

CLOSING THE DESIGN VS AS-BUILT PERFORMANCE GAP

Ross Holleron
January 2014

Nearer to
zero

Planning for zero carbon
homes from 201



Introduction to the (English) Zero Carbon Hub

PURPOSE AND STRATEGIC OBJECTIVES

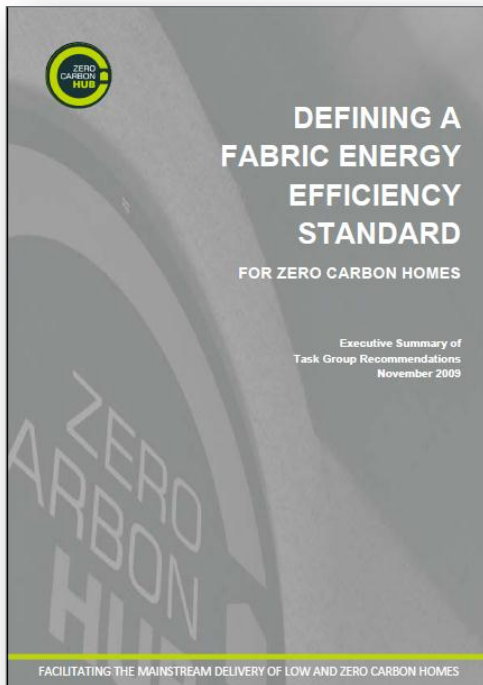
Supporting the delivery of low and zero carbon homes

- Providing leadership and creating confidence
- Reducing risk and clearing obstacles
- Disseminating information

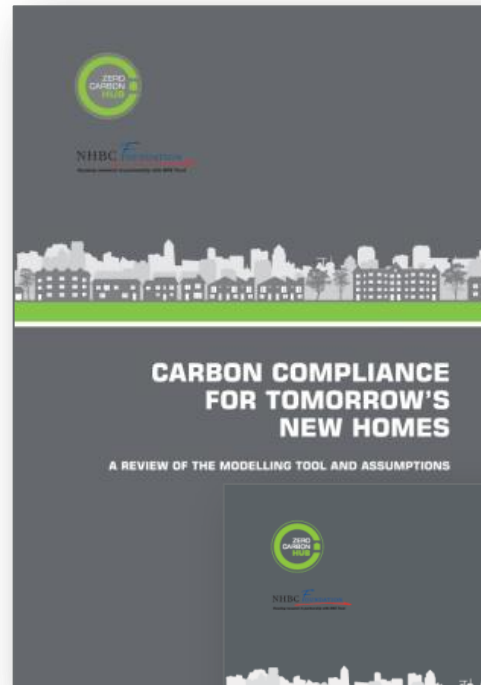
New Homes	New Non-Residential
Existing Homes	Existing Non-Residential

The Hub's Journey so far

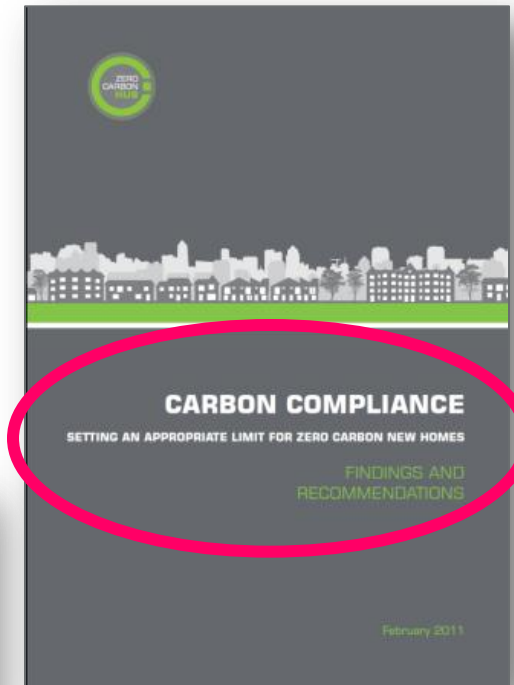
Nov 2009



Aug 2010



Feb 2011



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



leeds metropolitan university

Low carbon housing

Lessons from Elm Tree Mews

November 2010

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

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

The report:

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

Malcolm Bell,
Jon Wingfield,
Dominic Miles-Shenton,
Janey Seawers

TEMPLE AVENUE PROJECT

ENERGY EFFICIENT NEW HOMES FOR THE 21ST CENTURY



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



Prepared by:

Prepared for:

Contract Number:

GASTEC at CRE Ltd
ACCOM
EA Technology
The Energy Saving Trust
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



GHA Monitoring Programme 2009-11: Technical Report

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



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

Technology Strategy Board
Using Innovation



Building performance evaluation

COMPETITION FOR FUNDING
MAY 2010 - 2012



LOW IMPACT BUILDING INNOVATION PLATFORM

3RD EDITION



JRHT
ZERO CARBON HOUSING TRUST

Low and zero carbon homes: understanding the performance challenge



Evidence assembled for CC4TNH

Measured v Predicted whole-house fabric performance

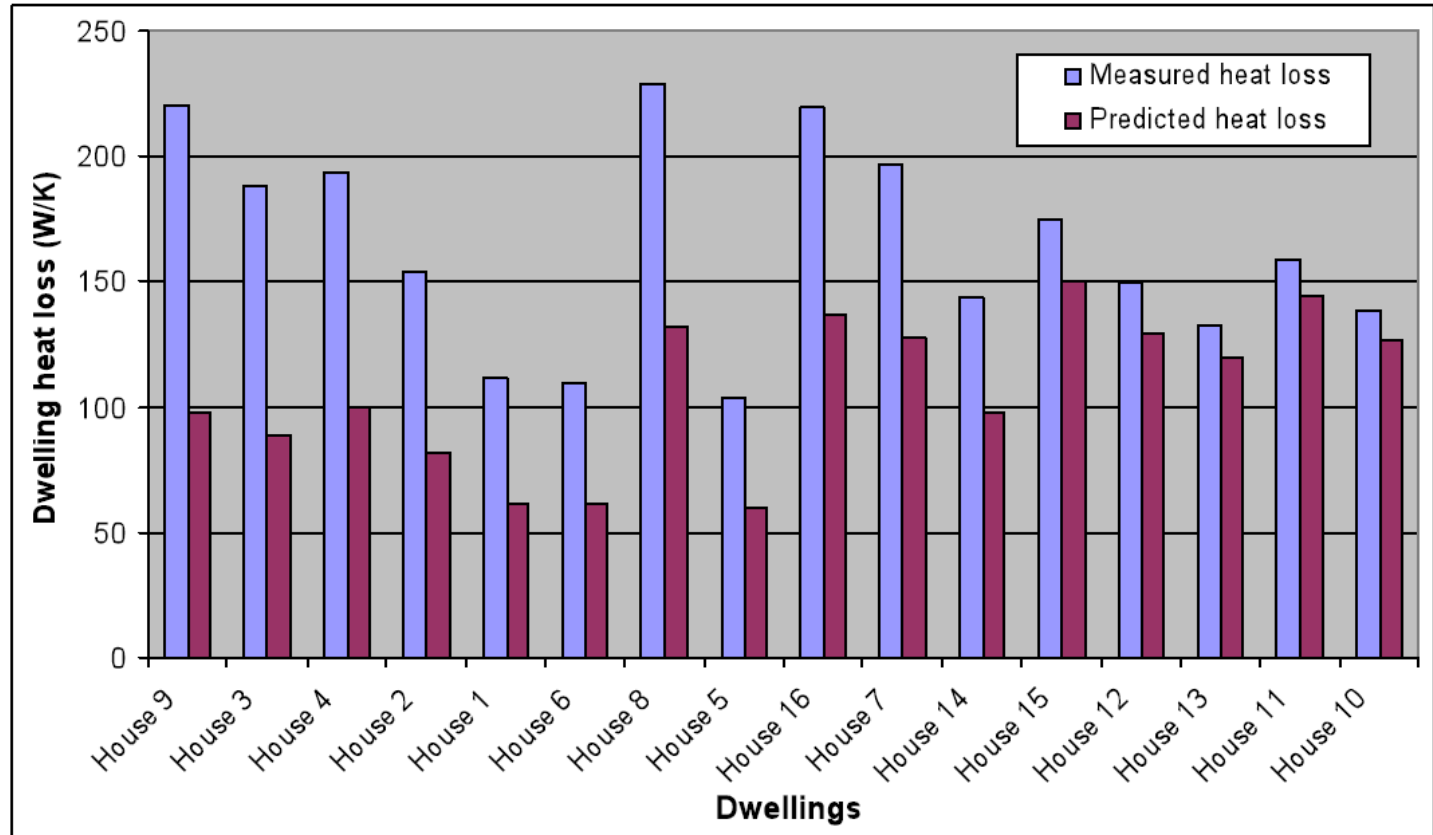


Figure 1 Measured v Predicted whole house heat loss for 16 dwellings⁴

Closing the performance gap

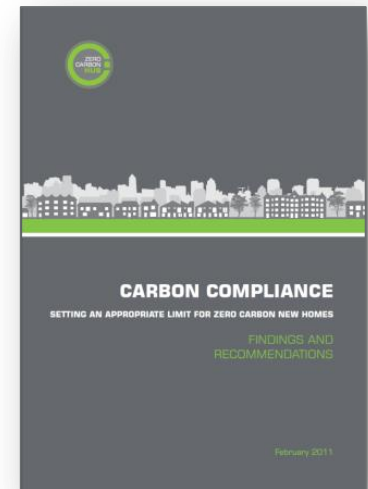
- Carbon Compliance report, Recommendation 4a:

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.

Feb 2011

- The journey:

- 2013 -> 2016 -> 2020



Why it's important to industry

- Improving quality throughout the process
- Improving occupant satisfaction
- Levelling the 'playing field'
- Improving links between parts of industry to reduce overall costs
- An alternative to Regulation

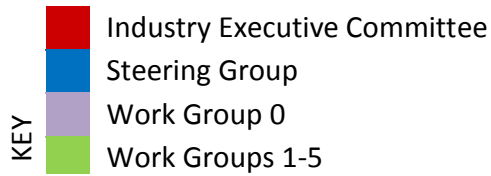
The current project

Main aim:

