ZERO CARBON HUB

Policy context and latest research

Ross Holleron, Projects Director
Aims of this presentation:

- Brief review of policy development
- Highlight what is meant by ‘Zero Carbon Homes’
- Examples of practical guidance
- Indication of future risks
PURPOSE AND STRATEGIC OBJECTIVES

Facilitate the mainstream delivery of low and zero carbon homes working across borders

- Provide leadership & create confidence
- Reduce risk
- Disseminate information
Priorities for the ZCH in 2015 - 16

Policy development (5%)

Risk research (35%)

Dissemination (60%)

(Allowable Solutions)

(Overheating, Ventilation & Performance Gap)

(Technical & Consumer)
Where are you?

2016
Why Zero Carbon Homes?
2001-2010 was the warmest decade on record.

2012: Hottest day ever in Scotland and wettest June in the UK.

2013: Wettest winter ever recorded.

2014: Was the hottest year ever recorded.

THE EFFECTS OF CLIMATE CHANGE
THE EFFECTS OF CLIMATE CHANGE


Northwest Passage
Northern Sea Route

Source: Hugo Ahlenius, UNEP/GRID-Arendal
UK Government, European Policy & the Zero Carbon Agenda
THE JOURNEY SO FAR.......

2007
Building a greener future: policy statement

2008
UK GBC standard unattainable on many sites

Jul 2008
ZCH created

March 2011
New Government Regulated CO₂ only

PartL2010
No FEES
SAP2010 FEES

PartL2013
6% improvement FEE considered

2013
AS consultation launched

2016
All new homes to be zero carbon

2019/2020
EU Nearly Zero Energy Buildings

THE JOURNEY SO FAR.......

Carbon Compliance

Allowable Solutions

On site low/zero carbon heat and power

Fabric Energy Efficiency

Zero Carbon
Government Policy
Zero Carbon 2016
MEETING ZERO CARBON TARGETS

The Zero Carbon Hierarchy

- Building fabric performance
- Energy efficiency
- On-site low/zero carbon energy (and connected heat)
- Allowable solutions

Zero Carbon = Solutions addressing the carbon emission reductions that are difficult to achieve on site

Carbon Compliance = On-site heat and power generation

5% Complete
75% Complete
95% Complete

Energy efficiency
On-site low/zero carbon energy (and connected heat)
Allowable solutions

MEETING ZERO CARBON TARGETS

Carbon Compliance = On-site heat and power generation

Allowable solutions

MEETING ZERO CARBON TARGETS
2016 CARBON COMPLIANCE

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

Carbon Compliance Standard
- Heating/cooling appliances
- Mechanical ventilation
- Hot water
- Active controls
- Fixed lighting
- All LZC technologies
THE FABRIC ENERGY EFFICIENCY STANDARD

Building Fabric:
- U-values
- Thermal mass

Thermal Bridging

Air-permeability

Orientation, solar gains,
Glazing proportion
Fabric Energy Efficiency Standard (kWh/m²/yr)

- Current practice (CP)
- CP + No heat loss through party wall
- Spec A
- Spec B
- Spec C-
- Spec C (EST APEE)
- Spec D (PassivHaus Equivalent)

Increasing fabric performance

- Task Group's Recommended Level
DON’T PANIC!

Concrete

Brick and Block
14 kg CO$_2$(eq) /m$^2$/year for low rise apartment blocks (four storeys and below).

39 kWh/m$^2$/year
Apartment

39 kWh/m$^2$/year
Mid terrace

11 kg CO$_2$(eq) /m$^2$/year for attached houses

46 kWh/m$^2$/year
End terrace/semi detached

10 kg CO$_2$(eq) /m$^2$/year for detached houses

46 kWh/m$^2$/year
Detached

A similar fabric specification can deliver the required performance (39 or 46 kWh/m$^2$/year) in these house types.

Detached house needs a slightly higher fabric specification to meet 46 kWh/m$^2$/year.
ZCH recommendations

**CO₂ Improvements over Part L1A 2006**

- Part L1A 2006: 0%
- Part L1A 2010 / CfSH 3: 25%
- CfSH 4: 44%
- CC Apartments: 44%
- CC Attached: 56%
- CC Detached: 60%
- CfSH 5: 100%

Ultimately subject to full Part L 2016 consultation

Recent government announcements?
ZERO CARBON HOME v CODE 5 HOME

2016 Zero Carbon Home

- Fabric Energy Efficiency
- On-site LZC Heat and Power
- Allowable Solutions

Code 5 Home

- Fabric Energy Efficiency
- On-site LZC Heat and Power
Allowable Solutions

100% On site
Beyond Carbon Compliance

D.I.Y
Retrofit, heat networks

3rd Party Contracting
Direct, LA, matching, brokerage

Invest in a Fund
Managing a portfolio of projects

Small site exemption announced
(10 units or less)
Site Conditions:
- Access
- Location (regional weather)
- Ground conditions
- Flood risk
- Existing trees, water bodies etc
- Local energy source for biomass, wind conditions etc
- Existing district heating network

Planning:
- 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

What is the Energy Strategy?
Costs
Additional Cost of Zero Carbon Homes

- **2015**: £5k? (Carbon Compliance: 25%, Allowable Solutions: 0)
- **Revised definition 2011**: £10k (Carbon Compliance: 33%, Allowable Solutions: 0)
- **Revised definition 2008/9**: £20k per home (Carbon Compliance: 70%, Allowable Solutions: 0)
- **Original definition**: £40k per home (Carbon Compliance: 100%, Allowable Solutions: 0)

**kg CO₂ m²/year**
- 2006 Part L: 25
- 2010 Part L: 20
- 2013 Part L: 14
- 2016 Part L: 10
- True Zero Carbon: -20

**Reduction on 2006 Part L**
- Code 3: 25%
- Code 4: 33%
- ‘Code 4½’: 70%
- Code 5: 100%
- Code 6: ~150-200%

**Allowable Solutions**
- 2008/9: £20k per home
- 2011: £10k
- 2015: £5k?
So how do we achieve Low Energy Homes?
Annual Household energy spend....

