

Energy Systems Catapult

Unleashing the Energy Opportunity

CATAPULT
Energy Systems



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What is a Catapult?

- Government business **innovation** intervention
- Part of a **world-leading network** of technology and innovation centres
- Build on existing grant and networking support
- **Bridge the gap** between businesses, academia, research and government
- A long-term investment to **transform** the UK's ability to create new products and services
- Open up global opportunities for the UK and **generate sustained economic growth** for the future
- Established and overseen by **Innovate UK**



10 Catapults
£1.6 billion

The Energy Systems Catapult



Whole System Analysis

Convene key stakeholders, develop and apply research, analysis and modelling capabilities to help UK make strategic choices about transition pathways and innovation priorities collaborating with industry, Government and academia



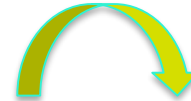
Innovation & Commercialisation

Whole systems architectures; systems integration; consumer insights; subject matter experts; development; “product” management; energy knowledge exchange; collaboration; targeted support for SMEs



Test & Demonstration Platform

Whole systems; facilities, capabilities and best practice; alliances and partnerships; appropriate scale; multi-vector; technical, commercial, business; Consumers insights; mitigate risk and reduce time to market; realistic pricing of risk



Unleashing the Energy Opportunity



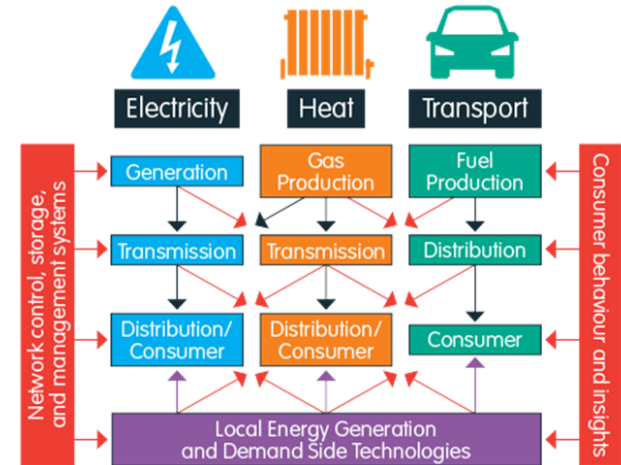
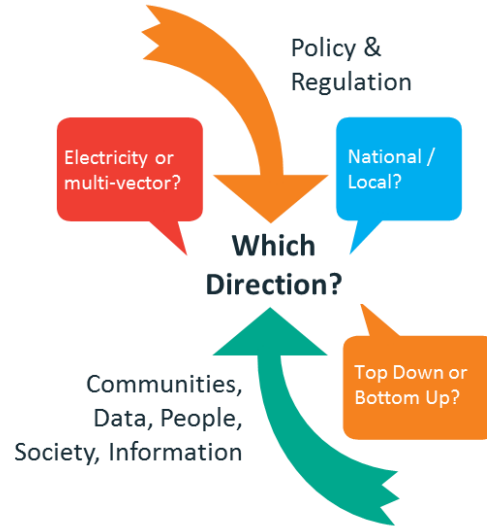
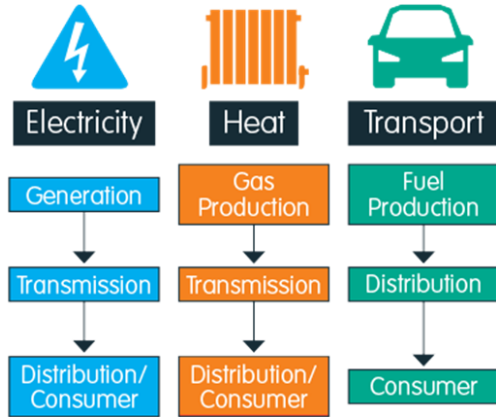
Mission

to provide a clear innovation pathway for new technologies, services and business models that will transform the energy system and drive economic growth.

Energy Systems Catapult offers unique assets and capabilities that help innovators overcome the technical, regulatory, economic and social barriers blocking routes to market.

Energy Systems Catapult is an expert, independent authority, and a trusted interface between government, industry and academia

Our Energy System is Changing



Addressing Market failure

Based on Market Intelligence

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Structural Barriers

Investment Barriers

Procedural Barriers

Integrational Barriers

Technical Barriers

Consumer Barriers

Cultural Barriers

ESC can...

