



Hy4Heat

Welcome



PARISH NOTICES

6Fs – Checklist

- Fire alarms
- Fire assembly point
- Facilities
- Food and drink
- Wi-Fi
- Fones



Purpose of today

- BEIS strategic context for Hy4Heat
- Overview of the Hy4Heat programme
- Making connections
 - ... with each other ...
 - ... with the Hy4Heat team
- Information and knowledge exchange



Agenda

ITEM	SPEAKER
WELCOME	
Energy Innovation	Mark Taylor
Long term heat decarbonisation	Olivia Absalom
Hy4Heat – Sponsor view	Jon Saltmarsh
Hy4Heat – the programme	Mark Neller
Hy4Heat – procurement	Heidi Genoni / Steve Loades
Panel Q&A	Mark Eldridge
LUNCH	
Round table(s) – Session 1	
Round table(s) – Session 2	
CLOSE	





Hy4Heat

Energy Innovation

Dr Mark Taylor

Deputy Director Energy Innovation

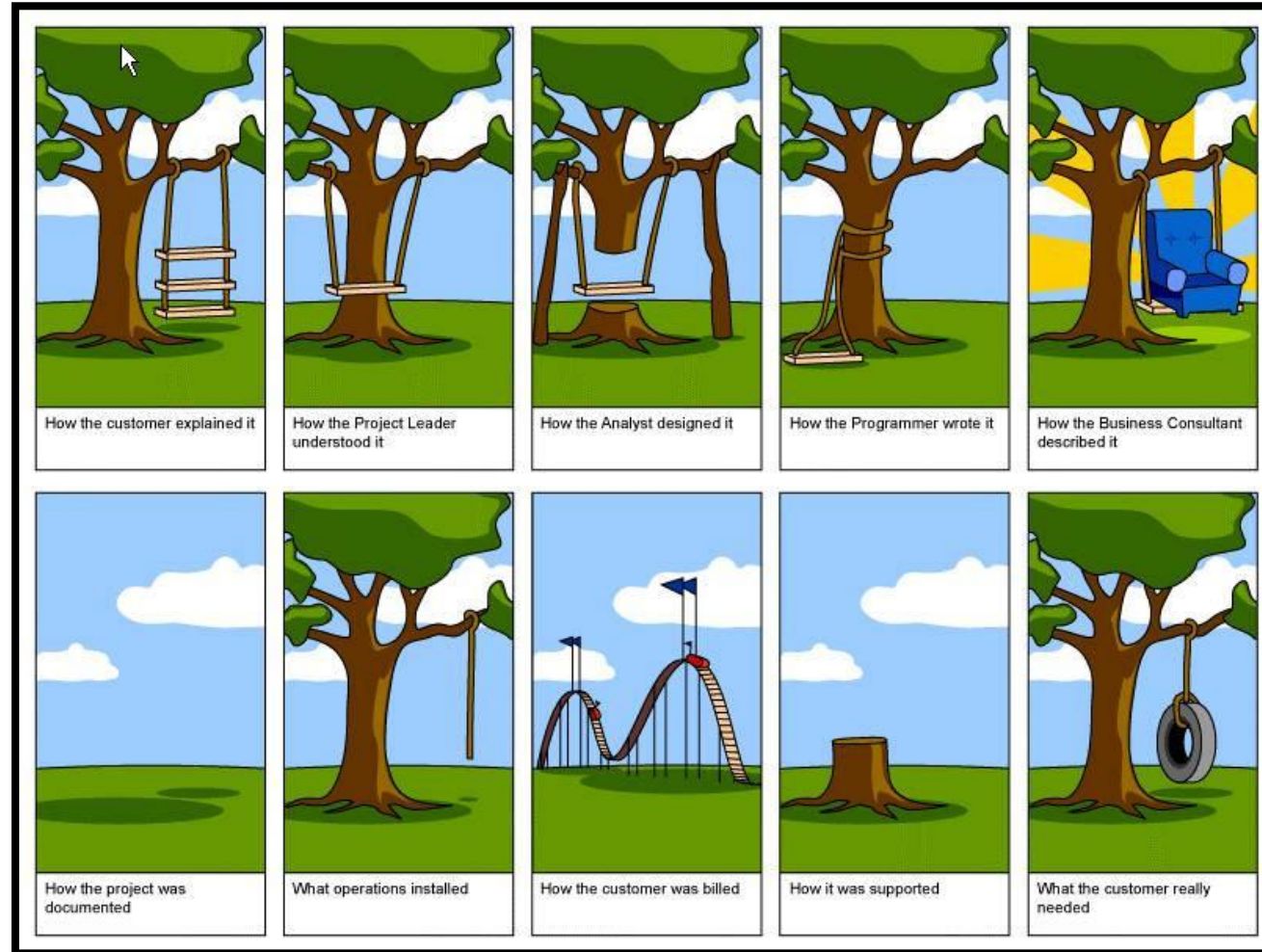
Science and Innovation for Climate and Energy (SICE)


Department for
Business, Energy
& Industrial Strategy

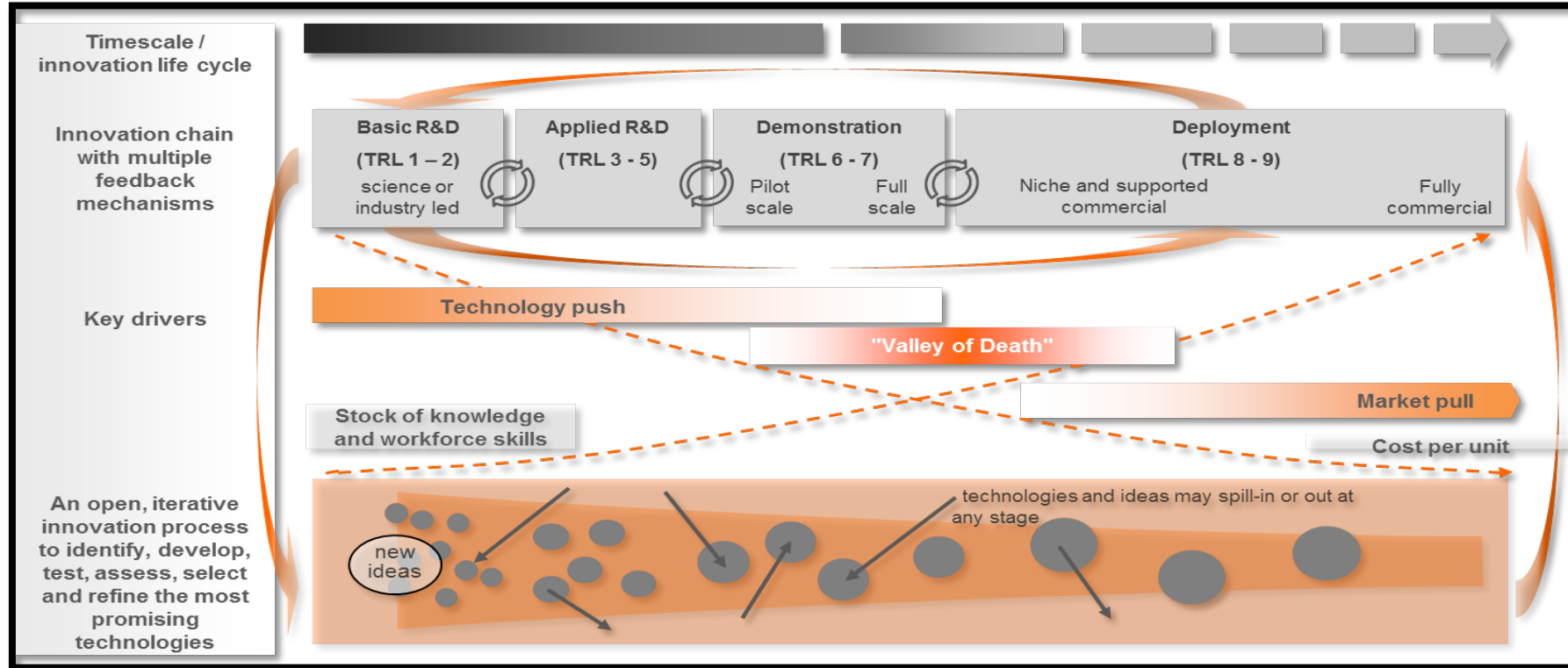
Recently joined the Civil Service ...



... innovation is difficult ... to get right



Energy Innovation – HMG's role



There are specific barriers to commercialisation in the energy sector. Central Government funding targets the **'valley of death'** between demonstration & deployment. UKRI - Research Councils and Universities focus on basic R&D, Innovate UK focuses on applied R&D.

BEIS Energy Innovation Portfolio (EIP)

AIM

to accelerate the commercialisation of innovative, clean, cheap and reliable energy technologies by the mid 2020s.

OBJECTIVES

- Support the development and demonstration of new energy technologies, systems and processes
- Stimulate and leverage private sector investment in the most promising mid-to-late stage energy innovations, with a focus on the mid-2020s
- Maximise international funding and collaboration opportunities that will benefit the UK clean energy sector

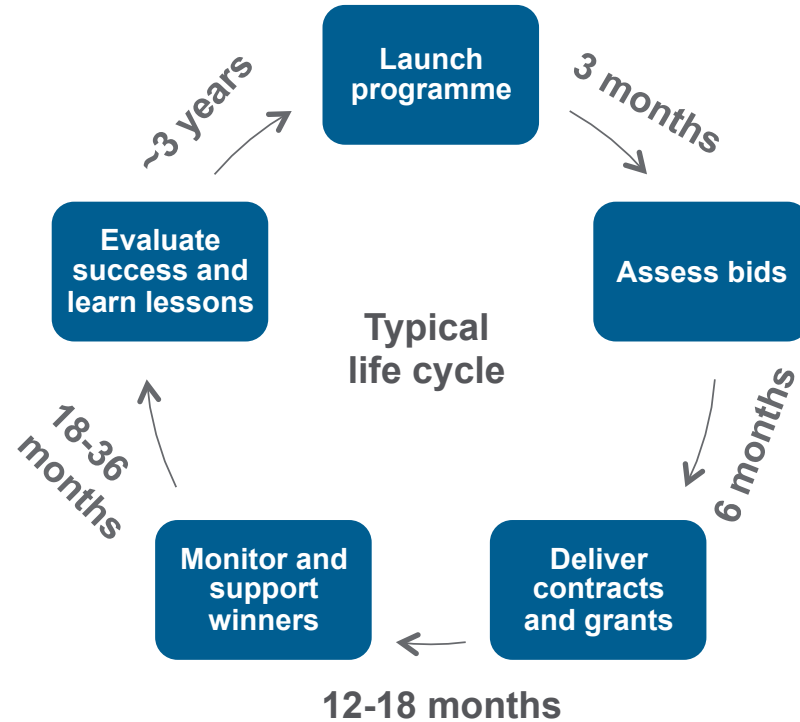


EIP – Six themes

The £505m portfolio has been grouped into 6 themes, selected through a top-down and bottom-up process, with cross-government discussion

EIP Theme	£m	Innovation needs	Links to Clean Growth Plan & Industrial Strategy
Nuclear	180	<ul style="list-style-type: none"> • Developing advanced, more efficient reactors • Developing lower cost reactors 	<ul style="list-style-type: none"> • Boosting UK nuclear skills and supply chains • Future carbon reduction of electricity
Renewables	15	<ul style="list-style-type: none"> • Developing lower cost energy 	<ul style="list-style-type: none"> • Building the renewables sector • Lower carbon electricity
Industry & CCS	100	<ul style="list-style-type: none"> • Developing more efficient ways to use energy • Developing low carbon fuel sources for industry • Researching and demonstrating CCUS 	<ul style="list-style-type: none"> • More efficient industry, with lower energy bills • Lower carbon industry
Built Environment	90	<ul style="list-style-type: none"> • Developing options for low carbon heating • Developing innovative energy efficiency solutions • Researching and testing community energy solutions 	<ul style="list-style-type: none"> • New product offer and supply chains, with potential for new UK IP, and exports • Lower carbon heat options for the UK
Smart Systems	70	<ul style="list-style-type: none"> • Developing lower cost energy storage • Developing 'smart' demand side response options 	<ul style="list-style-type: none"> • Builds a new 'smart' industry in the UK • More effective, lower carbon energy use
Cross-cutting	50	<ul style="list-style-type: none"> • Supporting 'disruptive' innovations across the energy sector, including from SMEs 	<ul style="list-style-type: none"> • Could develop new low carbon options

EIP – Delivery models



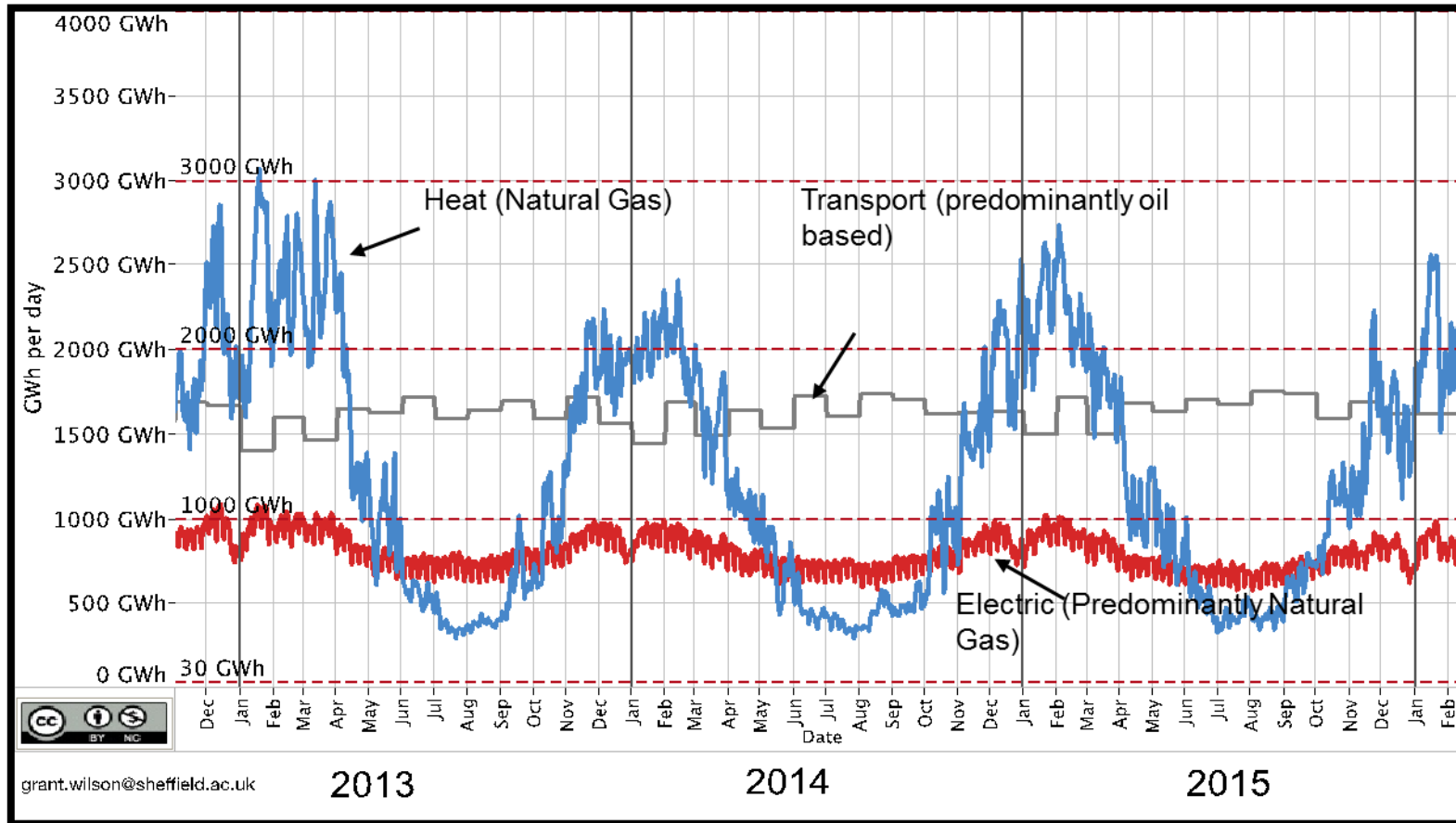
Number of different **delivery models**, including:

- Open competitions for the best and brightest energy ideas (e.g. EEF)
- Bespoke competitions (e.g. SMRs)
- Large-scale demonstration (e.g. CCU)
- Pilots and trials (e.g. Smart Systems)
- Working internationally (e.g. MI)

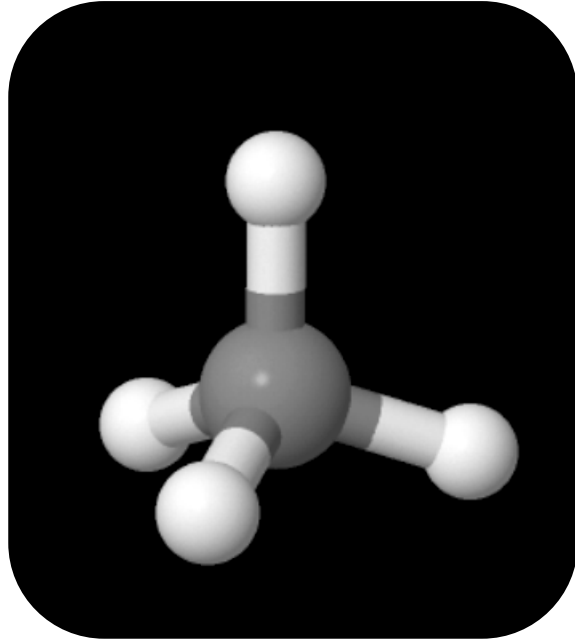
Work with and through **delivery partners**, including:

- Catapults (Energy Systems Catapult and Offshore Renewables Catapult)
- Innovate UK
- Energy Technologies Institute

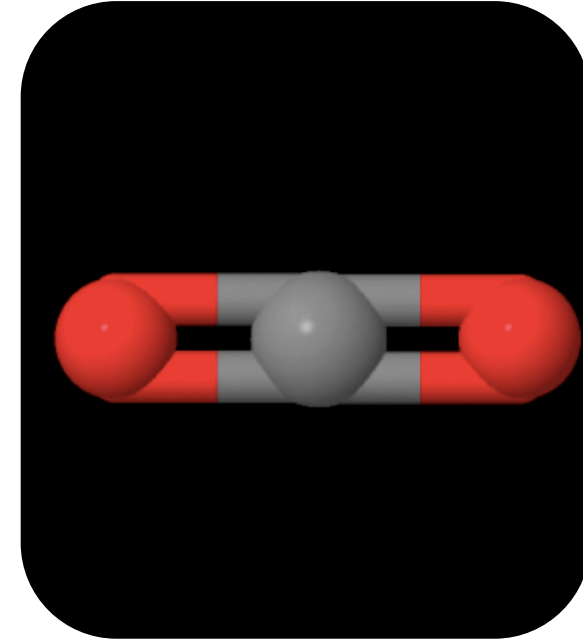
The challenge is well understood ...



