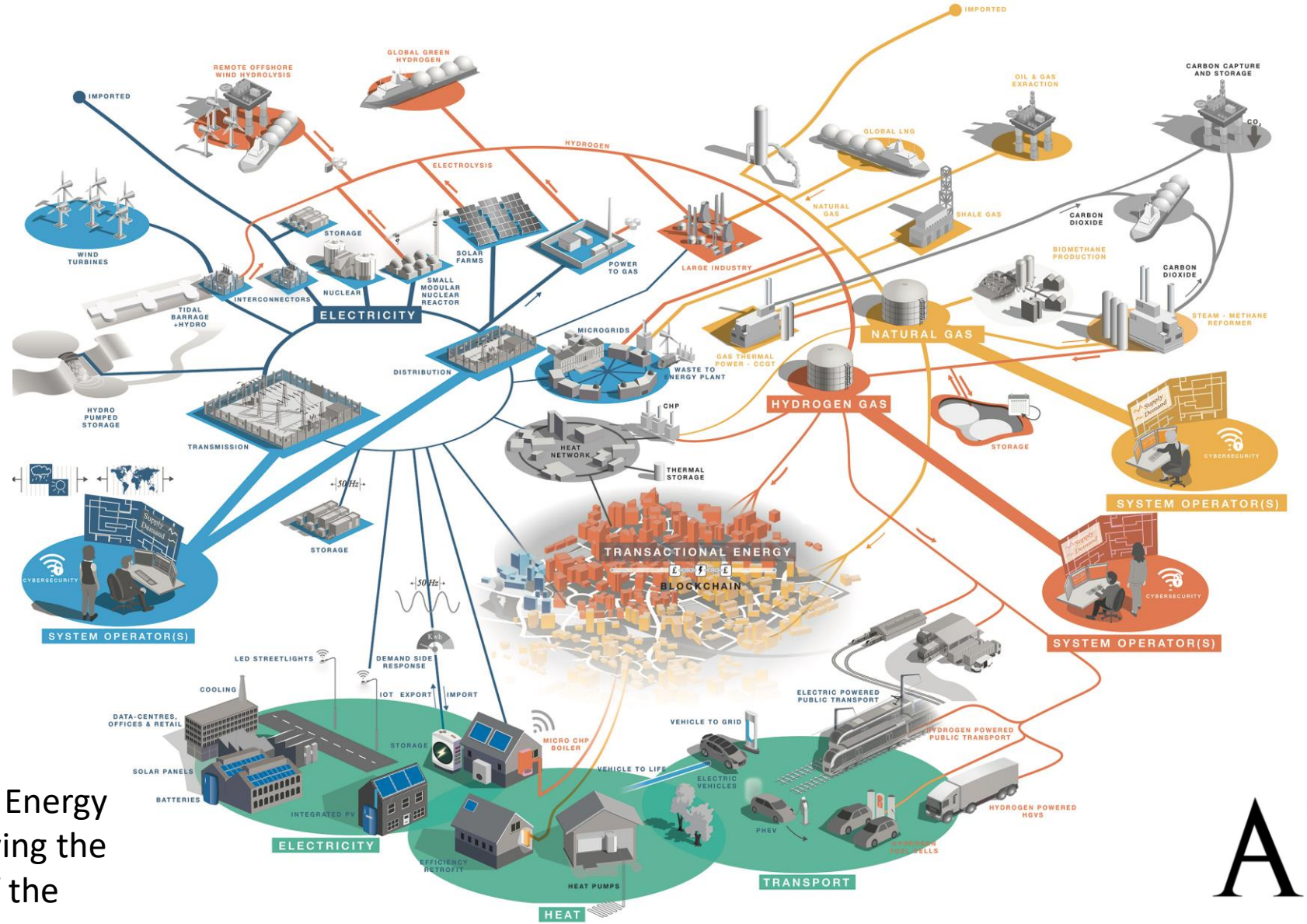
Hy4Heat

demonstrating
hydrogen for heat

Heidi Genoni ARUP

Utility Week Live – 21 May 2019



Arup's 'Future of Energy 2035' map, showing the energy system of the future

ARUP

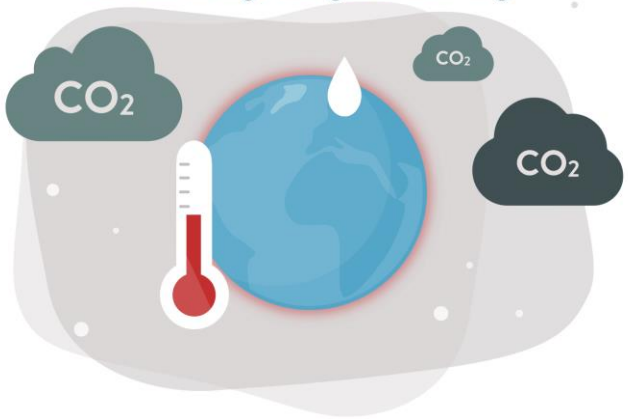
Policy is set out in two key documents

Clean Growth Innovation Challenges

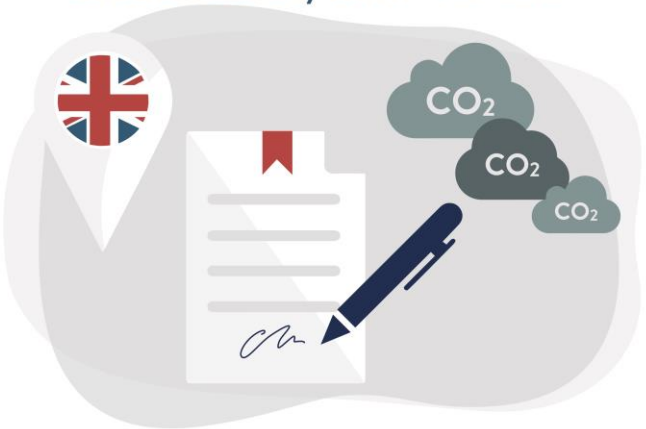
"Clean fuels such as hydrogen and bioenergy could be used for transport, industry, and to heat our homes and businesses. We need to test how they work in the existing gas network, whether they can fire industrial processes, and how they could be used in domestic appliances."

Clean Growth Innovation Challenges - Clean Growth Strategy

Carbon Dioxide is contributing to climate change and global warming

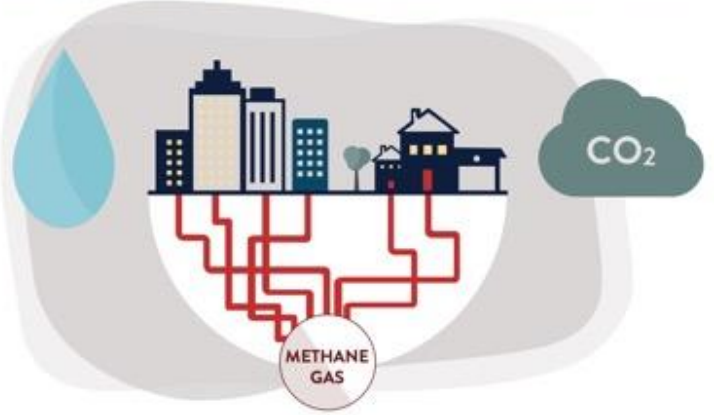


The UK government has a 2050 target to **reduce carbon emissions by 80%** of 1990 levels