Inform Market structures and regulations to better incentivise innovation

Support policy stability bringing investor confidence

Develop sector capability to innovate

The UK's Clean Growth Strategy

- Invest up to £100m in CCS innovations across industrial sectors
- More than £2.5bn spent on low-carbon innovation by 2021
- New Sector Deal for offshore wind, which could add an extra 10GW of new capacity
- £3.6bn of investment set aside to upgrade household energy performance
- Packages of measures improve business energy productivity by at least 20% by 2030
- £1bn support scheme for ultra-low emissions vehicles
- "Develop one of the best electric vehicle charging networks in the world"



Future Power System Architecture Project - an introduction

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Future Power Systems Architecture (FPSA)

- an ambitious effort involving dozens of industry professionals, academics, policymakers and stakeholders to assess the challenges to be faced in the electricity system by 2030 and to identify new functionality required.

FPSA1 key outcomes

- Substantial new or extended functionalities required for power system by 2030
- Implementation challenges of the new functionality are significant
- Delivery by 2030 is possible but we need to start now
- Much of the new functionality is concerned with interactions spanning the whole system
- Whole-system functionality, including active consumer engagement, presents challenges for today's institutional arrangements
- Outcomes need to be considered by network price controls



Drivers of new or extended functionality

The flexibility to meet changing but uncertain requirements

The change in mix of electricity generation

The use of incentives to enable customers to benefit and the system to operate more efficiently

The recovery from major events or emergencies

The active management of networks, generation, storage and demand

The emergence of new parties providing new services to customers

The emerging need for coordination across energy vectors

Each of the 35 identified functions can be aligned with one (or more) of these key drivers

Overall Conclusions

Substantial new or extended functionality is required to meet energy policy objectives by 2030

The new functionality presents **substantial implementation challenges** from technical, market and commercial perspectives

It is feasible to deliver the changes required but **the scale and complexity warrant special focus and urgency**

Much new functionality involves **interactions** spanning from **smart appliances to traditional power stations**

The interaction between functions and the need for coordination implies the sector is facing **transformative change**

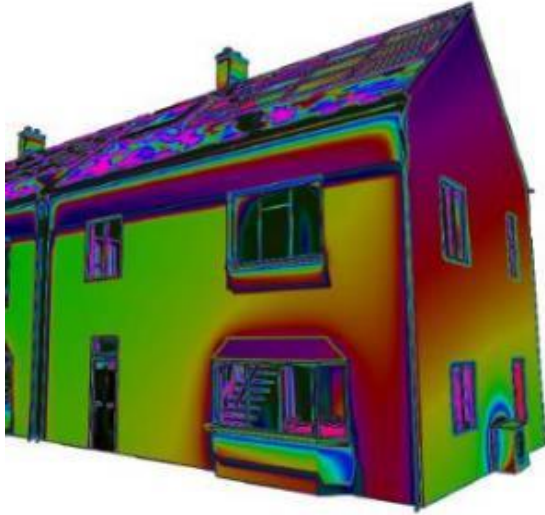
These arise from **greater complexity and technical challenge** - with scope for adverse interactions between system components

These **developments are already having an impact** on the power system and 14 years to 2030 is a demanding timetable

New approaches are required to develop the necessary whole-system solutions to power system architectural evolution

ETI's Smart Systems and Heat Programme

Delivered by
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“Creating future-proof and economic local heating solutions for the UK”

- Connecting together – the understanding of consumer needs and behaviour with the development and integration of technologies and new business models into...
- Delivering enhanced knowledge amongst industry and public sector
- Resulting in industry and investor confidence to implement from 2020 which enables a UK heat transition

ETI members



CATERPILLAR®



Rolls-Royce



Department for
Business, Energy
& Industrial Strategy

EPSRC
Pioneering research
and skills

Innovate UK
Technology Strategy Board

ETI programme associate

HITACHI
Inspire the Next

The Energy Systems Catapult is delivering Phase One of the SSH programme as a supplier to the ETI following the transition of the SSH programme team.

The Catapult is responsible for the delivery of Phase Two of the SSH programme independently of the ETI.

Smart Systems and Heat

Realising Benefits

Industry having a route to deliver energy services that decarbonise heat in **local areas** that people and communities support and value

Phase 2

Establishing a Shared Ecosystem

Living Lab to help others test new energy services

100 home living lab

Planning evidence and dialogue to make infrastructure decisions

Informing future energy system architectures


Department for Business, Energy & Industrial Strategy

Delivered by
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Establishing the knowledge tools and capability

30 home field trial

1

Consumer Solutions

Software platform and supporting design and integration capabilities to gather, process and use data to help service providers **create and deliver better domestic energy services**

2

Local Area Strategies

Local energy transition planning capability, building consensus among stakeholders to **make local infrastructure investment decisions with confidence**

3

Market, Business and ICT Solutions

System operations design capability, trading-off commercial, information and physical domains across gas, heat and power to **enable effective multi-party systems integration**

