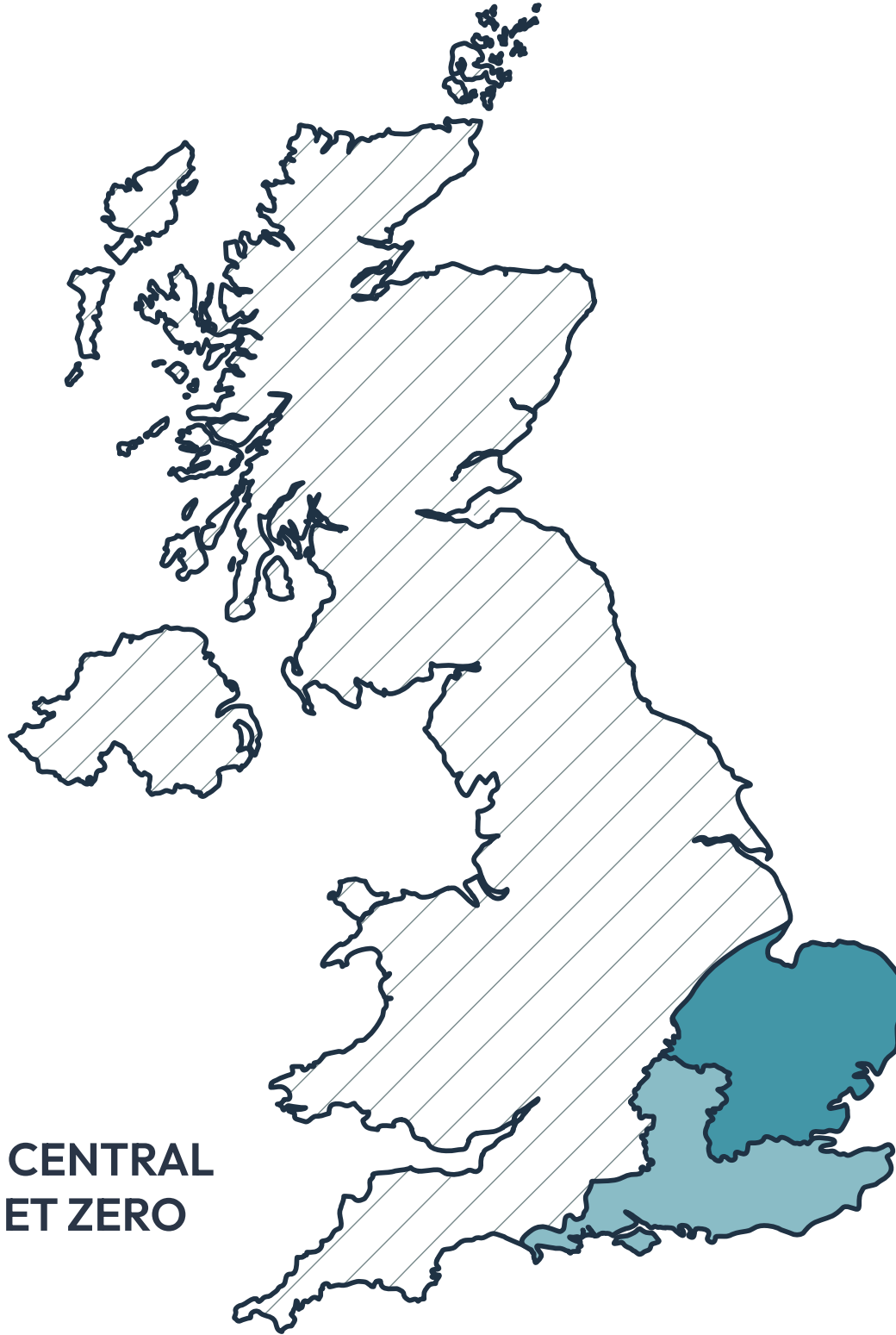
Capital Hydrogen is a collaboration between Cadent, SGN and National Grid Gas Transmission.



