

Autumn 2010

A new professionalism?
The background to Soft Landings

Bill Bordass

***the* USABLE BUILDINGS TRUST**
www.usablebuildings.co.uk

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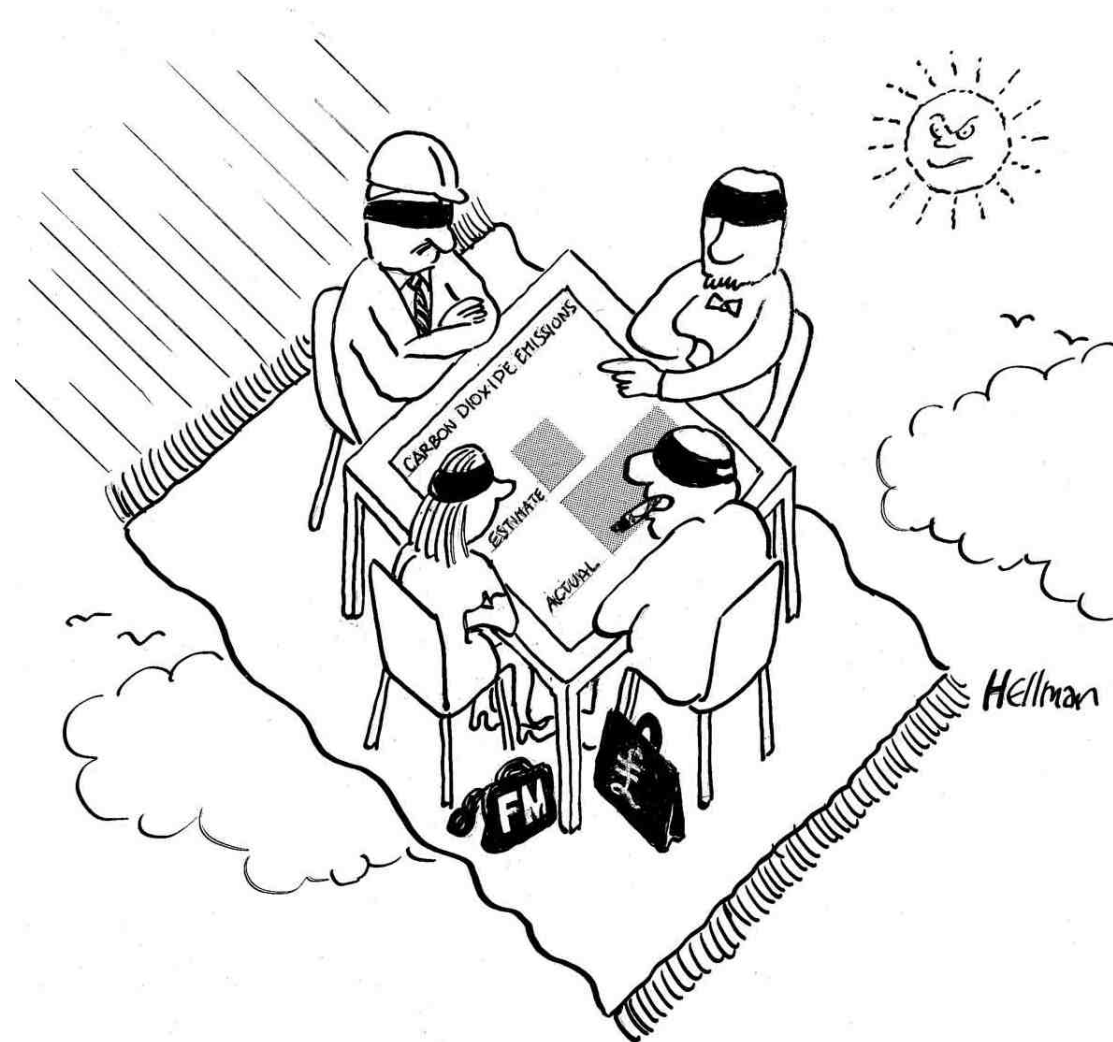
“Clients are the crash-test dummies of the design world” ... SAM CASSELS



Crash test observations in the motor industry



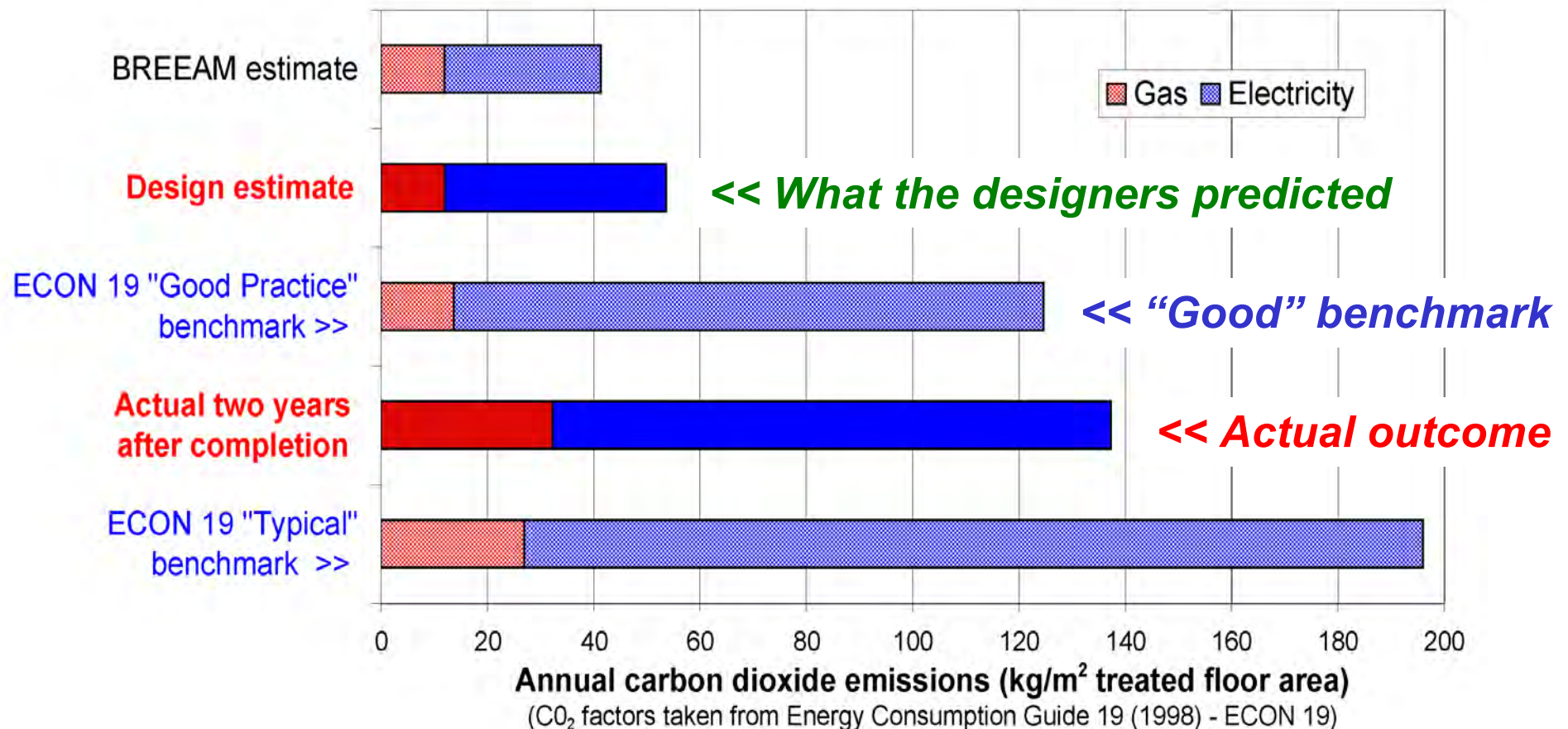
Crash test observations in the building industry



SOURCE: by Louis Hellman for cover of W Bordass, *Flying Blind*, Association for the Conservation of Energy, London, (2001).

