



ZERO CARBON HUB

HBF Technical Conference

Closing the design vs as-built performance gap

Rob Pannell, Director, Zero Carbon Hub







The new DCLG Ministerial team



Secretary of State for Communities and Local Government – The Rt Hon Eric Pickles MP



Minister of State (Housing): Mark Prisk MP

Housing, Local Growth, Cities and Regeneration
High Streets, Town Centres and Markets



Parliamentary Under-Secretary of State – The Rt Hon Don Foster MP

- **Housing (supporting Mark Prisk)**
- *Building Regulations*
- *Climate Change and Sustainable Development*
- Integration and Race Equality
- Localism, Decentralisation and Community Rights



Parliamentary Under Secretary of State (Planning) – Nick Boles MP

- Planning and Development
- Local Growth (supporting Mark Prisk)
- Deregulation



ZERO CARBON HUB

The Zero Carbon Hub



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





2016 TIMELINE

Programme Delivery Timeline Report No.		1	2	3	4	5	6	7	8	9	10	11
Date		Oct 2008	Jan 2009	Apr 2009	Oct 2009	Jan 2010	Nov 2010	Mar 2011	Jun 2011	Sep 2011	Nov 2011	Jan 2012
OVERALL PROGRAMME STATUS		A	A	A	A	A	A	A	A	RA	RA	RA
General comments		/	/	AG	AG	AG	/	/	/	/	/	/
EPBD		/	/	A	A	G	/	/	/	/	/	/
Definition of Zero Carbon		/	/	A	AG	(See below)						
Fabric Energy Efficiency Standard (FEES)		/	/	/	/	G	G	G	G	G	G	G
Carbon Compliance		/	/	/	/	AG	G	G	G	AG	AG	A
Allowable Solutions		/	/	/	/	R	RA	RA	R	R	R	R
National Calculation Methodology - SAP		/	/	AG	RA	RA	RA	RA	R	R	R	R
Low carbon pre-production homes	Scaling up examples of low carbon and zero carbon homes	/	/	AG	AG	AG	/	/	/	/	/	/
Zero carbon prototype homes		/	/	AG	AG	AG	AG	AG	A	A	A	A
Scale-up		/	/	AG	RA	RA	/	/	/	/	/	/
Knowledge and Skills		/	/	A	A	A	AG	AG	A	A	A	A
Miscellaneous		/	/	AG	AG	AG	/	/	/	/	/	/
Community energy and infrastructure enabling actions		/	/	/	/	/	A	A	A	A	A	A