... the issue to fix is ...



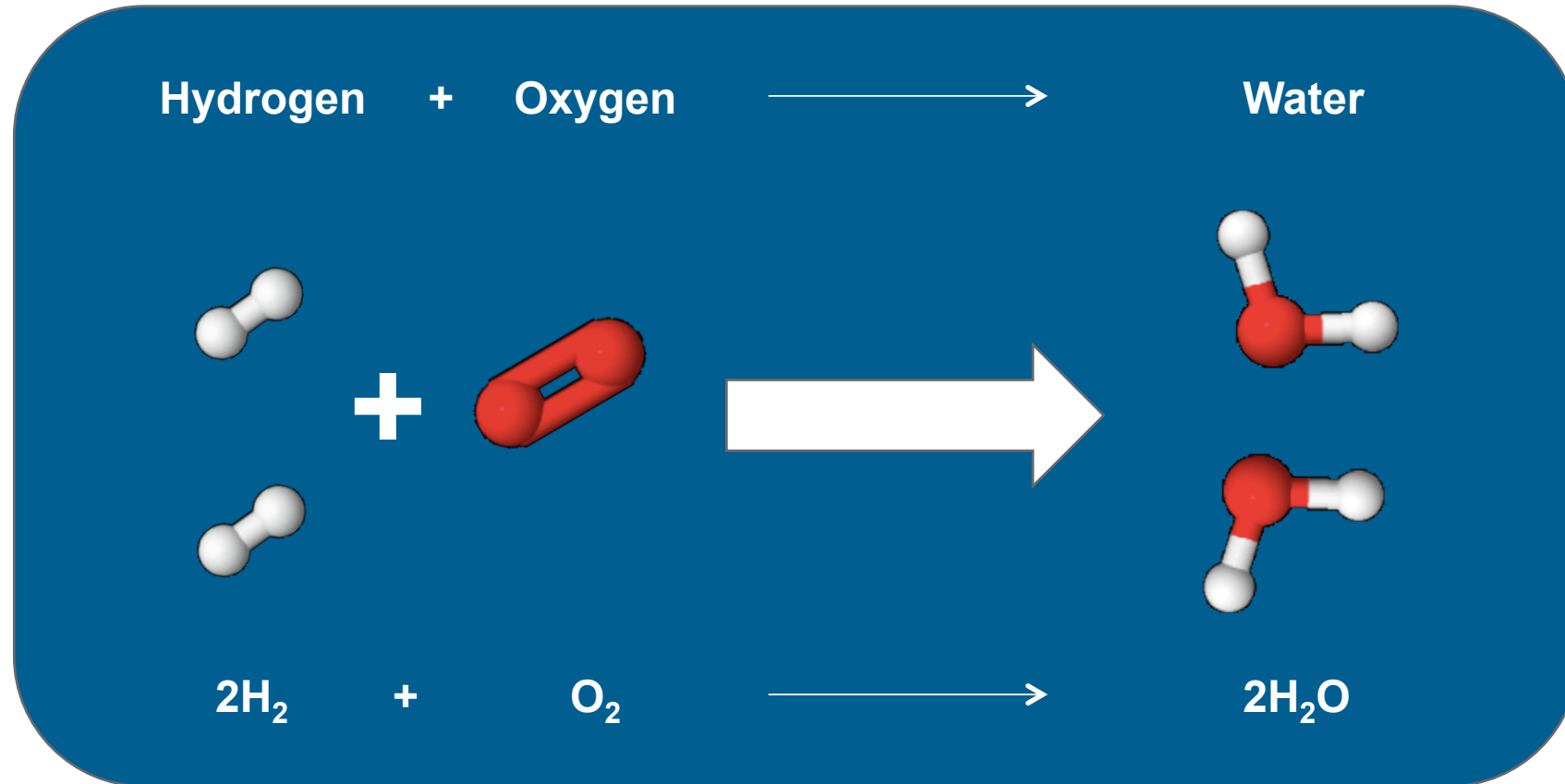
Methane (CH₄)



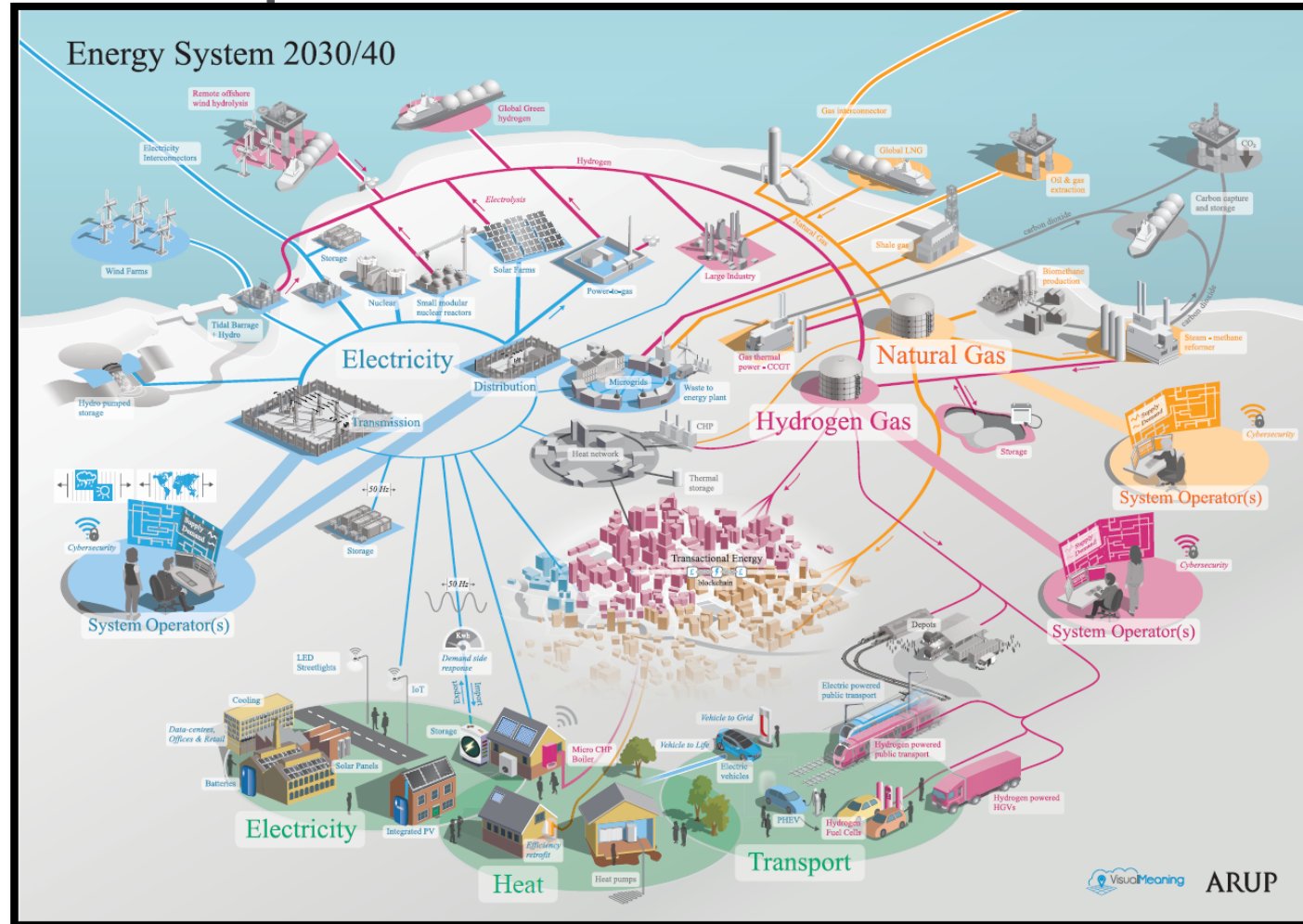
Carbon dioxide (CO₂)



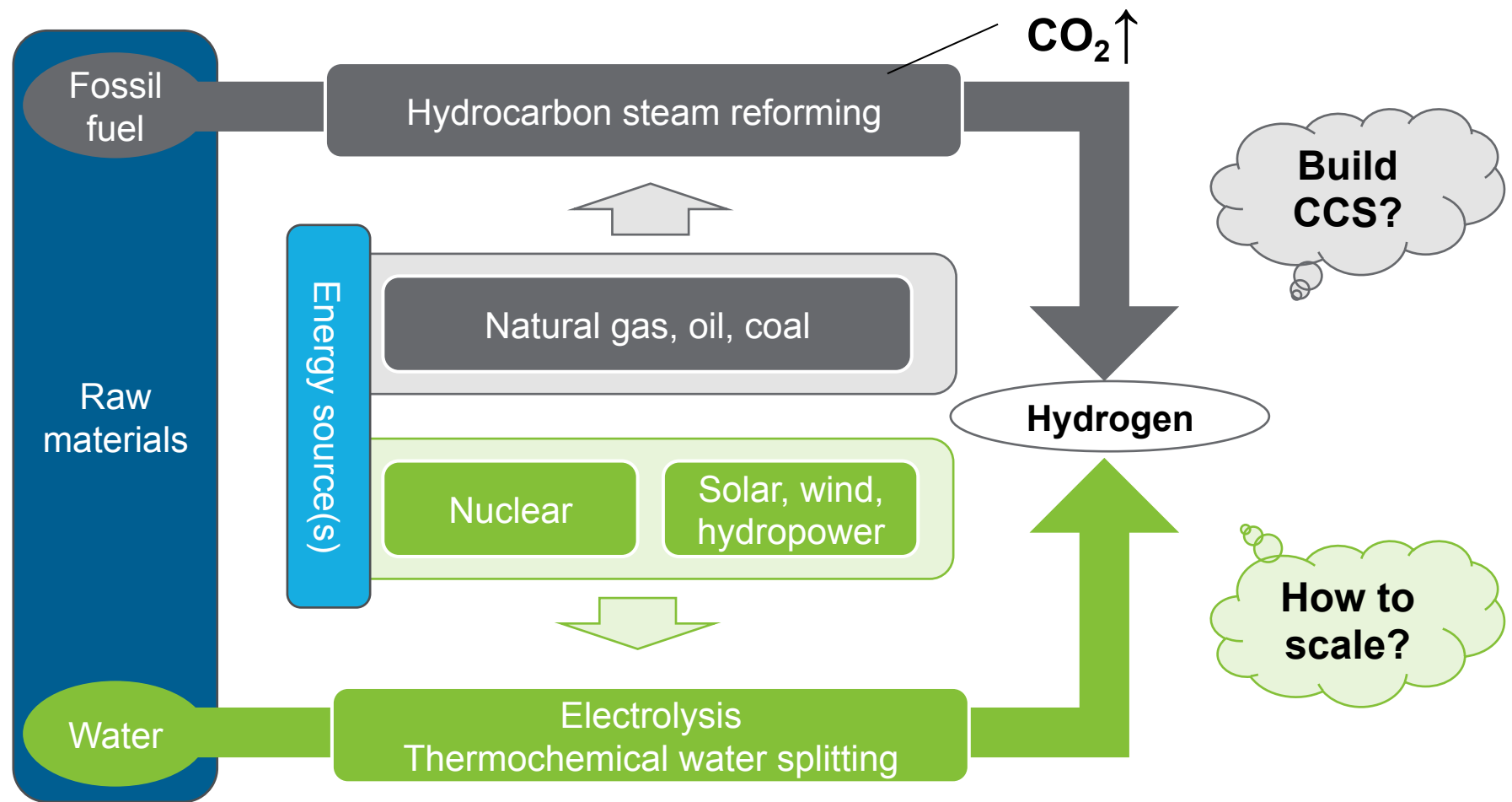
... one option is hydrogen ...



... system is complex ...

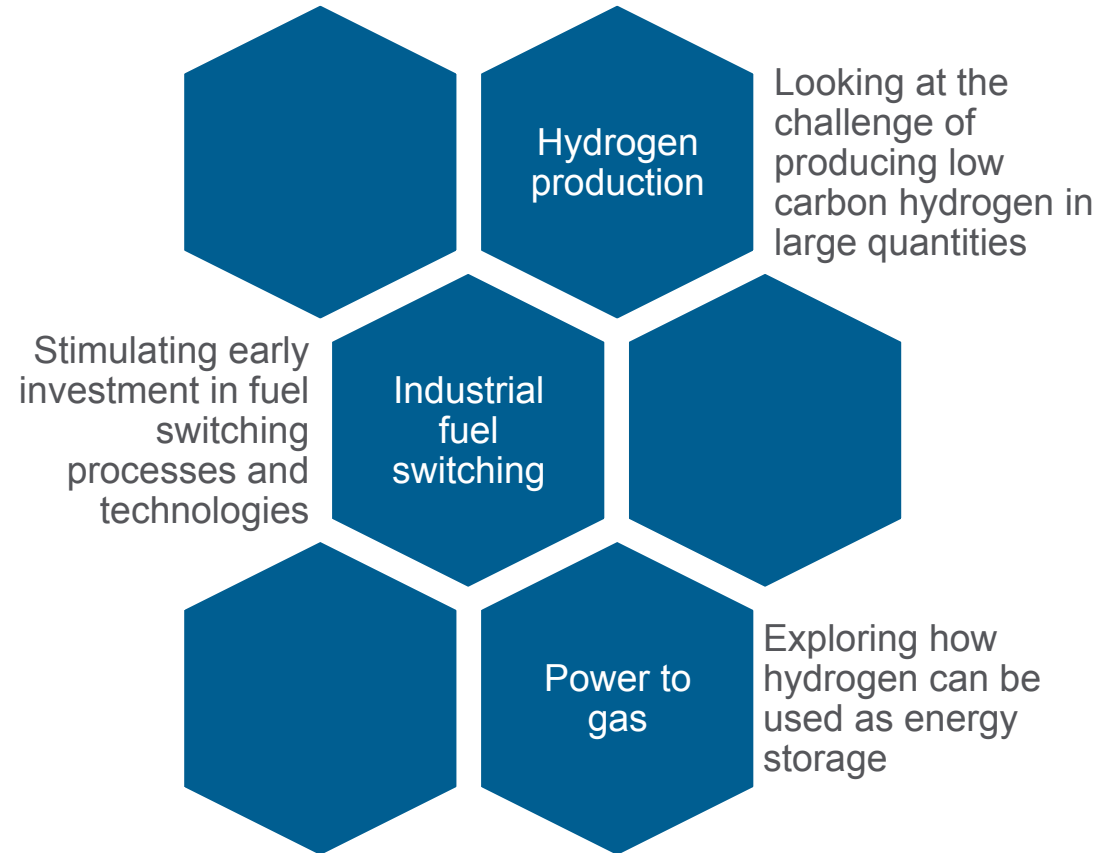


... many solutions ... and much debate ...



... safety, reuse of gas network, zero carbon production, CCUS, pathways ...

... range of hydrogen interests ...



... hydrogen must compete ...



and ... prove itself against alternatives
(e.g. electrification etc.)



Hy4Heat

Long term heat decarbonisation

Olivia Absalom

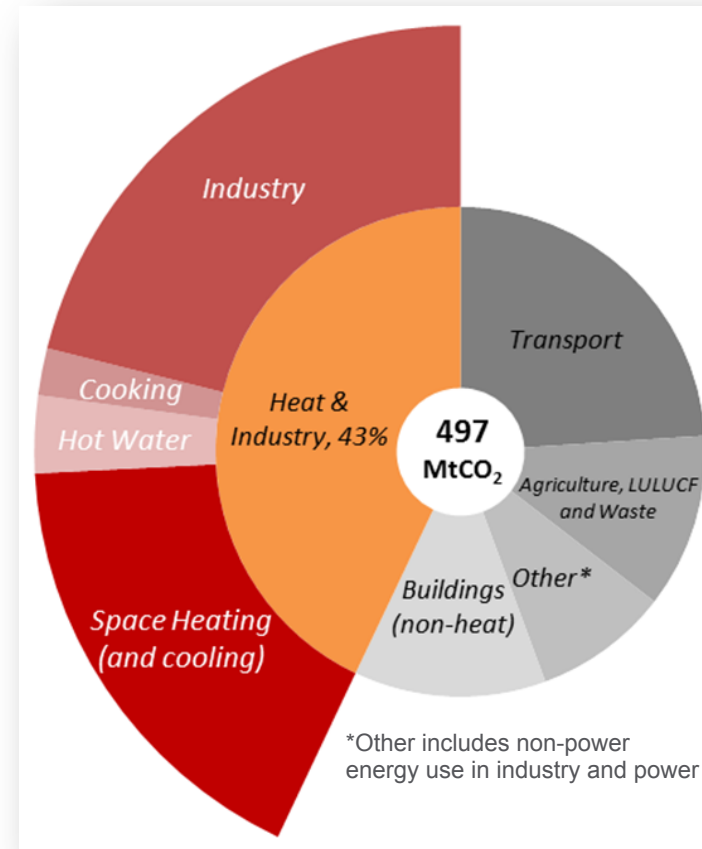
Deputy Head, Strategic Heat Review

Heat and Business Energy (HBE)

Heat in the context of climate change goals ...

