

Welcome!

We will start promptly at
14.02

While you are waiting, please access
Sli.do which we will be using for Q&A

slido

Event Code:

#NGG8

Sli.do Instructions:

You can access Sli.do at www.sli.do or by downloading
the Sli.do app.

Once you've logged on, enter the code above when prompted.

HyNTS
national**grid**

HyNTS

Welcome and Opening



Antony Green
Project Director – Hydrogen

Thank you for joining us today

Please feedback via:

Event Code:
slido #NKG8

HyNTS

Introductions



Antony Green
Project Director – Hydrogen



Jenny Pemberton
Stakeholder Manager



Tom Neal
Innovation Delivery
Manager



Danielle Stewart
Long Term Strategy
Manager



Suki Ferris
Development Lead



Lloyd Mitchell
Pipelines Engineer



HyNTS

Logistics

Should last for approximately **60 minutes**

Questions and polling via [slido.com](#) **#NCG8**

All callers will be placed on **mute**

We will circulate the **slides and a recording** of this webinar

HyNTS

Agenda

nationalgrid

- ◆ Introduction
- ◆ Hydrogen & the NTS
- ◆ Market design in a hydrogen future
- ◆ Hydrogen technical knowledge gaps
- ◆ Our HyNTS Programme

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Poll question

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HyNTS

A hydrogen future?

nationalgrid

WORLD ECONOMIC FORUM

A clean energy future with hydrogen could be closer than we think

LATEST NEWS

GLOBAL: 'HYDROGEN MARKET IS ON THE VERGE OF A REVOLUTION'

DW Made for minds.

TOP STORIES MEDIA CENTER TV RADIO LEARN GERMAN

GERMANY CORONAVIRUS WORLD BUSINESS SCIENCE ENVIRONMENT CULTURE SPORTS

Germany and hydrogen — €9 billion to spend as strategy is revealed

RECHARGE

Global news and intelligence for the Energy Transition

Wind Transition Markets Technology

New EU hydrogen strategy 'marks beginning of the end of the fossil-fuel era'

WoodMac: 2020s Will Be the 'Decade Of Hydrogen'

In markets like Germany, green hydrogen production costs will equal fossil-fuel-based hydrogen by 2030, new research indicates.

Green Hydrogen Could Bring UK GBP 320 Billion by 2050 – Report

Development of an indigenous green hydrogen industry could generate GBP 320 billion for the UK economy and sustain up to 120,000 jobs by 2050, a new report finds.

GOV.UK

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Press release

PM commits £350 million to fuel green recovery

VIEW

f-cell+HFC VANCOUVER
Sept 9+10, 2020

The Hydrogen and Fuel Cell Digital Event
hfcell.com #fcellhfc

UK launches Hydrogen Advisory Council

By Joanna Sampson on Jul 22, 2020 | Translate

NEWS

The UK Government has launched a Hydrogen Advisory Council as part of its decarbonisation efforts.

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Hydrogen & the NTS

Danielle Stewart





Hydrogen is a **clean and abundant alternative to methane** (known as natural gas)



Hydrogen is a future **clean energy source** only releasing water vapour when it is burned



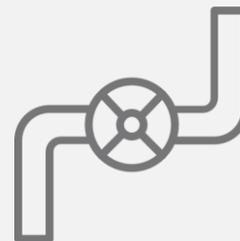
Hydrogen is already used as a fuel for transport and is being trialled internationally



Blue Hydrogen is produced from non-renewable sources using Steam Methane Reformation and Autothermal Reforming



Green Hydrogen is produced using electrolysis to produce hydrogen from renewable electricity



Challenge to economically produce hydrogen at scale, and adapt the existing infrastructure for hydrogen

Transitioning to hydrogen – key steps

Transitioning to hydrogen requires alignment across production, transmission and demand:



Production

What are the location, timing and volume of production sources?

- Blue hydrogen
- Green hydrogen
- Natural gas
- Imports / exports
- Increased interaction with electricity

Where will storage be available?
Intraday and intra-seasonal



Transmission

There are a number of technical considerations:

- Readiness of assets
- Conversion vs new build
- 100% hydrogen or blend
- Incremental or pipe by pipe conversion

Impacts of hydrogen on system operation?



