

# INNOVATIVE ZERO CARBON WORKING GROUP

Join us for a discussion on  
decarbonising homes.

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24 January 2024

Locally-led Innovation Accelerators delivered in  
partnership with DSIT, Innovate UK and City Regions



# Agenda

10:00 Welcome from IZCWG Chair

10:05 Welcome from our Host

10:15 Householder Experience of Future Homes

10:25 Thermal Imaging for Retrofit

10:35 Starting on the Retrofit Journey

10:45 Q&A

11:00 Comfort Break

11:10 Elsewhere in the Innovation Alliance

11:15 Collaboration for Innovation in the Retrofit System

11:25 Discussion

11:45 Roundtable: collaboration and partnership opportunities



# Welcome from the Chair



# Welcome from our Host

-

Mott MacDonald





# Accelerating to Net Zero

Taking a Place-based approach



# Introducing Mott MacDonald

We work in  
**135**  
countries

**170**  
permanent  
offices in over  
50 countries

**16k**  
staff

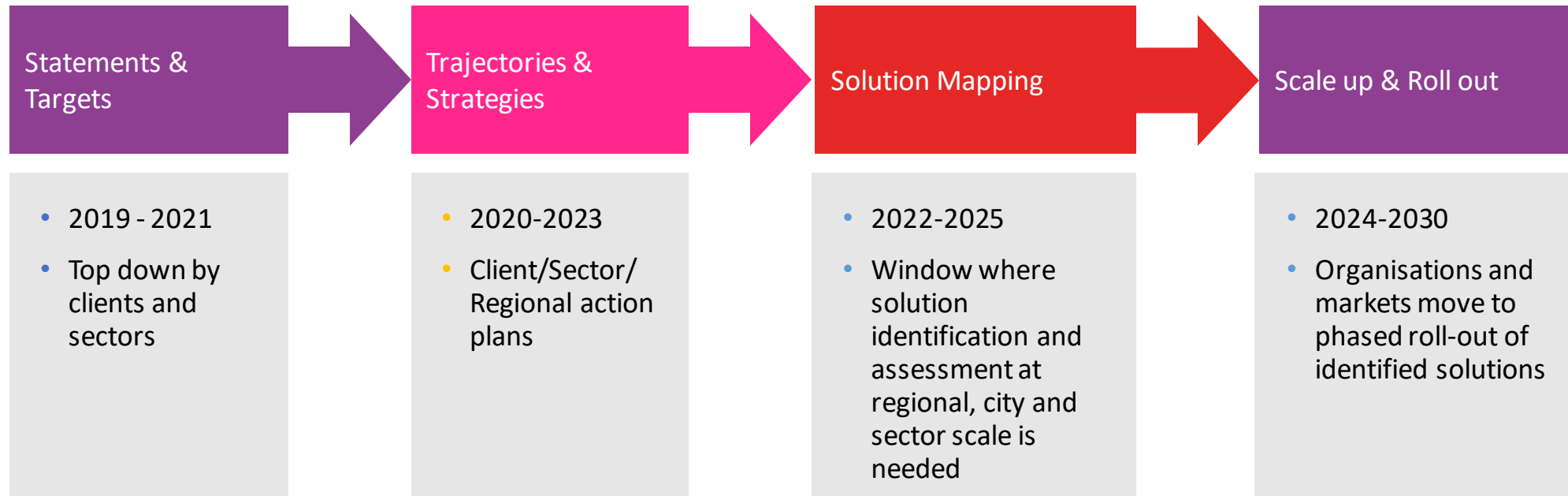
**\$2**  
billion  
turnover

Over  
**150**  
years'  
heritage

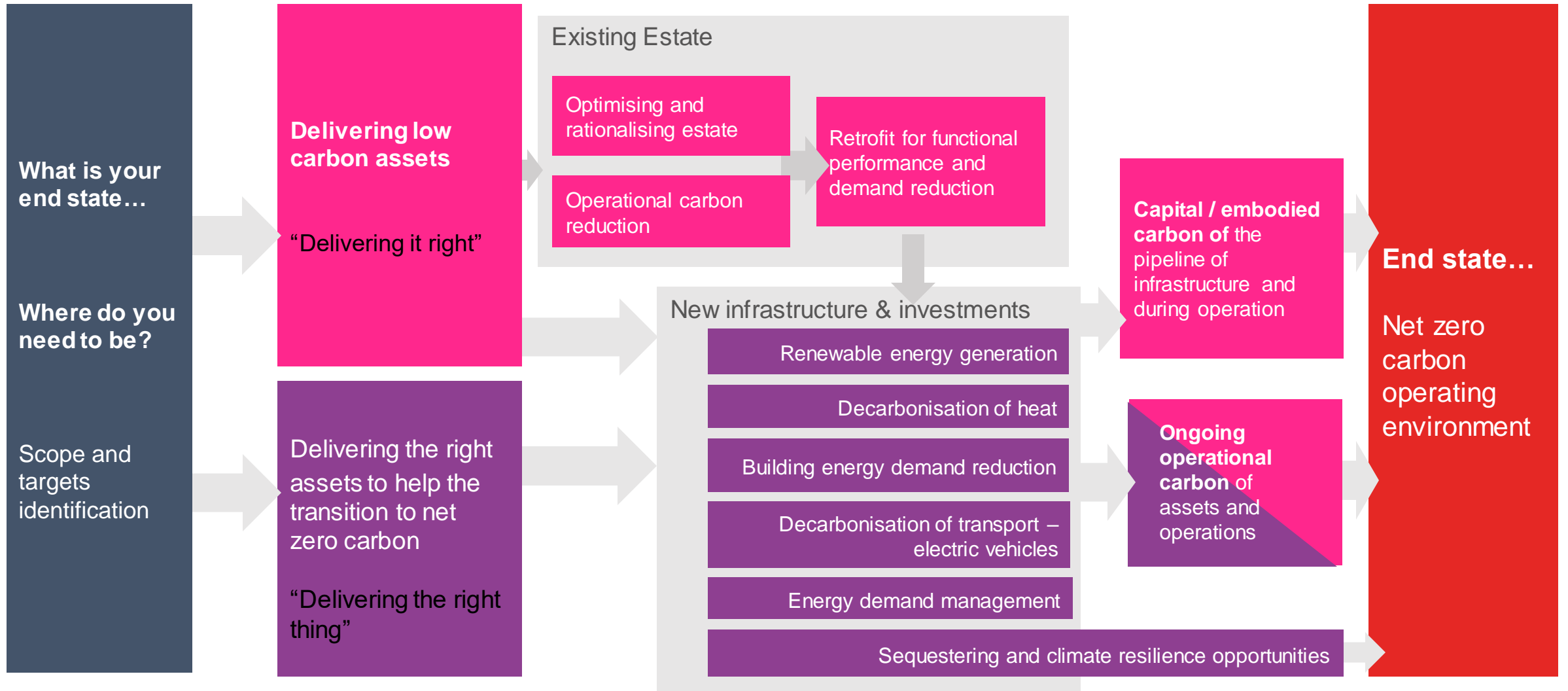
We're a global engineering, management and development consultancy focused on guiding our clients through many of the planet's most intricate challenges.