VIABILITY





UK Government Policy & the Zero Carbon Agenda





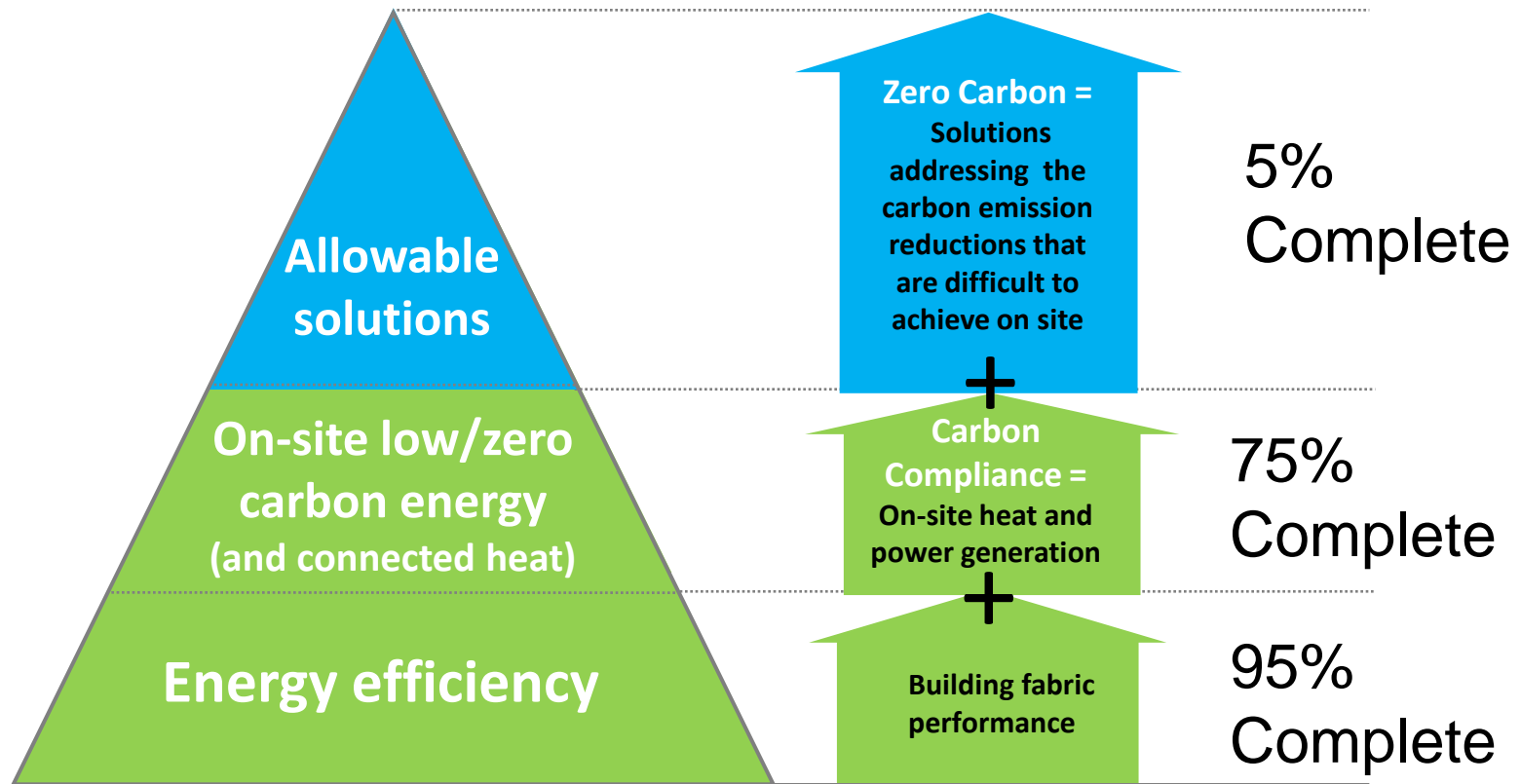
CARBON CULPRITS



Culprits: most CO2 from buildings stems from heating. Houses are particularly energy-inefficient



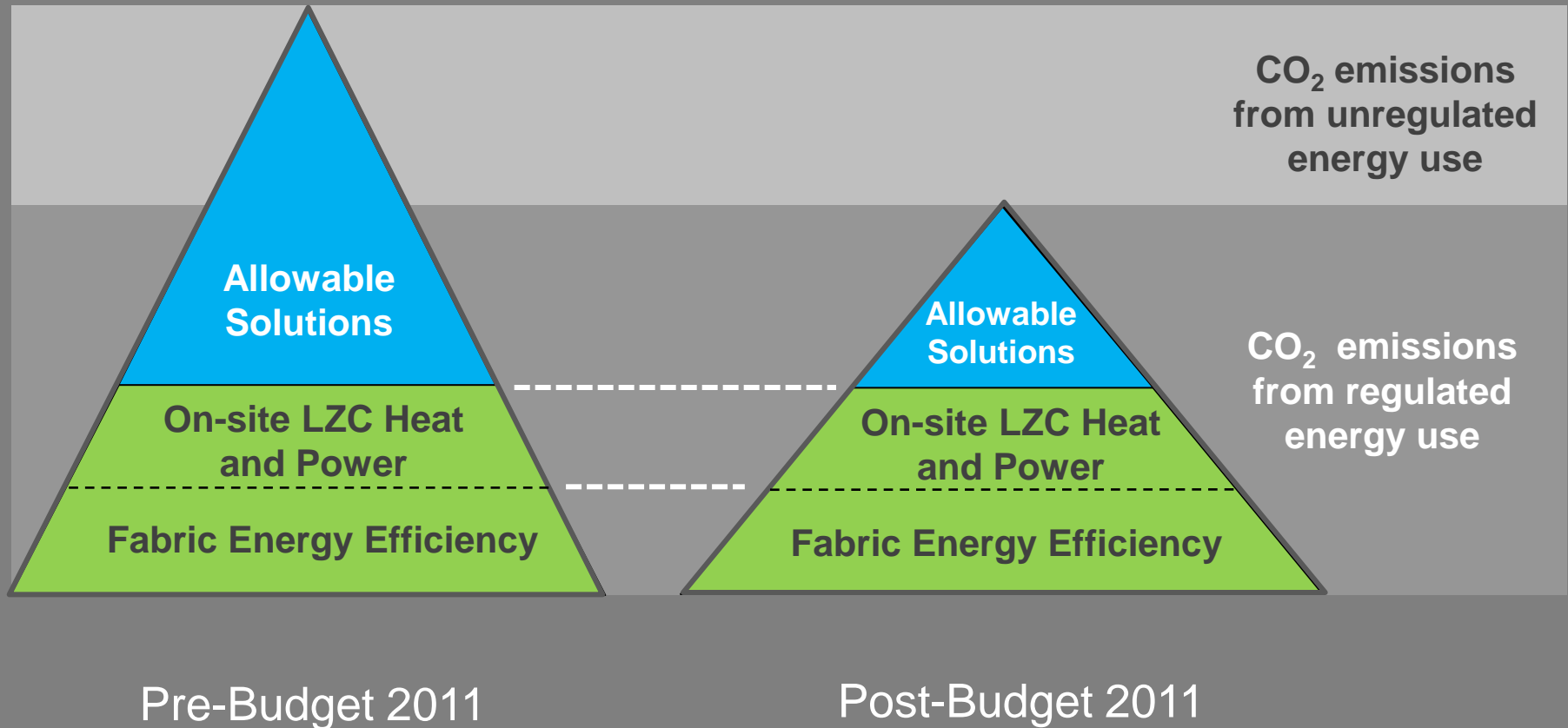
ZERO CARBON HIERARCHY



The Zero Carbon Hierarchy – stepped progress towards a workable definition.



