WHEN TRUST MATTERS

Hydrogen Pipeline Transportation

HyDex

Jo-Anne Tomkins

IGEM

- IGEM is the professional engineering institution for gas, here to support individuals and organisations connected with the industry.
- Hydrogen Knowledge Centre – A one of a kind digital library that is designed specifically for those working and studying in the future energy field.

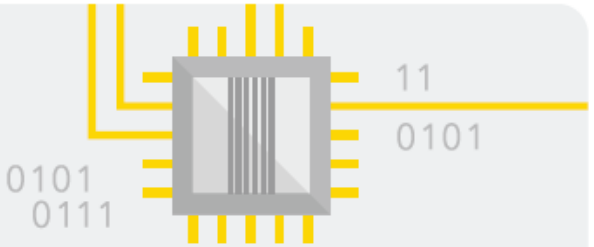
Why DNV?

- Experience
- Skills
- Policy
- Safety
- Regulations
- Standards
- International Cooperation
- Materials Characterisation
- Consumer Acceptance
- Complex
- Leadership
- Independence

Energy Transition Outlook

Our **best estimate**, not the future we want
A **single forecast**, not scenarios

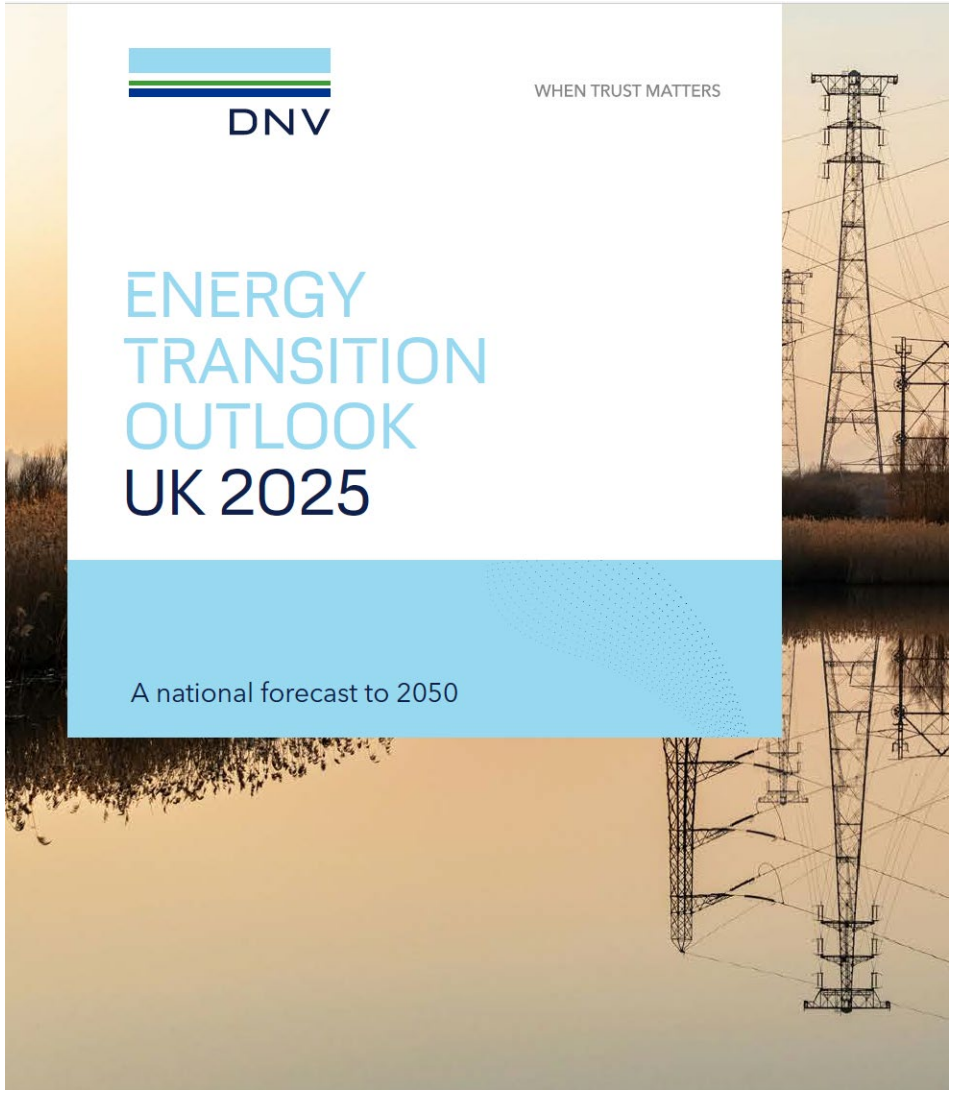
UK as part of the **Global Energy System** – through technology, economy, energy resources

