

# Update on regulatory changes and codes for sustainable design

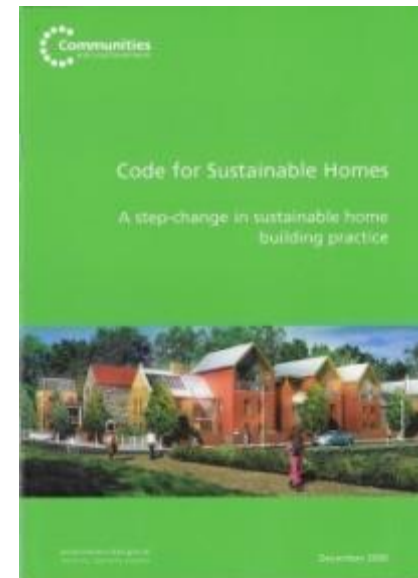


Prof. David Strong  
Chief Executive, Inbuilt Ltd  
AJ Sustainable Design Summit  
2<sup>nd</sup> December 2008




# Regulatory and other drivers

- **Zero Carbon Agenda**
  - All new homes zero carbon by 2016
  - All new non-domestic buildings zero carbon by 2019
    - But, still confusion over definitions
- **Code for Sustainable Homes**
  - Code Level 3 mandatory for RSLs from April 2007
  - Mandatory for all private homes from May 2008 (no minimum standard)
- **Code for Sustainable non-domestic buildings?**
  - BREEAM “Excellent” already required for all new public buildings
  - UK-GBC Consultation closes 12<sup>th</sup> December 2008
- **Next Revisions of Building Regulations Part L**
  - 2010, 2013, 2016 (zero carbon)
  - Merton type requirements





- **E.U. Energy Performance of Buildings Directive**
  - Articles 3-6 implemented in 2006
  - Articles 7-10 implemented 2007-2008
    - Energy Certification
    - Regular Plant Inspection
- **Ecotowns/Carbon Challenge**
- **What Next?**
  - New fiscal instruments and tax incentives?
  - Further EU legislation/Directives
  - National strategic plan to improve the energy performance of existing buildings?

 <b>EUROPEAN UNION</b>	
<small>THE EUROPEAN PARLIAMENT</small>	<small>THE COUNCIL</small>
<small>Brussels, 12 November 2002 (DE- en)</small>	
<small>2001/0098 (COD)</small>	<small>PE-CONS 366502 ENFR 124 ENV 593 CODEC 1295</small>
<small><b>LEGISLATIVE ACTS AND OTHER INSTRUMENTS</b> Subject: Directive of the European Parliament and of the Council on the energy performance of buildings</small>	
<small>In accordance with Article 251(3) of the EC Treaty, this document will not be the subject of approval by the Council; it is intended solely for the information of delegates</small>	
<small>PE-CONS 366502</small>	<small>DG C III SW/jpb EN</small>

# EU Energy Performance of Buildings Directive (EPBD)



Requires Member States to start implementing by 4<sup>th</sup> Jan 2006 with full implementation of all Articles by Jan 2009:

- **Minimum Energy Performance Standards**

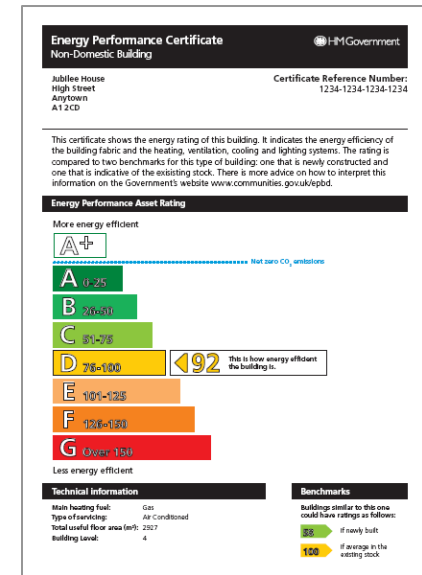
- an acceptable methodology for calculating the integrated energy performance of buildings
- minimum energy performance standards for new buildings
- minimum energy performance requirements for large **existing** buildings subject to major renovation

