XCO2

RETROFIT FOR THE HAMPSTEAD GARDEN SUBURB

AGENDA

1. Introduction
2. **Overview and context**
3. **Energy Use, Retrofit methodologies & Risk Assessments !**
4. **The Elemental Approach-Loft/roofs, Walls, Floors, Windows/Doors**
5. **Meeting Residual Energy Demand- Heating & Hot water**
6. ‘**Unregulated’ Energy**
7. **Case Studies**
8. **Key Takeaways + Q&A**

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INTRODUCTION

XCO2 is a 50-strong multi-disciplinary consultancy providing innovative and robust solutions for energy, sustainability, environmental and building services design and operational performance

ENERGY • SUSTAINABILITY • MEP

TARGETING NET ZERO, FROM CONCEPT TO OPERATION

PLANNING

Energy

Whole-Life Carbon

Sustainability

Daylight and Sunlight

Overheating

Air Quality

Circular Economy

MASTERPLAN

Environmental Design

Wind Microclimate

Environmental Strategy

Services Infrastructure

CERTIFICATION

BREEAM

LEED

WELL

Passivhaus

CEEQUAL

Part L

Thermal Bridging

MEP

Mechanical, Electrical and Public Health

HVAC Assessments

Load Assessments

Services Retrofit

Utilities

Peer Reviews

PERFORMANCE

Energy Audits

Indoor Air Quality

Post-Occupancy Evaluations

Energy and Emissions Monitoring

Occupant Satisfaction Assessment

CLIENTS


Peabody


Notting Hill
Genesis


pocket
living


populo
LIVING


catalyst


THE ROYAL BOROUGH OF
KENSINGTON
AND CHELSEA


ROYAL borough of
GREENWICH


Hackney


Southwark
Council
southwark.gov.uk


Brent


Camden


ISLINGTON


L&Q


the
guinness
partnership


Waltham Forest

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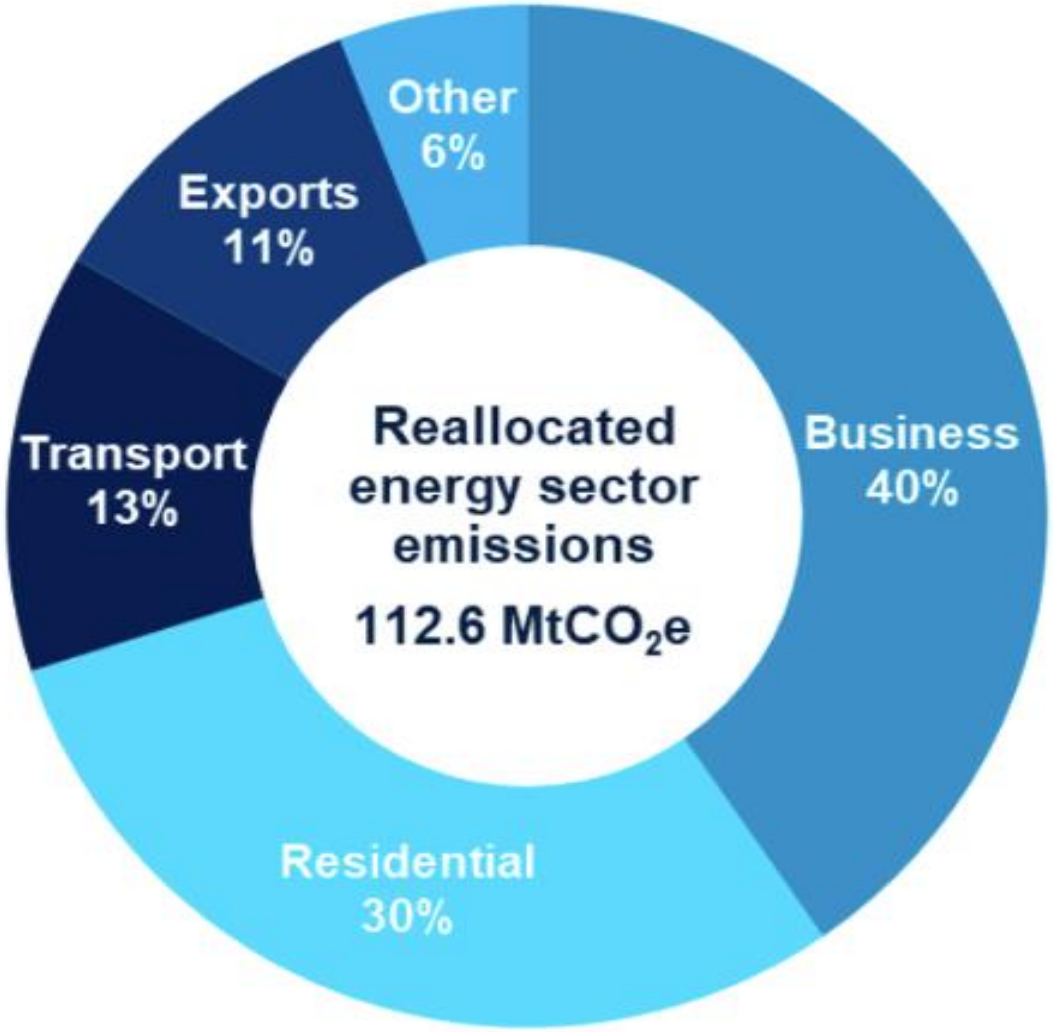
OVERVIEW AND CONTEXT

PLANETARY CONTEXT

UK Emissions Context & net zero buildings



Source: BEIS 2021

25 Million comprehensive retrofits in 30 years with **ALL** pre 1990 homes complete by 2050

833,000 per year
3,307 per working day
or
1 every 40 seconds

FROM GENERATOR TO CONSUMER

nationalgrid

Essential Steps

Recipe

- 2.6m heat pumps by 2025
- Additional 912 mw of Solar PV
- Extensive Retrofit
- Thermal storage
- Intelligent demand side balancing to match supply availability.