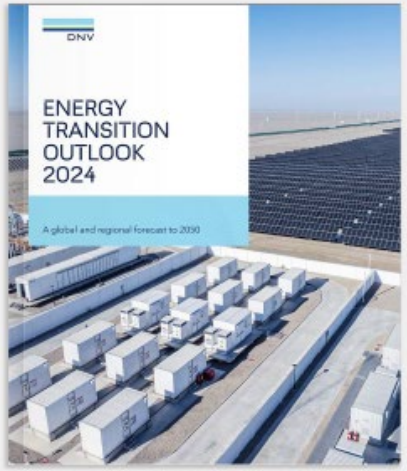


Technology uptake is mainly cost driven - reflecting global trends and learning curves

Key confirmed **policy** trends included: e.g. phase out of ICE, commitment to industrial clusters

Download the 2025 UK ETO Report





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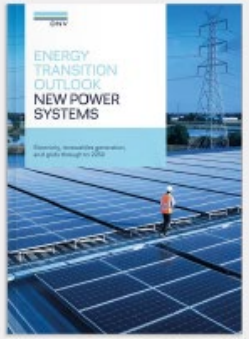
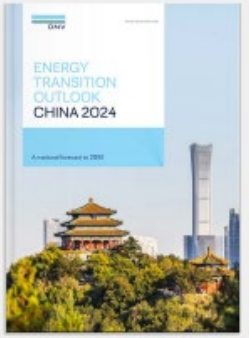
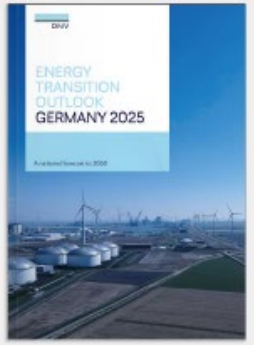
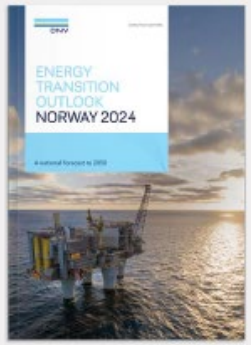
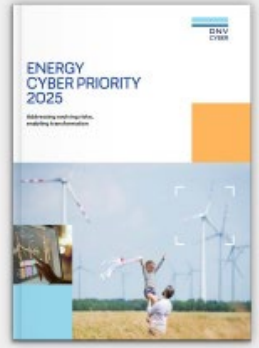