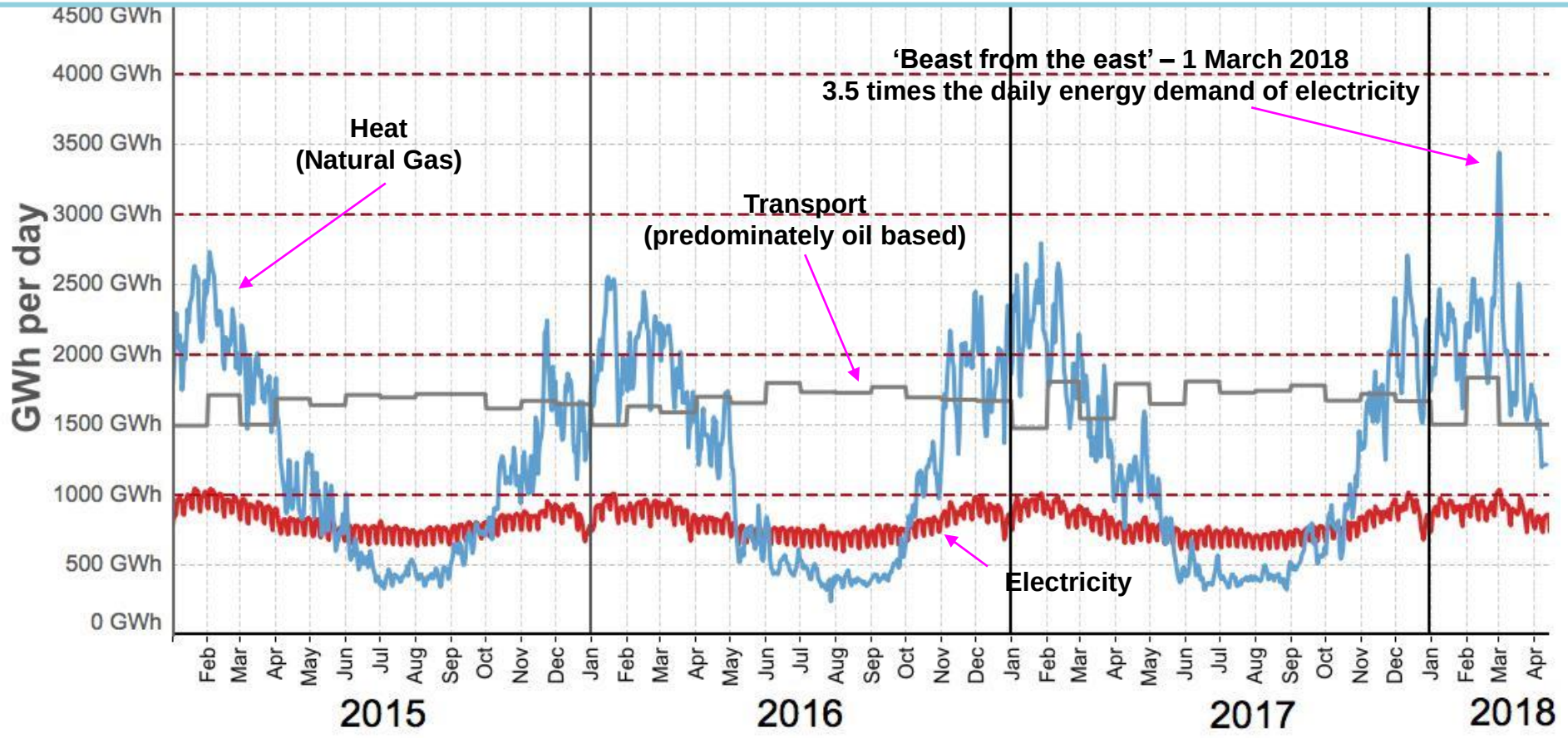


Heating and cooling UK homes is about **half all energy consumption and a third of carbon emissions**

80% of homes and business use natural (methane) gas. When used for heating and cooking, this releases water and carbon dioxide