- **Energy performance certificates**

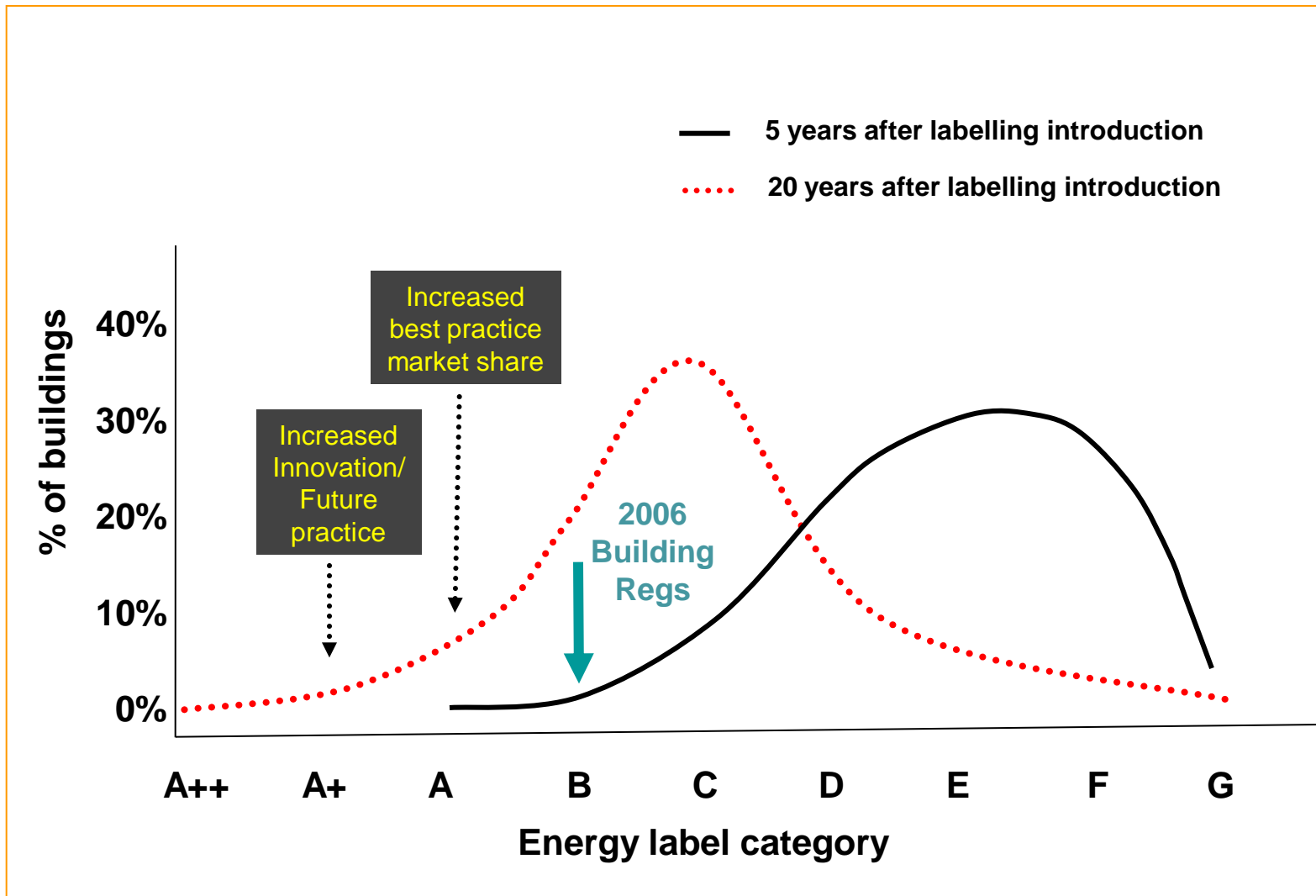
- provided to prospective purchaser/tenant
- prominent display of the energy certificate in all public buildings and “institutions providing public services”

- **Regular plant inspection associated with**

- boilers
- air-conditioning systems




# Transforming the market



# Energy Report for Home Information Pack



- Design based upon focus group and market research
- The research highlighted that it is important to keep the label simple to maximise consumer understanding and impact
- A simple A to G label, has been adopted but, very confusingly, with two Ratings:
  - Energy Efficiency
  - Environmental Impact (CO<sub>2</sub>)


**Energy Performance Certificate** 

[address] Dwelling type: Semi-detached house  
 Date of assessment: 09 March 2007  
 Date of certificate: [dd mmmm yyyy]  
 Reference number: 0000-0000-0000-0000-0000  
 Total floor area: 82 m<sup>2</sup>

This home's performance is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO<sub>2</sub>) emissions.


