



# Why BREEAM? Thermal performance as part of energy and environmental standards

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12<sup>th</sup> October 2011

Part of the BRE Trust

## **Buildings can be more energy efficient**

- New buildings should take Building Regulations as a minimum standard
- Better performance is perfectly possible and need cost little or no more to build
- Major refurbishment offers a golden opportunity to improve performance too
  
- The benefits are significant – how can they be achieved?
- How can they be quantified and recognised?

## Where the savings come from – New build

1. Reduce demand for artificial heat, ventilation, cooling and light
  - Orientation
  - Layout
  - **Insulation**
  - Thermal responsiveness
  - Daylight
  - Natural ventilation
2. Improve the efficiency of meeting that demand
  - More efficient plant, properly sized
  - Appropriate controls
3. Innovation
  - Materials (insulation, phase-change, etc)
  - Construction methods
  - Improved HVAC and lighting technologies
  - Renewable energy systems

## Zero Energy houses or close



**BRE Innovation Park**

## Renewable House - Code 4



## The Princes Foundation Natural House



## Making it work in practice

- Designed it
- Built it
- Calculated it
- Tested it
- Commissioned it
- Labelled it
- Written it in the log book

## But it could all be for nothing unless

- **It's properly handed over to the building owner/user, and**
- **It's properly managed thereafter**