The challenge – UK energy demand

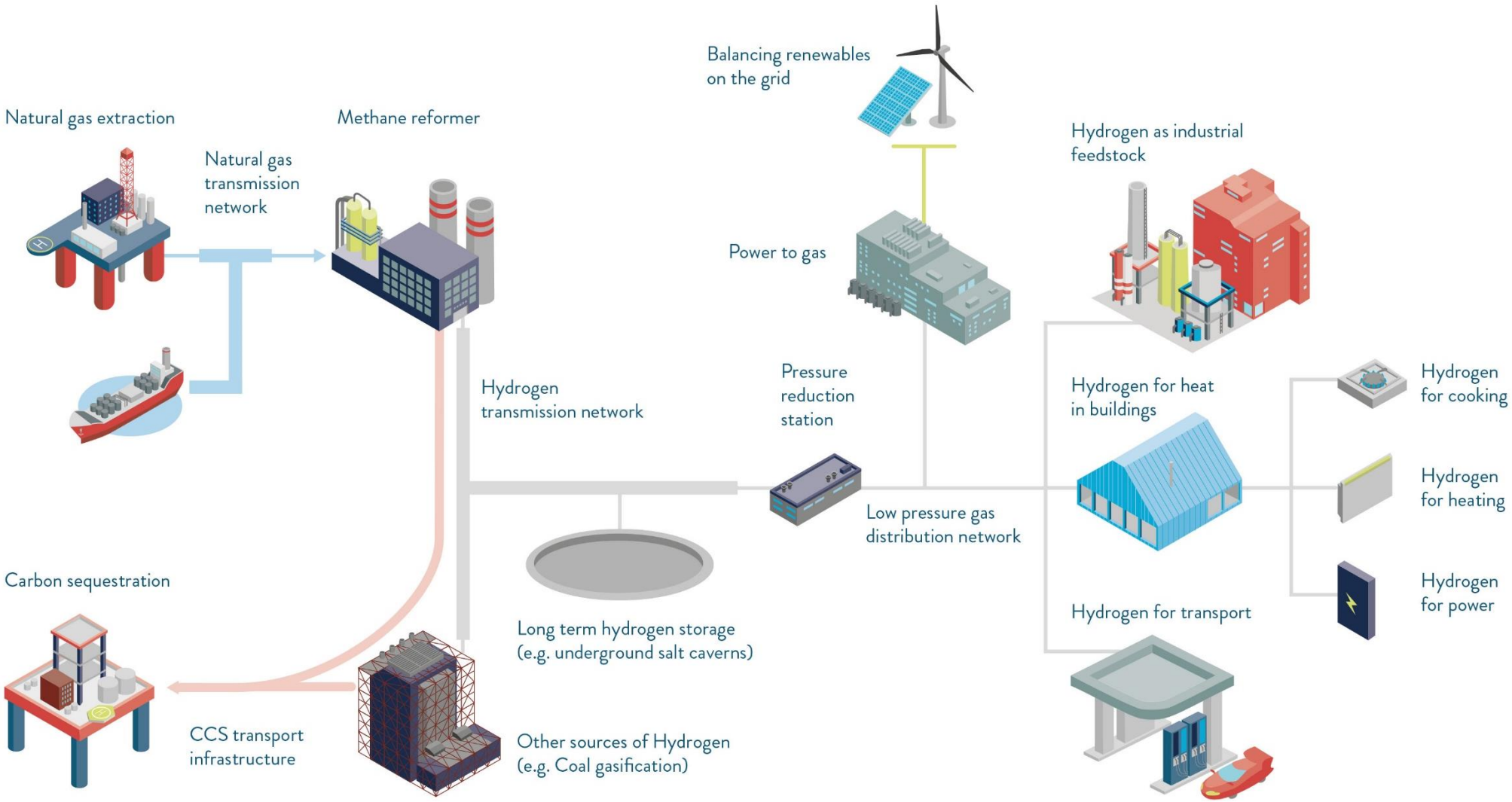


Data are from National Grid, Elexon and BEIS. Charts are licensed under an Attribution-NoDerivatives 4.0 International license
Charts can be downloaded from http://bit.ly/energycharts