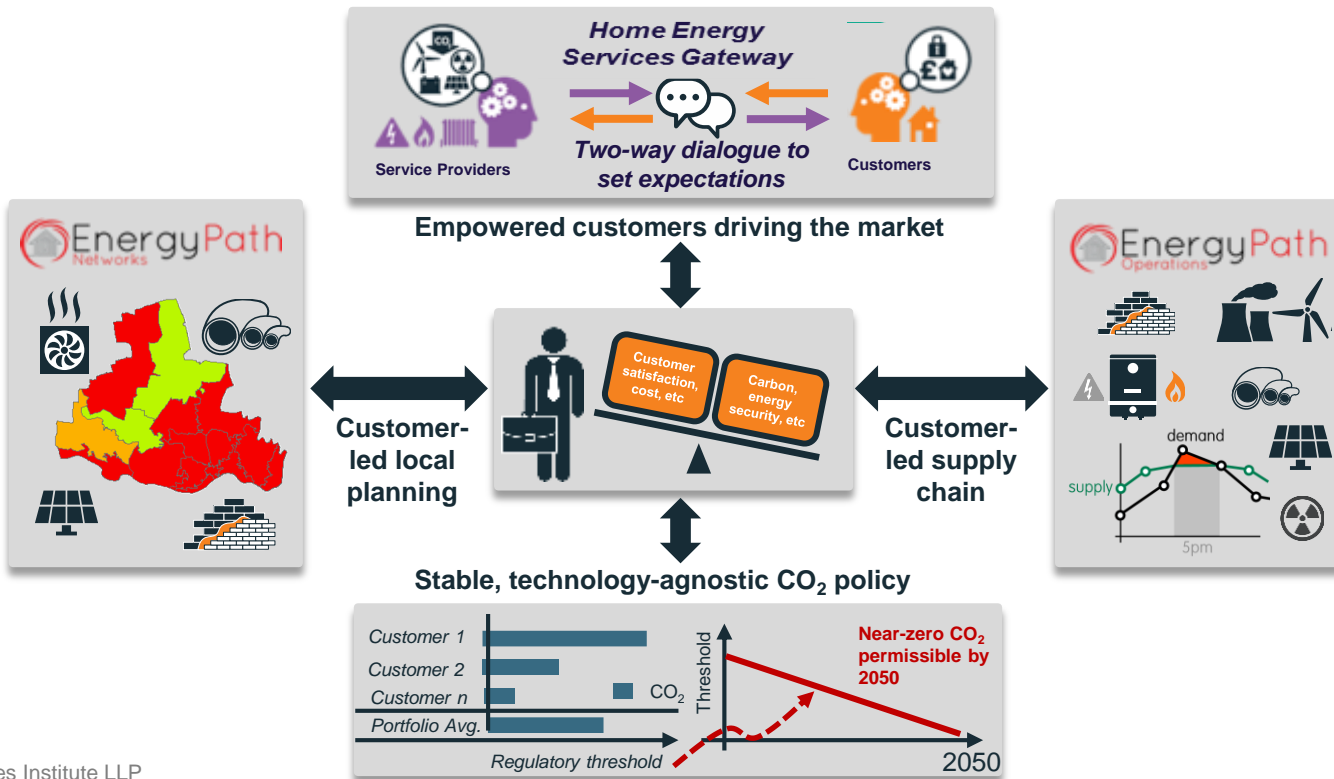

energy technologies institute

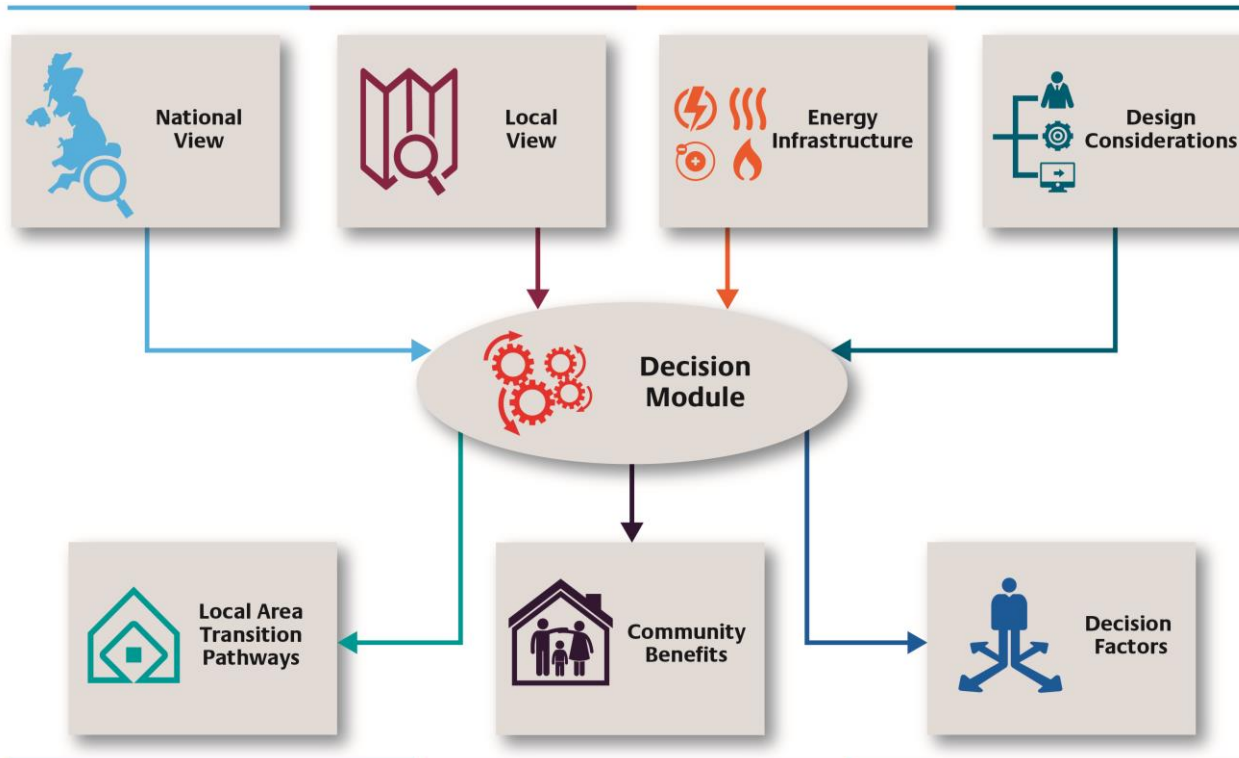
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Phase 1