**Energy Efficiency Rating**

Rating	Current	Potential
Very energy efficient - lower running costs		
(92-100) <b>A</b>		
(81-91) <b>B</b>		
(69-80) <b>C</b>		
(55-68) <b>D</b>		
(39-54) <b>E</b>		
(21-38) <b>F</b>		
(1-20) <b>G</b>		
Not energy efficient - higher running costs		
	50	73

UK 2007 

**Environmental Impact (CO<sub>2</sub>) Rating**

Rating	Current	Potential
Very environmentally friendly - lower CO <sub>2</sub> emissions		
(92-100) <b>A</b>		
(81-91) <b>B</b>		
(69-80) <b>C</b>		
(55-68) <b>D</b>		
(39-54) <b>E</b>		
(21-38) <b>F</b>		
(1-20) <b>G</b>		
Not environmentally friendly - higher CO <sub>2</sub> emissions		
	48	72

UK 2007 

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills will be.


The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO<sub>2</sub>) emissions. The higher the rating the less impact it has on the environment.

**Estimated energy use, carbon dioxide (CO<sub>2</sub>) emissions and fuel costs of this home**

	Current	Potential
Energy Use	375 kWh/m <sup>2</sup> per year	198 kWh/m <sup>2</sup> per year
Carbon dioxide emissions	5.1 tonnes per year	2.7 tonnes per year
Lighting	£63 per year	£32 per year
Heating	£509 per year	£286 per year
Hot water	£119 per year	£75 per year

Based on standardised assumptions about occupancy, heating patterns and geographical location, the above table provides an indication of how much it will cost to provide lighting, heating and hot water to this home. The fuel costs only take into account the cost of fuel and not any associated service, maintenance or safety inspection. This certificate has been provided for comparative purposes only and enables one home to be compared with another. Always check the date the certificate was issued, because fuel prices can increase over time and energy saving recommendations will evolve.

To see how this home can achieve its potential rating please see the recommended measures.

 Remember to look for the energy saving recommended logo when buying energy-efficient products. It's a quick and easy way to identify the most energy-efficient products on the market.

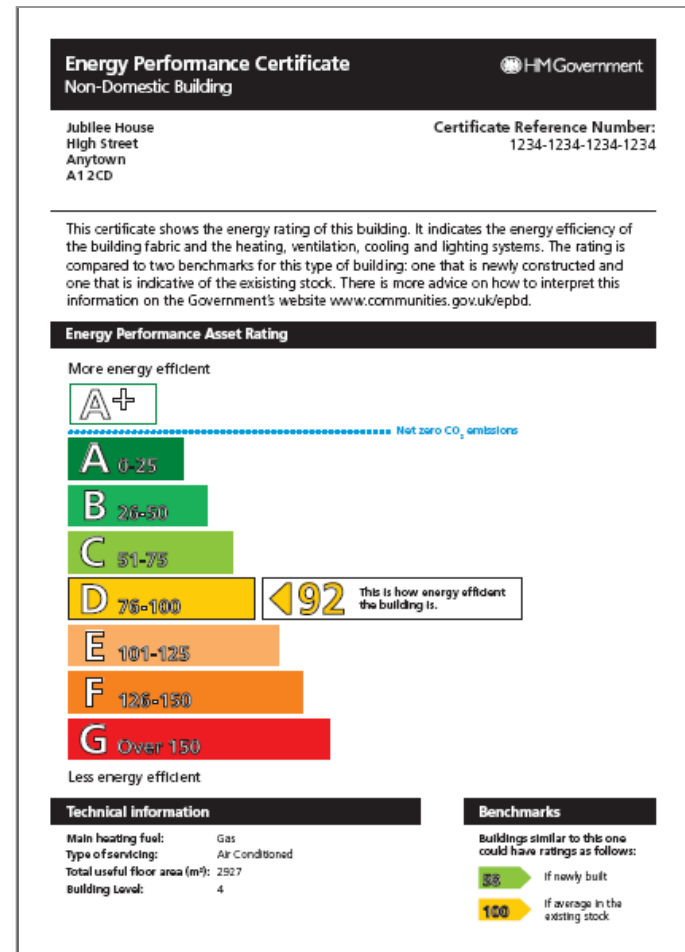
For advice on how to take action and to find out about offers available to help make your home more energy efficient, call 0800 512 012 or visit [www.energysavingtrust.org.uk/myhome](http://www.energysavingtrust.org.uk/myhome)