- The Climate Change Act sets an 80% decarbonisation target by 2050.
- Decarbonisation achievements in the power and waste sectors need to be replicated in “harder to reach” sectors.
- Meeting this target implies decarbonising nearly all heat in buildings and most industrial processes.
- The Clean Growth Strategy identifies heat as the **most difficult decarbonisation challenge** facing the country

Estimated UK Emissions attributable to heating and industry, 2015



Source: BEIS estimates derived from ECUK 2016, Energy and Emissions Projections 2016, GHG Inventory 2017, BEIS IAG guidance 2017

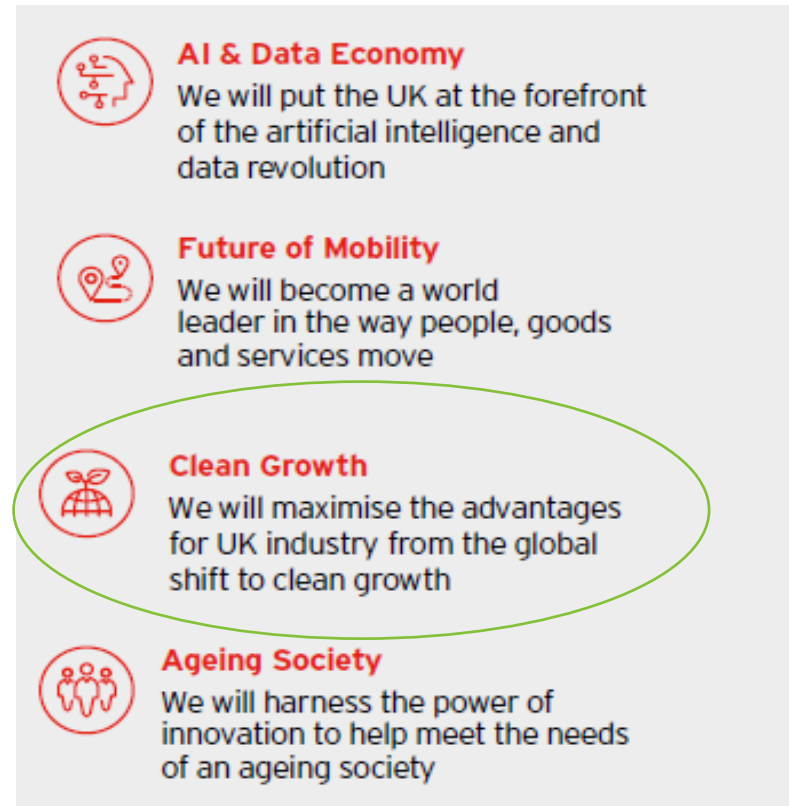
The Industrial Strategy

Maximising the advantages for UK industry from the global shift to clean growth

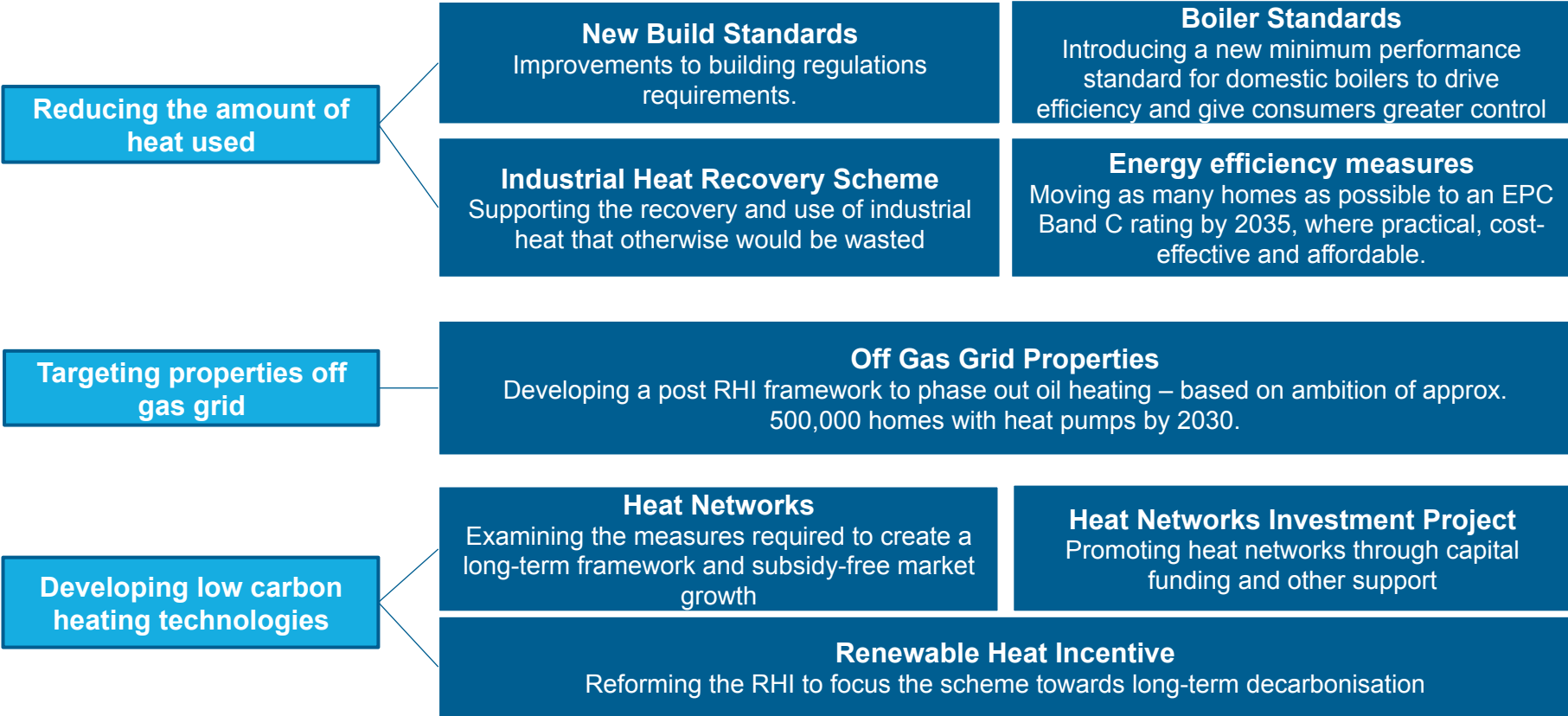
Boosting productivity and earning power



Grand Challenges to put the future of the UK at the forefront of the industries of the future



Already taking action to decarbonise heat



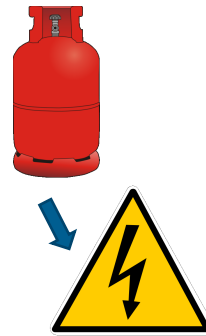
Department for
Business, Energy
& Industrial Strategy

Long term options for decarbonising heat

A number of technologies hold potential, but there is no consensus on which approach will work best at the scale needed – for consumers and for minimising costs.

Electrification

- conversion to electric heat pumps or other electric technologies
- particularly useful for buildings not on the gas grid



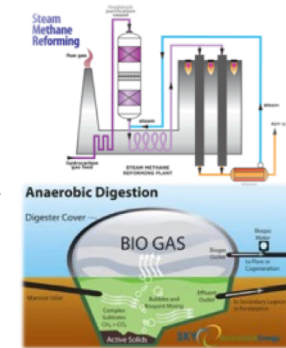
District heat networks

- cost effective where there is sufficient density of heat demand
- likely to be an important part of the mix in the long term



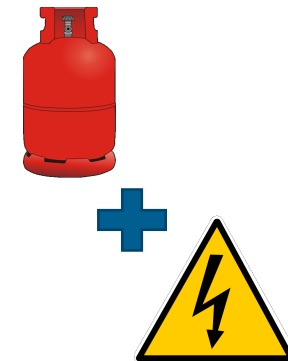
Decarbonising the gas grid

- using hydrogen or biogas
- more work is needed to assess cost and feasibility

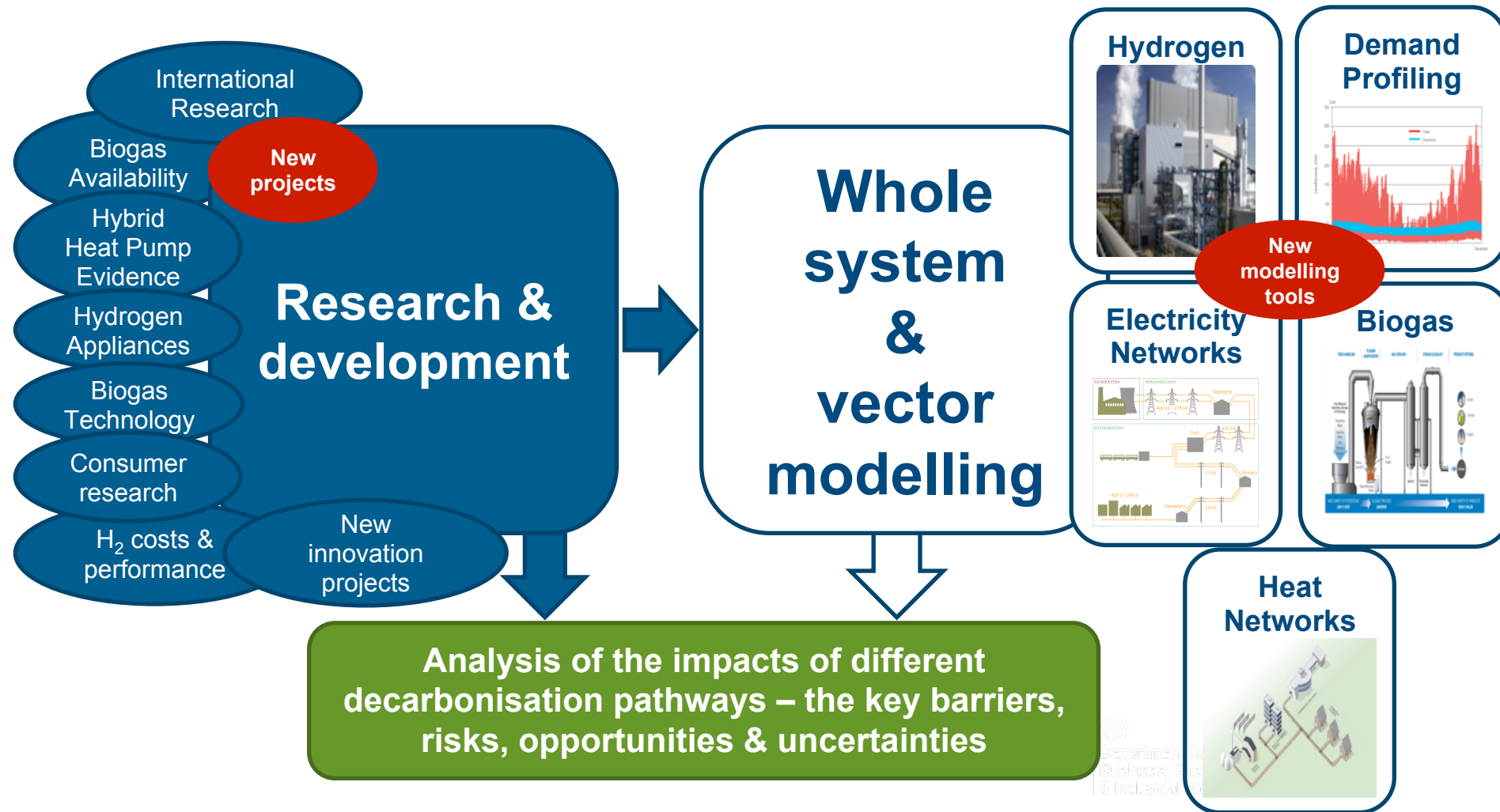


Hybrid solutions

- two different heating technologies and energy sources working together



Strengthening & synthesising the evidence base



Paving the way for decisions on our long-term heat strategy ...

As set out in the Clean Growth Strategy:

- We will **lay the groundwork** in this Parliament to set up **decisions in the first half of the next decade** about the long term future of heat.
- We will **publish initial findings from commissioned research** into different heat demand scenarios.
- We will **publish a full report on the review of the evidence** for decarbonising heat, by summer 2018.





Hy4Heat

Hy4Heat – Sponsor View

Jon Saltmarsh

Head of Built Environment Technology and Systems

Science and Innovation for Climate and Energy (SICE)

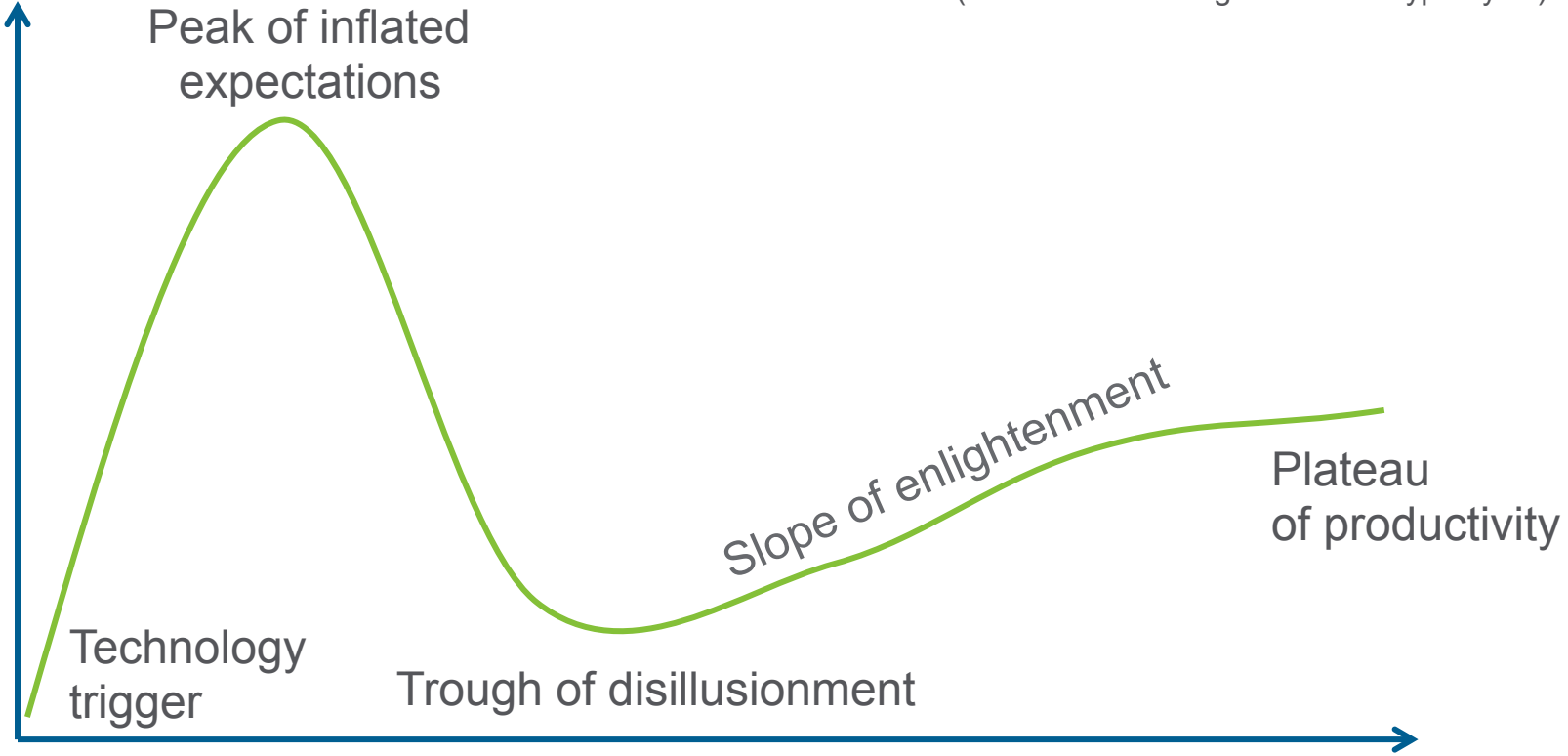

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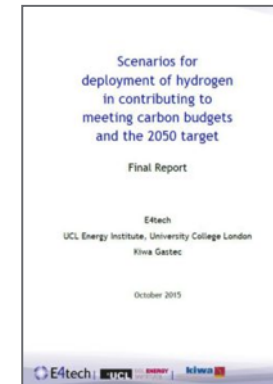
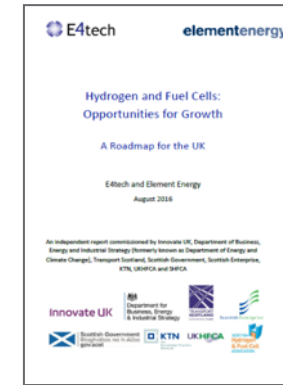
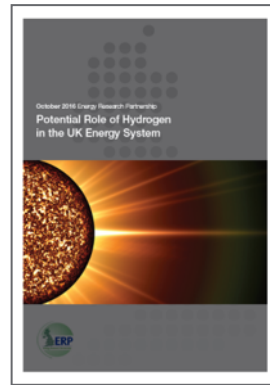
Department for
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The hydrogen hype cycle ...