Demand

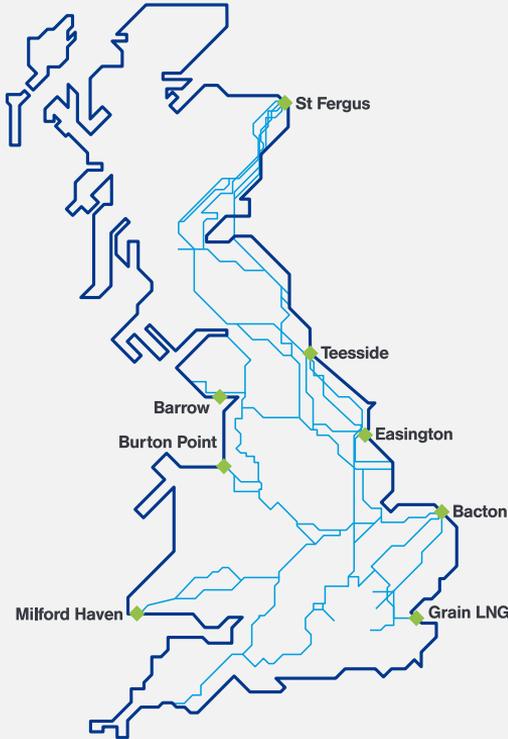
What are the demand locations, timing and volumes as sectors decline, convert and emerge?

- Power
- Heat
- Industry
- Transport
- Increased interaction with electricity

Market readiness e.g. H₂ boilers?

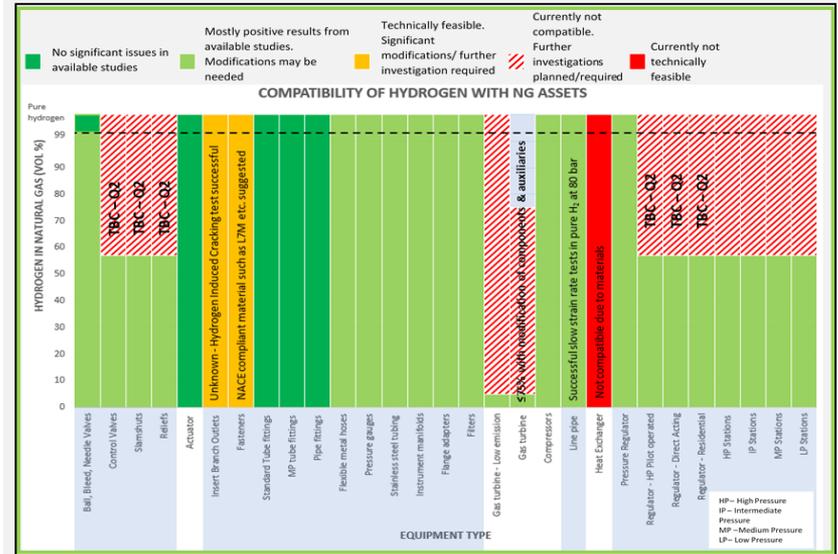
Network Capacity

First results from a model of the NTS converted to hydrogen demonstrate that the current infrastructure can carry the required volumes of hydrogen in 2050.



Asset Readiness

Results from a first data request from our suppliers infer a high degree of readiness for hydrogen



HyNTS

Developing a UK hydrogen backbone

HyNTS Project Union

Project Union will review the potential phased repurposing of NTS pipelines to carry hydrogen and provide a hydrogen transmission 'backbone' for the UK

