



ZERO CARBON HUB

NEIL JEFFERSON



FACILITATING THE MAINSTREAM DELIVERY OF LOW AND ZERO CARBON HOMES



OVERVIEW

AGENDA

- Definition
- Fabric Energy Efficiency Standard
- Carbon Compliance Standard
- Consumer engagement
- Skills and training



ROLE OF THE ZERO CARBON HUB

PURPOSE AND STRATEGIC OBJECTIVES

Facilitate the mainstream delivery of low and zero carbon homes

- Provide leadership and create confidence
- Reduce risk and clear obstacles
- Disseminate information

New Homes	New Non-Residential
Existing Homes	Existing Non-Residential



FIVE WORKSTREAMS

Building

Energy

Examples

Consumer

Skills



INTERNATIONAL PERSPECTIVE



ZERO CARBON COMPENDIUM

Who's doing what in housing worldwide



CITY PERSPECTIVE





EXAMPLES

The BASF House

Level 4 Code for Sustainable Homes
 CO2 emissions: **At least 44% reduction**
 Developer: **BASF**
 Architect: **Derek Trowell Architects**
 Completed: **January 2008**
 Location: **University of Nottingham**

The BASF Project at housing is providing storey high and a dist...
 The aim is Sustainable Passive House complete replicable



Low-carbon approach

Fabric The concrete frame is finished with thermal insulation (EPS) with conventional mortar incorporated at cooling the finished wall systems a

Heat and zero carbon is the goal heat of the entering the majority of locally generated and water



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Miller Homes Miller Zero Housing Project

Level 6 Code for Sustainable Homes
 Targetting **148% reduction over Part L2006**
 Developer: **Miller Homes Ltd**
 Architect: **Fraser Brown MacKenna Architects**
 Expected: **May/June 2009**
 Location: **Basingstoke, Hampshire**

The Miller Homes Miller Zero housing project comprises the homes complying with Code levels 3, 4, 5 and 6. The development is an R&D project aimed at showcasing how these various code levels dwellings can be produced and the implications for the supply chain.

The level 6 house is a two-storey 4-bedroom house with a floor area of 105m². It uses products that are available on the market and aims to put them into functional use while demonstrating that zero carbon housing can be achieved today.

Low-carbon approach

Fabric The walls are fabricated from storey high concrete planks. An advantage of using this system is that due to the large size of the planks and the thin joint that mortar, there are fewer smaller joints through which air can leak, thus creating a more airtight envelope. Another advantage is their high thermal mass, which provides passive heating and cooling throughout the seasons. Exterior insulation minimises heat losses through the building envelope and through reduced thermal bridging.

Heat and power generation All heat and power generation comes from renewable resources. These include a biomass boiler connected to under floor heating and a hot water cylinder for maximum efficiency. A large photovoltaic array on the roof provides power.

Ventilation The house uses a mechanical ventilation system with an in-built heat recovery unit and summer by-pass option.



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LZ CARBON PROFILE

Profile: 009
 June 2009

Southdale House

Level 3 Code for Sustainable Homes
 CO2 emissions: **A**
 Developer: **S**
 Architect: **N**
 Completed: **J**
 Location: **W**



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LZ CARBON PROFILE

Profile: 011
 June 2009

Adelaide Wharf

Ecohomes Excellent
 Developer: **First Base**
 Architect: **Alford Hall Monaghan Morris**
 Completed: **October 2007**
 Location: **Shoreditch, East London**

Adelaide Wharf is a development of 147 mixed tenure apartments, ranging between one and four bedroom flats, and 700 m² of office space. There are 73 flats for private market, 41 shared ownership for key workers, and 33 social rented.

Typical office building technologies have been utilised with a concrete frame clad with a utilised cladding system, which was craned from delivery trucks directly on to the building without the need for scaffolding. Pre-fabricated bathroom pods, plant rooms, balconies and dry lined internal partitions were also used. The developer calculates the project's design efficiency saved six months of construction time.



Low Carbon Approach

Fabric A concrete frame construction was used with insulated utilised cladding panels interlocked to provide a high level of thermal performance, reducing energy consumption.