Delivering 'heat as a service'

creating an ecosystem to help the energy sector make a customer-centric market really work



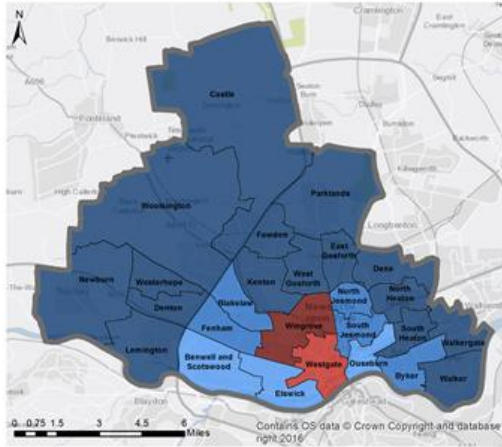


Currently working with three local authorities to deliver Area Energy Strategies

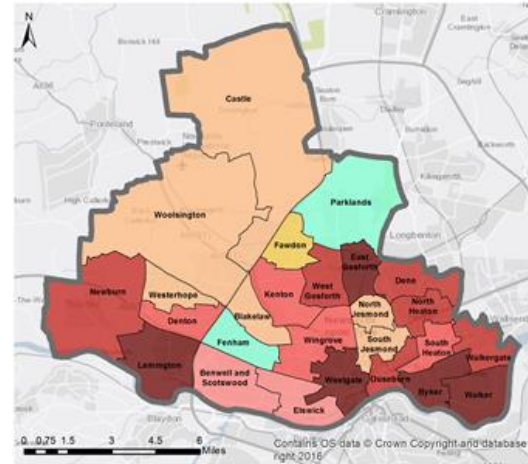
- **Newcastle**
 - **Greater Manchester (Bury)**
 - **Bridgend (with the Welsh Government)**
- A spatial Energy Study has also been delivered to GMCA:

https://es.catapult.org.uk/wpcontent/uploads/2016/05/Compressed_GMCA_Spatial_Energy_Plan_2016_11_07-LATEST-ilovepdf-compressed.pdf