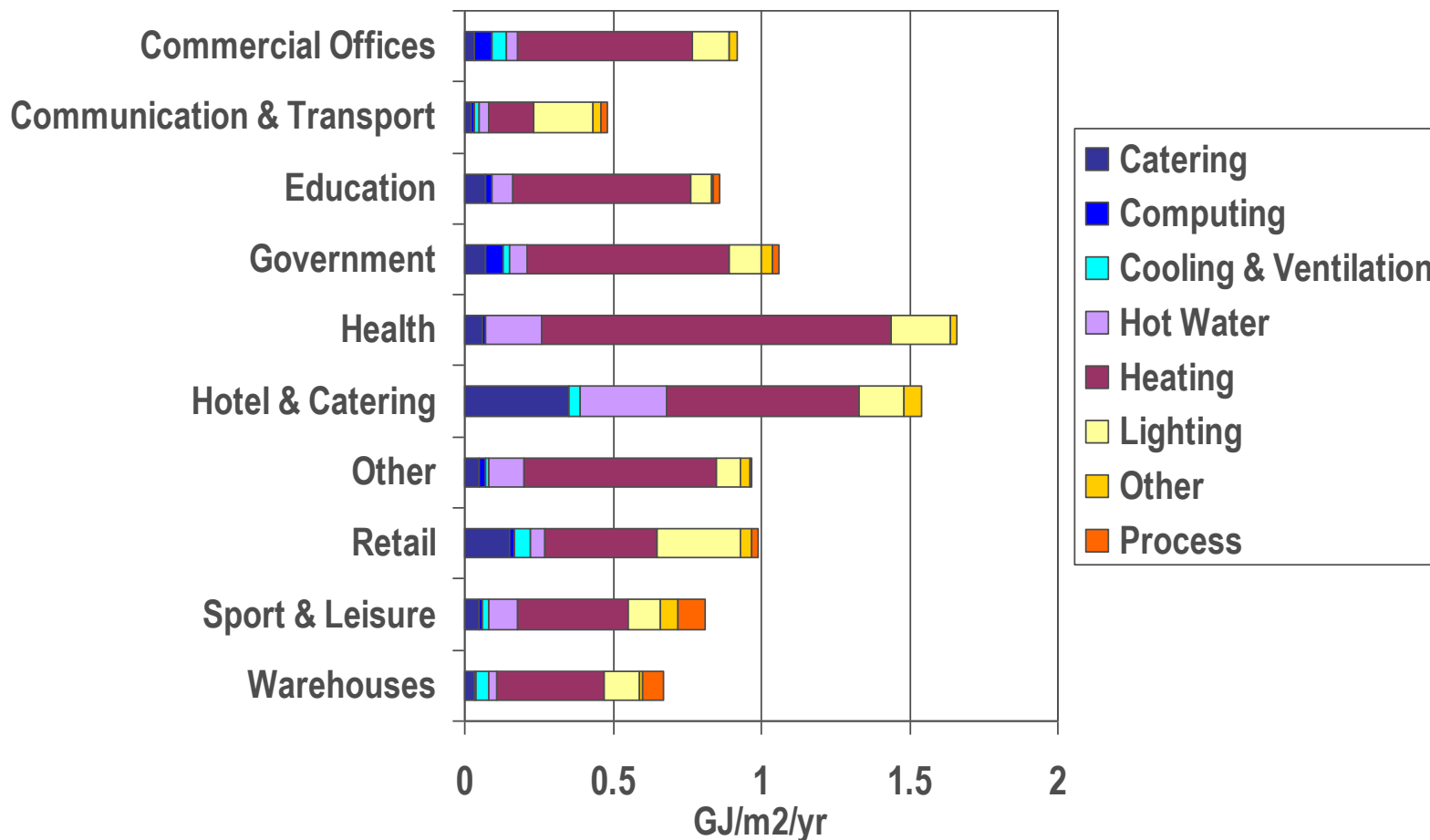
## Making existing buildings Low Carbon

- Similar principles as for new build
- But much more challenging in an existing shell
- Seize the opportunity when refurbishing
- Innovative solutions needed
  
- Essential for a low-carbon future



# Existing Buildings

Average energy consumption per unit floor area



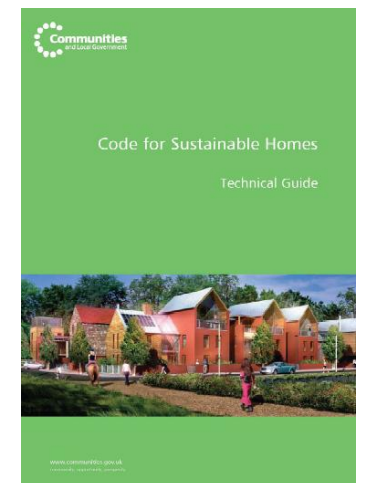
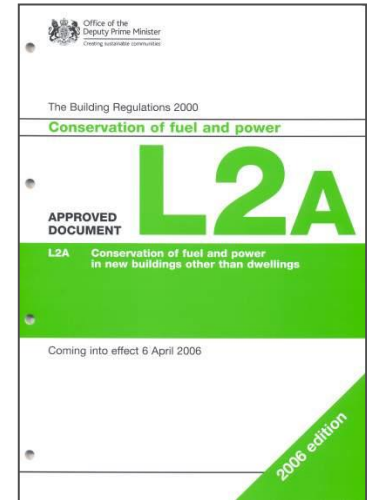
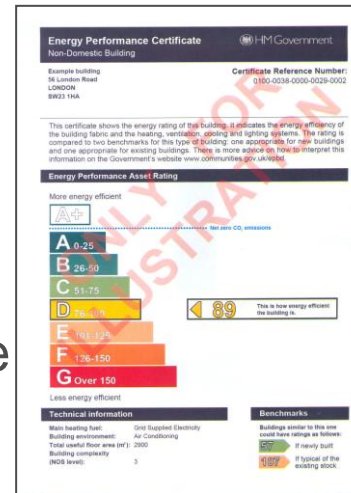
# Regulations, Codes, Standards, Labels....

- Just for energy:
  - Building Regulations Part L
  - EPBD
  - CSH
  - BREEAM
  - Energy Related Products Directive
  - .....