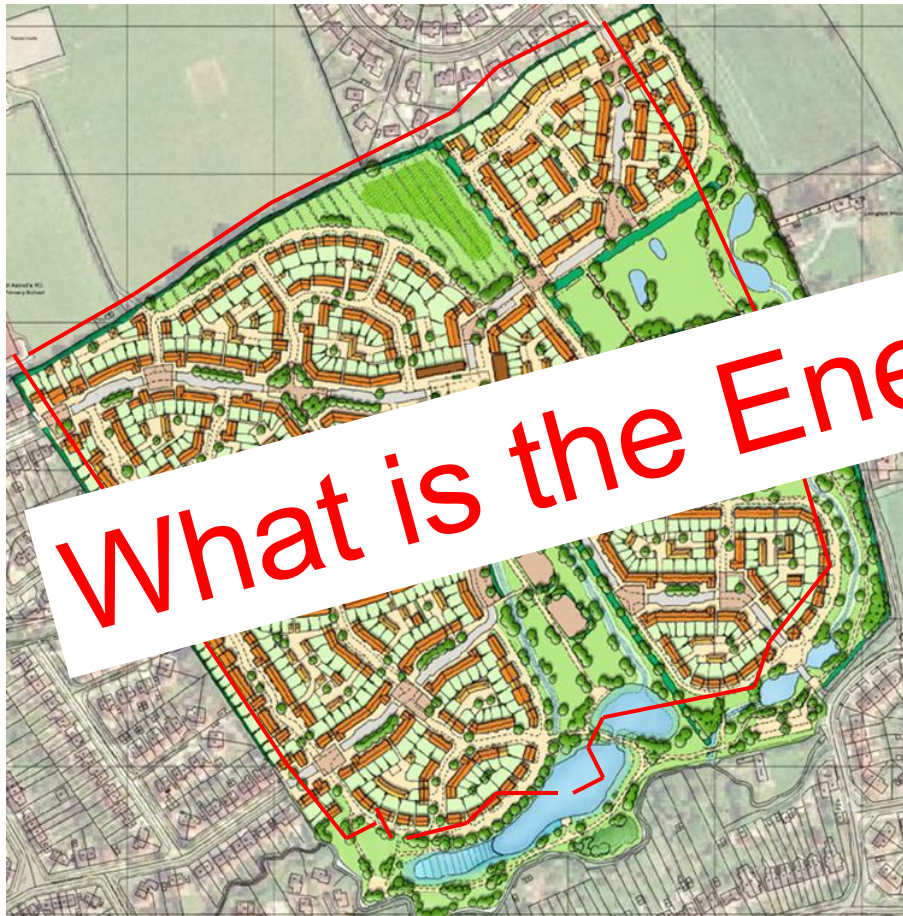
UNDERSTANDING THE BUDGET 2011





DEVELOPMENT LAYOUTS

Additional Considerations



Site Conditions:

- Access
- Location (regional weather)
- Ground conditions
- Flood risk
- Existing trees
- Local wind

What is the Energy Strategy?

- Dwelling type mix/ density
- Built form considerations - roof pitch, building height etc
- PV and solar panels
- Local Renewable targets

Site Layout:

- Dwelling types
- Design for solar technologies:
 - Orientation for solar technology
 - Roof pitch
 - Over-shading

Other:

- Localism



STEP 1 2016 FABRIC ENERGY EFFICIENCY STANDARD (FEES)

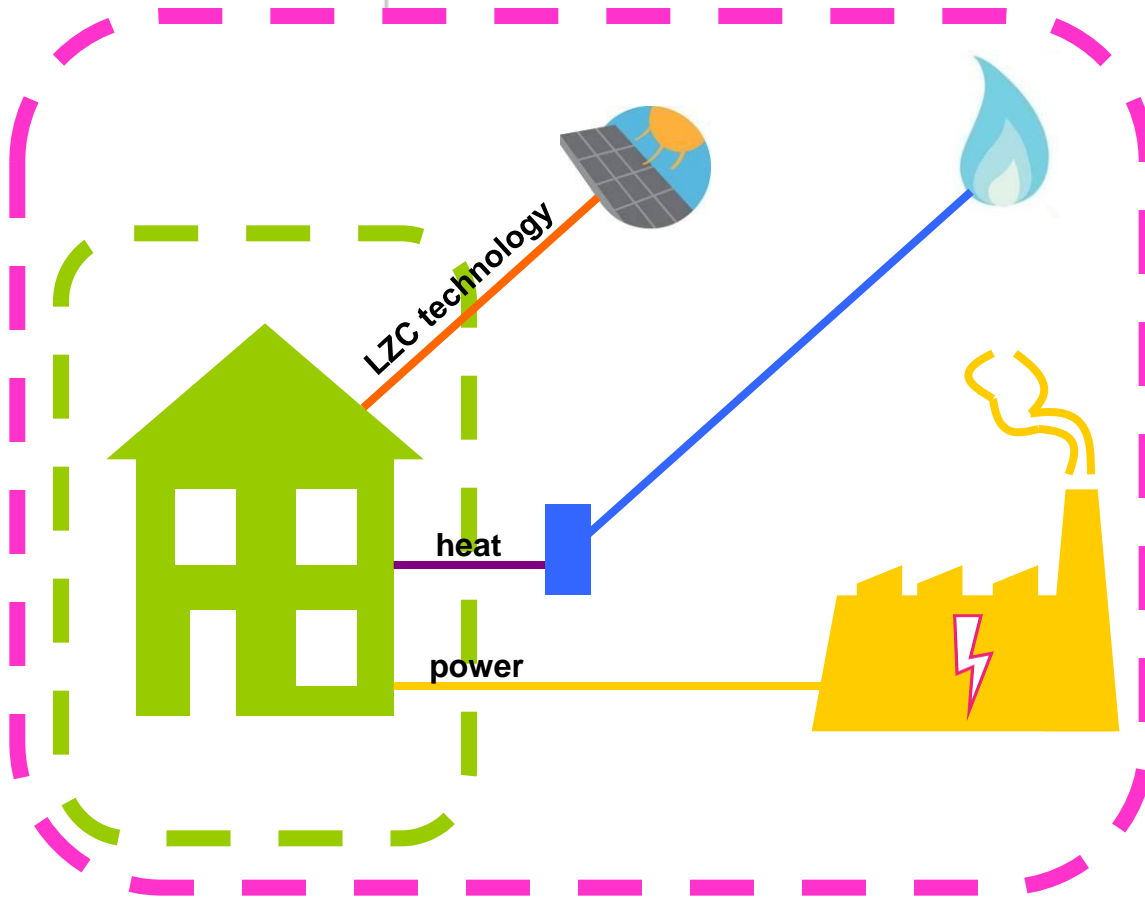
Fabric Energy Efficiency of **39 kWh/m²/year** for apartments & mid terrace
46 kWh/m²/year for end terrace, semi and detached



