

**The Difference between
Predictions and Reality of Non-
Domestic Building Performance**

13 December 2011



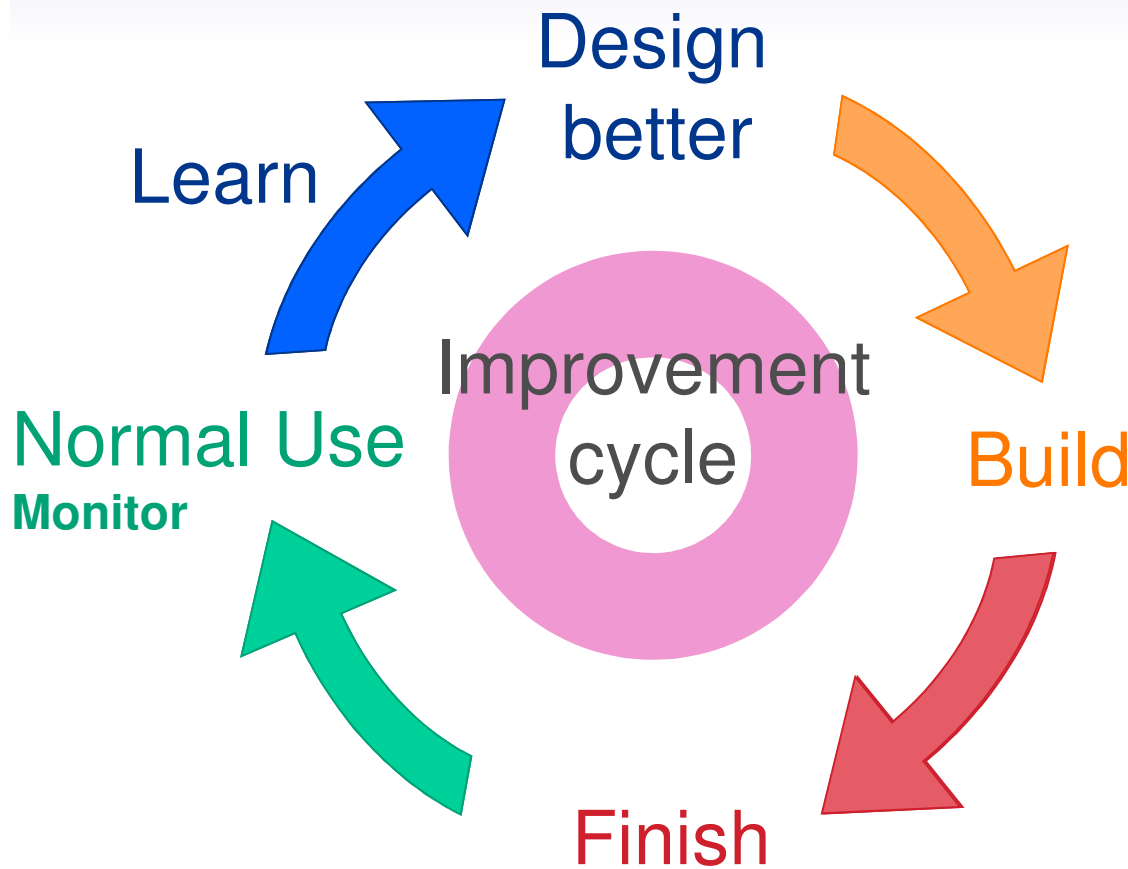
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**Technology Strategy Board assigned
BPE Assessor**