# Asset Rating – the calculation methodology to generate an EPC



A methodology which calculates ‘integrated energy performance of buildings’ (Art 1),

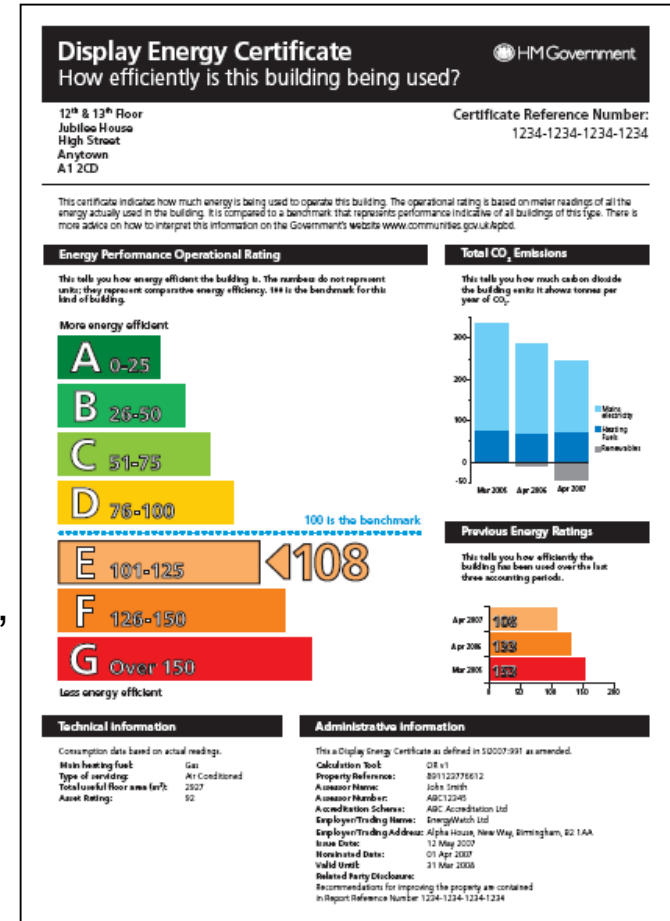
- Taking account of (Annex):
  - Indoor conditions
  - Fabric performance
  - HVAC and DHW
  - Lighting and daylighting
  - Position and orientation
  - Passive design features
  - Renewable and chp options
- Produced using SBEM or DSM
- Penalty for failing to make an EPC available:-
  - 12.5% of rateable value
  - Min. penalty £500 Max. £5,000



# Display Energy Certificates (DECs)



- From Oct 2008 public sector occupiers of large buildings (over 1000m<sup>2</sup>) will need to display a DEC
  - Will need to be recalculated each year
  - Calculation will need to use the government's “approved methodology”
  - Special arrangements for multiple buildings and large campuses
  - DEC can only be produced by an Approved Energy Assessor
  - Must be accompanied by an “Advisory Report”



# Why EPCs and DECAs are important in delivering market transformation



- Significant new drivers for building clients, owners and operators associated with:-
  - Brand equity/CSR issues
  - Environmental reporting (and disclosure requirements) associated with property portfolios
- Introduces new requirement into the property transaction process
- Building energy labelling will make architectural greenwash more difficult
- Will have a real and demonstrable impact on Asset Value (positive and negative)