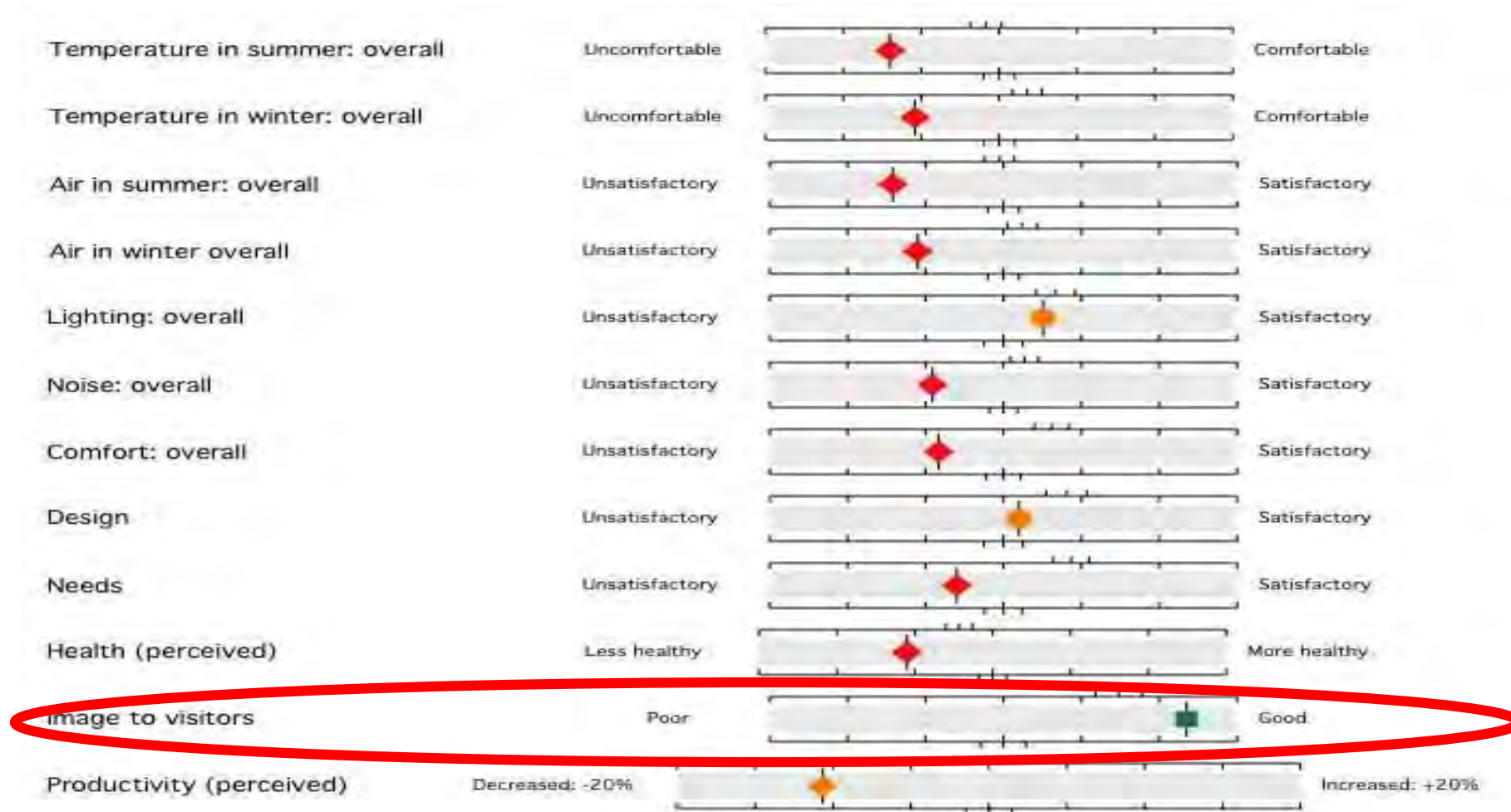
The Credibility Gap: *We couldn't deliver low-energy and carbon performance reliably in the 1990s. We're still finding it difficult.*

Data from the winner of a Green Building of the Year Award



Credibility gaps: Occupant satisfaction

Occupant survey, award-winning school, UK, 2009



What impresses the judges may not impress the users!

SOURCE: Unpublished occupant survey of an award-winning school 2009. Courtesy of Building Use Studies Ltd.

There are similarities in Australia
e.g. Paul Bannister, Ecolibrium (2009)

Why good buildings go bad while some are just born that way

Dr Paul Bannister, Exergy Australia Pty Ltd

ABSTRACT

With the realisation that climate change is not going to be resolved by inaction or unrealised promises, the issue of actual building performance has become focal in today's commercial buildings sector. With this has come the genuinely problematic issue of delivering and operating buildings at levels of efficiency higher than have been achieved before.

While some argue that good design is all, those involved in operating buildings are generally aware that the issues of delivering and operating high-efficiency buildings are somewhat more complex. A building that has a good theoretical performance may not perform well in practice, while many lesser buildings may be easier to operate and improve.

In this paper, a range of issues that cause apparently well designed buildings to perform poorly are explored, with particular emphasis on the issues affecting base buildings under the Australian Building Greenhouse Rating scheme. These issues include items that can be seen as the responsibility of various participants in the supply chain, as well as many that are the product of numerous such participants. It is identified that delivering and operating high-efficiency buildings is a complex and multifaceted problem that requires a holistic rather than reductionist view of the building process. Some guidelines for more reliable delivery of efficient buildings are also provided.

SOURCE: *Ecolibrium*, the Journal of the Australian Institute of Refrigeration, AC and Heating, 24-32 (February 2009)

Structure of the talk

1. THE PAST - *What we've been missing*

Post-Occupancy Evaluation, POE (*we prefer BPE - Building Performance Evaluation*) has been with us a long time.

So what's stopping the industry doing it routinely?

2. THIS LAST DECADE - *Faltering steps*

Developments in changing the culture

by proper engagement, not bureaucratic tick-boxes

3. THE FUTURE - *A new professionalism*

Routine engagement of client, design and building teams with users and outcomes. Making follow-through and feedback routine.

Without feedback there is no learning

What the industry has been missing: *The evidence under our noses*

“in theory, theory and practice are the same, in practice they aren’t”
SANTA FE INSTITUTE for research into complex systems

*“unlike medicine, the professions in construction
have not developed a tradition of practice-based user research ...
Plentiful data about design performance are out there, in the field ...
Our shame is that we don’t make anything like enough use of it”*
FRANK DUFFY Building Research & Information, 2008

*“Architects prefer to learn through direct personal experience.
Engineers prefer principles and established rules.”*
PORTSMOUTH SCHOOL OF ARCHITECTURE: How do we learn?

*“I’ve seen many low-carbon designs,
but hardly any low-carbon buildings”*
ANDY SHEPPARD Arup, 2009



Why are these lights on
in a new university building?

THE PAST:

A systemic problem for the industry

“Designers seldom get feedback and only notice problems when asked to investigate a failure.”

A BLYTH, CRISP Commission 00/02

Post-occupancy evaluation is not a very good name for the activity

Being wise after the event: remote, late, academic, threatening

Some see it as expensive, indigestible, and of questionable value

Who owns feedback? Everybody benefits but nobody wants to pay

What we hear we think we know already

THE PAST:

Why haven't we tuned into outcomes?

“Designers seldom get feedback and only notice problems when asked to investigate a failure.”

A BLYTH, CRISP Commission 00/02

Post-occupancy evaluation is not a very good name for the activity

“It's what happens after we're gone” FACILITIES MANAGER

Being wise after the event: remote, late, academic, threatening

“We look silly and our PI insurers don't like it” DESIGNER

Some see it as expensive, indigestible, and of questionable value

Newcomers can ignore established techniques and try to do too much.

Who owns feedback? Everybody benefits but nobody wants to pay

“Designers should pay, they and their next clients benefit” CLIENT

What we hear we think we know already

“It's deja vu all over again” YOGI BERRA

Can we find a way of getting the information and acting on it ... ?

Déjà vu all over again for me too

Optimising the irrelevant

by Bill Bordass

Why is the hi-tech office failing to meet users' needs? Is it the technology or the design process that's at fault? Bill Bordass identifies some of the problems and offers some solutions.

When people think of designing low energy buildings, they tend to fall into one of two traps. One is: "If we get the principles right, everything will automatically follow" or, "all you need is a lovely new bit of technology and it will solve the world's problems".

However, when you actually start looking at and analysing buildings they don't tend to give you the same messages. For



THE PAST:

Where I and colleagues come from

1975-85 Multidisciplinary design. Architectural and energy research

1985-90 Single issue studies of buildings in use

e.g. the *Office environment survey (1987)* and *Energy in offices (1990)*

1990-date Multidisciplinary studies and consultancy

including Feedback and BPE activities, studies of occupant use of buildings and environmental controls, briefing and design advice.

1995-2002 PROBE

Roderic Bunn was the initiator and editor

Post-occupancy Review Of Buildings and their Engineering

Twenty published POEs of interesting recently-completed buildings: *technical and environmental performance, surveys of occupants & management.*

2000-date The Usable Buildings Trust

www.usablebuildings.co.uk

A charity to promote building performance evaluation and feedback:
data, techniques, papers, contacts, networks, teaching, website.

*It has been difficult to get findings to stick with the industry, for which building performance in use is so often another country: **cut the tape and walk away!***

Some findings from Probe

Good buildings, but problems recurred, e.g.

- Interfaces between work packages.
- Control systems and user interfaces.
- User dissatisfaction with environment, noise and unwanted interruptions.
- Poor handover processes, with little follow-through into occupancy.
- Unmanageable complexity, once mostly in deep air conditioned buildings, was migrating into “sustainable” buildings.

Design intent needs to be clear.

Essential features are often absent.

Keep it simple and do it well.

Take account of unintended consequences.

Manage expectations to avoid credibility gaps between expectations and outcomes.



Seven strategic themes from Probe:

Ends before means! Heart of the new professionalism?

