

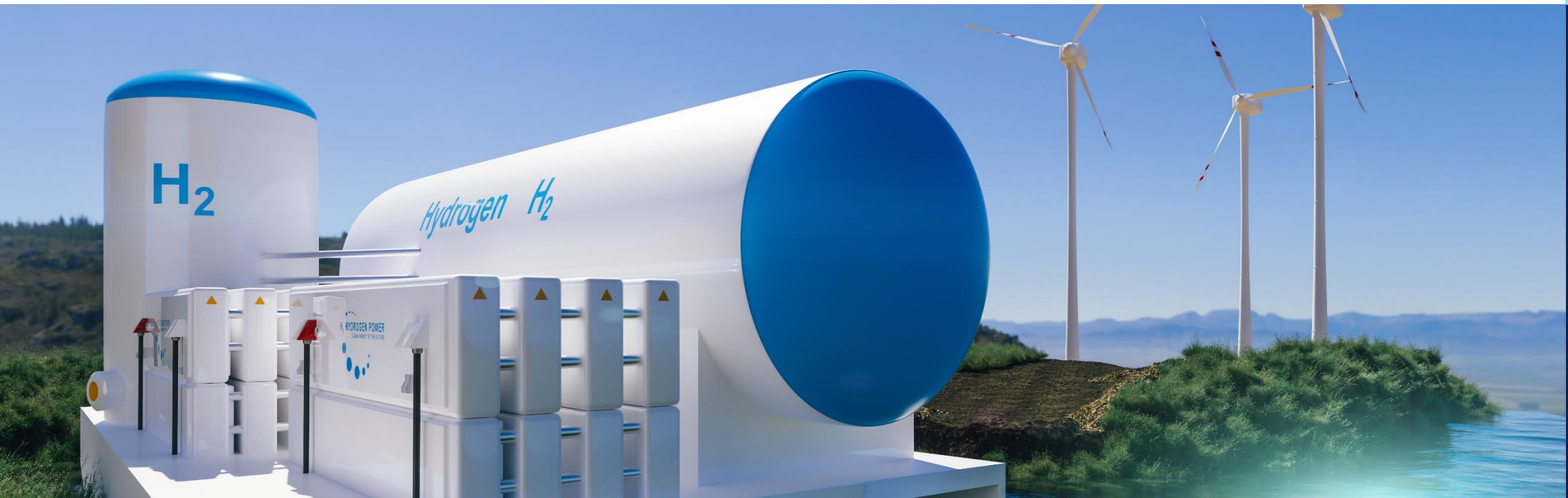


WHEN TRUST MATTERS

Hydrogen Research at Scale

Introduction to our Hydrogen Services

02 December 2021



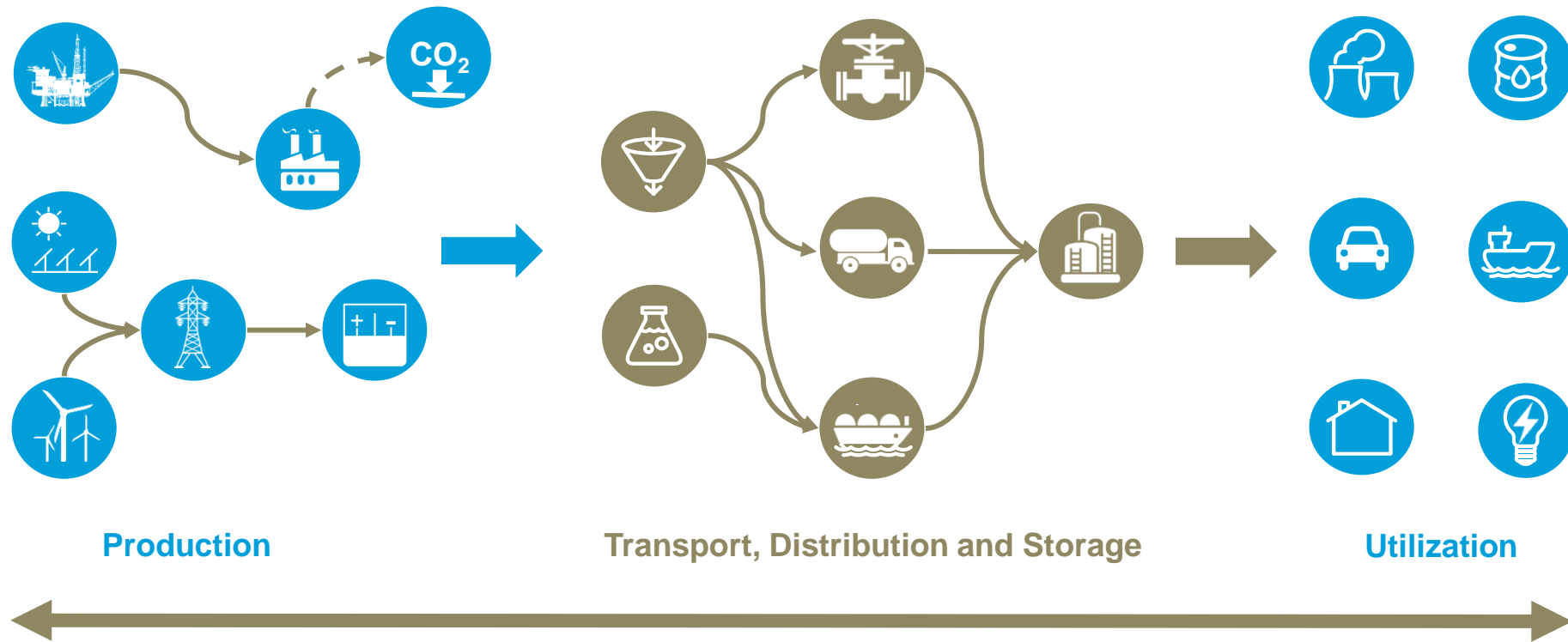
Our purpose

To safeguard life,
property, and the
environment

Our vision

A trusted voice
to tackle global
transformations

Unique position to cover the whole hydrogen value chain



DNV offers a wide range of both **technical and business advisory** services and, with broad expertise across the energy and maritime industries, we are in a **unique position** to cover the **whole hydrogen value chain**.

Research Facilities

Our laboratory facilities



Flow testing and calibration services

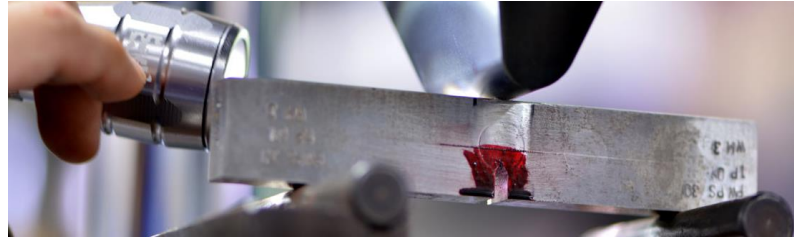
Our flow testing and calibration laboratories offer full-scale flow simulation of various gases (including hydrogen) and flow conditions for testing, validation and calibration of metering and valves.

The physical simulation is supported by computer modelling and multi-disciplinary advisory staff.

Our flow laboratories are based in:

- Groningen, NL
- Bishop Auckland, UK

[\[Link\]](#)
[\[Link\]](#)



Materials qualification and testing services

Hydrogen can have a degenerative effect on materials and assets which is still largely unquantified. Our laboratories offer full-scale or simulated material qualification, testing and advisory to quantify failure behaviour such as material fatigue, cracking or corrosion.

Our labs are suitable for a wide range of testing conditions, (composite) materials, coatings and assets such as valves and turbines.

Our material laboratories are based in:

- Høvik, NO
- Bergen, NO
- Loughborough, UK
- Columbus, US
- Singapore

[\[Link\]](#)
[\[Link\]](#)
[\[Link\]](#)
[\[Link\]](#)
[\[Link\]](#)



Full-scale testing services