# The Code for Sustainable Homes

Launched in April 2007

- Owned by the Department for Communities and Local Government (CLG); administered and maintained by BRE
- ‘a step change in sustainable home building practice’
- Replaced EcoHomes scheme
- Mandatory from April 2008
- **NEW-BUILD ONLY**





# Code Categories



- **Energy/CO<sub>2</sub>**



- **Waste**



- **Water**



- **Pollution**



- **Materials**



- **Health & Wellbeing**



- **Surface Water Run-off**



- **Management**



- **Ecology**



# Energy and CO<sub>2</sub> Emissions

- **Ene1** Dwelling Emission Rate
- **Ene2** Building fabric
- **Ene3** Internal Lighting
- **Ene4** Drying Space
- **Ene5** Energy Labelled white goods
- **Ene6** External Lighting
- **Ene7** Low or Zero Carbon (LZC) Technologies
- **Ene8** Cycle storage
- **Ene9** Home Office

# Energy Standards and Building Regulations



Code Level	Minimum percentage improvement in dwelling emission rate over target emission rate	Building Regulations
Level 1	$\geq 10$	-
Level 2	$\geq 18$	-
Level 3	$\geq 25$	2010
Level 4	$\geq 44$	2013
Level 5	$\geq 100$	-
Level 6	'Zero Carbon Home'	2016



# Code levels and points score

<b>Code Levels</b>	<b>Total Points (not credits!) Score out of 102.67 (equal to or greater than):</b>
<b>Level 1 (★)</b>	<b>36 Points</b>
<b>Level 2 (★★)</b>	<b>48 Points</b>
<b>Level 3 (★★★)</b>	<b>57 Points</b>
<b>Level 4 (★★★★)</b>	<b>68 Points</b>
<b>Level 5 (★★★★★)</b>	<b>84 Points</b>
<b>Level 6 (★★★★★★)</b>	<b>90 Points</b>



# The Code for Sustainable Homes

Mandatory requirements:

	Energy	Water	Surface Water Runoff	Waste	Health & Wellbeing	Total Points
Code Level	(% better than TER)	(litres/person/day)		Construction Waste	Lifetime Homes	Weighted % required
1(*)	10	120	Peak run-off rates post development < pre-development	SWMP must be produced and implemented		36
2(**)	18	120				48
3(***)	25	105				57
4(****)	44	105				68
5(*****)	100	80				84
6(*****)	Zero carbon *	80			Mandatory	90



# The Code for Sustainable Homes

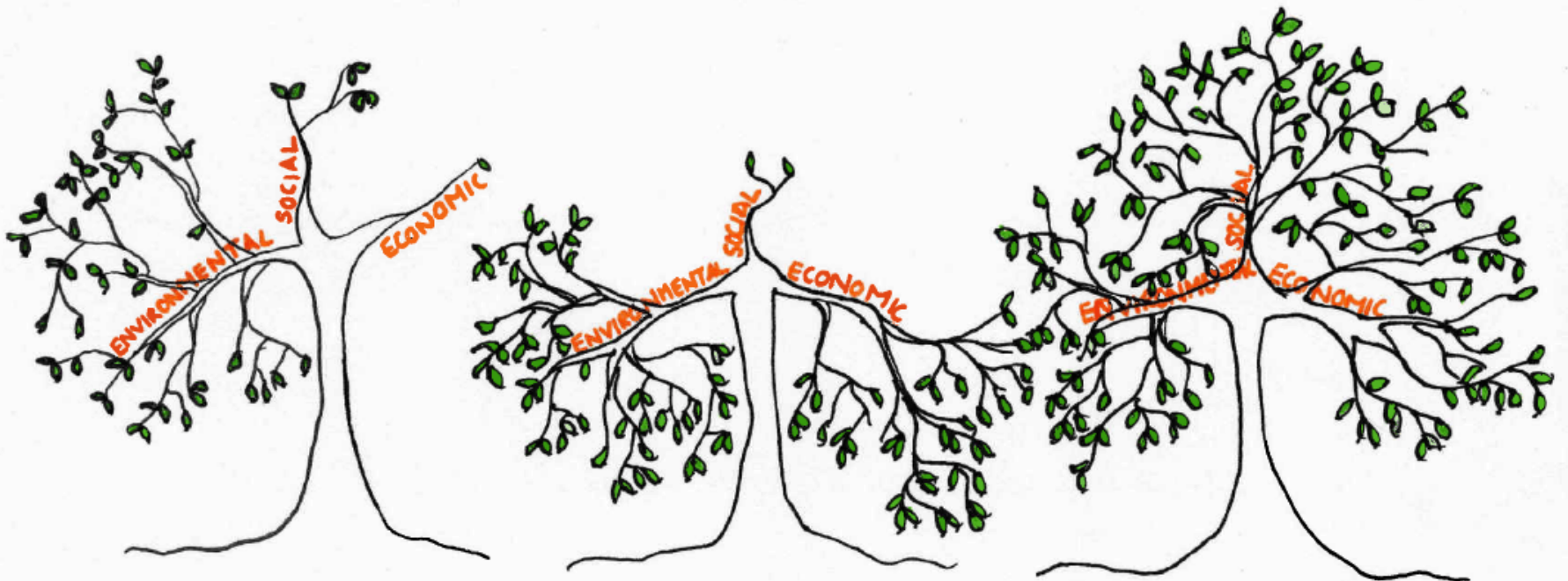
Code implementation timeline:

	2008	2009	2010	2011	2012	2013	2014	2015	2016
English Partnerships funded projects	Code level 3		Proposed Code level 4					Proposed Code level 6	
Housing Corporation funded projects	Code level 3					Code level 4			Likely to require Code level 6
Everyone else via Building Regulations	Assessment mandatory for all dwellings		Code level 3			Code level 4			Proposed zero carbon homes



# Major concerns in the UK that the Code for Sustainable Homes could lead to:

- Imbalance
- Missed opportunities
- Highly perverse outcomes





# Firstly, what do we mean by net-zero Carbon and is it an illusion anyway?

Terminology and definition are currently very confusing. Over the past year, different government departments/agencies have used at least three different definitions:-

**Zero Carbon:** no carbon-emitting fuels are burnt on site and no electricity is imported from the grid.

**Net Zero Carbon:** carbon emitting fuels are burnt on site, but locally generated renewable energy is exported to the grid to make up for this.

**Carbon Neutral:** offsite generated renewable energy is imported from the grid via private wires.



# What is a renewable technology or low carbon technology?

- There is no standard definition of what constitutes a “renewable” technology or low carbon technology, different government departments, agencies and programmes recognise various systems, technologies and energy sources as “renewables”.
- “Active” renewable options include:-
  - Biomass/biofuels/biogas
  - Photovoltaics
  - Solar Thermal
  - Heat Pumps
  - Wind Turbine
  - Micro-chp
  - Hydro (including wave/tidal)
  - Energy from waste





Some technologies don't even feature in any government list of renewable technology but are (arguably) the most effective!