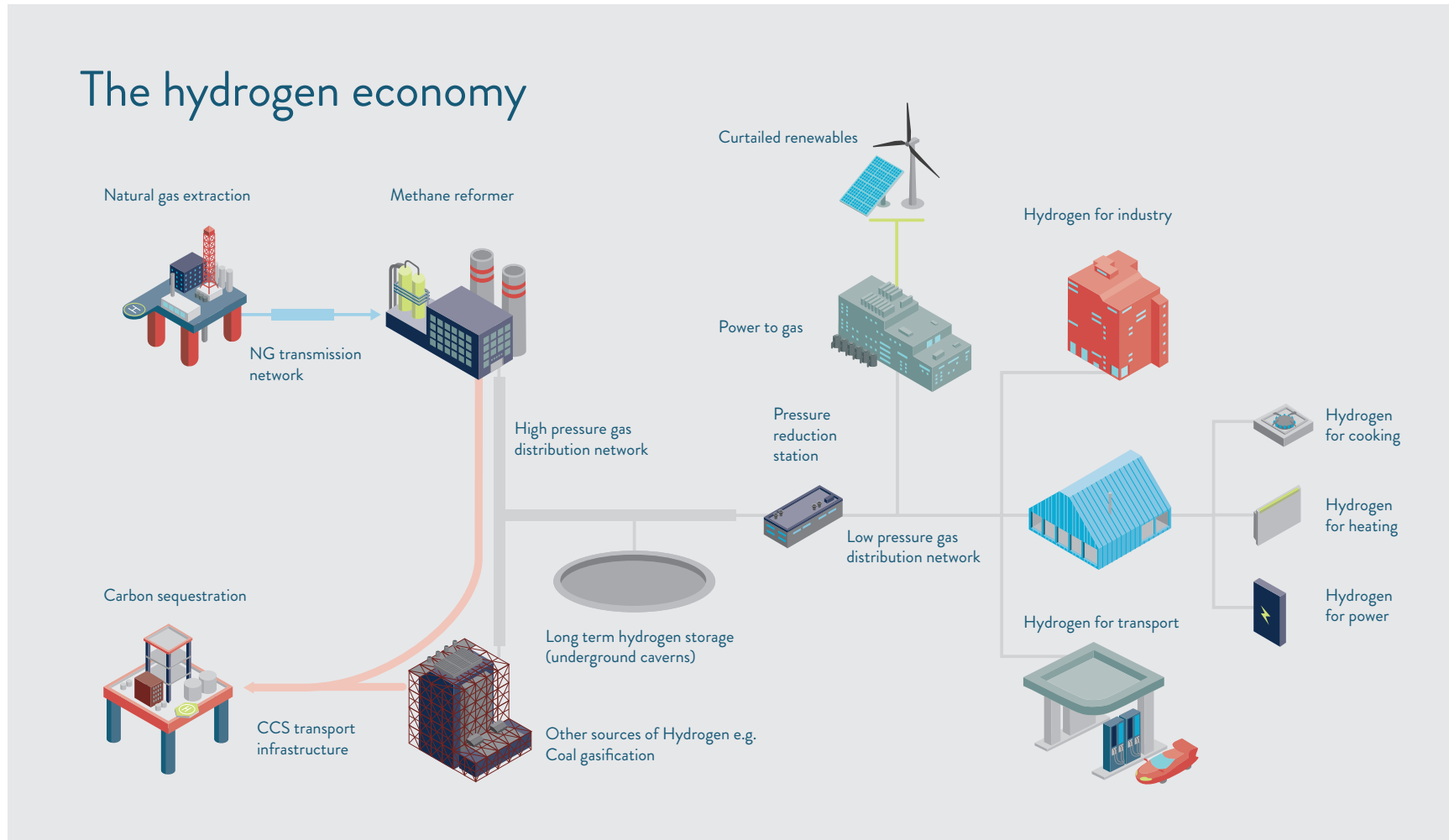
(Gartner Inc. www.gartner.com/hype-cycle)



... the evidence base has grown ...



... a vision needs to be tested ...



... critical questions need answering ...

Will consumers be prepared to switch?

How leaky are the gas pipes in buildings with hydrogen?

How do we odourise hydrogen?

Will all components in the distribution network work with hydrogen?

Can we build hydrogen appliances at an acceptable cost?

Do we need to add a flame colourant to hydrogen?

How leaky is the gas distribution network with hydrogen?

Can we build dual fuel appliances?

What needs to be done to demonstrate safety?

What will emissions be from hydrogen appliances?

How best to minimise disruption to consumers?

What needs to be done to certify safety?

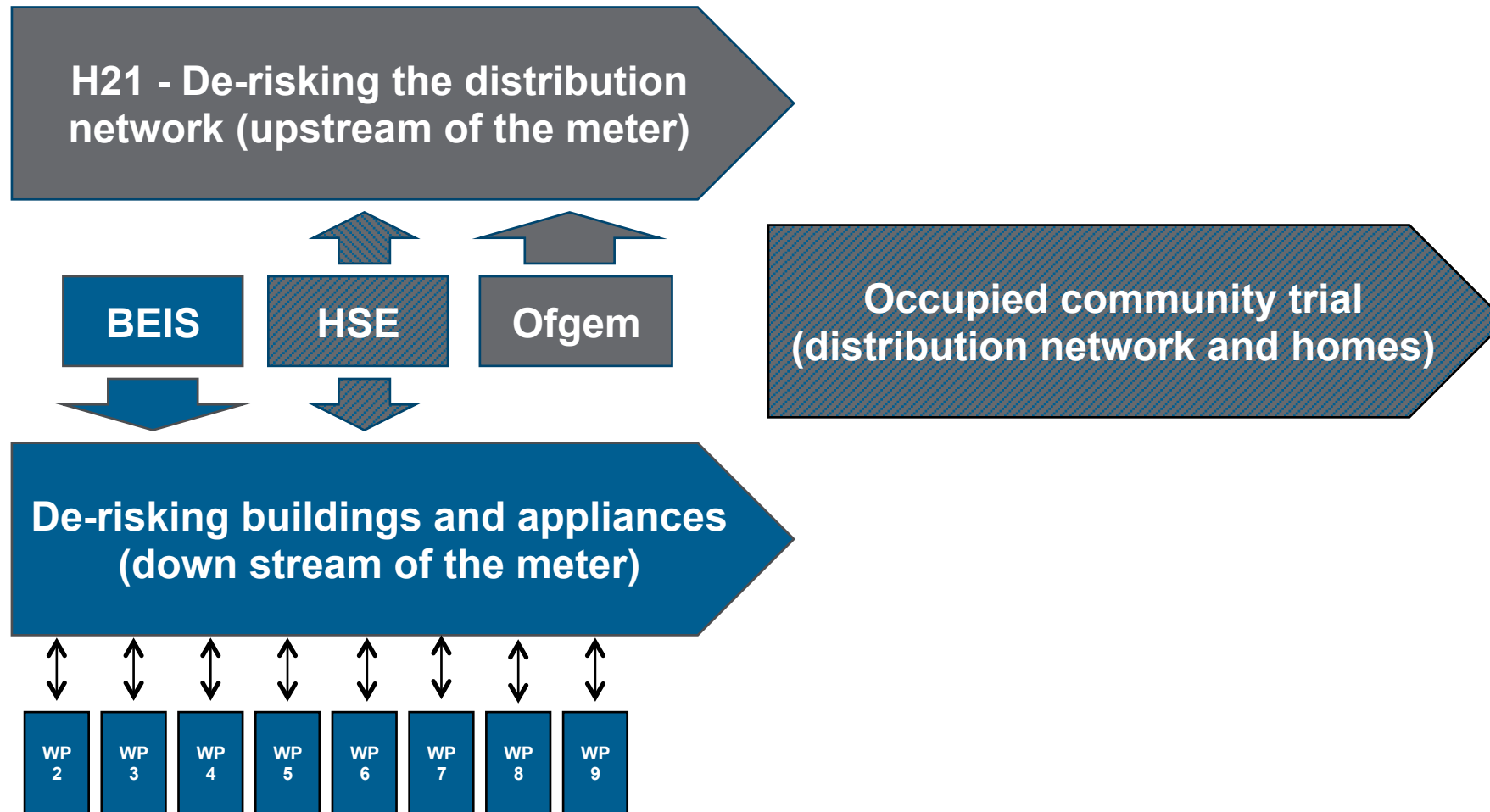


... therefore hydrogen innovation

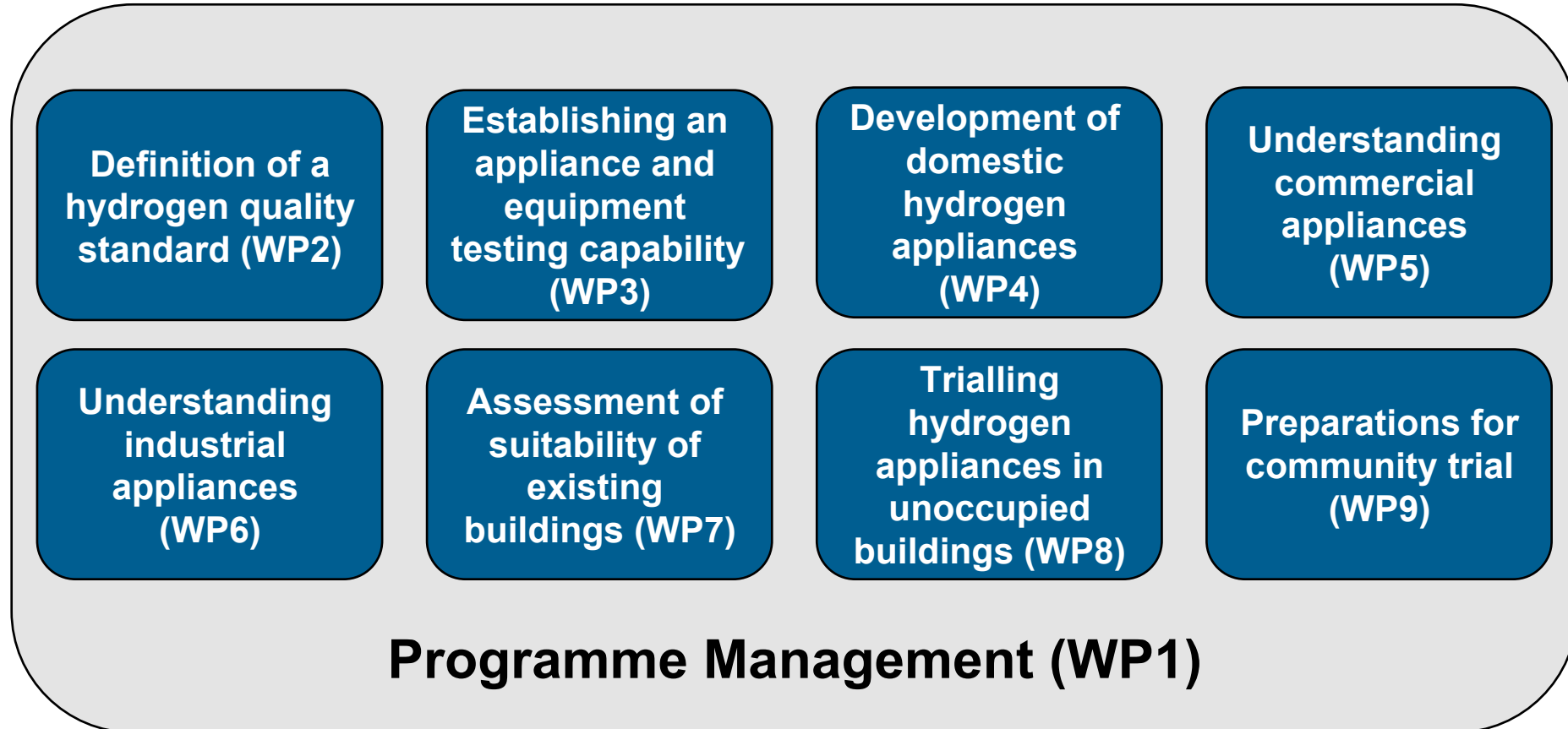
- Inform policy decisions in the early 2020s on the option of heat decarbonisation through the use of hydrogen
- Identify evidence gaps and ways to fill them – evidence generation not evidence gathering
- Working with industry and making use of all expertise
- Preparing for an occupied community trial



Hydrogen innovation programme



BEIS hydrogen innovation programme



BEIS has appointed Arup+ as programme management contractor (WP1) and to prepare for community trial (WP9). Other packages to be competed.



VISION

**Hydrogen is a strategic option for decarbonising heat.
The Hy4Heat programme has demonstrated that it will be safe, reliable, and convenient for use in buildings,
and there is an agreed plan in place for a community trial, if required.**

MISSION

**To establish if it is technically possible and safe
to replace methane with hydrogen in commercial and residential buildings and gas appliances.
This will enable the Government to determine whether to proceed to a community trial.**

OBJECTIVES

**To provide the technical, performance, usability and safety evidence
to de-risk the use of hydrogen for heat in buildings
whilst working with others to prepare for a future occupied trial.**