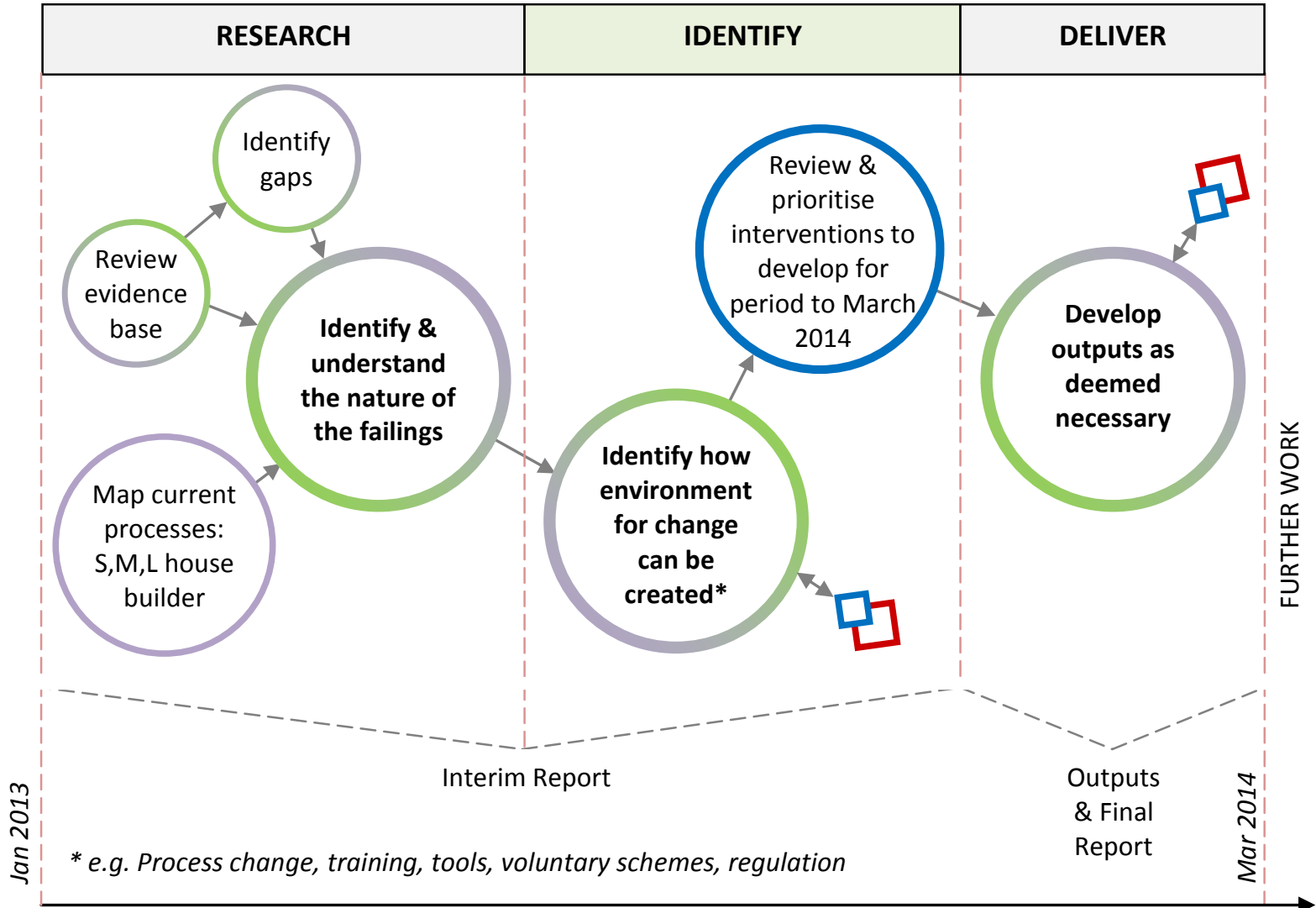
- To improve the as-built performance of new homes and enable the 2020 ambition to be met
- The group to be seen as *the* place which will, collaboratively, bring together and help to develop all strands of work in this area.

What are we trying to do?

- Find solutions that suit industry & government
- Preferably at no extra cost



Work stages



Planner requirements

- Knowledge
- Responsibility
- Communication
- Skills

Land acquisition & Planning

Designer understanding - site issues

Design continuity

Information flow to SAP Assessor

Detailed design

Performance info provided to Procurement

Services integration

Sub-contractor design decisions

Product substitution

Procurement

Feedback on 'unbuildable' details

Procurement documentation (skills and performance)

Installation & commissioning

QA processes (air tightness)

Construction & Commissioning

SAP Audit process

Verification of fabric thermal performance

Verification of building services performance

As-built SAP process

Verification & Testing

EU testing standards for material & products

SAP treatment of technology performance

ACDs buildability, tolerances & Site conditions

Product identification on site / in situ

○ Literature reviews

- Academic and industry research papers
- Laboratory testing
- Field trials

○ Development site reviews

- Interview process – Concept design to construction
- Site walk through – Design specification versus site
- SAP Audits – Design stage versus site observations