- Measurement units:

- Delivered energy
- Primary energy
- Carbon dioxide
- Level X
- Excellent

– Confusing? Possibly



## Each has its distinct purpose

- Building Regulations (Part L)
  - Setting a threshold for new buildings
  - Doesn't cover all energy usage
  - Based on comparison with previous standards
  - Only applies when 'works' being done
  - Some impact on existing buildings
- EPC
  - Calculates absolute CO<sub>2</sub> emissions, but under standard conditions
  - Same energy uses as Part L
  - Applies to new and existing buildings
  - Allows comparison between buildings
- DEC
  - A measure of actual energy use, including the effect of management
  - Covers all energy use in the building
  - Need a way to link back to EPC

## Each has its distinct purpose

- CSH / BREEAM
  - Covers many more environmental parameters
  - Energy credits on same basis as Part L, plus some other factors
  - Currently used mostly for new build – but now BREEAM in Use
  - Setting the future agenda for buildings
- ErPD
  - Setting minimum standards for performance of individual products (energy-using and energy-affecting)
  - Need then to be linked into system and whole building performance

## Which energy certificate when?

- Construction, sale or rent:
  - Which building should I occupy?
    - Compare assets on a consistent basis
    - Calculation on a standardised basis
  - How might that building be improved?
- Public display (DECs)
  - How well am I operating this building?
    - In-use performance compared to benchmarks
    - How can I improve?
      - Management and operation / Fabric and plant
  - Currently (larger) public buildings only
  - Potential to extend to commercial buildings

# Domestic EPC

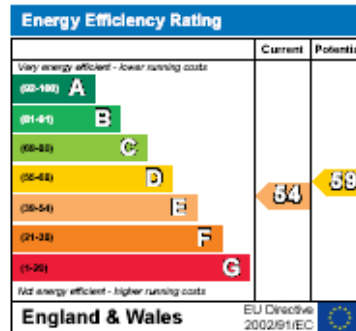
## Energy Performance Certificate



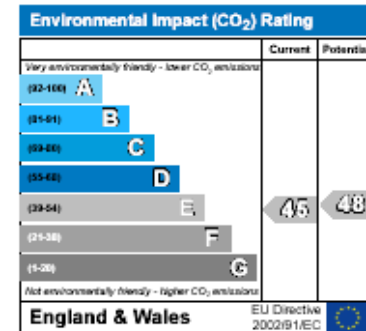
8 High Street,  
Twickenham,  
Middlesex,  
TW4 8AF

Dwelling type: Semi-detached house  
Date of assessment: 07 February 2007  
Date of certificate: [dd mmmm yyyy]  
Reference number: 0000-0000-0000-0000-0000  
Total floor area: 90 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.



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	302 kWh/m <sup>2</sup> per year	276 kWh/m <sup>2</sup> per year
Carbon dioxide emissions	5.9 tonnes per year	5.4 tonnes per year
Lighting	£64 per year	£38 per year
Heating	£498 per year	£469 per year
Hot water	£152 per year	£142 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)

## EPC – non domestic

- C rating
- Very close to 2006 Regulations standard
- Accompanied by Recommendations Report
- Is this seen as adding value?
- Is it enough to encourage action?




# Display Energy Certificate

- Based on measured energy use
- To be renewed every year
- Shows progress year on year
- Level 100 represents 'typical' benchmark
- Accompanied by Advisory Report (only every 7 years) showing recommendations for improvement

## Display Energy Certificate

How efficiently is this building being used?



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**A Government Dept**  
12<sup>th</sup> & 13<sup>th</sup> Floor  
Jubilee House  
High Street  
Anytown  
A1 2CD

**Certificate Reference Number:**  
1234-1234-1234-1234

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This certificate indicates how much energy is being used to operate this building. The operational rating is based on meter readings of all the energy actually used in the building. It is compared to a benchmark that represents performance indicative of all buildings of this type. There is more advice on how to interpret this information on the Government's website [www.communities.gov.uk/lepbd](http://www.communities.gov.uk/lepbd).

**Energy Performance Operational Rating**

This tells you how efficiently energy has been used in the building. The numbers do not represent actual units of energy consumed; they represent comparative energy efficiency. 100 would be typical for this kind of building.