Gas grid disconnection

60-65% energy demand reduction

Optimised renewable energy generation and efficiency

A. Design and deliver best thermal-envelope performance

- Wall, roof, floor, window and door insulation and air tightness

B. Design optimal ventilation and power systems

- Solar PV or thermal
- GSHP or ASHP
- Thermal storage
- Demand management

COPING WITH THE NEW NORMS: ADAPTATION & AFFORDABILITY CHALLENGES

3°c - 4°c

BAU GLOBAL WARMING

ADAPTATION

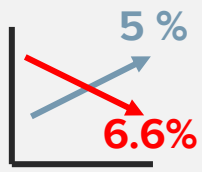
ADDRESSING THE CHANGING CLIMATE

Legal implications-unfit for habitation

2000

Annual UK overheating deaths

Overheating homes

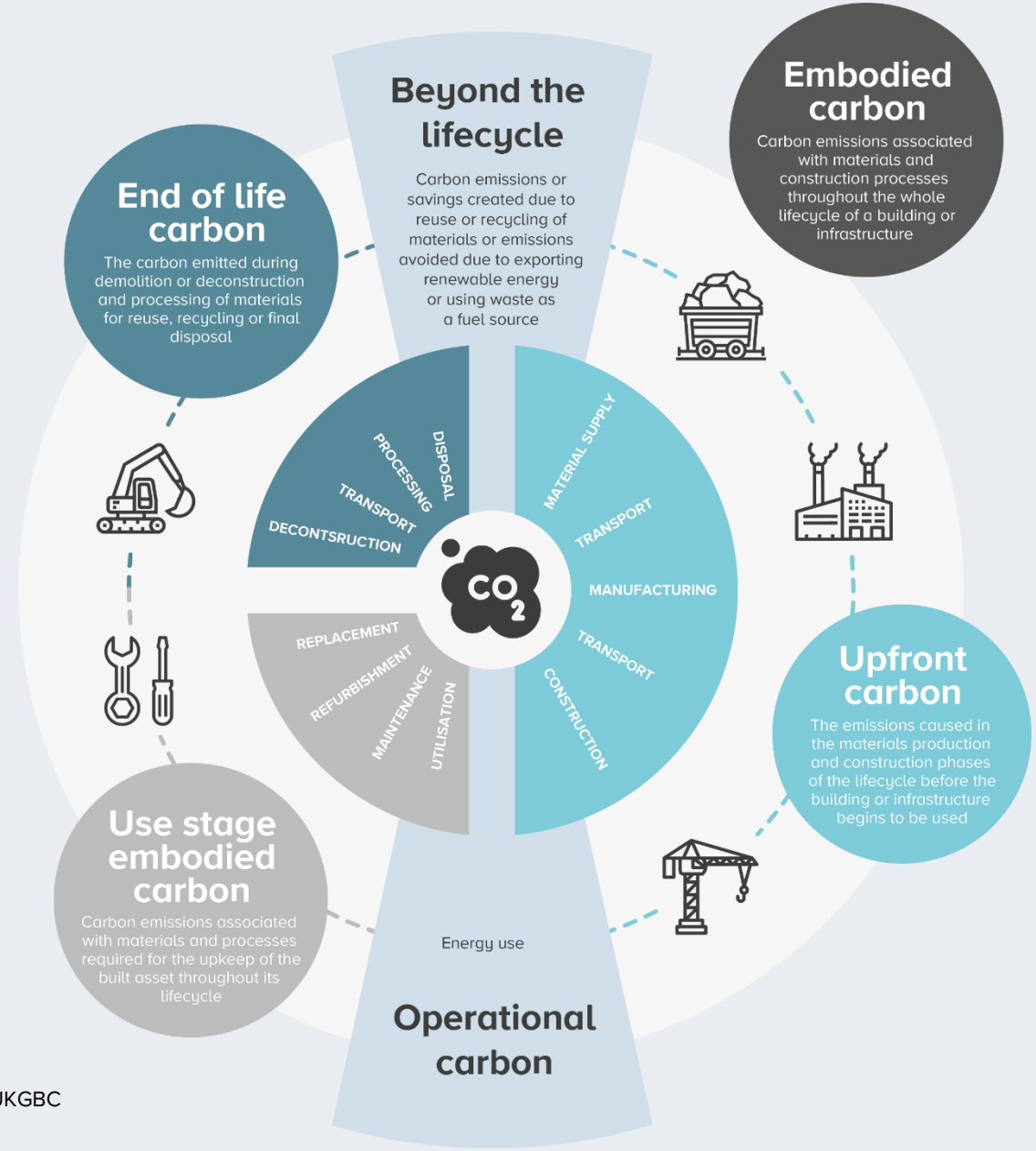


Heating Vs Cooling 2035

AFFORDABILITY

ADDRESSING THE COST OF LIVING CRISIS

150,000



WHOLE LIFE CARBON

=

OPERATIONAL CARBON

+

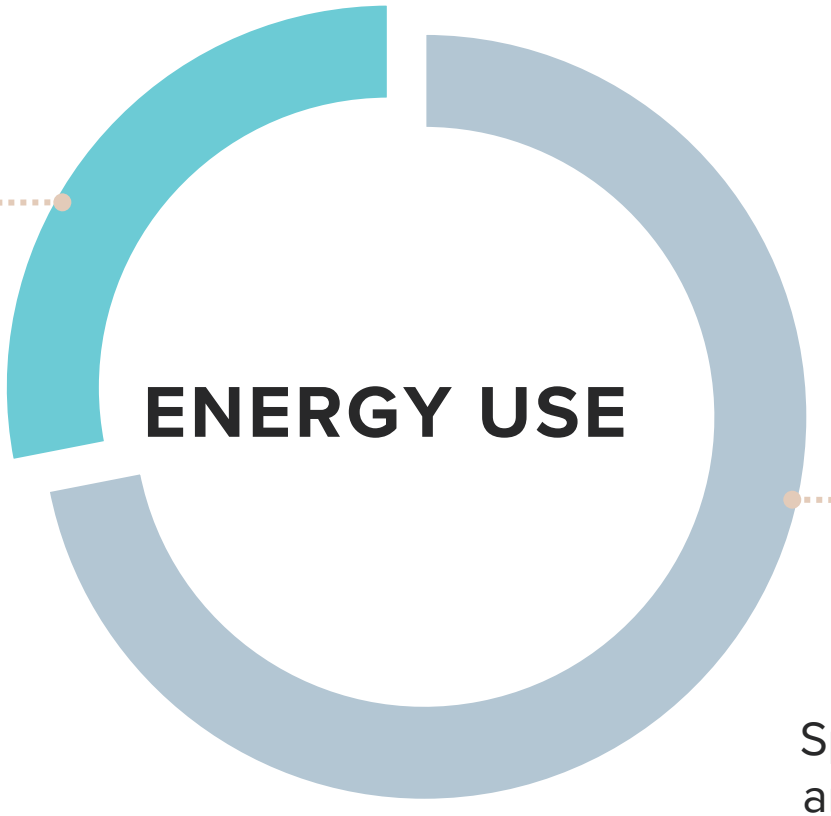
EMBODIED CARBON

ENERGY USE, RETROFIT METHODOLOGIES & PAS2035

AVERAGE DOMESTIC ENERGY CONSUMPTION

17-20%

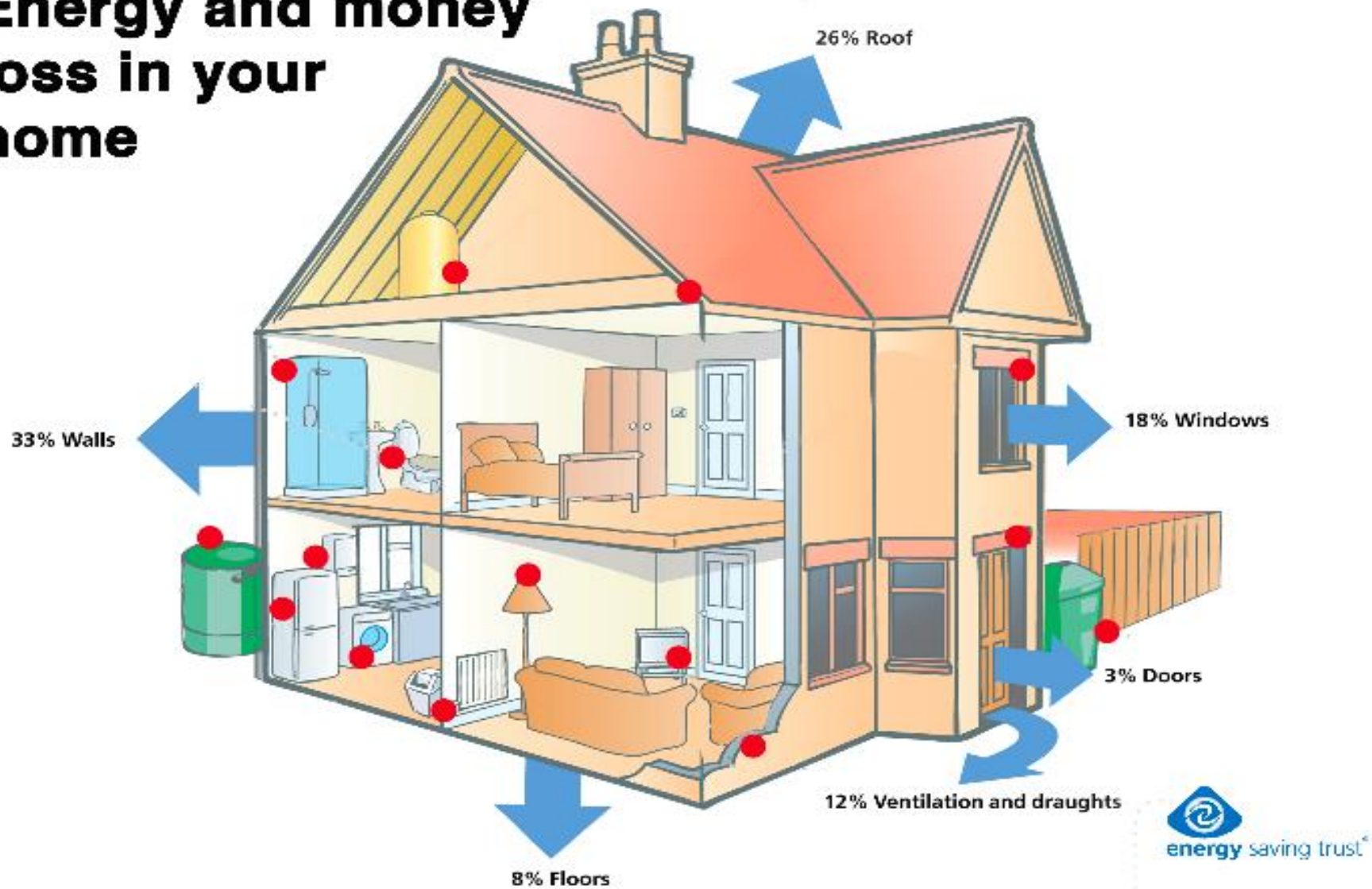
Light, Cooking,
Large Appliances,
Small Appliances



