

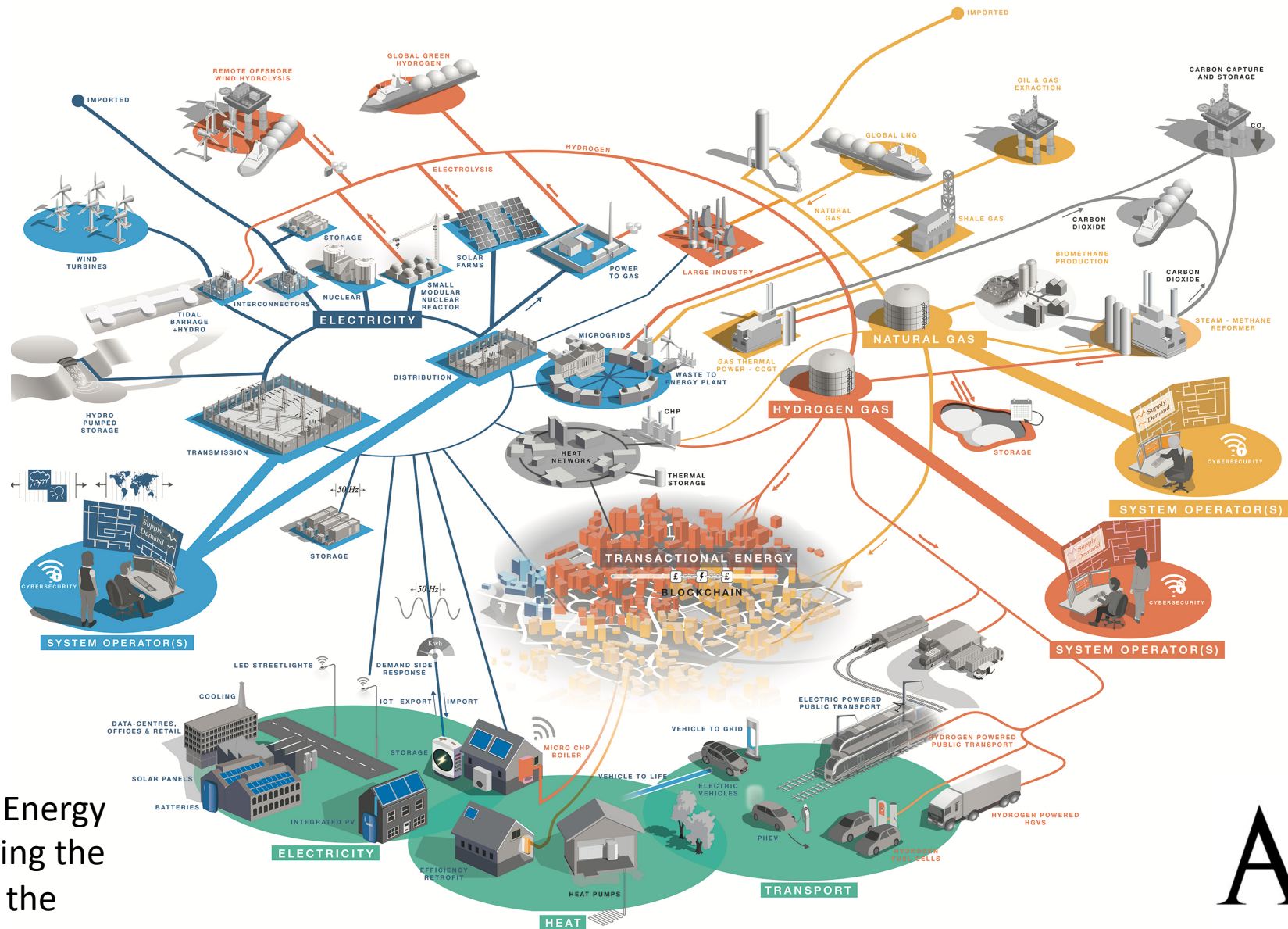


# Hy4Heat

demonstrating  
hydrogen for heat

Heidi Genoni **ARUP**

IGEM – 12 June 2019



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

ARUP

# Policy is set out in two key documents

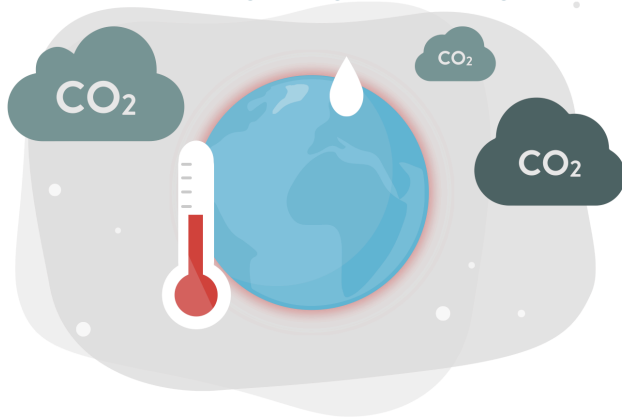
## **Clean Growth Innovation Challenges**