National Grid Gas Transmission own and operate the UK's gas transmission network, delivering gas to industry, power stations, and wider gas distribution networks.

Cadent operate London's gas distribution network north of the River Thames and the East of England, home to over 5 million people.

SGN operate London's gas distribution network south of the River Thames, home to over 3 million people.



HYDROGEN IS CENTRAL TO THE UK'S NET ZERO STRATEGY

In 2019 the UK became the first country globally to commit to bring all greenhouse gas emissions to net zero by 2050.

The 2020 Ten Point Plan and the 2021 Net Zero Strategy set out the UK government's **approach to reaching net zero.**

Hydrogen has excellent storage potential and can be easily distributed using existing infrastructure.

Hydrogen will need to play a role across all decarbonisation pathways for the UK, alongside electrification.

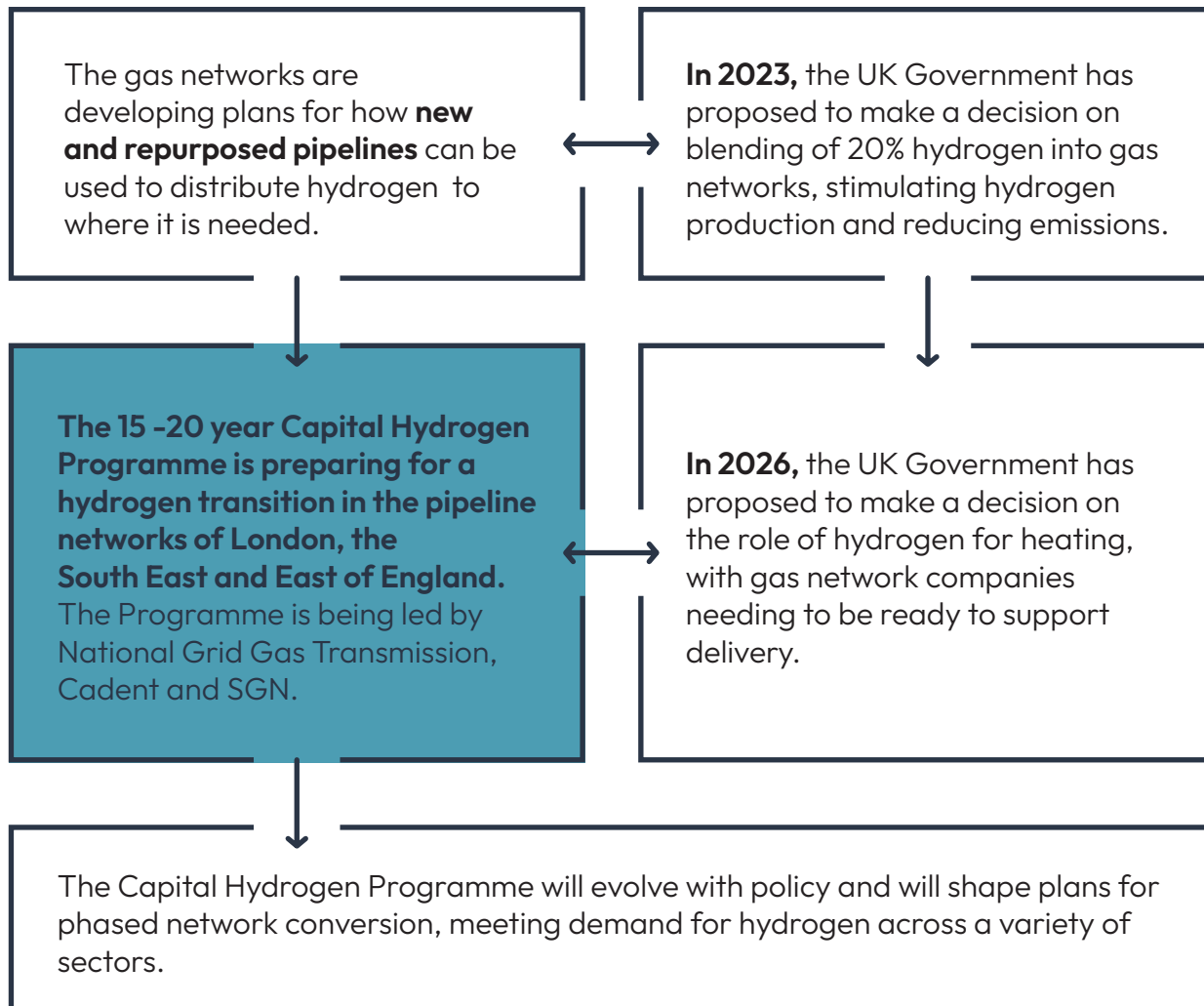
In 2021, the UK Government published its Hydrogen Strategy, identifying its role in supporting the journey to Net Zero.