# Climate, Net Zero and beyond

Market trajectory to 2030



# Components of net zero carbon

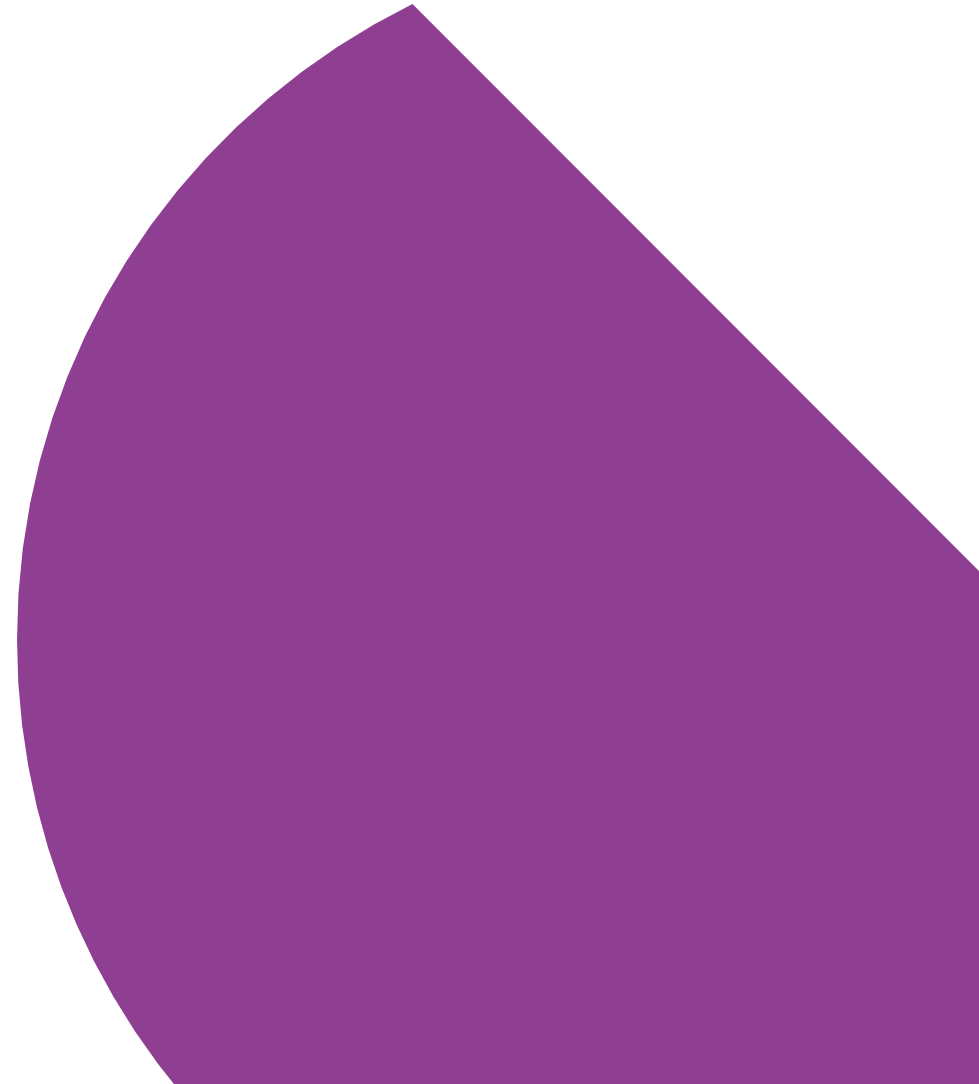






# Thank you

Luke Strickland  
[luke.strickland@mottmac.com](mailto:luke.strickland@mottmac.com)



# Householder Experience of Future Homes

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Birmingham City University



# Householder Experience of Future Homes



**Dr Monica Mateo-Garcia**

MArch MPhil PhD PGCert FHEA

Senior Lecturer in Sustainable Built Environment



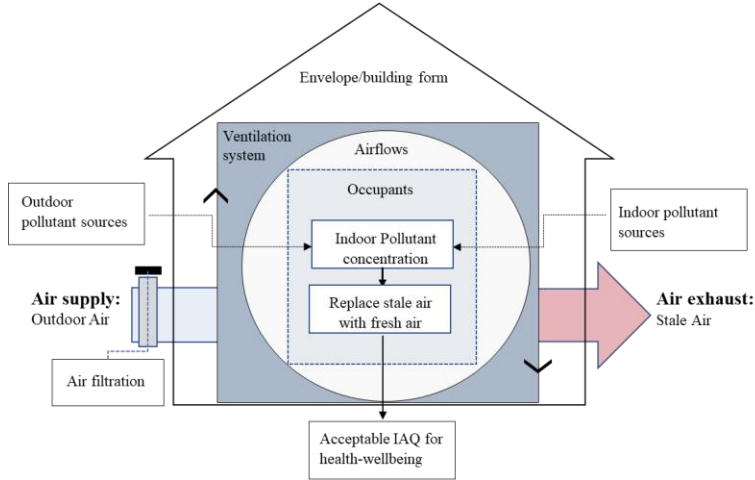
BIRMINGHAM CITY  
University



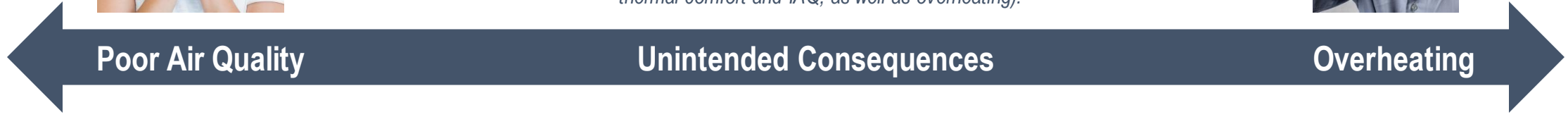
# CENTRE FOR FUTURE HOMES

FUTURE HOMES. HEALTHY HOMES

HELPING ORGANISATIONS  
CREATE BETTER HOMES WITH  
THE LATEST RESEARCH



*Increased thermal insulation and air tightness are causing unintended consequences (low thermal comfort and IAQ, as well as overheating).*



**REAL WORLD  
RESEARCH**

**Robust solutions  
Scalable  
Cost effective  
Human behaviour and wellbeing**

**LIVING LAB**

# Centre for Future Homes. Research Projects

## Improving Air Quality and reducing overheating

## Future Homes Standard

## Sustainable low-carbon retrofit

## Occupant engagement through technology

1

**Indoor Air Quality and overheating**  
(with Redrow, Taylor Wimpey, Barratt)

2

**Future Homes Eco Drive**  
(with Midland Heart HA)

3

**Retrofit performance (ERDF)**

4

**Digital Home User App**  
(with Covatic and School of Computing)

5

**Future Homes Air Quality**  
(with Leeds University, UKRI NERC project)

6

**Future Homes Elvetham Rd**  
(with Midland Heart HA)

7

**Ecrofit SAP**  
(with ERDF and School of Computing)

8

**Intelligent air-sourcing to net zero**  
(with Wondrwall and Daikin)

9

**I am Zero**  
(with Covatic and School of Computing)

10

**Future Homes Project**  
(with Keepmoat)

11

**Energy Performance gap in UK Housing stock (PhD)**

12

**Heat Pump research**  
(with Dept of Engineering)  
(Heat Pump Challenge)





PROJECT 80  
HOMES FOR THE FUTURE



- **Design and Build** (difficulties and opportunities)
- **Monitor Building performance** energy (cost), carbon, air quality
- **User experience and learning**
- Costing, economics and carbon accounting