**Hydrogen
standard**

**Testing
capability**

**Domestic
appliances**

**Commercial
appliances**

**Industrial
appliances**

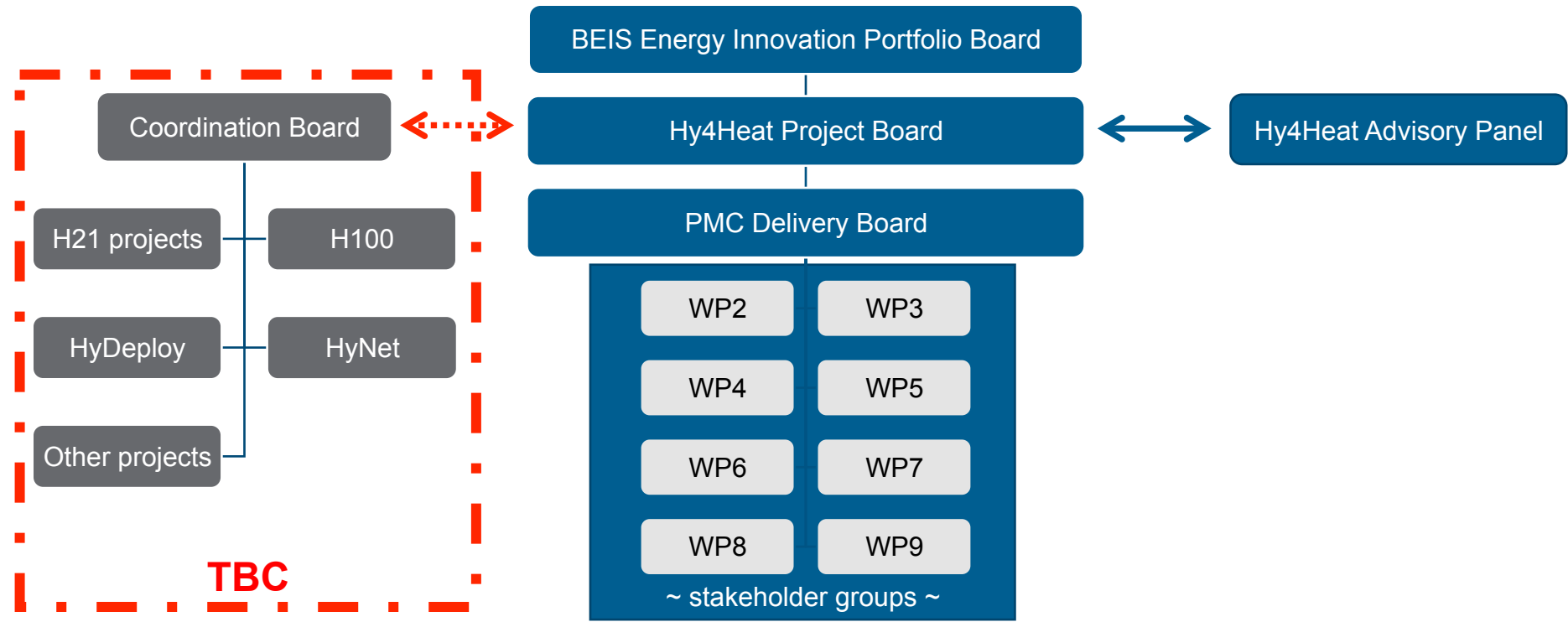
**Risk and safety
assessments**

**Demonstration
trials**

**Community trial
preparations**



Governance arrangements





Hy4Heat

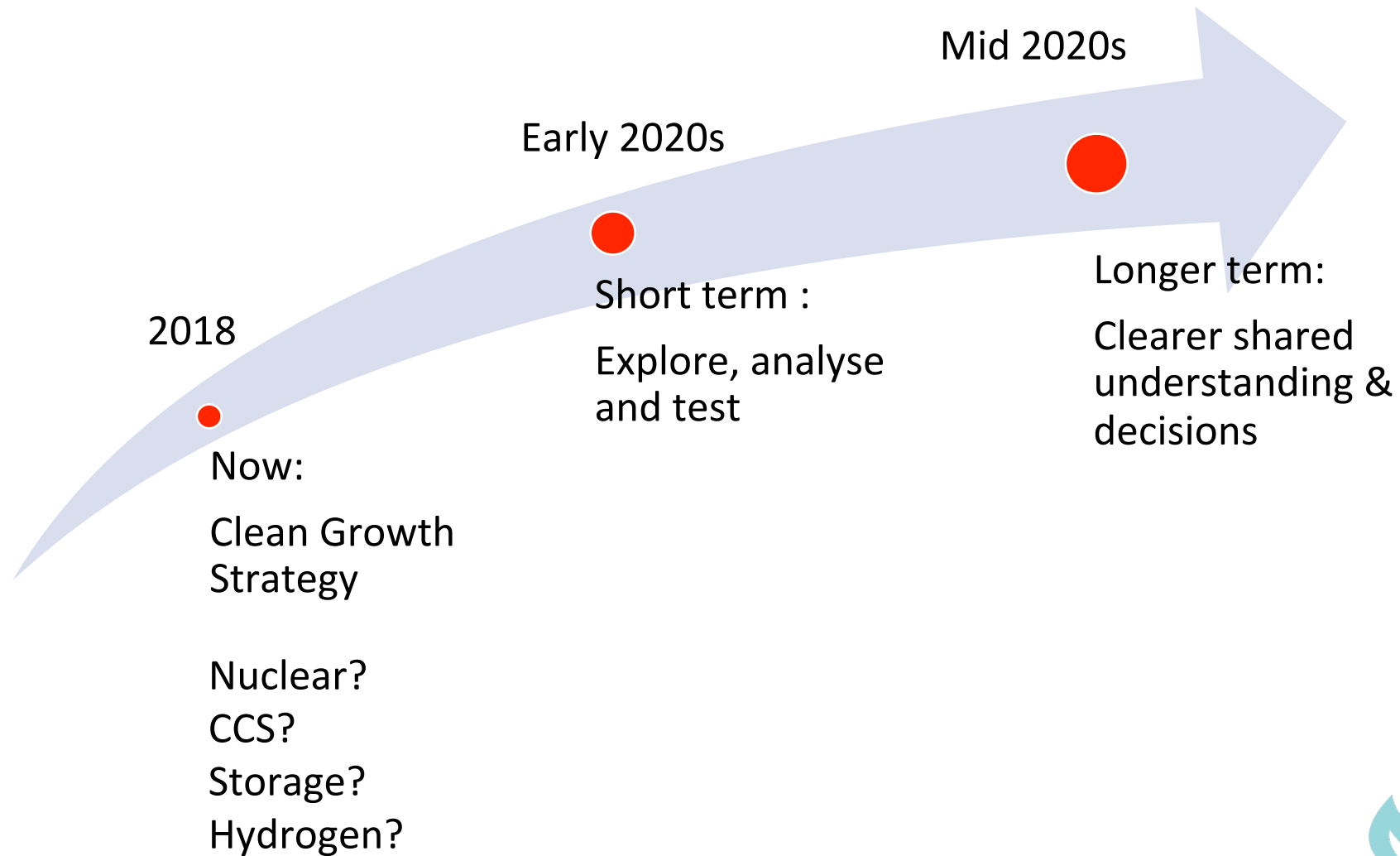
Mark Neller

Hy4Heat Programme Director



Hy4Heat

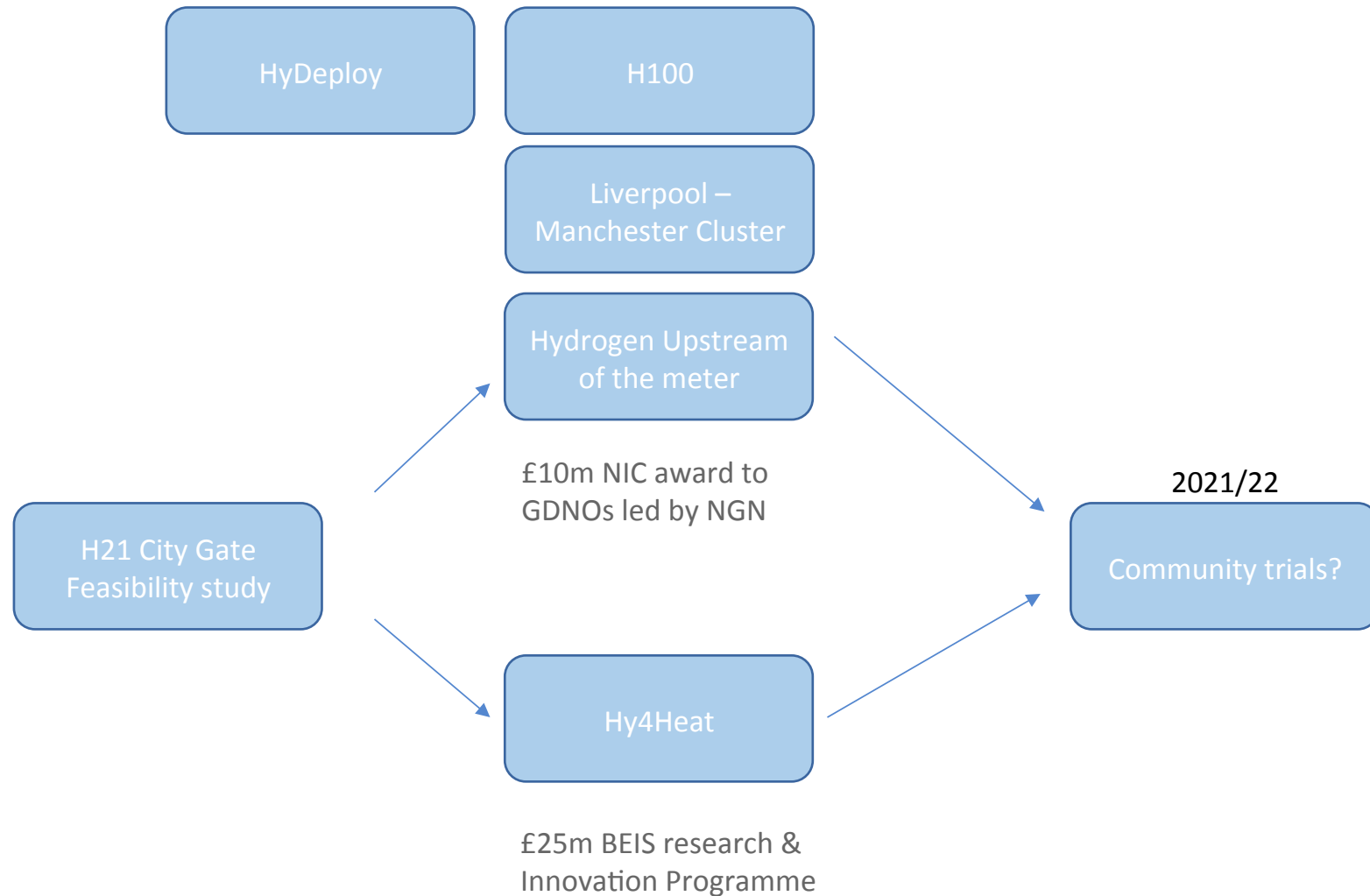
Heat Strategic context



Hy4Heat Mission

To establish if it is technically possible, safe and convenient to replace methane with hydrogen in residential and commercial buildings and gas appliances. This will enable the government to determine whether to proceed to a community trial.

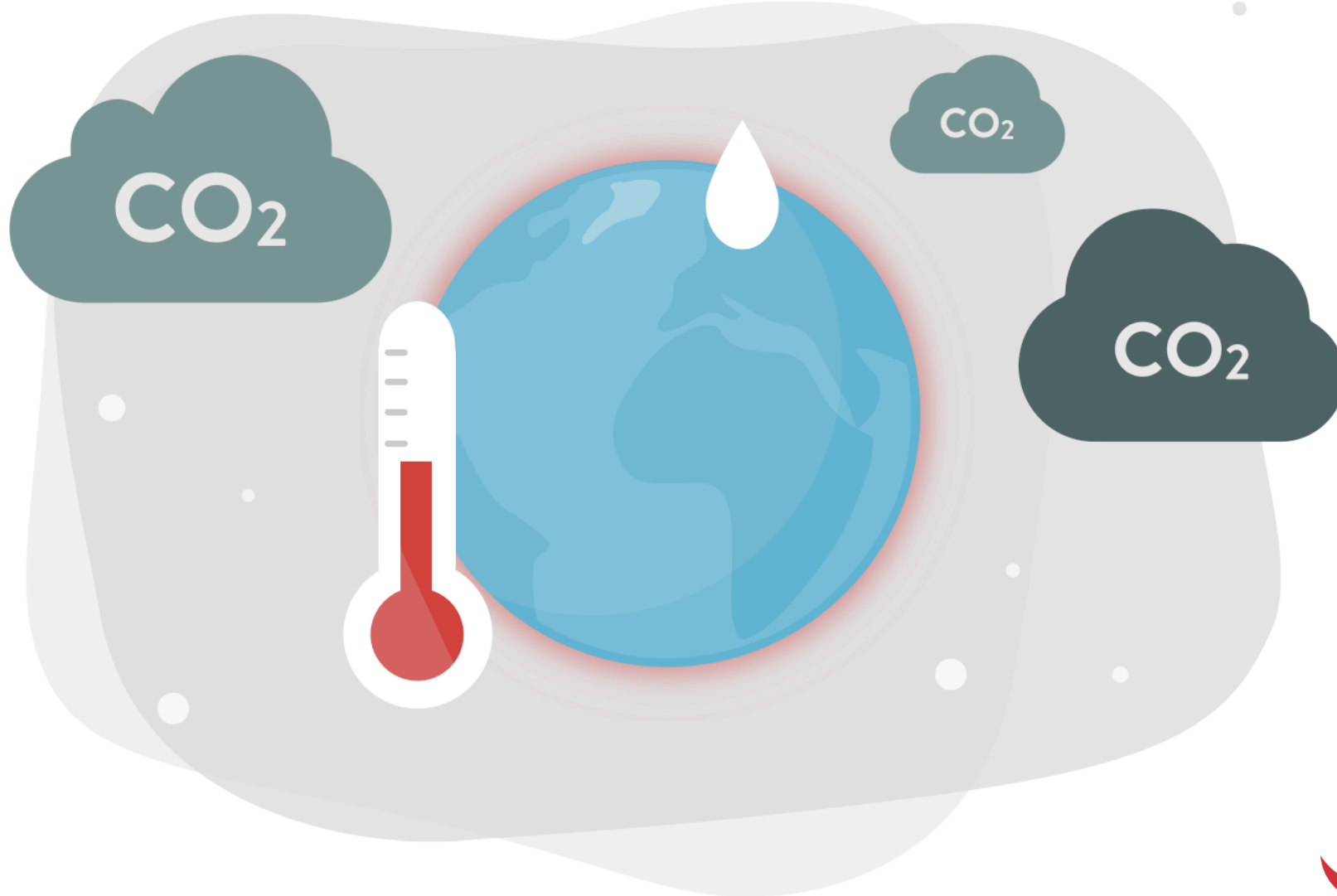
Relationship with GDNO projects



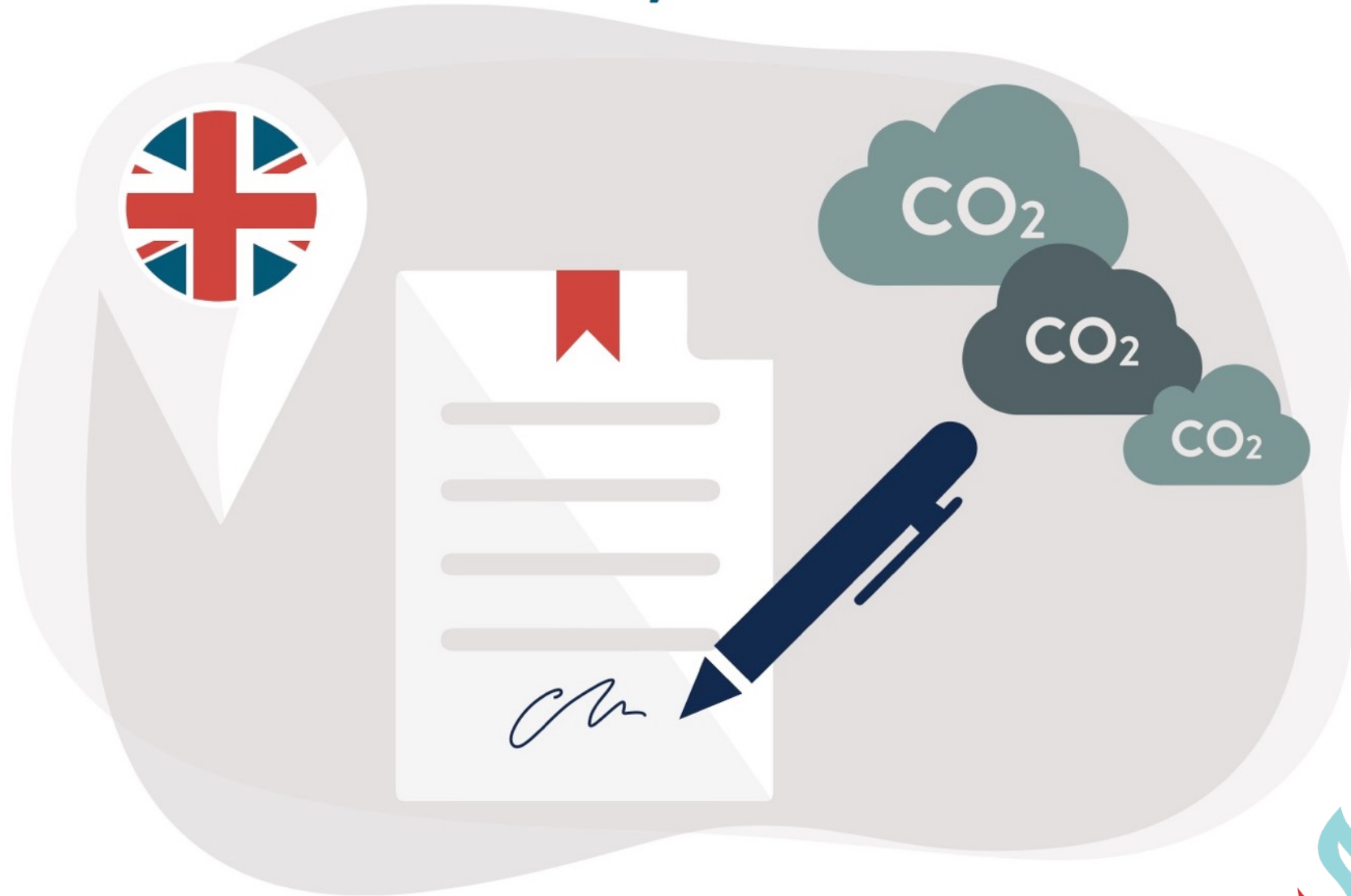
Stakeholder focused programme

- Advisory panel
- Work package stakeholder engagement groups
- Use network of energy expertise
- Consumer and public perception

Carbon Dioxide is contributing to climate change and global warming



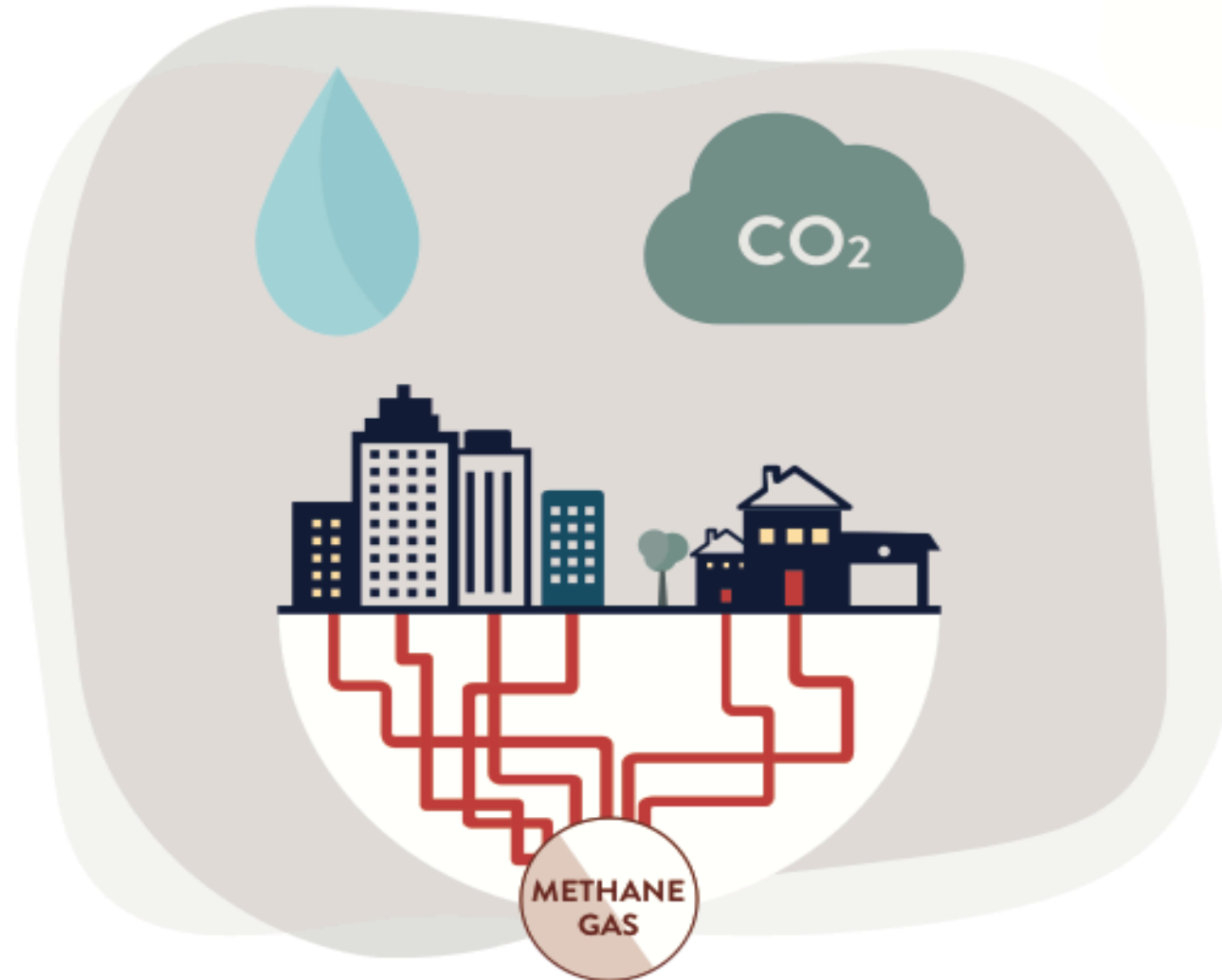
The UK government has a 2050 target to **reduce carbon emissions by 80%** of 1990 levels