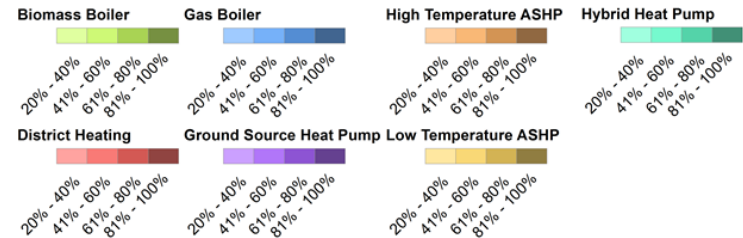
Business As Usual



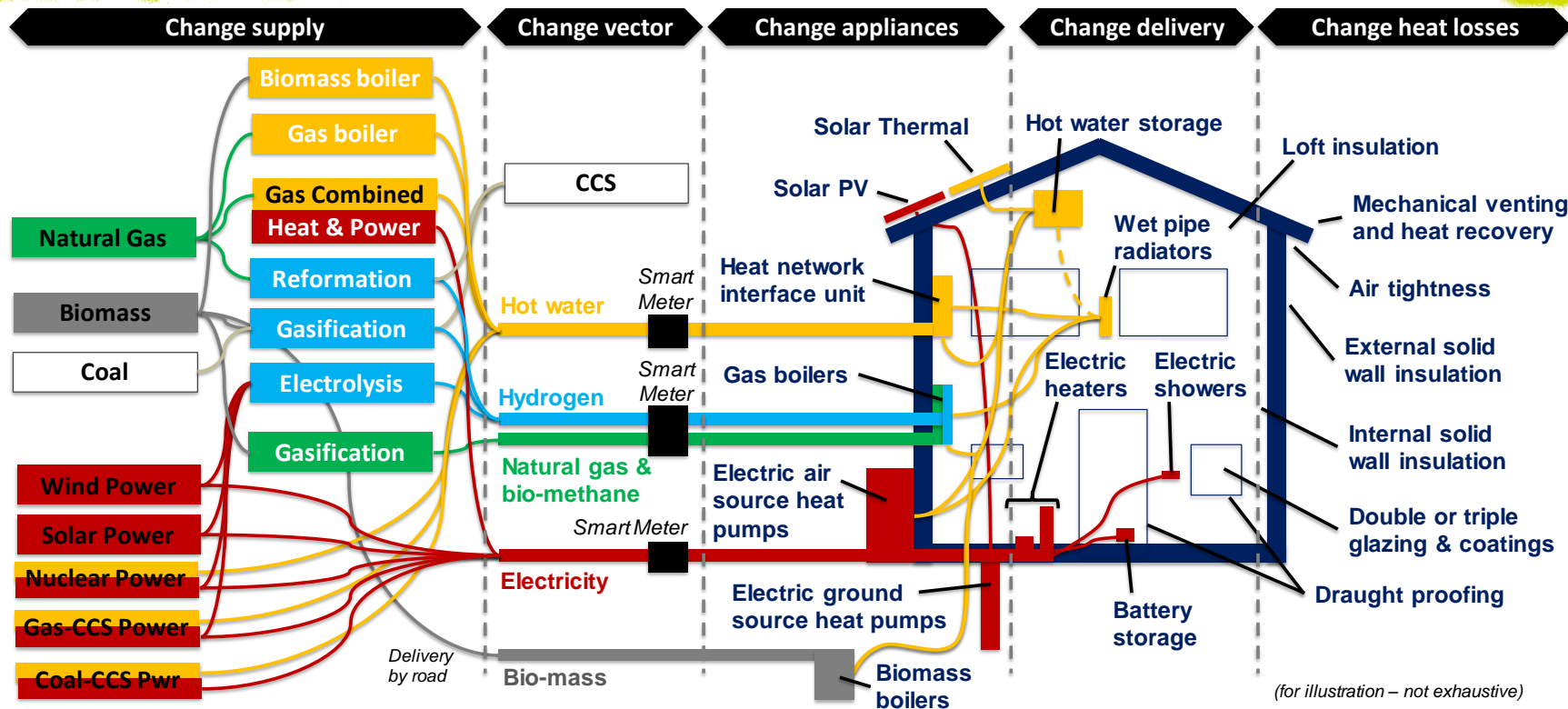
Carbon Target



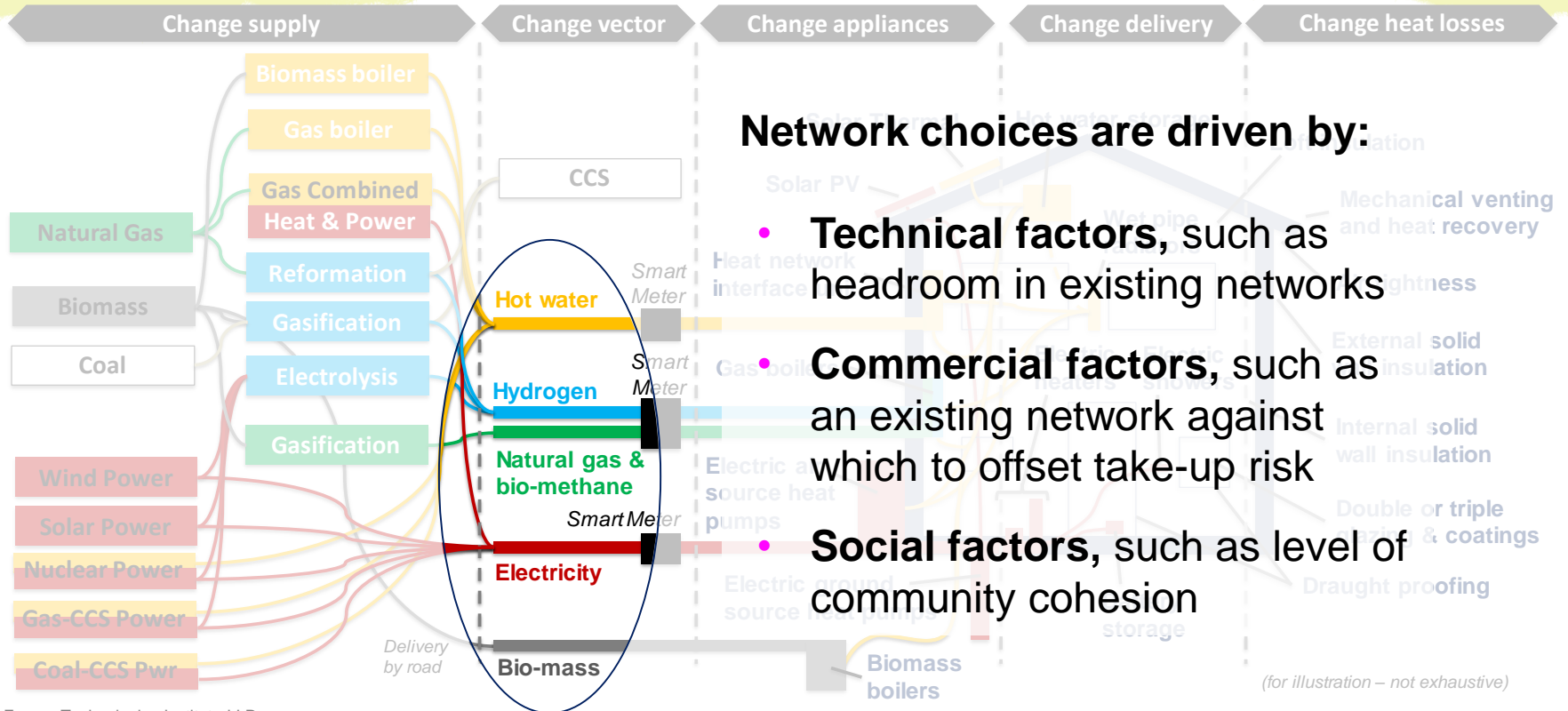
Dominant Heating System by Ward (2050)



Decarbonising domestic energy is a very complex systems integration challenge



The technical task is complex, to integrate a different set of components in different places



Network choices are driven by:

- **Technical factors**, such as headroom in existing networks