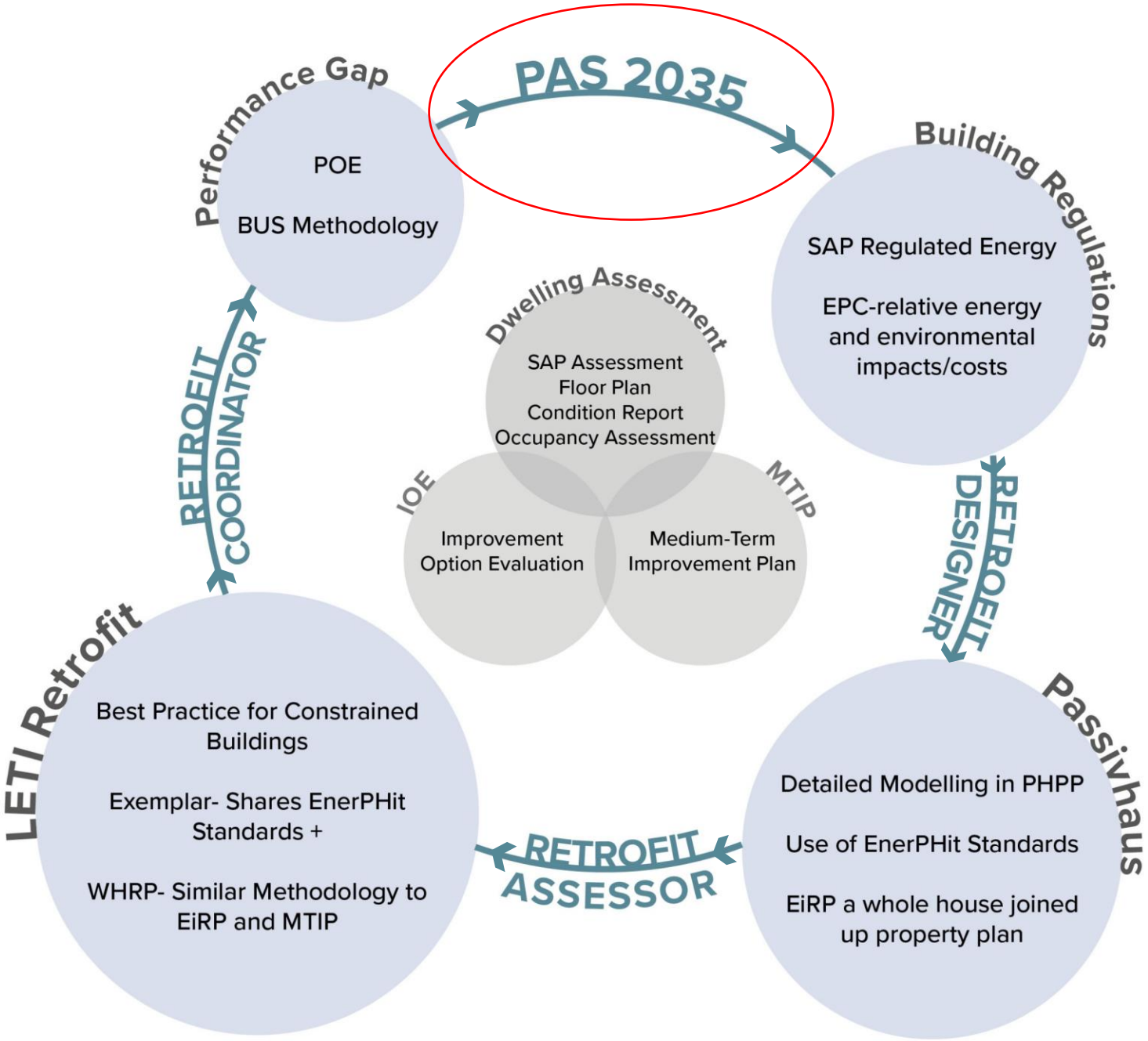
Space Heating
and Hot Water

80-83%

Energy and money loss in your home



energy saving trust


PAS 2035
Performance Gap
POE
BUS Methodology
Building Regulations
SAP Regulated Energy
EPC-relative energy and environmental impacts/costs
RETROFIT COORDINATOR
RETROFIT DESIGNER
Dwelling Assessment
SAP Assessment
Floor Plan
Condition Report
Occupancy Assessment
IOE
Improvement Option Evaluation
MTIP
Medium-Term Improvement Plan
LETI Retrofit
Best Practice for Constrained Buildings
Exemplar- Shares EnerPHit Standards +
WHRP- Similar Methodology to EiRP and MTIP
RETROFIT ASSESSOR
Passivhaus
Detailed Modelling in PHPP
Use of EnerPHit Standards
EiRP a whole house joined up property plan

PAS 2035 & the path to reduced risk in retrofit

WHY ?

Underperforms
- running costs
- carbon emissions
- occupant comfort

Poor indoor air Quality
- Carbon dioxide
- Carbon monoxide
- VOC's

Building Fabric deterioration
- mould growth
- wet rot
- dry rot

Human health impacts (Sick Building Syndrome)
- respiratory disorders
- chronic fatigue
- skin irritation

HOW ?

Property Risk Profiles & Design Paths
- high
- medium
- low

Sets Responsibilities
- Retrofit Assessor
- Retrofit Designer
- Retrofit Coordinator

Assesses
- existing condition
- occupant patterns/aims
- cost effectiveness

Recommends
- demand reduction/EE measures
- Residual energy strategies

AIMS

Medium Term Improvement Plan
- Sequenced single or multi phase interventions
- Bespoke to each property
- £ capital cost estimates
- kWh, CO2 and £ payback assessments
- Regulatory compliant

Fabric First approach
- all building elements considered
- ventilation strategies
- renewables
- Accredited installation
- Monitoring

- Registered record for future buyers

Measure	Capital cost	Carbon cost effectiveness	Disruption
Floors			
Floor insulation	££	😊😊😊😊😊	
Walls			
Internal wall insulation	££££	😊😊😊😊😊	
Cavity wall insulation	££	😊😊😊😊😊	
External wall insulation	££££/£	😊😊😊😊😊	
Roofs			
Loft insulation	££	😊😊😊😊😊	
Rafter insulation (only when reroofing)	£££	😊😊	
Windows and doors			
Replacement windows and doors (U value 1.8)	£££	😊😊	
Replacement windows and doors (U value 0.8)	£££££	😊😊	
Air tightness and ventilation			
Draught-stripping	£	😊😊😊😊😊	
Major air-tightness measures	££	😊😊😊😊😊	
Air-tightness measures with MVHR	£££	😊😊	
Lighting and appliances			
Low energy lights	£	😊😊😊😊😊	
Low energy appliances (marginal cost of replacement)	£££	😊😊	
Heating			
Replacement gas boiler	£££	😊😊	
Upgrading heating controls	££	😊😊😊	
Micro CHP	££££	😊	
Ground source heat pump	£££££	😊	
Air source heat pump	££££	😊	
Wood pellet boiler	££££	😊😊	
Renewable energy systems			
Solar hot water heating	£££	😊	
1kW photovoltaic panels	££££	😊	
Micro wind turbine	£££	😊	