# Headline Results

- 12 homes, 3 different solutions SUCCESSFULLY delivered
- Adapted conventional house types and masonry construction
- Designed to 80-90% reduction in carbon from 2013 regulations
- 70% carbon reduction with heat pump and PV over gas in 2025 design
- Heat pumps easily deliver over 20°C even when outside -7°C.
- Scheme 15% more expensive overall but early adoption and variety cost
- Small reduction in bills
- Occupants delighted with comfort

- 4 sets of interviews plus visits: prior to occupation, occupation, mid term, end of heating season.
- Health and Thermal Comfort
  - All occupants said they were *“happy with their new homes”* and *“were happy with the [thermal comfort]”*.
  - none of the family members had experienced the ‘recurring issue of asthma’ since moving into their new home
- Heating Controls
  - Even with manuals, webinars and visits, some occupants said they were not fully conversant with the space heating controls
  - Detected an excessive spike in energy usage during the nights; discovered fan heaters
- Ventilation
  - Many households reported opening their windows all day even with MVHR as they said they liked *“fresh air”*
  - Flooring in some houses covered the ventilation pathways under doors
  - Internal doors were open during the day but closed at night

# Learnings and Recommendations



# Heat pump strategy

- Heat pumps should be more standardised
- Controls need to be more user-friendly
- Different occupant strategies need accommodating (particularly the desire to have intermittent operation)
- Effective commissioning and on-going maintenance are essential





# Ventilation strategy and overheating

- A ventilation operation strategy for contractors, maintenance people and occupants is needed for long-term success
- Occupants need to understand their role in achieving healthy air and ventilation, and how their lifestyle choices affect the air quality
- Ventilation pathways need to be understood by door and flooring fitters, as well as occupants (fire safety)



# Performance and condition reporting

- Achieving significant reductions in energy use depends on the lifestyles of occupants.
- Future homes are more complex. Real-time monitoring is advised to ensure low carbon and healthy environments, also basis of feedback to occupants
- Home occupiers need clear and concise information to influence behavioural change and ensure the continued effectiveness of the home.



# Headline recommendations for Users

- Occupants need to be provided with more **information** about their home, its equipment and the influence of their lifestyle to bring about low carbon living.
- The **handover** to occupants needs to be carefully managed over an extended period.
- Heat equipment, controls, ventilation and buildings must be designed to be understandable and **operable** by occupants.

# MANY THANKS

Dr Monica Mateo-Garcia  
monica.mateogarcia@bcu.ac.uk

## PROJECT 80 – ECO DRIVE HANDSWORTH

FUTURE HOMES STANDARD CASE STUDY

Interim Report July 2023

**Report Authors**

Monica Mateo-Garcia  
Emmanuel Aboagye-Nimo  
Franco Cheung  
Kui Weng  
Mike Leonard  
Tony Hopkin  
David Boyd



<https://www.bcu.ac.uk/business/partnerships-and-projects/projects/the-centre-for-future-homes/future-homes-standard-case-study-eco-drive-handsworth>

# Thermal Imaging for Retrofit - Skilled Mapping





Inception  
Program

# CUT HEAT LOSS

*January 2024*

**Maxi House Halesfield 20, Telford, TF7 4QU**



## Founding Team

Alex Wrigglesworth, CEO  
Isabelle Bonnet, CTO  
Harry Finley, COO &  
thermographer

## Why the West Midlands

**18%**

Households in the West Midlands live in fuel poverty

**£200M**

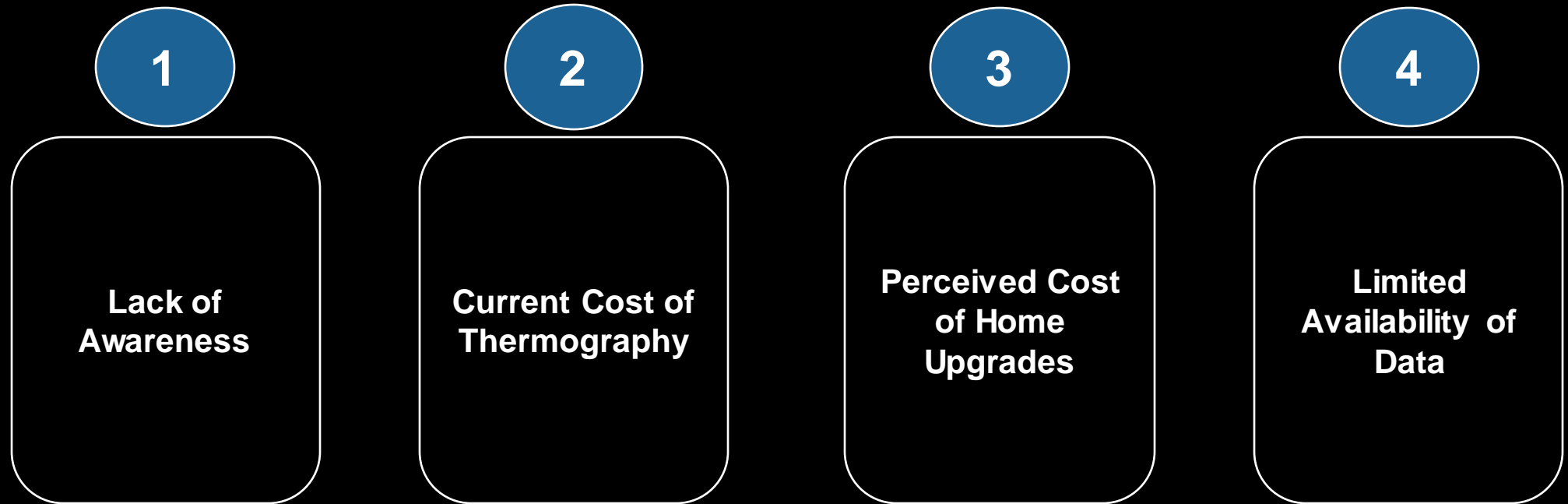
*is lost each year through inefficient West Midlands homes*

**50%**

*of energy efficiency can be saved through retrofitting*

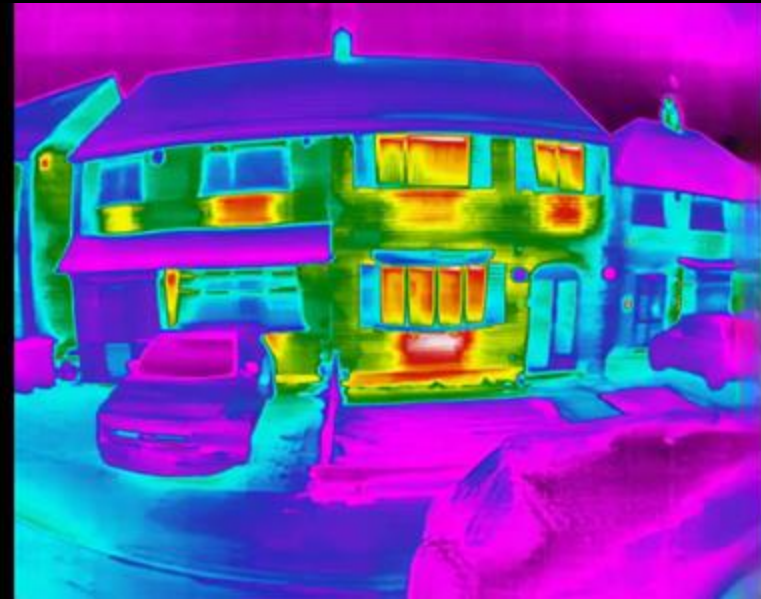
# The Problem

There are multiple barriers to home occupiers taking proactive steps to improve their home energy efficiency, all of which drive customer inertia and block progress on a national scale