- **Performance not prescriptive** No U-value lists/limits on elements. Uses kWh/m²/yr. For simplicity - space heating and cooling only.
- **Two levels depending on dwelling type**
However same construction delivers 39 or 46, except in the case of the detached



STEP 1 2016 FABRIC ENERGY EFFICIENCY STANDARD (FEES) - Scope of 'Energy Efficiency'



Energy Efficiency Standard

- Building fabric U-values
- Thermal bridging
- Air permeability
- Thermal mass
- Solar, metabolic, lighting & appliance gains

Carbon Compliance Standard

- Heating / cooling appliances (boilers, etc)
- Mechanical ventilation
- Hot water
- Active controls
- Fixed lighting
- All LZR technologies



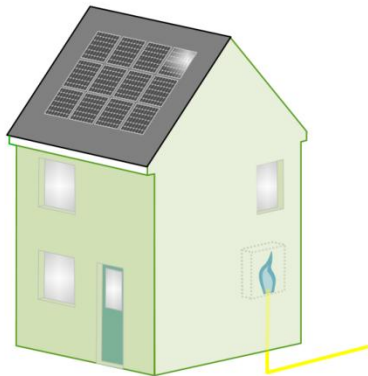
STEP 2 2016 CARBON COMPLIANCE

Target Carbon Compliance of **10** kg CO₂/m²/year for detached homes

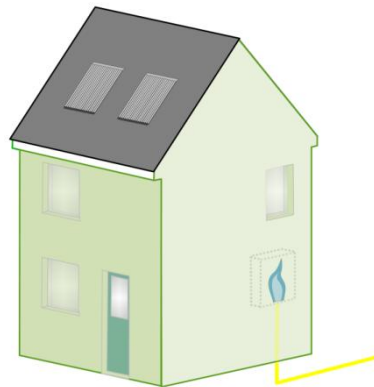
11 kg CO₂/m²/year for attached homes

14 kg CO₂/m²/year for apartments

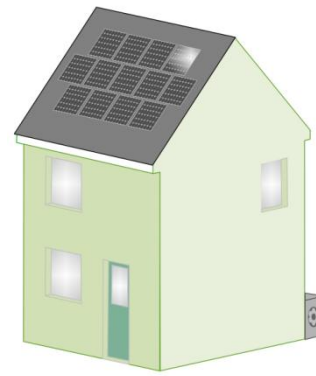
Approach provides solutions for a range of practical situations:



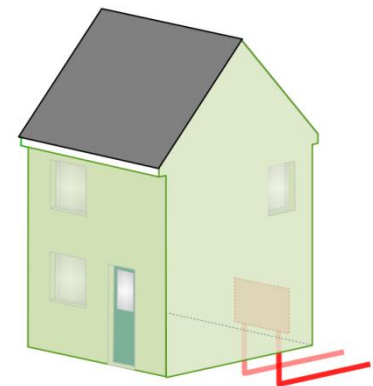
On gas grid
'PV'



On gas grid
'Fabric'



Off gas grid
Heat Pump



Community Heat
Network



STEP 3 2016 ALLOWABLE SOLUTIONS

Developer makes an Allowable Solutions payment for a particular development

A verification, validation, and process

Developer receives a Certificate showing that the required carbon savings (to meet zero carbon standard) have been achieved



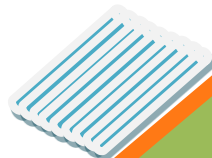
ALLOWABLE SOLUTIONS

Calculated over 30yrs

Investment in
offsite LZC
(financial return)