THE ELEMENTAL APPROACH

LOFTS + ROOFS

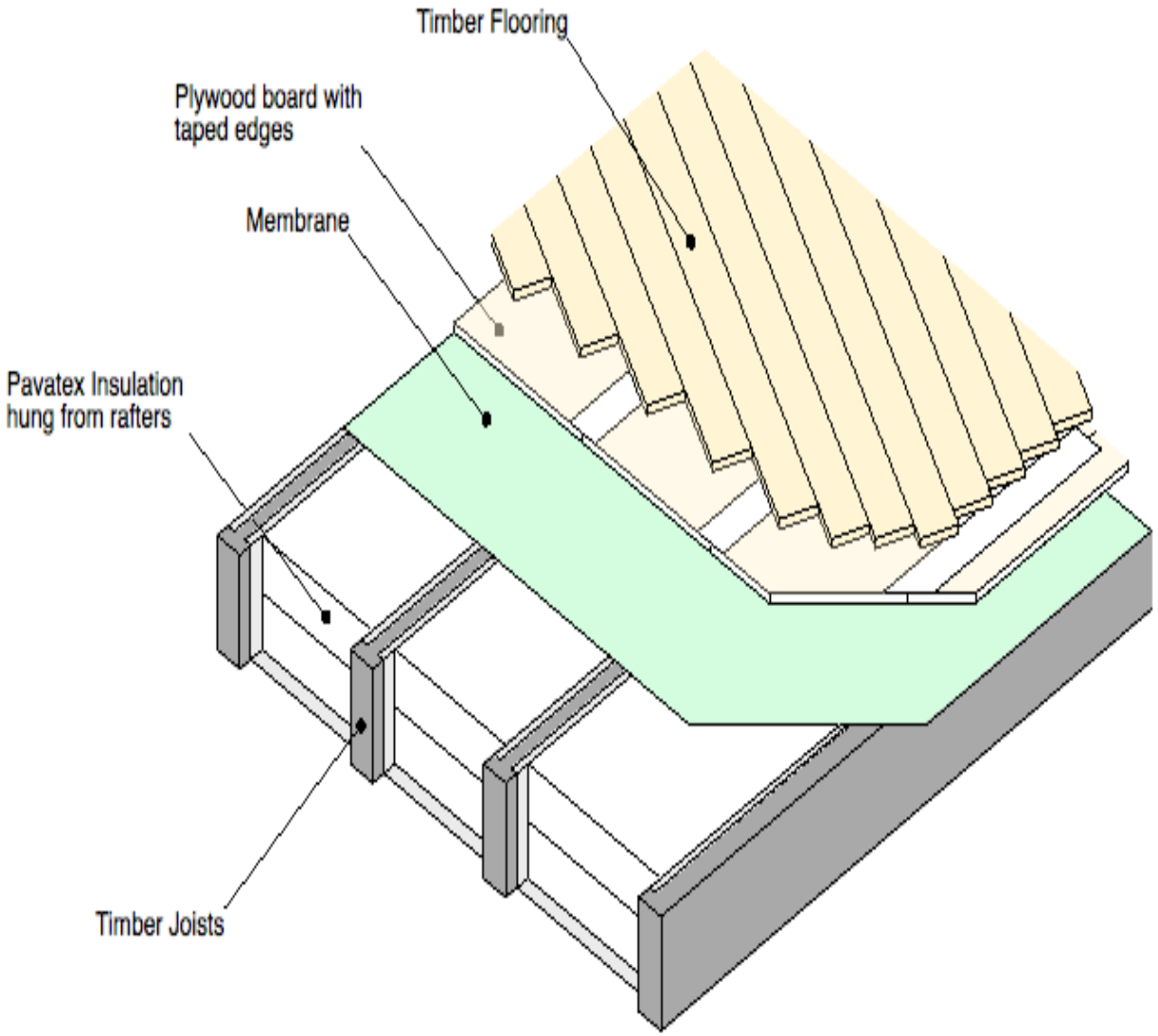
Between and above rafters.

Rigid storage platforms.

Between and above rafters

Maintaining ridge to eaves ventilation

Floor Insulation-a systematic approach

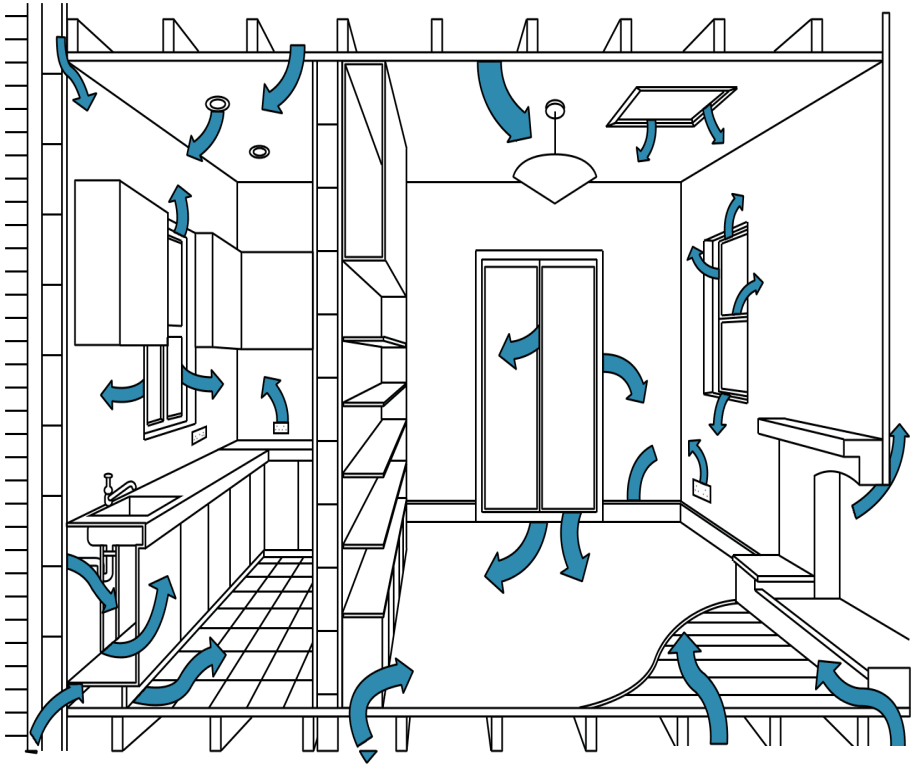


SOLID WALL INSULATION

EWI

IWI-Vapour Open

IWI-Vapour closed



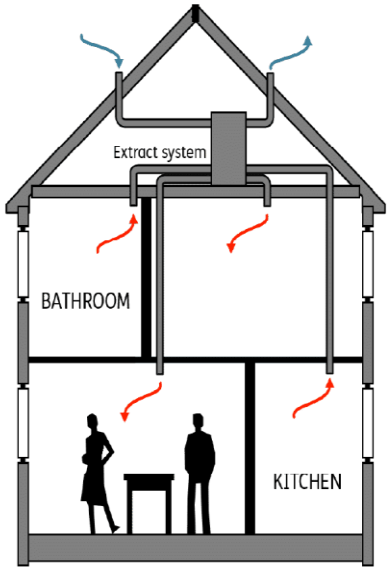
AIRTIGHTNESS

Windows/Doors 18%

Permanent Vents 9%

Loft Hatches 2%

Balance 71%



System 4 (MVHR)

VENTILATION

Part F-30L/Sec per person or 50L/Sec if smokers.