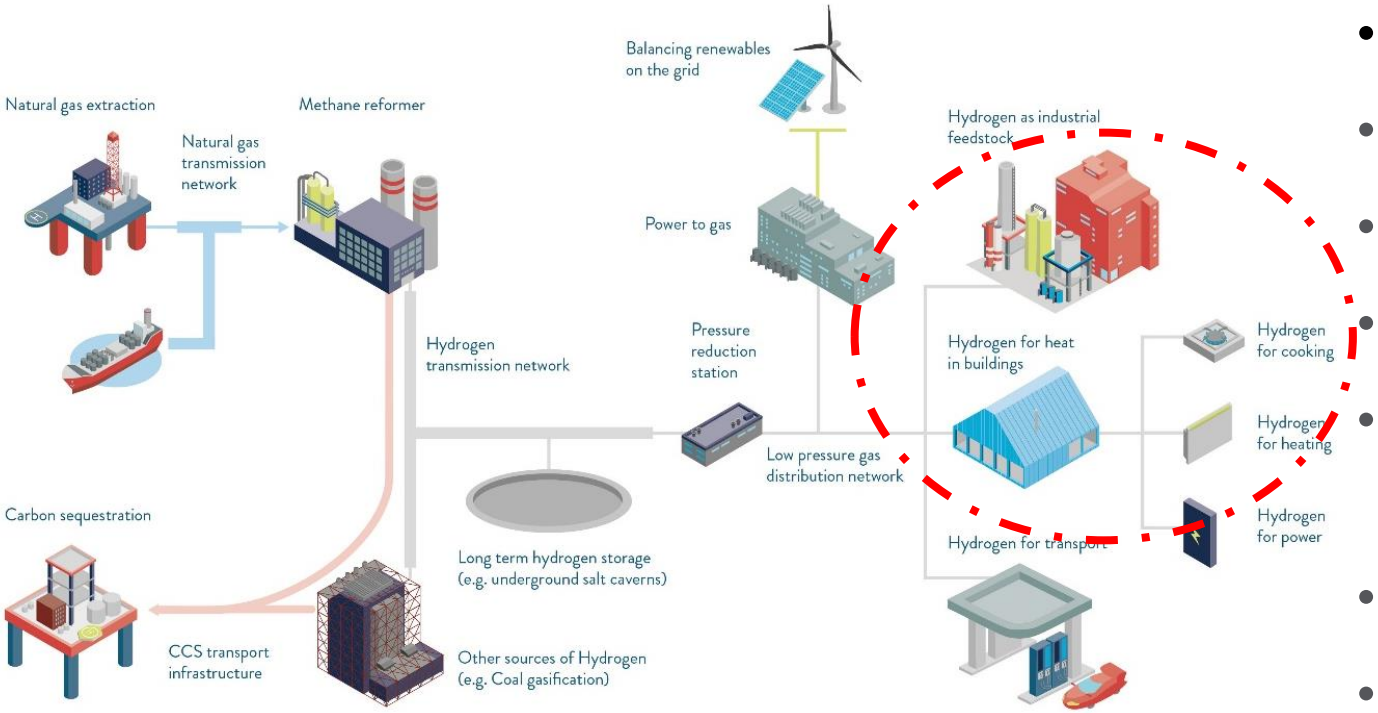
by Dr Grant Wilson grant.wilson@sheffield.ac.uk