# The Issue of Awareness



Seeing the heat loss from one's homes increases the likelihood of taking energy efficient actions with 40% taking action with a Thermal Image vs 16.7% without (*Plymouth-University-study,2016*)

# Outreach

Our communication plan started 22nd January across Birmingham to drive awareness of CutHeatLoss



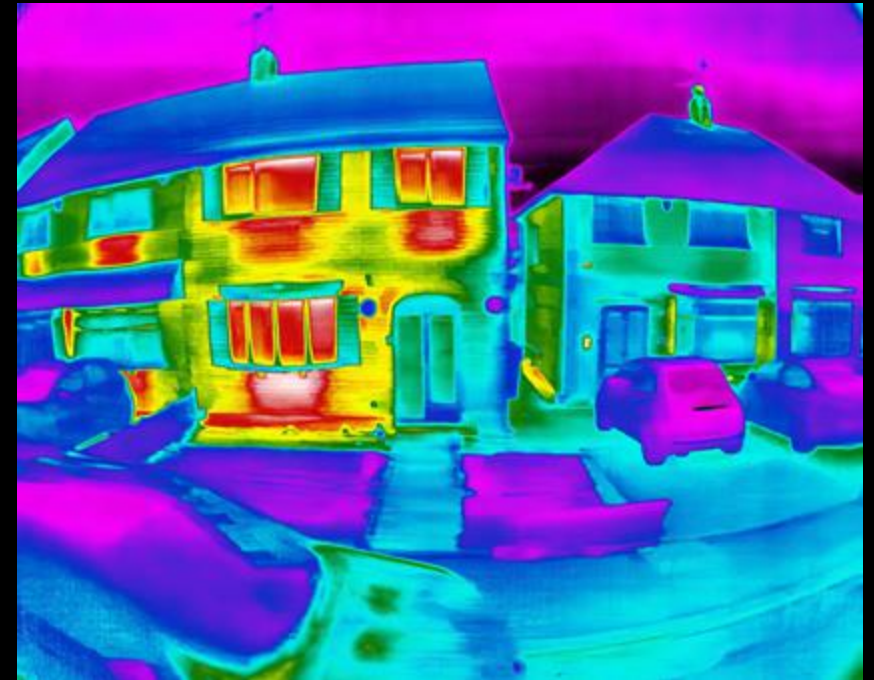
# What We Do

CutHeatLoss is the first and only national-scale thermal data collection provider, capturing high resolution thermal imagery, analysed using AI, to provide affordable thermal reports

Data captured via mobile mapping in  
West Midlands 15/01/24



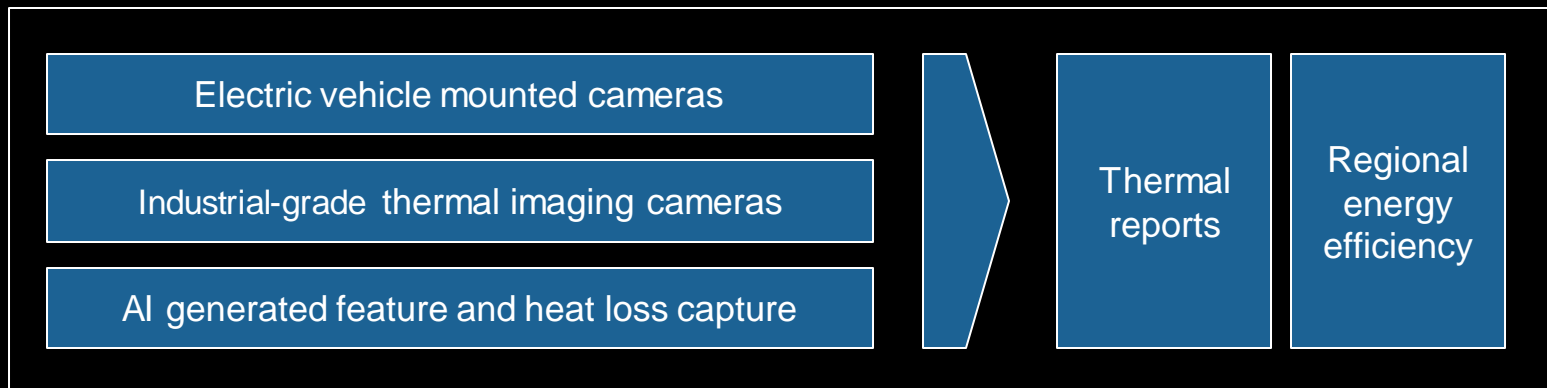
Thermal reports for customers  
to identify heat loss



# How we do it

We are proud to be creating what we believe will be the most advanced thermal mapping system in the world

- ✓ Industrial-grade thermal imaging cameras that detect and visualise the radiometric this into a visible image of up to 1M temperature differences
- ✓ Our unique mobile mapping system enables us to capture large regions in days
- ✓ AI model generates targeted recommendations, reducing dependency on manual thermography.
- ✓ This data set will fuel tomorrow's geospatial applications





2024

This year we aim to capture 80% of the UK and automate analysis with AI.....



2024

.....and automate analysis with AI





# The Team

Our core team is composed of proven experts in mobile mapping at scale and industry leading thermography

CTO



**Isabelle Bonnet**

Machine learning, statistics & math  
engineer and tech entrepreneur

CEO



**Alex Wrigglesworth**

13 years of experience in operations  
worldwide, 5 in mobile mapping

COO



**Harry Finley,**

5 years experience in mobile mapping  
and trained thermographer

# Skilled Mapping Ltd

Halesfield 20, Telford, London, England, TF7 4QU

Private limited Company, incorporated on 25 September 2019

Alex Wrigglesworth, founder

[alex@skilledmapping.com](mailto:alex@skilledmapping.com)

+44 7904455422

# Starting on the Retrofit Journey

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## Furbnow



# About Furbnow

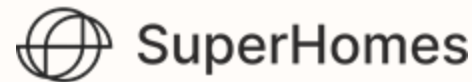
**Furbnow** is a retrofit service for homeowners looking to start their journey to reducing their energy bills and carbon emissions and having a warmer home.

Customers want impartial advice and clear information on what will work for their home and lifestyle, how they can stage the work to fit their budget and minimise disruption.

Furbnow's mission:

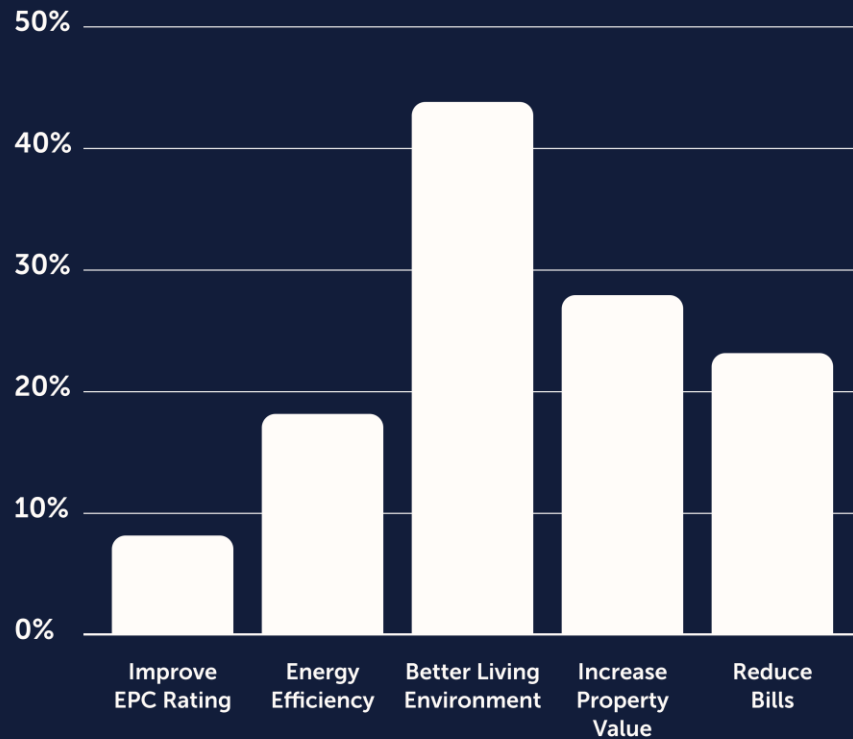
*to help every household decarbonise their home, without the hassle.*