APPROACHES

Breathable Air tightness membranes and tapes to all penetrations

MEETING RESIDUAL ENERGY DEMAND

ASHP/GSHP

THE END OF GAS

Coefficient of performance-Gas boiler
1kWh=.9kWh

Coefficient of performance-Gas boiler
1kWh=.2.8 to 3 kWh

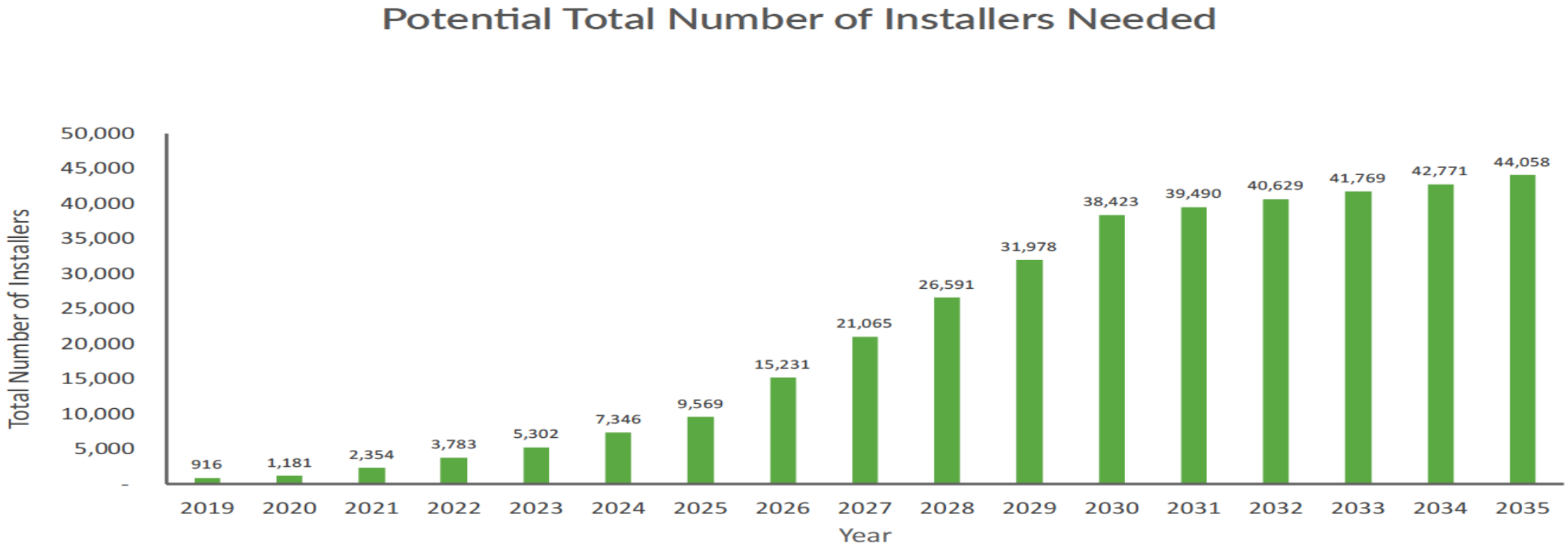
“We will aim for 600,000 heat pump installations per year by 2028” [1]

22,000 in 2017

27,000 in 2018

600K PA by 2028

A circa 30 fold increase in 6.5 years.....



1. The Ten Point Plan for a Green Industrial Revolution BEIS, NOV 2020
2. BSRIA 2018
3. HPA 2020

PRE-CONDITIONS FOR ASHP OR GSHP.....