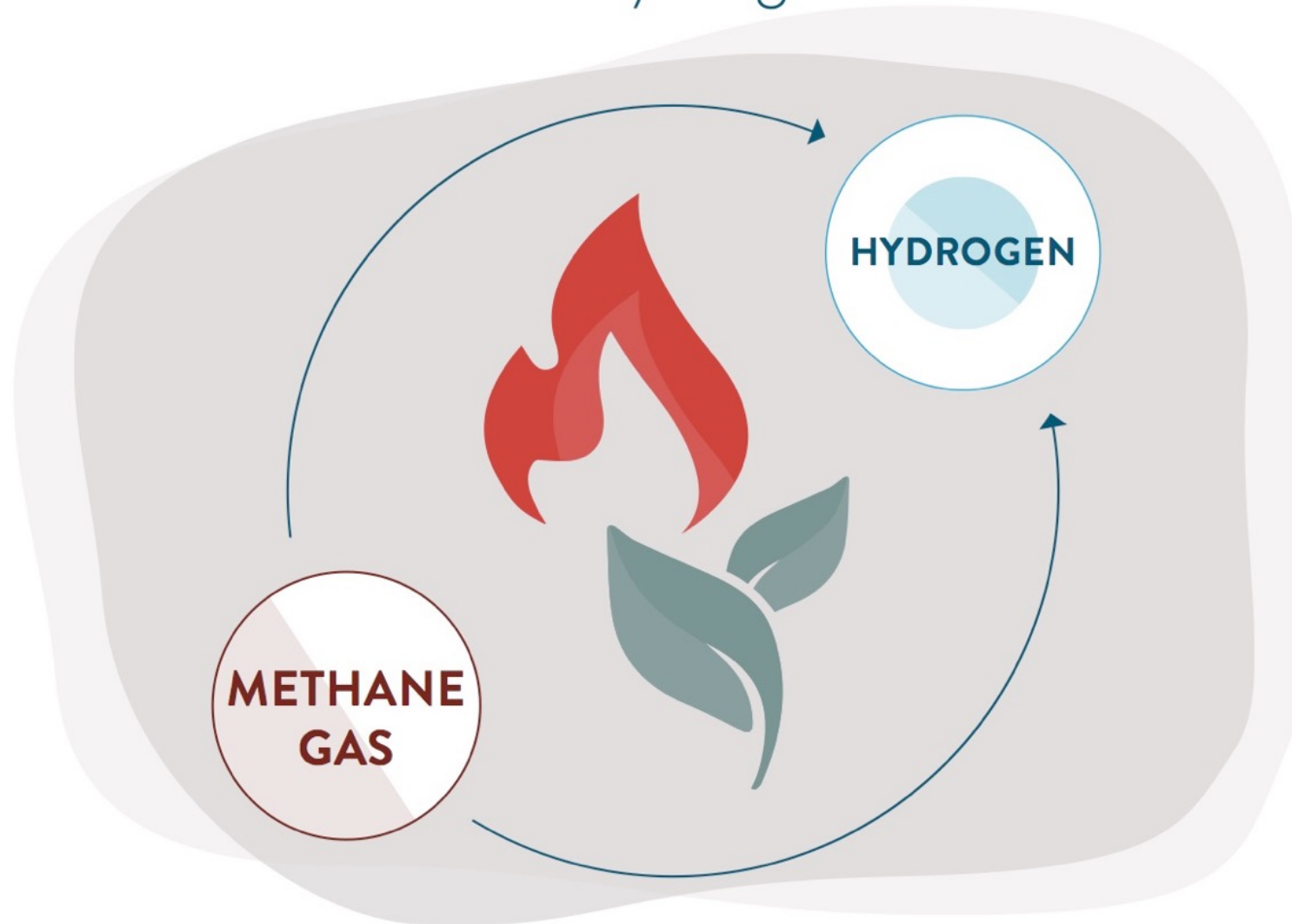
Heating and cooling UK homes is about **half all energy consumption and a third of carbon emissions**



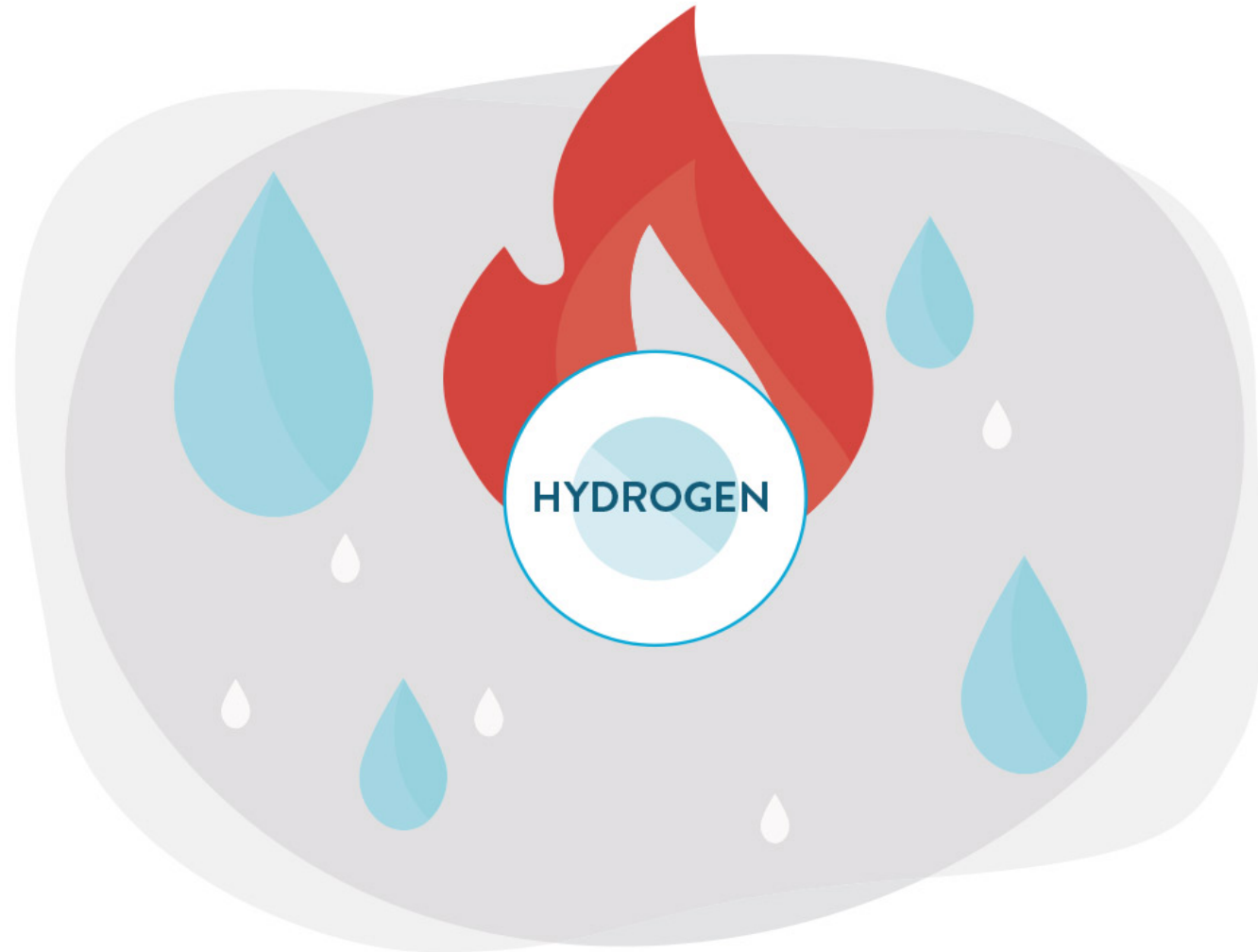
80% of homes use natural gas (methane).
When used for heating and cooking, this releases
water and carbon dioxide.



BEIS (Department for Business, Energy & Industrial Strategy) is looking at ways of **decarbonising heat**. One of the options is replacing methane with hydrogen



Hydrogen, when converted to heat
releases no carbon dioxide



BEIS is considering several options: from how hydrogen could be **produced sustainably at scale...** through to **how much a change might cost...**



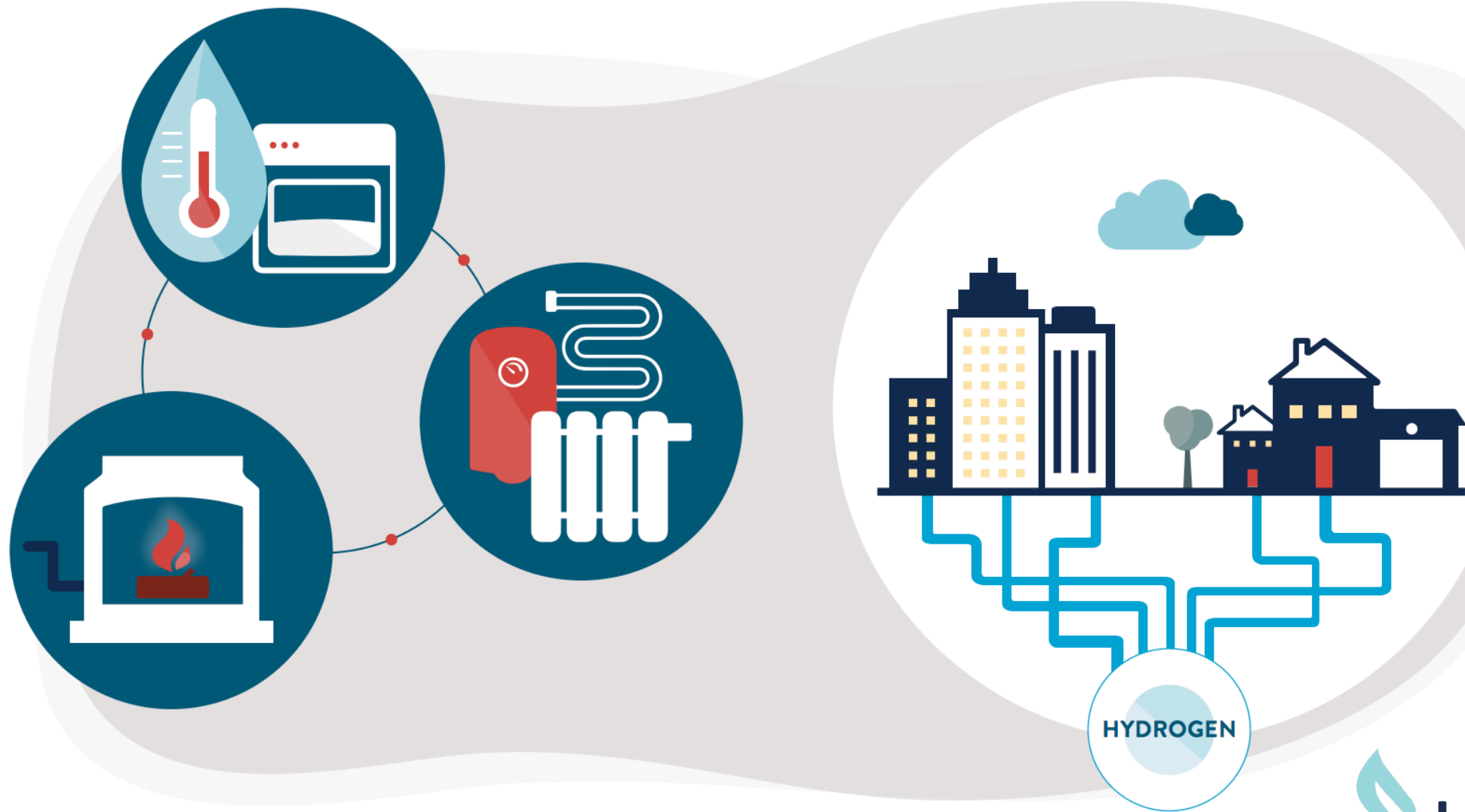
Hy4Heat is part of this work – and is a group of **industry partners and experts...**



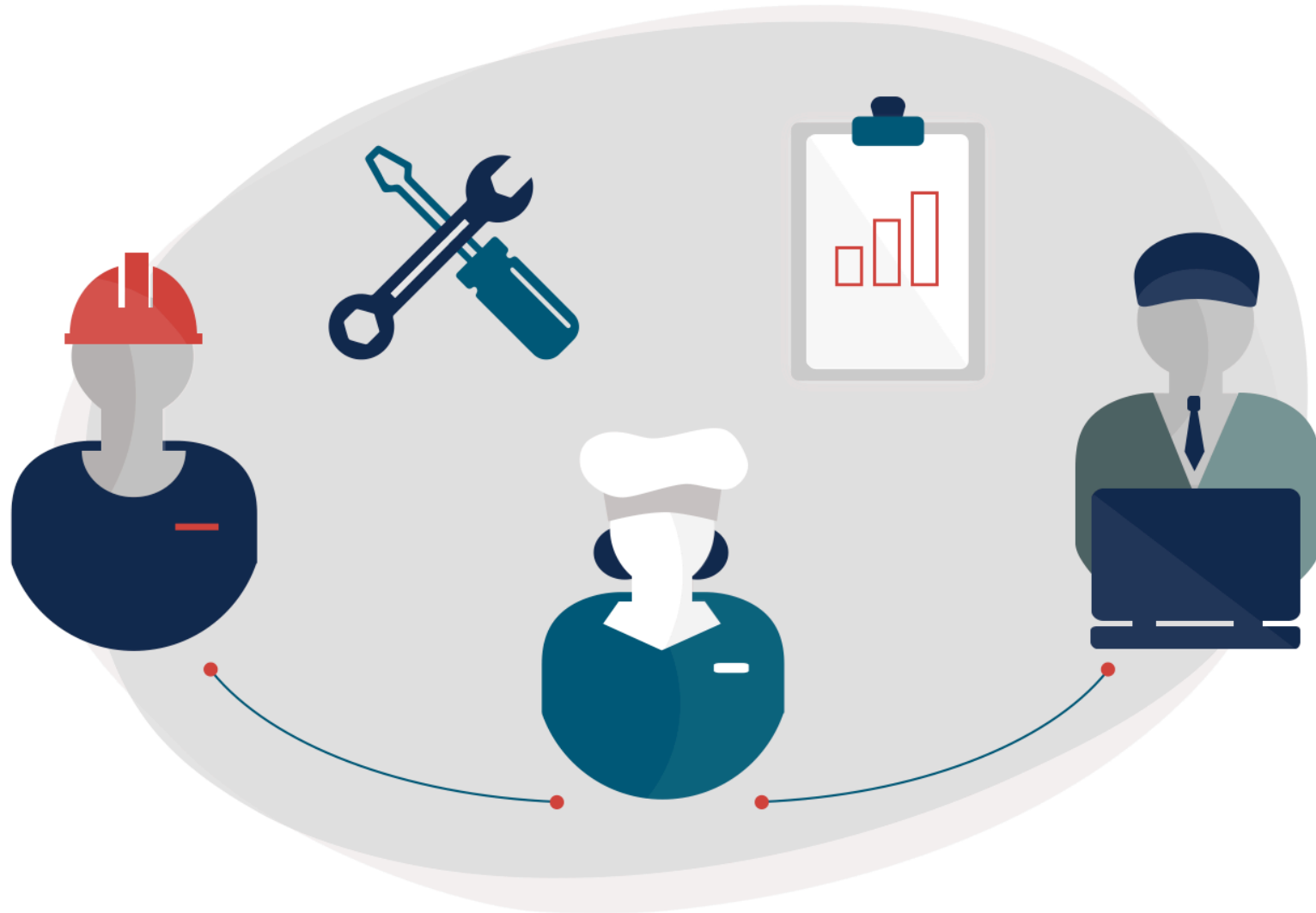
defining a hydrogen **quality standard**...



developing appliances for **use with hydrogen gas...**



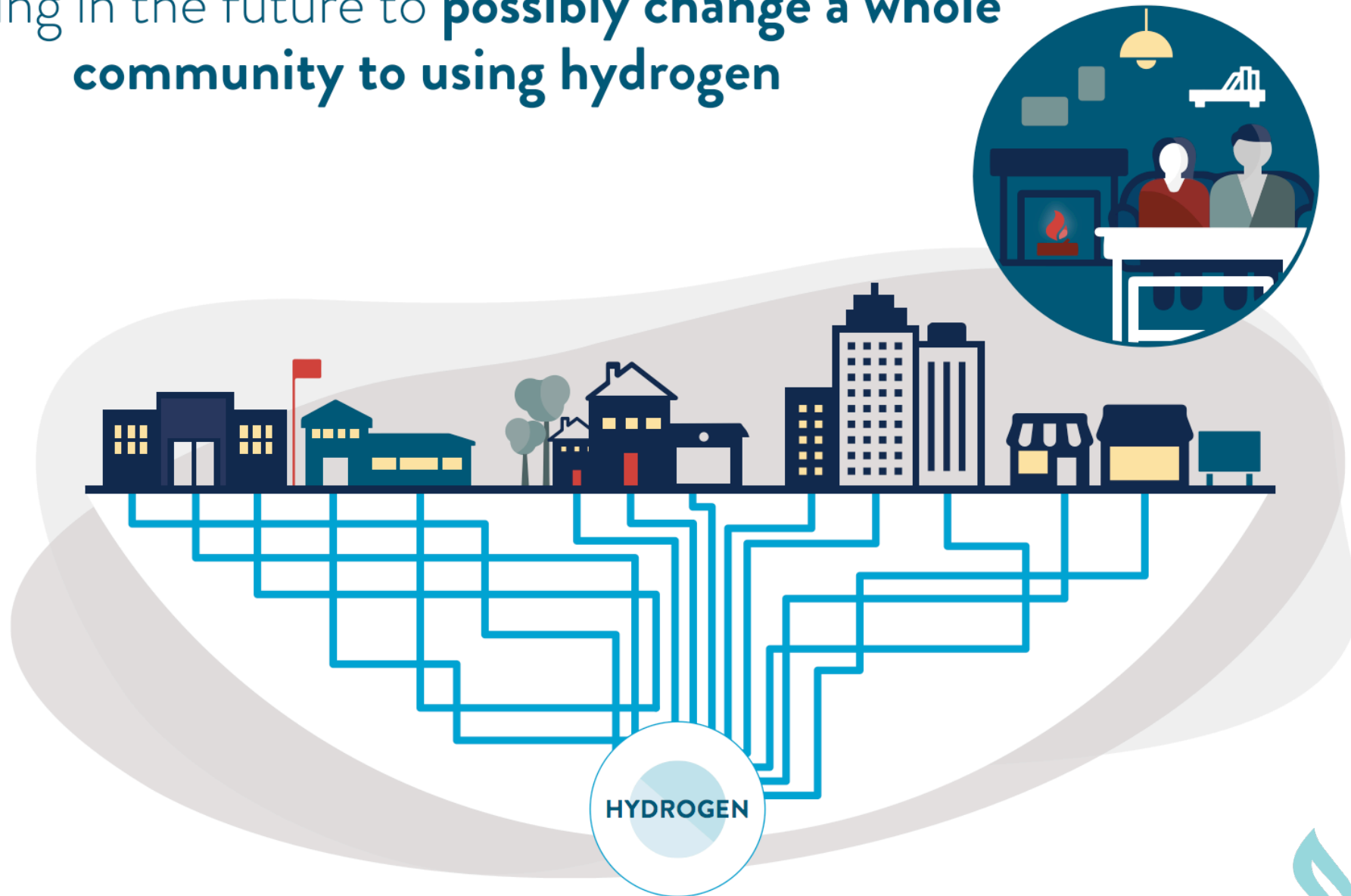
and **testing them** to make sure they're **safe, reliable and convenient**



Creating demonstration showrooms and getting
people's feedback...