*“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



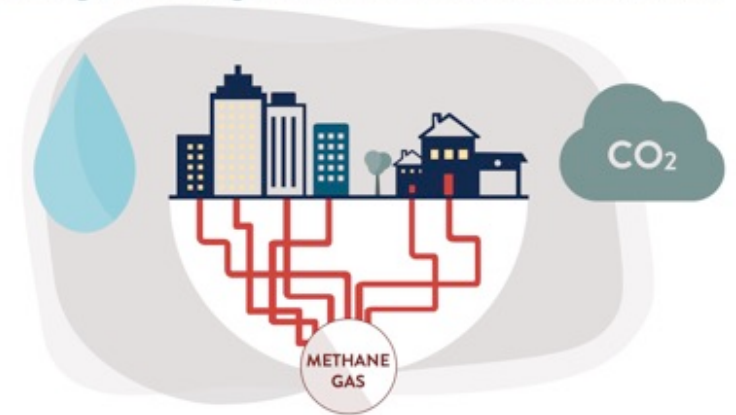
The UK government has a 2050 target to **reduce carbon emissions by 80%** of 1990 levels



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

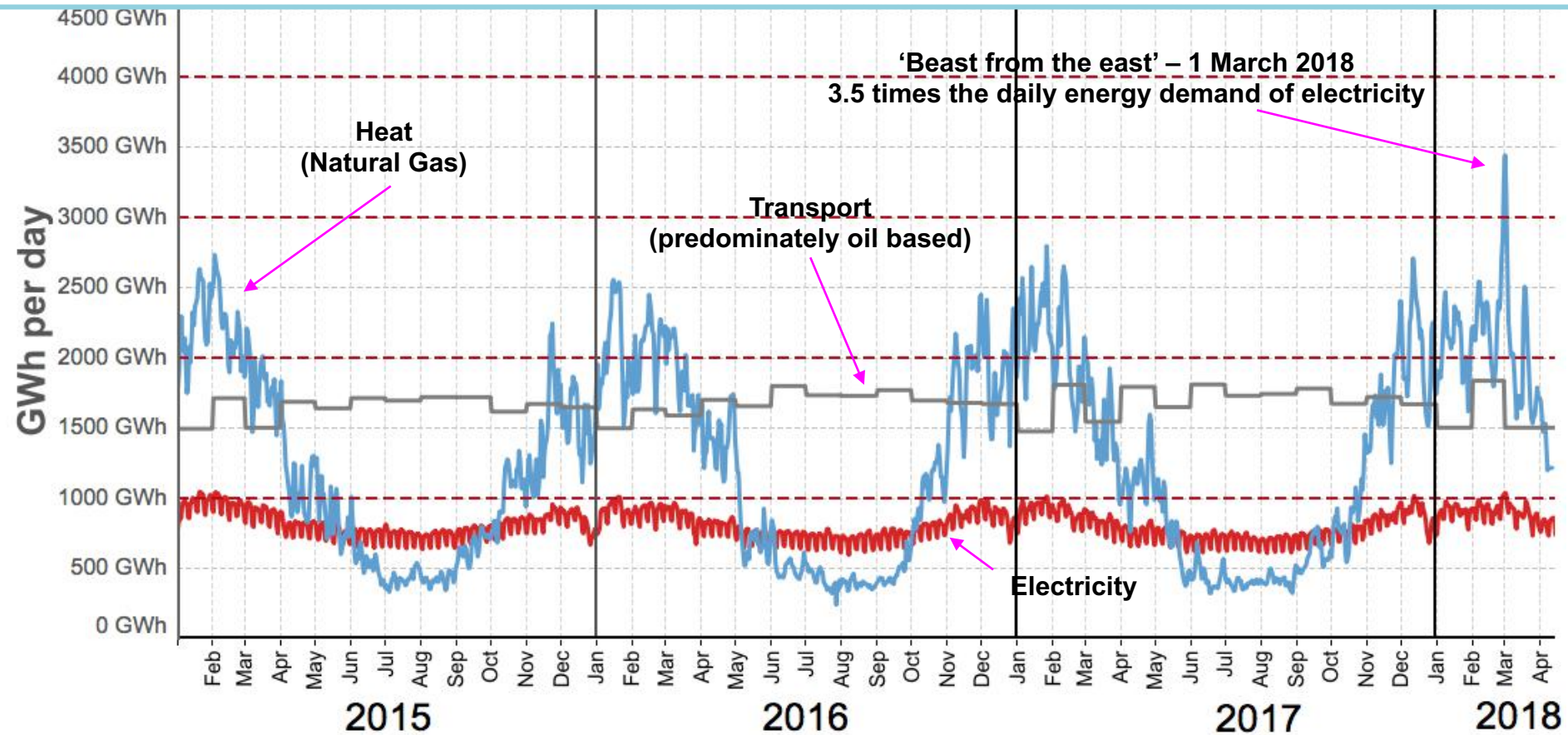


**80% of homes and business** use natural (methane) gas. When used for heating and cooking, this releases water and carbon dioxide