Photo: Roger Wollstadt

Conceptual view of a hydrogen system



Hydrogen innovation programmes



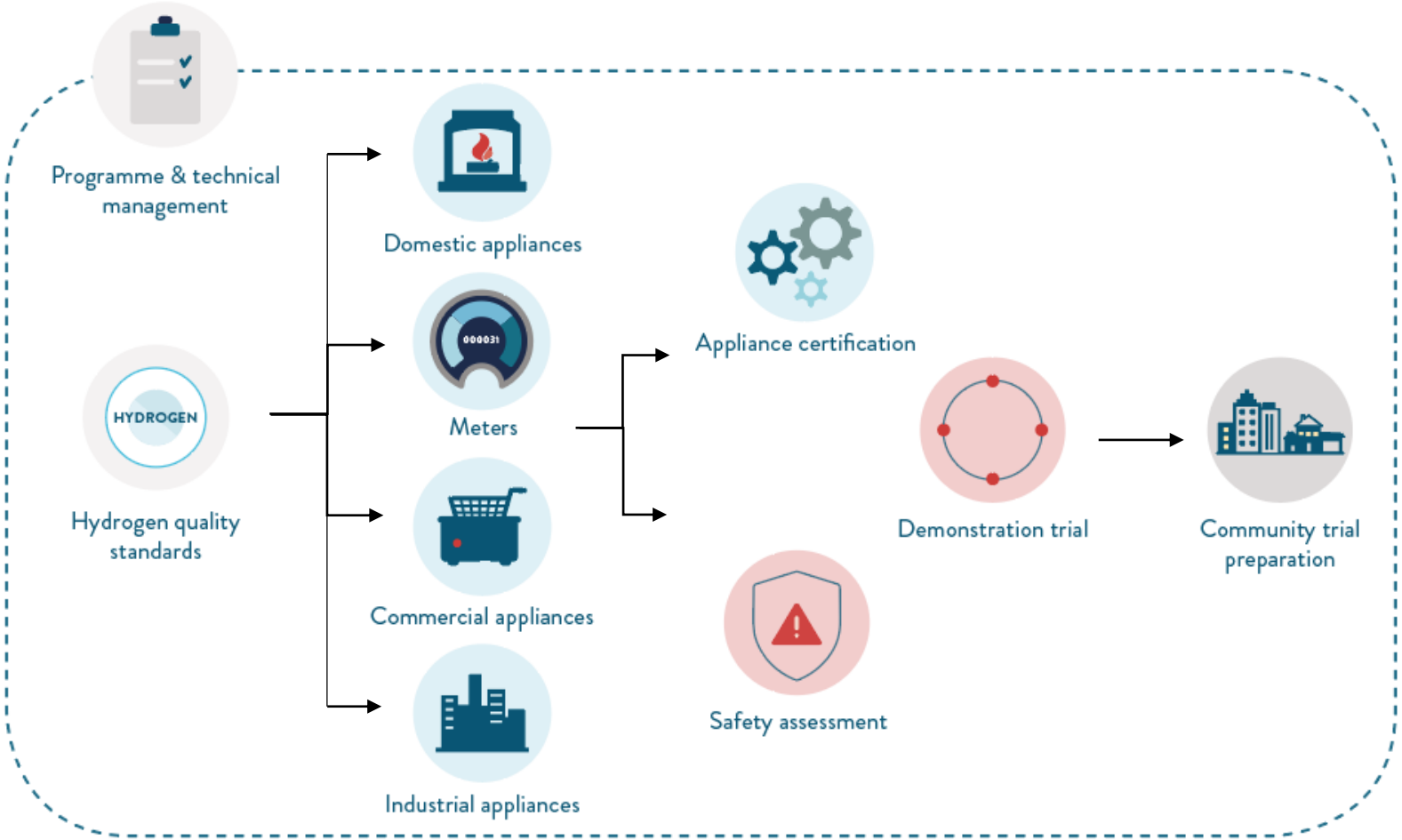
- **BEIS Hy4Heat – Hydrogen end use**
- H21 – Hydrogen in the distribution network
- BEIS – Hydrogen supply & storage
- H100 – Hydrogen end use (new build)
- HyDeploy – Blending 20% hydrogen in the network
- DfT – Hydrogen for transport
- BEIS – Industrial fuel switching
- HyNet – End to end demonstration
- H21 – North of England feasibility study