**Advanced wind powered solar assisted renewable low carbon drying system**

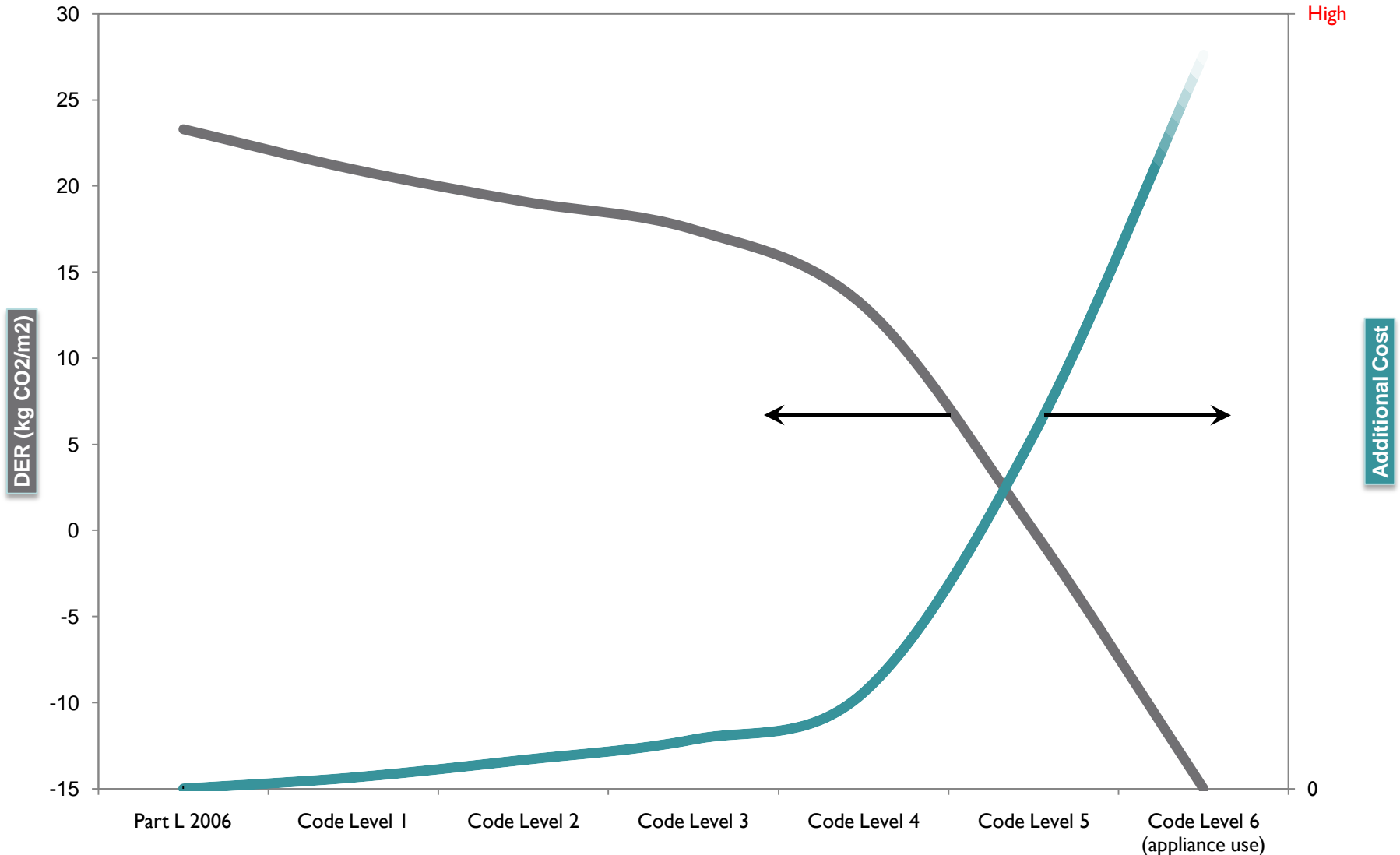


# Is zero Carbon offering the consumer a false promise?

The home is only zero-carbon in the sense that it complies with a **theoretical** carbon requirement

- Heating, lighting, hot-water energy requirements are derived from SAP
- Appliance related carbon comes from an HMRC formula which links CO<sub>2</sub> to the m<sup>2</sup> of the house
  - The formula does not have any basis in fact/science!
- The home could only be genuinely zero carbon if lifestyles are prescribed and energy rationed so as to balance onsite generation!
  - Politically unacceptable!

# Carbon emissions vs. Code Level –the law of diminishing returns!



- Based on an 80m<sup>2</sup> semi-detached house



# Stewart Milne –Sigma House, BRE

- “CSH Level 5, near zero carbon”
- Will it deliver in practice?
  - One of the wind turbines has already blown off
  - Given the location and ground turbulence effects, it’s very unlikely that the micro-wind turbines will produce anything like the manufacturer’s rated output
    - recent research has revealed that many building mounted micro-wind systems in the urban environment are actually **net-consumers** of energy
- Does Passivhaus provide a better standard?
  - Major interest by UK Housebuilders





## Will the CSH result in major problems associated with:-

- Summertime overheating
- Flood resilience
- Transport
- Security
- Acoustic performance
- Indoor air quality/Health problems
  - No IAQ regulations
    - c1900 about 50 materials (mostly natural)
      - Now over 50,000 compounds and chemicals





# Is the zero-carbon agenda acting as a huge distraction from the vital challenges associated with:

- Reducing carbon emissions from the **existing building stock**
  - An **urgent** inter-departmental government review and strategic plan was promised in November 2003 –it's never materialised!
    - c.f. Germany
- Securing investment/planning for large scale renewables
- In terms of £ invested per Tonne carbon saved, both of these options will provide a much greater/faster return than making new homes “zero” carbon!