# 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



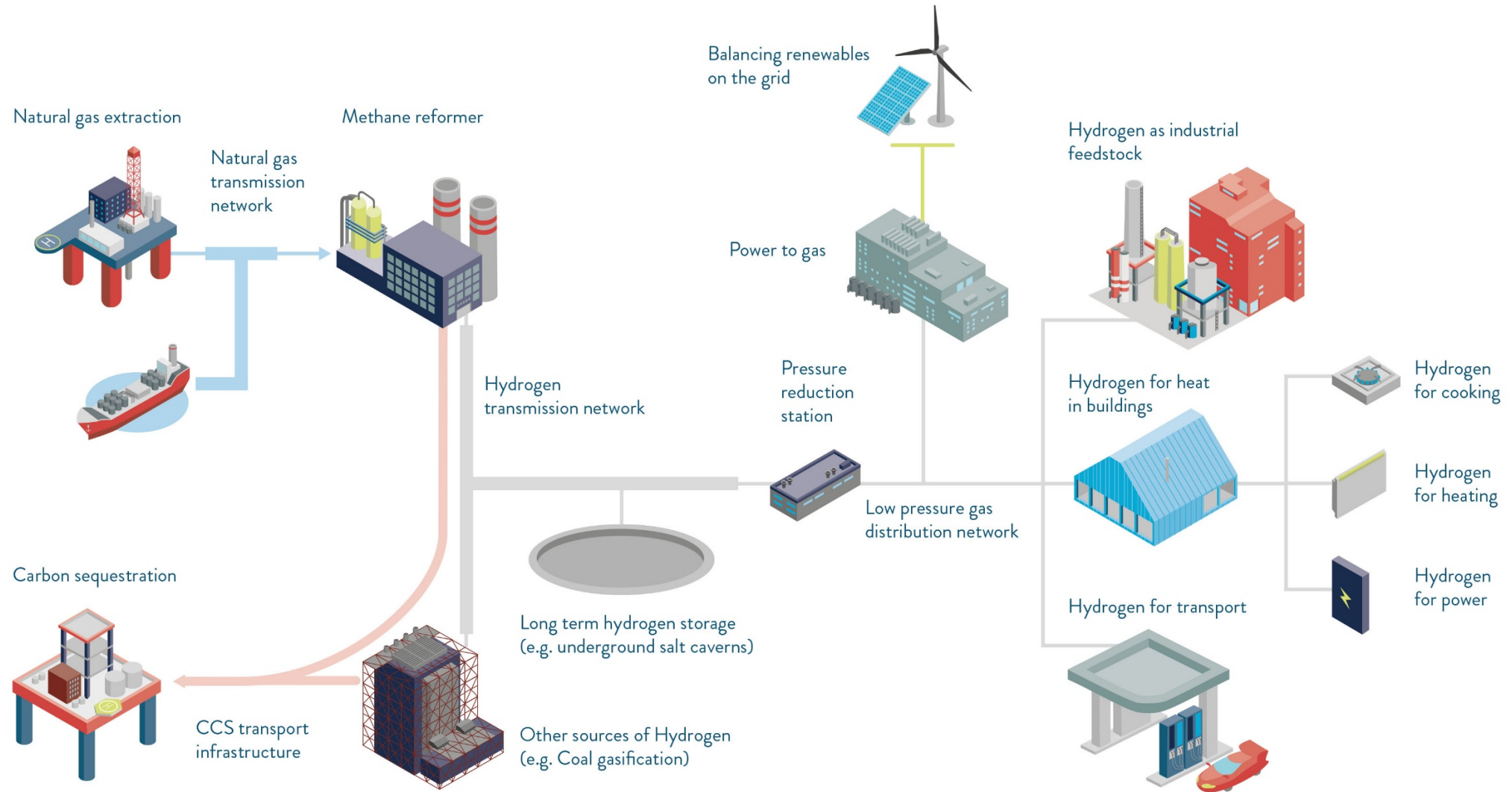




Photo: Roger Wollstadt

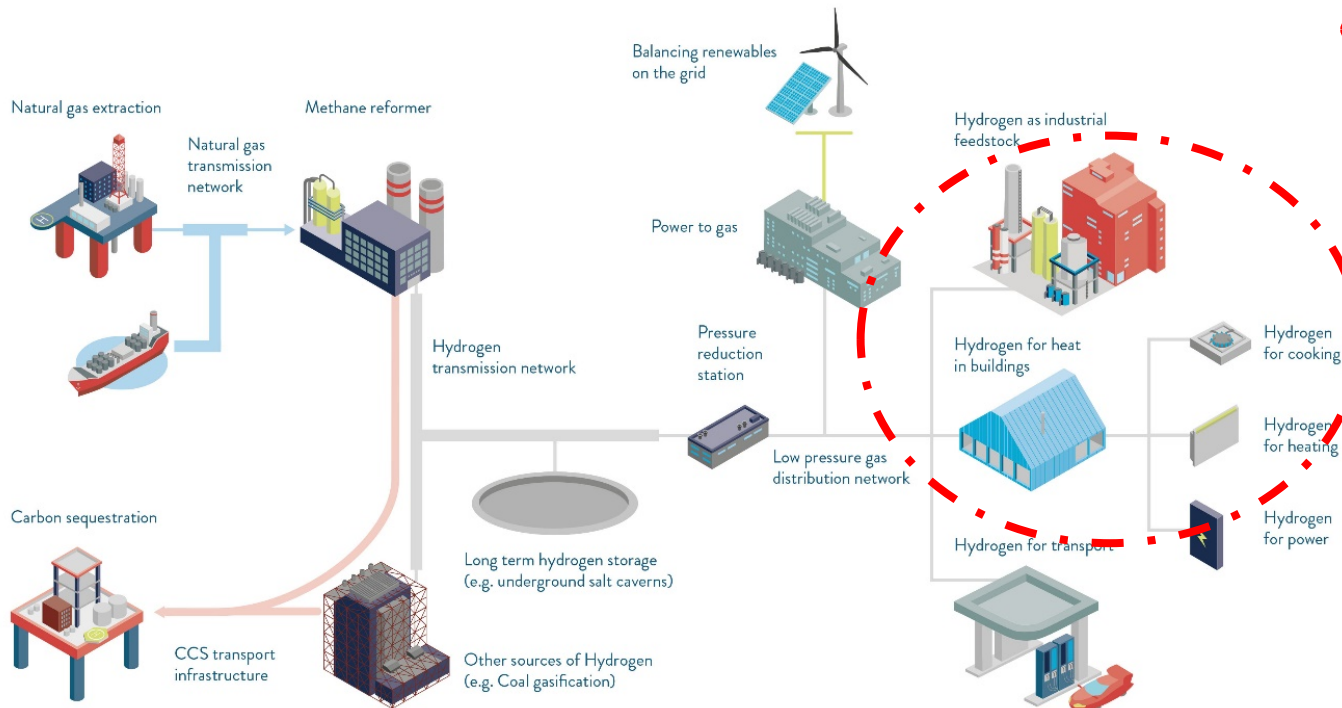


# Conceptual view of a hydrogen system





# 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

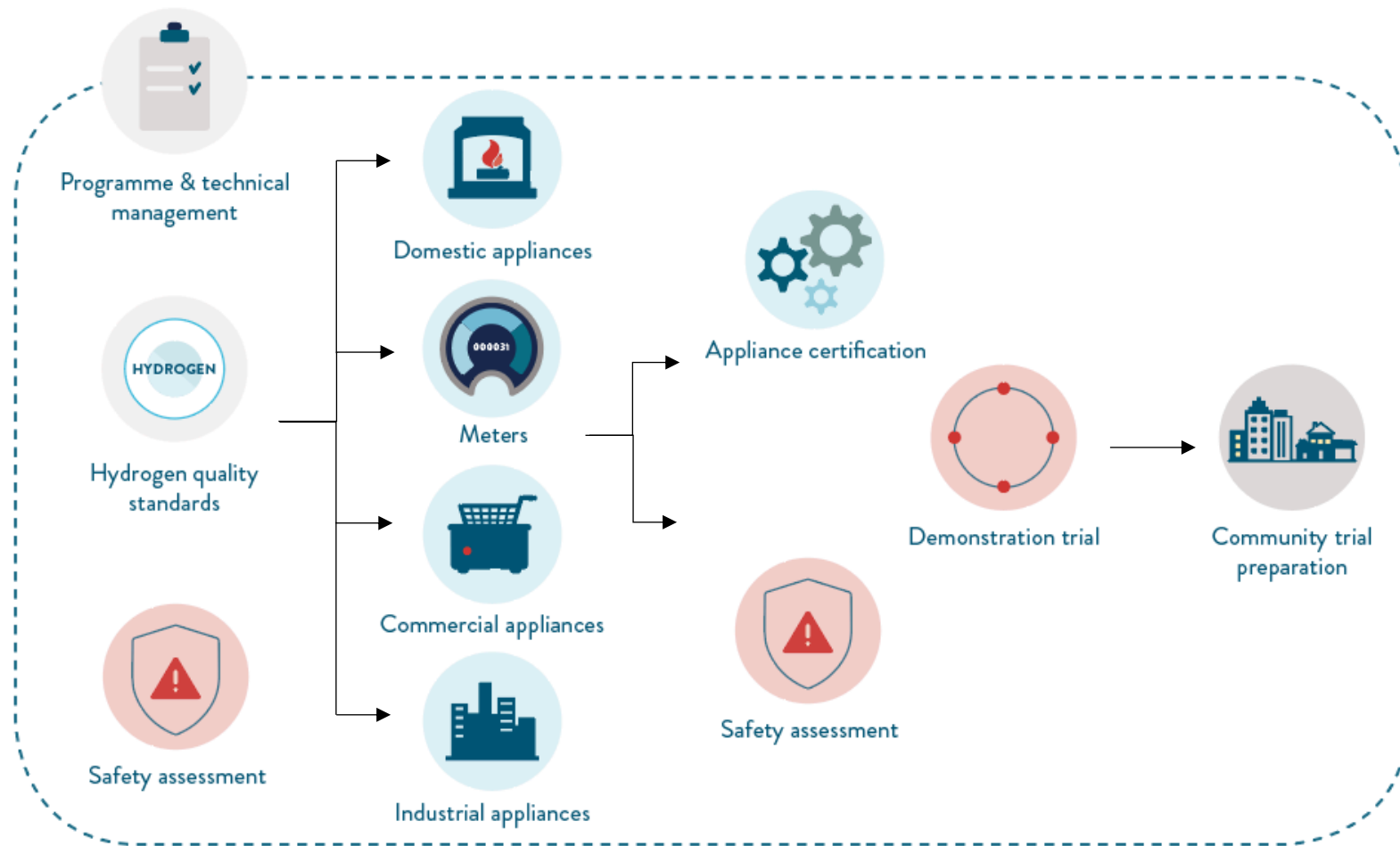
To establish if it is technically possible, safe and convenient to replace natural gas (methane) with hydrogen in residential and commercial buildings and gas appliances

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





# Hy4Heat programme work packages



# ARUP+

KIWA | EMBERS | YOENERGY  
PROGRESSIVE ENERGY

# Hy4Heat programme timeline overview

2018

2019

2020

2021

Hy4Heat ends



WP1&9 PMC Managing WPs in preparation for a Community Trial



WP2 Quality and standards



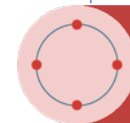
WP7 Safety and risk assessment



WP3 Development of appliance certification



WP4 Development of certified domestic appliances and WP10 Metering development



WP8 Demonstration trials



WP5 Commercial appliances  
Understanding the market

Potential commercial appliance development



WP6 Industrial appliances  
Understanding the market

Potential industrial appliance development

Possible  
Community Trial



# Hydrogen quality & standards (WP2)

- IGEM are developing hydrogen standards (upstream of the ECV):
  - Materials
  - Leakage rates
  - Ventilation
  - Installation
  - Air supply, etc.
- Hydrogen Purity & Colourant requirements - DNV GL
- Odorants - NPL determining options



