Project Union and FutureGrid

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ProjectUnion Project Union overview



Development of a UK hydrogen "backbone" by repurposing ~2,000 km of existing assets (~25% of NTS today)



Integral to delivering the UK's hydrogen strategy



Aligned to green and blue hydrogen developments and CCUS clusters



Decarbonise heavy industry (e.g. steel, concrete, and glass manufacturers)



Connect hydrogen production, demand, storage, and export centres



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ProjectUnion We are engaging with a broad range of stakeholders...



Stakeholder feedback

"If you can create a market for green H_2 , you're not locked into bilateral contracts... The NTS gives you a market and a business case where you can scale H_2 a lot easier with less risk."

Tom Johnson, RWE

"The chemical sector net zero roadmap depends on H_2 and CCUS. As technology as it stands today, electricity is just not part of the question for most CIA members - they couldn't do it"

David Mitchell, Chemical Industries Association

"Project Union has clear benefits to the clusters and H_2 projects. In a highly distributed system, each individual project has to meet peak demand. If you connect the hubs, you massively improve resilience between them and increases asset utilisation."

Nilay Shah, Imperial College London

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ProjectUnion ...and have received wide support for Project Union

based on the CO2 content in manufacturing"

the dots allows the whole system to grow."

Chris Williams, Wales Industry Group

Project Union is required to decarbonise industry and support levelling up across the UK



Project Union is required to connect large-scale hydrogen production and energy storage



Orsted

"By the mid 2030's we need significant access to storage for hydrogen... The NTS can connect large scale renewable energy production to large-scale storage sites and help cover energy deficit periods in the winter."

"[Project Union] could save industry a lot of money and even keep many of our members in business - some companies would

"Project Union will benefit UK manufacturing outside the first clusters. The race to sustainability will be led by the clusters which get a head start and global headquarters will then invest in areas with the infrastructure and benefits to get to net zero faster.

And this is already happening - We know a local company that has lost a large order for Jammie Dodgers to national super market

"Large-scale green hydrogen will require national transmission and access to storage. Having a backbone network connecting

Graham Cooley-ITM Power

Rob Duncalf - Orsted

Project Union will connect isolated markets together and drive competition



"Union allows you to connect isolated hydrogen markets and production points together to create a level and fair playing field and drive competition."



Mike Copson - Shell

"Union would allow us to connect to customers outside the clusters and enable us to scale production faster and help support costs coming down"

Martin Foreman - BP

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ProjectUnion Roadmap to 2050

"There is huge potential for hydrogen to help the UK transition towards a green economy and we are committed to investing in its development as part of our plans to build back greener" - Energy Minister Anne-Marie Trevelyan

c	2021	2022-25	2026	ب 2027 ب		2045		
ProjectUnio	Start of Project Union	Pre-FEED and FEED	Conversion begins	Major hydrogen supply and demand centres connected to backbone as they develop Initial backbone by early 30's		Option for full national hydrogen transmission network	n 2050	
							LIK Achieves	
UK Hydrogen	2021	2022-25	2026		2030	2045	Net Zero	
	UK H ₂ Strategy	K H ₂ Strategy blished art of utureGrid ¹ Blue and green hydrogen feasibility and testing through FutureGrid and others	First hydrogen and CCUS clusters		Gov. target of 5GW H_2	Scotland		
	published				Green H ₂ cost parity	achieves Net		
	Start of FutureGrid ¹		operational		Four clusters	2010		

We are starting now to reach net zero

FutureGrid

An ambitious programme to build a hydrogen test facility from decommissioned assets at DNV's facility in Cumbria to demonstrate the National Transmission System (NTS) can transport hydrogen.

DNV

DNV Engineering Research & Development Centre – Spadeadam, Cumbria

FutureGrid Test Facility Set Up

Work Package **Build & Commission** ΊΔ

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Offline Hydrogen Test **Facility**

A representative range of NTS assets of different types, sizes, and material grades are being supplied from decommissioned assets to build the hydrogen test facility.

The facility will initially run on 100% natural gas to collect baseline data for the equipment and then move through 2%, 10% and 20% hydrogen / natural gas mixtures and then 100% hydrogen.

use of a gas compressor.

The facility will have a maximum flow of 1.76 MSm3/day generated by the



Standalone Hydrogen Test **Modules**

Standalone hydrogen test modules will operate alongside the main test facility, to provide key data required to feed into the main facility including:

(1) Material Permeation Testing

(2) Pipe Coating & CP Testing

(3) Fatigue Testing

(4) Flange Testing

(5) Asset Leak Testing

(6) Rupture Testing

FutureGrid Phase 1 Delivery & Phase 2 Development

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Steel Pipeline

18" X65 outlet pipework from the high pressure gas storage array to the first isolation valve

Three lengths of 36" X60, 19.1mm WT pipe for the low pressure (LP) gas storage array from the Pipeline Maintenance Centre (PMC) 18" X52 pipe to join HP Gas storage array to Enron and Enron to Lanark assets.

Seven lengths of 48" pipe grade X65 for high pressure (HP) gas storage array (previously welded and constructed as part of the H21 Phase 2a project)



Filters & Meter Streams

One 18" Filter and associated valves, two 10" meter streams (one of the meter stream to be replaced by a meter from Eakring with modifications to the pipework and the second left blanked)

18" header and outlet manifold sections, 18" Flow control valve (FCV) and 18" Non return valve (NRV) sourced from Enron Billingham.



Recompression Unit

New item to allow operation of test facility

Re-compressor unit housed in a steel container



Valves

36" ball valve and 18" bypass pipework with associated 18" valves sourced from Lanark

Two 18" valves sourced from Billingham

Two new 4" NB manual isolation valves and a non-return valve



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Flow Control Valve

8" Flow Control Valve (FCV) sourced from Sellafield



3" and 4" above ground installation (AGI) c/w twin filter streams, twin meter streams, pre-heater (incl boiler package) and twin regulator streams from Hays Chemicals

FutureGrid Hydrogen Testing Plan

Three concentrations of hydrogen will be tested:



100%

hydrogen

Operate the offline test facility for 7 months across the 3 H₂ concentrations with the standalone test modules running throughout the 2 year period.

Validate flow parameters such as gas velocities, pressures, energy delivery to understand how we need to operate the NTS with a hydrogen blend (or 100%).

Review and evaluate the test

results utilising the Fluxys Fast Screening Methodology allowing

for the extrapolation of results

across the NTS.



Offline Hydrogen Test Facility

A representative range of decommissioned NTS assets of different types, sizes, and material grades will be tested with 2, 20 & 100% hydrogen



Standalone Hydrogen Test Modules

Standalone hydrogen test modules will operate alongside the main test facility, to provide key data required to feed into the main facility

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