Our remote test site in the UK is used for testing and research of fires, explosions and blasts with full-scale hazardous trials and simulation of real-world environments.

Next to testing hydrogen explosion and ignition behavior, full-scale houses are built at the site to test hydrogen dispersion for the H21 project. Future Grid

Our full-scale testing service is based in:

- Spadeadam, UK

[\[Link\]](#)

Our laboratory facilities



Renewable energy technology and gas laboratory

Our renewable energy technology and gas laboratory is a multi-purpose facility for testing and developing new technologies.

The facility is currently used for developing residential and industrial burners, suitable for the full range of natural gas and hydrogen mixtures. The first working prototypes have already been developed.

Our renewable energy technology and gas laboratory is based in:

- Groningen, NL

[\[Link\]](#)



Engines laboratory

Direct combustion of hydrogen in engines is not being discussed widely, but could still be suitable in some applications.

Our engines laboratory is used for fuel combustion behaviour and performance testing.

Our engines laboratory is based in:

- Groningen, NL

[\[Link\]](#)



Gas analytical laboratory

Quality and composition of hydrogen (mixtures) is an important aspect for the correct working and durability of end user applications.

Our gas analytics laboratory performs gas composition analyses, supported with advisory, for a wide range of customers and gas compositions.

Our gas analytics laboratory is based in:

- Groningen, NL

[\[Link\]](#)

Overview



Major Hazard site for research

- Hazards from flammable gases
- Effect of hydrogen properties on hazards

Providing evidence based results

- Large research studies
- Joint Industry Projects.