The UK Hydrogen Strategy estimates that by 2035, hydrogen energy could replace the equivalent of 17% of the UK's natural gas demand. This would significantly support decarbonisation across industry, power generation, heating in buildings and transport.

To deliver on this hydrogen opportunity, the UK Government and Ofgem, the UK's energy regulator, has asked gas networks to start planning for a hydrogen transition.

EVOLVING POLICY & HYDROGEN NETWORK PLANNING

National Grid Gas Transmission are developing a programme to deliver a full UK hydrogen backbone through Project Union by the early 2030s. This will involve converting key sections of the existing gas network and short sections of new pipelines which will be essential to the resilience of the Capital's energy systems.



USING HYDROGEN TO SUPPORT 2030 NET ZERO LONDON

The Mayor of London has an ambition to bring London's emissions to Net Zero by 2030. The Greater London Authority (GLA) has delivered scenario work to show how this could be achieved.

Capital Hydrogen's demand assessment for hydrogen builds on the GLA work and illustrates how gas networks will work together to achieve the Mayor of London's preferred 'Accelerated Green' Pathway to Net Zero.

This pathway includes significant deployment of hydrogen by 2030, with further growth in hydrogen use by 2050 across a range of sectors.

Decarbonising the East and South East of England

Throughout the East and South East of England, over 90 councils and combined authorities have declared a climate emergency.

They are in the process of designing and implementing plans to achieve ambitious net zero targets and would like to understand the role that hydrogen could play.