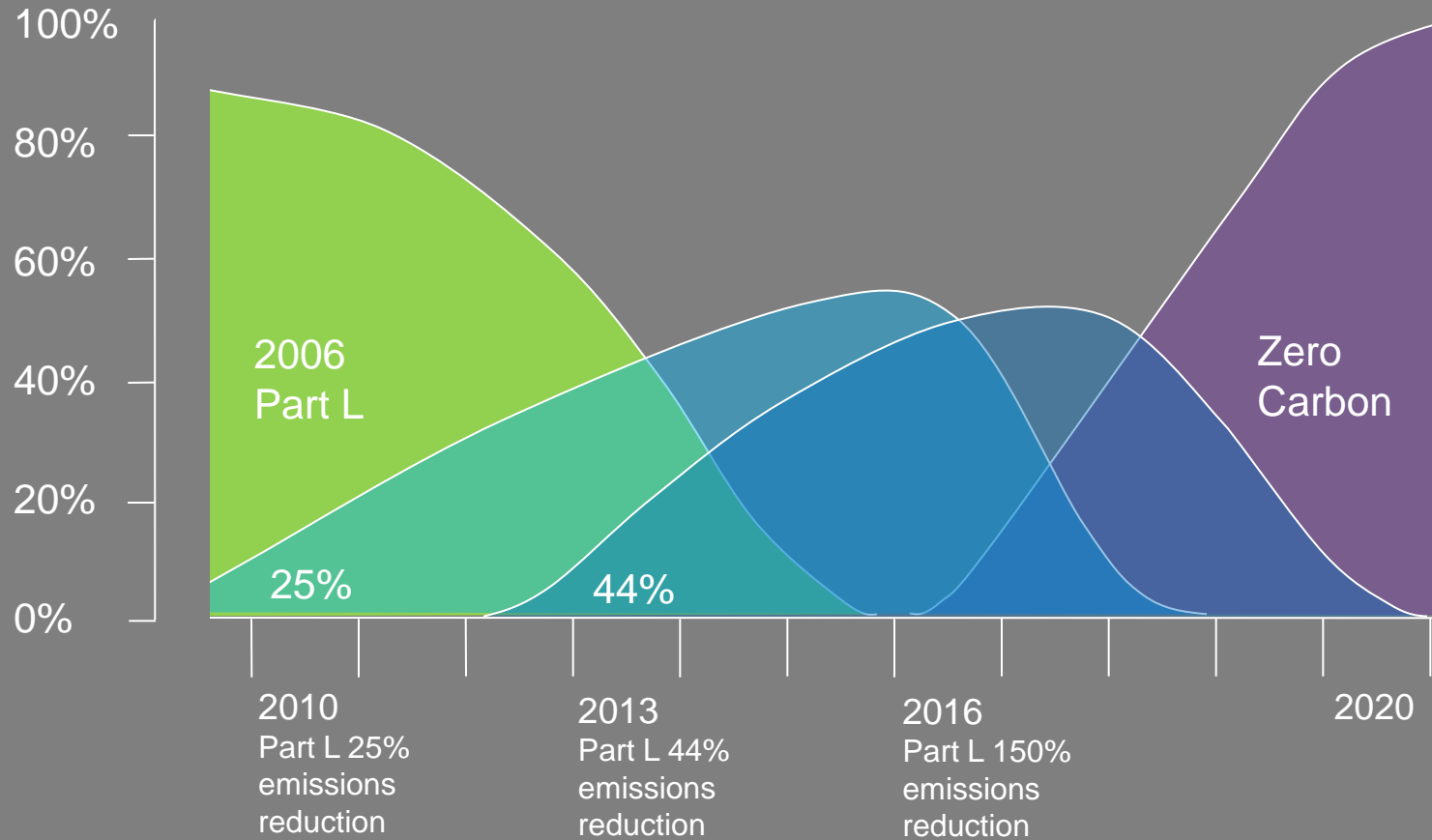
Heat and power generation A centralised gas-powered heating system, using gas condensing boilers, provides energy-efficient heating and hot water for each apartment through localised heat exchangers.