Delivery Partners with



# Homeowners

Motivations for home improvements



Source: Mortgage Advice Bureau (2022)



Don't know where to start



Unsure where best to invest in my home



Can't find the right tradespeople I trust





# Fragmented Market



## Homeowners

Wants affordable to run, warm, healthy home that reduces carbon emissions

Need independent, trusted advice to navigate complexity of retrofit

Need reassurance and support to make the decision to take on a retrofit project



## Installers and Surveyors

Set up to sell individual products and delivery grant programmes

Business at risk from sector growth/decline linked to grant programme announcements

Want higher value customers and jobs with minimal acquisition effort

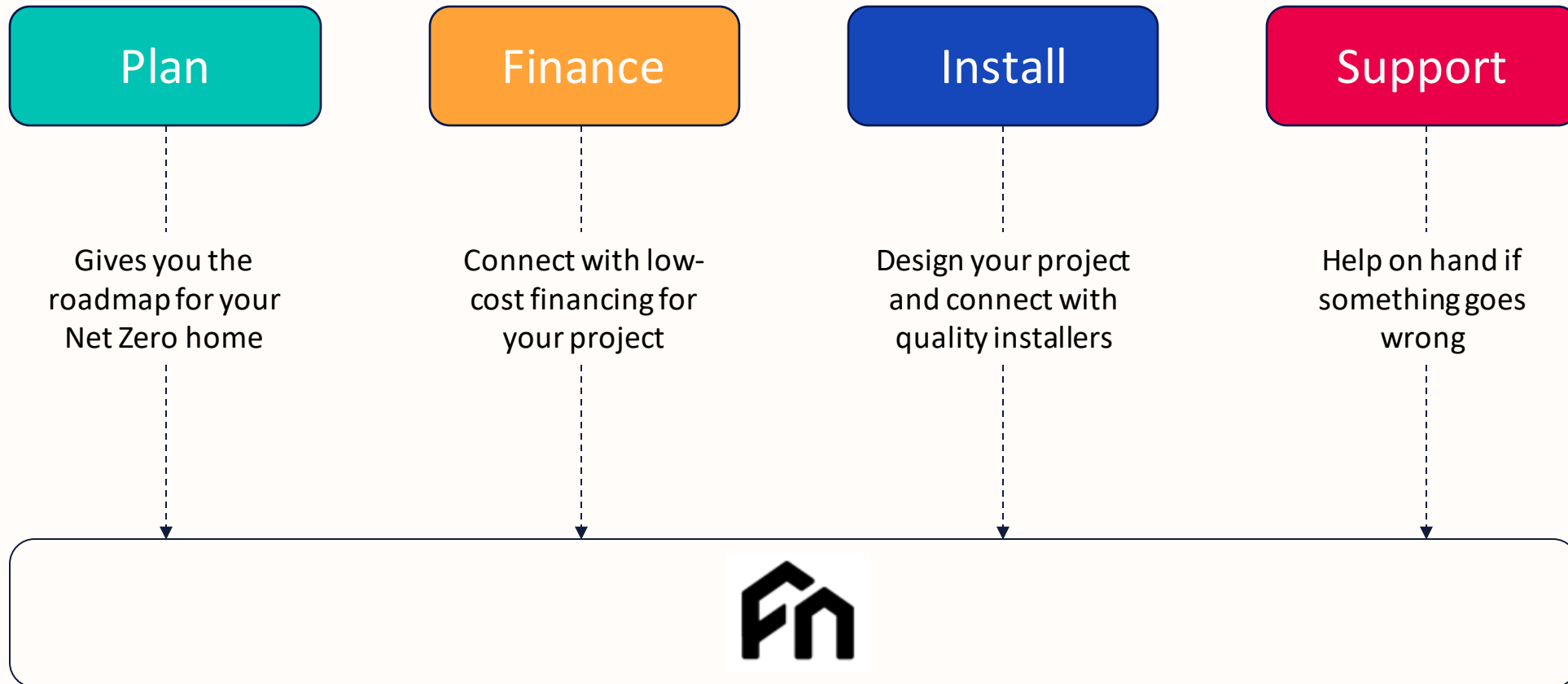


# furbnow

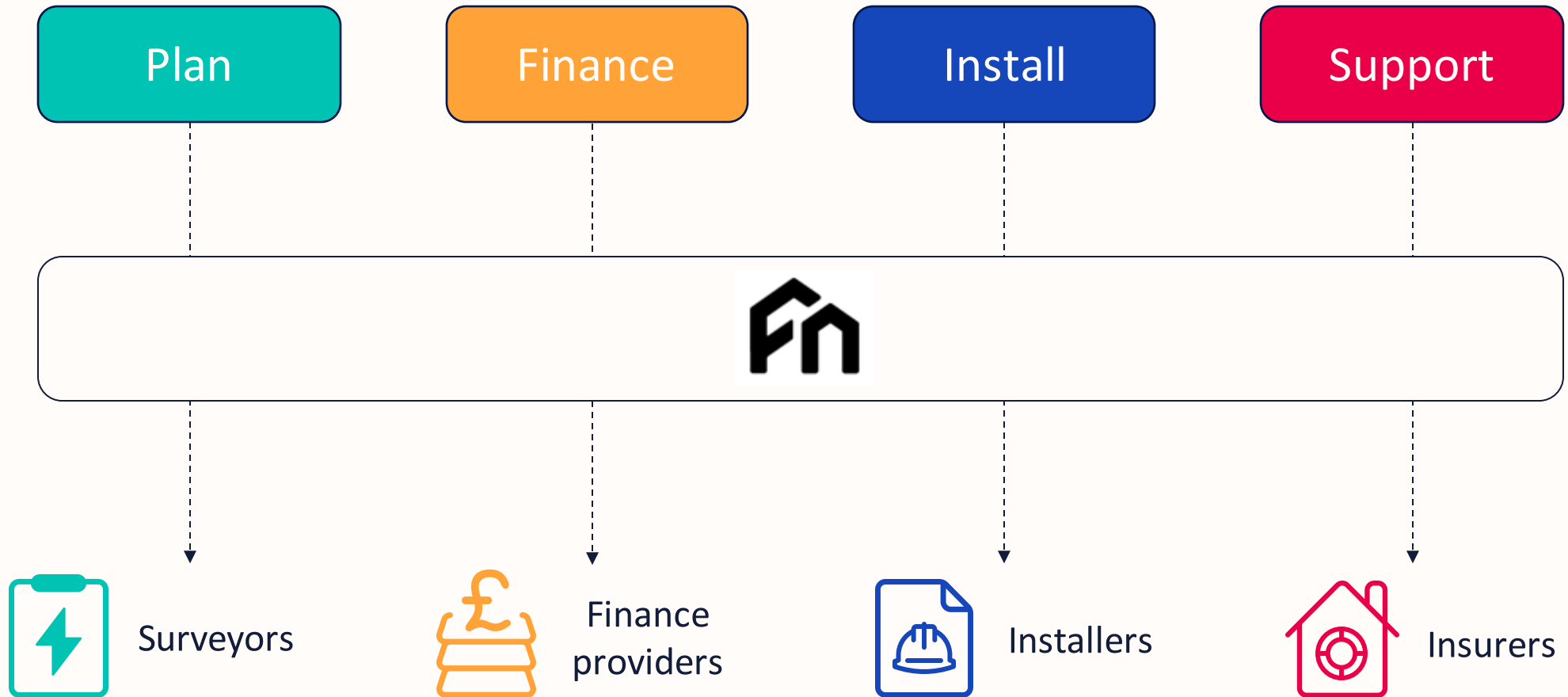
Drawing together a fragmented supply chain  
to accelerate home retrofit