○ SAP Process Analysis

- Survey of assessors
- Sensitivity of common input issues



DEVELOPING COMMERCIALY VIABLE PROCESS CONTROL TOWARDS 2020



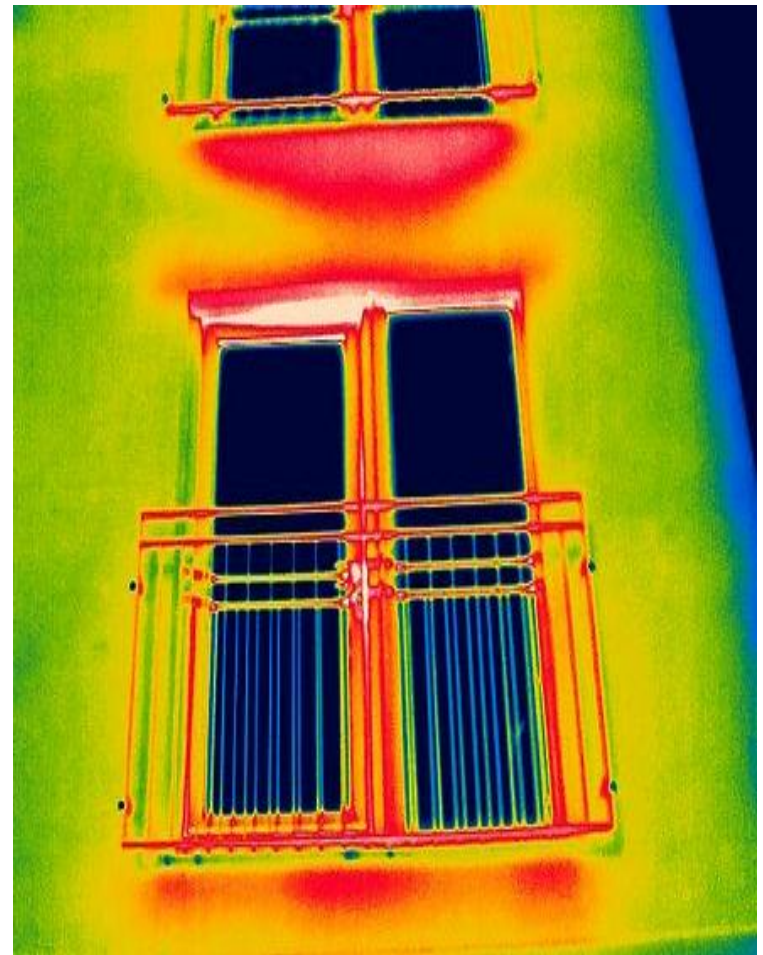
Thermographic imaging

Method

- Internal & external images of the building fabric taken during the co-heating testing
- Carried out early in the morning to minimise distortion to surface temperatures

Observations

- Thermographic images reveal weaknesses in the build and design
- Analysis must be carried out by an experienced person



In-situ U-value measurement

Method

- Heat flux testing carried out during co-heating test in one flat in each block
- Heat loss measured across north-facing external walls and also party walls

Observations

- The difference in measured and calculated U-values is similar to tests of this nature
- A party wall bypass was noted in both blocks



Co-heating test

Observations on implementation

- Test carried out in April, at very end of what is considered the suitable period
- Active site, so difficult to maintain controlled temperature in adjacent units