**More energy efficient**

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

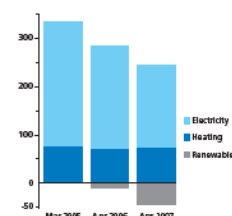
F 126-150

G Over 150

**Less energy efficient**

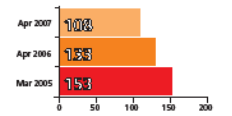
**Total CO<sub>2</sub> Emissions**

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO<sub>2</sub>.



**Previous Operational Ratings**

This tells you how efficiently energy has been used in this building over the last three accounting periods



100 would be typical

108

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**Technical Information**

This tells you technical information about how energy is used in this building

**Main heating fuel:** Gas  
**Building Environment:** Air Conditioned  
**Total useful floor area (m<sup>2</sup>):** 2927  
**Asset Rating:** 92

	Heating	Electrical
Annual Energy Use (kWh/m <sup>2</sup> /year)	126	129
Typical Energy Use (kWh/m <sup>2</sup> /year)	120	95
Energy from renewables	0%	20%

**Administrative Information**

This is a Display Energy Certificate as defined in SI0007:991 as amended.

**Assessment Software:** OR v1  
**Property Reference:** 89 1123776612  
**Assessor Name:** John Smith  
**Assessor Number:** ABC 12345  
**Accreditation Scheme:** ABC Accreditation Ltd  
**Employer/Trading Name:** EnergyWatch Ltd  
**Employer/Trading Address:** Alpha House, New Way, Birmingham, B2 1AA  
**Issue Date:** 12 May 2007  
**Nominated Date:** 01 Apr 2007  
**Valid Until:** 31 Mar 2008  
**Related Party Disclosure:** EnergyWatch are contracted as energy managers  
Recommendations for improving the energy efficiency of the building are contained in Report Reference Number 1234-1234-1234-1234

## EPC v DEC – why are they different?

### EPC

Calculated

Excludes non-regulated end uses

Standardised operation

Good management assumed

For comparing buildings

(As miles per gallon)

Can predict savings (theoretical)