# This is how we get your home to Net Zero



Our platform integrates the customer journey to drive quality and scale



# Driving and aggregating consumer demand - a win for every platform partner



Surveyors

Easy access to leads  
within their areas

B2B tools to help working  
efficiency



Finance  
providers

Activate consumer interest  
in green finance

Proof of work to enable  
green lending



Installers

Qualified leads at low CAC

Customer pre-sales and  
aftercare



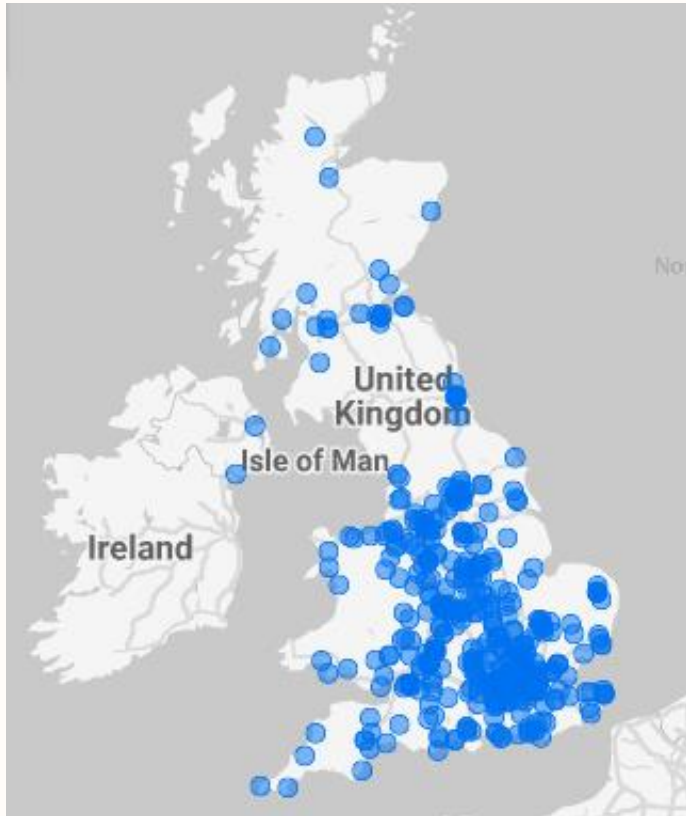
Insurers

New market insurance  
opportunity

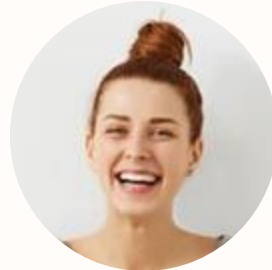




# Customer Feedback



Furbnow Sign-ups (March 2023)



“I want someone who’s going to look at my whole house to retrofit it and deliver a great result. That’s what I’m looking for.”



“I feel really reassured [that Furbnow] can help me find installers and get my retrofit project started.”

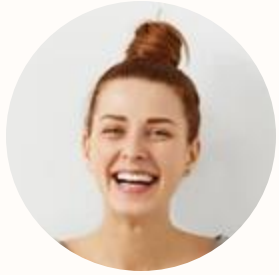


“After what felt like a lot of fruitless phone calls to find an expert, step forward Furbnow, a firm set up to fill exactly this space in the market.”

**The  
Guardian**



# Customer Feedback



“I want someone who’s going to look at my whole house to retrofit it and deliver a great result. That’s what I’m looking for.”

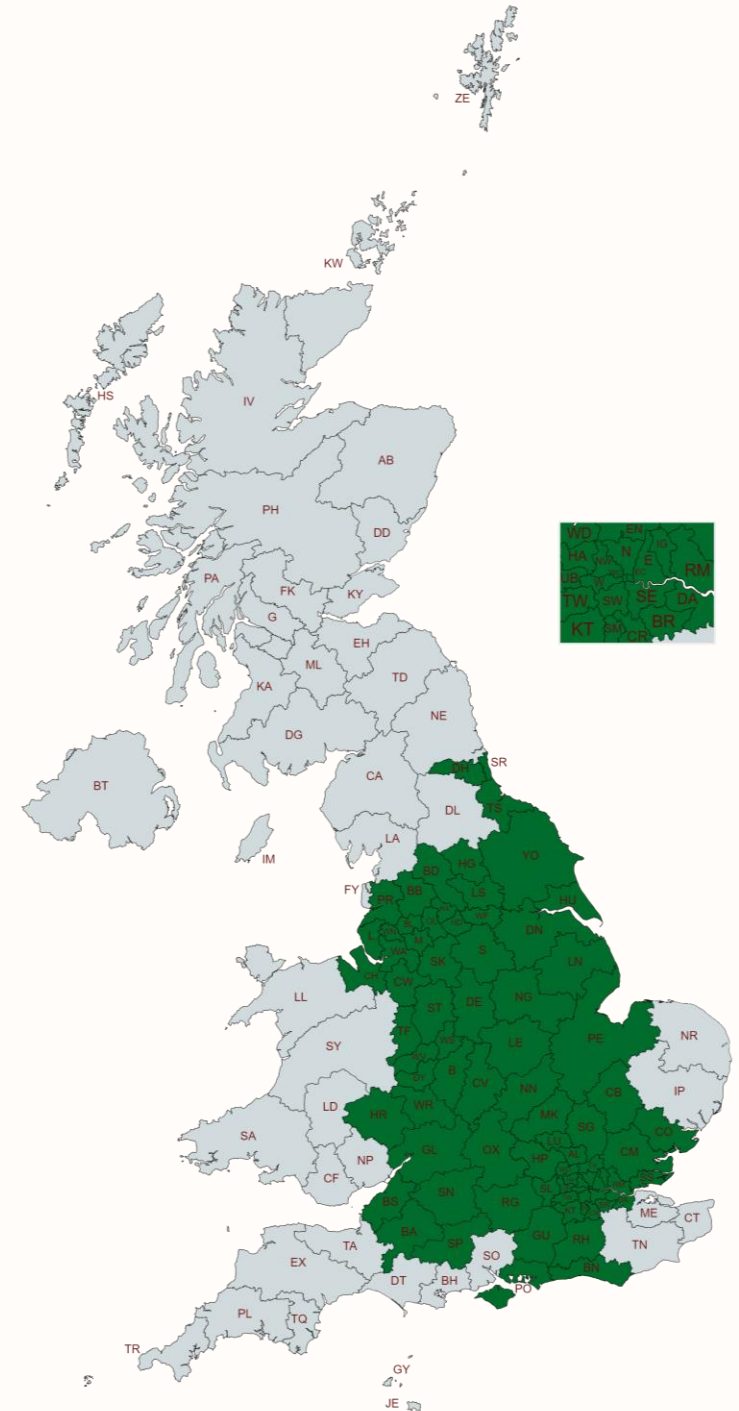


"Very satisfied - everything was clearly explained, and sufficient information provided, in not too technical a form, to enable me to form a judgement on the proposed work."