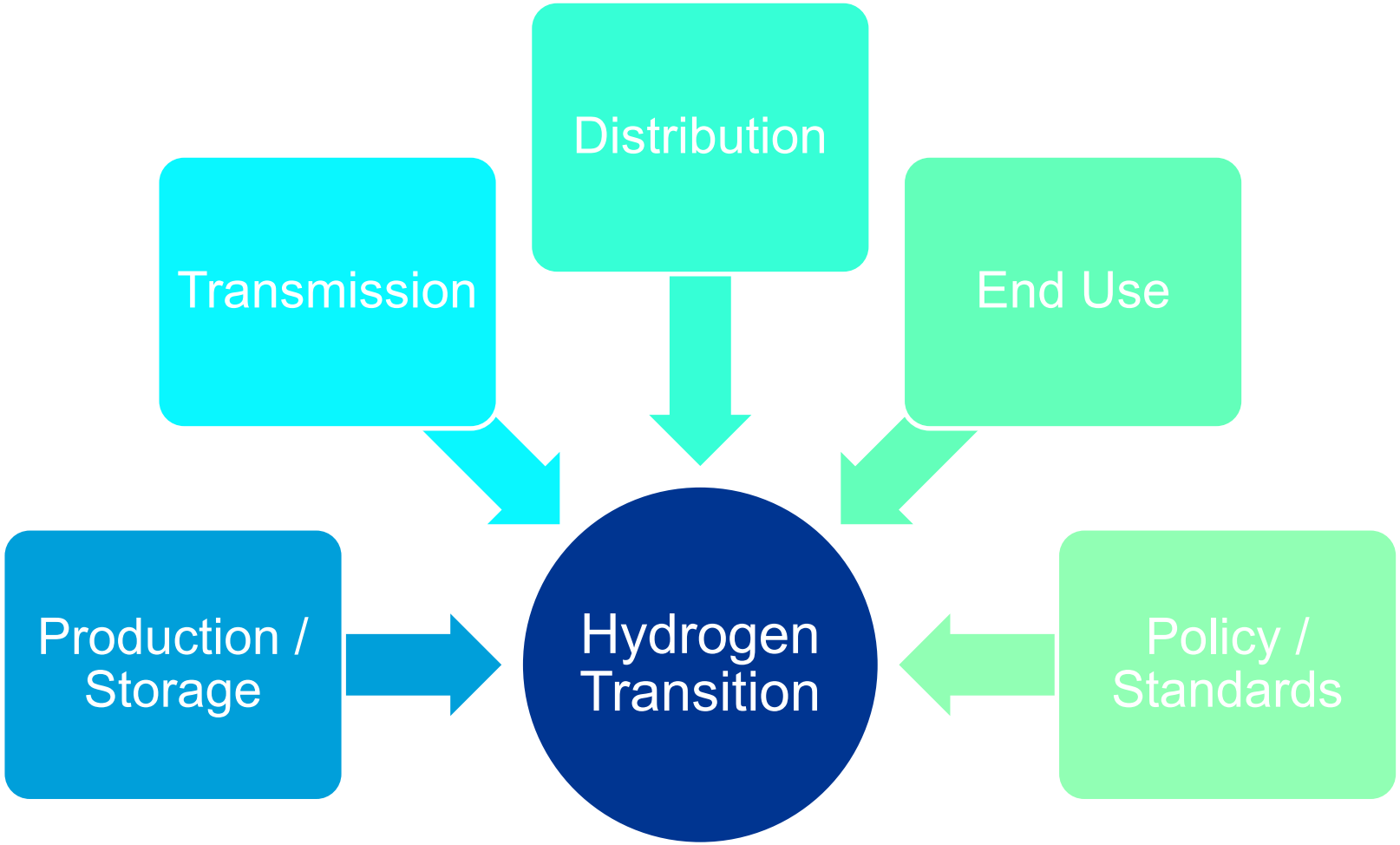




Why repurpose pipelines for hydrogen?

- To achieve the goals of the Paris agreement DNV predicts hydrogen will need to meet 15% of energy demand by 2050
- Hydrogen will need to be transported to users
- The estimated cost for repurposing pipelines is lower of new build costs
- Supply chain issues will increase the costs and time scales of new build compared to repurposing
- Thus, it is expected that between 50 and 80% of hydrogen pipelines will be repurposed from existing natural gas assets

Hydrogen Transition Projects



Existing UK Infrastructure - NTS

National Gas Transmission Overview

Our network is a national asset essential to the functioning of society and is deemed a critical part of Great Britain's Critical National Infrastructure.