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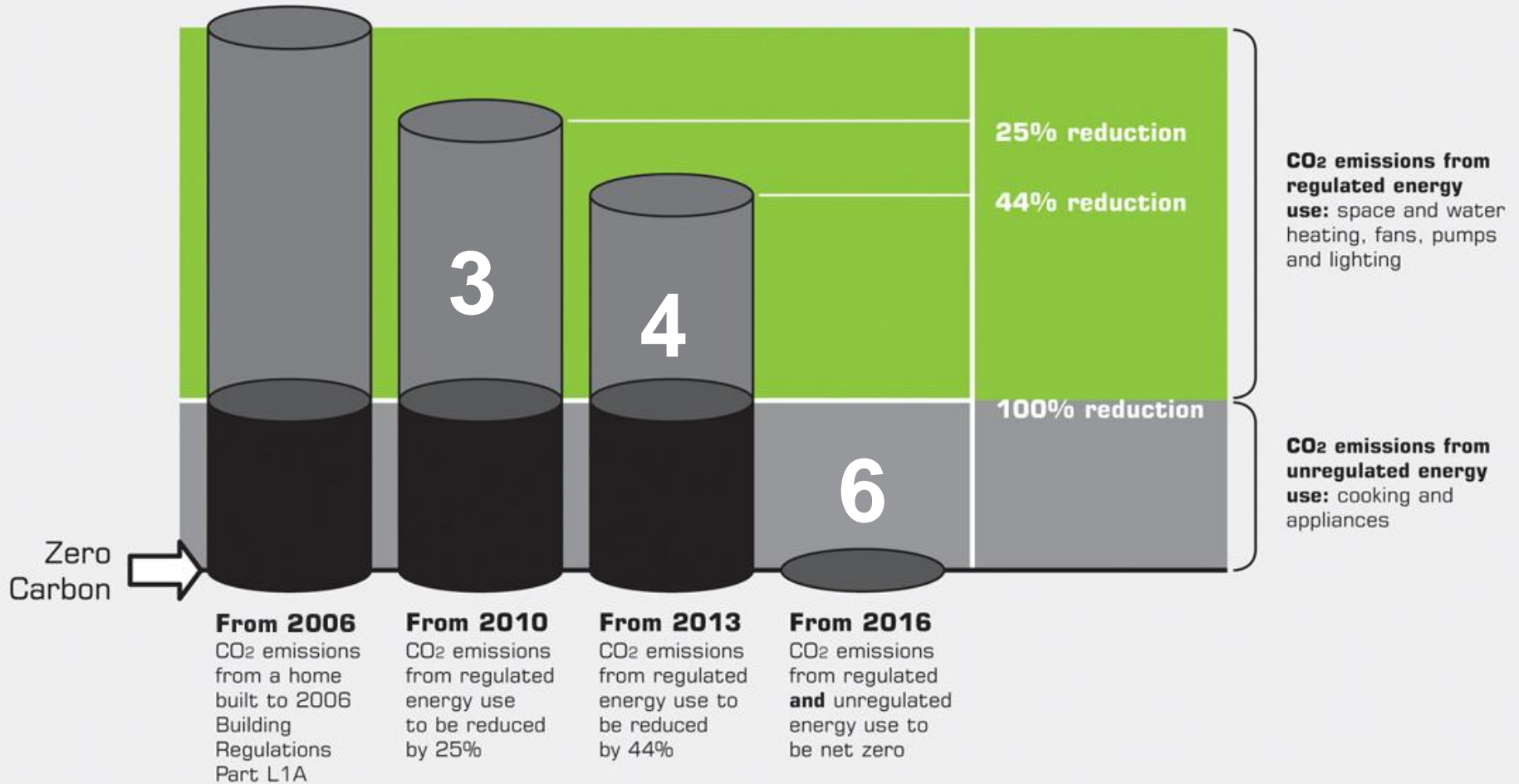
THE JOURNEY TO ZERO CARBON

% of homes built





THE JOURNEY TO ZERO CARBON





DEFINITION



The Zero Carbon Hierarchy

a workable definition.

FACILITATING THE MAINSTREAM DELIVERY OF LOW AND ZERO CARBON HOMES



ZERO CARBON DEFINITION

WHERE ARE WE NOW?

Summary:

- A Hub-led Task Group has developed a minimum Fabric Energy Efficiency Standard (FEES), now included in the Code for Sustainable Homes.
- Carbon Compliance (energy efficiency + on-site renewables) being investigated by two Hub-led Task Groups this year.
- Allowable Solutions - awaiting further Government announcement on policy.



CARBON COMPLIANCE STANDARD





TASK GROUP STRUCTURE

Carbon Compliance Standard Task Group

HBF	WWF	REA	LGA
RIBA	UKBCSE	CPA	HBA
AECB	UKGBC	EST	FMB
LDA	LABC	NHBC	GHA
CHPA	HCA	CF	Consultants
Observers:	DCLG	DECC	BIS
HMT	SG	WAG	