“After what felt like a lot of fruitless phone calls to find an expert, step forward Furbnow, a firm set up to fill exactly this space in the market.”

**The  
Guardian**





Delivering low carbon homes,  
without the hassle

[becky@furbnow.com](mailto:becky@furbnow.com)



# Q&A





# Comfort Break



# Update on Innovation Alliance and West Midlands Innovation Programme

-

Pam Waddell, Innovation Alliance  
for the West Midlands



# Innovation Alliance for the West Midlands\*

A bottom-up, independent Alliance of diverse organisations active or interested in (science and technology based) innovation across the WM region

Our two core aims:

- Build and maintain a thriving innovation ecosystem
- Stimulate and catalyse a pipeline of support innovation activity

\* Established Jan 2018, building on BSC partnership since 2007





## Partners

UNIVERSITY OF BIRMINGHAM | BCRRE



sustainability west midlands





# The WM Innovation Programme (WMIP)

- The Innovation Alliance WM is the partnership that drives WMIP in with the WMCA.
- WMIP pillars:
  - **Gateway:** sector focused and sector-agnostic innovation networks and events, open for all
  - **People:** A Virtual Innovation Team of sector experts embedded in business-facing partner organisations offering specialist innovation support.
  - **Project:** A portfolio of pilot innovation support projects addressing needs and gaps in support is beginning to come – watch this space.
- Collaborate with Innovation Accelerator and other support activity

Locally-led Innovation Accelerators delivered in partnership with DSIT, Innovate UK and City Regions



Innovate UK

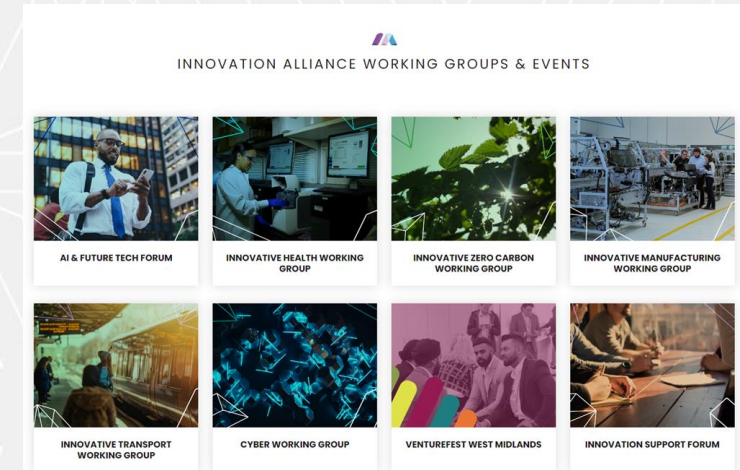


West Midlands  
Combined Authority



# Upcoming Working Group Events

- **Innovative Manufacturing WG:** Sustainability for Manufacturers, February 7th at WMG
- **Innovative Health WG:** Innovative Healthcare Solutions: Harnessing 3D Printing and Advanced Prototyping, 22nd February
- **Innovative Transport WG:** SME Accelerator Opportunities, 28th February with Connected Places Catapult
- **AI & Future Tech Forum with Innovative Health WG:** on AI in Healthcare (date tbc)





# Venturefest West Midlands

- Connects and informs innovators, entrepreneurs, early and growth-stage businesses, investors, universities and support organisations
- Annual event in Birmingham with 600+ attendees: 21<sup>st</sup> March 2024 – keynotes, panels, pitching competition, exhibition, networking:
  - Stands available
  - Registration open [www.venturefestwm.co.uk/register](http://www.venturefestwm.co.uk/register)
- Venturefest Mobile Hub events targeting local ecosystems:
  - Coventry University, 8th Feb – focus on immersive technology
  - Further events in planning for spring/ summer 2024



## How to get involved:

- Find out more on IAWM/ WMIP and register for newsletters and networks <https://innovationwm.co.uk/>
- Attend Venturefest WM 2024 <https://www.venturefestwm.co.uk/>

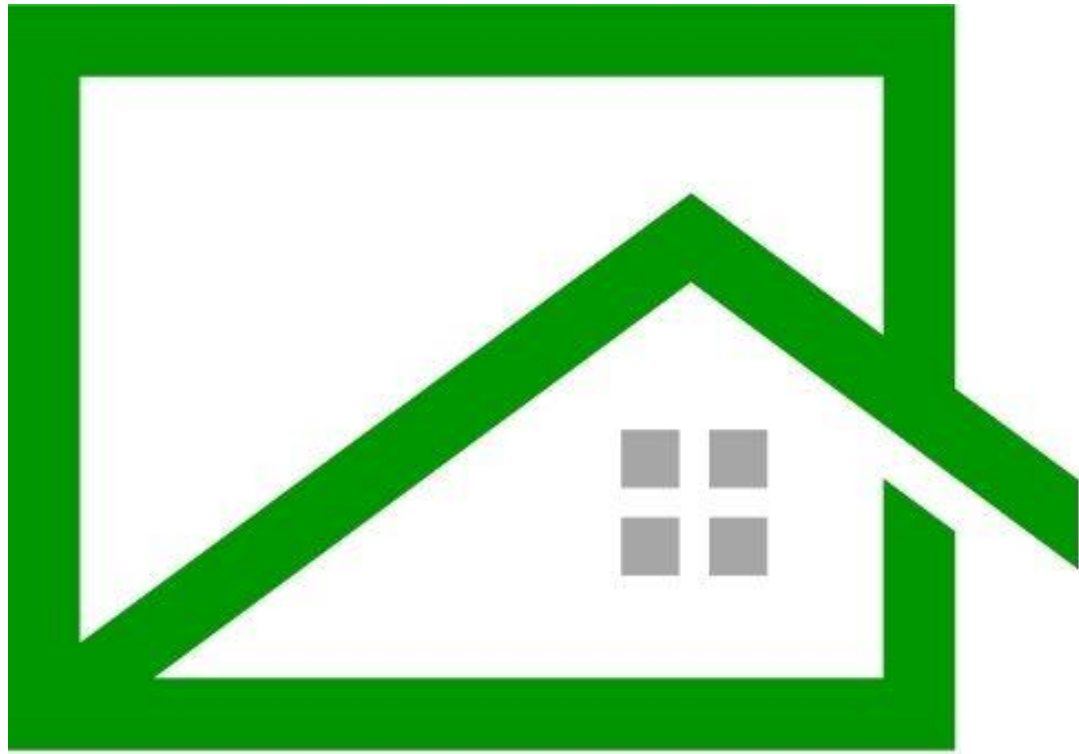
# Collaboration for Innovation in the Retrofit System