<table>
<thead>
<tr>
<th>Type</th>
<th>1-bed</th>
<th>3-bed Semi-detached</th>
<th>3-bed Mid-terrace house</th>
<th>4-bed Detached house</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Floor Flat</td>
<td>£940</td>
<td>£1,430</td>
<td>£1,670</td>
<td>£2,460</td>
</tr>
<tr>
<td>Victorian</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Victorian with some modern day improvements</td>
<td></td>
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</tbody>
</table>

Does exactly what it says on the tin.
THE PERFORMANCE GAP

Found cross-cutting themes:

- KNOWLEDGE & SKILLS
- RESPONSIBILITY
- COMMUNICATION
How is the u-value calculated?

Can’t assume same thickness across entire roof
Design Assumed:
- Wall ties
- Compressed edge seal
- Insulation

90% of sites visited:
- Window in wrong position
- U & G values wrong
Common themes on site
Site Posters - Fabric and Services

Fabric
1. Groundworks
2. Beam and Block Floor
3. Door Threshold
4. Cavity Wall – partial fill
5. Cavity wall – full fill
6. Floor Joists
7. Separating wall
8. Lintels
9. Windows
10. Bay windows
11. Projecting windows
12. Eaves
13. Roof
14. Dryline
15. Ventilation
16. Heating / hotwater
17. Finals
**WINDOW INSTALLATION**

- **Problem to Avoid**: Windows installed forward of design position
  - Colds spot
  - No overlap of window and cavity

- **What to Do**:
  1. Close the cavity with tightly packed insulation
  2. Insulation to window reveal
  3. Window fitter to provide non-standard large drill
  4. Overlap frames with cavity as much as possible - minimum 30mm
  5. Check trickle vent sizes as design
  6. Less than 10mm tolerance around window frame and structural opening

- **Good Practice**: A large overlap with cavity will improve thermal performance.
  For improved airtightness, use air barrier tapes between the window/door and structure.

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**EAVES**

- **Problem to Avoid**: No insulation at eaves
  - Squashed insulation
  - Insulation missing
  - Reduced space above joists makes installation of full insulation impossible

- **What to Do**:
  1. Install rigid insulation to top of the wall plate
  2. Trust design to accommodate space for insulation at eaves
  3. Lay mineral wool insulation into eaves
  4. Cut insulation around eaves tiles

- **Option 1**
  - 150MM

- **Option 2**
  - 150MM

- **Good Practice**: Install insulation before eaves are inaccessible.

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**NEW RESIDENTIAL SOLUTIONS FROM SAINT-GOBAIN**
**Dryline/Plaster**

**Problem to Avoid:** Air-leakage

**What to Do:**
- Foam fill all penetrations/gaps before drylining
- Stagger ceiling boards end over door openings to minimise future cracking
- Mark continuous ribbon of adhearse to be applied around all openings, along the top and bottom and at internal and external corners of walls and over service chasers

**Good Practice:** Use a parasite or plaster on block work to improve airtightness

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**Ventilation**

**Problem to Avoid:** Poorly specified and installed ductwork

**What to Do:**
- Install rigid ductwork for extract fans, and minimise use of flex ductwork
- Install all connection fans to part f domestic ventilation compliance guide
- Commissioning sheets to be provided to site manager
- Check noise of fan is not excessive
- Check ducts to outside are fully insulated
- Clearly label the ventilation controls

**Good Practice:** Specialist or manufacturer to commission fans

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**New Residential Solutions from Saint-Gobain**
UNINTENDED CONSEQUENCES?
BACKGROUND

Understanding overheating - where to start:
An introduction for house builders and designers

Overheating in new homes:
A review of the evidence

Overheating in homes:
An introduction for planners, designers and project owners

OVERHEATING AND VENTILATION IN HOMES
New projects by the Zero Carbon Hub
THE CHALLENGE FOR THE WHOLE SECTOR

We must consistently provide homes which maintain comfortable temperatures throughout the year

– Making homes warmer in winter can make them less comfortable in summer

– The technical solutions exist to do both – we can be clever – but needs thought

– Lack of incentives (carrots or sticks) and lack of awareness

How do you know whether you have an overheating problem?

Do you know what the future may bring?
OVERHEATING – THE EVIDENCE

- Potentially up to 20% of the housing stock
- Climatic trends for more frequent heat waves (2003 – 2040?)
- Increasingly dense urban developments
- Aging population
PRELIMINARY FINDINGS

Industry perspective
- Difficulty of definitions
- Generic causes and risks known
- Limited triaging / planned assessment
- Monitoring and occupant surveys

Government perspective
- Heat wave and National Plans
- Limited LA heat risk mapping
- Building regulations / compliance
NEXT STEPS

Raising awareness
- Technical / behavioural (HP)
- Monitored case studies (HP)
- Examples of risk mapping (LA)

Updates to SAP Appendix P
- Short term revisions
- Long term strategic role

Technical solution guidance
- Linking causes - scenarios

Agree modelling methodology
- Future incidence
- National / local level

Definition / standard
- Format
- Implementation

Costs and benefits
- Preliminary study
- Effective support for HPs

Procurement
- Example clauses / templates

Advice on economic analysis
- Loss of sleep / productivity
- Local healthcare costs
Questions for you to consider.....

- Does your ambition out weigh your talent?

- How do we avoid the ‘gym membership’ syndrome?
THANK YOU

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