Hy4Heat mission

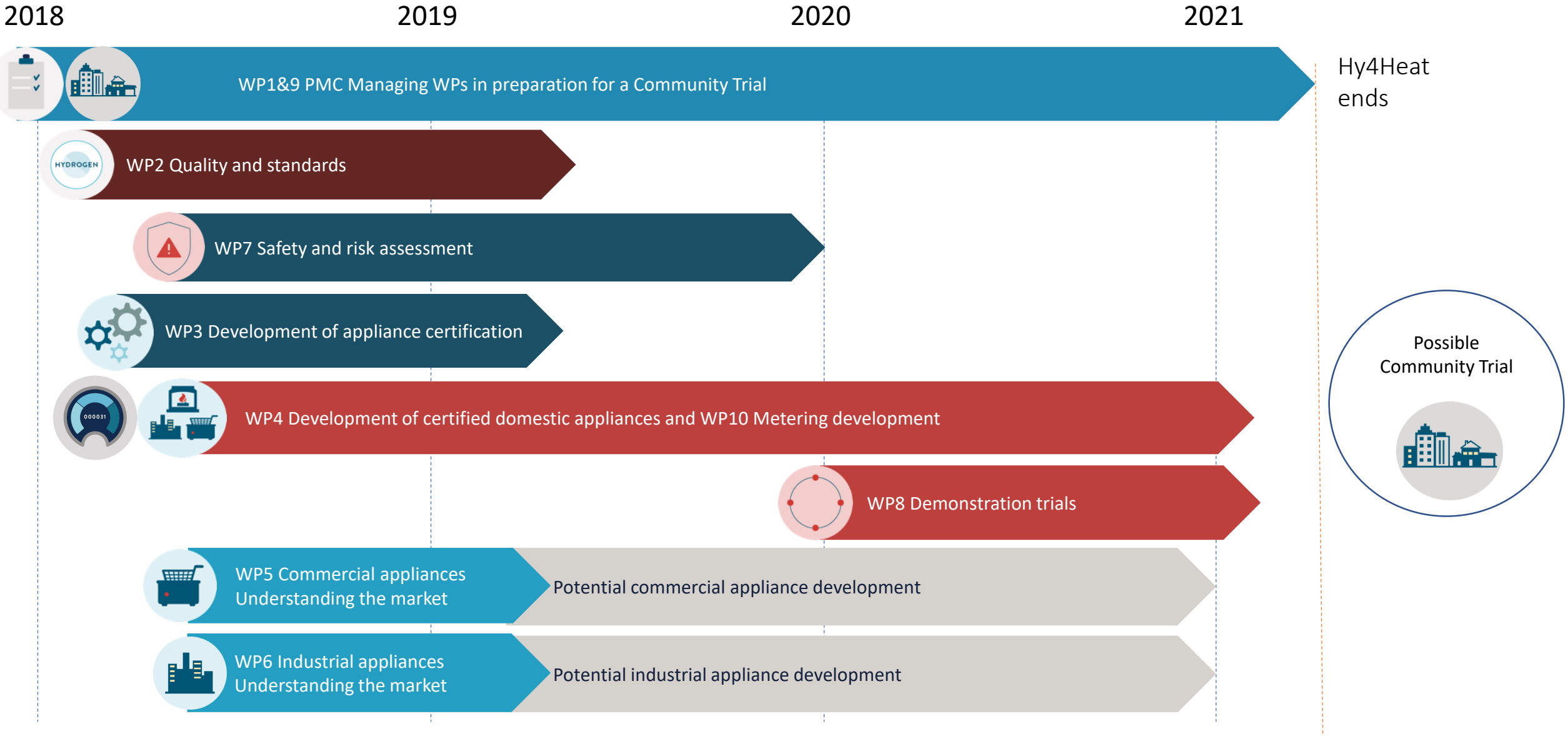
To establish if it is technically possible, safe and convenient to replace natural gas (methane) with hydrogen in residential and commercial buildings and gas appliances

This will help enable the government to determine whether to proceed to a community trial of hydrogen

Hy4Heat programme work packages



Hy4Heat programme timeline overview



Hydrogen quality & standards (WP2)

- Standards - IGEM are developing standards, by reviewing and revising existing relevant standards e.g.
  - Materials
  - Leakage rates
  - Ventilation
  - Installation
  - Air supply, etc.
- Purity & Colourant - DNV GL are defining requirements for heating
- Odorants - NPL determining options

IGEM
Institution of
Gas Engineers & Managers

DNV·GL

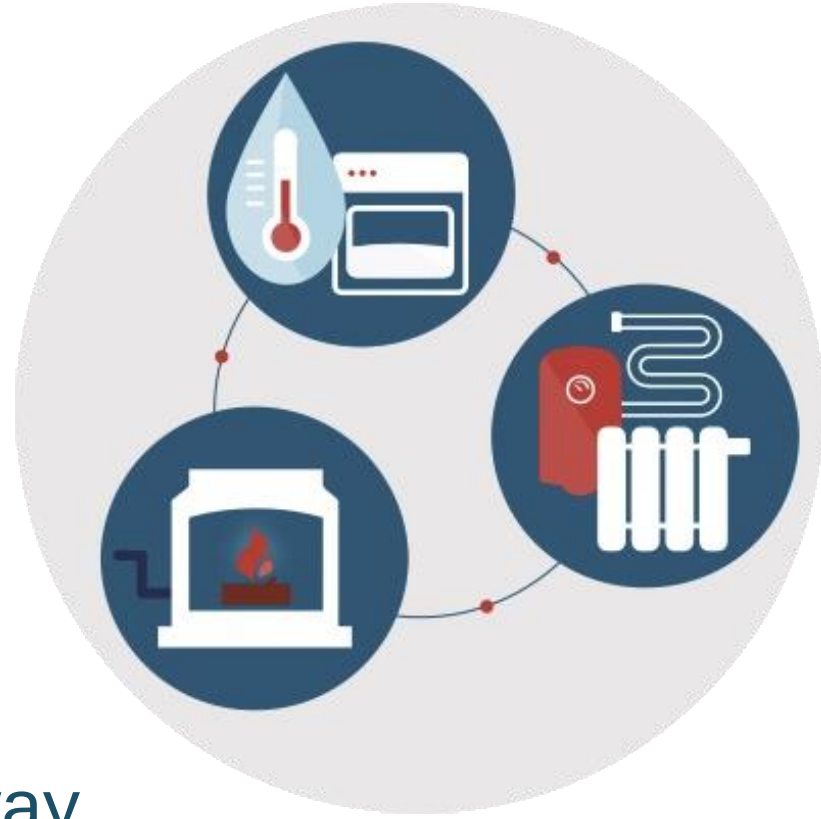
NPL

Safety assessment (WP7)