TASK GROUP STRUCTURE

**Carbon Compliance Standard
Task Group**



Evidence and insight

Technical



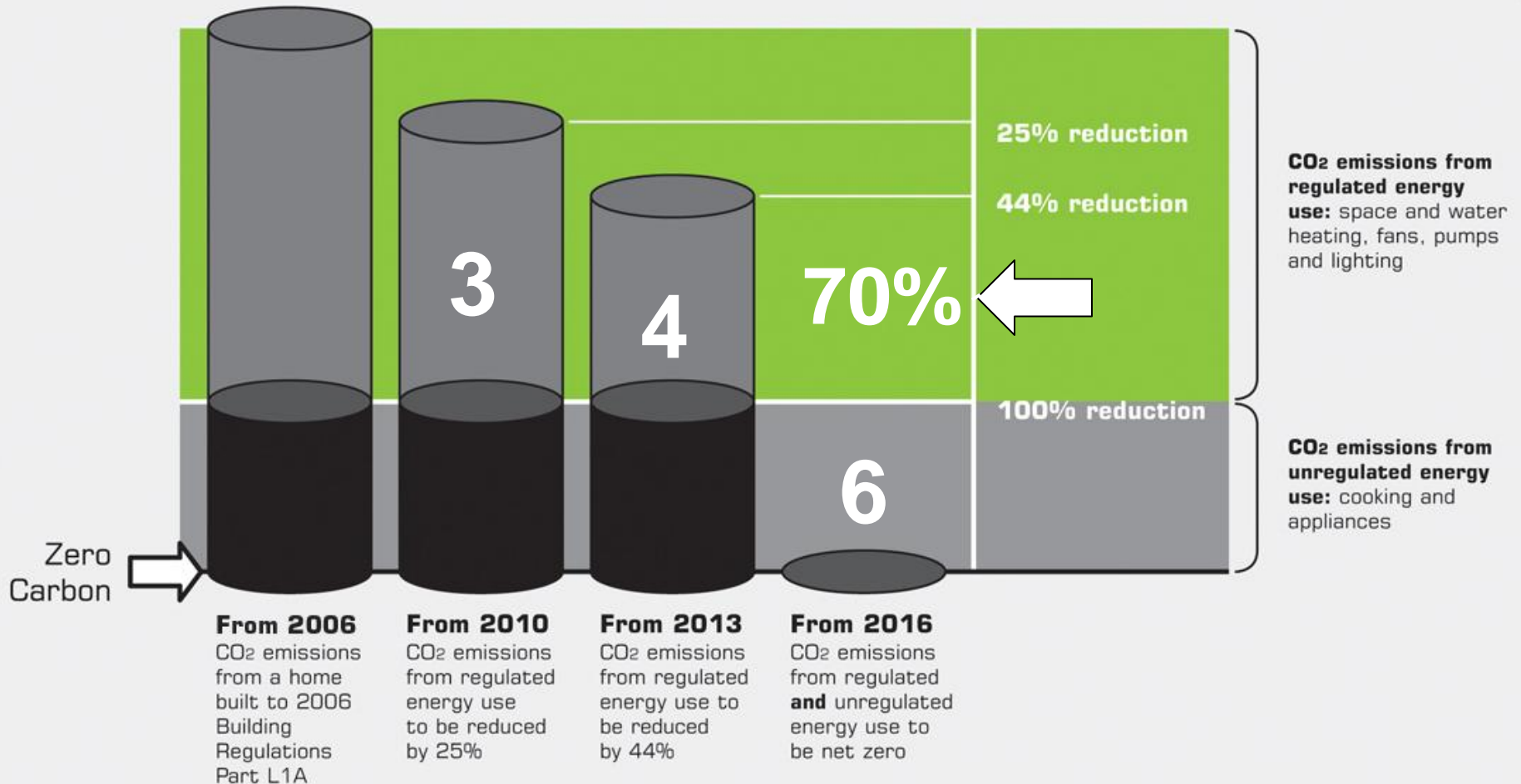
Policy



Commercial

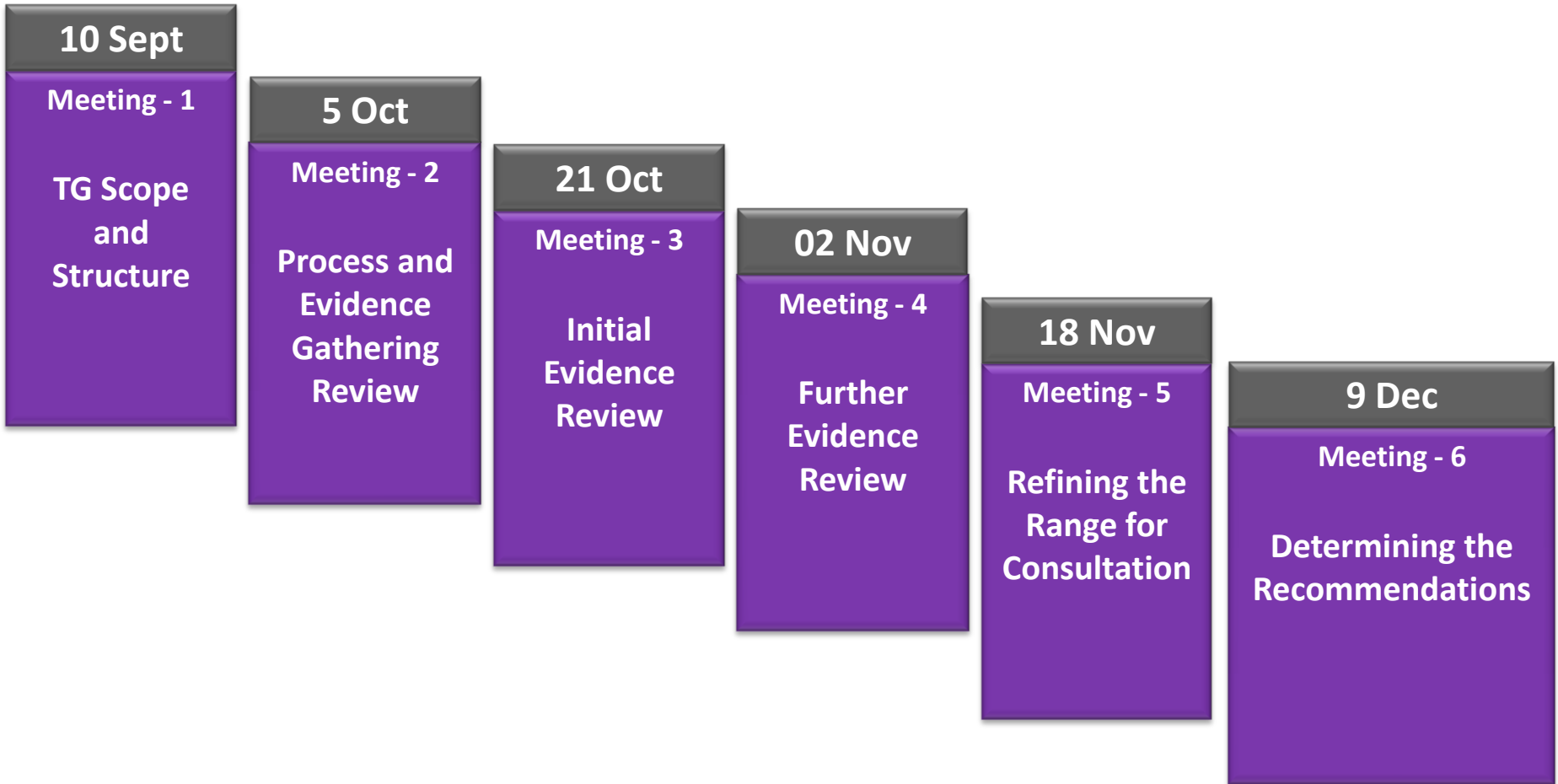


THE JOURNEY TO ZERO CARBON





TASK GROUP JOURNEY





'HAVE YOUR SAY' CONSULTATION EVENTS

www.zerocarbonhub.org

- 30 November – Manchester
- 1 December – London
- 2 December – Milton Keynes





CARBON COMPLIANCE ASSUMPTIONS

OVERVIEW

Overview of findings and recommendations

The Task Group's summary of the Topic Work Group reports

TOPIC 1

Carbon compliance tools considerations

Looking at modelling tools currently available both here and abroad and considering key characteristics, what they assess and the trade off between accuracy and ease of use.

TOPIC 2

Carbon intensity of fuels

Considering the implications of, and an appropriate response to, the changing carbon intensity of electricity and other fuels.

TOPIC 3

Future climate change

Setting out how projected national and local climate changes could affect energy demand. Exploring for example how the compliance tool should embrace overheating risk.