1. MEET NEEDS. Occupants like buildings that respond to them.
Seek robust solutions, minimise downside risks.
2. MANAGEABILITY. Don't procure what you can't afford to manage.
Technical performance and occupant satisfaction will also suffer.
3. INTEGRATED APPROACH. Comfortable buildings can be energy-efficient and cost-effective. *But only if they are made to do so.*
4. CLEAR and ROBUST. Get the essentials right. *Put innovations on firm foundations. Keep things simple and intrinsically efficient.*
5. REALISM ABOUT PROCESS. Buildings are more like ships than cars. *They need "sea trials" and fine tuning.*
6. SYSTEMIC INTERACTIONS. Promote virtuous circles.
Otherwise buildings will go into circles of decline.
7. REFLECTIVE PRACTICE. Review everything, as contexts evolve.
Don't lose sight of strategic objectives, or critical details.
Use feedback to learn from your own experiences and from others.

We've been trying to close the feedback loop at www.usablebuildings.co.uk



... from the Usable Buildings Trust

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Usable Buildings is a free resource for practitioners, managers, building owners, developers, students and anyone else who wants to make buildings more suitable for the people who use them, less damaging to the natural environment and a better long-term investment. Usable Buildings is run by the Usable Buildings Trust.

The Usable Buildings Trust (UBT) is an independent charity, registered in the United Kingdom. UBT promotes better buildings through the more effective use of feedback on how they actually work. It spreads the results through its website, user groups, collaborative working and input to postgraduate courses. UBT is also a home for approaches which are not quite ready for widespread application and an incubator for their development. [Aims Background](#)

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Latest one liners: "Who are you going to believe? Me, or your own eyes?" [Groucho Marx](#) | "If the choice is between cooking alive and wasting money unnecessarily I would rather waste some money, because long before we cook we are going to kill each other if we don't deal with climate change." [George Soros](#) | "The paradox of public transport is the better it does its job the less 'efficient' it may be." [Tony Judt](#) | "I got rid of the Ferrari: it was bad for my hamstrings." [Ryan Giggs](#) [More](#)

Hosting : We host the [Feedback Portfolio: Techniques](#) and the [Probe](#) archive.

Support : We support [Soft Landings](#).

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Thursday, March 18

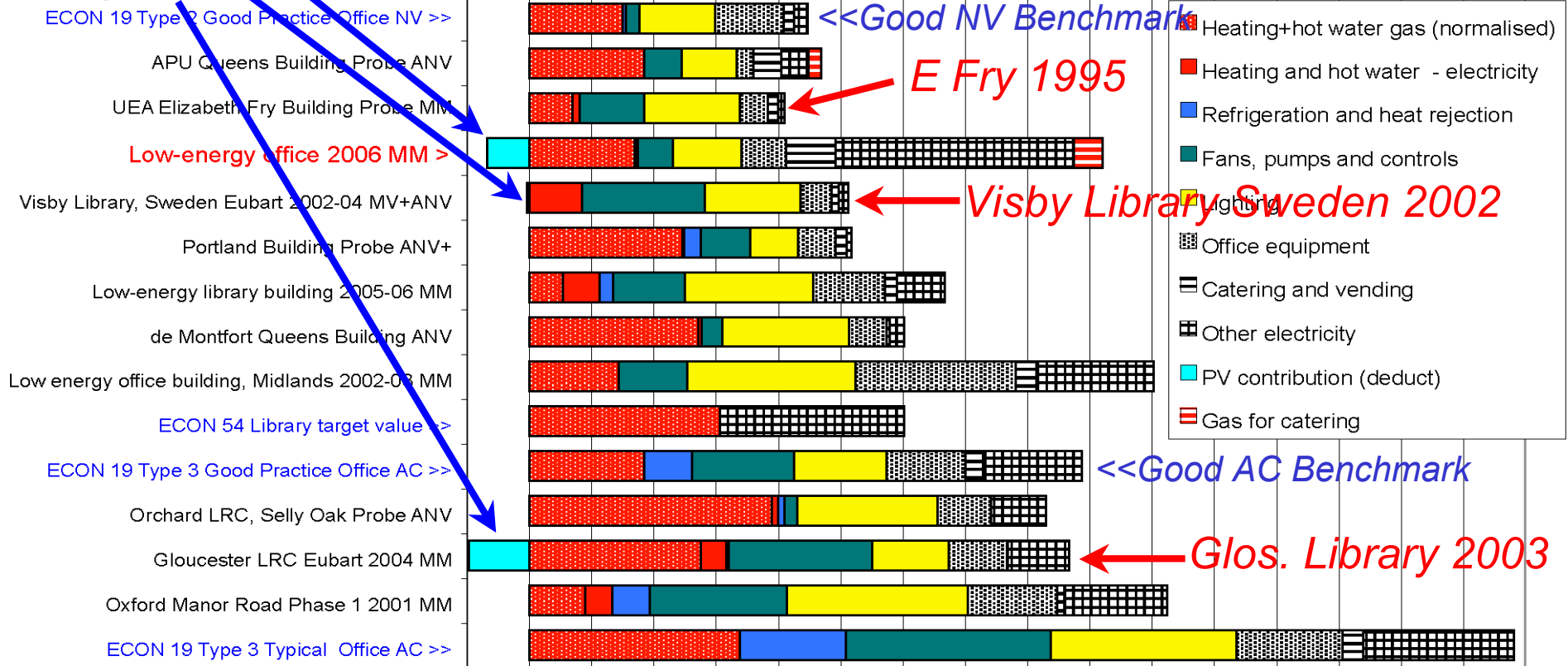
THE LAST DECADE: *Snakes and Ladders*

Annual CO₂ emissions from low-energy university and office buildings

kg CO₂/m² Treated Floor Area at UK CO₂ factors of 0.19 for gas and 0.55 for electricity

-10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160

*PV - subtract
this to get
imports*



SOURCE: Visby and Gloucester data from: *Eubart - Intelligent Buildings, Final technical brochure* (2004), figure 5.

Is requiring these a distraction
when we can't yet get the basics right?



Why aren't we doing better?

Things new professionals need to tackle

- Poor transparency between expectations and outcomes, *especially for energy performance, often for occupant satisfaction.*
 - Design intent is not made clear to the users, *especially in the design of controls and BMS systems.*
 - Designers don't follow through into operation, *so do not pass on knowledge and get things tuned up.*
 - There is very little feedback, *so we do not learn fast from emerging issues and unintended consequences.*
 - Many buildings are getting too complicated, *when we can't even do the simple things well.*
 - Modern procurement systems make it difficult to pay attention to critical detail. *Bad idea when promoting innovation.*
-

Designers' changing attitudes *to engagement with building performance*

1990-95

"We don't want to know. We can't admit we're not perfect."

1995-2000 *"The results are interesting, but they are from yesterday's projects. We've already learnt the lessons I'm sure."*

2000-2005 *"We would be interested in doing something, but only if somebody else pays for it. Can't you get money for more Probes?"*

2005-date

"Perhaps we should get some experience of this, it might be important."

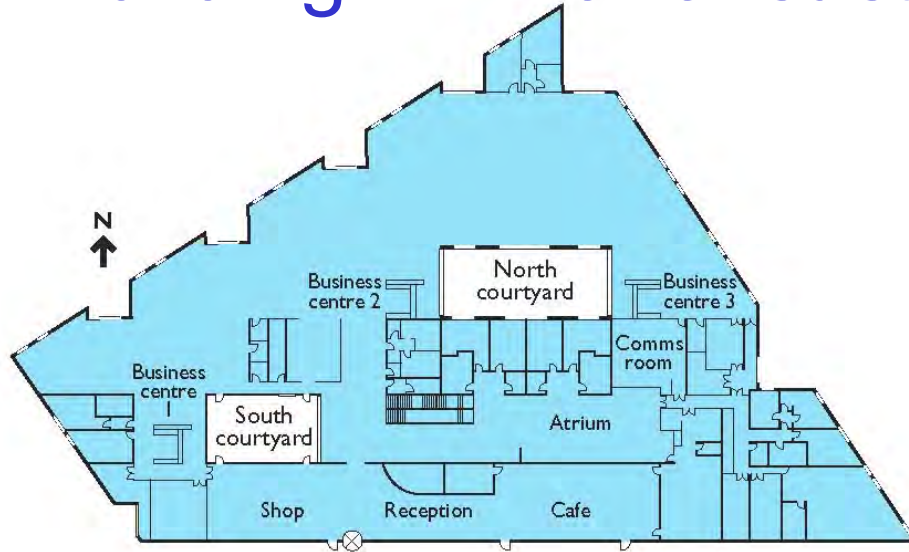
Today (at least for leading firms)

"If we don't understand outcomes better and meet expectations more reliably, we might not have much of a business in ten years' time."