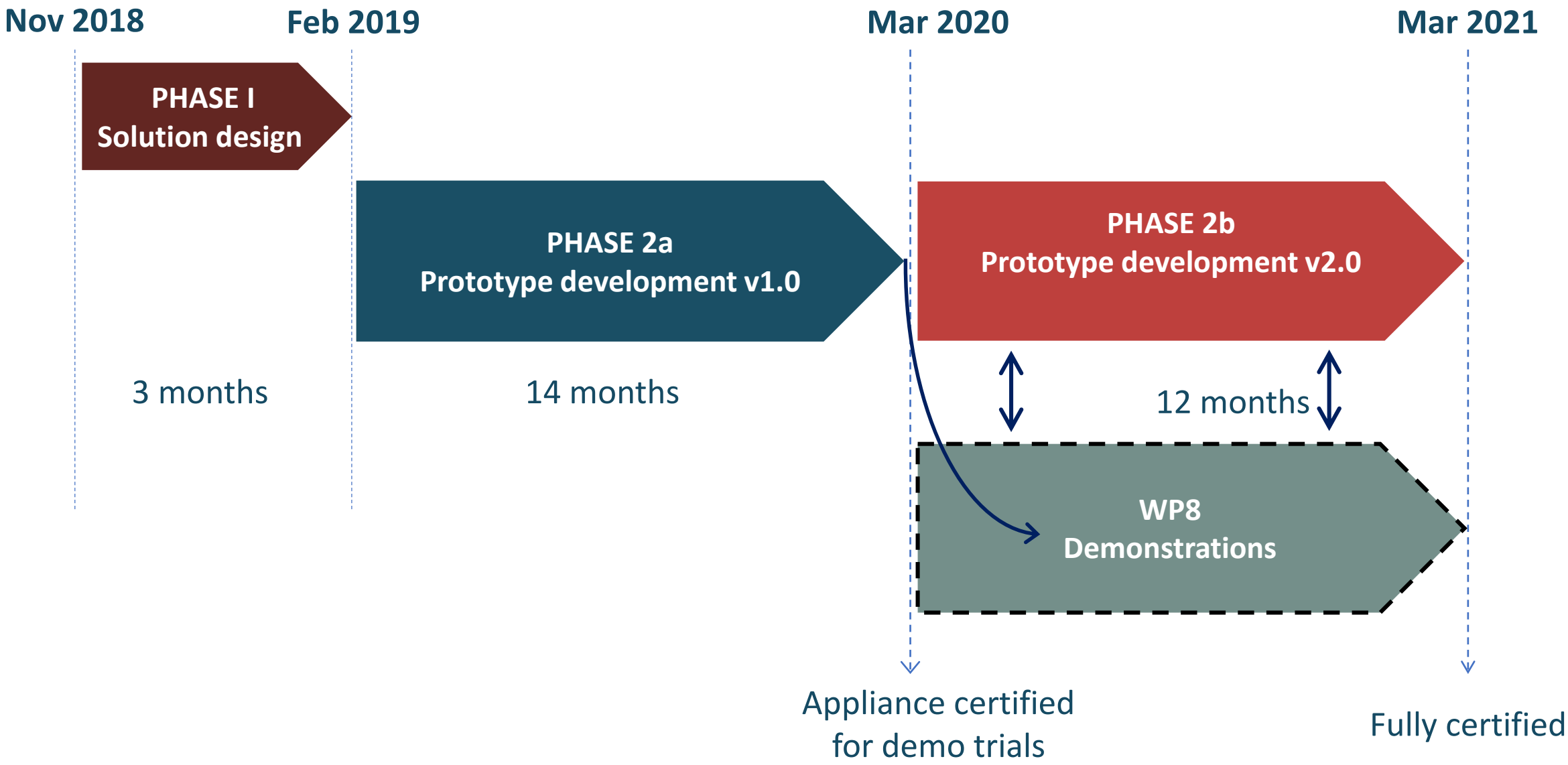
- Comparing hydrogen with natural gas
- Building on knowledge, data and evidence that exists already e.g. collaborating with the GDNO's
- Further experimental testing about to commence to gather further evidence
- HSE engagement

Domestic hydrogen appliances (WP4)

- Need to develop appliances to enable hydrogen end use:
  - gas boilers
  - gas cookers
  - gas fires
  - innovative hydrogen appliances
- Approach broadly *'like for like'* and *'hydrogen ready'* replacement
- SBRI Pre-Commercial Procurement innovation competition currently underway and into Phase 2



Phased competition structure – Domestic Appliances



Hydrogen appliance certification (WP3)

- Hydrogen appliances to be certified under GAR (Gas Appliance Regulation)
- BSI (British Standards Institute) developing PAS 4444

bsi.