TOPIC 4

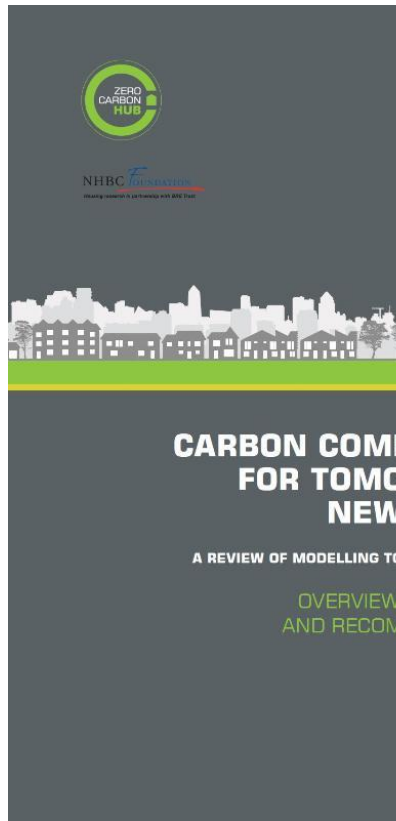
Closing the gap between designed and built performance

How the compliance tool should accommodate (and help reduce) any performance gap between design performance and what is achieved on site.

TOPIC 5

How the performance standard should be expressed

This looks at whether carbon compliance should be expressed as an improvement versus a notional building (as now) or in absolute terms (kg CO₂ emissions per unit area).





TECHNICAL: MODELLING OUTPUTS

CARBON TARGET = 14 kgCO_{2(e)}/m²/yr

Target = 14

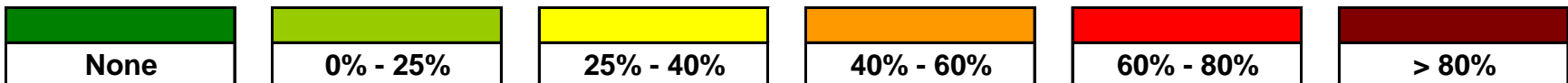
	Mid Terrace House						
	Inst. Electric (i)	Gas combi boiler (i)	Gas boiler (i)	ASHP (i)	GSHP (c.)	Biomass boiler (c.)	Gas CHP (c.)
FEES - Borders	Red	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
FEES - East Pennines	Orange	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
FEES - Thames	Orange	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
FEES - South West	Orange	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Spec C - Borders	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Spec C - East Pennines	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Spec C - Thames	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Spec C - South West	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green

Individual solutions

Communal solutions

Key

Area of PV required, as percentage of Ground Floor area:





TECHNICAL/COMMERCIAL FEASIBILITY MATRIX

Technical feasibility matrix (at 2015)

Technical feasibility:	Key		
	No major issues	Conditions	Prohibitive
NOTE:	This matrix is intended to show, from a technical point of view only, which technology options might be feasible for different development types, projecting ahead to 2015. The text in the coloured box gives reasoning for the feasibility chosen (green/orange/red). Commercial, policy and carbon target related issues for a particular technology are flagged in the appropriate column to the right.		

Technical feasibility:	Key			POLICY related comments	CARBON TARGET related comments
	No major issues	Conditions	Prohibitive		
NOTE:	This matrix is intended to show, from a technical point of view only, which technology options might be feasible for different development types, projecting ahead to 2015. The text in the coloured box gives reasoning for the feasibility chosen (green/orange/red). Commercial, policy and carbon target related issues for a particular technology are flagged in the appropriate column to the right.			Additional energy storage -> adding heat to heat requirement -> increasing grid connection challenge	Grid decarbonised grid, tight carbon budget
				Grid properties: -> capacity, losses	Decarbonised grid, potentially tight grid depending on COP -> increased fabric

Technology option	DEVELOPMENT TYPE			LOW DENSITY			Individual dwelling
	Small 1-10	Medium 50-250	Large 500+	Small 1-10	Medium 50-250	Large 500+	
Continuous electric (at point of use + panel heaters)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Gas boiler (or combi)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
ASHP	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
GSHP (horizontal)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
GSHP (vertical)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Biomass boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Micro gas CHP	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
ASHP + Biomass back boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
GSHP + Biomass back boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Electric immersion, panel heaters + SHW	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Gas boiler + SHW	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
ASHP + SHW	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
GSHP (vertical) + SHW	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Biomass boiler + SHW	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Micro CHP + SHW	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Exhaust air HP (CPHU)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	
Fuel cell (reformed natural gas)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	

Technical feasibility matrix (at 2016)