Soft Landings: *Formative stages*

- **Late 1990s.** Architect Mark Way assists occupiers moving into a new office building designed when chairman of RMJM. Learns a lot and decides that the approach should be much more widely used.
- **Late 1990s.** After reviewing the Probe series of sixteen published Post-Occupancy Evaluations of recently-completed buildings, the Probe team and UBT advocates *Sea Trials* for new buildings, to help get them tuned up after handover and provide routine feedback.
- **2001.** Cambridge University Estates Department becomes interested in the process, which Mark Way then calls *Soft Landings*.
- **2002-04.** *Soft Landings* research led by Mark Way, with an industry group and UBT, with support from Cambridge Estates Department.
- **2004-07.** *Soft Landings* elements used on some projects, mainly by the research team members, *see following slides*.
- **2008.** BSRIA offers support by managing an industry group.
- **2009.** *Soft Landings* tested in case studies of school projects.

Pioneer Example: National Trust Heelis Building *Winner of sustainability awards*



Scheme design by Feilden Clegg Bradley Studios (architects), Max Fordham (building services), Adams Kara Taylor (structural).

Expectations Management:

Sustainability matrix approach used at Heelis

Sustainability Matrix: Offices

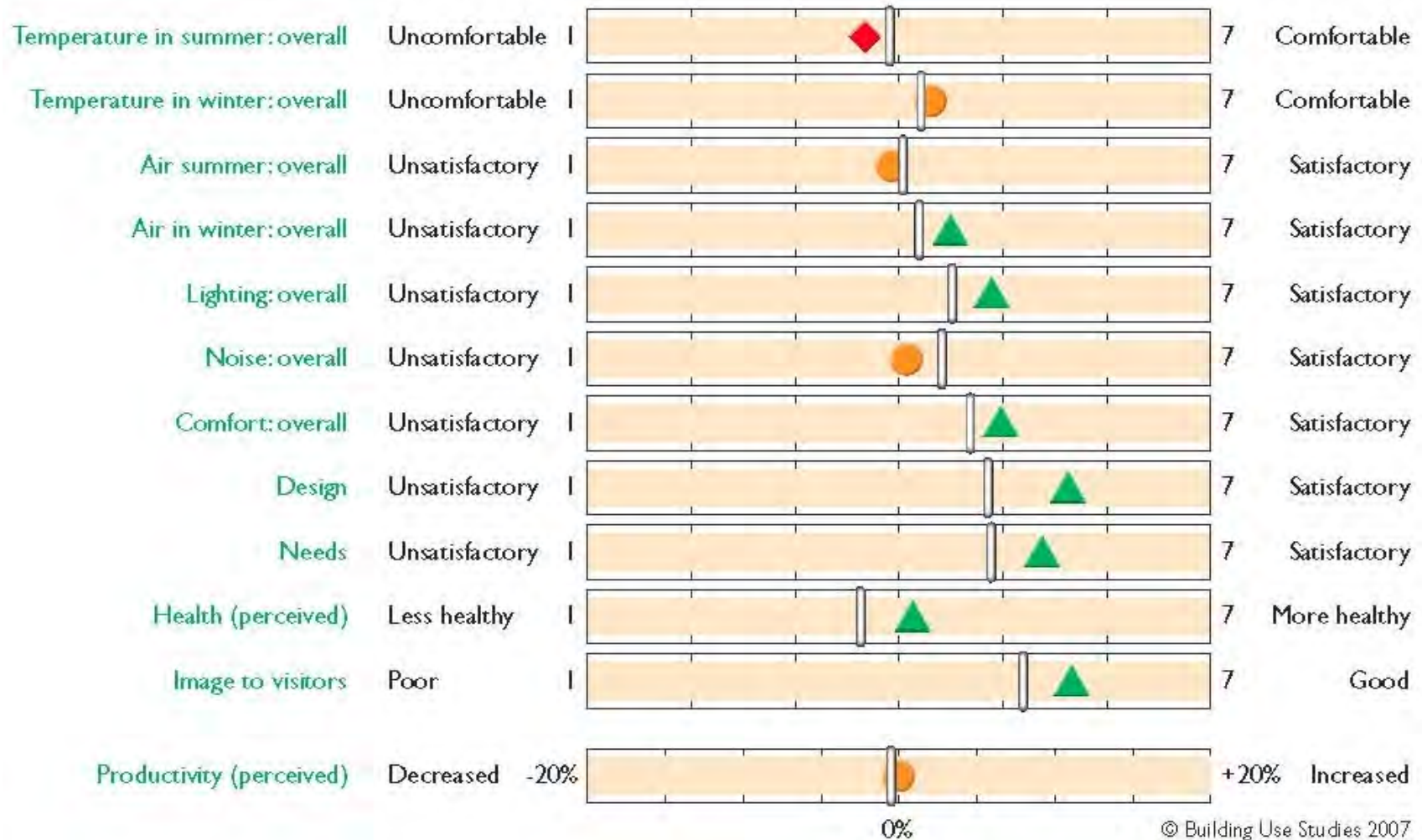
Feilden Clegg Bradley Architects LLP ©

Operational Energy Consumption and CO² Emissions

	1. GOOD PRACTICE	2. BEST PRACTICE	3. INNOVATIVE	4. PIONEERING	NOTES
1. CO² Emission Target	40kgCO ² /m ² /yr	30kgCO ² /m ² /yr	15kgCO ² /m ² /yr	"Carbon neutral" 0kgCO ² /m	Industry standard EEO targets
2. Heating Load Target	79kWhr/m ² /yr	47kWhr/m ² /yr	30kWhr/m ² /yr	20kWhr/m ² /yr	Industry standard EEO targets
3. Electrical Load Target	54kWhr/m ² /yr	43kWhr/m ² /yr	35kWhr/m ² /yr	25kWhr/m ² /yr	Industry standard EEO targets
4. U Values:					
Wall	0.35	0.25	0.2	0.1	good practice=current
Average Window	2.2	1.8	1.4	0.9	building regulations
Roof	0.2	0.18	0.15	0.1	pioneering=Bedzed values
Ground Floor	0.25	0.22	0.2	0.1	
5. Airtightness	<10m ³ /hr/m ²	<8m ³ /hr/m ²	<5m ³ /hr/m ²	<3m ³ /hr/m ²	All measures require careful attention to details and monitoring construction.
6. Ventilation	Natural ventilation where possible. Mechanical ventilation where not.	Designed natural ventilation with automatic openers, mechanical ventilation to WCs etc.	Mechanical ventilation with heat reclaim in winter and BMS controlled natural ventilation in summer.		BMS with manual overrides preferable on all windows.
7. On Site Energy Generation		Solar domestic water heating to WCs.	Solar domestic water heating to WC cores. Cost effective PV installation using PVs to shade rooflights. Gas fired CHP installation.	Solar water heating to kitchens. Maximum PV installation using most efficient PVs. Wood/waste fired CHP.	Potential 50% grant available from DTI for solar water heating, up to 65% for PV installation.
8. Daylighting	"Reasonable" to BS8206 part 2. A 2% daylight factor.	80% office space daylit to meet criteria of BS8206: part 2.	100% of office space daylit to BS8206 part 2		Ensure prevention of solar heat gain/glare by building form/shading systems
9. Artificial Lighting Controls	PIR detectors in WCs etc. Low energy fittings throughout.	Luminance and presence detectors throughout building. No dimming.	Luminance and presence detection at all fittings with dimming to zero and BMS override.		Personalised controls strongly recommended by Rob Jarman
10. Cooling Systems/Sources	Zero ozone depletion refrigerants in high efficiency comfort cooling/air conditioning systems.	Night time structural cooling with automatic window vents.	Evaporative cooling to rooms with high internal heat gains.	Borehole/ground water cooling to rooms with high internal heat gains.	Need to provide for areas where cooling is required and provide upgrade path for entire building.
11. Embodied Energy in Structural Materials	Steel and concrete frame engineered to minimise mass of materials.	Use of cement replacements eg GGBFS in concrete. Use recycled steel.	Timber structure in lieu of steel or concrete but retaining concrete floors. Use of recycled aggregates in structural concrete.	All timber structure with thermal mass provided using minimum amount of concrete.	NB. Rob Jarman particularly keen on use of timber for low embodied energy


POST-OCCUPANCY EVALUATION

BUS questionnaire survey at Heelis



SPREADING THE WORD:


Heelis designers report back in public



↪ Ba-graph-1-.jpg

↪ 2007-Study.jpg

Images



Building Analysis

So, how are you doing?

November 2007

Heelis, the National Trust's HQ in Swindon, is two years old. Senior engineer at Max Fordham Guy Nevill, who helped design it, takes a look at how it's been performing

By Guy Nevill

When the National Trust decided it needed a new headquarters to bring together staff from four different sites around the country, sustainability was a big part of the brief. The new building, Heelis, has now been in use for two years, so it is a good time to review how it is performing.

The Heelis complex, which covers about 7000m² and accommodates 470 people, was designed by architect Feilden Clegg Bradley with Max Fordham as M&E consultant. The site in Swindon once formed part of Isambard Kingdom Brunel's Great Western Railway Works. The total cost was £16.73 million.

GAINING CLIENT CONFIDENCE: *Heelis FM comments in 2007*

Heelis building facilities manager **Liz Adams** educated the staff on what to expect from their new home.

“We told users not to expect stable conditions. We call it a ‘layers building’ as it won’t suddenly react to changes in weather conditions, but take a while to heat up and cool down. So we remind people in September to bring in a cardigan.