Teesside – St Fergus

Humber – Teesside

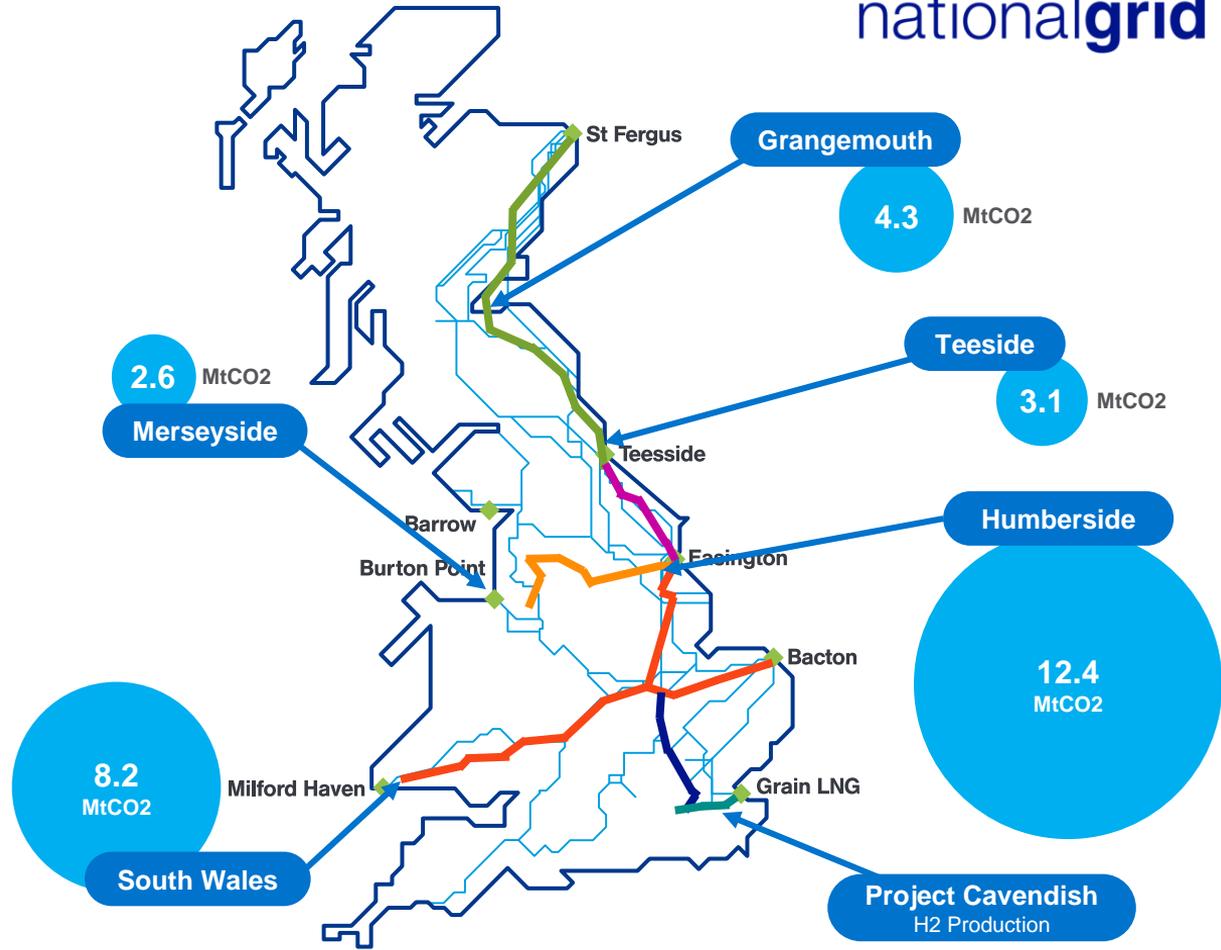
Humber – Merseyside

South Wales – Bacton – Humber

East Midlands - Cavendish

Cavendish - London

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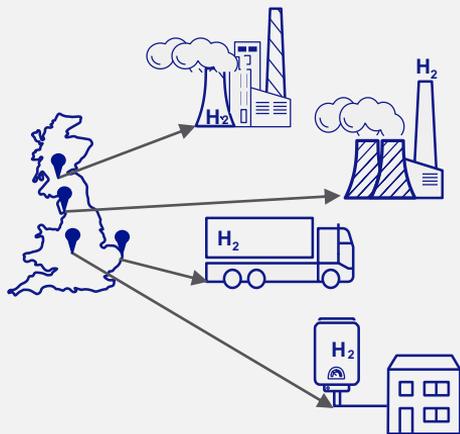
Market design in a hydrogen future

Suki Ferris

Phase 1

Defined four potential H₂ transition scenarios across 2020-2050 time horizon

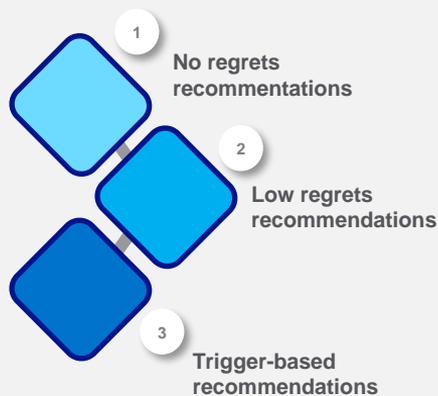
7th May – 11th June 2020



Phase 2

Developed market action recommendations, based upon potential market change

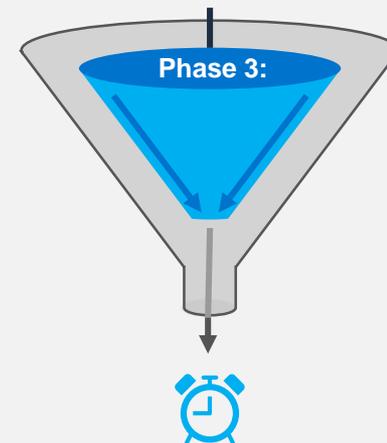
13th June – 9th October 2020



Phase 3

Deep dive into selected market actions and decision on next steps.