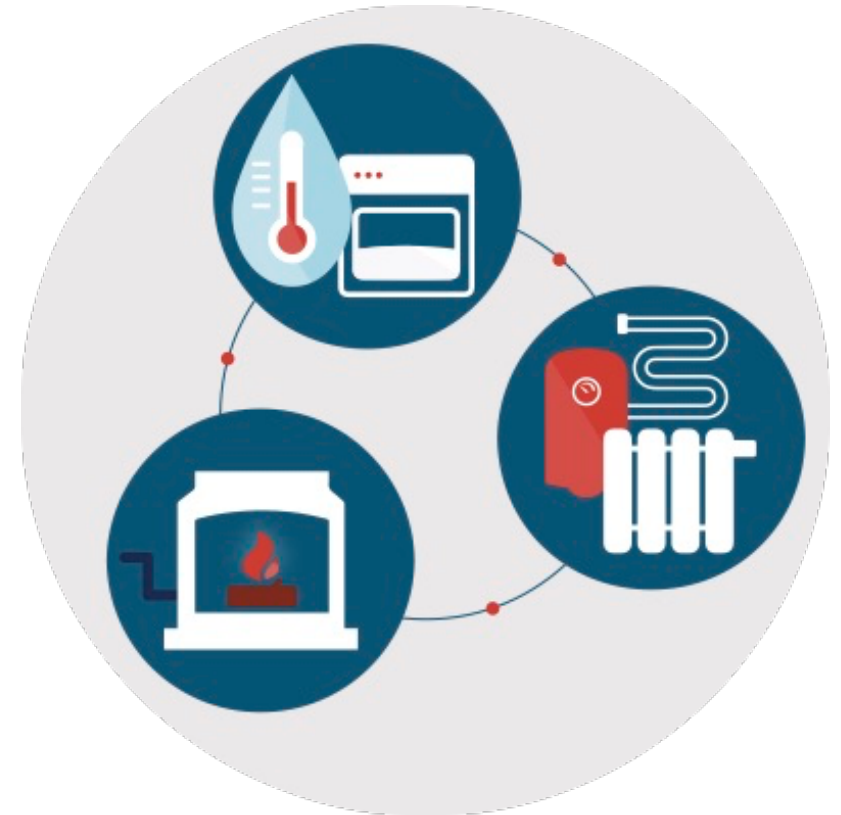
# Safety assessment (WP7)

- Comparing hydrogen with natural gas
- Building on knowledge, data and evidence that already exists
- Further experimental testing about to commence to gather further evidence e.g. leakage and accumulation, ventilation in different enclosed spaces within a typical property – Steer Energy & DNVGL
- Collaborating with the GDNO's to gather further incident data than already exists
- HSE engagement



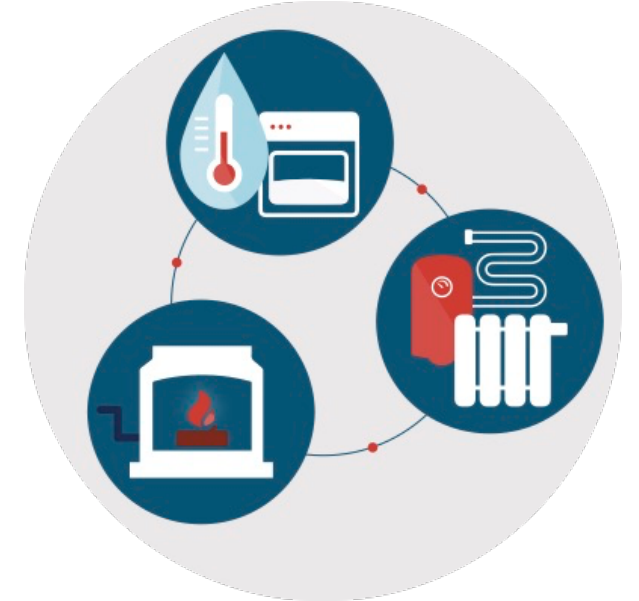
# Domestic hydrogen appliances (WP4)

- Developing hydrogen appliances:
  - boilers
  - cookers
  - gas fires
  - innovative hydrogen appliances
- Approach broadly *'like for like'* and *'hydrogen ready'* replacement
- To meet or improve upon existing emission, safety, and functional requirements