Risk assessment

- Methodology
- Differences from hydrocarbons

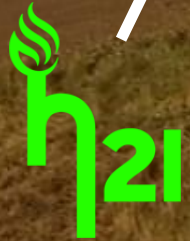
HyStreet: A Hydrogen Network Research Facility at DNV Spadeadam



FutureGrid

Under construction – full gas transmission loop

Releases from domestic pipework downstream of the meter



Phase 2: MicroGrid distribution network for assessing working procedures for H₂ network



Phase 1: Releases from gas distribution network upstream of the meter



WBS1
Small Releases



WBS2
Large Releases



WBS3
Ignition Potential



WBS4
Explosion Severity



H21 Phase 1

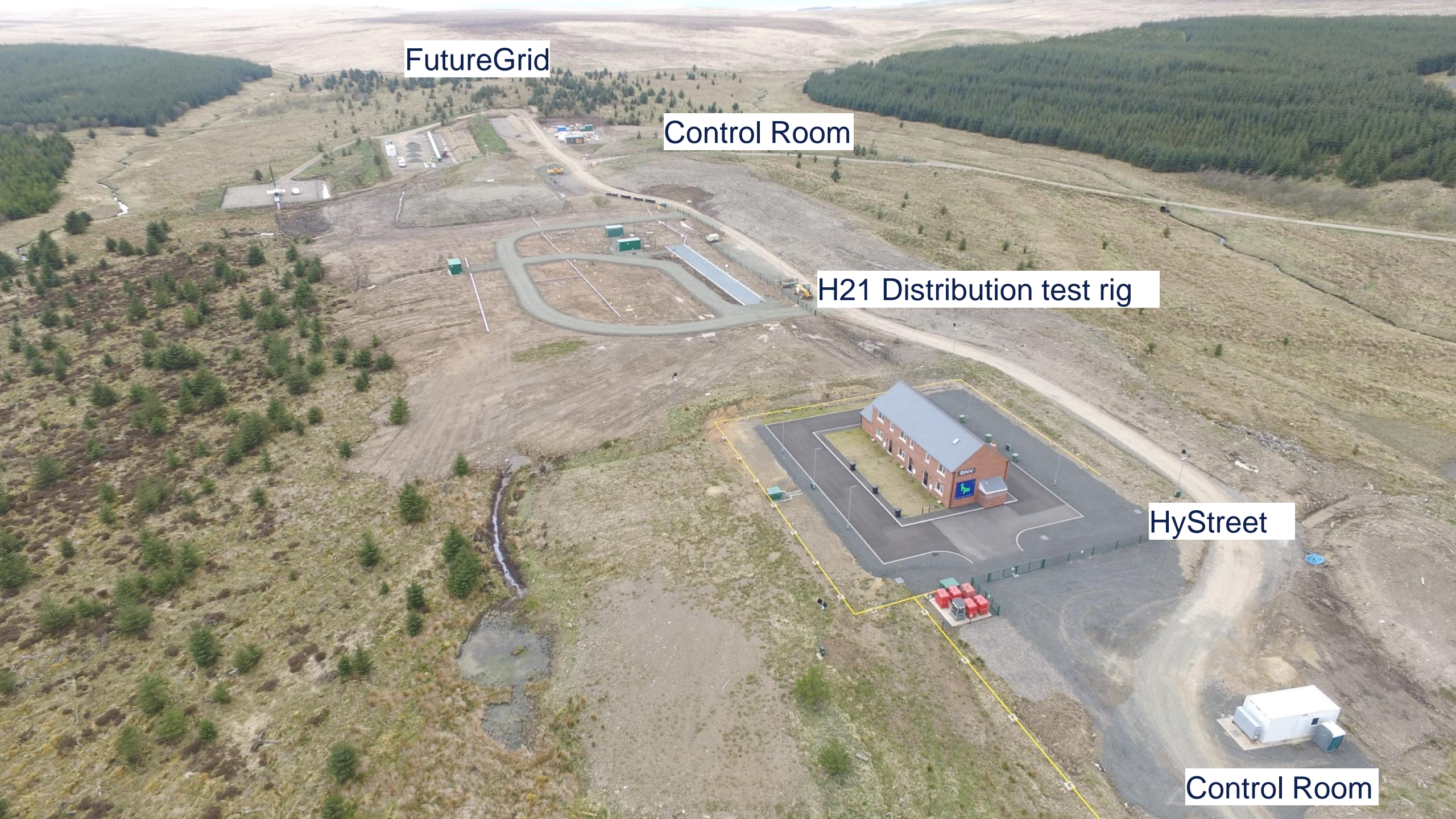
H21 Phase 2



H21 Phase 2a – Construction work

- PE mini network with valves included.
- Pressure Regulating equipment from Network – Orpheus modules and above ground regulator.
- 42" Hydrogen Pipeline Storage facility.





FutureGrid

Control Room

H21 Distribution test rig

HyStreet

Control Room

Our vision

A trusted voice to tackle global transformations

www.dnv.com