### DEC

Measured

Includes everything metered

As actual usage

Real management

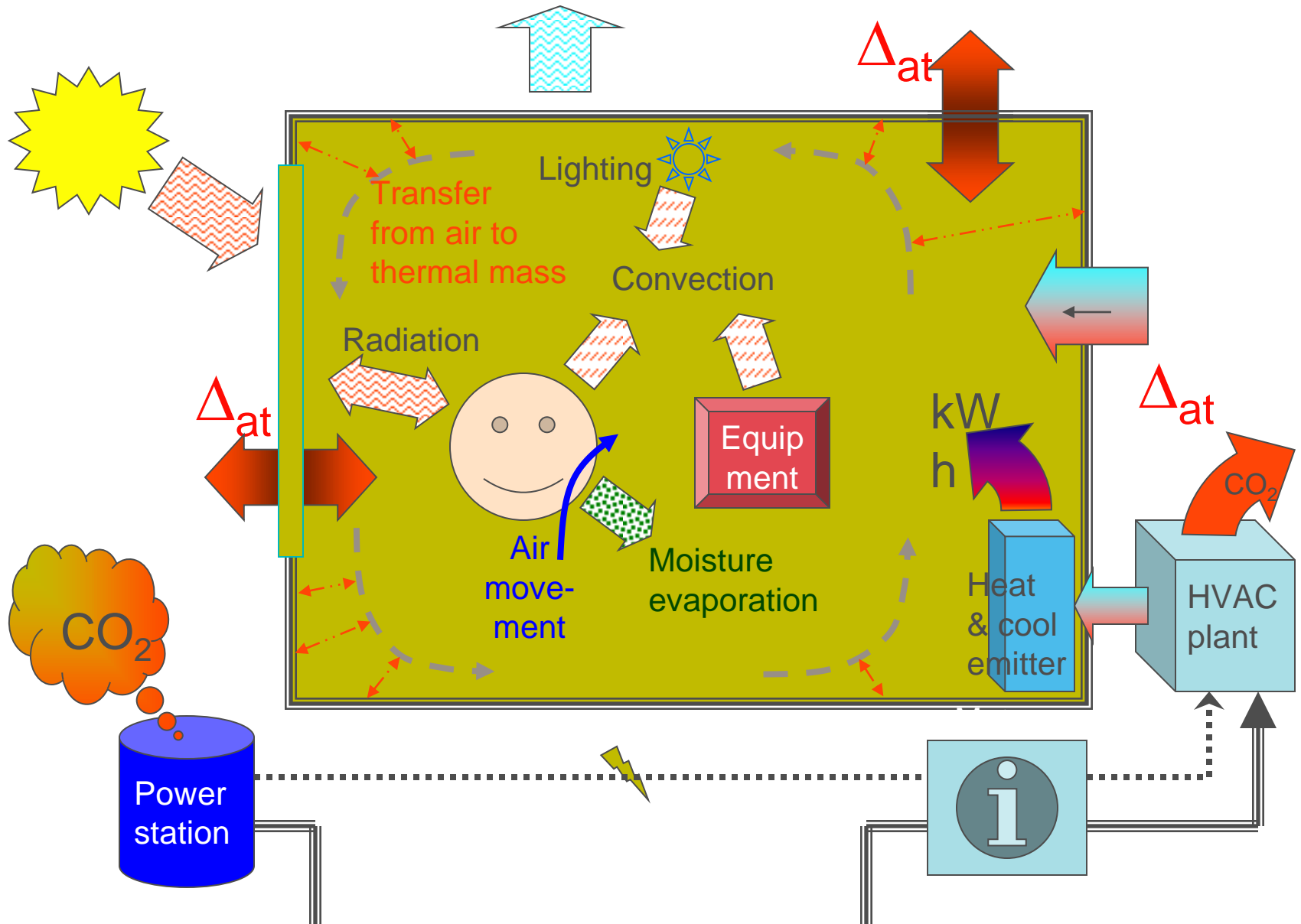
For stimulating improvement

(Year on year)

Can measure actual savings

BRE is developing a means to align the two measures

# Calculating building energy performance



## Calculation tools – for minimum standards and Energy Performance Certificates

### For new dwellings:

- SAP (Standard Assessment Procedure)
- Available from [www.bre.co.uk/sap2009](http://www.bre.co.uk/sap2009)

### For existing dwellings

- Reduced Data SAP (RdSAP)

### For all other buildings

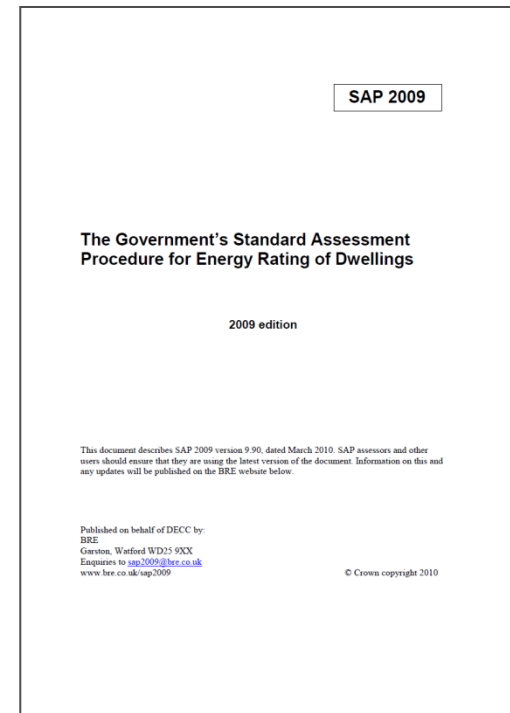
- Simplified Building Energy Model (SBEM)
- Available from [www.ncm.bre.co.uk](http://www.ncm.bre.co.uk)
- Approved Dynamic Simulation Models