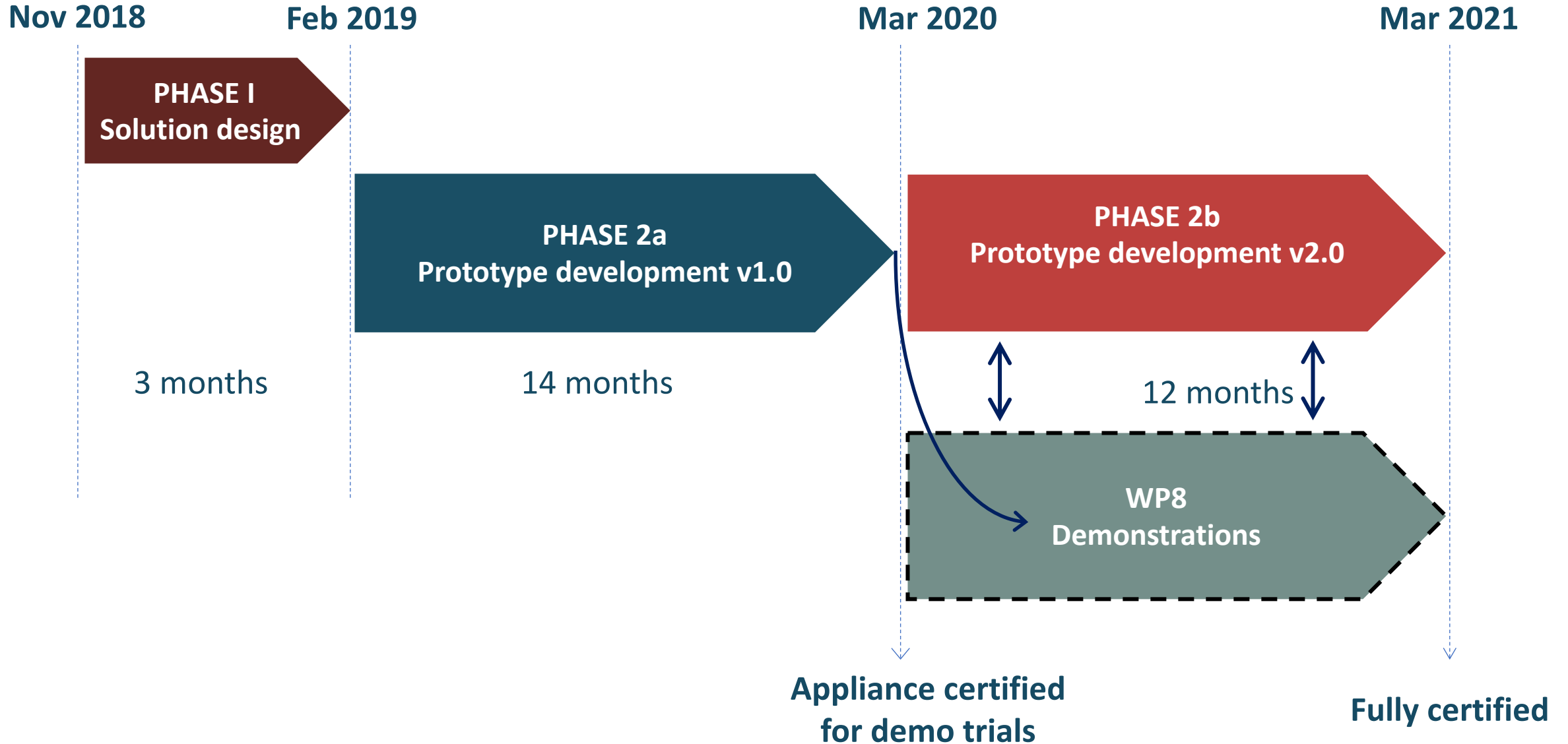




# Domestic hydrogen appliances (WP4)



# Domestic hydrogen appliances development (WP4)



## 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)

- OJEU Innovation Partnership procurement currently underway
- Fiscal and smart enabled meters (SMETS2)
- Meter to include ‘excess flow detection’ and ‘gas disablement functionality’



## 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



ERM

**elementenergy**



## Commercial hydrogen appliances & equipment (WP5)

- Engagement event held on 21 May 2019
- Seeking to procure the development of innovative hydrogen:
  - Catering appliances
  - Space heating and hot water
  - Critical system components e.g. connectors, sensors, fittings and valves etc.