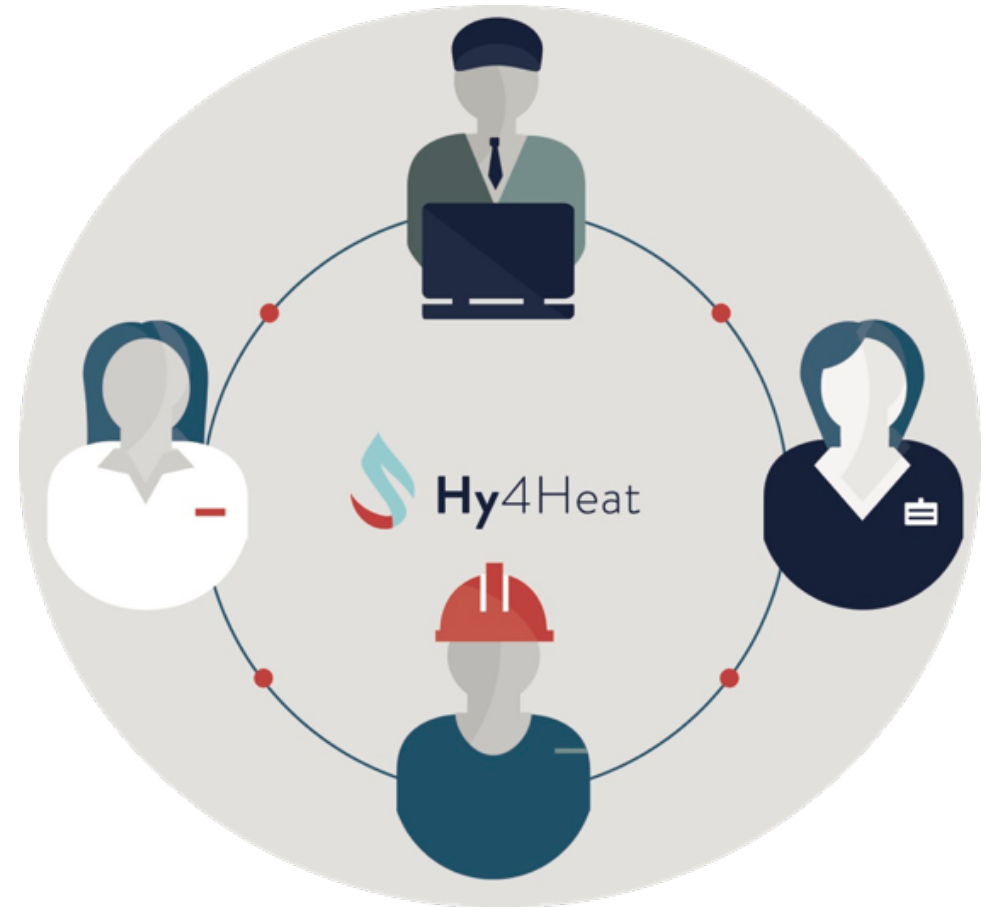


planning in the future to **possibly change a whole community to using hydrogen**

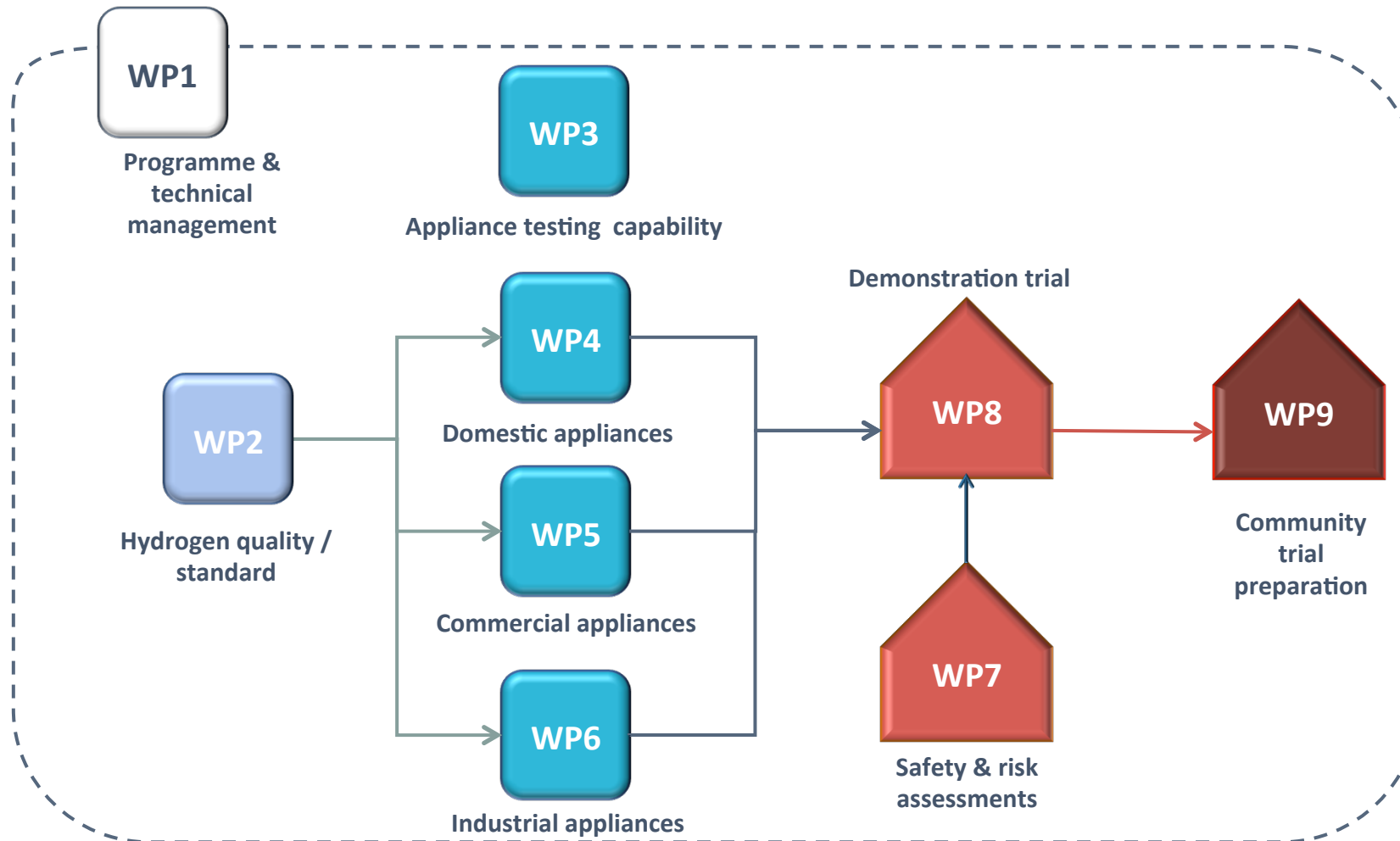


Our approach

- Collaborative
- Impartial
- Evidence based
- Stakeholder focused



Programme Work Packages

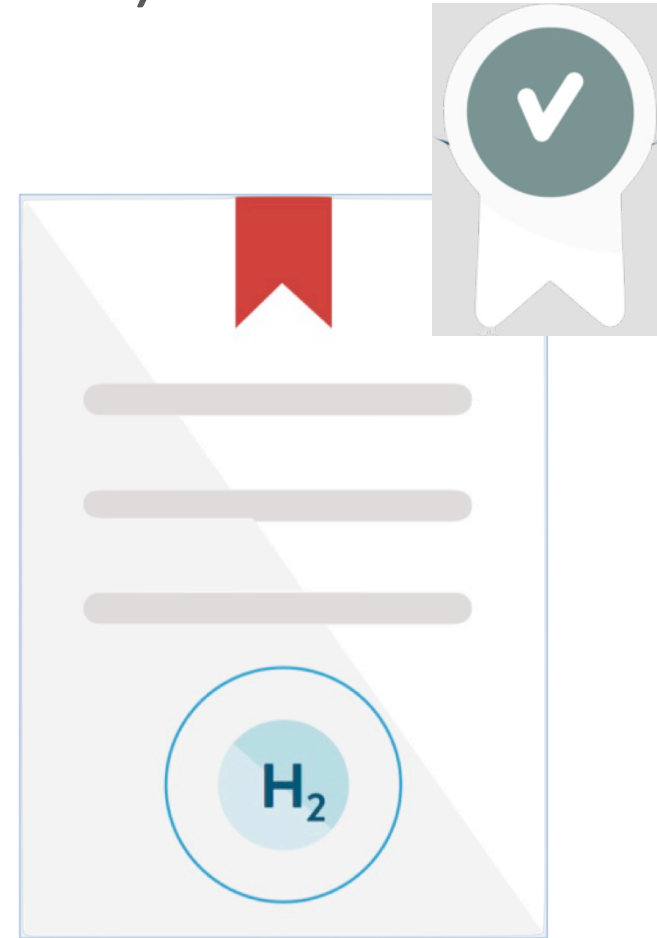


Work packages

- Hydrogen quality standard
- Appliance testing and capability
- Domestic appliances (boilers, cookers gas fires)
- Commercial appliances
- Industrial appliances
- Safety, risk assessments
- Demonstration trials
- Community trial preparation

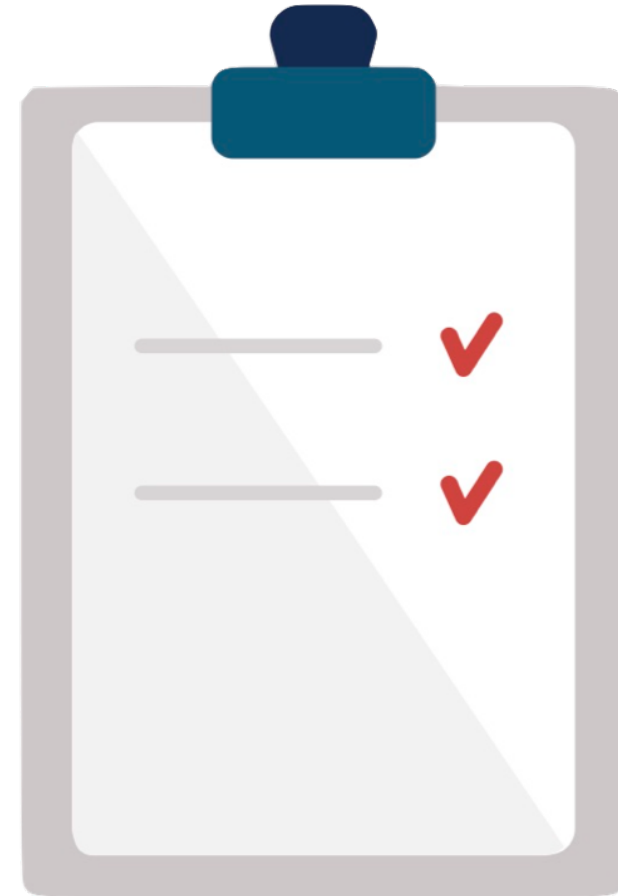
Hydrogen quality standards (WP2)

- Definition of a hydrogen quality standard



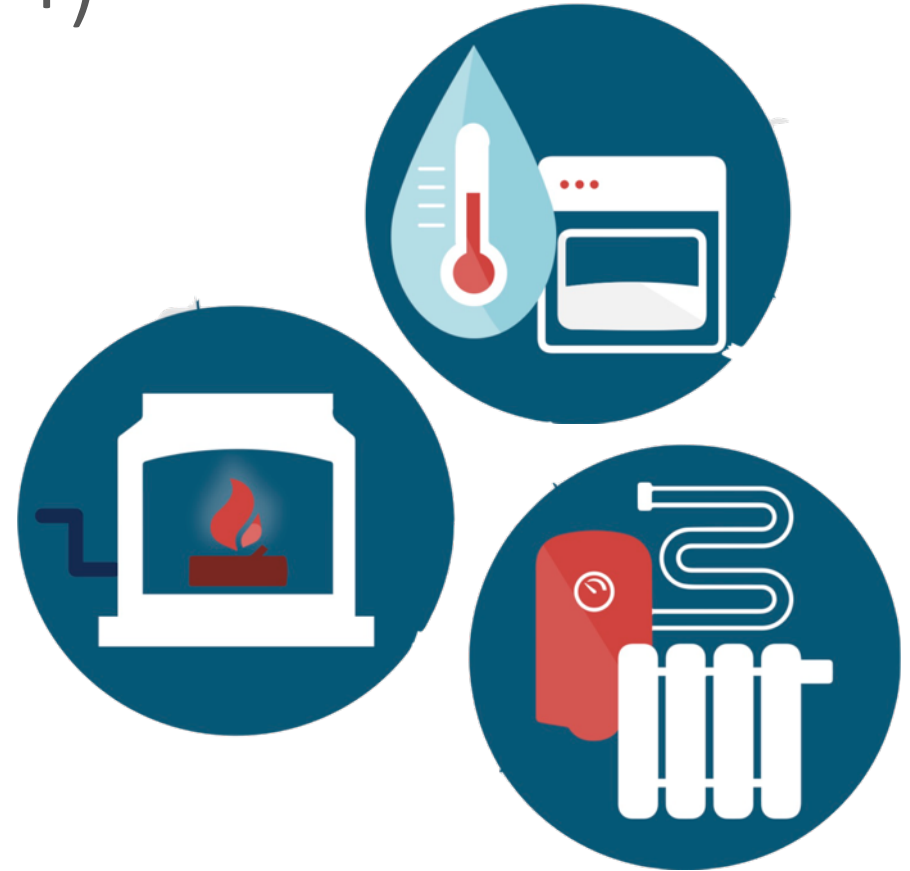
Appliance testing and capability (WP3)

- Establishing an appliance and equipment testing capability



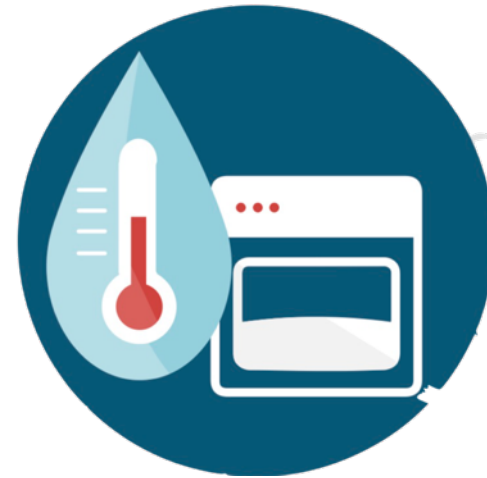
Domestic appliances - (WP4)

- Development of domestic hydrogen appliances
- Boilers
- Cookers
- Gas fires



Commercial appliances (WP5)

- Understanding commercial appliances
- Establishing an appliance and equipment testing capability



Industrial appliances (WP6)

- Understanding industrial appliances



Safety risk and assessments (WP7)

- Assessment of suitability of existing buildings



Demonstration trials (WP8)

- Demonstrating hydrogen appliances – and getting feedback



Community trial preparation (WP9)

- Selecting suitable sites
- Engaging local authorities – for public consultation
- Liaison with gas suppliers, safety regulators, etc



Challenges

- Multi-faceted programme
- Interdependencies across work packages
- Success is reliant on collaboration and partnerships
- Getting the right suppliers to partner with

Engagement groups

Quality & Standards

Safety & Risk

Pipework & Fittings

**Boilers (domestic/
commercial)**

**Cookers
(domestic / commercial)**

Gas Fires

Industrial appliances

Locations

Capability



Hy4Heat

Heidi Genoni

Hy4Heat Programme Manager

2018

2019

2020

2021

Hy4Heat
ends

Quality and standards

Safety and risk assessment

Appliance testing capability

Development of certified domestic appliances
Boilers, Cookers, Gas Fires

Demonstration trials

Commercial appliances
Understanding the market
existing and future use

Specific commercial appliance
development

Industrial appliances
Understanding the market
existing and future use

Specific industrial appliance
development

Community
trial

Scope of works anticipated	Target dates:	
	PIN release (if required)	ITT release
Hydrogen quality standards <ul style="list-style-type: none"> • ISO standards - development of, and advice in, the adoption of ISO standards • Odorant & colourant – research, options development, and testing 	Early March '18	Mid-April '18
Safety & risk assessments <ul style="list-style-type: none"> • Quality Research Assessments (QRA) approach • Physical testing (e.g. deflagrations and other quantitative data) 	Early May '18	Mid-June '18
Domestic appliances <ul style="list-style-type: none"> • Study/report into the fundamentals of flame and burner design • Study/report into, and demonstration of, tray and burner manufacture (for gas fires / space heaters) 	Early May '18	Late June '18

Scope of works anticipated	Target dates:	
	PIN release (if required)	ITT release
Commercial appliances <ul style="list-style-type: none"> Study/report to understand the market <i>Subsequent, development of appliances tbc</i> 	Mid-June '18 <i>tbc</i>	Mid-July '18 <i>tbc</i>
Industrial appliances <ul style="list-style-type: none"> Study/report to understand the market <i>Subsequent, development of appliances tbc</i> 	Mid-June '18 <i>tbc</i>	Mid-July '18 <i>tbc</i>
Appliance testing & capability <ul style="list-style-type: none"> Study/report & advice to Notified Bodies <i>Subsequent, development of facilities tbc</i> 	Mid-June '18 <i>tbc</i>	Late July '18 <i>tbc</i>
Demonstration trials <ul style="list-style-type: none"> <i>Locations and facilities tbc</i> 	tbc	tbc

Scope of works anticipated: Certified Domestic Appliances	Target dates:		No. of contracts to be awarded
	PIN release (if required)	ITT release	
Boilers	Early May '18	Late June '18	2-3
Cookers	Early May '18	Late June '18	2-3
Gas fires / space heaters	Early May '18	Late June '18	2-3

Boilers	Cookers	Gas fires (space heaters)
<ul style="list-style-type: none"> • Combi boiler • System/regular boiler 	<ul style="list-style-type: none"> • Hob • Hob oven / double oven 	<ul style="list-style-type: none"> • Gas fires / space heaters: economy/standard/executive appliances