1. 60% reduction in your demand

+

2. Solar PV Array

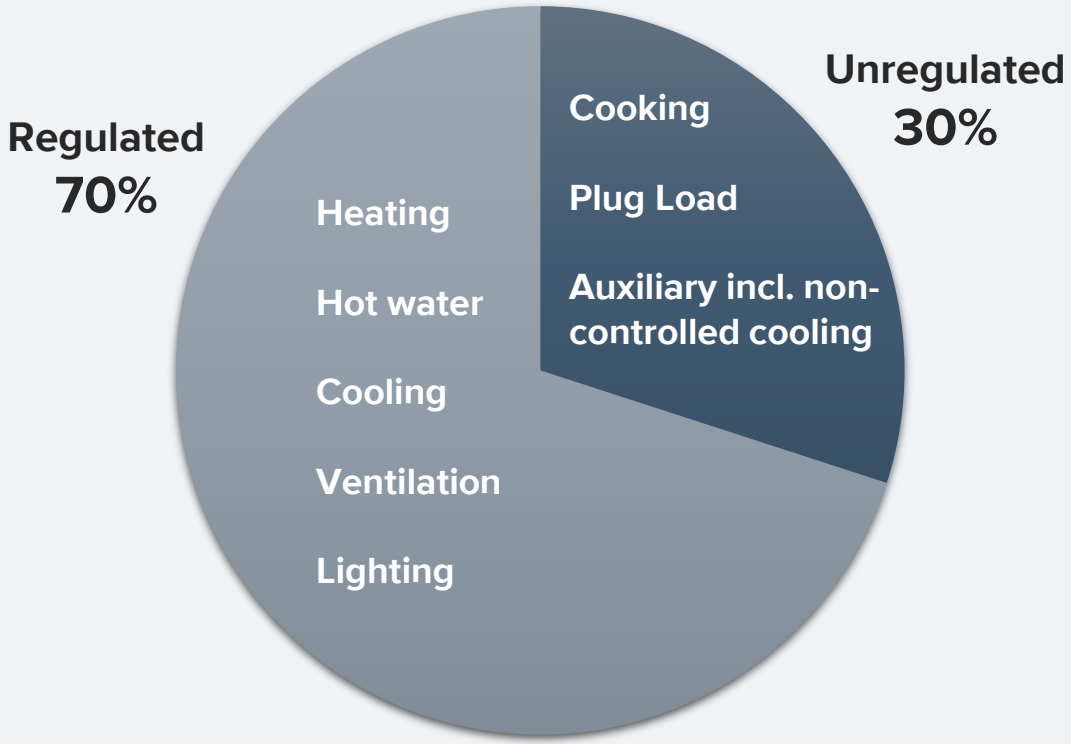
+

3. Heat Pump

Electricity is 4 times the price of gas per kWh

UNREGULATED ENERGY

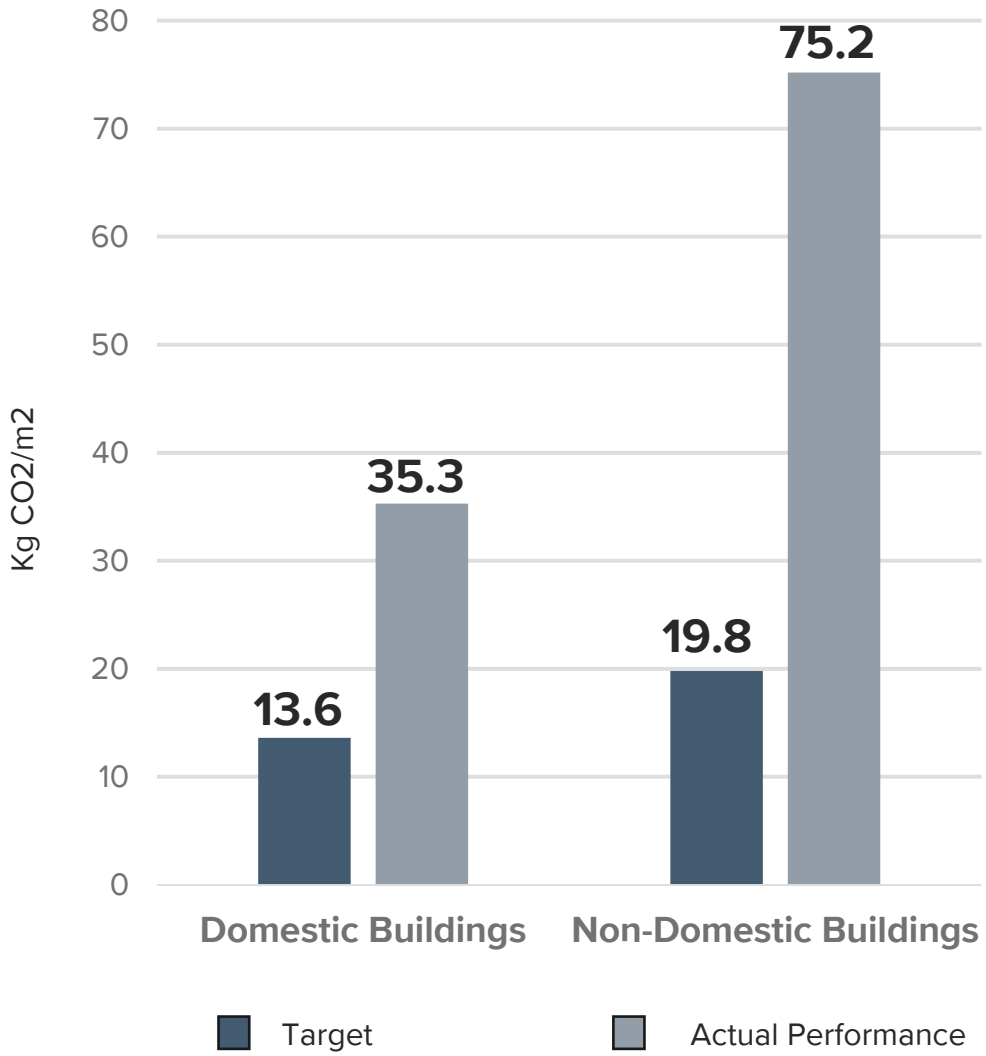
OPERATIONAL CARBON THE FULL PICTURE



The Implications

2050 Net Zero ≠ Net Zero

THE PERFORMANCE GAP



Source: Innovate UK

CASE STUDIES

HISTORIC BUILDINGS WORK

CECIL SHARP HOUSE **LONDON**

Grade II Listed Building Retrofit

Services

MEP Engineering

Accoustics

Operational Performance

BATTERSEA ARTS CENTRE **LONDON**

Grade II Listed Building Retrofit

Services

MEP Engineering

Energy Strategy

BELSIZE FIRE STATION **LONDON**

Grade II* Listed Building Conversion to Flats

Services

BREEAM Assessment

Energy Strategy

Sustainability Strategy

PEABODY AVENUE

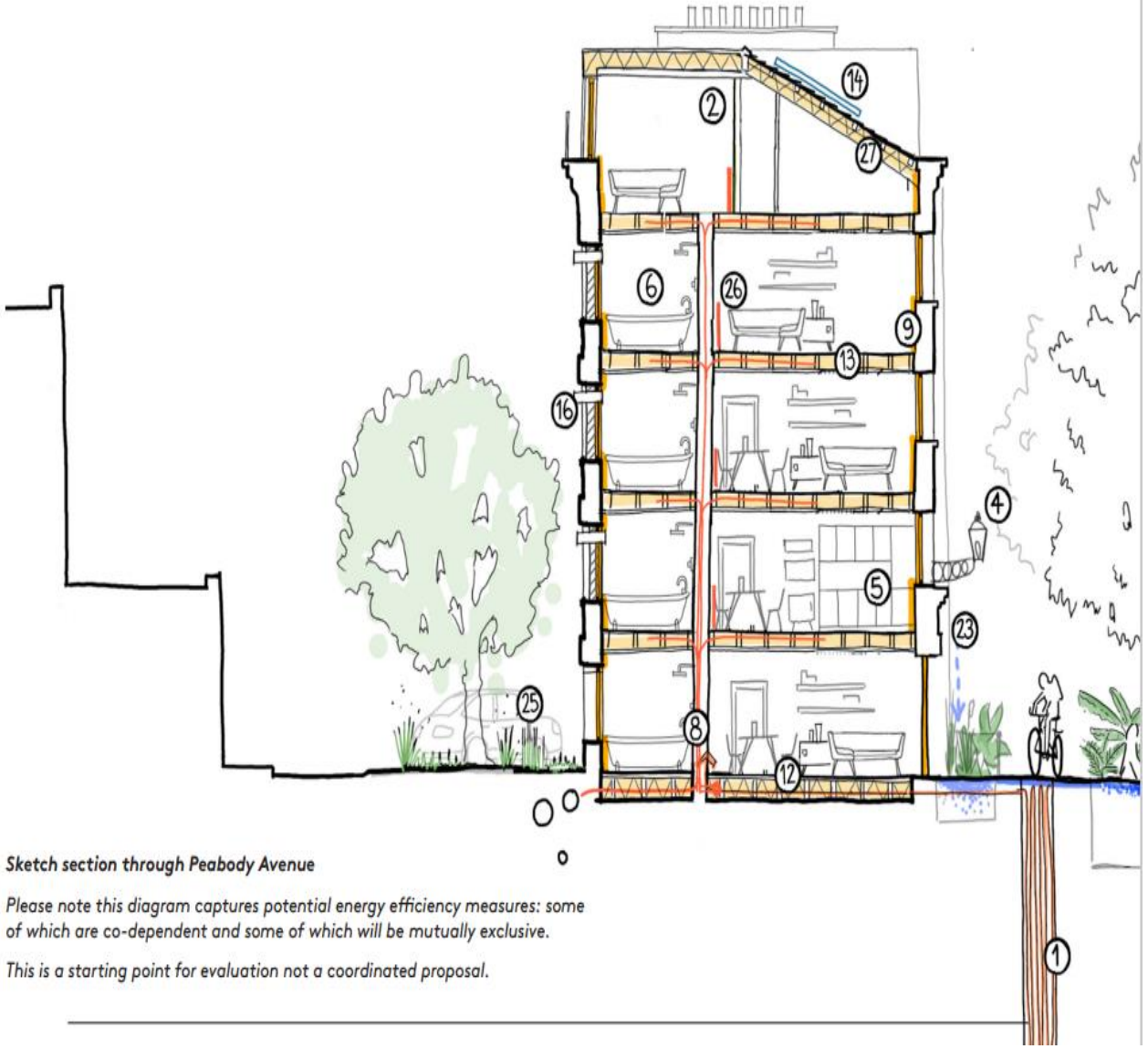
Decarbonisation strategy for Heritage Estates .