# SBEM

## SAP

- SAP is the UK Government's Standard Assessment Procedure for Energy Rating of Dwellings
  - Part of the UK national methodology for calculation of the energy performance of buildings
  - Based on BREDEM
- Checks compliance with Building Regulations
- Provides energy ratings (EPCs)
- SAP software is developed commercially
- Latest version - SAP2009 - for 2010 regulations
- Currently developing SAP2012
- Details on [www.bre.co.uk/sap2009](http://www.bre.co.uk/sap2009)
  - SAP specification
  - worksheet
  - tables



## SBEM – two ‘live’ versions

Provides Building Regs compliance and EPCs in England, Wales, Scotland, N Ireland, Republic of Ireland and Jersey

For compliance with Part L 2006

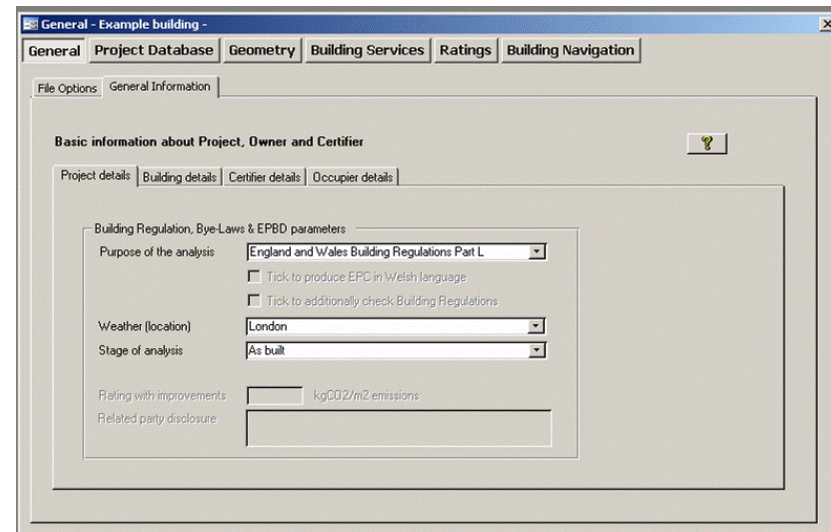
- SBEM v3.5.b (from [www.ncm.bre.co.uk](http://www.ncm.bre.co.uk))