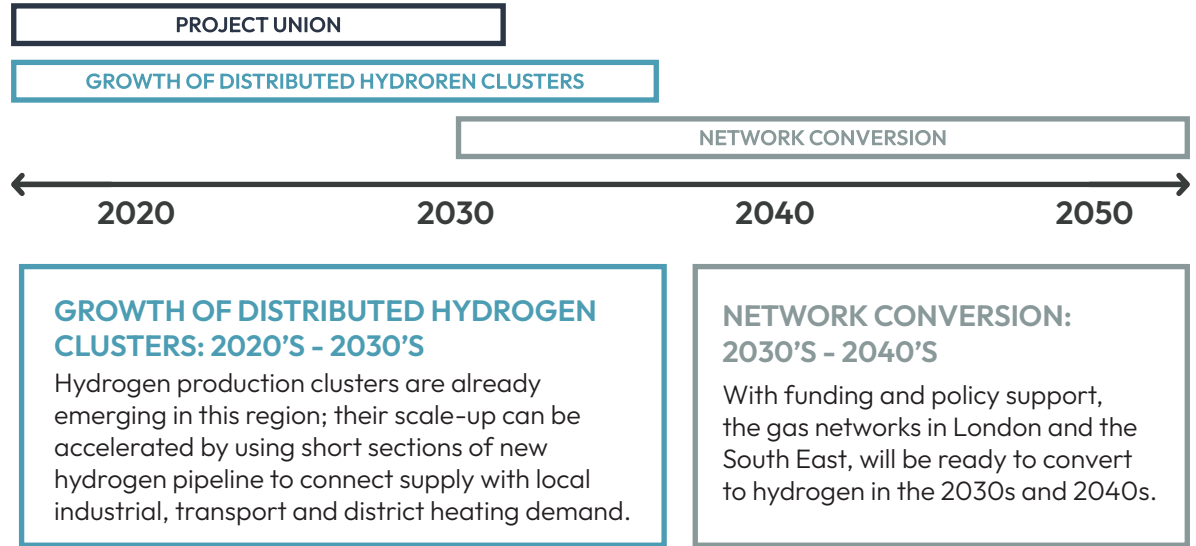
CAPITAL HYDROGEN PROPOSED PHASES

Capital Hydrogen's demand assessment for London has shown that **40 TWh of hydrogen** will be required by **2050**. This will be achieved in phases:

PROJECT UNION: 2022 - 2030

National Grid Gas Transmission will convert key sections of the existing gas network, with some new build, to deliver a UK hydrogen backbone by the early 2030s. Project Union will connect hydrogen production, storage and end-use, **providing resilience** to London and the wider UK energy system.

Hydrogen delivered from key strategic supply locations from around the UK will be transported efficiently through transmission pipelines to the Capital. **Converting existing network** infrastructure will provide a **low-cost, minimally disruptive option** to transport hydrogen.



In this region, the project has identified:

200 TWh of storage potential in the Wessex Basin.

100-170 TWh per year of potential hydrogen production by 2050



By 2050 London will need:

40 TWh per year of hydrogen, to decarbonise over 2.6 Million homes, 200,000 businesses and power generation sites.

By delivering London's hydrogen needs alone, Capital Hydrogen will realise the following benefits:

£40 billion GVA added to the UK economy

40,000 jobs created in manufacturing and the wider supply chain

Increased energy **security**

7.8 MtCO₂ saved per year through hydrogen deployment

1. Hydrogen production at **Bacton Energy Hub** could scale up to have over 355 MW production capacity by 2030.

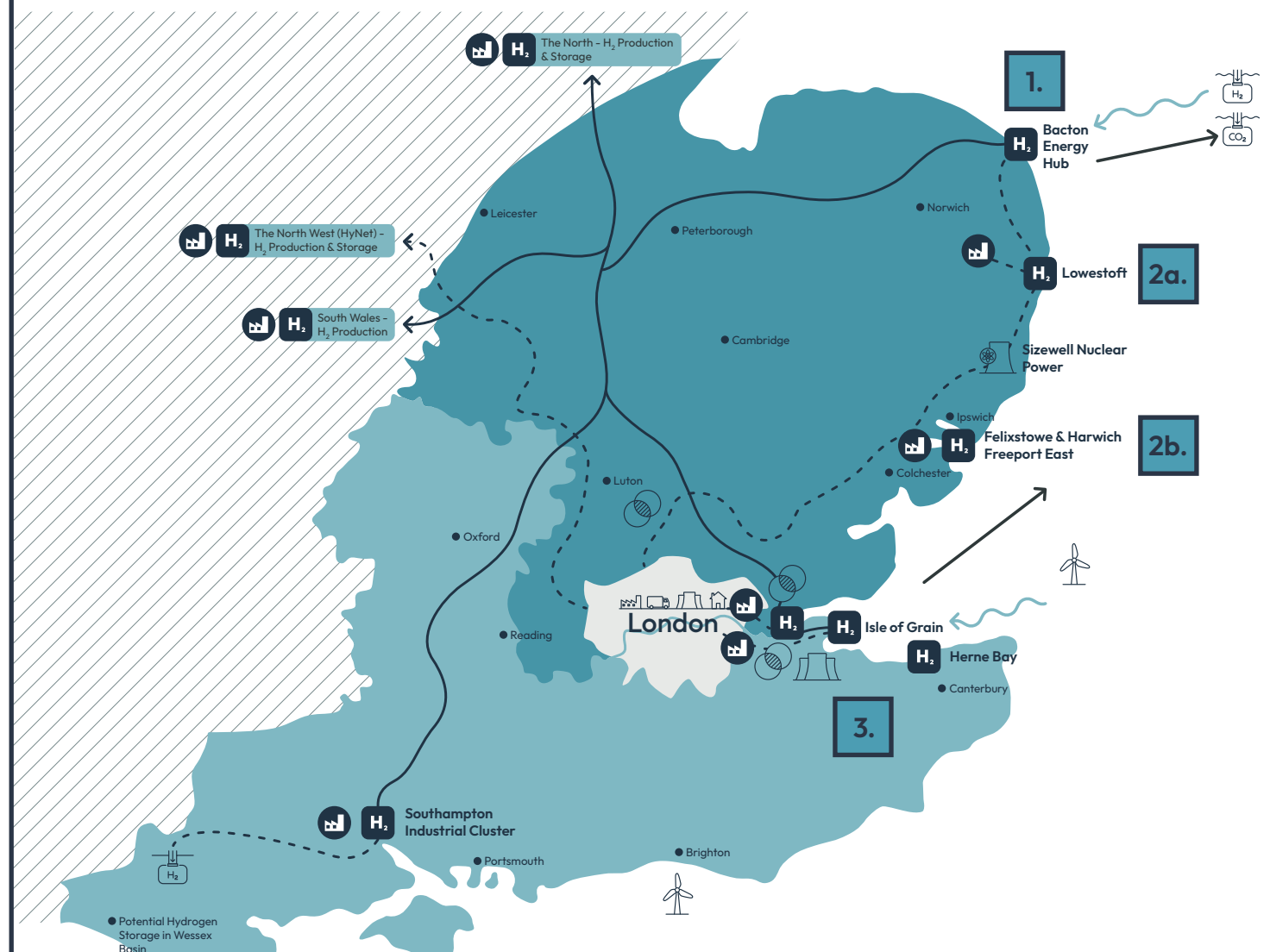
2. Distributed Hydrogen clusters near **a. Lowestoft** and **b. Felixstowe and Harwich Freeport East** could have more than 1GW production capacity by 2035, with production and demand connected through short sections of new pipeline at each location.

3. Hydrogen production and import in the **Thames Estuary and Isle of Grain** could scale up in the 2030s providing more than 60TWh per year by 2050.

Regions	
Cadent	Rest of the UK
SGN	

Pipes
H ₂ transmission pipes - repurposed
H ₂ transmission pipes - new or repurposed

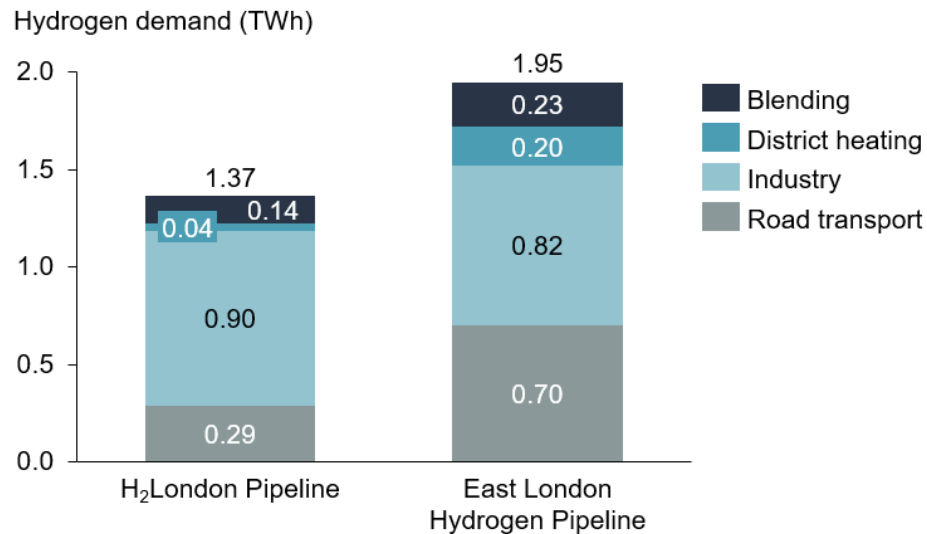
Shipping Routes
CO ₂ Exports
H ₂ Imports