Continue carbon
compliance
onsite

Export LZC heat to
existing stock

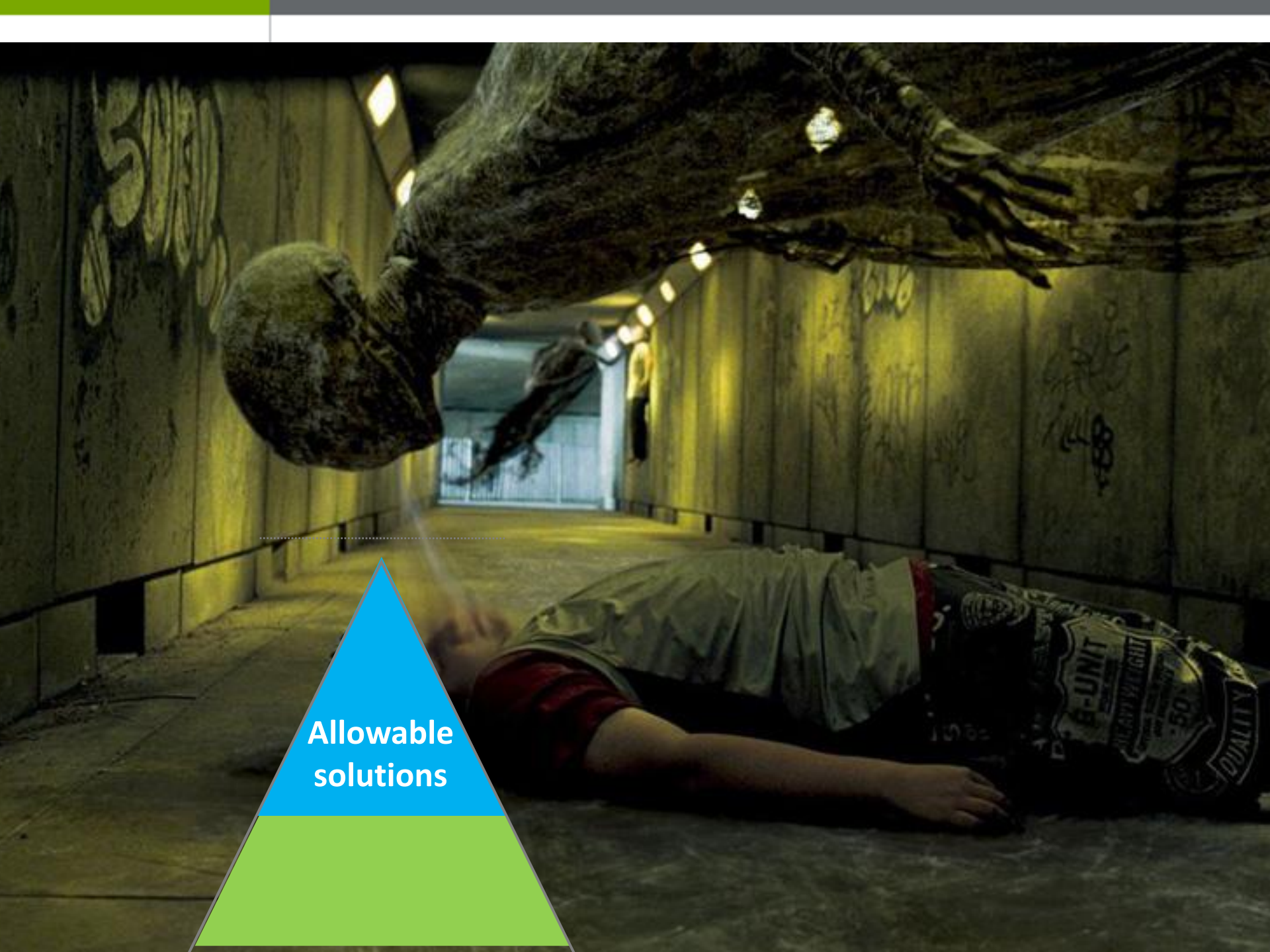


Offsite LZC electricity
with direct physical
connection

Efficient appliances
and controls

Section 106
credit

Improve existing
stock fabric



Allowable
solutions

A blue street sign with the word "Performance" in white, mounted on a black pole against a sunset sky. The sign is rectangular with a white border and is attached to the pole with metal brackets. The background is a blurred sunset with orange and red clouds.

Performance

3 KILLED AS BRIDGE COLLAPSES IN DELHI

New Delhi



BREAKING NEWS

SOURCES: CRACKS IN BRIDGE SEEN

One is Killed as Philly Baseball Stands Collapse

(By Associated Press)

PHILADELPHIA, May 16 — One man was reported killed and a number injured in a collapse of part of the lower tier of the right field grandstand of the Philadelphia National league baseball park Saturday. The accident occurred in the first half of the seventh inning in the game between St. Louis and Philadelphia. The game was suspended at the score 12 to 2.

The dead man died from heart failure. A number of other persons were injured and taken to hospitals. The collapse occurred near the first base line and involved two tiers of the stand, 20 feet wide. The stand fell through the ground but the debris was not down. It is believed that the concrete became weakened during the game.

Vol. 67, No. 290 ★ ★ ★



SAN MATEO, CALIFORNIA, TUESDAY, DECEMBER

Bridge Falls Into Gorge-







Mmmm?