Why the TSB Competition for Building Performance



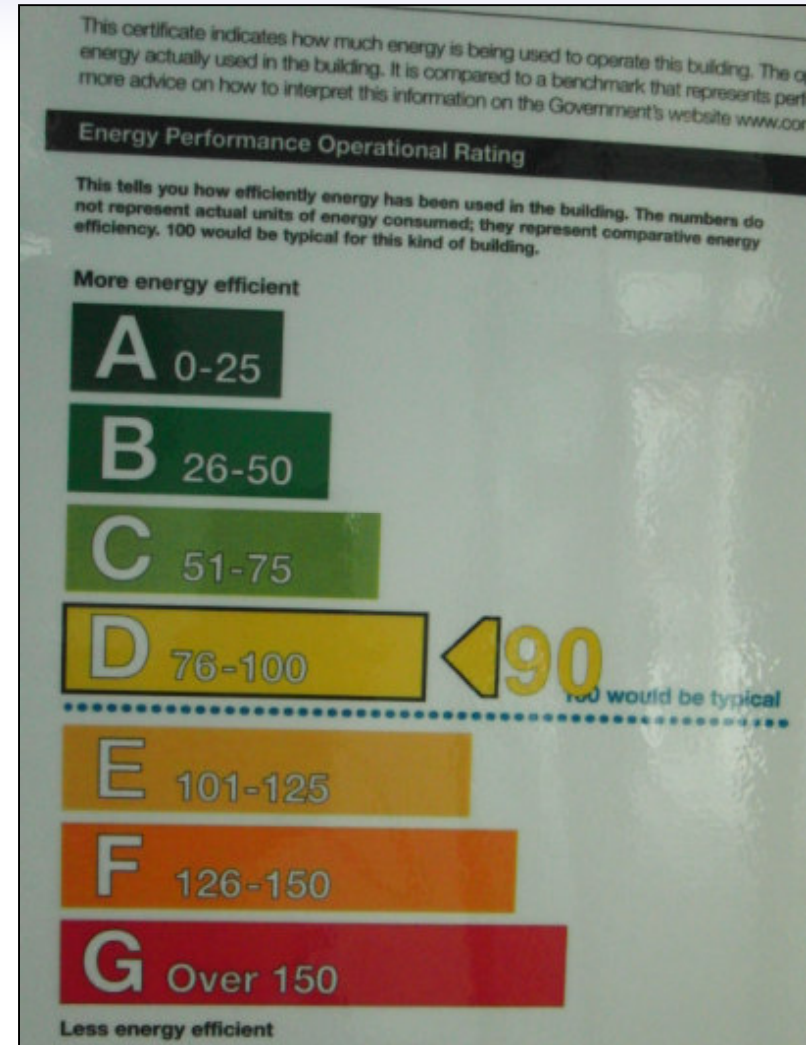
- Energy Survey
- Assessment of occupant satisfaction

- Large gap between Real performance and Virtual performance
- Industry has a long way to go before low carbon buildings are realised in the main stream
- 80% reduction in carbon emissions by 2050
- Buildings account for 45% of total UK carbon emissions
- Feedback loop:
 - needs to be closed
 - results of feedback acted upon

Typical Building Headlines

High sustainable agenda:

- EPC Asset Rating 'A'
- BREEAM 'Excellent'
- LEED 'Platinum'
- 50% CO2 less than Part L
- Sustainability & Green awards
- How is this so different than what we modelled?
- Let looks at common themes with these sustainable buildings



Lighting



- Blinds to be added due to glare



- Passive design, lack of make-up air due to lock windows
- User manual produced, no occupant had received

Lighting



Not accounted in
design



User Interfaces

“An intelligent building is one that doesn’t make its occupants feel stupid”... Adrian Leaman

- What are these controls for?
- Do users understand lighting or mechanical strategy?
- Underperforming controls



- Night and day mode
- Dimming
- Neither patients or nurses understood

Metering



- Primary means for accounting for energy
- Difficult to find and read
- What does on-site FM know about system? Several not aware of metering system
- Reconciliation sub-meters with main meter – some no working, calibrated incorrectly
- Renewable sources, typically come with own metering package, not tied into main metering system
- Many can't state how building is performing - flying blind

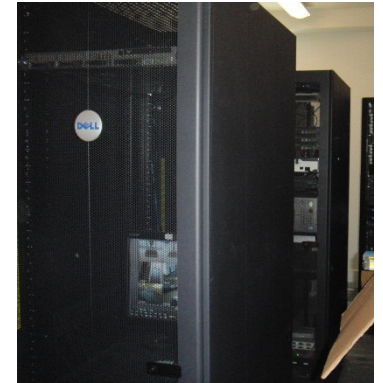
Building Management System



- Difficult to use – too complex
- May require outside BMS systems engineer to adjust
- Lack of training for on-site staff
- How useful is it as a energy reporting or monitoring tool?
 - If not monitoring, how act?