# UK Green Building Council Consultation Code for Sustainable (non-domestic) Buildings



## Key Questions:

- How do we define what a sustainable building is?
- What are the immediate sustainability priorities (e.g. climate change?) that we need to address?
- What does industry need in order to help overcome sustainability challenges and realise new opportunities?
- What should be the primary purpose of a Code for Sustainable Buildings?

# UK Green Building Council Consultation Code for Sustainable (non-domestic) Buildings – cont'd



- Is there a need?
- How should the Code interact with other sustainability tools, standards and aspirations?
- What issues does the Code need to cover?
- What should the Code be measuring and how?
- How do we ensure quality control and technical rigour in a Code?
- What are the key elements of the policy and regulatory context in which the Code must operate?
- What are the main issues of conflict?
- Should Government lead and industry follow in the development of the Code?
- How can we demonstrate / create value in sustainable buildings and developments?
- How can we define a “sustainable building” in a way which enables valuers, investors and occupiers to attribute a financial value to sustainability?
- Who should own, operate, manage and pay for the Code?
- In your sector, what would ensure wide take-up of a Code for Sustainable Buildings?



# The Performance Gap

Why don't most low carbon sustainable buildings perform as well as the initial designs claim?





# City Hall



“Norman Foster’s City Hall, which is billed as an exemplary sustainable building, uses 50% more energy than it was designed to do.”

Why? What’s gone wrong? Where is the discrepancy?

# The 'Gherkin'

“London’s first ecological tall building..”

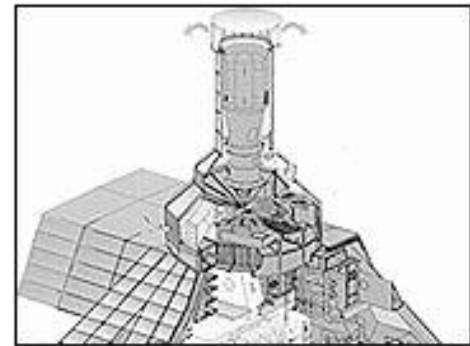
Predicted energy consumption 150kWh/m<sup>2</sup>

- But what happened when the fire regulations were applied?
- No independent environmental assessment
- How much energy does it use in practice?
- Are the sceptics right – and if so to what extent?





# Portcullis House



“It is highly energy efficient. It uses only about one third as much fuel as a conventionally air conditioned building. Heat is recycled from exhaust air, and cooling is provided by groundwater from boreholes.”

But what's the reality in practice?



# Designing out the need for technology and unmanageable complexity

What will the future look like?



Hopefully, not like this!



Or like this?



Or this?





# Three Exemplars

## Housing



**greenoak**  
housing association



# Commercial Building Beaufort Court (RES Group and Inbuilt HQ) – Zero Carbon Refurbishment of an Egg Farm



# Learning the lessons



- Every major new building is a prototype
- Desperate need for independent, objective research to determine what works and what doesn't
  - Post occupancy evaluation
  - Energy monitoring
  - Best practice for designers and operators
- Key role for UK Green Building Council
  - See [www.ukgbc.org](http://www.ukgbc.org)





# Delivering genuine sustainability requires a holistic approach

Critical to look through the correct end of the telescope and focus on **whole system thinking**:



- Develop a **clear vision**
- Looking for **synergistic solutions** which address and resolve multiple problems and issues simultaneously
- **Collaborative**, multi-disciplinary, integrated team working is essential
- Exploiting the opportunities offered by nature to ventilate, heat, cool and illuminate our buildings.
- Delivering spaces, places and buildings which are **genuinely sustainable**

Sustainability is more than zero carbon and can't be bolted-on: it must be "in-built"

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