12th October – December 2020



- ✓ **Deliver** analysis on short-term market action recommendations.
- ✓ **Outputs** will be reviewed, refined and agreed by the H2 GMaP cross industry working.



- ✓ A final report of collated project findings will be disseminated on our Future of Gas website

<https://www.nationalgrid.com/uk/gas-transmission/future-of-gas>



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Hydrogen technical knowledge gaps

Lloyd Mitchell



There are five principle knowledge gaps we are seeking to address:



Materials concerns

- Pipelines and mechanical assets eg:
- Hydrogen embrittlement
 - Seals & soft parts
 - Weld quality



Safety concerns

- Risk assessment and new safety case development including:
- Hazardous areas
 - Electrical equipment
 - Plant operations



Flow characteristics

- How will hydrogen move around our network?
- Gas velocity
 - Pressure drop
 - Saltation



Compression

- What will need to change in our compressor strategy?
- Turbine compatibility
 - Gas compressibility
 - Investment cycles



Network management

- How do we ensure we can maintain security of supply?
- Storage capacity
 - Network inputs
 - Deblending

Our HyNTS programme

Tom Neal



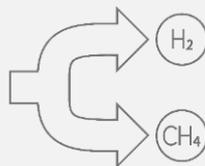
HyNTS is a programme of work that seeks to identify the opportunities and address the challenges that transporting hydrogen within the National Transmission System (NTS) presents. This will unlock the potential of Hydrogen to deliver the UK's 2050 Net Zero targets.

Feasibility of H₂ in the NTS



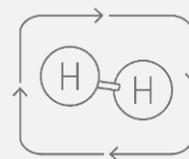
A feasibility study with the aim of determining the capability of the NTS to transport hydrogen.

Hydrogen Deblending



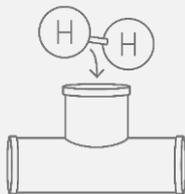
To assess a variety of hydrogen recovery technologies including techno-economic analysis to identify suitable technologies.

Hydrogen Flow Loop



Offline test loop to evaluate metallurgy changes on existing NTS steel pipe and new MASIP pipe when exposed to 30% hydrogen.

NTS Hydrogen Injection



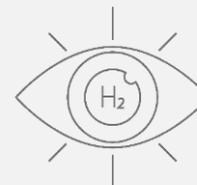
To identify the technical requirements to enable a physical trial of Hydrogen injection into the NTS.

Project Cavendish



A review of the potential of the Isle of Grain region to use existing infrastructure to supply hydrogen to London & the South East.

Aberdeen Vision



A feasibility study for the generation of hydrogen at St Fergus using the NTS (up to 2%) to supply the city of Aberdeen.

HyNTS FutureGrid

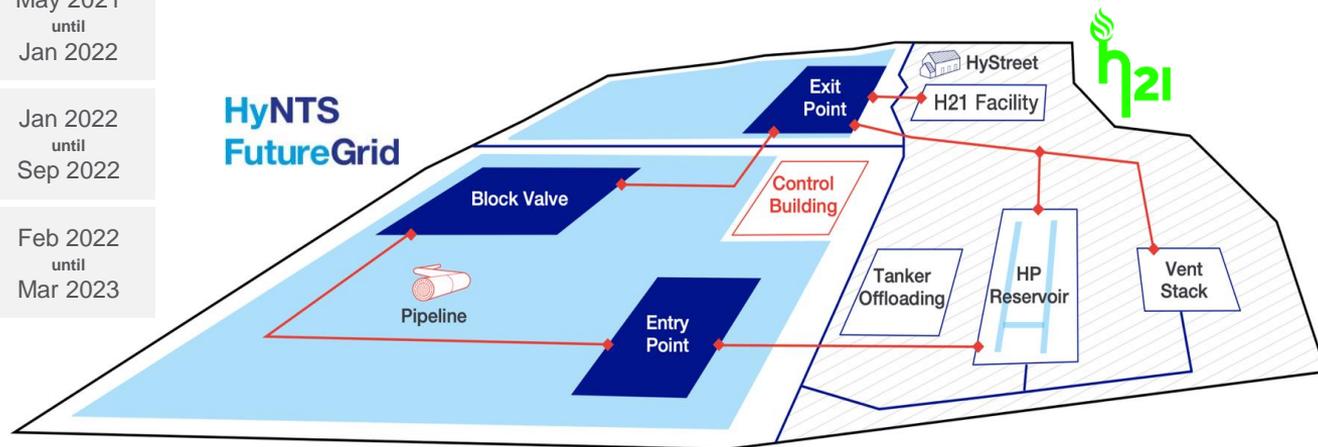
Phase 1 overview

This ambitious programme seeks to build a hydrogen test facility from decommissioned assets at DNV GL Spadeadam to demonstrate the National Transmission System (NTS) can transport hydrogen.