For compliance with Part L 2010

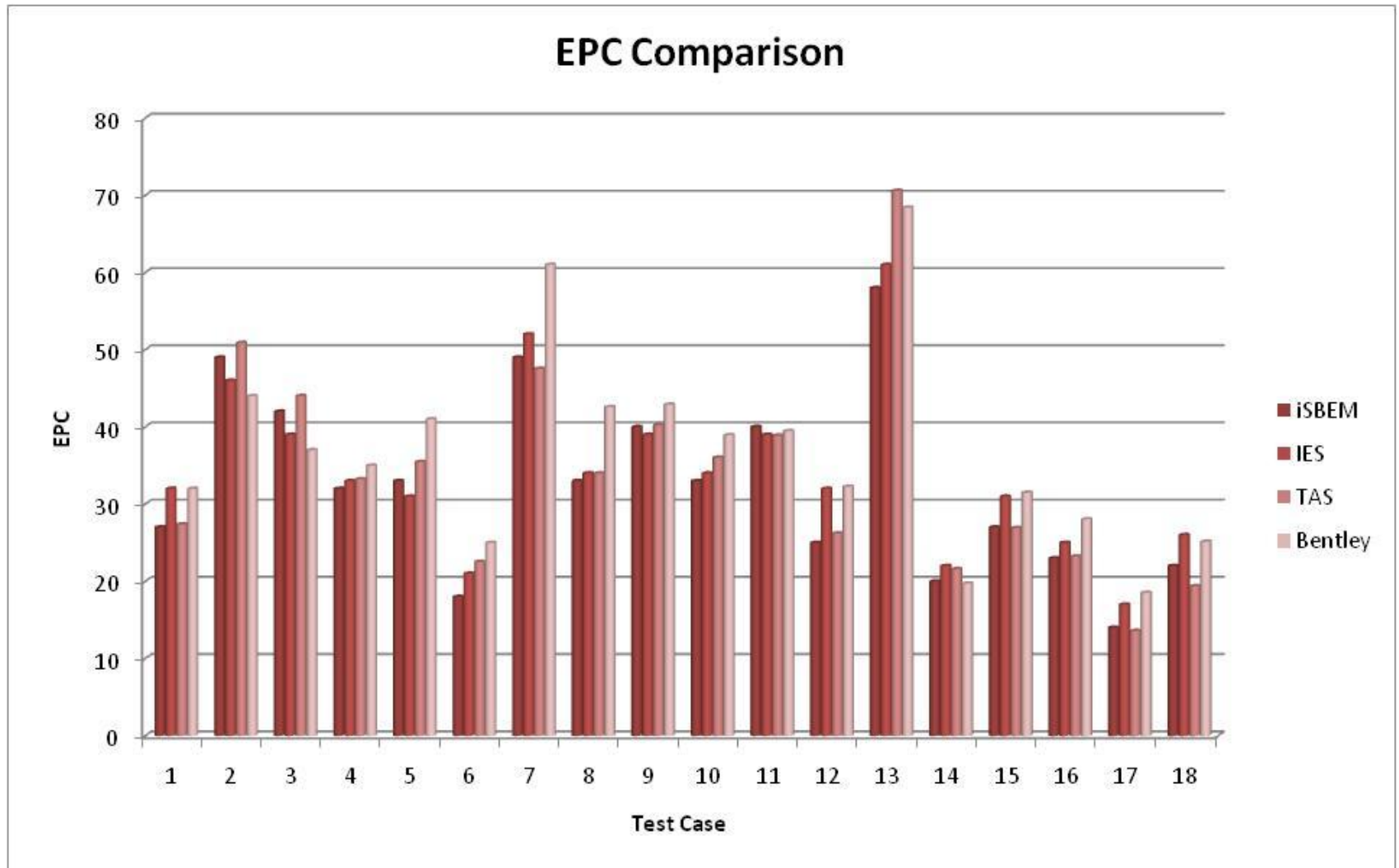
- SBEM v 4.1.c
- At design submission
- And again at completion