“In the Autumn, when the outside temperature drops overnight, the building won’t necessarily react immediately. So out come the cardies.

“Comfort has been better in year two as the building has settled into a pattern. People are far more used to how the building’s systems work. The biggest problem is managing expectations about what the building will do in summer.

“We commissioned Max Fordham to carry out monitoring and fine tuning in the first two years. We have a good relationship with the design team – it’s been fantastic.”

What makes Heelis different?

- Contains elements of Soft Landings - *the architects, engineers and cost consultants were all on the original research team in 2002-04.*
 - A motivated client with clear environmental agenda, *including staff travel plan.*
 - Services engineer appointed for post-completion monitoring.
 - Motivated and proactive facilities manager.
 - Sustainability prize money spent on POE.
 - Participants prepared to publish warts and all.
 - Deficiencies in procurement system exposed: *the designers can't go it alone. Hence Soft Landings.*
-

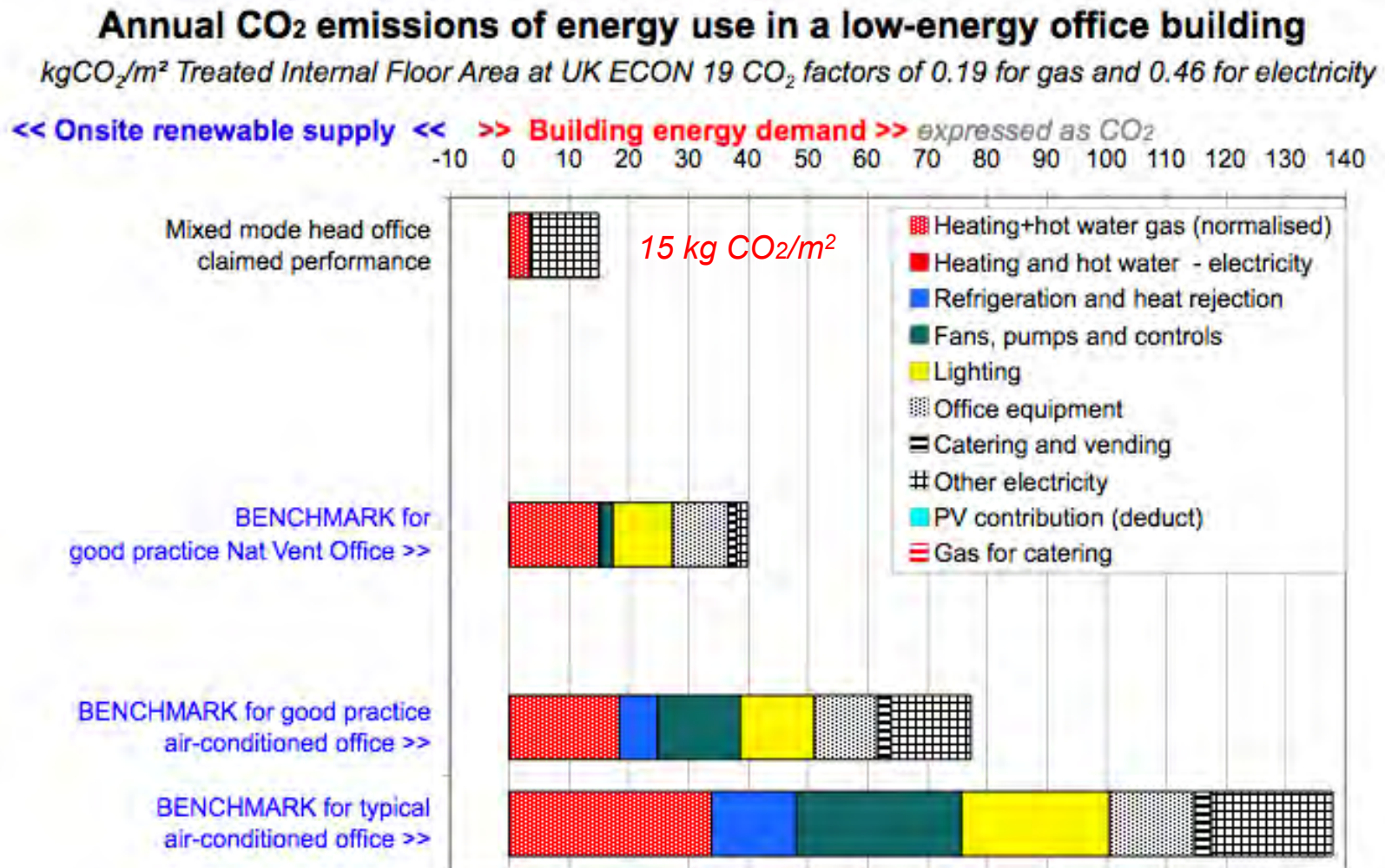
Seven strategic themes from Probe: *How does Heelis score?*

1. MEET NEEDS. Occupants like buildings that respond to them.
Better than normal, with aftercare, FM + continuous improvement.
2. MANAGEABILITY. Don't procure what you can't afford to manage.
Better than normal, partly thanks to aftercare and FM.
3. INTEGRATED. Comfortable buildings can be energy-efficient.
Better than normal, but work packaging caused controls problems.
4. CLEAR and ROBUST. Get the essentials right. *Put innovations on firm foundations. Procurement system affected attention to detail.*
5. REALISTIC ABOUT PROCESS. Buildings are more like ships than cars. *Partial success, but gaps from shifting responsibilities.*
6. SYSTEMIC INTERACTIONS. Promote virtuous circles.
Reality-checking and continuous improvement cycles.
7. REFLECTIVE PRACTICE. Review everything, as contexts evolve.
Yes, up to a point, and with participants sharing their experiences.