national gas 4 x Subsidiaries

national gas transmission

national gas services

Premtech

national gas metering

Managing

c.5000 miles of pipeline and >500 AGIs

>60 compressors across 21 sites

3x the energy transported by the electricity grid

33% UK annual electricity generated from gas

National Transmission Direct Connection

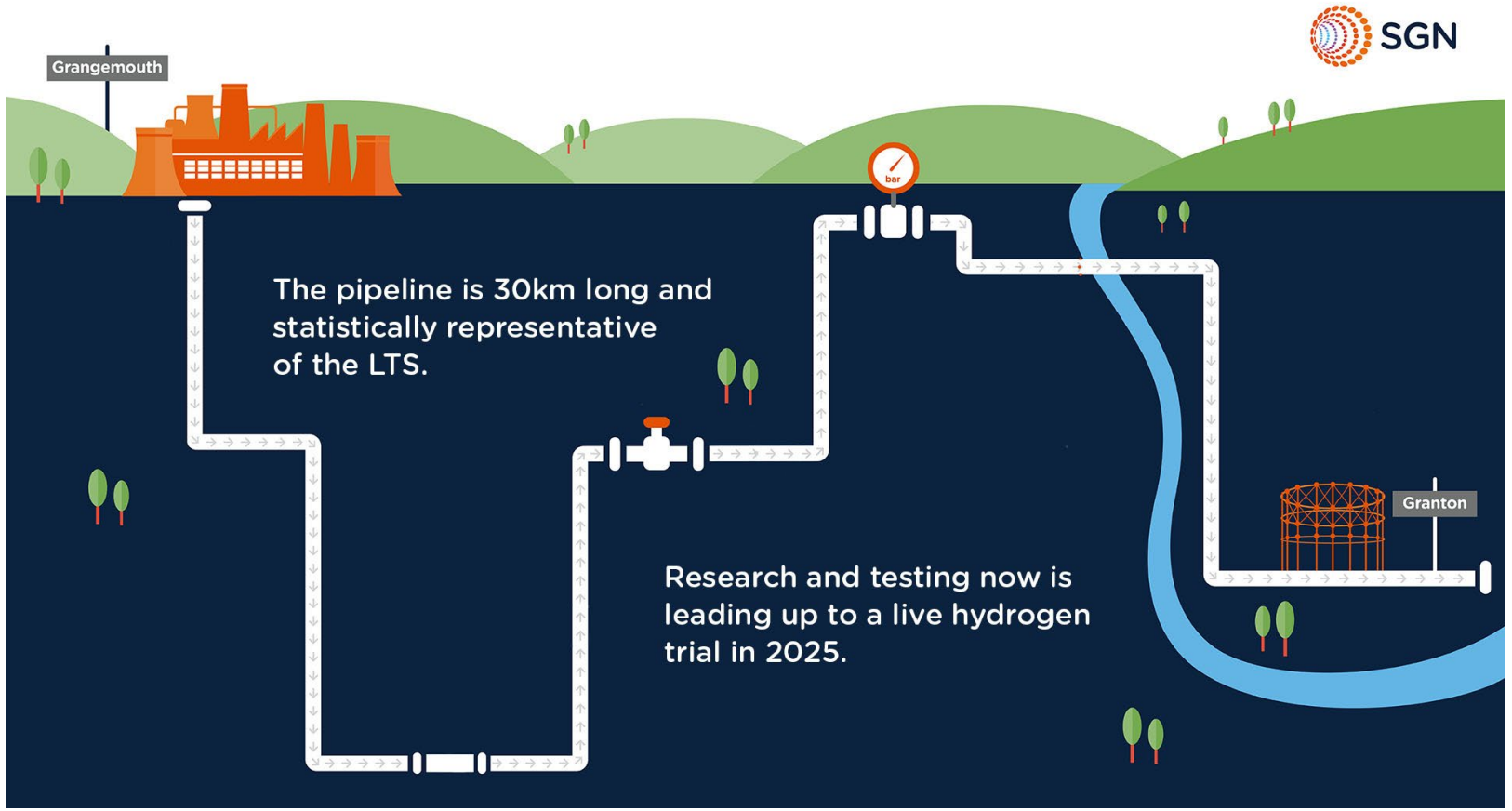
- 15 Industrial
- 35 Power Generation
- 9 Storage Sites
- 2 LNG Terminals
- 3 Interconnectors
- 4 Distribution Businesses