For all EPCs

- Moved to v4.1.c post March 2011



# SBEM and DSMs

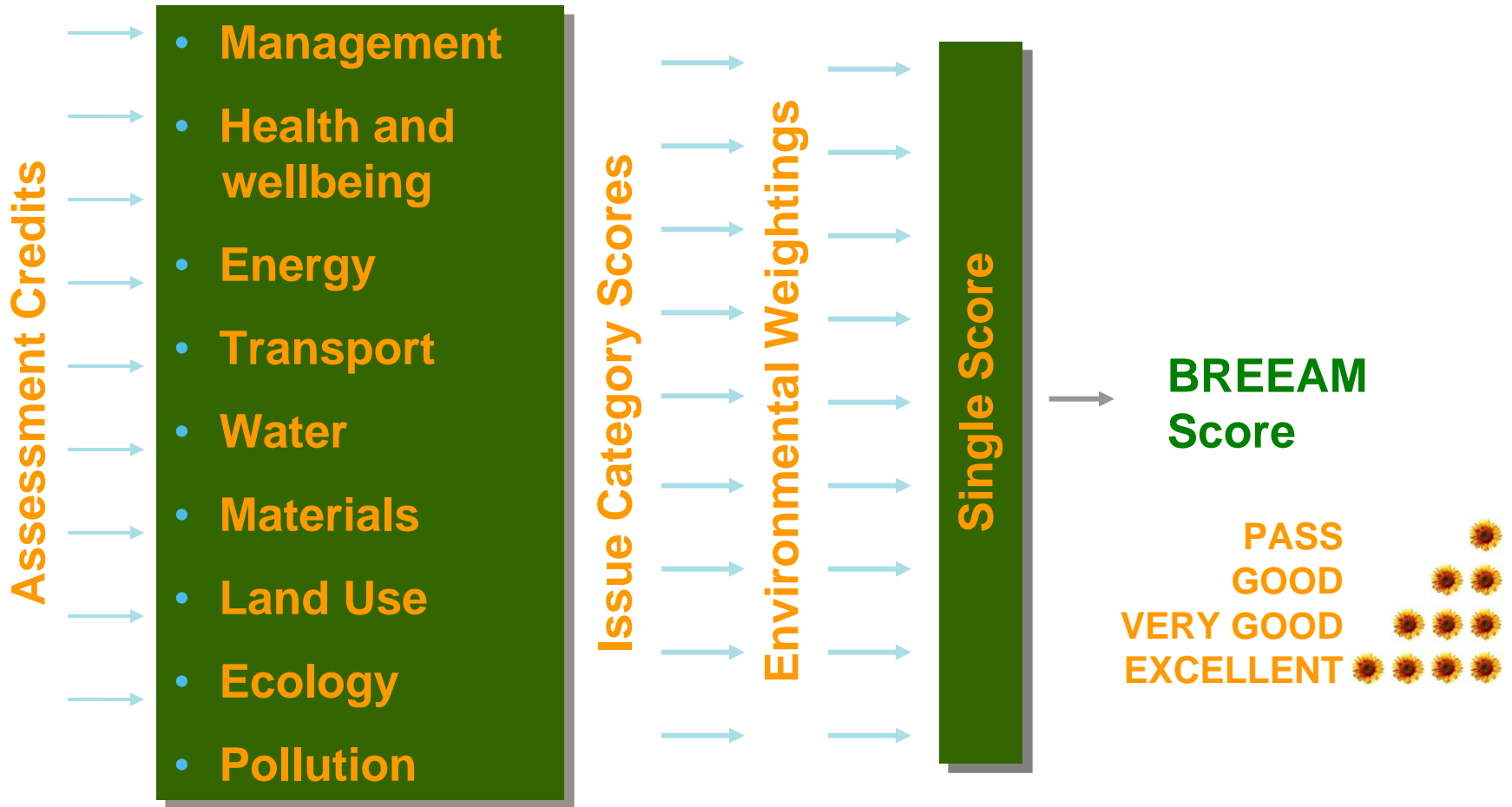


## Other uses for SAP & SBEM

- Tailored guidance for specific buildings
- Support to other policies
  - Green Deal
  - EPC / DEC comparison
- Tools can be flexible and tailored when released from constraints of compliance checking and EPCs



# BREEAM - Balanced Scorecard



**Mandatory Standards**

- Energy
- Potable Water Consumption
- Waste
- Materials
- Water Surface Run-off

**Tradable Credits**

- Energy
- Potable Water Consumption
- Waste
- Materials
- Water Surface Run-off
- Pollution
- Health & Wellbeing
- Management

**Issue Category Scores**

**Environmental Weightings**

**Overall Score**

- Level 1
- Level 2
- Level 3
- Level 4
- Level 5
- Level 6

**Code for Sustainable Homes**

A step-change in sustainable home building practice



## **BREEAM 2011 – Energy credits**

Three stage approach to energy credits, based on

1. Reduced energy demand (built form, fabric efficiency)
2. Reduced energy consumption (system efficiency to meet demand)
3. Reduced carbon emissions (fuel choices, use of renewable energy systems)

Weighted combination of these 3 factors

## Common methodology

Standard methods for calculating

- U-values
- Thermal performance
- Integrated building energy performance
- Overall environmental impact
  
- All self-consistent and transparent

**Thank you!**

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