Technology option	DEVELOPMENT TYPE			LOW DENSITY			Individual dwelling	COMMERCIAL related comments
	Small 1-10	Medium 50-250	Large 500+	Small 1-10	Medium 50-250	Large 500+		
ASHP	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
GSHP (horizontal)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Gas boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Biomass boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Gas CHP + Gas boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Gas CHP + Biomass boiler + Gas boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Biomass CHP + gas boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Biogas CHP + gas boiler	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Fuel cell (reformed natural gas)	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Waste-to-energy CHP	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Waste heat	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites
Geothermal	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install	Not recommended, easy to install		Not applicable to individual system for low density sites

Individual dwelling energy solutions

Cluster (intermediate energy) solutions

COMMERCIAL related comments

Level of distribution systems may be disproportionate compared to individual system for low density sites



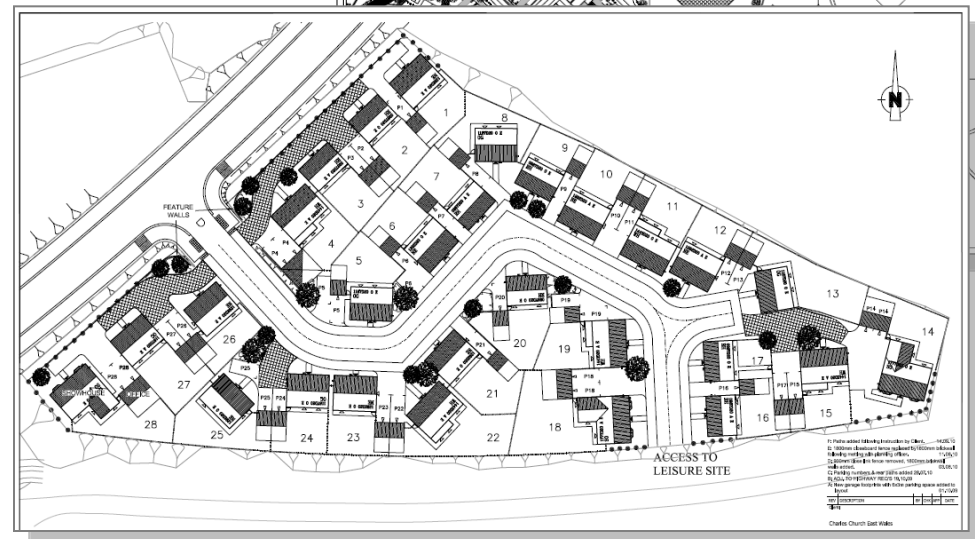
COMMERCIAL DEVELOPMENT SCENARIOS

■ Dwelling versus development

Single dwelling provides limited understanding
Greater context at development level
Illustrative examples from industry
Each with typical constraints and challenges