National Gas Transmission | The Path to Decarbonisation Workshop | August 2024

FutureGrid / Project Union

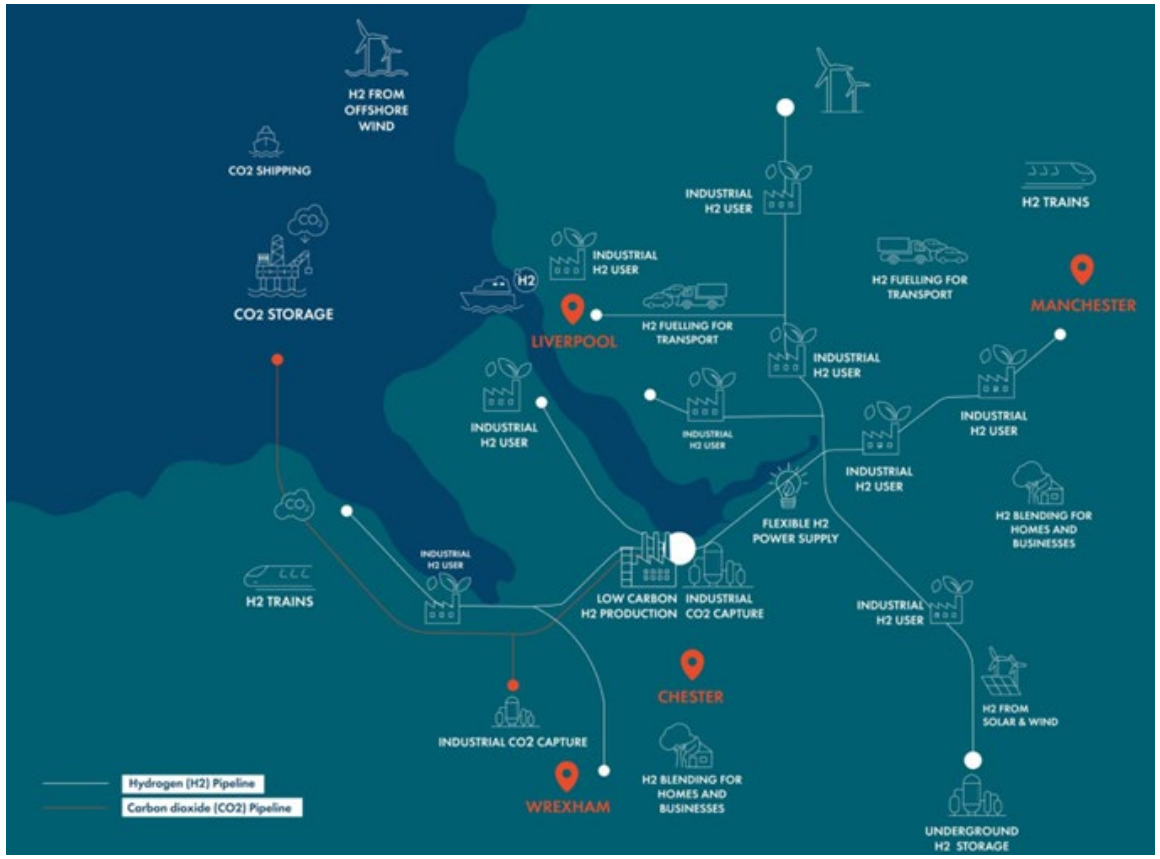
Existing UK Infrastructure / LTS Futures

- LTS, above 7 barg,(high pressure) 11,600 km
- Intermediate Pressure 2 barg – 7 barg
- Medium Pressure 75 mbarg – 2 barg
- Low Pressure – below 75 mbarg