LOCATION: Pimlico, London SW1

Scope: Assessment of baseline performance;

Options Appraisal for EPC B targets.

Architect: KCA
Client: Peabody



Source: architects Tender stage design sketch considerations

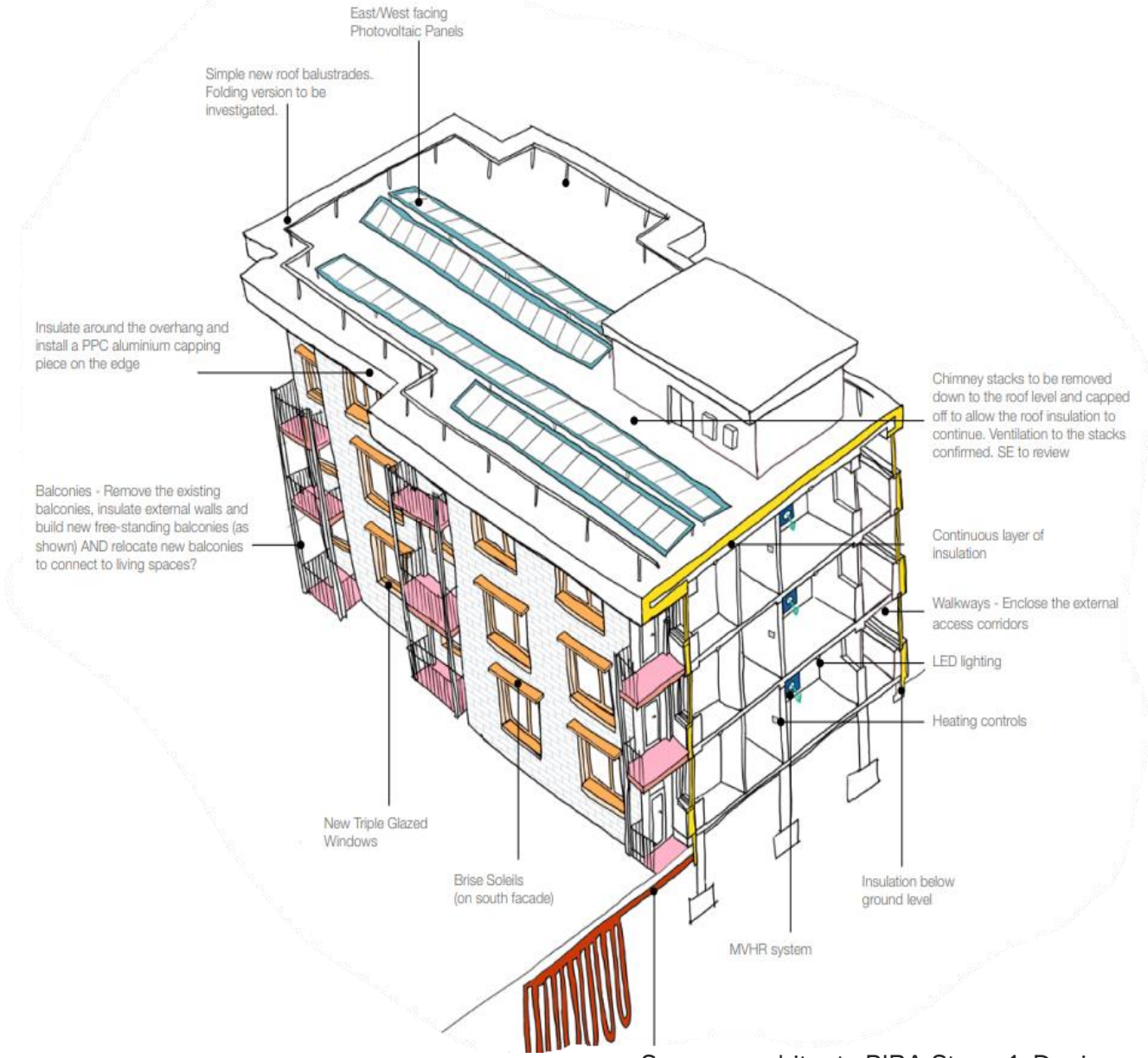
CHATSWORTH ESTATE

63 Flats to ‘future-fit’ net-zero standards for LBH.

LOCATION: London Borough Hackney

Scope:To provide 3 optional design packages; EPC B, EPC A Net Zero or EnerPHit Net Zero.

Architect: Architype
Client: London Borough Hackney



Source: architects RIBA Stage 1 Design Sketch

St. Helier – The Eco6

Porch pod within PD rights

Fabric Measures employed:

- CWI
- Triple glazed windows and doors
- Roof insulation at ceiling level
- Prefabricated porch pod to house Energy kit
- Close off airbricks and ventilate underfloor void

MEPH Measures employed:

- 3.85kWp roof mounted Solar PV
- Ventive exhaust ASHP/MVHR with…
- Sunamp heat battery with immersion diverter
- Gas disconnection-Electric hobs and ovens
- Low flow taps

KEY TAKEAWAYS

Every pre 1990 home will need to be substantially retrofitted by 2050

Net Zero can not be achieved by ‘simply’ buying ‘green’ energy

Everyone has a role to play and every home counts

Fabric first, Whole House Approach

No insulation without ventilation

?

www.xco2.com

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