- **Commercial factors**, such as an existing network against which to offset take-up risk
- **Social factors**, such as level of community cohesion

(for illustration – not exhaustive)

The technical task is complex, to integrate a different set of components in different places

Change supply

Change vector

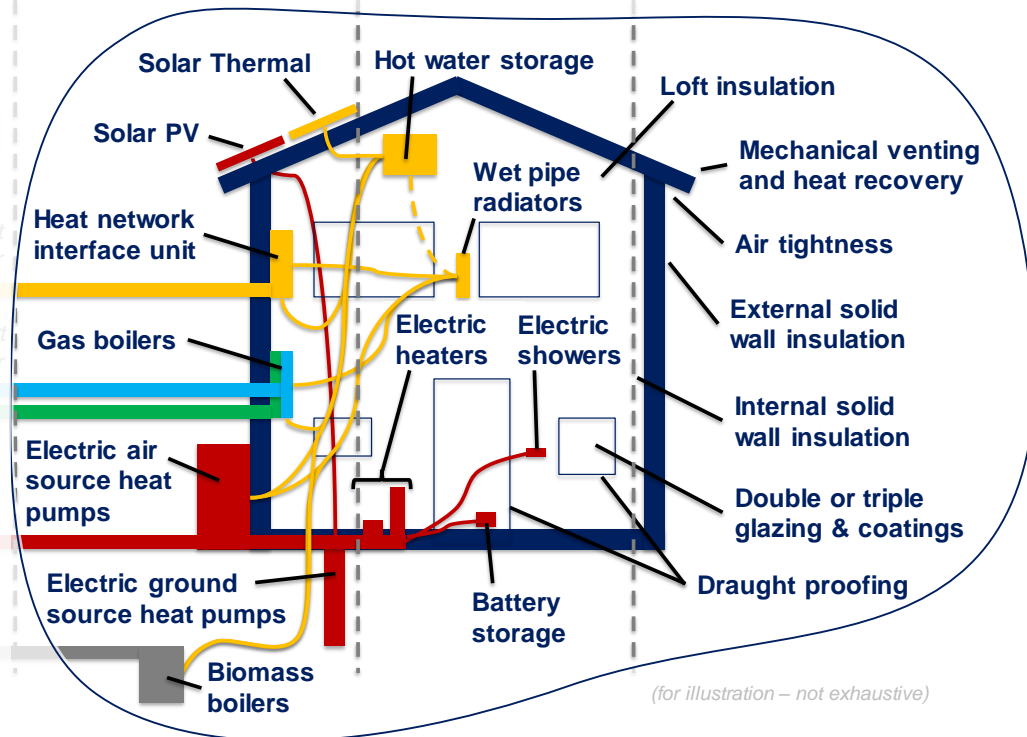
Change appliances

Change delivery

Change heat losses

Home choices are driven by:

- **Technical factors**, such as the condition of the fabric
- **Commercial factors**, such as split incentives between owners and occupiers
- **Consumer factors**, such as aesthetics, use of space, willingness / ability to invest, symbolic value of home, etc



Business model gap: delivering integration to guarantee the outcomes people value

Social housing



Local Authorities
and Housing
Associations

New build



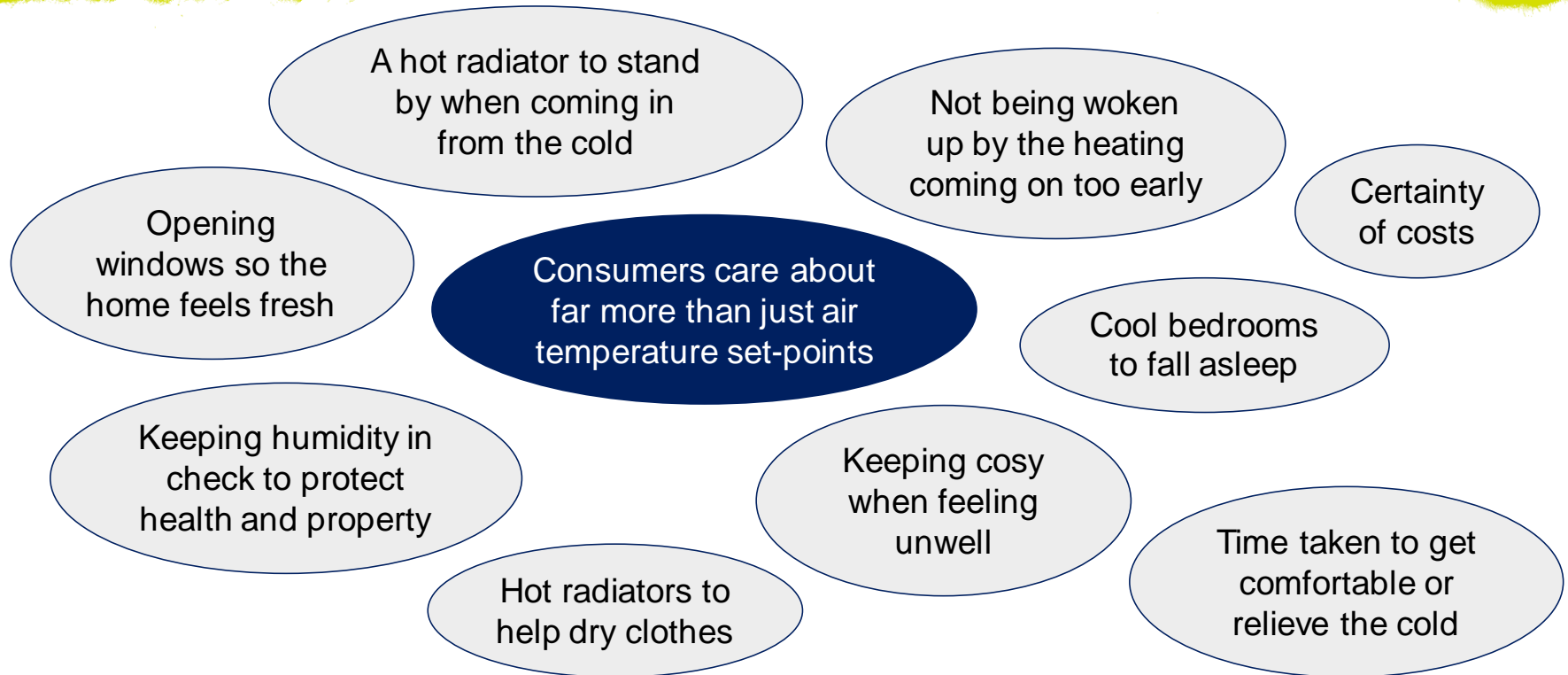
Housing
Developers

Private rent & owner-occupier



?

It is essential to recognise different people value different things; and a lot more than temperature



What is an energy service?

Last year I spent

- £1,380 on
- 14,983kWh of gas and
- 4,125kWh of electricity.

Next year, I've no idea

- How much fuel I need
- What it will cost, or
- What experience I will get.



I want to warm

the rooms I choose...

...to the temperatures I like...

...when I am home.

For a fixed monthly price!

Problem: discovering customers' expectations

1. "I want..."