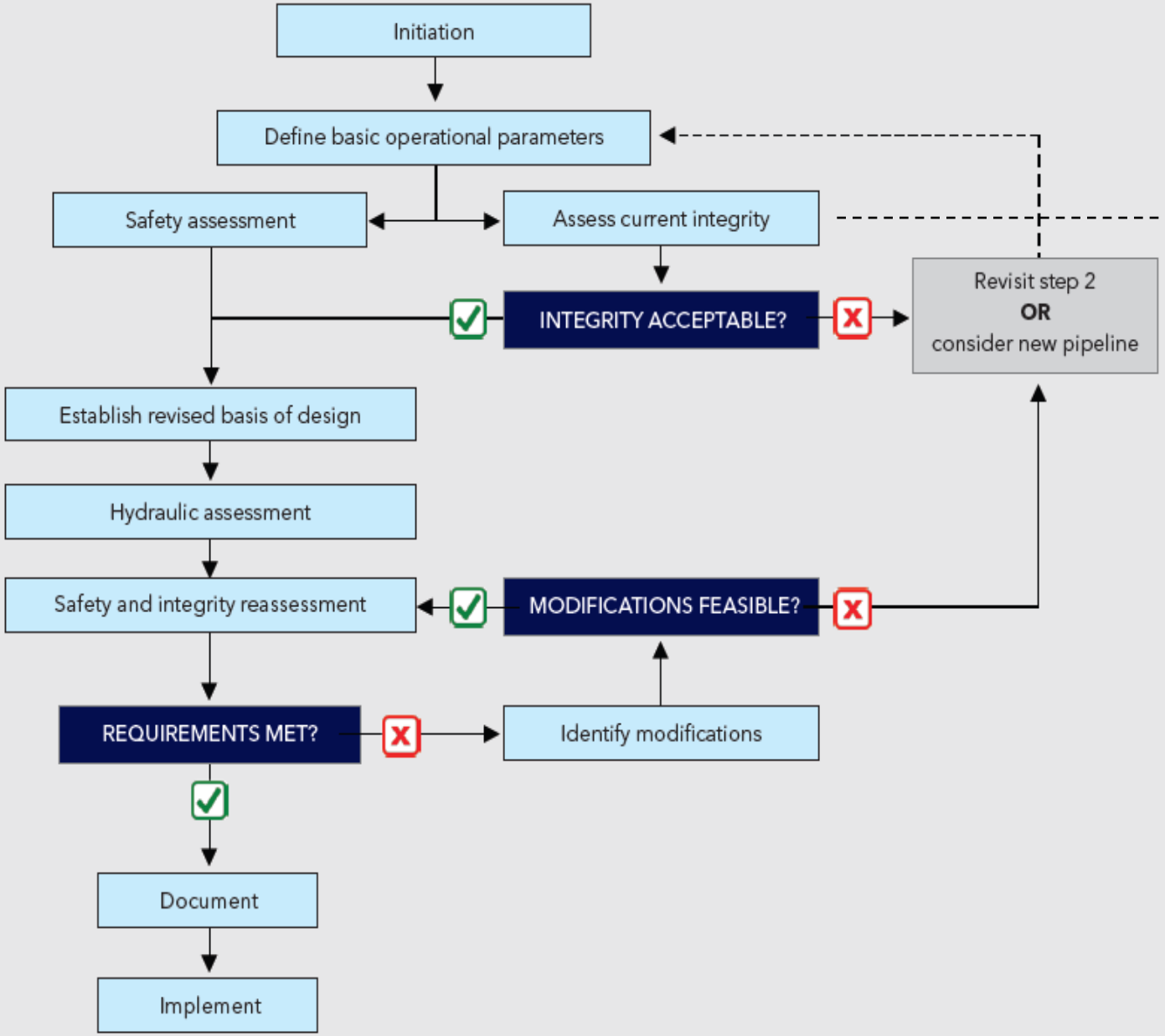
HyNet North West

- New purpose built, 125 km, 100% hydrogen network
- Connecting hydrogen production, storage, industrial users, with other future options
- Also includes a number of HAGIs, which includes equipment like:
  - Pressure Reduction Units that control the flow or pressure of hydrogen into the network
  - Instrument and control kiosks that house the equipment that monitors flow, pressure and temperature
  - Equipment to allow hydrogen to be blended with natural gas and supplied into the pipeline network.



East Coast Hydrogen

- Collaboration between National Gas, Northern Gas Networks and Cadent
- Connecting hydrogen production, storage, industrial users, with other future options
- 770 km of existing pipework could be repurposed
- Alongside some new build if reinforcement required



DNV Repurposing carbon dioxide. Process – DNV-SE-0657 – Re-qualification of pipeline systems for transport of hydrogen and

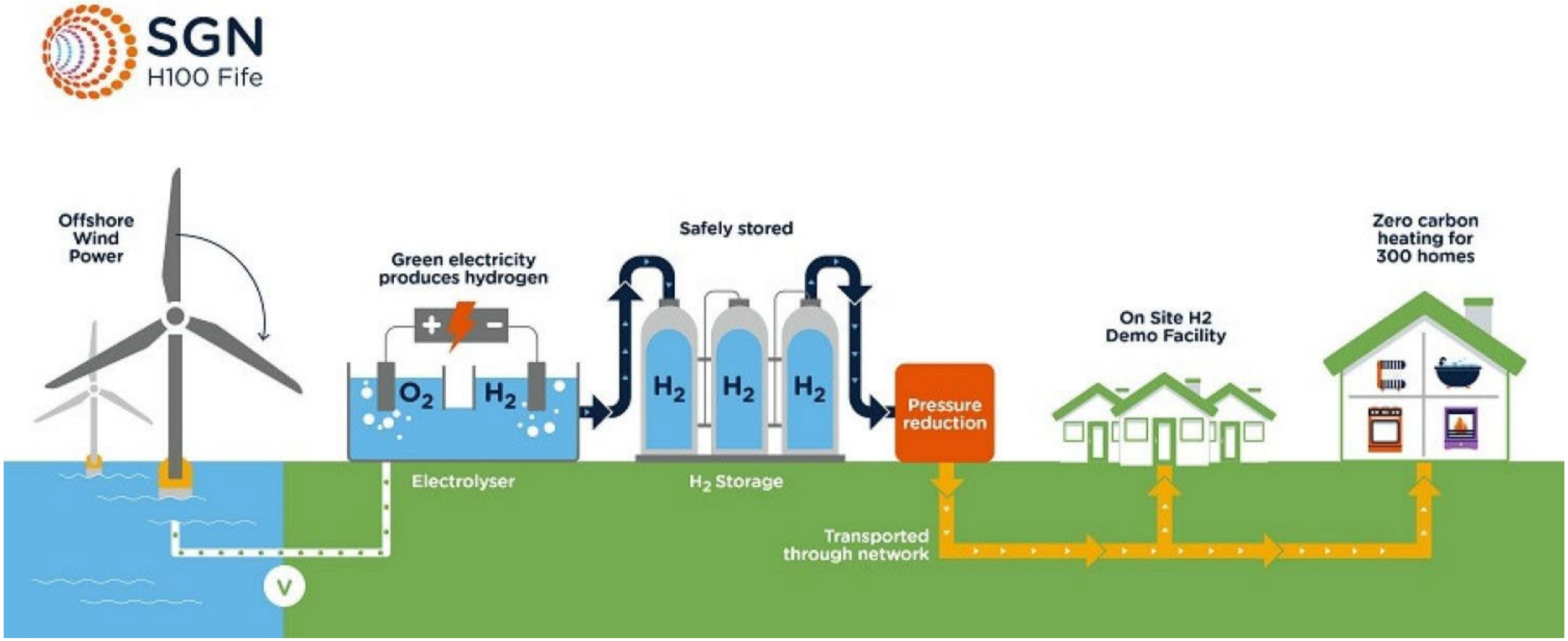
Safety Issues:

- Hydrogen's larger flammability range
- Hydrogen's lower minimum ignition energy
- Possible overpressure issue

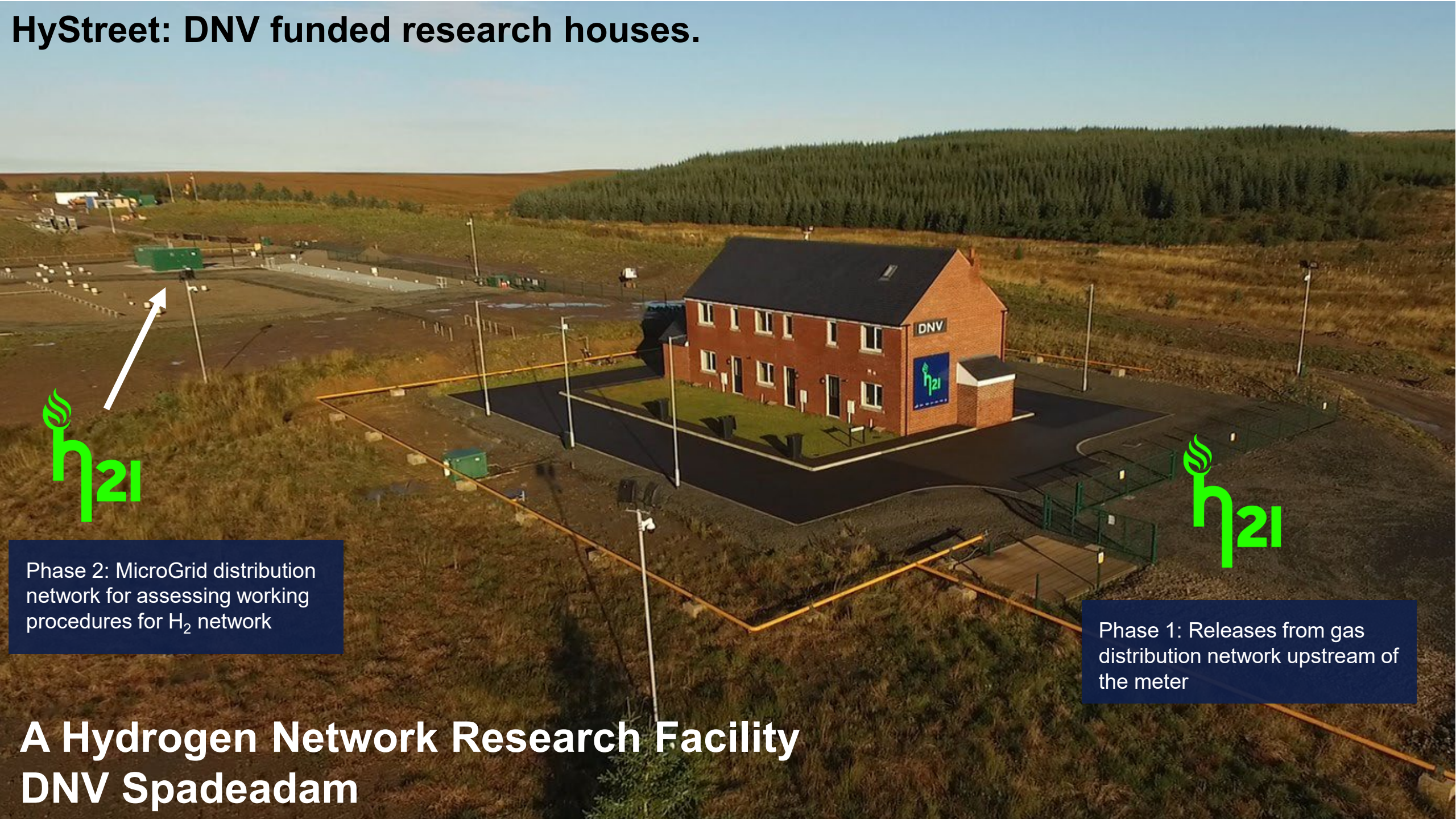
Integrity Issues:

- Fracture toughness
- Fatigue crack growth

Distribution – H100 Fife



HyStreet: DNV funded research houses.



Phase 2: MicroGrid distribution network for assessing working procedures for H_2 network

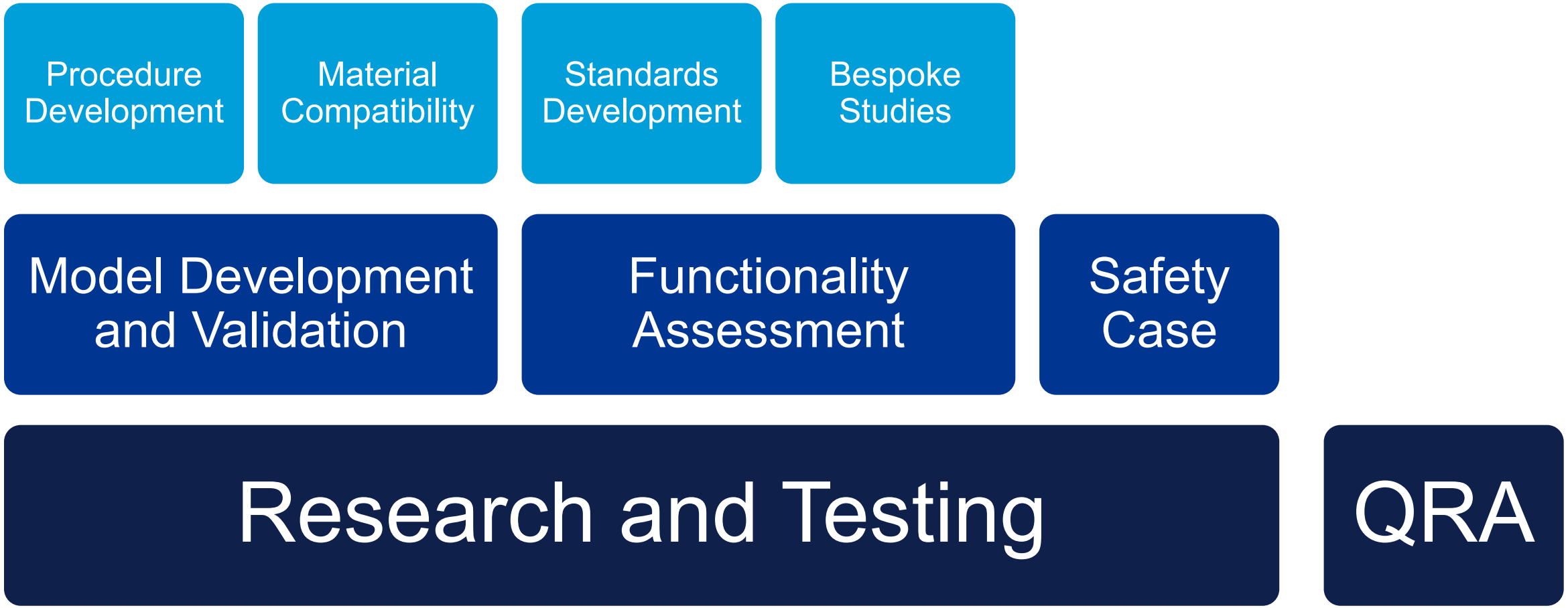
Phase 1: Releases from gas distribution network upstream of the meter

A Hydrogen Network Research Facility
DNV Spadeadam

DNV HyStreet

- Houses funded by DNV
- Fully controlled system for hydrogen and natural gas releases. Accommodating a variety of gas accumulation scenarios.
- Network connections for H21 project.
- Appliance testing/ demonstration houses.

Assessment Components



Future Work

- Further rupture testing
- Dispersion validation
- Ignition probability
- Reliability
- Trials / further industrial projects
- Standards development and amendment
- Regulation change
- Policy decision (support)