**Our aspiration is for ‘like-for-like’ replacements...
each manufacturer must provide:**

- a) Fully certified appliances (to be produced in the most timely manner, ready for demonstration trials)**
- b) Business Plans and associated roll-out development plans (for high/medium/low market uptake; including associated costs, assumptions, and implications for each)**



Hy4Heat

Hy4Heat - Procurement

Dr Steve Loades

Project Manager Hydrogen Innovation

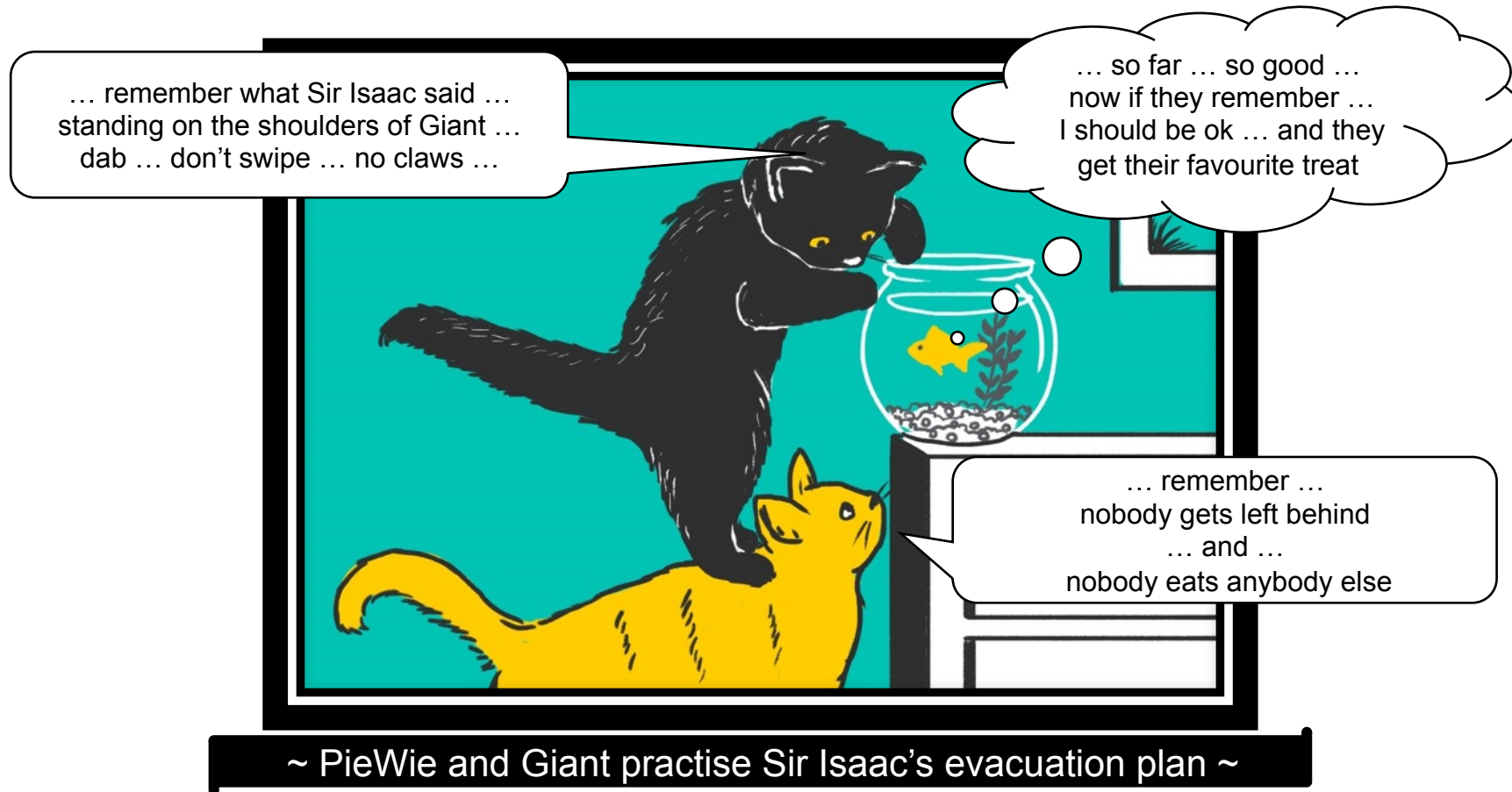
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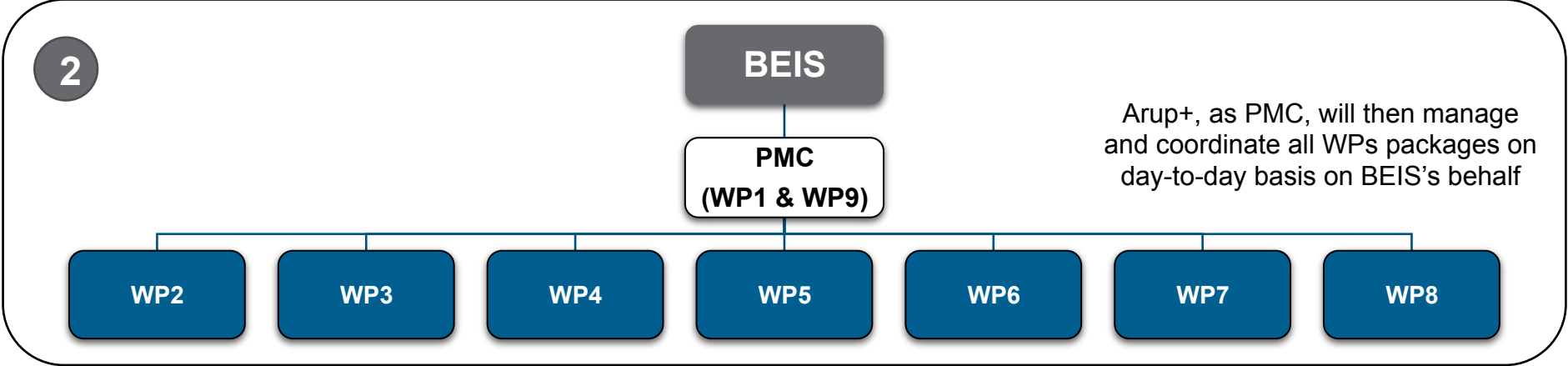
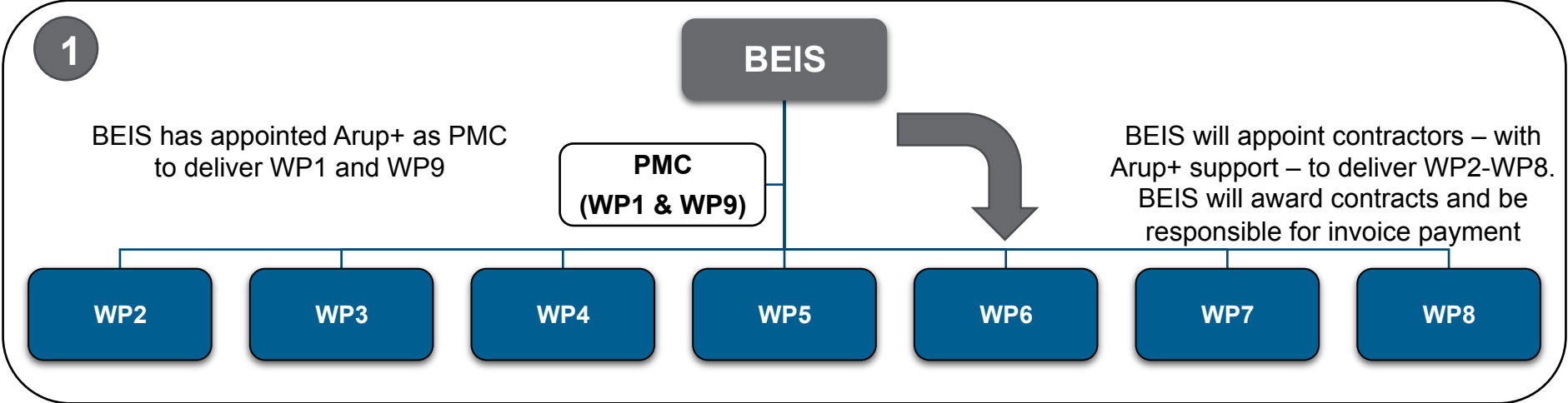
Department for
Business, Energy
& Industrial Strategy

Constructive collaboration ... meeting challenges creatively ...



... supported by clear commercial and contractual arrangements

WP procurement and management



PMC procurement exclusion

Invitation to Tender for Programme Management Contractor (PMC) for UK hydrogen for heat demonstration

Tender Reference Number: 1318/06/2017

C: Conflict of interest

The appointed programme management contractor for this ITT will undertake a central role in developing the detailed technical design and specification of subsequent work packages (WP2-WP8) and assisting with procurement and award procedures.

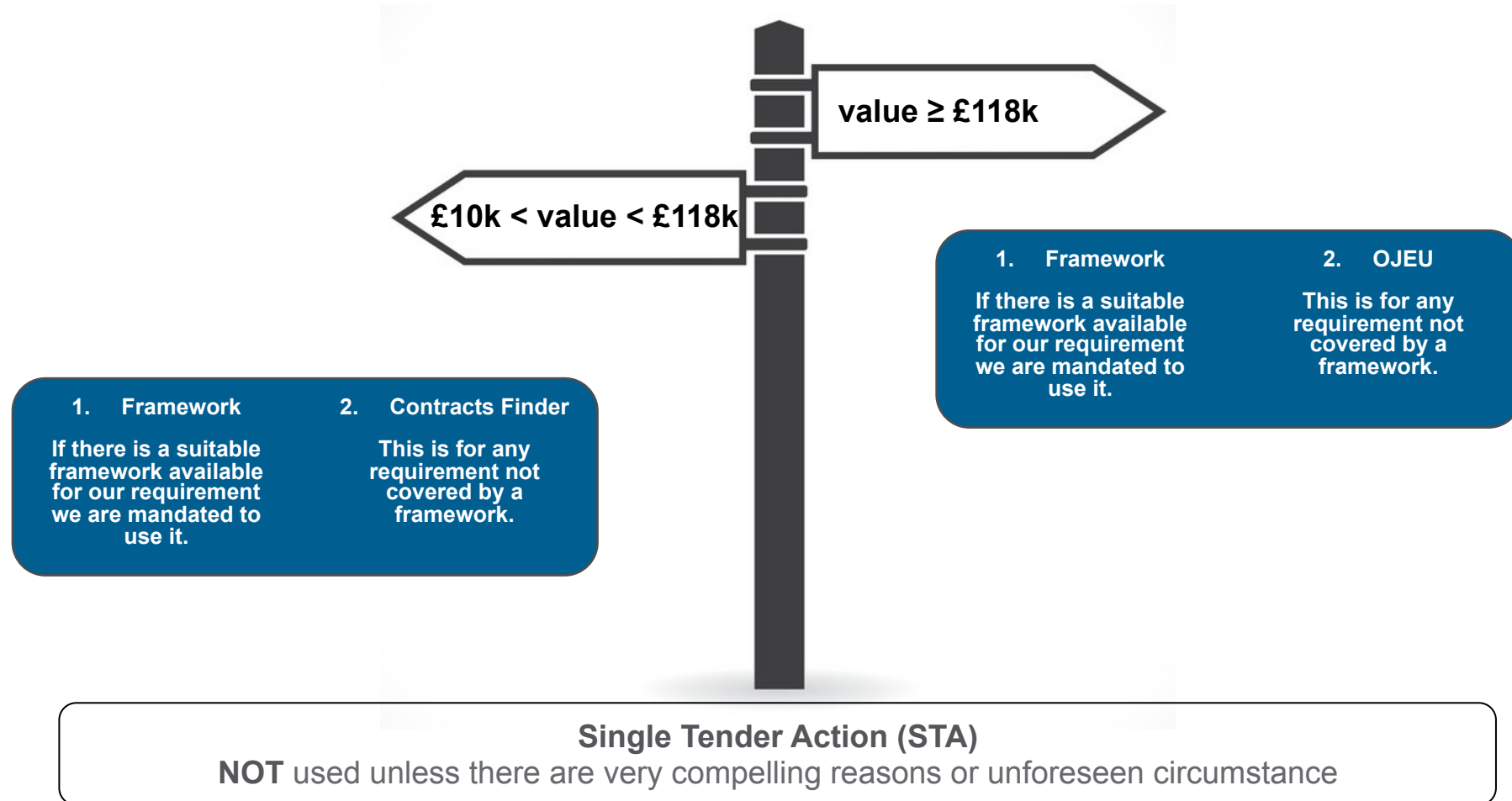
BEIS therefore considers that there is no means by which it can ensure compliance with the duty to treat economic operators equally in accordance with regulation 18(1) of the Public Contracts Regulations 2015 other than by excluding the company or consortium appointed to deliver the PMC role for this ITT from the procurement processes for subsequent work packages.

In their tender response, tenderers are required to give a commitment to abide by this exclusion unless they can prove that their involvement in preparing the procurement procedure for subsequent work packages is not capable of distorting competition.

**Arup+ proposal committed to abide by this exclusion ...
therefore part of the contract with BEIS**



Procurement options / routes



Consortium bids

BEIS welcome bids from consortia / groups... as well as large(r) single entities

Some pointers:

- Single proposal
 - make clear the proposed role for each partner, the lead contact, the organisation and governance
 - set out how any sub-contractors will be managed and the % of the tendered activity (in terms of £) that will be sub-contracted
- Set out proposed arrangements, if a consortium is not proposing to form a corporate entity
 - BEIS reserves the right to require a successful consortium to form a single legal entity
- BEIS recognises that arrangements in relation to consortia may (within limits) be subject to future change
 - therefore respond in the light of the arrangements as currently envisaged
 - Notify BEIS of any future proposed change, so that a further assessment by applying the selection criteria to the new information provided can be made



Criteria – getting the balance right



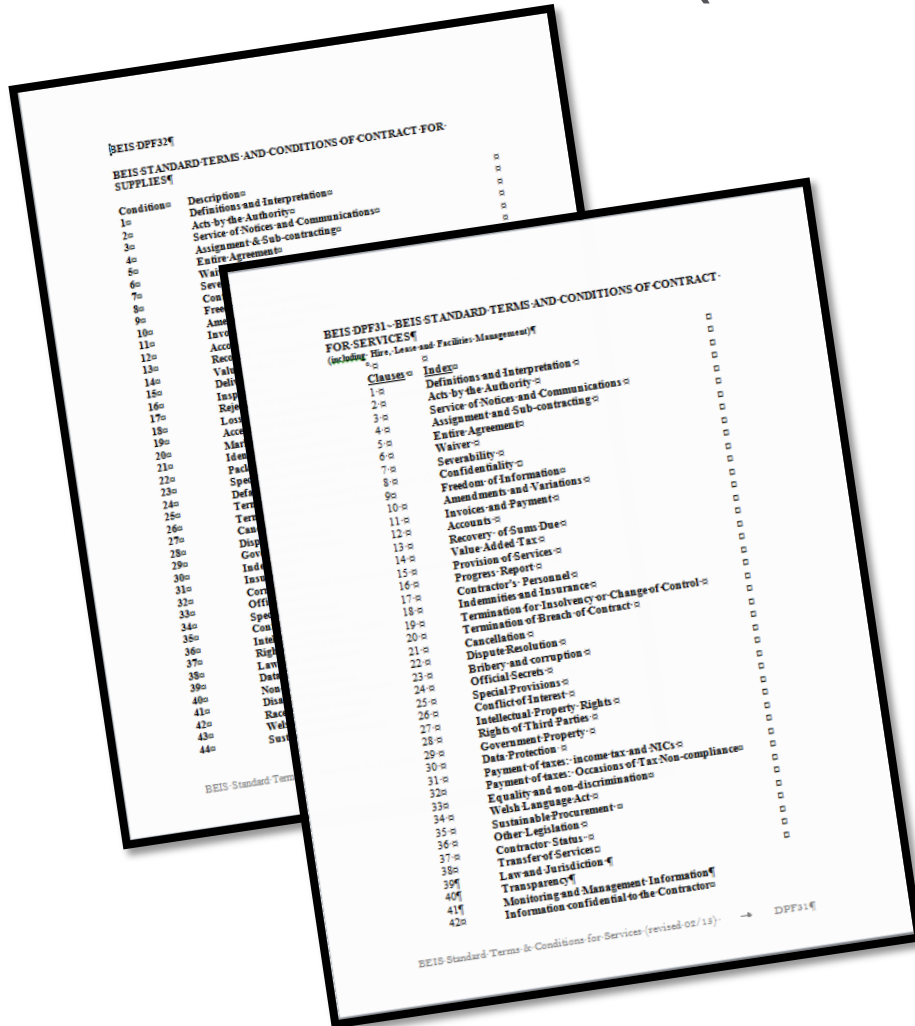
Proposals are scored:

- using a range of weighted criteria
- price is always a criterion

Full / final details are included in ITTs

Nb. BEIS reserves right to award contract on written bid only.

Terms and conditions (Ts & Cs)



- BEIS standard Ts & Cs are expected to form the basis of any contract
- BEIS will publish the final version of the Ts & Cs at the time of any ITT
 - These will be final and any bids submitted on condition that Ts & Cs are amended will be effectively submitting a non-compliant bid
- BEIS are happy to share these documents

Transparency

- In the interests of fairness, today's information will be posted on the OJEU DELTA portal – for all potential bidders
 - Linked with the overarching PIN notice
 - Including Q&A from panel session in an anonymised form





Hy4Heat

Q & A session

Mark Eldridge

Hy4Heat

Roundtable discussions

	Session A	Session B
Gas quality standards	Tables 1, 8 ,11	Tables 1, 8,11
Local space heaters (gas fires)	Table 2	Table 2
Boilers	Tables 4, 10, 12	Tables 4, 10
Cookers and catering	Table 3	Table 3
Industrial appliances	Tables 6,7,9	Tables 6,7,9
Meters, pipework & safety	Table 5	Tables 5, 12



Hy4Heat