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Richard Bubbb







**SHAP**

SUSTAINABLE HOUSING  
ACTION PARTNERSHIP

# Innovative Zero Carbon Working Group

**24.01.2024**

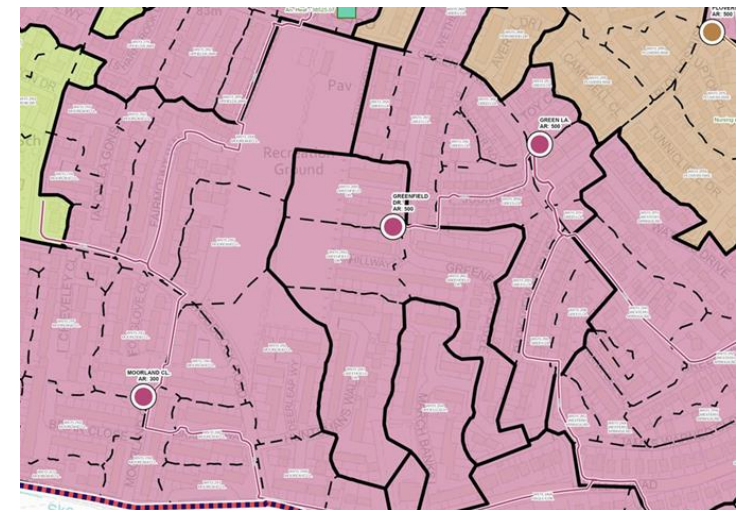
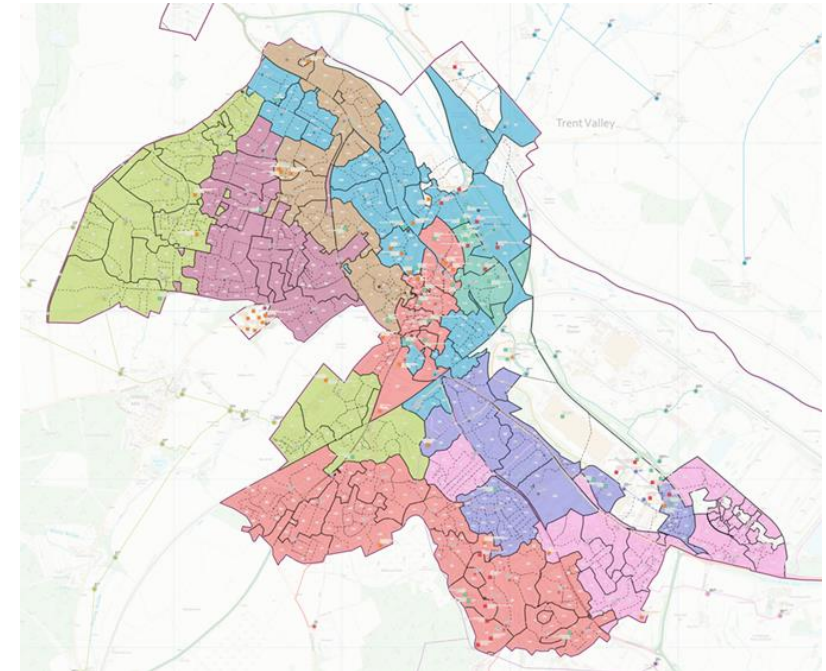
**Richard Bubb**

# Data-driven retrofit

SHAP worked on Zero Carbon Rugeley to create a retrofit roadmap for 10,200 properties, using EPC data, actual gas and electricity use, sample property assessments and incorporating some non-RdSAP data.

The first iteration showed that around two-thirds of the 101 substations were up to 300% over capacity when moving to electric heating.

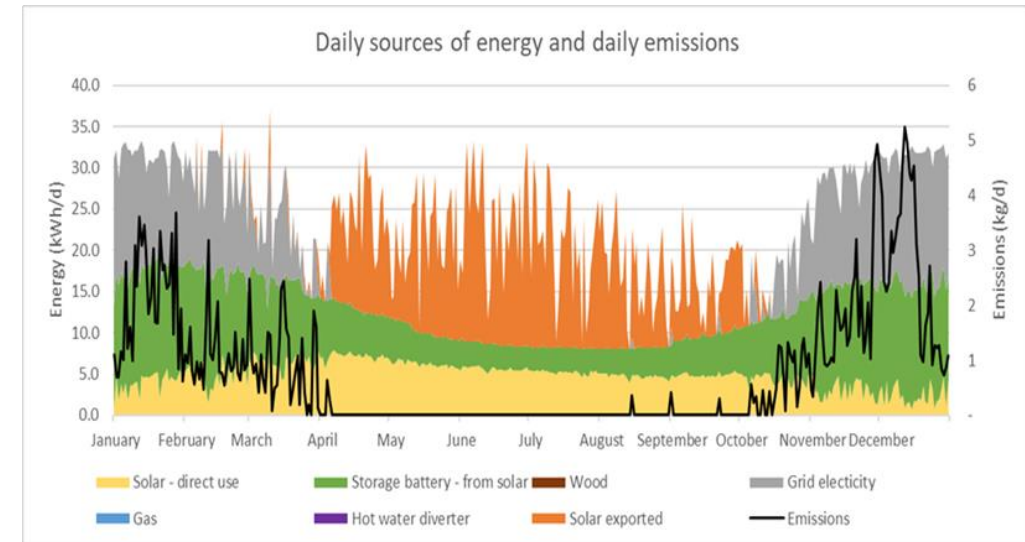
Properties needed a deeper fabric retrofit to reduce space heating and energy demand.



# Data-driven retrofit

The next iteration of modelling included:

- Heat demand based on three years of historical weather patterns.
- Solar PV and battery storage to generate and store electricity.
- Fabric improvement, energy use and generation based on optimised model of archetypes.
- Payback estimated from energy bills savings and use of flexible tariffs (including charging and discharging from the grid).



# Data-driven retrofit – key learning points

- Deep fabric retrofit is required to avoid grid constraint, together with local energy generation and storage.
- Managing charging at an area level is needed to avoid local peak use, as batteries could all charge when tariffs reduce at off-peak times.
- Lower energy demands create more financial benefits when using flexible tariffs, although this needs engaged householders or some level of automation to maximise.
- This is getting complex! Delivering retrofit at scale should be regarded as a complex system requiring long-term planning and the involvement of a broad range of stakeholders.

# Retrofit as a system

Innovation is not just technology. How do we innovate our approach to aspects that we feel need to be integrated instead of separated when considering a complex system:

- Zero carbon ambitions
- Property assessment – individual detail against scale
- Finance – short-term capital or detailed modelling and energy trading
- Supply chain – scale and collaboration
- Retrofit design and building passport
- Skills and quality
- Customer journey
- Regulation and legislation – barrier and opportunities
- Area co-ordination – including different tenures





# Retrofit as a complex system

Characteristics of a complex system:

- Inherent variety and uncertainty
- Dynamic and constantly evolving
- Requires constant reinterpretation and sensing

How can we use *innovation* to respond to factors within a complex system?



# Retrofit as a complex system

Characteristics of a complex system:

- Inherent variety and uncertainty
- Dynamic and constantly evolving
- Requires constant reinterpretation and sensing

How can we use *innovation* to respond to factors within a complex system?

- How do we collect and share data and observations better – of evolving and emerging processes?
- How do we create more openness but still protect intellectual property?
- What do you need and what do you bring to enable innovation to grow through collaboration?

# Discussion



# Roundtable: collaboration and partnership opportunities



Please take your time to complete our short feedback form. Your ideas are vital and will help us ensure future events align with your expectations.

Innovative Zero Carbon Working  
Group Evaluation Form 24 January  
2024