■ Scenarios at present

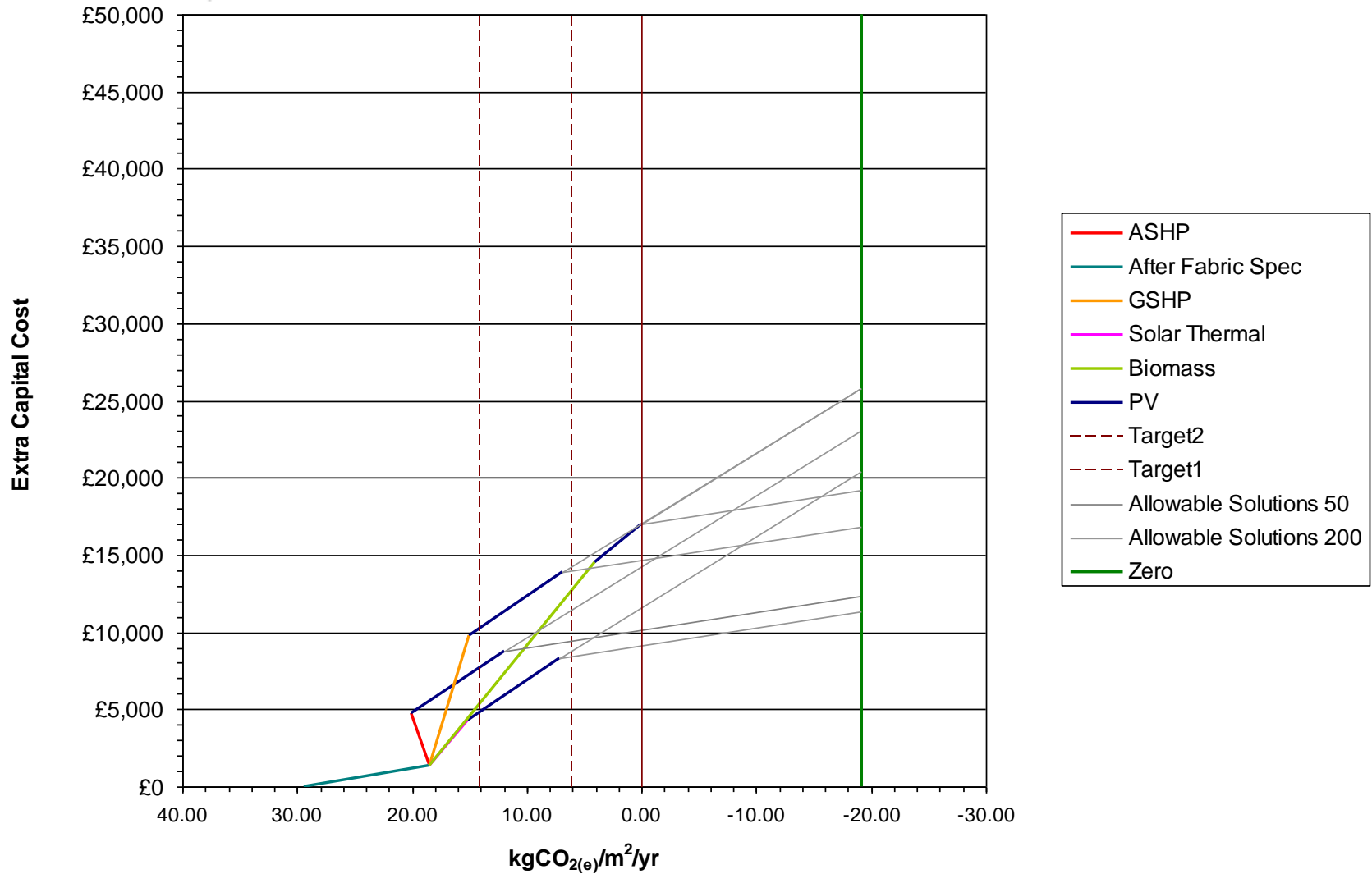
Low density and high density
Small (1 – 10)
Medium (50 - 250)
Large (500 +)

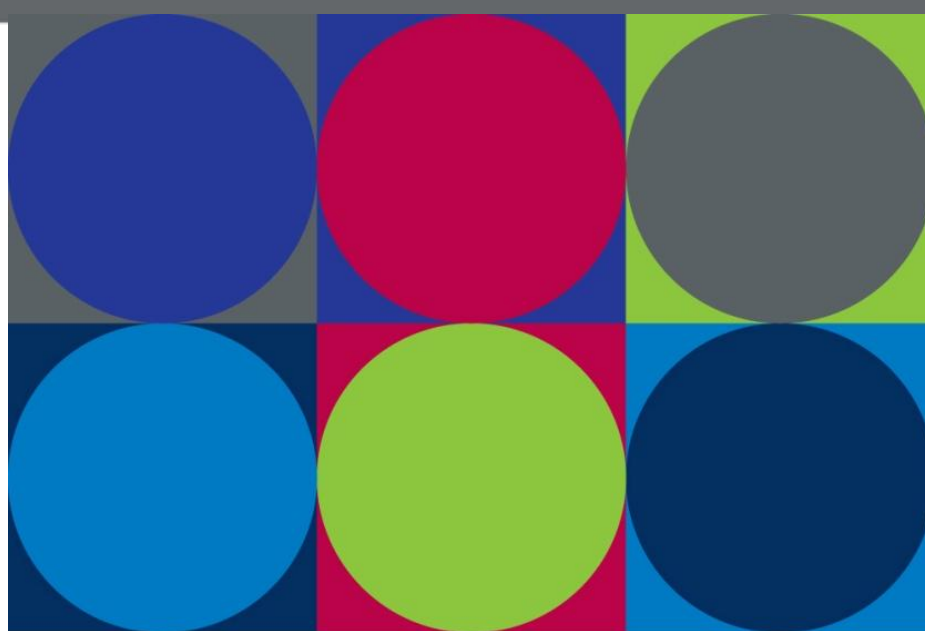




COST - £/tCO₂

Mid Terrace House East Pennines FEES 0.25PV





Home Building Skills

an action plan to 2020

homebuilding-skills.com



SKILLS AND TRAINING

FIRST EVENT AIMED AT PLANNERS AND BUILDERS

- 24 November 2010
- HG Wells, Woking
- £35+VAT
- SOLD OUT

Nearer to
zero

Planning for zero carbon
homes from 2016



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