FABRIC ENERGY EFFICIENCY STANDARD EVALUATION – CASE STUDY



Technology Strategy Board
Driving Innovation





REMOVE PROTECTIVE
TAPE IMMEDIATELY
AFTER INSTALLATION

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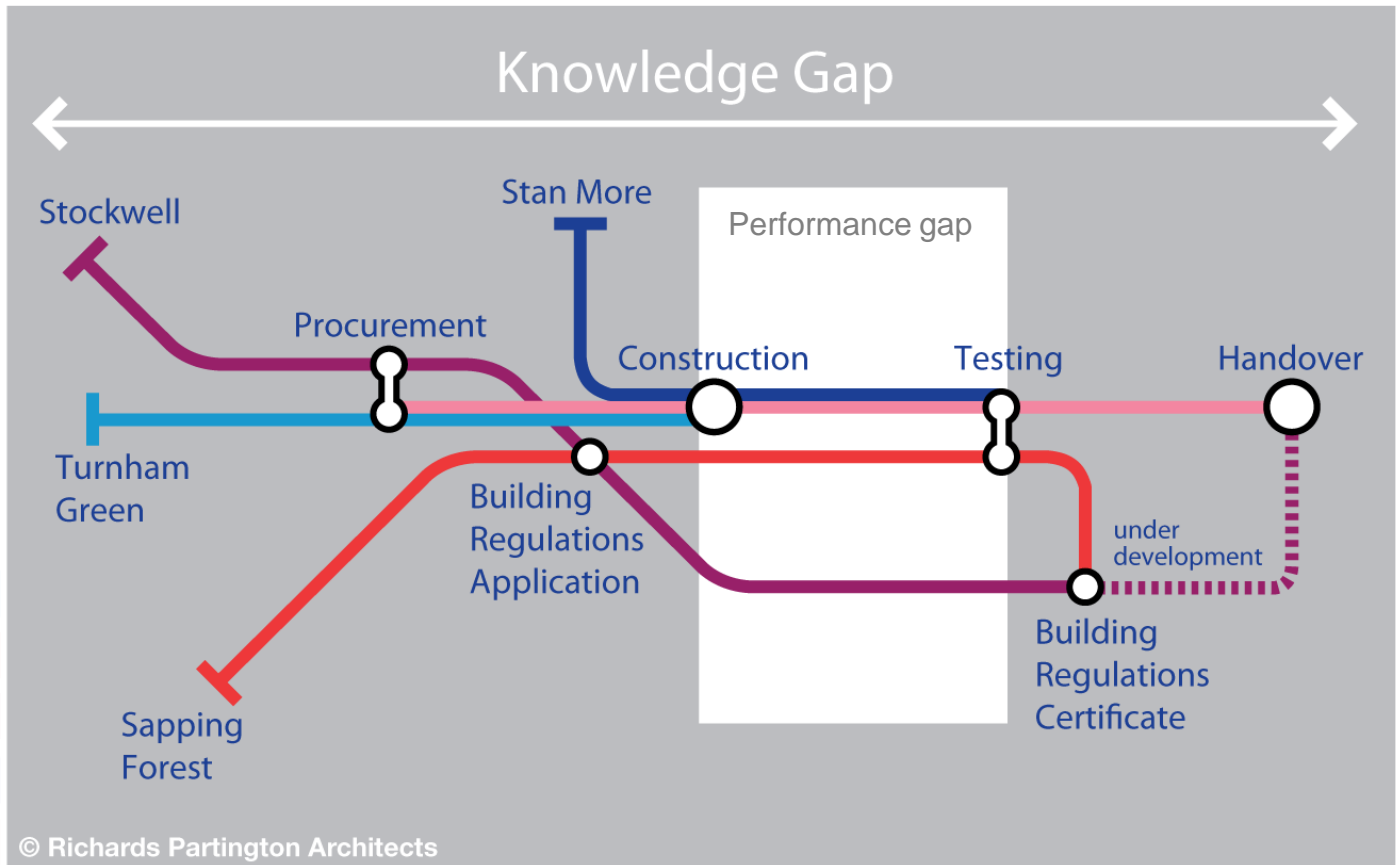




Mind the gap !!

Key to lines

- Designers
- SAP Assessor
- Manufacturer's Information
- Sub Contractor Design
- House Builder





Background & Evidence

EVALUATING THE IMPACT OF AN ENHANCED ENERGY PERFORMANCE STANDARD ON LOAD-BEARING MASONRY DOMESTIC CONSTRUCTION

Partners in Innovation Project: CI 393/663

Report Number 8 – Final Report - Executive Summary

Lessons from Stamford Brook
Bridging the Gap between Designed and Real Performance

Centre for the Built Environment, Leeds Metropolitan University
Centre for the Built Environment, Leeds Metropolitan University
School of Health & Human Sciences, Leeds Metropolitan University
Bartlett School of Graduate Studies, University College London

Good Homes Alliance

Results from Phase 1: Post-construction testing of a sample of highly sustainable new homes

Communities in Motion, Bryant Homes, REDROW, UCL, NHBC, Vent-Axia, leeds metropolitan university

Micro-CHP Accelerator

Project Report - March 2011

Low carbon housing

Lessons from Elm Tree Mews

November 2010

Malcolm Bell, Joe Wingfield, Domingo Miles-Shenton, Jenny Seawers

This report sets out the findings from a low carbon housing trial at Elm Tree Mews, and discusses the technical and policy issues that have arisen.

The Government has set an ambitious target to be zero carbon by 2016. With the appropriate insulation, improved efficiency and renewable energy, this target is theoretically possible. However, in practice, even existing buildings are not being achieved and that this points to the need to address these concerns. This report seeks to address these concerns through the evaluation of a low carbon development.

The report:

- evaluates the energy/carbon performance of the dwellings prior to occupation and

Final Report: In-situ monitoring of efficiencies of condensing boilers and use of secondary heating

Prepared by: GASTEC at CRE Ltd, ACCOM EA Technology, The Energy Saving Trust

Contract Number: GaC3563

June 2009



Getting warmer: a field trial of heat pumps

The Energy Saving Trust



Here comes the sun: a field trial of solar water heating systems

The Energy Saving Trust

CARBON COMPLIANCE

SETTING AN APPROPRIATE LIMIT FOR ZERO CARBON NEW HOMES

FINDINGS AND RECOMMENDATIONS

February 2011

CARBON COMPLIANCE FOR TOMORROW'S NEW HOMES

MODELLING TOOL AND ASSUMPTIONS

OVERVIEW OF FINDINGS AND RECOMMENDATIONS

July 2010

CARBON COMPLIANCE FOR TOMORROW'S NEW HOMES

A REVIEW OF THE MODELLING TOOL AND ASSUMPTIONS

TOPIC 4: CLOSING THE GAP BETWEEN DESIGNED AND BUILT PERFORMANCE

August 2010



Low and zero carbon homes: understanding the performance challenge

Informing the debate

NHBC Foundation



Part L 2013 consultation

- Compliance and performance industry working group
 - Performance sub-group
- Consultation
 - Regulatory framework to incentivise QA process (PAS or similar)
 - Recognising that no Govt decisions made yet
- Building Regs team have shared key messages from consultation responses
 - Broad support for aims, **but some concerns about formality of an end to end PAS QA process/ confidence factor**
 - Lack of evidence / analysis on where performance gap occurs