Services		
Hydrogen Production or Import	Underground H ₂ Storage	Power Station
Distributed Hydrogen Cluster	Underwater H ₂ Storage	Potential H ₂ Production from Nuclear Power
Blending H ₂ with natural gas into the gas network	Underwater CO ₂ Storage	Potential H ₂ Production from Wind Energy

THAMES ESTUARY: TWO NEW PIPELINES COULD ACCELERATE LONDON'S DECARBONISATION OF 'HARD TO ABATE' SECTORS

We've engaged with **over 30 heavy industrial gas users** located along the estuary, **7 new and existing district heat networks** and **7 organisations involved in the transit of freight**. This has identified significant potential demand for low carbon hydrogen; around **3.3TWh by 2033**.



We've identified that **two new 100% hydrogen pipelines** are needed to link production and demand to the east of London on the Thames Estuary.

These will provide connection for the hydrogen production sites currently in development within the region where there is potential for up to **800MW hydrogen production in the Thames Estuary region by 2030**.

The pipelines will also support the huge potential for **hydrogen import** and transportation on the Thames estuary, supporting the activities of organisations working to provide clean fuel infrastructure for marine transport.

A cluster of up to **5 district heating networks** in Barking & Dagenham, providing heat for up to 35,000 homes

Feeding these new pipelines, low carbon hydrogen can be supplied from a range of production sites.

A network of hydrogen refuelling stations that could help decarbonise road freight throughout East London and the Thames Estuary area