## Demonstrations (WP8)

- Showing the prototype hydrogen appliances and equipment developed in the WP4,10,5
- Mock up kitchen and living room, cooking shows etc.
- Spring 2020 onwards

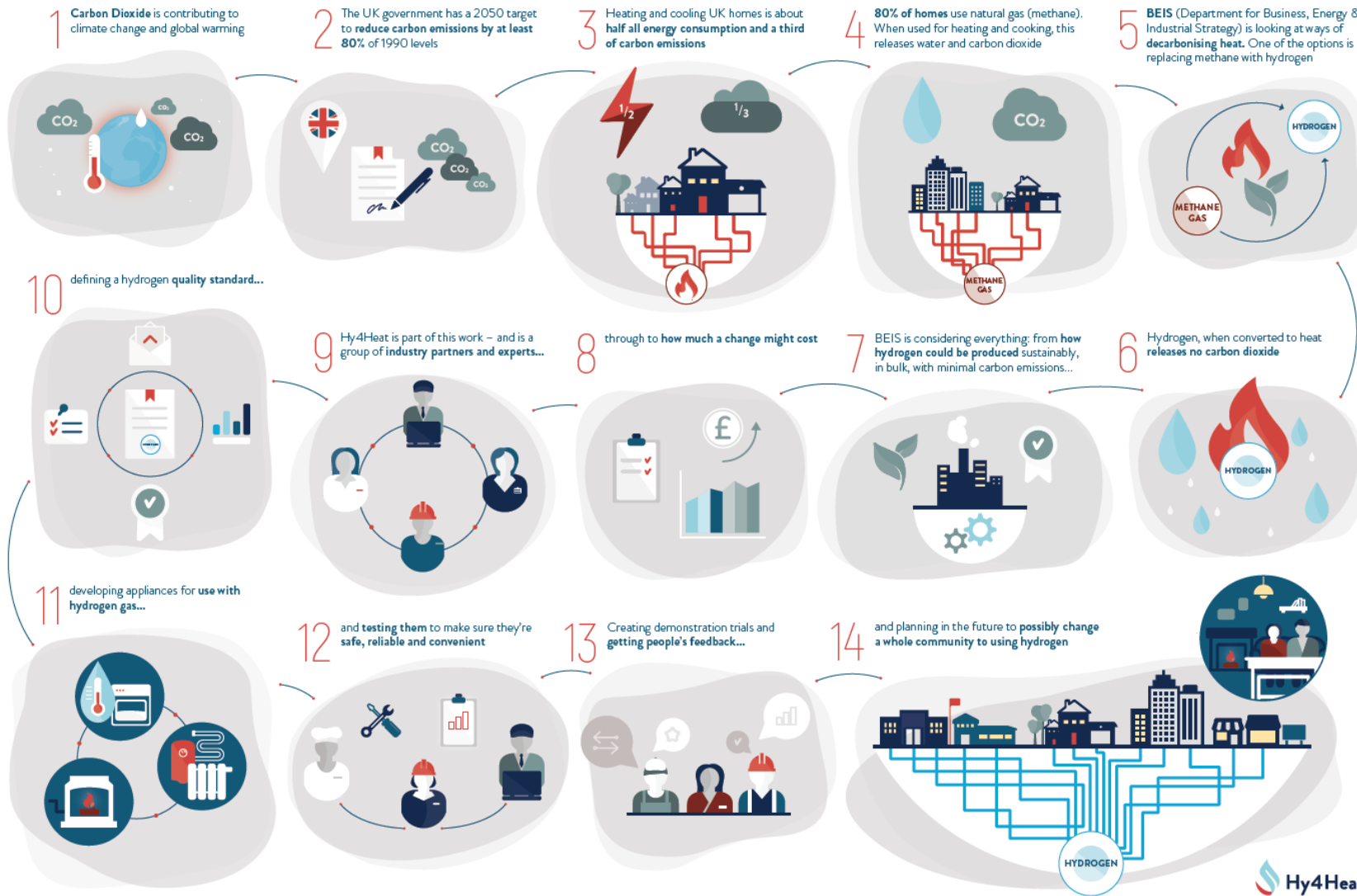


## Potential community trials (WP9)

- Planning and preparation necessary for a potential community trials
- Identifying potential locations, likely to be an area with each GDNO
- Proposed to run from 2021 onwards



# The Hy4Heat Programme



[www.hy4heat.info](http://www.hy4heat.info)

@Hy4Heat

[hy4heat@arup.com](mailto:hy4heat@arup.com)

- 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