Closing the performance gap

- Carbon Compliance report, Recommendation 4a:
From 2020 the test results distribution should demonstrate that at least 90% of all dwellings would meet or perform better than the designed energy / carbon performance.
- The journey
 - 2013 -> 2016 -> 2020
- Alternative approach
 - Via Hub-led industry group
 - Collaborative
 - Wide industry support



The proposal

Main aim:

- To improve the as-built performance of new homes and meet the 2020 ambition
- In particular to provide:
 - **Enabling actions** for industry to act to close the gap between the designed and as-built performance of dwellings, starting in 2013.
 - **Tangible outputs** such as guidance documentation and dissemination of good practice will form an important part of the group's work.
- Hub-led group seen as *the* place which will, collaboratively, bring together all strands of current work .

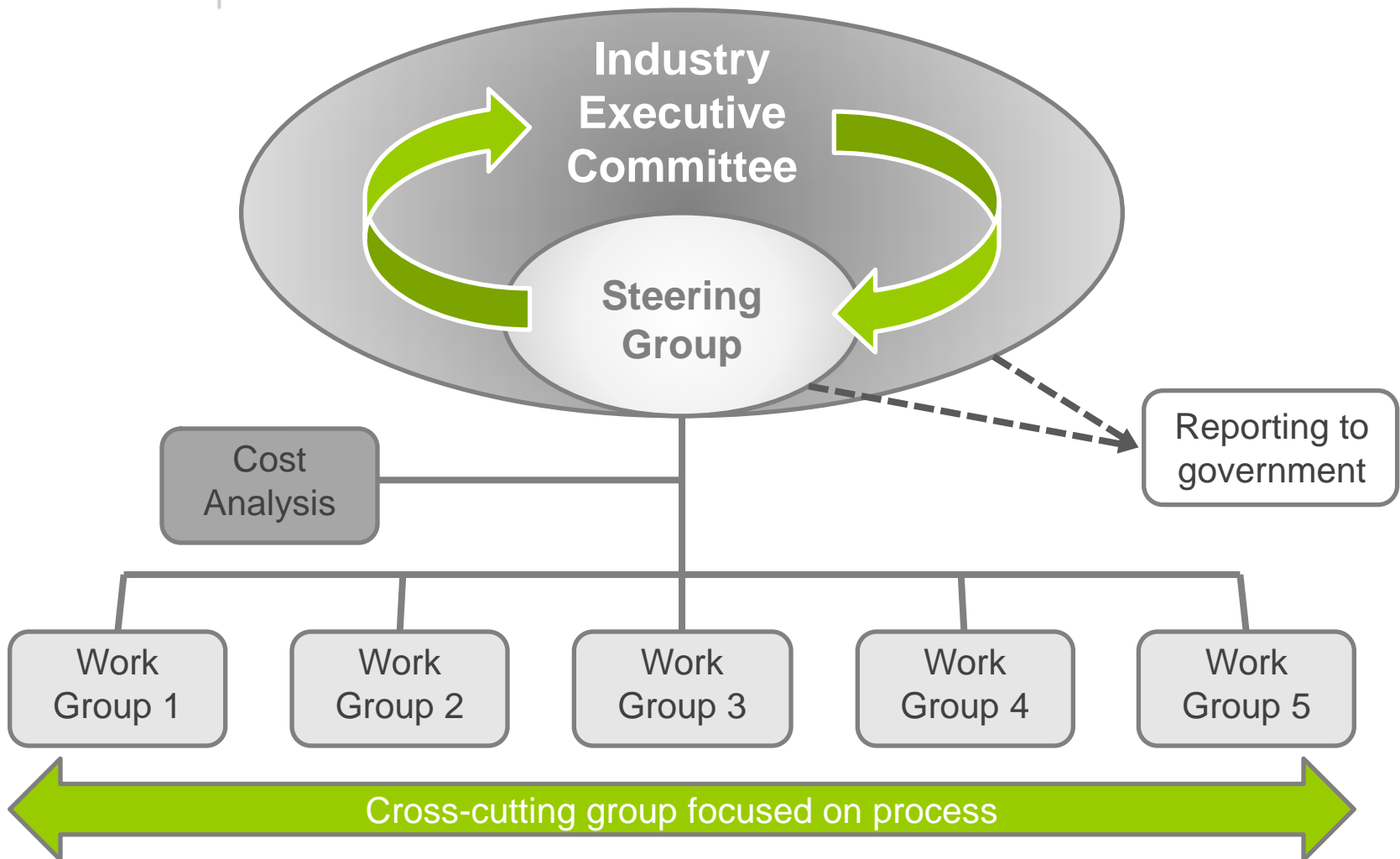


Objectives

- **Draw together and analyse existing work** in this area
- **Identify the gaps** in the evidence base & set criteria for further data collection & analysis to ensure all aspects are addressed.
- **Agree the programme of work** to meet the target for 90% of all new homes to meet or exceed their designed energy/carbon performance from 2020.
- **Develop** the information, education/ training, guidance, and good practice requirements for industry to adopt as potential '**quick wins**' from 2013
- **Develop collaboratively with all relevant parties to ensure support from industry and government**
 - Where necessary, **carry out the work** to help close the performance gap – such as further research, testing procedures, quality assurance schemes, etc.