Unregulated Loads



Server Rooms



- What is room set point?
 - “Server room is nice and cold”
- Rooms conditioned 24/7/365
- Check air distribution strategy

Renewable Technologies



Energy Performance Asset Rating

More energy efficient

A+ -6 This is how energy efficient the building is.

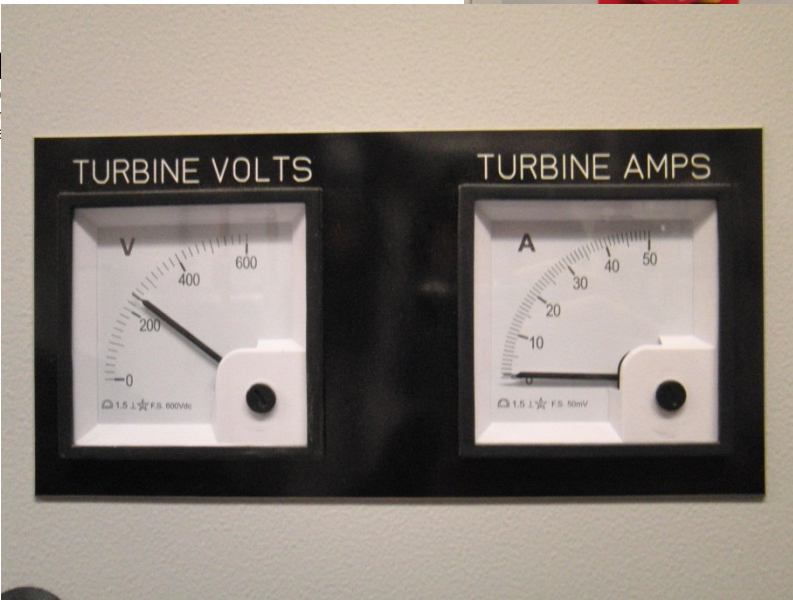
Net zero CO₂ emissions

A	0-25
B	26-50
C	51-75
D	76-100
E	101-125
F	126-150
G	Over 150

Less energy efficient

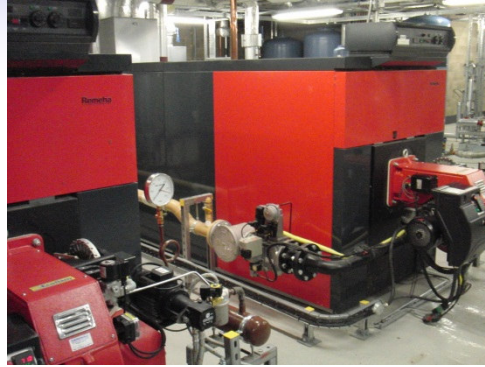
Technical information

Main heating fuel:	Grid Supplied Ele
Building environment:	Heating and Mech
Total useful floor area (m ²):	741.396
Building complexity (NOS level):	5
Building emission rate (kgCO ₂ /m ²):	-2.44



Commissioning time squeezed

Renewable Technologies



Ineffective meeting
heating demands, gas
boilers now lead

- Find many that are off
- FM complaints - difficult to clean, problems with woodchip conveyor, expensive to service
- More trouble than its worth?
- Robust design?
- Incorporating features, but not performance

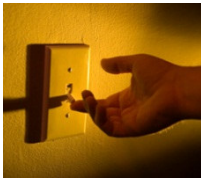
Good Intentions



- **Architect – building form, orientation etc.**
- **Lighting designer – complementary lighting design to building**
- **Equipment suppliers – input into design, depending on controls and lights**
- **Electrical engineer – provision of power, coordination with other trades**
- **Main Contractor, Electrical sub contractor**
- **Electrical sub sub contractor for various components, example controls**
- **Design intent lost in process, fragmented delivery**
- **Who is going to fine tune the system?**