- few hours
- medium temperatures
- some rooms"



2. [But I do]

- more hours
- maximum temperatures
- all rooms
- with open windows



3. "I'm so annoyed with my supplier, they are a nightmare"



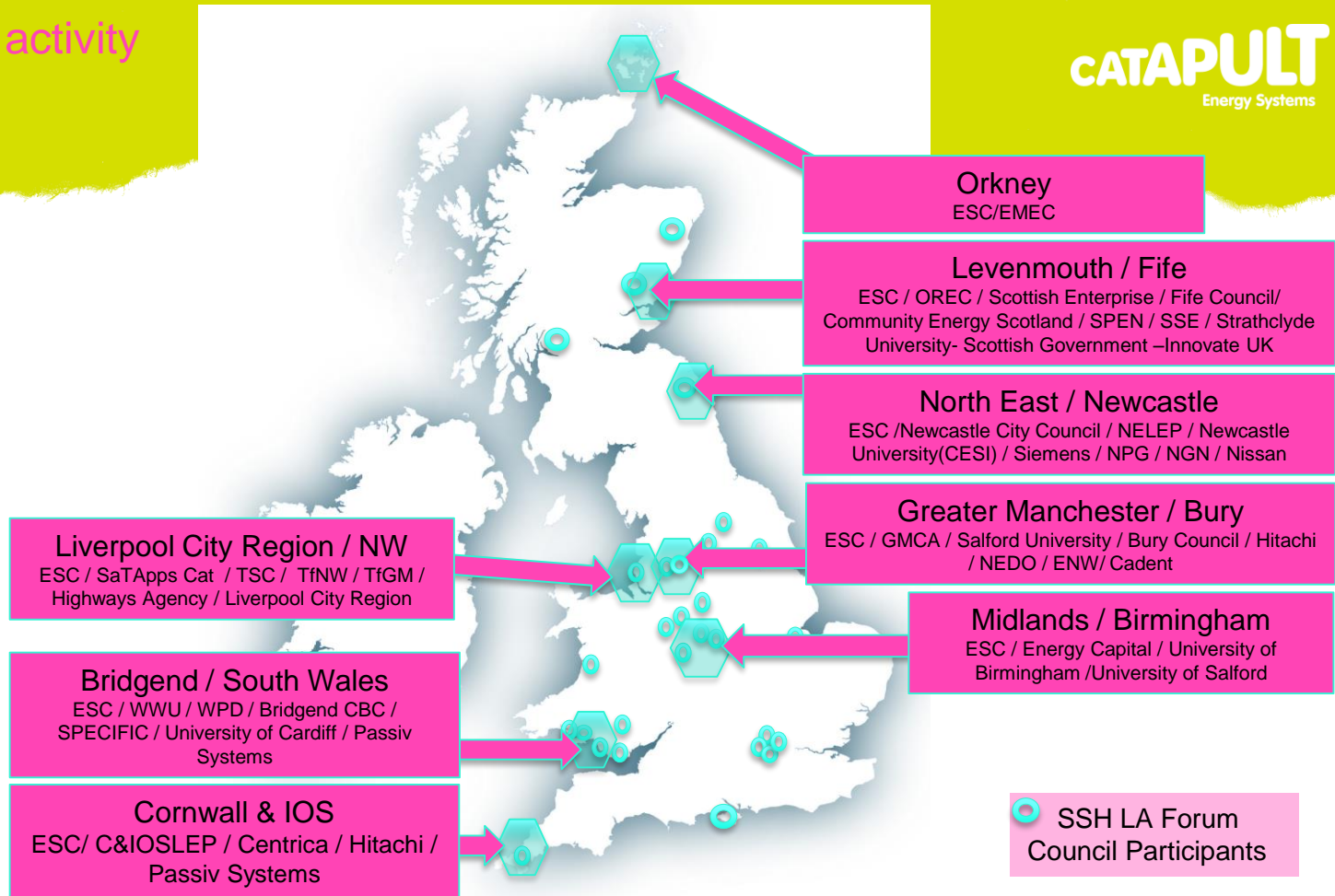
4. "But you never knew what you needed..."

SMEs

what they tell us they need.....

- 1. Building confidence for investors in the direction of change for energy systems
- 2. Demonstration of how new technologies can integrate into networks and systems
- 3. Understanding changing consumer behaviour and the impact on their propositions
- 4. Helping identify and test new business models and value propositions
- 5. Access to finance and help to find new ways of funding their innovation
- 6 . Sharing of best practice and data/knowledge
- 7. More flexible access to test facilities
- 8. Access to new skills, capabilities and training, including modelling, datasets and methods
- 9. Collaboration with others around shared interest, including pooling resources to overcome common technology issues and reduce costs
- 10.Route to market advice and acceleration
- 11. Awareness and navigation of policy and regulation

Current regional activity





Thankyou

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