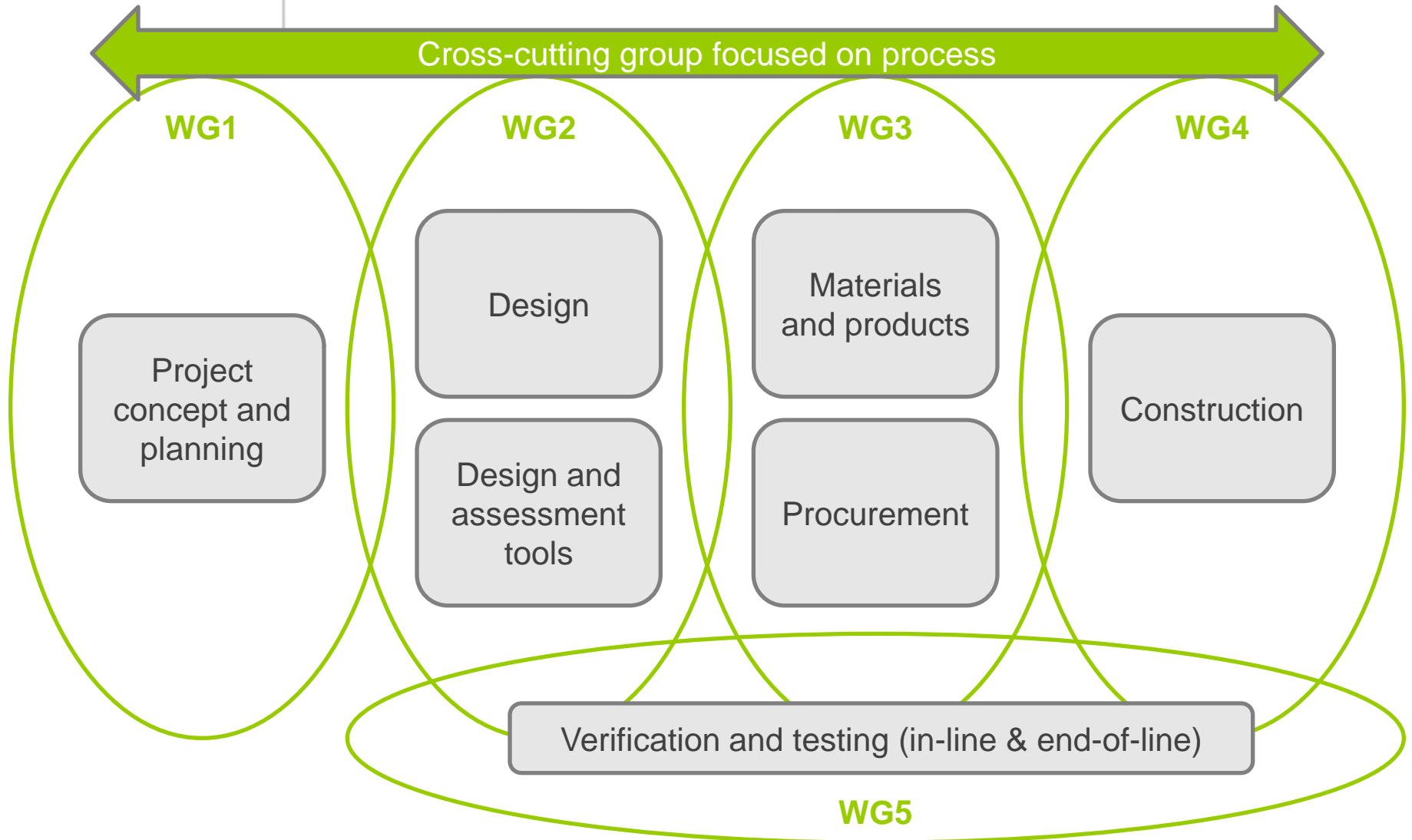


Structure





Work Group interaction





Scope & Programme

The work will be delivered across two phases using SMART criteria:

- **Phase 1** – Short term non-regulatory mechanisms alongside the 2013 amendment to Part L of the Building Regulations
- **Phase 2** – Medium term work to provide greater confidence of ensuring the 2016 ‘as built’ CO₂ emissions targets are met for new homes; with further recommendations for regulatory and non-regulatory changes.
- **[Phase 3** – Longer term work subject to future agreement]

Jan 2012
to
Sept 2013

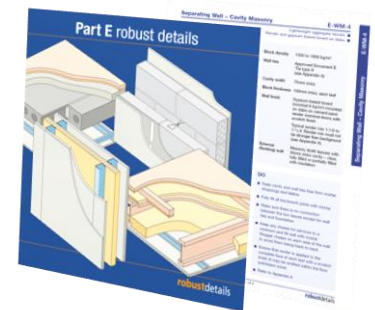
Oct 2013
to
Sept 2014

From
Oct 2014



Potential outputs

- **Guidance** targeted at particular professions and/or stages of the design and construction process e.g. models for SMEs, construction joint pattern books
- **Improved process** between inter-company departments and industry sectors
- Develop and recommend **'deemed to satisfy'** models of compliance
- Recommendations for relevant **training and education** of key personnel including designers; assessors; approvers etc.
- Development of training and/or seminar material
- Recommendations for new or amended **accreditation schemes**
- Recommendations for changes to the **compliance tool** (SAP)
- Development or adoption of a methodology for reporting the **in-situ performance** of materials and systems
- Recommendations for in-line and end-of-line **test methods**





What performance gap ?



THANK YOU