Soft Landings aims to add “*the golden thread*” ... MARK WAY

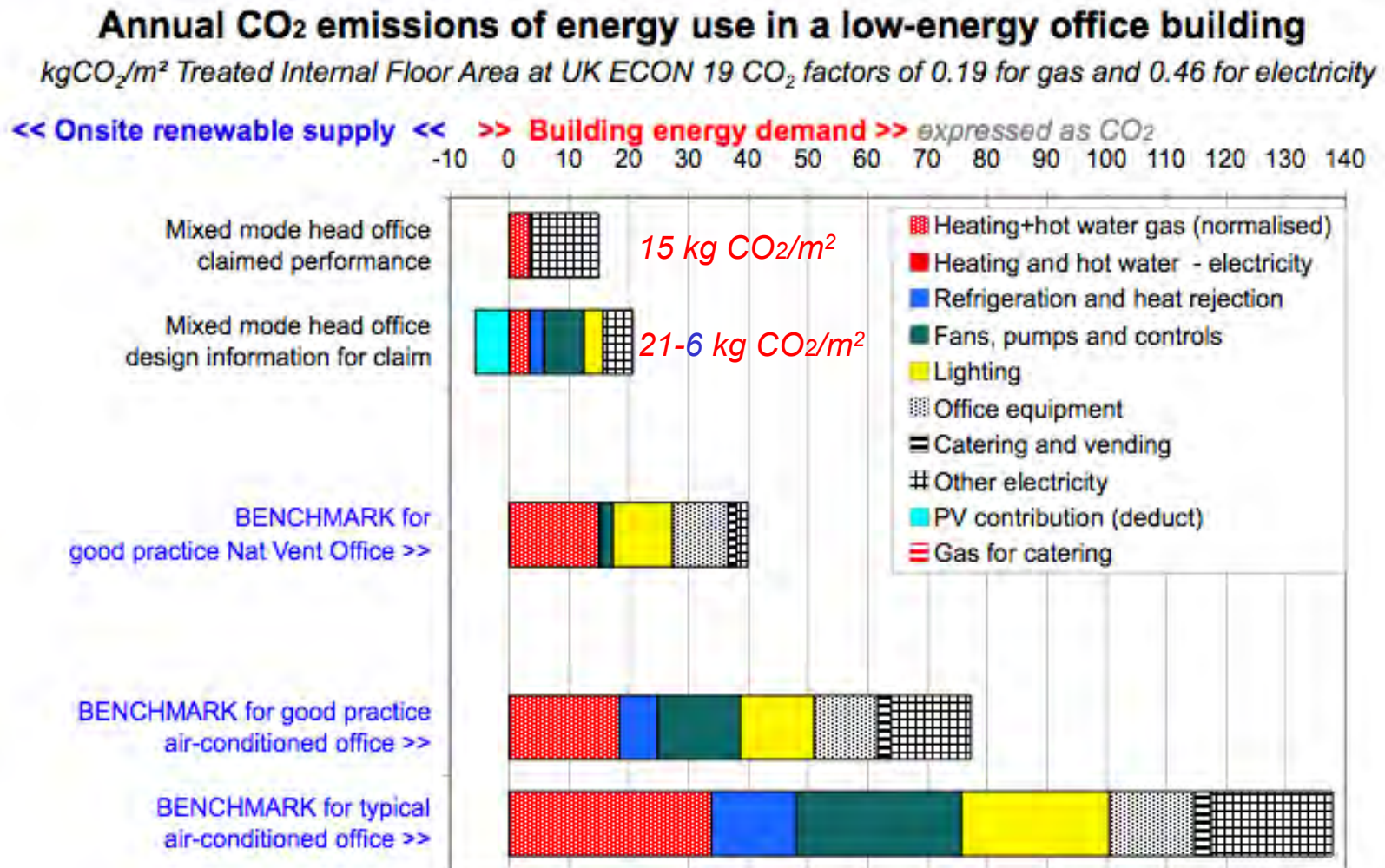
Expectations Management: an example

1: the design claim, as published



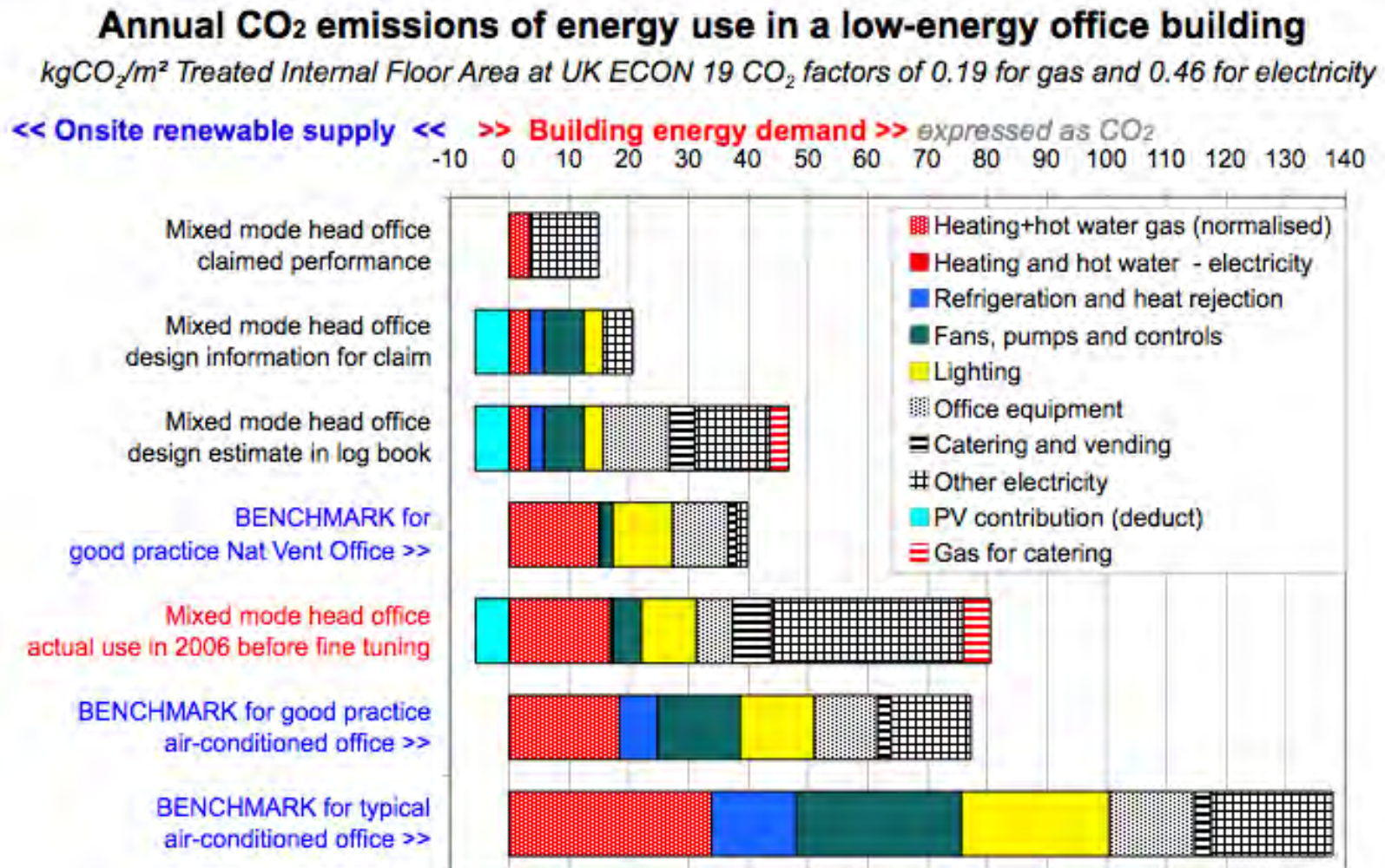
Expectations Management: an example

2: the basis for the design claim



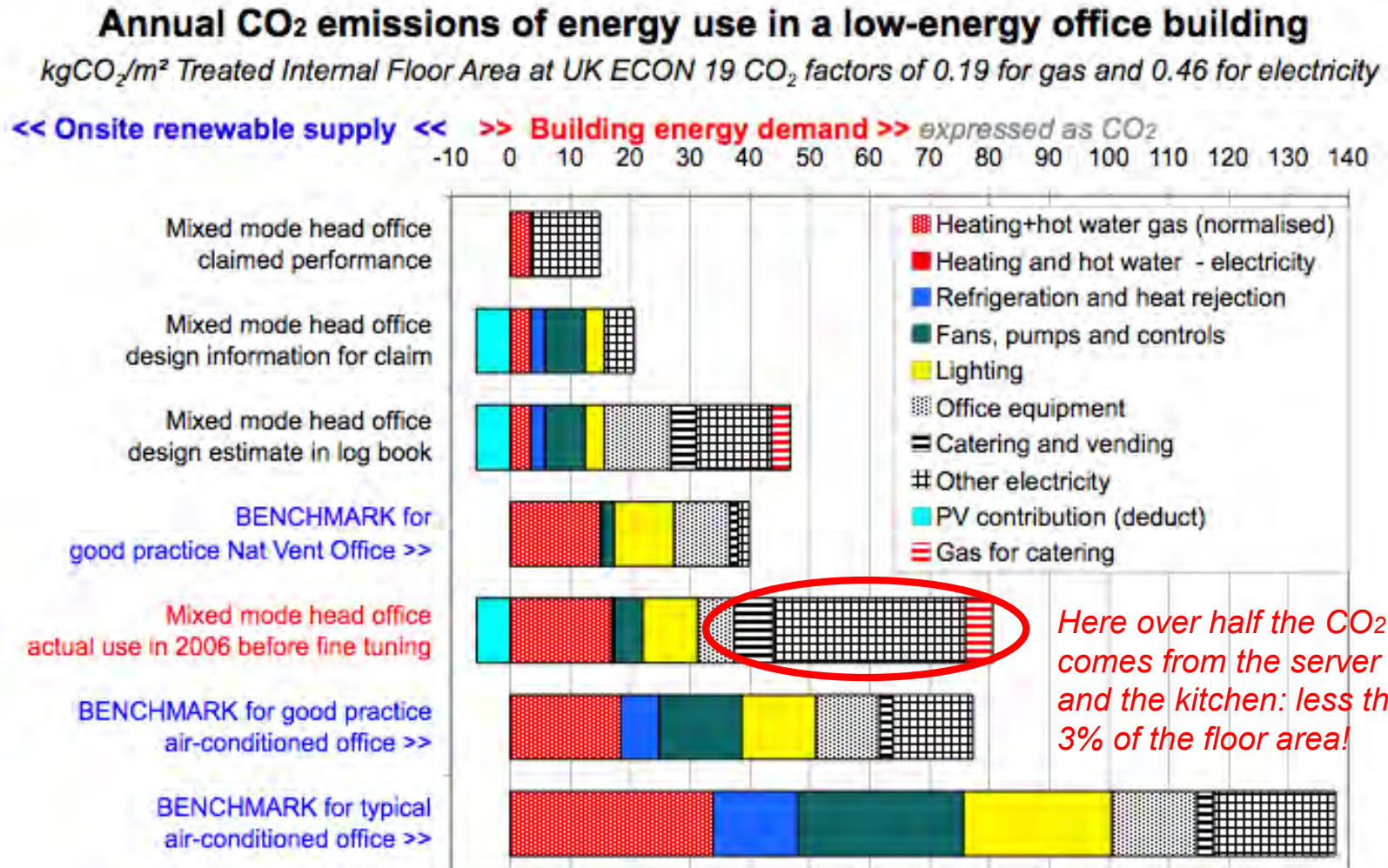
Expectations Management: an example

4: actual performance in use, before fine tuning

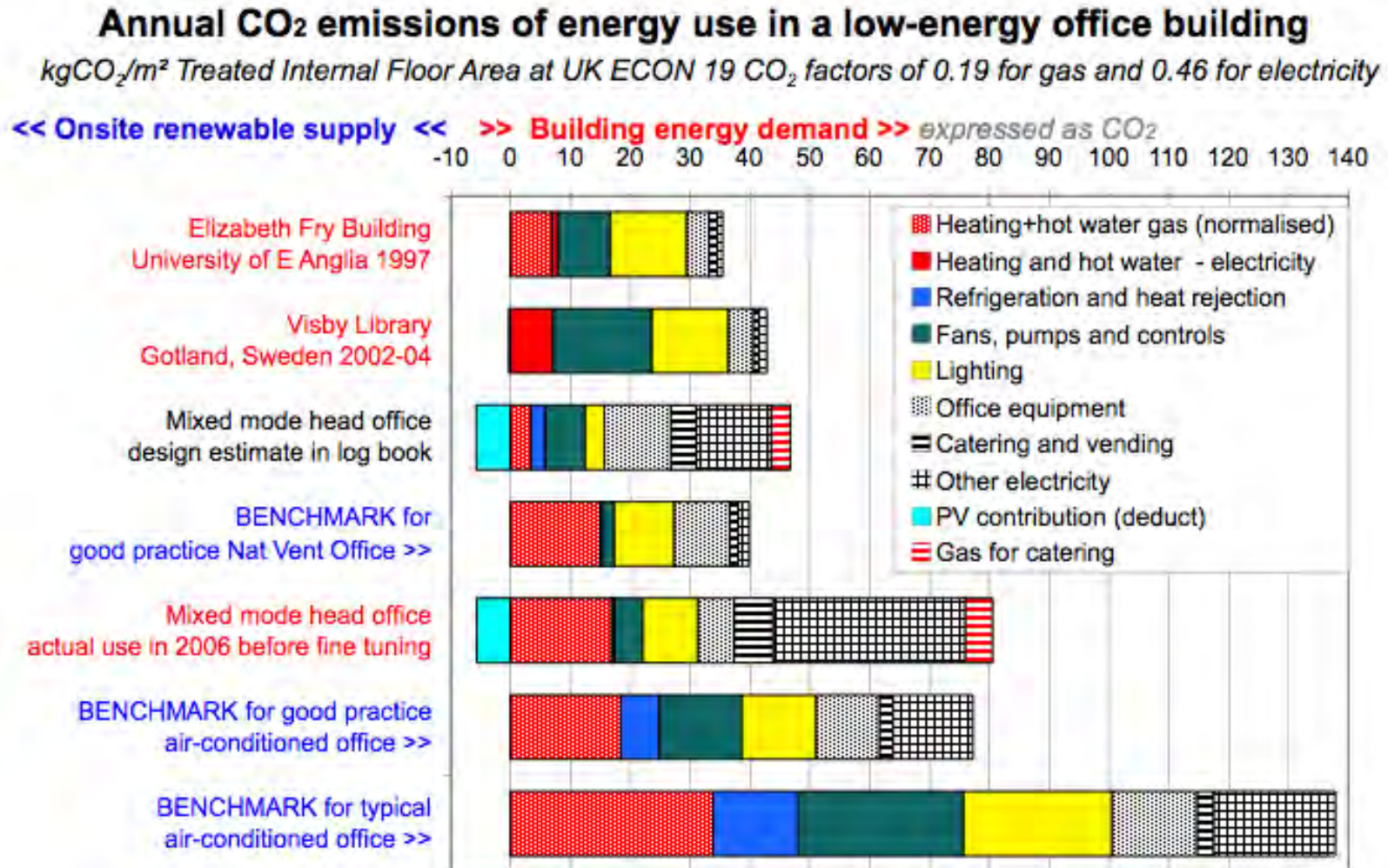