Hydrogen meters (WP10)

- Need to develop hydrogen meters to enable hydrogen end use
- Fiscal and smart enabled meters
- OJEU Innovation Partnership procurement currently underway

Commercial / Industrial appliances & equipment (WP5&6)

- Market study into commercial and industrial sectors
- Contracts awarded to:
  - ERM (WP5)
  - Element Energy (WP6)
- Reports to be published in coming months

elementenergy

ERM

Commercial hydrogen appliances & equipment (WP5)

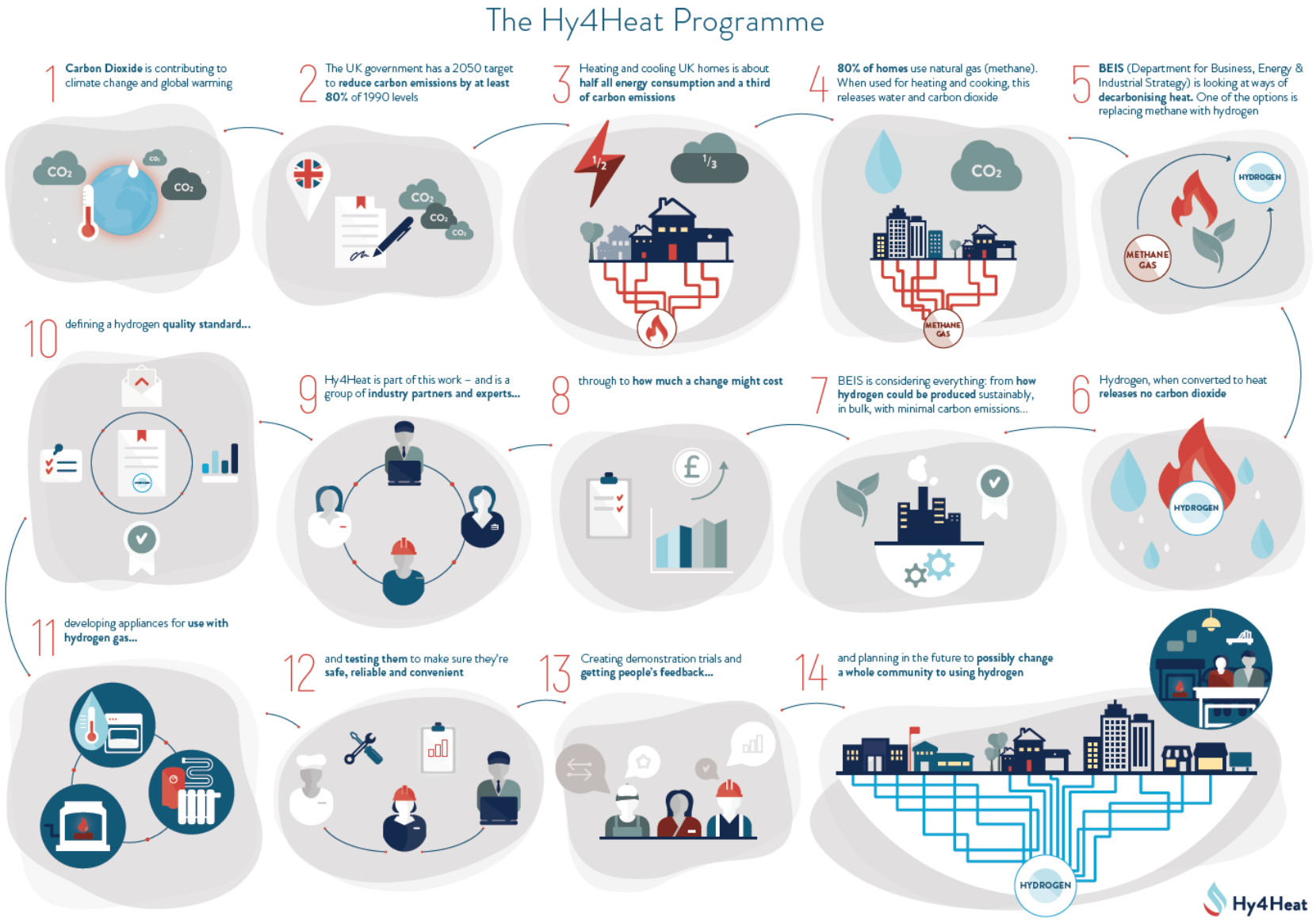
- Industry stakeholder engagement event on 21 May 2019
- Seeking to procure the development of:
  - Catering appliances
  - Space heating and hot water
  - Innovative appliances
  - Critical system components e.g. connectors, sensors, fittings and valves

Demonstrations (WP8)

- Showrooms of hydrogen appliances and equipment i.e. unoccupied demonstration trial, mock up living room, kitchen, home etc.
- Anticipated spring/summer 2020
- Using the hydrogen prototypes developed in WP4,10,5

Potential community trial (WP9)

- Planning and preparation necessary for a potential community trial
- Proposed to run from 2021 onwards



www.hy4heat.info

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- Quarterly Newsletter
- Progress Reports
- Updates
- Documents/ITTs etc

Summary

- Decarbonising heat is arguably the greatest challenge in meeting UK climate change targets
- There are a range of practical programmes and projects underway to provide evidence required
- It’s difficult to envisage a future whole energy system solution that wouldn't involve hydrogen in some areas