Summary of Gaps between Predictions and Reality

- Over-optimistic design calculations – not everything is counted
- Failure to manage design intention through the entire delivery process, and fine tune systems
- Over complicated systems, over reliance on automation, lack of training for managers, awareness-raising for occupants
- Under performing controls, poor design and commissioning
- Cost and time trumps quality, designs become fragile under these pressures
- Lack of awareness of how building is performing



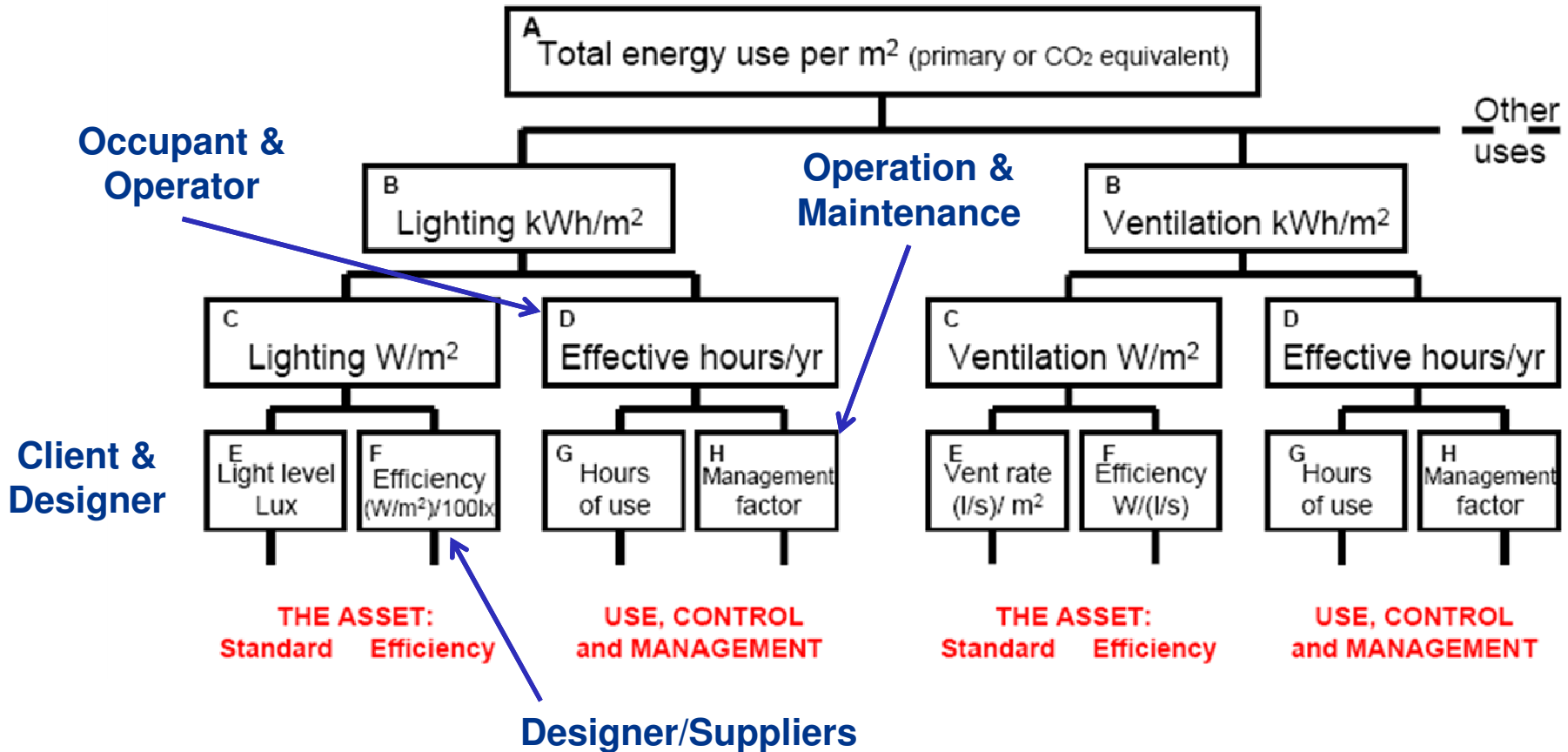
Closing the Gap



- **Design tools are inaccurate predictors of energy use and occupant satisfaction**
 - Don't account for hours of operation and operational preferences
 - Use different tools for regulations vs client expectations – capture true use of building
 - Tools like CIBSE TM22 – Energy Assessment and Reporting method can provide check mechanism
- **Need a change in outlook if Energy/Carbon Performance is the new metric**, - Clients, designers, contractors and operators need to own their share of the project, and support others in delivery of performance