Expectations Management: an example

5: it's not all bad news, and the feedback is vital

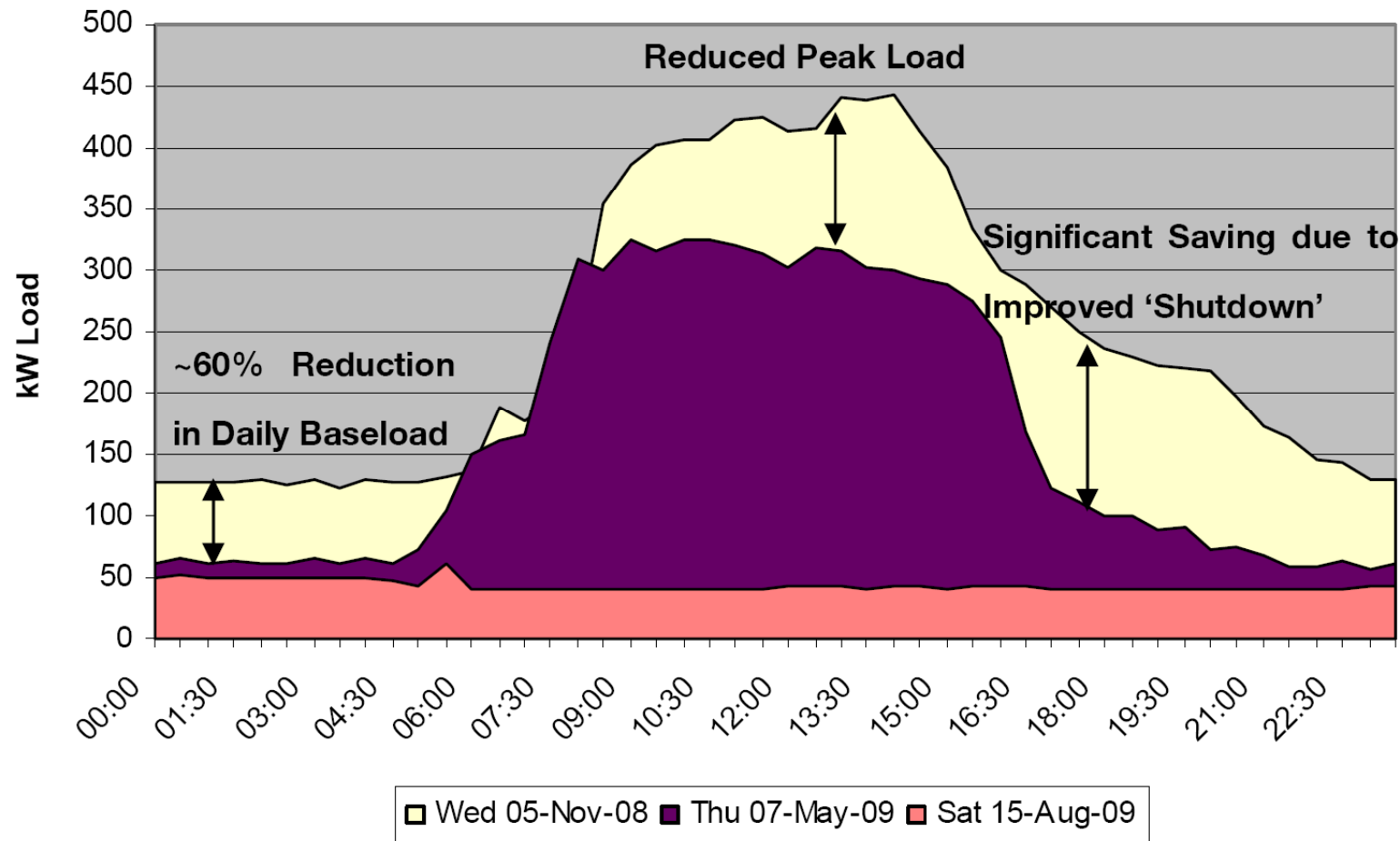


We must learn from the fine structure: 6: how it relates to two other low-energy buildings



Follow-through can pay for itself

Designer intervention in a relatively new school



Avoid unintended consequences, especially default to ON

Feeding forward in phased projects: *Window control improvements at Cambridge Maths building*