The project will be delivered in three phases:

Phase 1a	Offline Facility Build	May 2021 until Jan 2022
Phase 1b	NTS Asset Testing	Jan 2022 until Sep 2022
Phase 1c	Safety & Risk Impact	Feb 2022 until Mar 2023

The FutureGrid test facility will connect to the existing H21 distribution facility creating a representative UK Hydrogen Testing and Training Facility:



FutureGrid
Project Partners:



HyNTS

Our Hydrogen Outlook

We want to be ready to begin a hydrogen conversion by 2026

Conversion of the NTS to hydrogen is being evaluated

We're evaluating our asset readiness

We're planning a full scale offline test facility

FutureGrid will demonstrate up to 100% h2 in NTS assets

NTS has the capacity for 2050 hydrogen demand

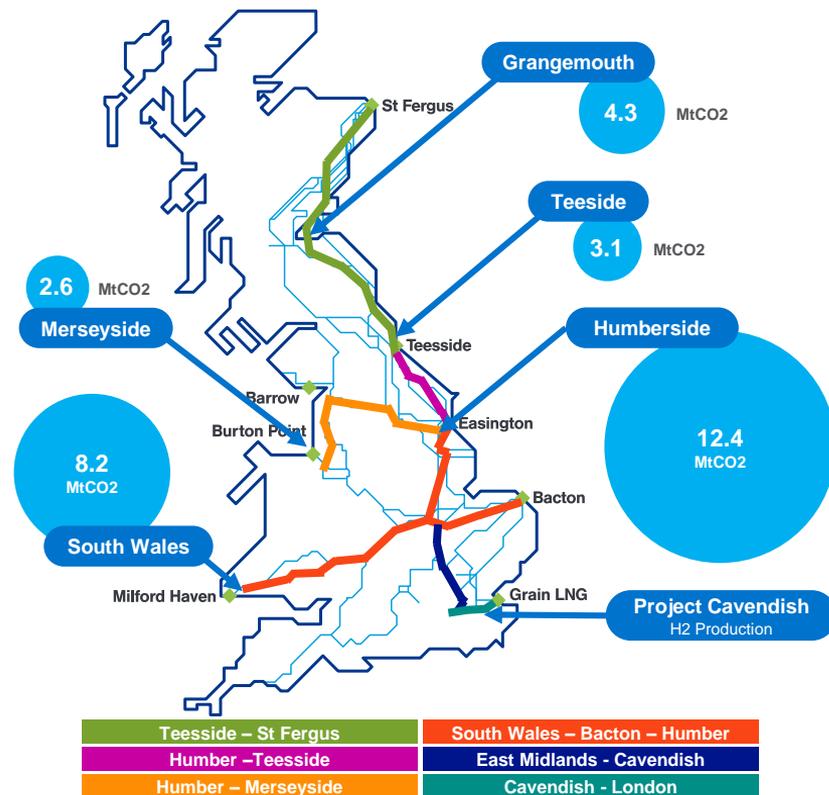
We're now modelling a wider range of scenarios

Conversion likely to begin with a hydrogen backbone

Project Union links the industrial clusters

We're collaborating to develop our future plans

Through Gas Goes Green, HPDG and H2GAR



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Questions?

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Digital strategy and information provision	Mon 02 nd Nov @ 14.00 – 15.00	Complete
Shaping the Innovation Strategy for RIIO-2	Tue 03 rd Nov @ 14.00 – 15.00	Complete
Operating the network	Thu 05 th Nov @ 10.30 – 11.30	Complete
Building skills today for a Net Zero	Mon 09 th Nov @ 13.30 – 14.30	Complete
Reducing methane emissions: opportunities and barriers	Thu 12 th Nov @ 11.00 – 12.00	Complete
Gas Markets Action Plan (GMaP)	Mon 16 th Nov @ 10.00 – 11.00	Complete
Mapping our hydrogen transition	Wed 18 th Nov @ 14.00 – 15.00	Complete
Net Zero construction 2025/26 roadmap	Thu 19 th Nov @ 10.00 – 11.00	Register here
Heating our homes in a Net Zero future	Fri 20 th Nov @ 9.00 – 10.00	Register here
Planning the network	Mon 23 rd Nov @ 14.00 – 15.00	Register here
HyNTS FutureGrid	Tue 1 st Dec @ 14.00 – 15.00	Register here

thank you!

You can find out more across our website and social media or email us at: FutureGrid@nationalgrid.com



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FutureGrid](http://www.nationalgrid.com/FutureGrid)