TM22 Energy Tree

“Tree diagram” analysis of building energy consumption and service provision
Each box can be considered as a benchmark



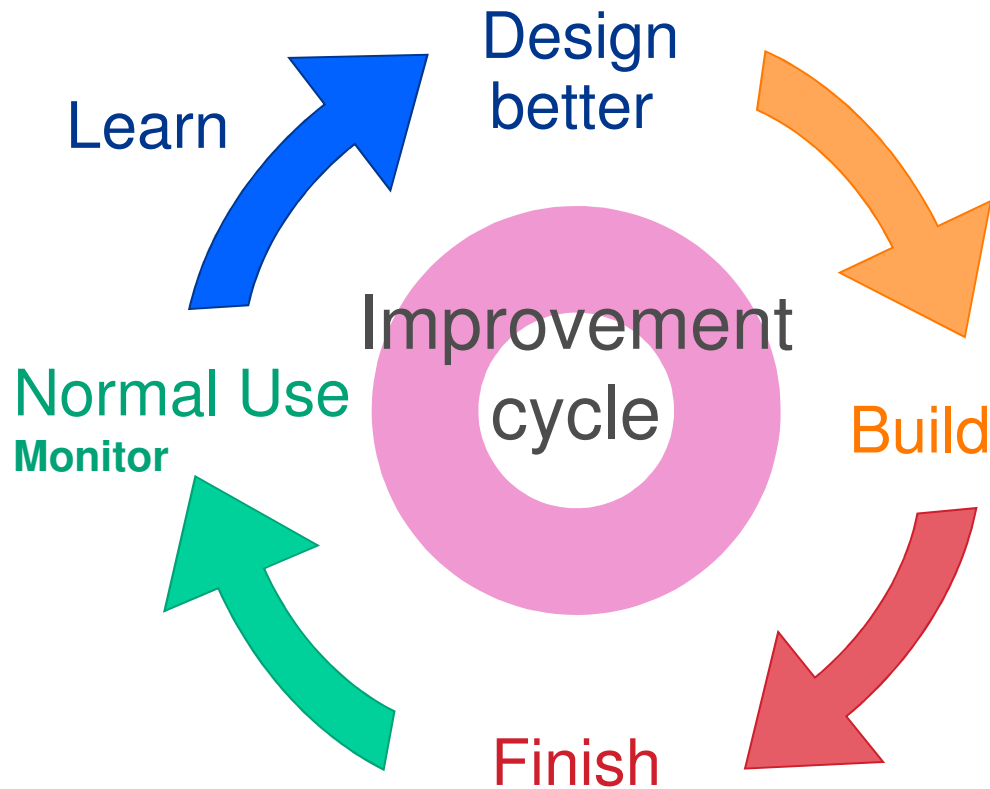
Builders and subcontractors are also responsible for meeting design requirements

Soft Landings may be able to help

- Framework for a graduated handover of building
- Enhances and defines duties of design and build team, and client:
 - Briefing stage – increasing dialog in supply chain
 - Forecast building performance from a users point of view
 - User involvement, before and after handover
 - Support client during first months of operation up to 3 years of use – fine tune systems



Summary



- Understand our buildings in use via building performance
- Utilise tools that provide a more realistic picture of performance
- Need a change of outlook & encourage a no blame culture within teams
- Make feedback routine and embed a culture of building performance evaluation in the construction industry
- Close the loop between design aspirations and in-use performance
- BREEAM 'Excellent' ≠ DEC 'D' rating