PHASE 1



- Difficult to understand
- Some poorly located
- Remote control problems



PHASE 2

- Improved, custom design
- Better located
- Not yet perfect

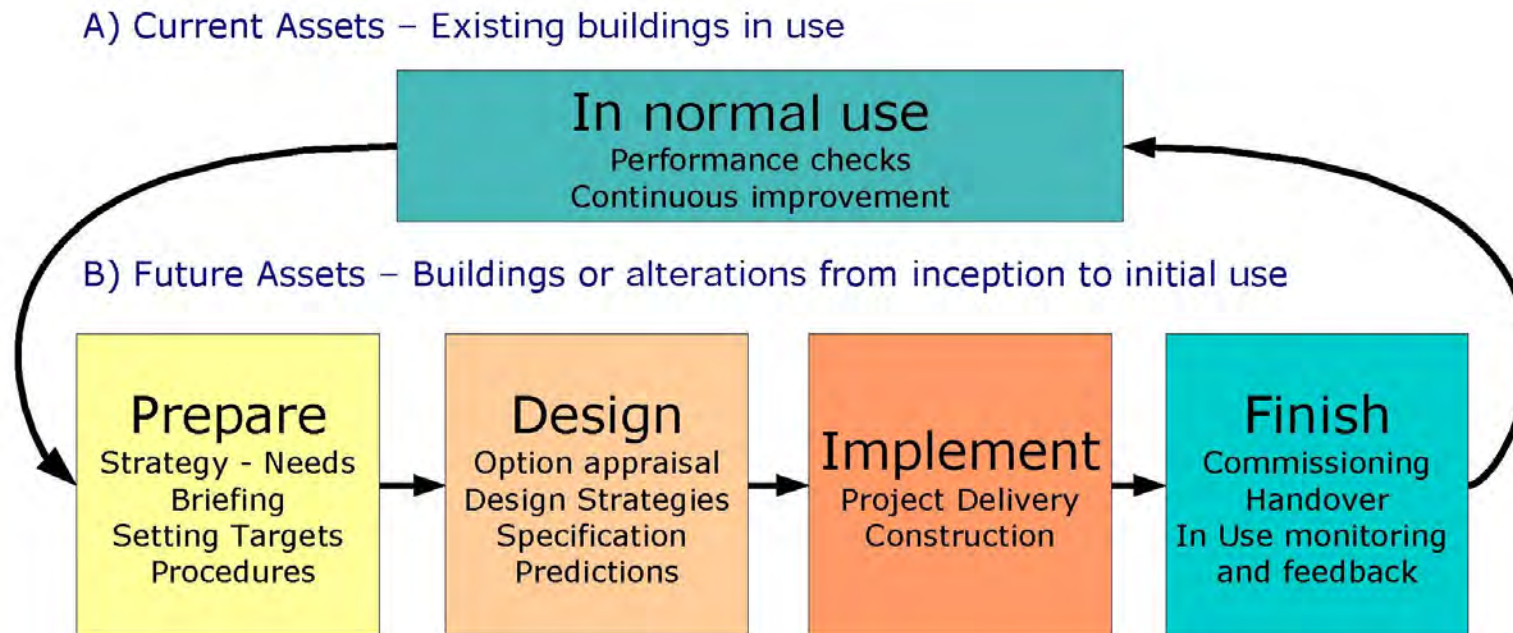


THE FUTURE: What we need to do:

Tune into outcomes ... and fast!

- Clients are getting more interested in performance.
We need to set realistic expectations and manage them through the design and production process, and into use.
 - Sustainability requires much more focus on achieved performance.
And not just of the regulated items designers currently regard as being their responsibility - this misses many opportunities.
 - Government is asking us to jump through many hoops - we need to understand what really adds value and what needs to be improved.
For the planet's sake, we can't afford to invest in the wrong things.
 - Things are changing fast, so we need rapid feedback on how well things are actually working. We must learn as much as possible from our own experiences, and share them with others.
We no longer have the time to rely on somebody else doing it for us.
 - To understand **how** things happened, **we need stories, not just data.**
-

THE FUTURE: *Closing the loop, making BPE, follow-through and Feedback routine*



You can use POE at any stage in the life cycle of a building or project

HINDSIGHT: After you've completed a project (*learning and fine tuning*)

FORESIGHT: Before you do something new (*existing situation + analogues*)

INSIGHT: At any time (*reality checking, managing expectations*).

*Our processes need to bring it all together, and reinforce the **Finish** stage*

How can we do all this?

Soft Landings may be able to help

It augments the duties of the design and building team, (*and of client representatives*), especially:

- During the critical briefing stage.
- With closer forecasting of building performance.
- With greater involvement with users before and after handover, and on-site presence during settling-in; and
- including monitoring and review for the first 3 years of use.

It can:

- *Be used on any project, in any country, with any procurement route.*
- *Provide a fast track to raising building performance.*
- *Help to provide more customer focus for the industry.*
- *Improve client relationships and user satisfaction.*
- *Build recognition that some debugging is to be expected.*

It is primarily about a change in attitude.

It needs champions to take it forward - The new professionals.

THE FUTURE: New professionals *follow through design intent into reality*

- They understand what is needed *strategic briefing*
- Are clear what they want, and communicate it plainly *strategic design*
- Are ambitious, but realistic *question all assumptions, understand users*
- Follow things right through *e.g. using **Soft Landings** procedures*
- Review what they do *manage expectations, undertake reality checks*
- Are clear what they are after *specify: what, why and how*
- Check that things will work *technical feasibility, usability and manageability*
- Get things done well *communicate, train, inspect*
- Finish them off *commission, operational readiness, handover, dialogue*
- Help the users to understand and take ownership *provide aftercare support*
- Review performance in use *including **post-occupancy evaluation***
- Work with occupiers to make things better *monitoring, review and fine tuning*
- Anticipate and spot unintended consequences *revenge effects*
- Learn from it all *and share their experiences*

KEEP IT SIMPLE AND DO IT WELL

*Roderic Bunn will tell you how **SOFT LANDINGS** can help*

WAKE UP! BE PROFESSIONAL!

Demonstrate your real value



Roderic Bunn
will give you more details later

the **SOFT LANDINGS FRAMEWORK**
for better briefing, design, handover and building performance in-use



Find out more *and download the Soft Landings Framework* - free at
www.usablebuildings.co.uk
www.softlandings.org.uk

PRESENTATION ENDS

The following slides may however be used to introduce Soft Landings if Roderic Bunn's talk does not follow this introduction.

A video of these was also recorded by Tony Walsh on 30 September 2010, following the main filming.

Soft Landings: the Five main stages

From the Framework published in July 2009

1. Inception and Briefing
*Appropriate processes.
Assigned responsibilities.
Well-informed targets.*
2. Design development
and expectations management.
3. Preparation for handover
better operational readiness.
4. Initial aftercare
*Information, troubleshooting,
fine tuning, training.*
5. Longer-term aftercare
*monitoring, review, independent
POE, feedback and feedforward.*



the **SOFT LANDINGS FRAMEWORK**
for better briefing, design, handover and building performance in-use



Soft Landings **Stage 1:** *Inception and briefing*

- **The most important stage**, because it binds the team and sets the whole style of engagement with outcomes.
 - However, clients have been reluctant to pay, thinking that the industry ought to be doing it anyway.
 - And modern procurement methods have often salami-sliced things and made it difficult to maintain *the golden thread* through a project and into use. *Project management aspects are therefore coming to the fore.*
 - *Some clients are writing it into their briefs.*
 - *Some PFI teams are starting to put it into their bids.*
 - *Some designers want it to be in their standard service.*
-

Soft Landings **Stage 2:** *Review during design and construction*

- Set stretching but realistic expectations.
 - Manage them through the process.
 - Undertake regular reviews and reality-checks.
 - Take proper account of usability and manageability and consult with occupiers.
 - One may need a *Soft Landings Champion* to make sure this is not forgotten, *e.g. to cajole the project manager.*
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Soft Landings Stage 3: *Preparation for handover*

- **A change in concept:** Handover becomes an event within an extended *Finish* stage, not the point at which the design and building team sign off and walk away.
 - **Preparation for operational readiness** includes not just the static and dynamic commissioning of the fabric and building services, but much closer engagement with the occupier's move-in and their management and maintenance team, *if they have one*.
 - **Preparation for aftercare**, with representatives of the design and building team on site after handover. *The time allocation depends on the size and complexity of the project - it might be one person for half a day a week, or much more.*
 - **If there is unfinished business**, e.g. owing to a forced early handover, then the *golden thread* is easily carried through into STAGE 4: initial aftercare and fine tuning.
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Soft Landings Stage 4: *Initial aftercare*

- **Design and building team members visit regularly:** *who and how many visits will depend on project.*
 - **They need a home in the building where they are visible to occupants,** *not be hiding in the site hut.*
 - **They explain the building to the users,** *in simple guides and in one or two introductory events.*
 - **They help the management to take ownership,** *the occupier must take the initiative, not stand back.*
 - **They keep people informed,** *e.g via a newsletter on the organisation's website, e.g. alerting to any problems.*
 - **Troubleshooting and fine tuning can be undertaken,** *the best insights have been where the soft landings team does some of its own work in the building and experiences its facilities.*
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Soft Landings Stage 5: *Monitoring, evaluation and feedback*

- **Extended aftercare period**, typically two or three years.
 - **Occupiers must take ownership** and do most of the monitoring themselves. *They may need motivating.*
 - **Independent post-occupancy evaluation can be included**, e.g. for occupant surveys, energy analysis, and structured discussions. *Independent review and benchmarking can be very helpful and reassuring.*
 - **The findings can be fed through rapidly**, e.g. to fine tune the systems, refine the use and operation of the building and in plan upgrades.
 - **The learning can also be spread much more widely**, via the people and organisations involved, and beyond.
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Soft Landings: *Everybody can win*

- Better communication, *fewer nasty surprises*
- More effective building readiness. *Less rework.*
- Natural route for feedback and Post-occupancy evaluation, *to improve the product and its performance in use.*
- Teams can develop reputations for customer service and performance delivery, *building relationships, retaining customers, commercial advantage.*
- Vital if we are to progress towards more sustainable, low-energy, low-carbon buildings and refurbishments, *closing the credibility gaps.*

However:

- **ATTITUDES:** *Everybody needs to be committed, starting with the client. Perhaps the biggest obstacle. The “golden thread” needs to stay in place.*
 - **PROCESSES:** *There is a learning curve to pay for (probably best from marketing budgets), and the feedback has to be managed.*
 - **TECHNIQUES:** *Independent POE surveys cost money (but not much).*
 - **CAPACITY:** *we need facilitators, investigators, troubleshooters and fixers.*
 - **MONEY:** *particularly finding any after practical completion.*
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