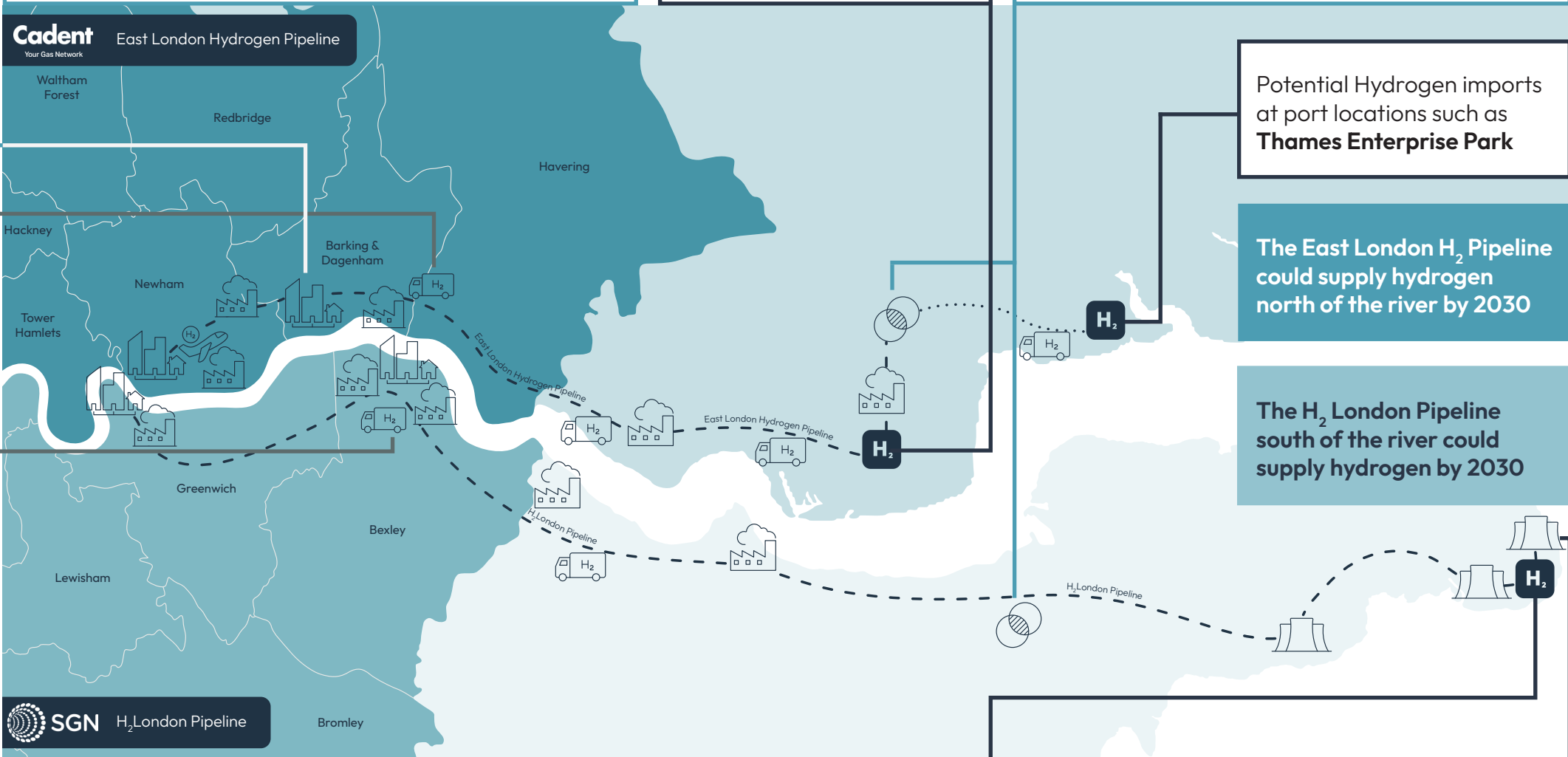
Positive engagements with organisation along the Thames Estuary have identified:

- 1.7 TWh hydrogen demand by 2033 from over 30 industrial companies
- 800MW hydrogen production potential locally in London by 2030

Large industrial users north of the river across the food and drink, chemicals, manufacturing and utilities sectors in Newham, Dagenham, Havering and Thurrock

Hydrogen production in **Thurrock** (up to 50MW by mid-2020's)

Hydrogen grid blending into the natural gas grid is possible from both pipelines, decarbonising existing gas supply to all homes across London



Cadent Your Gas Network East London Hydrogen Pipeline

SGN H₂ London Pipeline

Potential Hydrogen imports at port locations such as **Thames Enterprise Park**

The East London H₂ Pipeline could supply hydrogen north of the river by 2030

The H₂ London Pipeline south of the river could supply hydrogen by 2030

Large industrial users south of the river include: construction, manufacturing, other sectors at **Erith and Bexley** as well as future district heating networks in Greenwich

Potential hydrogen production at Isle of Grain (750MW by 2030)

Hydrogen blending in three **gas-fired power stations** at the Isle of Grain could help decarbonise electricity supply to London and the South East



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Working in partnership to deliver Hydrogen to London, the South East and the East of England

The organisations on the right hand side have shown overwhelming support for Capital Hydrogen. Each have made commitments to support the programme in their respective value chain segment.

Together with our committed partners as part of our Consortium Group, we will work collaboratively to build London's hydrogen alliance.

We look forward to working together as we approach the next design stages of the new and re-purposed pipelines through:

- Pre-FEED for National Grid Gas Transmission's Project Union: 2023
- Technical feasibility stage during 2023 for the two new pipelines in Thames Estuary region

Capital Hydrogen Programme Leads:



Capital Hydrogen Supporters:



For more information on the programme, to become a supporting member of our Consortium Group and to get in contact with our team, please visit: www.capitalhydrogen.co.uk