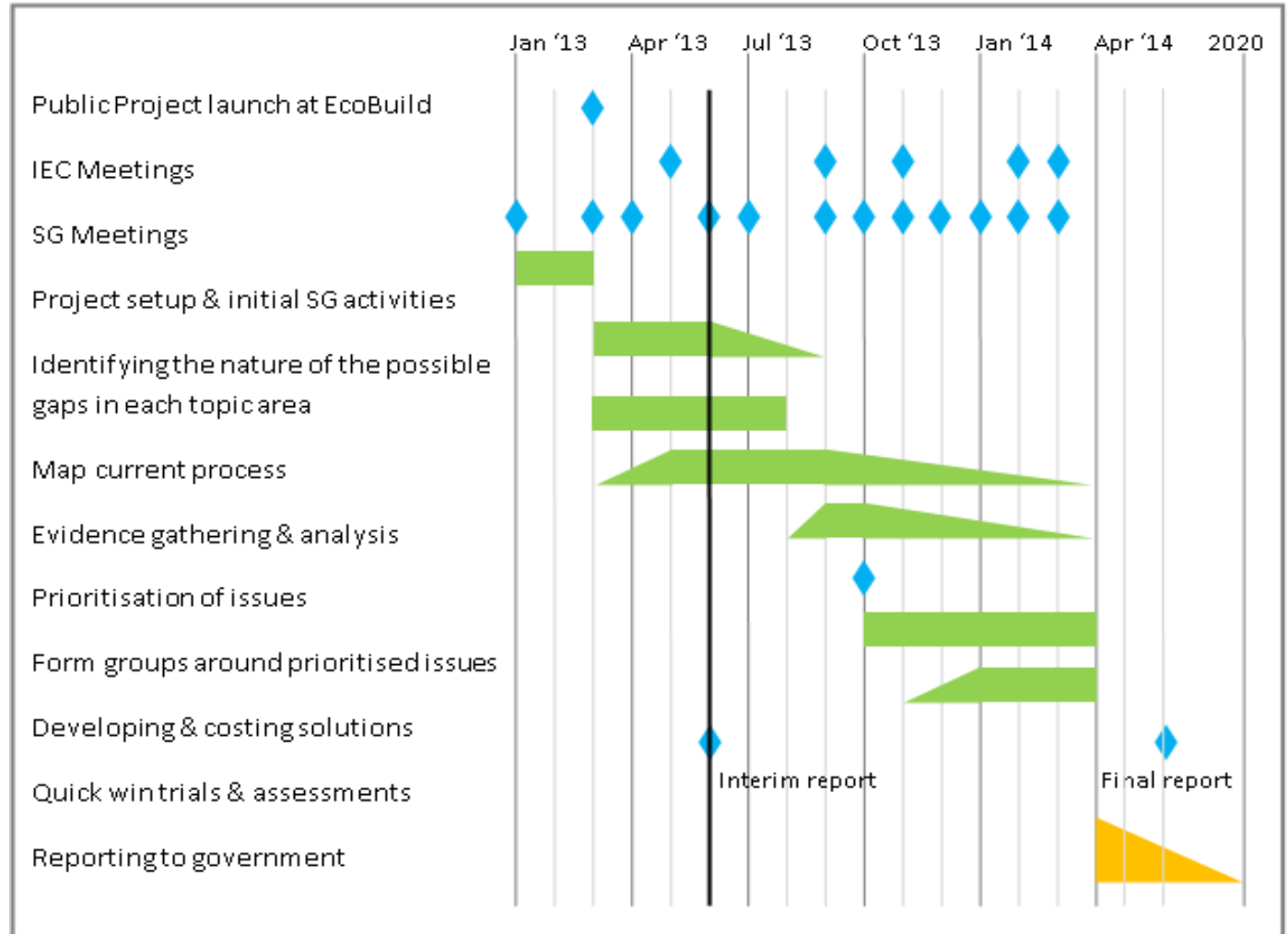
Observations on results

- Measured heat loss was greater than calculated heat loss
- Result at higher end of scale of published test results



We need 'inline' and 'end of line' techniques

Project next steps



On-going activities (not yet funded)

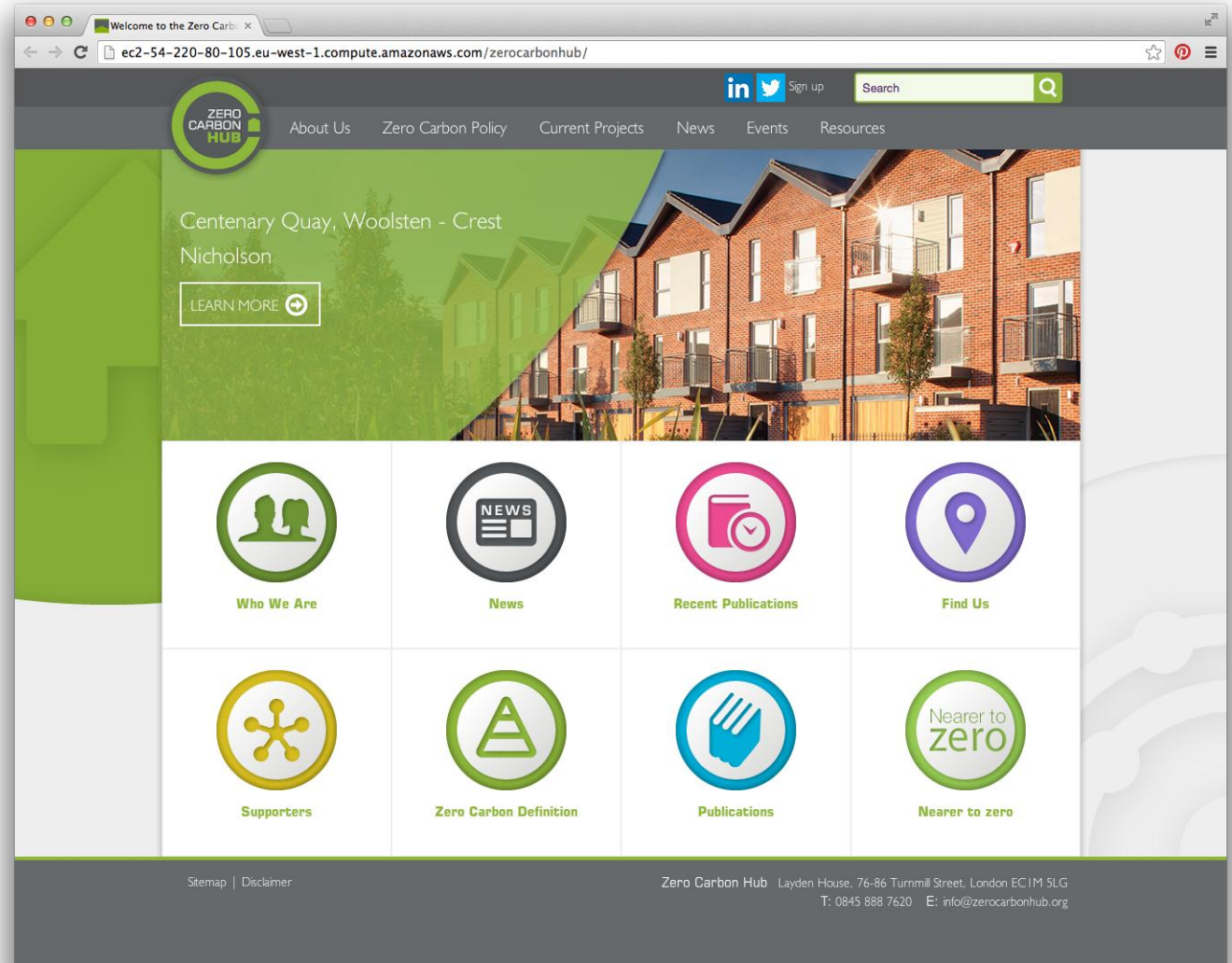


A reminder why it's important

- Improving quality throughout the process (not just end of line)
- Improving occupant satisfaction
- Levelling the 'playing field' (especially amongst product manufacturers)
- Improving links between parts of industry to reduce overall costs
- An alternative to Regulation

NEW WEBSITE

- Costing Report
- DvAB Interim Report
- DvAB Final Report



THANK YOU

Ross Holleron, Zero Carbon Hub

